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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# CSM/LM SPACECRAFT OPERATIONAL DATA BOOK

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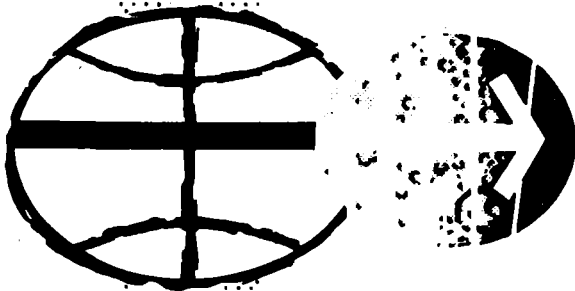
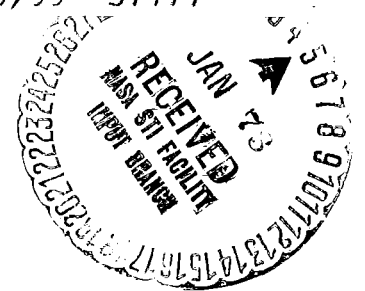
## VOLUME III MASS PROPERTIES

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MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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CSM/LM SPACECRAFT OPERATIONAL DATA BOOK

VOLUME III  
MASS PROPERTIES DATA BOOK


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## PREFACE

This document is the third revision issue of the Mass Properties Data Book. In this revision Missions "C", "C-Prime", "D", "F", "G", "H1", "H2", and "H3" have been deleted. The third revision incorporates Amendments 1 through 101, except those amendments associated with Missions "C", "C-Prime", "D", "F", "G", "H1", "H2", and "H3". Amendments released subsequent to publication of this Mass Properties Data Book, Revision 3, will be numbered sequentially with the next revision number (i.e., 102 and on).

In addition, Section 3.1, Mission J1 has been updated in this revision to include the latest sequential mass properties, propellant loads, transferable equipment mass properties, and trapped propellants. The LM-10 trapped propellants contained in Section 5.6 have also been updated.



VOLUME III

MASS PROPERTIES DATA BOOK

- 1.0 Introduction
- 2.0 Configuration and Reference Station Locations
- 3.0 Mass Properties and Loading Data by Mission
  - 3.1 Mission J1
  - 3.2 Mission J2
  - 3.3 Mission J3
  
- 4.0 CSM Reference Consumables Mass Properties Data
  - 4.1 SPS Tank Consumables Mass Properties, Trapped Propellants, SPS Density Equations and Graphs, and SPS Loading Windows
  - 4.2 RCS/ECS/EPS Consumables Mass Properties
  - 4.3 CSM RCS Load Calculation Tables and Loading Windows
  - 4.4 CM Ablator Data
  
- 5.0 LM Reference Consumables Mass Properties Data
  - 5.1 LM Descent Tank Mass Properties
  - 5.2 LM Ascent Tank Mass Properties
  - 5.3 LM RCS Tank Mass Properties
  - 5.4 LM Descent Water Tank Mass Properties
  - 5.5 LM Ascent Water Tank Mass Properties
  - 5.6 LM Trapped Consumables

## 1.0 INTRODUCTION

### 1.1 SCOPE

The complete Spacecraft Operational Data Book for the manned missions will consist of six separate volumes. These are defined as follows:

Volume I - CSM Data Book

Part I - Constraints and Performance  
Part II - Launch Mission Rule Redlines

Volume II - LM Data Book

Part I - Constraints and Performance  
Part II - Launch Mission Rule Redlines

Volume III - Mass Properties Data Book

Volume IV - EMU Data Book

Volume V - ALSEP Data Book

Volume VI - CSM EXPERIMENT Data Book for J-Missions

Volume VII - LCRU/GCTA Data Book

Volumes I and II present operational information on the capabilities and limitations of the spacecraft. A brief discussion of the purpose and scope of Volume III follows:

### 1.2 PURPOSE

The purpose of this document is to provide spacecraft mass properties data per mission for use in the mission planning activities, trajectory documentation, mission simulations, and to provide all necessary information and documentation for consumable loading. The data contained herein represent the latest predictions for the launch configuration mass properties and consumable loadings. Updates to these data will be provided based on the actual weight and balance data for each spacecraft. Mass properties data will be maintained and updated through the actual consumables loading.

Section 2.0 presents relevant spacecraft configuration drawings and station locations which may be useful in describing the location of various spacecraft components and the relationship of coordinate systems in the launch and docked configuration.

Section 3.0 presents mass properties and consumable loading data for each mission. Included in this section are the predicted mass properties for the launch configuration, the docked configuration, the normal entry, and for launch aborts.

Sections 4.0 and 5.0 contain consumables mass properties data and mission independent consumable loading information for the CSM and LM, respectively. In addition, CM ablator material data are provided in Section 4.0 to aid the user in determining CM mass properties during reentry.

Amendments to this document will be made by page additions or replacements. Data changed by an amendment will be denoted by an amendment date in the upper right hand corner and a vertical bar in the page margin to locate the change.

TABLE 1-1  
SELECTED ABBREVIATIONS AND ACRONYMS

ACT	Activation
ACQ	Acquisition
ALIGN	Alignment
ANG	Angle
ASCT	Ascent
APS	Ascent Propulsion Subsystem
A/S	Ascent Stage
ASSY	Assembly
BIOINST	Bioinstrumentation
CANN	Cannister
CAM	Camera
CK	Check
CIRC	Circularization
CSC	Close-Up Stereo Camera
COMPT	Compartment
CDR	Commander
CM	Command Module
CMP	Command Module Pilot
CSM	Command Service Module
COMM	Communication
CSI	Concentric Sequence Initiation
CWG	Constant Wear Garment
CONT	Container
CLSRC	Contingency Lunar Sample Return Container
DSEA	Data Storage Electronic Assembly
DECONTAM	Decontamination
DEPL	Depletion
DSCT	Descent
DOI	Descent Orbit Insertion
DPS	Descent Propulsion Subsystem
D/S	Descent Stage
DOCK	Docking
EOI	Earth Orbit Insertion
ELECT	Electrical
ECU	Environmental Control Unit
EQUIP	Equipment
EXCL	Exclude
EXC	Excursion
EXP	Experiment
EV	Extravehicular
FWD	Forward
HASS	Hasselblad
INDIC	Indicator
INFLT	In-Flight

TABLE 1-1 (CONTINUED)

ICG	In-Flight Coverall Garment
IV	Intravehicular
JETT	Jettison
LES	Launch Escape System
LEV	Launch Escape Vehicle
LV	Launch Vehicle
LH	Left Hand
LEB	Left Hand Equipment Bay
LIQ	Liquid
LEC	Lunar Equipment Conveyor
LM	Lunar Module
LOI	Lunar Orbit Insertion
LS	Lunar Surface
LMP	LM Pilot
LUN	Lunar
MC	Main Chute
MECH	Mechanism
MCC	Midcourse Correction
N/A	Not Available
OPS	Oxygen Purge System
PR	Pair
PGA	Pressure Garment Assembly
PROC	Procedure
RAD	Radiation
RCS	Reaction Control System
RELOC	Relocation
RESTR	Restraint
RT	Right
RH	Right Hand
RHEB	Right Hand Equipment Bay
SRC	Sample Return Container
SCRS	Scissors
SEP	Separation
SM	Service Module
SLA	Service Module LM Adapter
SPS	Service Propulsion System
S/C	Spacecraft
STG	Stage
STORE	Storage Tank
STOW	Stowage

TABLE 1-1 (CONCLUDED)

SUBSYS	Subsystem
SUMP	Sump Tank
SURF	Surface
SYS	System
RSS	Root Sum Square
TEMP	Temporary
TBD	To Be Determined
TEI	Tranearth Insertion
XFR	Transfer
TLI	Translunar Insertion
TRANS	Transposition
TRANS/DOCK	Transposition and Docking
UMB	Umbilical
UPR	Upper
UEB	Upper Equipment Bay
UCTA	Urine Collection Transfer Assembly
WT	Waist Tether
W/	With
W/O	Without

## 2.0 CONFIGURATION

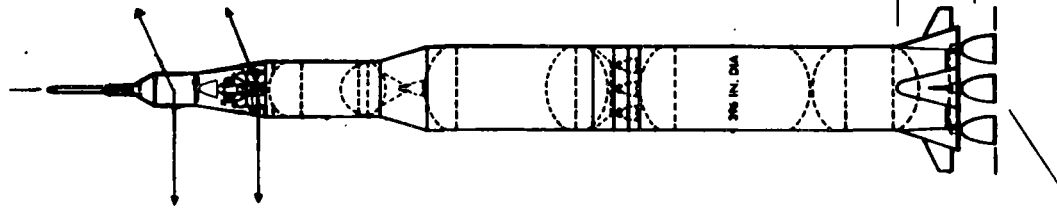
This section provides relevant spacecraft configuration drawings and station locations which may be useful in describing the location of various spacecraft components and the relationship of coordinate systems in the launch and docked configuration for Block II CSM spacecraft and Lunar Modules.

Configuration data are presented in the following categories and order:

1. Apollo Vehicle Coordinate System.
2. Saturn V Vehicle Outboard Profiles and Reference Dimensions.
3. Apollo Spacecraft Reference Stations, Thrust Chamber Locations, and CSM Consumables Tank Locations.
4. Lunar Module Reference Stations, Thrust Chamber Locations and LM Consumables Tank Locations.

Consumables mass properties data for the CSM and LM may be found in Sections 4.0 and 5.0, respectively, of this volume. These consumables mass property data must be compared to the onboard consumable loading data for each mission in Section 3.0 to determine the actual mission tanked consumables mass properties.

ALL AXES +X



- NOTES:
- DYNAMICAL AXES ORIGIN, THE DYNAMICAL AXES ORIGINS ARE LOCATED AT THE CENTER OF MASS FOR EACH CONFIGURATION.
  - STRUCTURAL AXES ORIGIN.
    - THE LAUNCH VEHICLE STRUCTURAL AXIS ORIGIN IS 100 INCHES BELOW THE S-1C GIMBAL REFERENCE PLANE.
    - THE CSM STRUCTURAL AXIS ORIGIN IS 1000 INCHES BELOW THE MOLD LINE OF THE HEAT SHIELD MAIN STRUCTURE ABLATION INTERFACE.
    - THE LM STRUCTURAL AXIS ORIGIN IS 200 INCHES BELOW LM ASCENT STAGE BASE.
  - MASS PROPERTIES AXES ORIGIN.
    - THE SPACECRAFT MASS PROPERTIES AXIS ORIGIN IS COINCIDENT WITH THE CSM STRUCTURAL AXIS ORIGIN.
    - THE LAUNCH VEHICLE MASS PROPERTIES AXIS ORIGIN IS COINCIDENT WITH ITS STRUCTURAL AXIS ORIGIN.

CSM AXES  
STRUCTURAL  
DYNAMICAL  
MASS PROPERTIES  
+Y

LM AXES  
STRUCTURAL  
DYNAMICAL  
MASS PROPERTIES  
+Y

CSM AXES  
STRUCTURAL  
DYNAMICAL  
MASS PROPERTIES  
+Z

LM AXES  
STRUCTURAL  
DYNAMICAL  
MASS PROPERTIES  
+Z

DIRECTION OF LAUNCH ("TARGET")  
LAUNCH VEHICLE AXES

STRUCTURAL +Z  
DYNAMICAL +Z  
MASS PROPERTIES -Z

LAUNCH VEHICLE AXES  
STRUCTURAL +Y  
DYNAMICAL +Y  
MASS PROPERTIES -Y

AXIS	AXIS SYMBOL	MOMENT SYMBOL	POSITIVE* ROTATION	LAUNCH VEHICLE ANGLE	CSM ANGLE	LM ANGLE	ANGLE SYMBOL	LINEAR VELOCITY	ANGULAR VELOCITY
LONGITUDINAL	X	L	+Y TO +Z	ROLL	ROLL	ROLL	$\phi$	u	p
TRANSVERSE (PITCH)	Y	M	+Z TO +X	PITCH	PITCH	PITCH	$\theta$	v	q
TRANSVERSE (YAW)	Z	N	+X TO +Y	YAW	YAW	YAW	$\psi$	w	r

\*POSITIVE ROTATIONS ARE DEFINED USING AXES FOR VEHICLE BEING CONSIDERED  
 $\theta$ CSM,  $\psi$ LM,  $\phi$ LV

FIGURE 2-1. VEHICLE COORDINATE AXES AND NOTATION SYSTEM



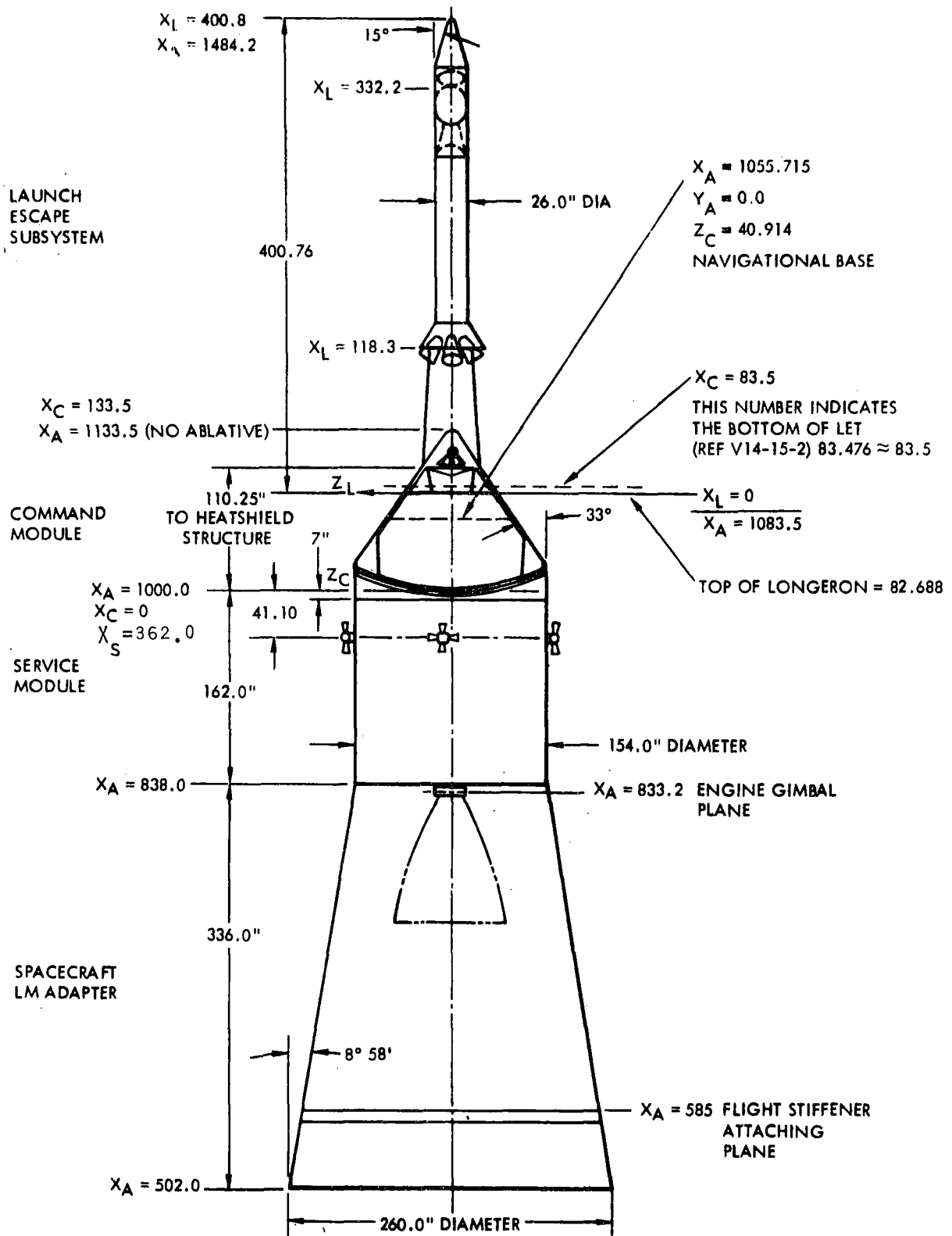


FIGURE 2-2. APOLLO SPACECRAFT REFERENCE DIMENSIONS

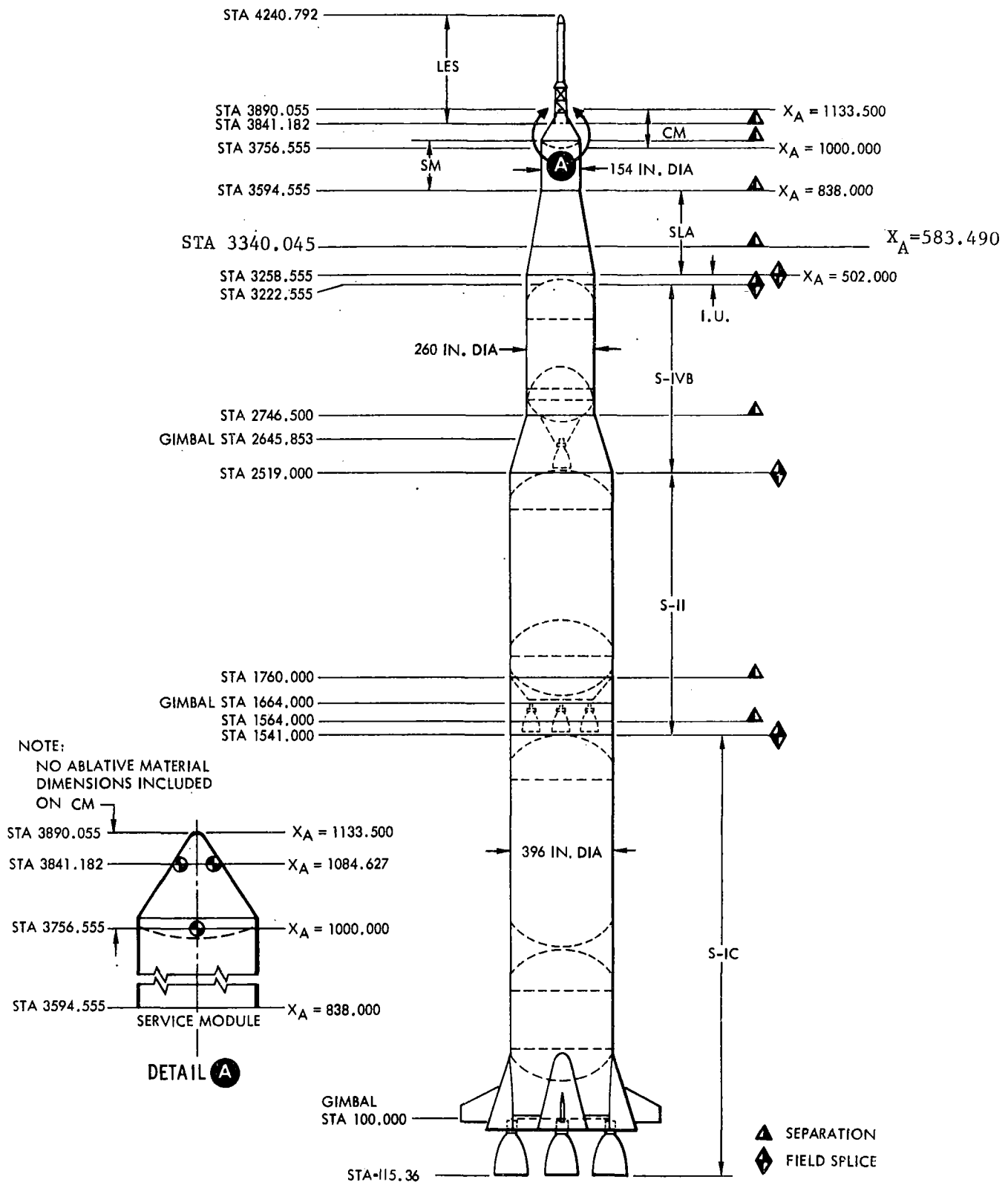


FIGURE 2-3. SATURN V/APOLLO CONFIGURATION

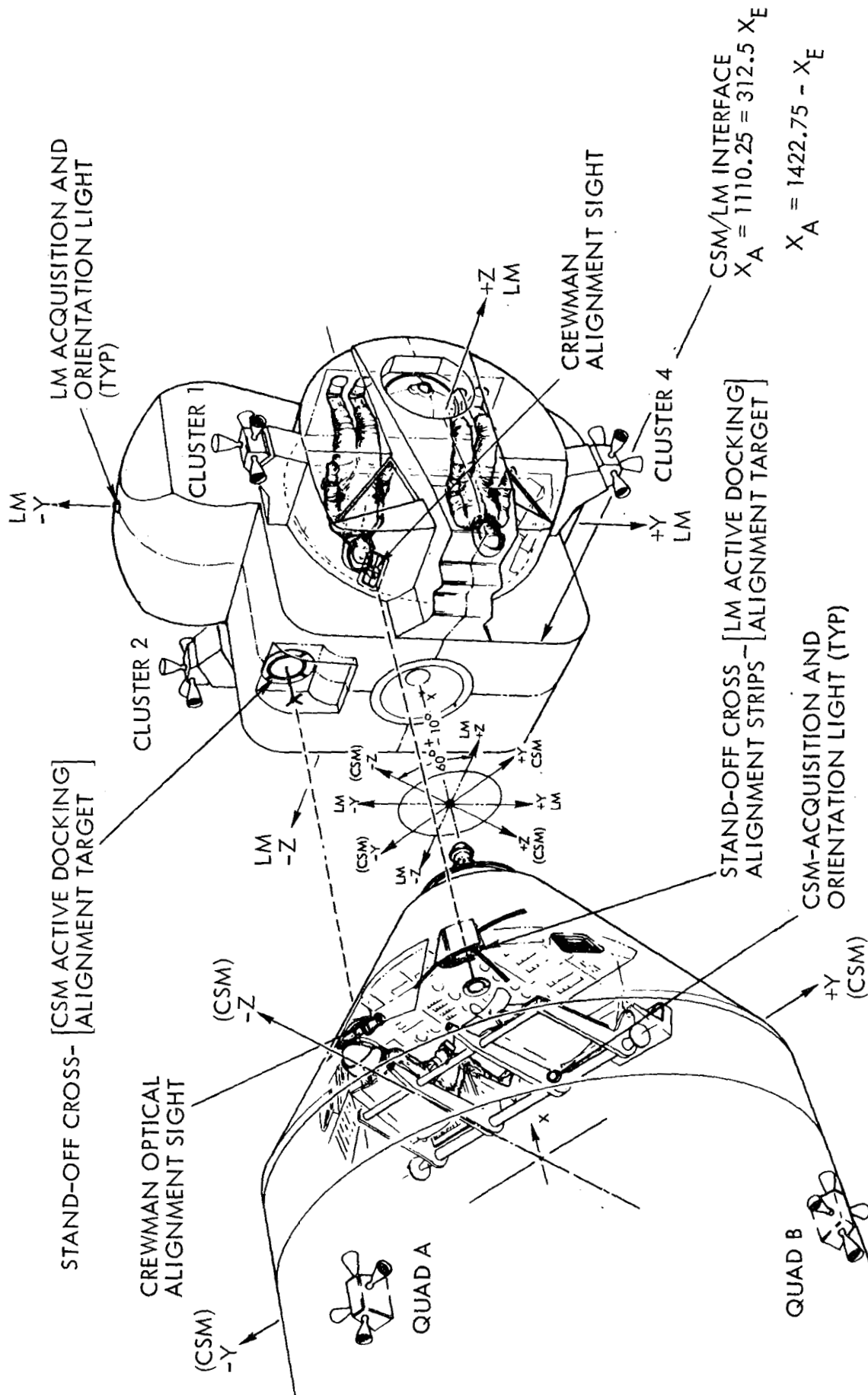


FIGURE 2-4. LM/CSM DOCKED ORIENTATION

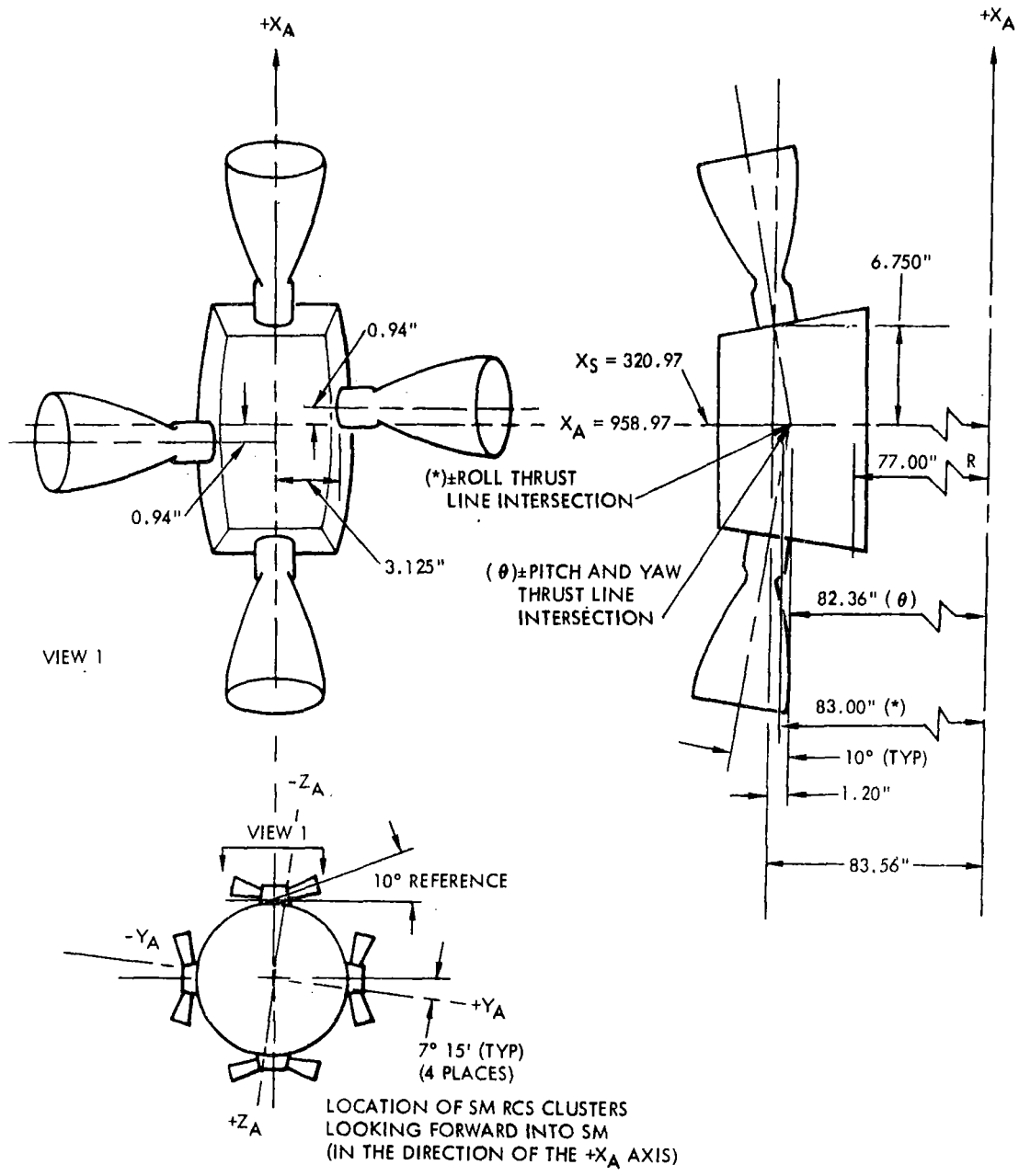
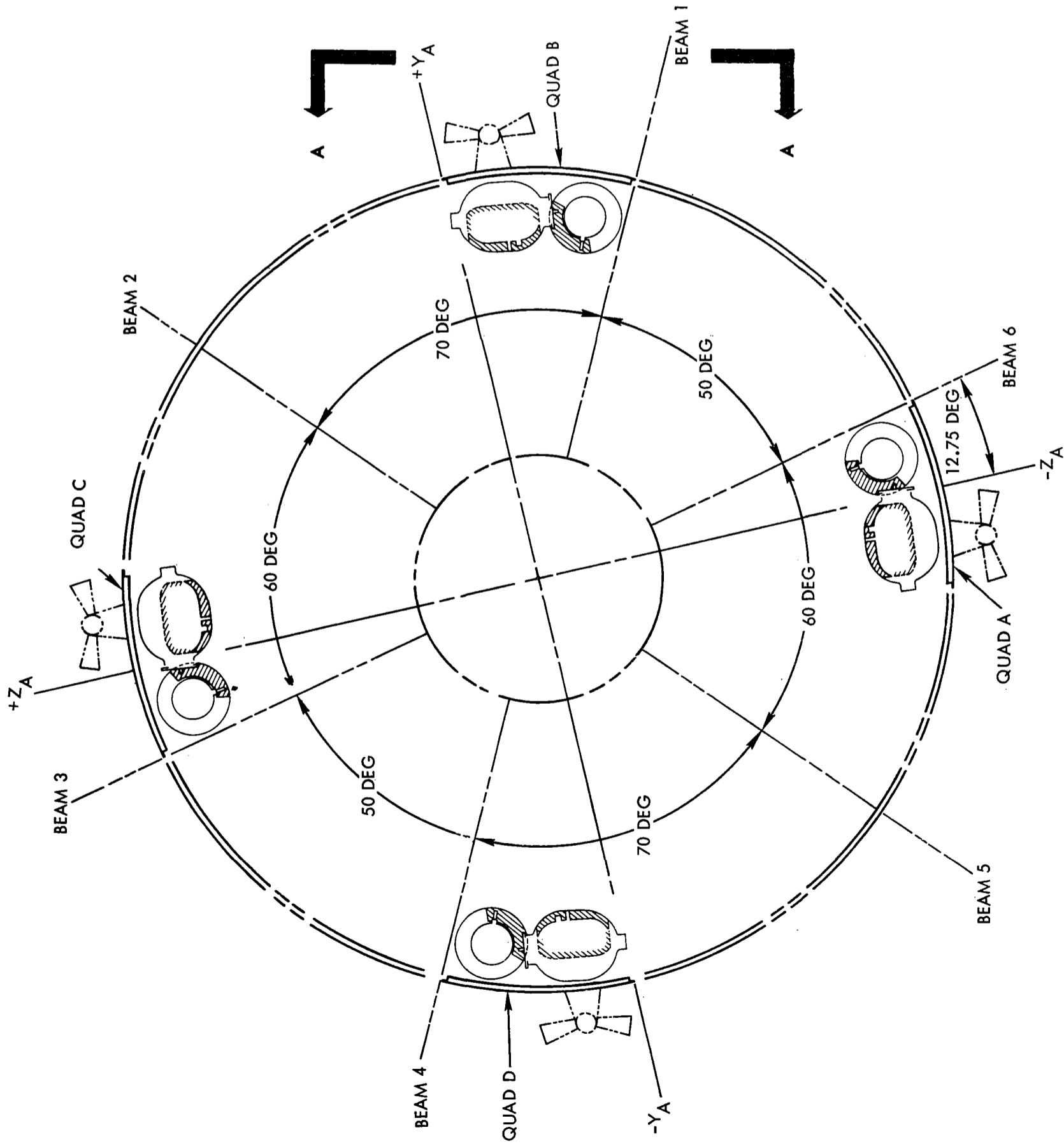
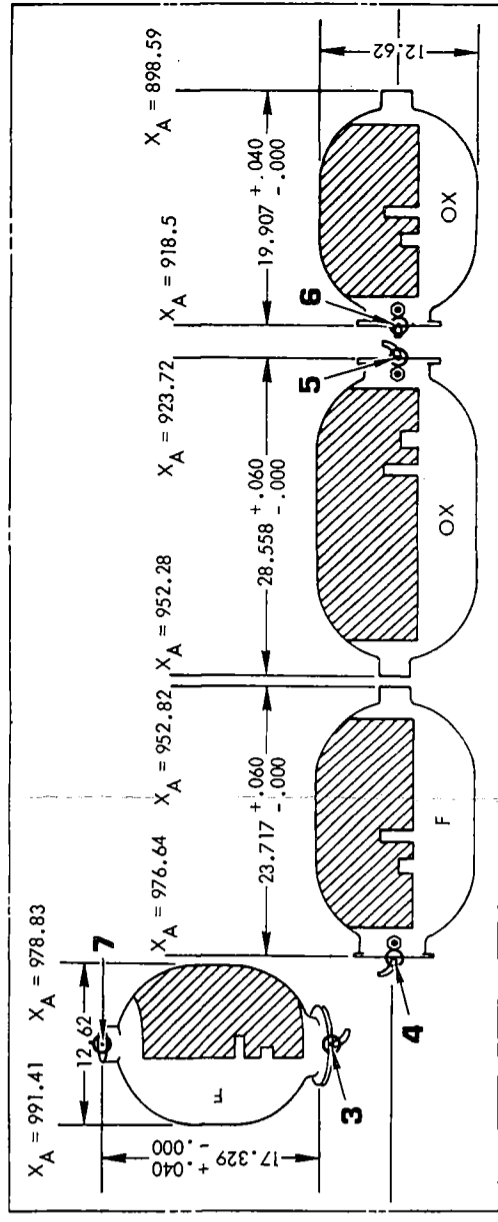


FIGURE 2-5. SERVICE MODULE RCS THRUST CHAMBER LOCATIONS



SM RCS QUAD A AND C

TANK POINT NUMBER	Y <sub>A</sub>			Z <sub>A</sub>		
	QUAD A	QUAD C	QUAD C	QUAD A	QUAD A	QUAD C
3	+1.708	-1.708	-1.708	-69.818	QUAD A	QUAD C
4	+7.346	-7.346	-7.346	-68.688	+69.818	+68.688
5	+7.346	-7.346	-7.346	-68.688	+68.688	+68.688
6	+7.346	-7.346	-7.346	-68.688	+68.688	+68.688
7	-15.535	+15.535	+15.535	-68.083	+68.083	+68.083

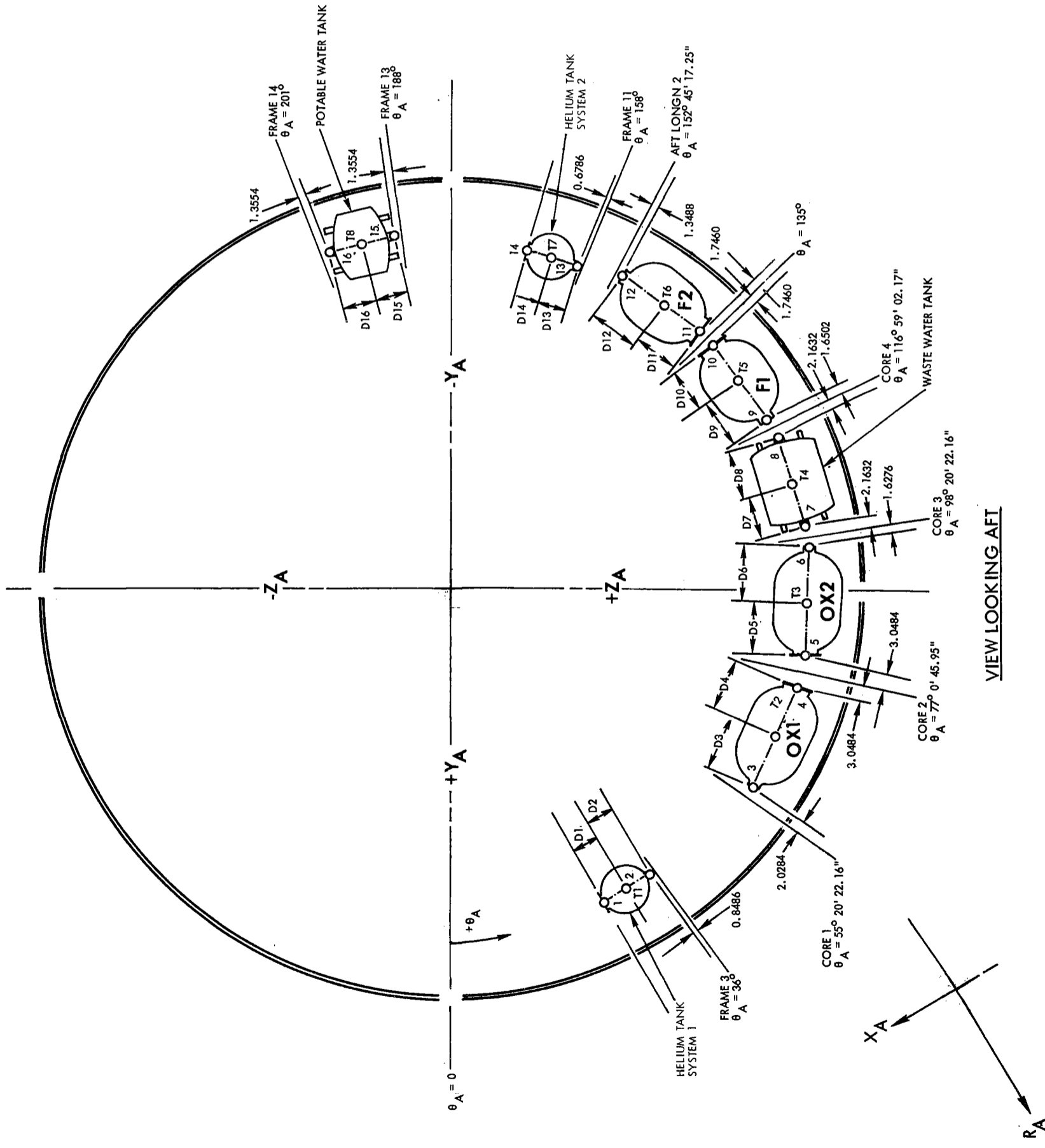


VIEW A-A  
(POINTS 1 AND 2 OMITTED)  
HELIUM TANK NOT SHOWN FOR CLARITY

SM RCS QUAD B AND D

TANK POINT NUMBER	Y <sub>A</sub>			Z <sub>A</sub>		
	QUAD B	QUAD D	QUAD D	QUAD B	QUAD B	QUAD D
3	+67.171	-67.171	-67.171	-19.123	QUAD B	QUAD D
4	+64.665	-64.665	-64.665	-24.300	+19.123	+24.300
5	+64.665	-64.665	-64.665	-24.300	+24.300	+24.300
6	+64.665	-64.665	-64.665	-24.300	+24.300	+24.300
7	+69.805	-69.805	-69.805	-1.995	+1.995	+1.995

FIGURE 2-6. SM/RCS TANK LOCATIONS IN CSM (X<sub>A</sub>) COORDINATE SYSTEM



\*OXIDIZER AND FUEL TANKS HAVE DIAMETER OF 12.62 INCHES  
 \*ALL DIMENSIONS GIVEN IN INCHES

OX1 - SYSTEM 1 OXIDIZER TANK  
 OX2 - SYSTEM 2 OXIDIZER TANK  
 F1 - SYSTEM 1 FUEL TANK  
 F2 - SYSTEM 2 FUEL TANK

PT	X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>	DISTANCE
1	1022.6000	57.3372	28.8372	D <sub>1</sub> 4.8100
2		52.4137	37.0319	D <sub>2</sub> 4.7500
3		36.0214	55.6649	D <sub>3</sub> 10.2895
4		17.8326	63.7554	D <sub>4</sub> 9.6175
5		11.8917	65.1255	D <sub>5</sub> 9.6175
6		-8.0033	65.8185	D <sub>6</sub> 10.2895
7		-11.7159	65.0097	D <sub>7</sub> 8.5600
8		-28.0290	59.8155	D <sub>8</sub> 8.5600
9		-31.4605	58.1506	D <sub>9</sub> 9.0005
10		-45.4375	47.9067	D <sub>10</sub> 8.3285
11		-47.9067	45.4375	D <sub>11</sub> 8.3285
12		-58.1506	31.4605	D <sub>12</sub> 9.0005
13		-59.7521	23.4095	D <sub>13</sub> 4.7500
14		-62.5468	14.2672	D <sub>14</sub> 4.8100
15		-65.0403	-10.5095	D <sub>15</sub> 6.1100
16	1022.6000	-61.9807	-22.3403	D <sub>16</sub> 6.1100

PT	X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>	R <sub>A</sub>	θ <sub>A</sub>
T1	1022.6000	54.8600	32.9603	64.0000	30° 59' 51.90"
T2		26.6200	59.8467	65.5000	66° 09' 13.25"
T3		2.2800	65.4603	65.5000	88° 00' 18.64"
T4		-19.8725	62.4126	65.5000	107° 39' 42.17"
T5		-38.7200	52.8300	65.5000	126° 14' 17.90"
T6		-52.8300	38.7200	65.5000	143° 45' 42.10"
T7		-61.1407	18.8670	63.9855	162° 51' 02.14"
T8	1022.6000	-63.5105	-16.4249	65.6000	194° 30'

FIGURE 2-7. CM/RCS TANK LOCATIONS IN APOLLO (X<sub>A</sub>) COORDINATE SYSTEM

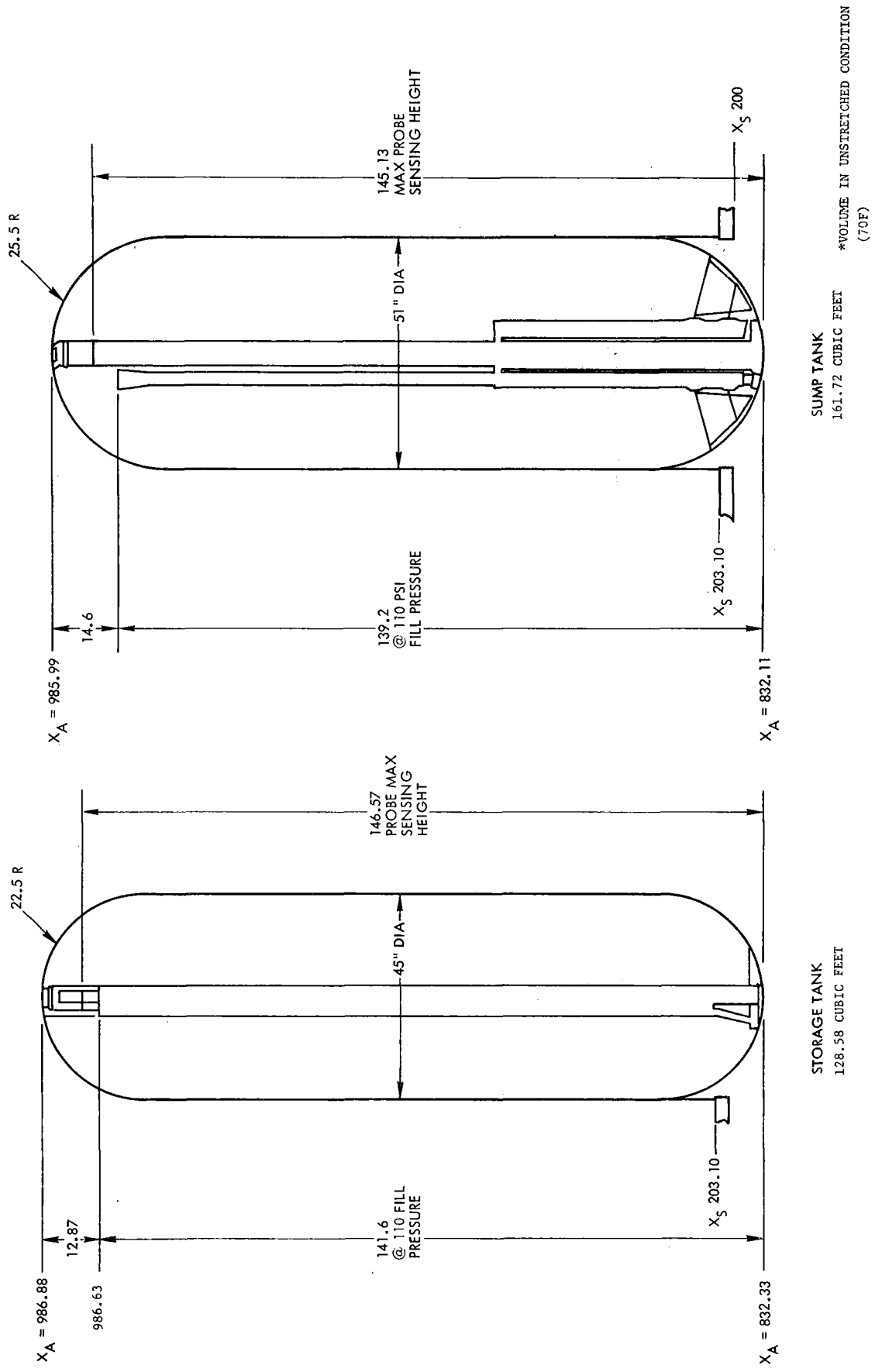


FIGURE 2-8. SPS TANK DIMENSIONS

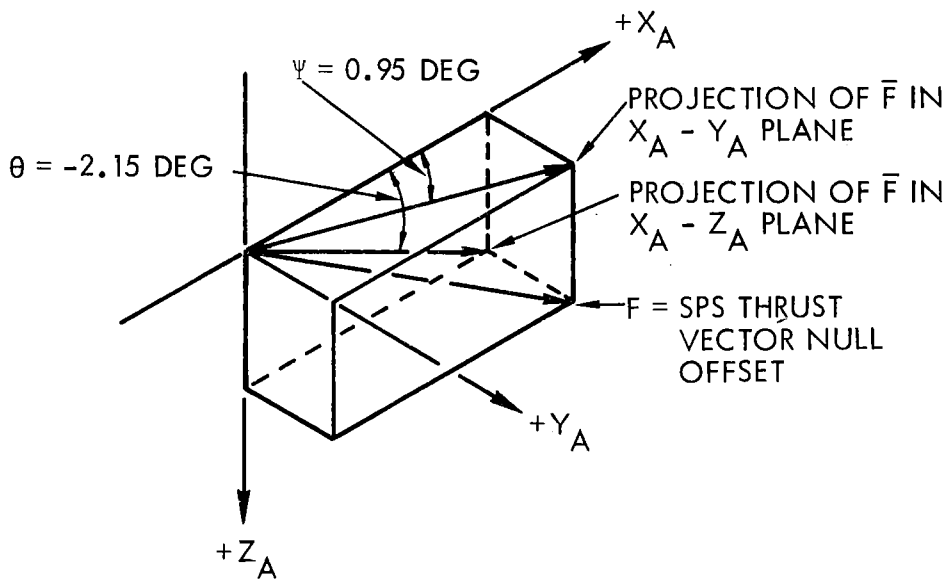
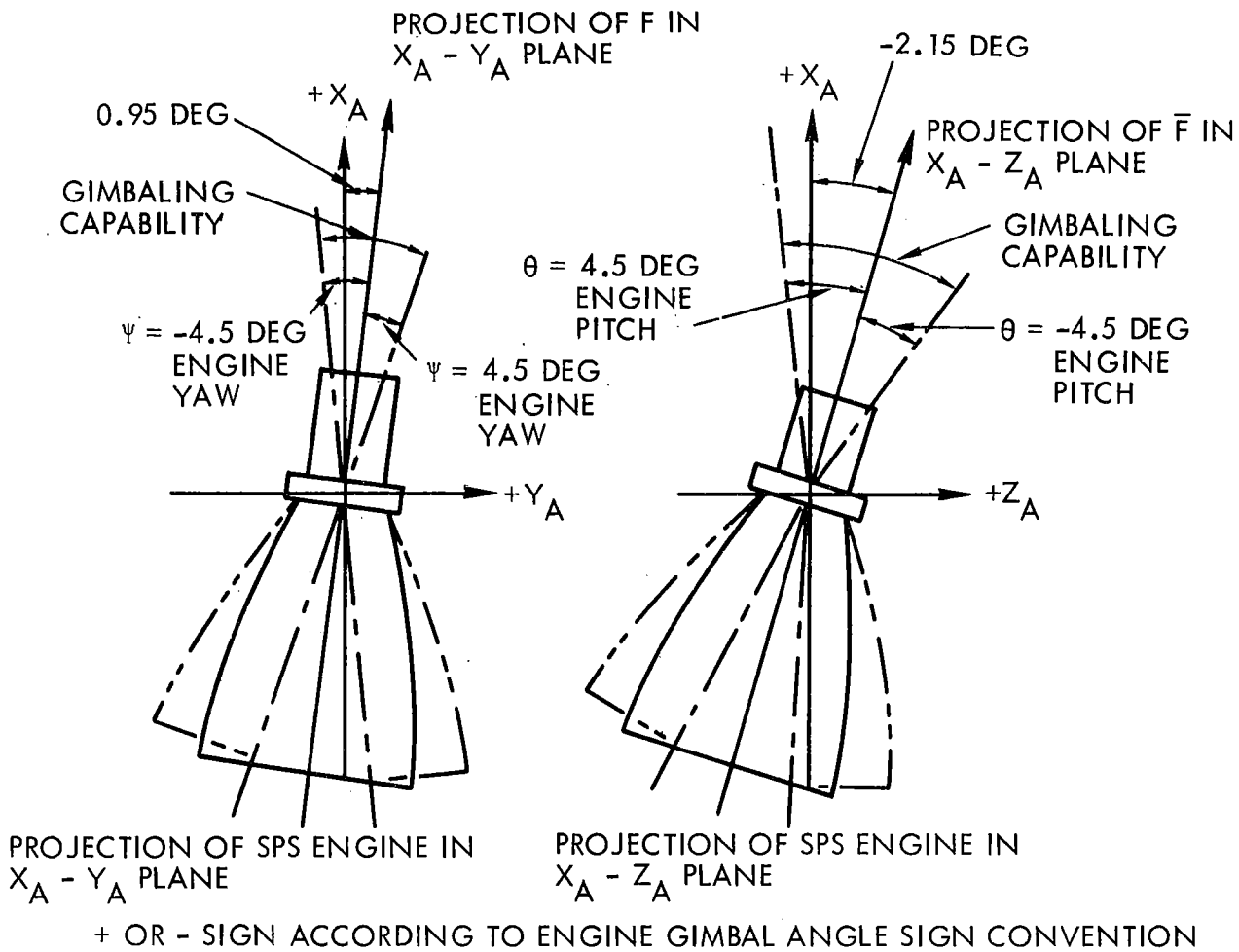
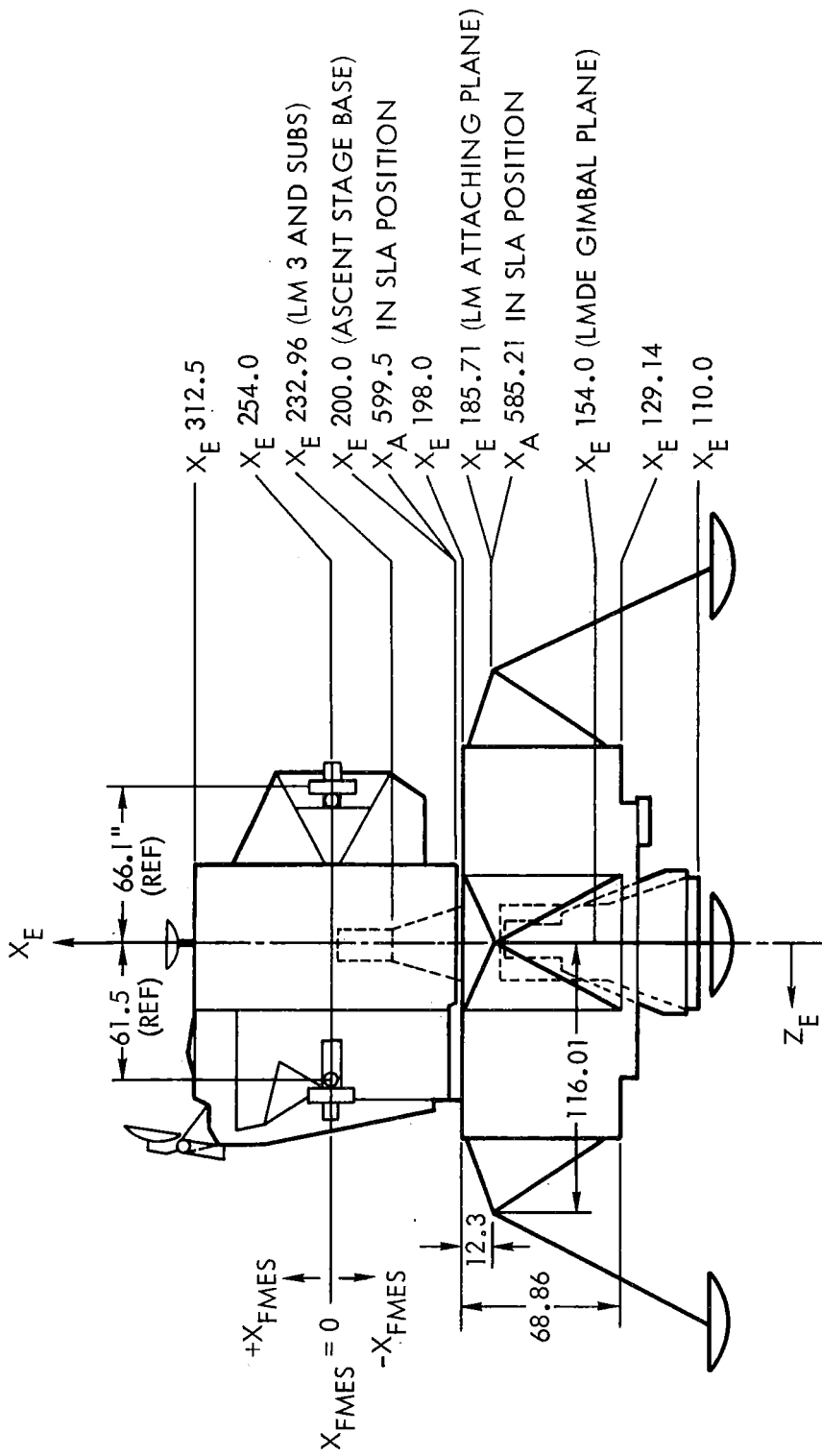


FIGURE 2-9. SPS THRUST VECTOR ORIENTATION





NOTE:  $X_E$  = LM COORDINATE SYSTEM  
 $X_A$  = APOLLO SPACECRAFT COORDINATE SYSTEM  
 ALL LINEAR DIMENSIONS ARE IN INCHES  
 RCS PITCH AND ROLL  $Z_E$  AND  $Y_E = \pm 66.1$  (EFFECTIVE GEOMETRIC MOMENT ARM)  
 RCS YAW JETS  $Z_E$  AND  $Y_E = \pm 61.5$  (EFFECTIVE GEOMETRIC MOMENT ARM)

FIGURE 2-12. LM REFERENCE DIMENSIONS

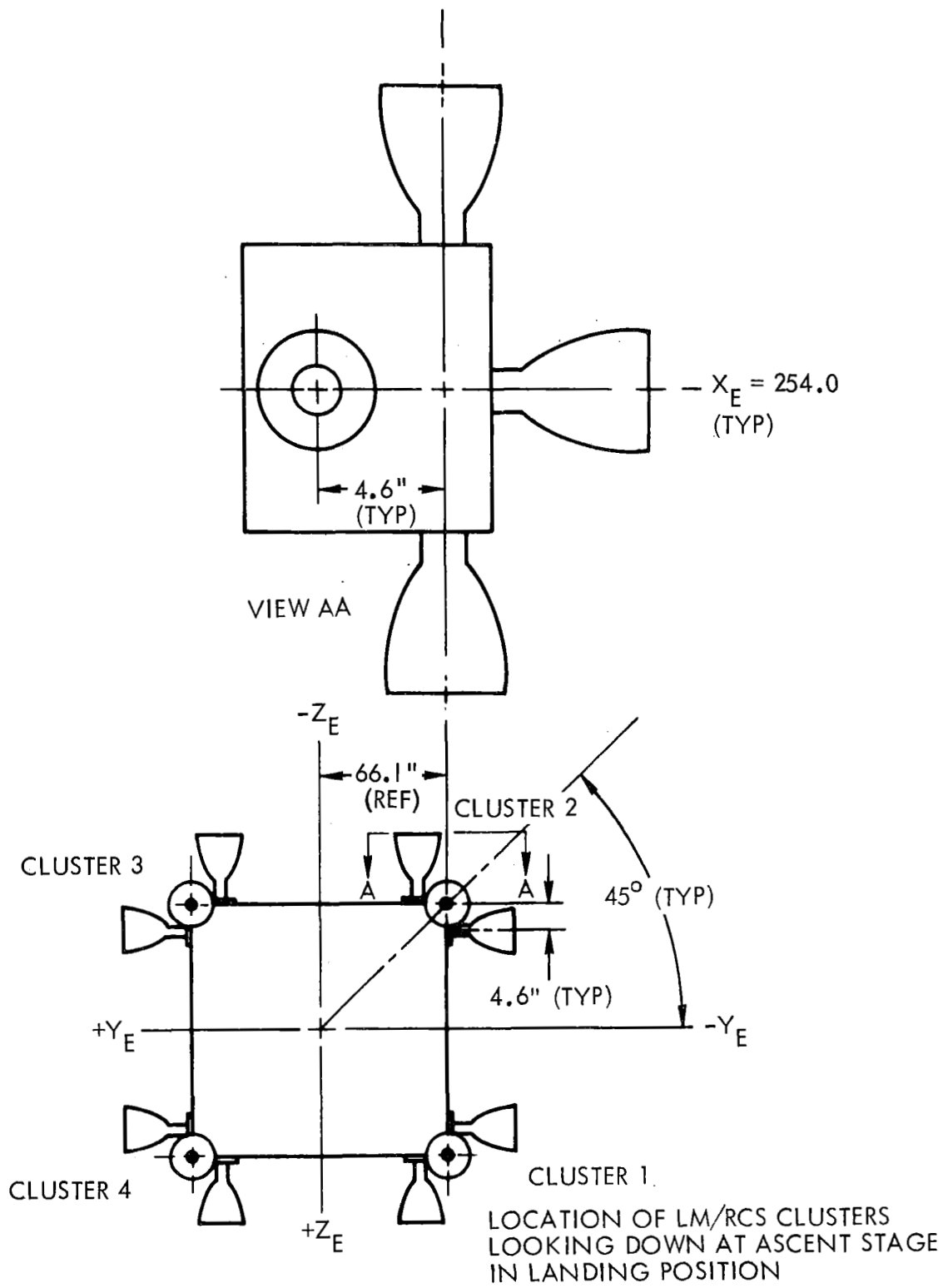
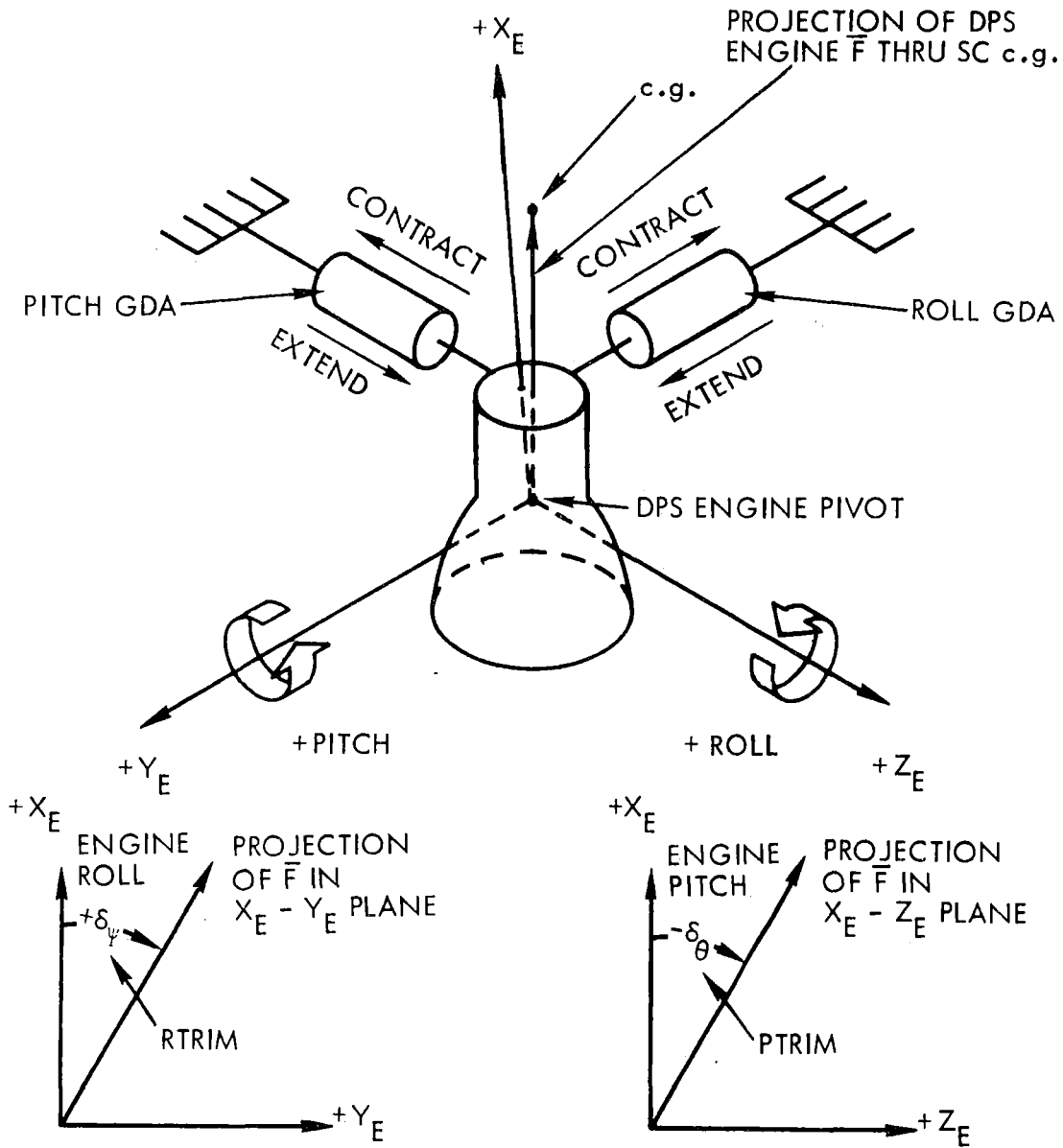


FIGURE 2-13. LM/RCS THRUST CHAMBER LOCATIONS

(GDA) Actuator Response	Rotation of Engine	Commanded Change Vehicle Angular Acceleration
Extend	$-\delta\theta$	+
Contract	$+\delta\theta$	-
Contract	$-\delta\psi$	+
Extend	$+\delta\psi$	-

} Pitch  
 } Pitch  
 } Roll  
 } Roll



+ OR - SIGN ACCORDING TO ENGINE GIMBAL ANGLE SIGN CONVENTION

FIGURE 2-14. SIGN CONVENTION FOR DPS GIMBAL ANGLE

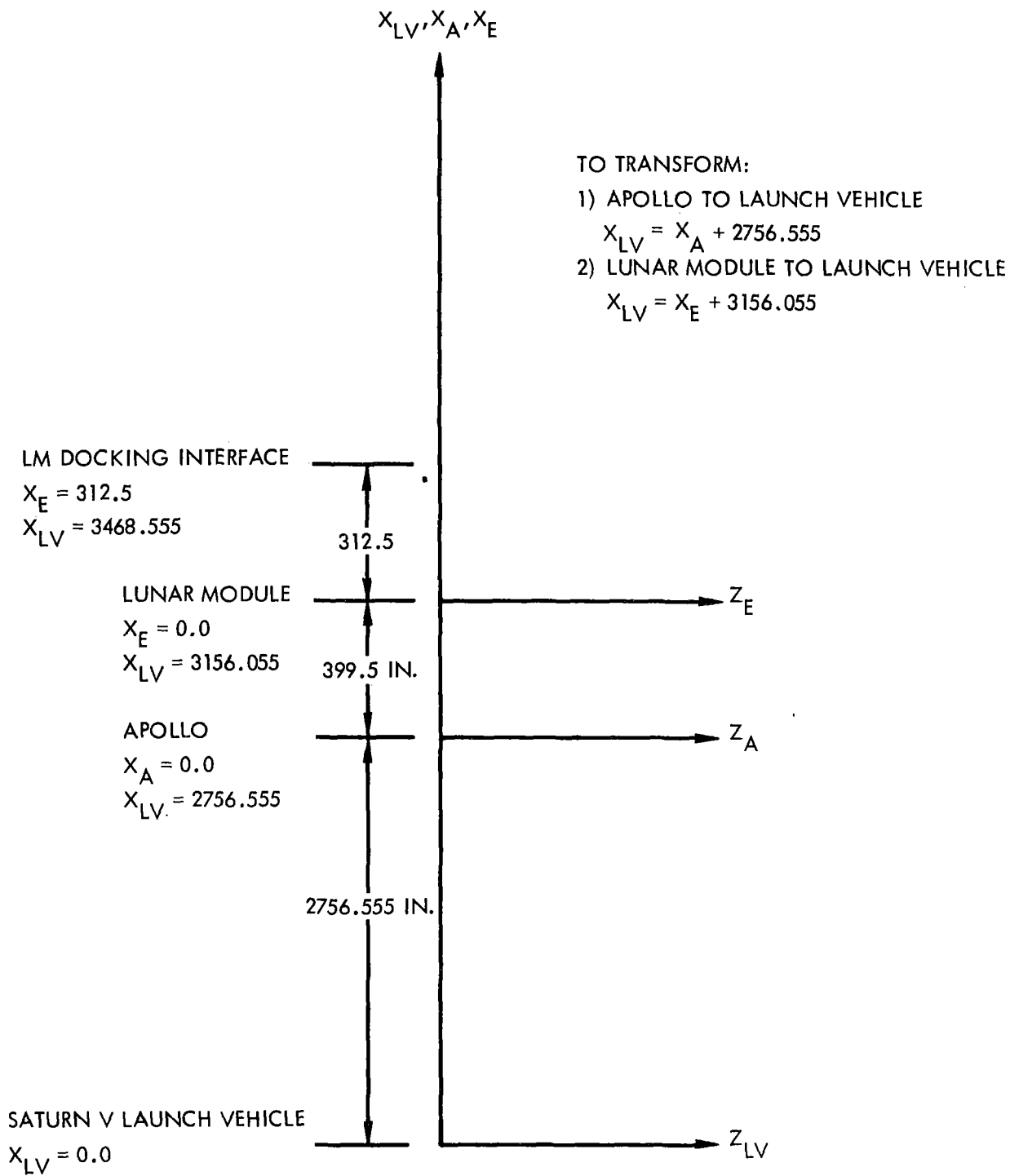


FIGURE 2-15. LAUNCH CONFIGURATION STATION REFERENCE

TO TRANSFORM:

1) LAUNCH VEHICLE TO APOLLO

$$X_A = 4578.805 - X_{LV}$$

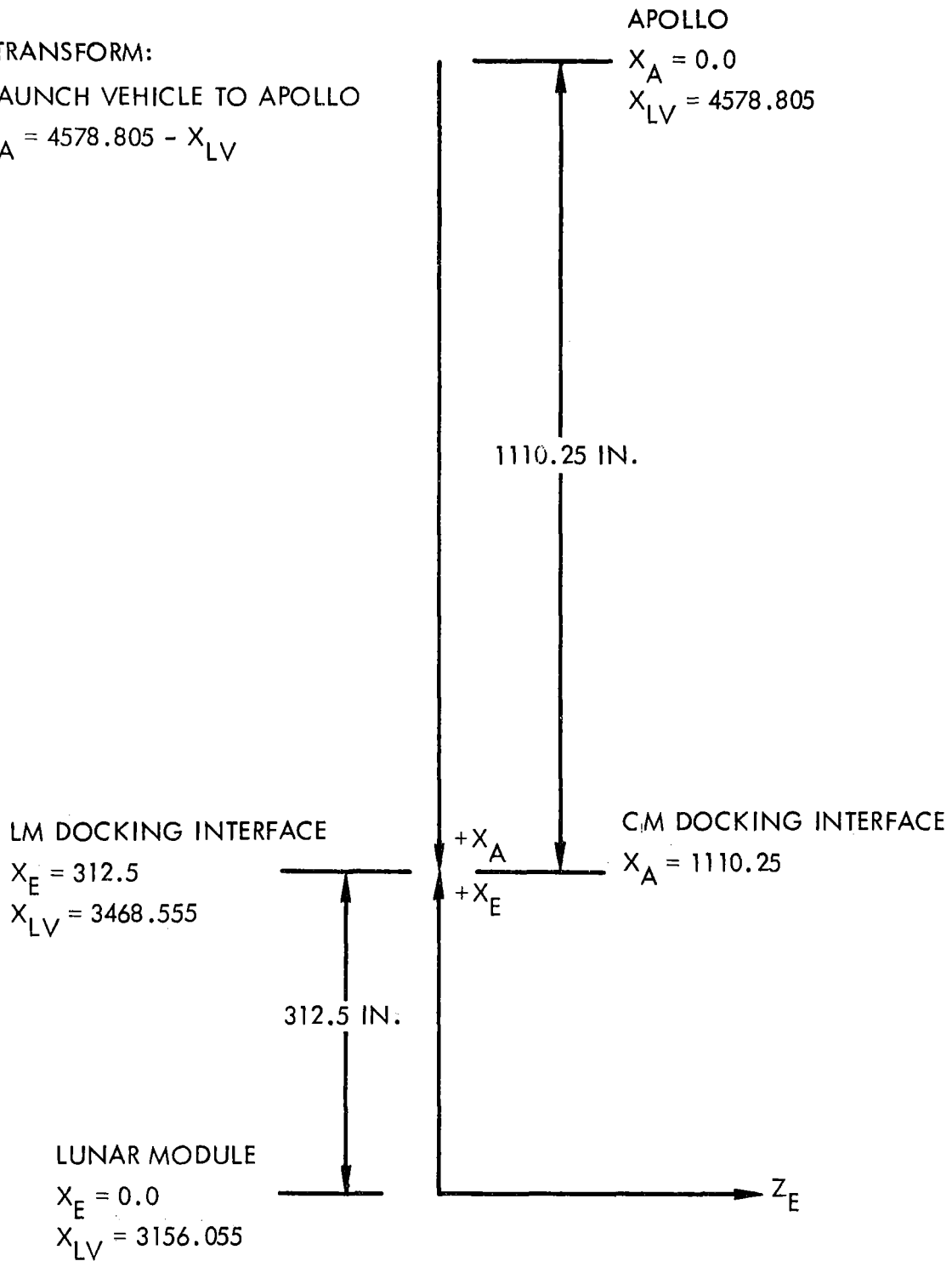


FIGURE 2-16. DOCKED CSM/LM STATION REFERENCE

	$Y_E$	$Z_E$
A/S WATER (2)	$\pm 25.0$	$\pm 13.7$
D/S WATER (2)	$\pm 43.2$	$\pm 43.2$
DPS FUEL (2)	$\pm 54.0$	0.0
DPS OXIDIZER (2)	0.0	$\pm 54.0$
APS FUEL (1)	-71.3	0.0
APS OXIDIZER (1)	+44.5	0.0
RCS FUEL (2)	$\pm 44.5$	$\pm 14.5$
RCS OXIDIZER (2)	$\pm 44.5$	$\mp 14.5$

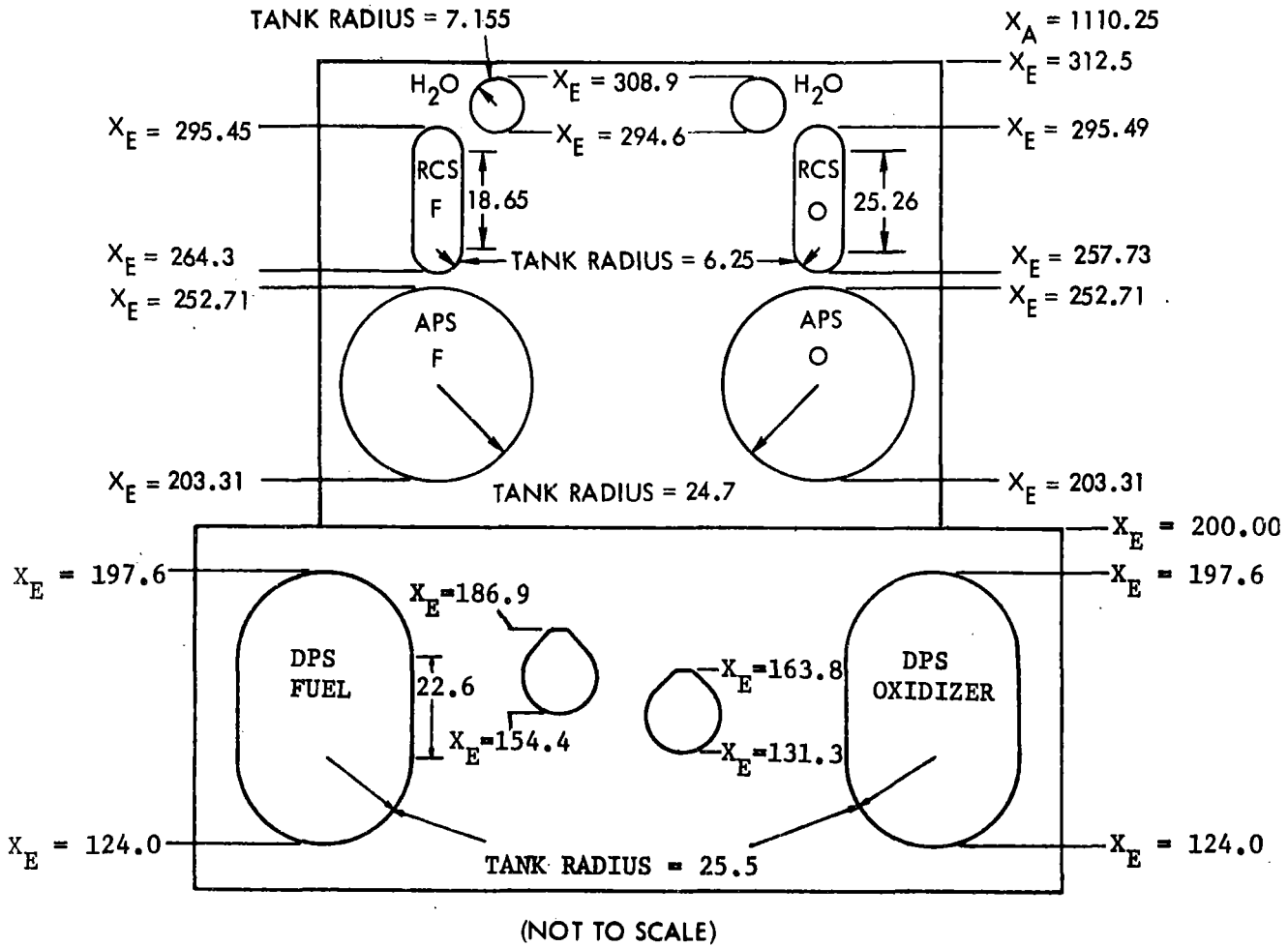


FIGURE 2-17. LM-10 AND SUBSEQUENT PROPELLANT TANK LOCATIONS IN LM ( $X_E$ ) COORDINATE SYSTEMS

### 3.0 SPACECRAFT MASS PROPERTIES AND LOADING DATA BY MISSION

The mass property data specified in this section represent the best prediction of launch configuration mass properties for each spacecraft. The data have been organized logically by Apollo mission and the tables have been organized according to basic mission profile. In addition, data are presented by individual and composite spacecraft to reflect the variation of centers-of-gravity, moments of inertia, and products of inertia as a function of spacecraft weight to enable the user to reasonably predict spacecraft mass properties at any time in the mission profile.

These data represent the composite results of the detailed mass properties data supplied to NASA (MSC-ASPO) by the contractors. Spacecraft mass property data are presented as follows:

1. Section 3.1 Mission J1
2. Section 3.2 Mission J2
3. Section 3.3 Mission J3

SUPPLEMENTARY DATA APPLICABLE TO SEQUENTIAL MASS PROPERTIES TABLES

General Comments to be applied to Tables 3.1-1 through 3.1-8:

Inertia data dispersions are  $\pm 10\%$ .

Dispersions shall be used as  $3\sigma$  deviation values.

All initial propellant weights are total tanked.

The (+) or (-) sign following the name of an item indicates that the item is added to or subtracted from the preceding total.

Table 3.1-1

SM/SPS gimbal angles for SPS abort sequence are: Pitch = -0.581  
Yaw = 1.838.

Table 3.1-2

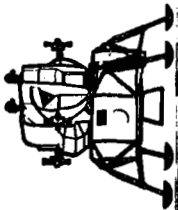
LM propellants are in high end of the tanks, (greatest X-c.g. station), for all docked configuration where the CSM is the controlling vehicle. The Mass Spectrometer and Gamma-Ray Spectrometer are shown deployed after each SPS firing following D.O.I. For all other summations the M.S. and G. R. Spectrometers are not deployed. The following are the individual mass properties for the M.S. and G.R. Spectrometers in Apollo Coordinates.

	Weight (lb)	X-Bar (in)	Y-Bar (in)	Z-Bar (in)
Gamma-Ray Retracted	45.4	865.1	33.0	-57.0
Gamma-Ray Deployed	28.0 17.4	865.1 865.1	231.3 132.2	-312.4 -184.7
Mass Spectrometer Retracted	47.4	863.1	55.8	-40.5
Mass Spectrometer Deployed	27.4 20.0	863.1 863.1	341.7 198.8	-149.4 -94.9

Tables 3.1-7 and 3.1-8

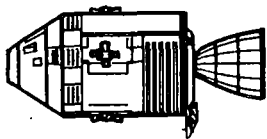
CSM and LM consumables changes are presented in Tables 3.1-7 and 3.1-8, respectively.





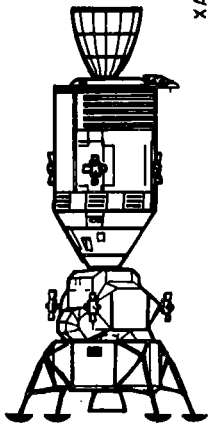
XE COORDINATES  
 TABLE 3.1-1  
 LM-10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRDUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN		
			X	Y	Z	IXX	IYY	IZZ	PXY	PYZ	PXZ	DX	DY	DZ
ASCENT STAGE	+	4727.9	257.5	-2	2.9	2736	2625	1528	-16	115	59	25.0	1.0	.5
LM RCS FUEL	+	102.1	279.1	44.6	14.5	0	0	0	0	0	0	1.0	1.0	.1
LM RCS FUEL	+	102.2	279.1	-44.6	-14.5	0	0	0	0	0	0	1.0	1.0	.1
LM RCS OXY	+	200.3	275.4	-44.6	14.5	0	1	1	0	0	0	2.0	1.0	.1
LM RCS OXY	+	200.3	275.4	44.6	-14.5	0	1	1	0	0	0	2.0	1.0	.1
LM APS FUEL	+	2011.3	228.0	-71.3	.0	0	0	0	0	0	0	5.4	1.0	.5
LM APS OXY	+	3217.4	228.0	44.5	.0	0	0	0	0	0	0	8.7	1.0	.5
ASCENT STAGE		10561.5	244.0	-.1	1.3	6610	3275	5988	-18	154	31	27.2	.6	.3
DESCENT STAGE	+	6139.0	156.8	2.7	-7.6	6541	4591	3560	107	-53	172	25.0	1.0	.5
LM DPS FUEL	+	3756.7	160.4	54.0	.0	0	7	7	0	0	0	7.1	1.0	.5
LM DPS FUEL	+	3756.7	160.4	-54.0	.0	0	7	7	0	0	0	7.1	1.0	.5
LM DPS OXY	+	5996.4	160.4	.0	54.0	0	12	12	0	0	0	12.7	1.0	.5
LM DPS OXY	+	5996.5	160.4	.0	-54.0	0	12	12	0	0	0	12.7	1.0	.5
DESCENT STAGE		25645.3	159.5	.6	-1.8	18883	12251	8350	97	-25	151	32.4	.5	.2
LM AT EARTH LAUNCH		36206.8	184.2	.4	-.9	25510	27657	25853	-24	554	178	42.3	.4	.2



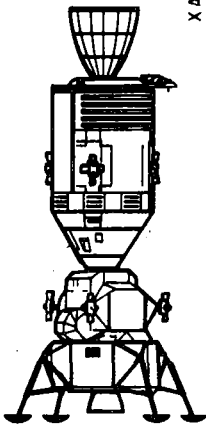
XA COORDINATES  
 TABLE 3.1-1 (CONTINUED)  
 CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DM	DX	DY	DZ
SLA RING	+	98.0	835.7	2.0	-6.6	120	65	56	0	0	0	.0	.0	.0	.0
SERVICE MODULE	+	13473.0	917.8	1.1	1.8	9551	14216	12976	-84	367	-1726	25.0	1.0	.5	.5
COMMAND MODULE	+	12822.0	1041.1	-2.2	5.6	5963	5458	4926	49	-426	2	25.0	1.0	.5	.5
CSM LESS SPS PROPELLANT		26993.0	977.4	.5	3.6	15659	41785	39944	-266	636	-1731	35.4	.7	.4	.4
SM SPS F-STORE	+	6756.7	904.0	-14.8	-47.8	0	1915	1915	0	0	0	59.0	1.0	.5	.5
SM SPS C-STORE	+	10768.9	903.9	14.8	47.8	0	3047	3047	0	0	0	121.0	1.0	.5	.5
SM SPS F-SUMP	+	8868.7	906.8	-48.3	-6.6	0	2608	2608	0	0	0	59.0	1.0	.5	.5
SM SPS D-SUMP	+	14199.4	907.0	48.3	6.6	0	4210	4210	0	0	0	121.0	1.0	.5	.5
SM WITH SPS PROPELLANT		54164.7	908.5	6.1	4.6	30299	35136	37276	-176	223	2211	192.0	.5	.3	.3
CSM AT EARTH LAUNCH		66986.7	533.9	4.9	4.8	36354	79559	81614	-2004	86	2199	193.6	.4	.2	.2



XA COORDINATES  
 TABLE 3.1-2  
 CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

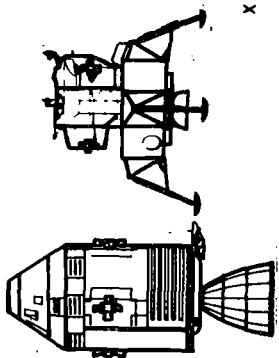
DESCRIPTION	S	WEIGHT PCUNDS	C. G. INCHES			INERTIAS SLUG-FI <sup>2</sup>			PRODUCTS SLUG-FI <sup>2</sup>			DISPERSIONS LB/IN		
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DX	DY	DZ
CSM AT EARTH LAUNCH		66986.7	533.9	4.9	4.8	36354	79959	81614	-2004	86	2199	193.6	.4	.2
LM AT EARTH LAUNCH		36206.8	583.7	.4	-.9	25510	27057	25853	-24	554	178	42.3	.4	.2
SLA (EXCLUDING RING)		3860.9	638.9	.6	-.2	9996	12495	12470	-47	116	28	25.0	1.0	.5
LES		9172.7	1300.9	.0	-.9	821	28513	28492	7	493	0	25.0	1.0	.5
CSM+LM+SLA+LES AT LAUNCH		116327.1	843.8	3.0	2.4	73006	1243977	1244313	3366	8592	2564	201.3	.3	.2
CSM+LM+SLA AT E.O.I.		107154.4	804.7	3.2	2.7	72142	766352	766714	6290	11351	2543	199.8	.4	.2
CSM+LM+SLA PRE TRANS/DOCK		107131.3	804.6	3.2	2.7	72132	766263	766628	6300	11339	2547	199.8	.4	.2
CSM AT TRANS/DOCK		66893.0	533.9	4.9	4.8	36268	79902	81569	-2007	89	2221	193.6	.4	.2
LM AT TRANS/DOCK		36204.1	1238.1	-.6	.8	25505	25851	26807	-470	302	-432	42.3	.4	.1
CSM/LM DOCKED		103097.1	1040.7	3.0	3.4	62008	575057	577712	-10568	-5767	1900	198.2	.4	.2
CM EQUIP.RELOC.1	-	531.7	1042.6	-9.1	-11.5	37	7	33	0	1	2	.0	.0	.0
CM EQUIP.RELOC.1	+	531.7	1034.7	-8.7	-13.5	31	33	42	-8	7	-2	.0	.0	.0
SIM DOOR	-	160.0	912.1	43.2	-59.5	20	65	85	0	0	0	.0	.0	.0
CM GASECUS O2	+	6.7	1168.7	13.0	-7.5	0	0	0	0	0	0	.0	.0	.0
CSM/LM PRE L.O.I.		102718.8	1041.2	2.9	3.5	61633	573550	576257	-10811	-6037	2036	198.2	.4	.2
CSM/LM POST L.O.I.		76348.8	1083.5	1.9	2.0	47965	442513	448593	-8348	-1503	-1081	198.2	.7	.2



X4 COORDINATES TABLE 3.1-2 (CONTINUED)  
CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DM	DX	DY	DZ
CSM/LM PRE D.O.I.		76295.9	1083.6	1.9	2.0	47918	442235	448321	-8349	-15CE	-1C69	198.2	.7	.2	.2
CSM/LM POST D.O.I.		74730.7	1087.1	1.7	2.1	47128	432866	438190	-7820	-1538	-1169	198.2	.7	.2	.2
DEPLOY M.S. AND G.R.		74730.7	1087.1	1.9	1.9	49173	433717	439384	-8686	-892	-2042	198.2	.7	.2	.2
2 CREW+EQUIP,CM-LM	-	500.6	1042.4	13.0	-10.7	21	4	22	-2	1	-2	.0	.0	.0	.0
EQUIP.XFR,LM-CM 1	+	1.1	1018.0	24.5	-15.0	0	0	0	0	0	0	.0	.0	.0	.0
CM EQUIP.RELOC.2	-	187.6	1018.3	-1.9	-19.9	14	14	12	-2	1	-2	.0	.0	.0	.0
CM EQUIP.RELOC.2	+	187.6	1040.6	-0.3	-15.5	22	8	17	0	2	2	.0	.0	.0	.0
LANDING GEAR UP	-	488.0	1306.5	1.1	-0.7	740	444	451	-2	1	-6	.0	.0	.0	.0
LANDING GEAR DOWN	+	488.0	1303.1	1.6	-0.9	1921	1027	1039	-3	2	-10	.0	.0	.0	.0
2 CREW+EQUIP,CM-LM	+	500.6	1170.8	36.6	-21.1	59	43	20	2	1	22	.0	.0	.0	.0
LM EQUIP.RELOC.1	-	46.7	1163.3	-0.9	-16.6	7	0	7	0	0	0	.0	.0	.0	.0
LM EQUIP.RELOC.1	+	46.7	1146.1	-9.6	2.6	4	1	2	0	0	-1	.0	.0	.0	.0
EQUIP.XFR,LM-CM 1	-	1.1	1122.7	.0	-0.0	0	0	0	0	0	0	.0	.0	.0	.0
CSM/LM AT SEPARATION		74563.6	1098.2	1.8	2.0	48350	432806	438197	-7454	-1843	-1189	198.2	.7	.2	.2

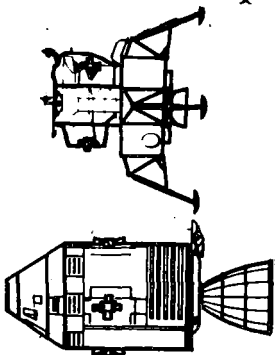
Gamma-Ray and mass spectrometers are not deployed unless specifically stated.



XA COORDINATES  
 CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FI <sup>2</sup>			PROPLCTS SLUG-FI <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DM	DX	DY	DZ
CSM PRE CIRC. BURN		37849.1	943.9	3.7	3.5	21310	59946	64334	-2289	1151	-720	193.6	.7	.3	.3
CSM POST CIRC. BURN		37570.3	944.2	3.6	3.5	21171	59897	64151	-2276	1148	-737	193.6	.7	.3	.3
EXPERIMENT JETT SM	-	77.3	886.0	22.0	-50.3	0	C	0	0	0	0	.0	.0	.0	.0
CSM AT SATT. JETT.		37493.0	944.3	3.6	3.6	21117	59792	64089	-2258	1096	-720	193.6	.7	.3	.3
DEPLOY M.S. AND G.R.		37493.0	944.3	4.1	3.2	23155	60652	65267	-2569	1327	-1593	193.6	.7	.3	.3
CSM PRE PLANE CHANGE 1		37250.3	944.4	3.7	3.6	20939	59656	63989	-2272	1115	-664	193.6	.7	.3	.3
CSM POST PLANE CHANGE 1		36117.1	945.5	3.4	3.6	20373	59375	63165	-2206	1097	-734	193.6	.8	.3	.3
DEPLOY M.S. AND G.R.		36117.1	945.5	3.9	3.2	22413	60235	64344	-2522	1332	-1607	193.6	.8	.3	.3
CSM AT ASCT.STAGE DOCKING		36023.1	945.5	3.4	3.6	20274	59314	63116	-2203	1102	-708	193.6	.8	.3	.3
ASCENT STAGE AT DOCKING		5687.0	1164.8	4.1	-2.2	3251	2160	2679	-92	70	-344	27.2	.8	.6	.2
CSM/ASCENT STAGE MANNED		4170.1	575.4	3.5	2.8	23561	112490	116774	-2132	-186	-1057	195.5	.8	.3	.3

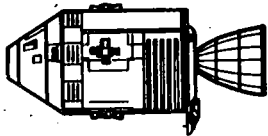
Gamma-Ray and mass spectrometers are not deployed unless specifically stated.



XA COORDINATES  
 TABLE 3.1-2 (CONTINUED)  
 CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN		
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	CM	DX	DY
2 CREW+EQUIP, LM-CM	-	714.9	1168.9	23.6	-17.5	144	78	114	25	-7	1	.0	.0	.0
EQUIP. XFR. CM-LM	+	384.5	1151.0	.0	-.0	0	63	63	0	0	0	.0	.0	.0
LM EQUIP. RELOC. 3	-	21.4	1122.7	.0	-.0	0	0	0	0	0	0	.0	.0	.0
LM EQUIP. RELOC. 3	+	21.4	1204.2	31.4	-40.8	0	0	0	0	0	0	.0	.0	.0
2 CREW+EQUIP, LM-CM	+	714.9	1035.4	9.7	-2.3	81	66	59	4	-11	-12	.0	.0	.0
EQUIP. XFR. CM-LM	-	384.5	1067.2	3.5	11.5	27	189	175	-15	-38	0	.0	.0	.0
CSM/ASCENT STAGE UNMANNED		41699.1	973.9	3.3	3.0	23360	108999	113259	-2700	259	-1020	195.5	.8	.3
CSM POST ASCENT STAGE JFT		36353.5	946.0	3.6	3.4	20333	59205	63020	-2098	968	-727	193.6	.8	.3
DEPLOY M.S. AND G.R.		36353.5	946.0	4.1	3.1	22370	60064	64198	-2416	1205	-1559	193.6	.8	.3
CM EQUIP. RELOC. 3	-	194.6	1039.2	-2.1	-12.1	23	9	20	2	0	1	.0	.0	.0
CM EQUIP. RELOC. 3	+	194.6	1019.7	5.2	-20.9	31	26	18	-1	4	-9	.0	.0	.0
CSM PRE T.E.I.		36155.0	946.0	3.7	3.3	20205	58982	62790	-2064	977	-696	193.6	.8	.3
CSM POST T.E.I.		26712.5	970.4	1.0	4.0	15456	45442	44686	-651	632	-1273	193.6	1.2	.4
DEPLOY M.S. AND G.R.		26712.5	970.4	1.7	3.5	17515	46304	45883	-1064	939	-2154	193.6	1.2	.4

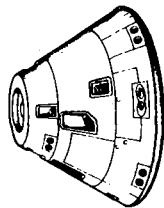
Gamma-Ray and mass spectrometers are not deployed unless specifically stated.



XA COORDINATES  
 CSM 112/LM10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DW	DX	DY	DZ
CM EQUIP.RELOC.4	-	167.2	1019.2	4.0	-22.4	23	20	14	-2	5	-8	.0	.0	.0	.0
CM EQUIP.RELOC.4	+	167.2	1042.0	-9	-12.6	18	4	15	0	1	2	.0	.0	.0	.0
CSM PRE EVA		26712.5	970.5	1.0	4.0	15437	45511	44735	-658	629	-1258	193.6	1.2	.4	.4
EQUIP.XFR. SM-CM	-	100.0	931.2	38.9	-53.3	1	13	15	-4	0	0	.0	.0	.0	.0
EQUIP.XFR. SM-CM	+	100.0	1020.4	-23.2	15.4	3	9	6	0	4	0	.0	.0	.0	.0
EVA OFFLOAD	-	32.6	1047.8	-26.7	37.3	0	0	0	0	0	0	.0	.0	.0	.0
CSM POST EVA		26679.9	970.7	.8	4.3	15339	45408	44729	-633	577	-1211	193.6	1.2	.4	.4
CM EQUIP.RELOC.5	-	189.6	1021.1	4.6	-16.3	18	14	20	-1	4	-3	.0	.0	.0	.0
CM EQUIP.RELOC.5	+	189.6	1039.2	-1.8	-15.7	27	12	20	1	1	1	.0	.0	.0	.0
CSM W/PGA STOWED		26679.9	970.9	.7	4.3	15347	45493	44817	-646	560	-1200	193.6	1.2	.4	.4
DEPLOY M.S. AND G.R.		26679.9	970.9	1.4	3.8	17410	46357	46016	-1061	869	-2083	193.6	1.2	.4	.4
CSM PRE CM/SM SEPARATION		26418.0	971.3	.8	4.2	15155	45255	44618	-665	553	-1140	193.6	1.2	.4	.4
SM POST CM/SM SEPARATION		13618.4	906.9	1.8	2.8	9129	14727	14685	-334	455	-1137	192.0	1.4	.7	.7

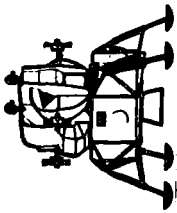
Gamma-Ray and mass spectrometers are not deployed unless specifically stated.



XA COORDINATES  
 TABLE 3.1-2 (CONTINUED)  
 CSM 112/LMIC EXPECTED SEQUENTIAL MASS PROPERTIES

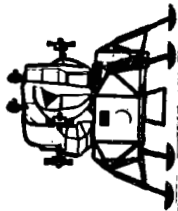
DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DW	DX	DY	DZ
CM POST CM/SM SEPARATION		1279.6	1039.9	-0.2	5.8	6007	5322	4733	69	-433	6	25.0	1.0	.5	.5
CM AT ENTRY		1278.0	1039.9	-0.3	5.7	6000	5315	4732	69	-431	7	25.0	1.0	.5	.5
ABLATOR BURNOFF	-	150.0	1031.1	.0	7.4	103	81	78	0	0	0	.0	.0	.0	.0
ENTRY COOLING	-	2.0	1022.6	-19.7	62.5	0	0	0	0	0	0	.0	.0	.0	.0
FWD HEAT SHIELD	-	310.0	1094.3	-0.5	.8	64	26	23	0	0	0	.0	.0	.0	.0
DROGUE+DISCONNECTS	-	80.0	1089.0	.0	23.9	1	1	0	0	0	0	.0	.0	.0	.0
CM AT MAIN CHUTE DEPLOY		12215.3	1038.3	-0.3	5.6	5805	4530	4379	69	-422	10	25.0	1.0	.5	.5
PILOT CHUTE+RISERS	-	45.5	1089.9	5.5	-5.8	2	2	1	0	0	0	.0	.0	.0	.0
MAIN CHUTE	-	401.4	1089.1	.4	8.5	62	22	43	0	0	0	.0	.0	.0	.0
CM RCS DUMP	-	202.7	1022.6	-5.8	57.0	0	0	0	0	0	0	.0	.0	.0	.0
CM AT IMPACT		11565.7	1036.7	-0.2	4.6	5619	4515	4066	59	-398	23	25.0	1.1	.6	.6





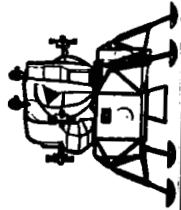
XE COORDINATES  
LM-10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS. SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DM	DX	DY	DZ
LM AT EARTH LAUNCH		36206.8	184.2	.4	-.9	25510	27057	25853	-24	554	178	42.3	.4	.2	.2
LANDING GEAR UP	-	488.0	116.3	.0	1.3	740	455	441	0	3	0	.0	.0	.0	.0
LANDING GEAR DOWN	+	488.0	119.7	.0	1.8	1921	1046	1021	0	4	0	.0	.0	.0	.0
LM CABLING	-	2.7	209.7	88.8	-29.0	0	C	0	0	0	0	.0	.0	.0	.0
CM GASECUS O2	+	6.7	254.0	.0	15.0	0	0	0	0	0	0	.0	.0	.0	.0
2 CREW+EQUIP,CM-LM	+	500.6	251.9	.0	42.2	59	6	56	-2	-1	1	.0	.0	.0	.0
LM EQUIP. RELOC. 1	-	46.7	259.4	-14.9	7.5	7	6	1	0	0	2	.0	.0	.0	.0
LM EQUIP. RELOC. 1	+	46.7	276.7	-2.6	-5.7	4	4	0	0	0	0	.0	.0	.0	.0
EQUIP. XFR, LM-CM 1	-	1.1	300.0	.0	.C	0	C	0	C	C	0	.0	.0	.0	.C
LM AT SEPARATION		36689.3	185.2	.4	-.3	26923	28302	26932	-20	850	172	42.3	.4	.2	.2
LM PRE P.D.I.		36607.2	185.0	.4	-.3	26878	28143	26750	-17	852	167	42.3	.4	.2	.2



XE COORDINATES  
 TABLE 3.1-3 (CONTINUED)  
 LM-10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DW	DX	DY	DZ
DESCENT ABLATION	-	29.0	145.4	.0	.0	0	C	0	0	0	0	.0	.0	.0	.0
HELIUM TRANSFER	-	48.5	148.5	47.2	-47.2	0	C	0	0	0	0	.0	.0	.0	.0
HELIUM TRANSFER	+	48.5	158.6	9.7	-8.7	0	C	0	0	0	0	.0	.0	.0	.0
LM AT TOUCHDOWN		17736.7	210.1	.8	-.6	14987	15836	17127	-76	893	193	42.3	.5	.2	.2
ASCENT STAGE AT TOUCHDOWN		10900.5	243.8	-.1	2.1	6754	3305	5916	-16	185	40	27.2	.6	.3	.3
LEFT AT LUNAR SITE	-	298.9	244.3	-9.0	24.6	40	54	41	-8	-20	6	.0	.0	.0	.0
ONLOAD AT LUN. SITE	+	158.2	263.0	-15.2	-5.0	8	5	9	1	0	-3	.0	.0	.0	.0
LM EQUIP. RELOC. 2	-	78.4	251.7	-13.1	15.6	13	16	10	-2	-7	3	.0	.0	.0	.0
LM EQUIP. RELOC. 2	+	78.4	247.4	1.7	23.5	13	25	14	0	-11	0	.0	.0	.0	.0
ASCENT STAGE AT LIFT OFF		10754.8	244.0	.1	2.5	6697	3345	5857	-11	195	48	27.2	.6	.3	.3
A/S ABLATION	-	10.0	220.2	.0	.0	0	C	0	0	0	0	.0	.0	.0	.0
ASCENT STAGE IN ORBIT		5950.6	257.4	.1	4.6	3332	2834	2044	-14	118	47	27.2	.8	.4	.4



XE COORDINATES  
 LM-10 EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>			DISPERSIONS LB/IN			
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ	DX	DY	DZ	
ASCENT STAGE PRE T.P.I.		5798.8	257.2	.1	4.6	3308	2824	2016	-14	119	49	27.2	.8	.4	.4
ASCENT STAGE PCST T.P.I.		5766.7	257.4	.1	4.6	3286	2818	1988	-14	118	49	27.2	.8	.4	.4
ASCENT STAGE AT DOCKING		5687.0	257.0	.1	4.7	3251	2803	1947	-14	120	52	27.2	.8	.4	.4
2 CREW+EQUIP, LM-CM	-	714.9	253.8	-3.4	29.2	144	103	88	-5	-25	16	.0	.0	.0	.0
EQUIP.XFER. CM-LM	+	384.5	271.8	.0	.0	0	63	63	0	0	0	.0	.0	.0	.0
LM EQUIP.RELOC.3	-	21.4	300.0	.0	.0	0	0	0	0	0	0	.0	.0	.0	.0
LM EQUIP.RELOC.3	+	21.4	218.5	-19.6	47.6	0	0	0	0	0	0	.0	.0	.0	.0
ASCENT STAGE AT JETTISON		5345.6	258.1	.5	1.3	3009	2676	1928	-7	150	45	27.2	.9	.5	.4

TABLE 3.1-3.1

LRV MASS PROPERTIES - FIRST TRAVERSE

LRV AT DEPARTURE WITH TWO CREW RIDING

DESCRIPTION	STOW. ITEM REF NO.	STORAGE LOCATION	WEIGHT	LRV COORDINATES		
				X-C.G.	Y-C.G.	Z-C.G.
LUNAR ROVING VEHICLE	K1000.	1 DEPLOY ON LUN.SURF.	460.9	53.0	-2.3	103.0
S-059 BAG,SAMPLE COLLECTION	G4003.1	1 NEAR ZONE A6	1.8	131.8	6.0	118.2
S-059 S.E.S. CONTAINER	G4003.2	1 NEAR ZONE A6	1.0	131.8	6.0	118.2
S-059 (20 BAG)D.S.B.DISPENSER	G4003.3	3 ZONE A10	3.3	84.9	.0	124.5
S-059 CORE TUBES	G4003.4	3 NEAR ZONE A9	1.9	126.5	6.3	115.5
S-059 CAP DISPENSER	G4003.5	1 ZONE A11	.2	128.0	8.0	126.9
S-059 DRILL STEMS	G4003.6	6 NEAR ZONE A6	2.6	131.8	6.0	118.2
S-059 DRILL STEMS CAP+RETAINER	G4003.7	2 NEAR ZONE A6	.3	131.8	6.0	118.2
S-059 TOOL EXTENSION	G4008.	1 ZONE A8	1.7	126.5	-12.5	126.2
S-059 TONGS,32 INCH	G4009.	2 ZONE A7	3.0	127.0	-6.0	126.2
S-059 GNDMON	G4012.	1 ZONE AU3	.6	120.9	2.8	106.4
S-059 LUNAR HAND TOOL CARRIER	G4035.	1 ZONE A2	11.0	128.0	.0	116.4
S-059 SCOOP,ADJUSTABLE SAMPL.	G4035.2	1 ZONE A12	.8	126.5	10.3	117.4
S-059 HAMMER	G4035.3	1 ZONE A9	2.8	126.5	4.0	115.5
S-059 BAG,EXTRA COLLECTION	G4048.	4 ZONE A6	4.8	120.3	11.2	115.9
S-059 RAKE,LUNAR SAMPLING	G4054.	1 NEAR ZONE A13	4.3	120.3	6.5	109.0
S-200 PENTROMETER,RECORDING	G4049.	1 ZONE A4	5.8	122.7	-6.2	108.9
MAGAZINE,16MM DAC	A0101.1	3 ZONE B1	3.0	84.5	-14.5	104.0
MAGAZINE,ELECTRIC HASSELBLAD	A0108.1	3 ZONE B2	4.2	84.5	-14.5	104.0
FILTER,POLARIZING	A1005.	1 CREW STATION - LEFT	.2	84.9	-14.5	124.5
CAMERA,L.S.ELECTRIC HASSELBLAD	A1015.	1 ZONE A10	10.0	84.9	.0	124.5
LENS,60MM	A1016.	1 ZONE A10	3.4	84.9	.0	124.5
TRIGGER,ELECTRIC HASSELBLAD	A1027.	1 ZONE A10	.4	84.9	.0	124.5
HANDLE,ELECTRIC HASSELBLAD	A1028.	1 ZONE A10	1.0	84.9	.0	124.5
BRUSH,LENS	A1042.	2 LEFT OF ZONE A5	.2	120.5	-19.0	114.5
CAM/POWER PACK ASSY,16MM L.S.	A1043.	1 ZONE D1	9.9	62.0	8.0	139.5
BRACKET,CAMERA MOUNT	B1001.1	1 ZONE A10	1.2	84.9	.0	124.5
STAFF,16MM CAMERA/PP	R1001.	1 NEAR ZONE D1	1.5	62.0	8.0	130.0
70MM CAMERA W/500MM LENS		1 ZONE B1	9.3	84.5	-14.5	104.0
TV SYSTEM,L.M COLOR	E1001.1	1 ZONE F2	11.3	13.1	14.3	117.9
TV CONTROL UNIT	E1001.2	1 ZONE F2	11.5	13.1	14.3	117.9
CABLE,LCRU/CTV	E1001.4	1 BELOW RT.CREW STA.	1.4	84.5	14.5	104.0

TABLE 3.1-3.1 (CONTINUED)

LRV MASS PROPERTIES - FIRST TRAVERSE

LRV AT DEPARTURE WITH TWO CREW RIDING

		LRV COORDINATES		
DESCRIPTION	STOW. ITEM REF. NO.	STORAGE LOCATION	WEIGHT	X-C.G. Y-C.G. Z-C.G.
LCRU,LUNAR COMM.RELAY UNIT	E1002.1	ZONE F1	54.4	6.9 .0 100.0
ANTENNA,HIGH GAIN(CABLE+MAST)	E1002.4	ZONE F4	10.3	13.9 -14.3 160.0
ANTENNA,LOW GAIN(CABLE+MAST)	E1002.5	ZONE E1	2.5	62.0 -8.0 139.8
PALLET,LRV AFT CHASSIS	03067.	ZONE A1	32.0	120.1 .3 115.9
LUNAR SURFACE MAPS,LM	A0114,13	ZONE A10	1.5	84.9 .0 124.5
CHRONOGRAPH	A0202.	CREW STATION - LEFT	.1	84.9 -14.5 124.5
CHRONOGRAPH	A0202.	CREW STATION - RIGHT	.1	84.9 -14.5 124.5
SUBSYSTEM,FECAL CONTAINMENT	B0113.	CREW STATION - LEFT	.3	84.9 -14.5 124.5
SUBSYSTEM,FECAL CONTAINMENT	B0113.	CREW STATION - RIGHT	.3	84.9 -14.5 124.5
UCTA	B0205.	CREW STATION - LEFT	.5	84.9 -14.5 124.5
UCTA	B0205.	CREW STATION - RIGHT	.5	84.9 -14.5 124.5
ASSY,BIOBELT	B0207.	CREW STATION - LEFT	.2	84.9 -14.5 124.5
ASSY,BIOBELT	B0207.	CREW STATION - RIGHT	.2	84.9 -14.5 124.5
ITLSA (CDR)	B0211.	CREW STATION - LEFT	45.0	84.9 -14.5 124.5
ITLSA (LMP)	B0211.	CREW STATION - RIGHT	45.0	84.9 -14.5 124.5
GLOVES,EV	B0213.	CREW STATION - LEFT	2.1	84.9 -14.5 124.5
GLOVES,EV	B0213.	CREW STATION - RIGHT	2.1	84.9 -14.5 124.5
HELMET ASSY	B0214.	CREW STATION - LEFT	2.6	84.9 -14.5 124.5
HELMET ASSY	B0214.	CREW STATION - RIGHT	2.6	84.9 -14.5 124.5
HARNES,ELEC - SUIT	B0215.	CREW STATION - LEFT	.5	84.9 -14.5 124.5
HARNES,ELEC - SUIT	B0215.	CREW STATION - RIGHT	.5	84.9 -14.5 124.5
WISE DEVICE,DRILL STRING	03072.	ZONE A1	.5	120.1 .3 115.9
HARNES,BIOINSTRUMENTION	B0216.	CREW STATION - LEFT	.3	84.9 -14.5 124.5
HARNES,BIOINSTRUMENTION	B0216.	CREW STATION - RIGHT	.3	84.9 -14.5 124.5
COMMUNICATION CARRIER	B0217.	CREW STATION - LEFT	1.6	84.9 -14.5 124.5
COMMUNICATION CARRIER	B0217.	CREW STATION - RIGHT	1.6	84.9 -14.5 124.5
POCKET,CHECKLIST AND SCISSORS	B0218.	CREW STATION - LEFT	.2	84.9 -14.5 124.5
POCKET,CHECKLIST AND SCISSORS	B0218.	CREW STATION - RIGHT	.2	84.9 -14.5 124.5
POCKET,CHECKLIST	B0219.	CREW STATION - LEFT	.2	84.9 -14.5 124.5
POCKET,CHECKLIST	B0219.	CREW STATION - RIGHT	.2	84.9 -14.5 124.5
REMOTE CONTROL UNIT,PLSS	B1001.	CREW STATION - LEFT	5.1	84.9 -14.5 124.5
REMOTE CONTROL UNIT,PLSS	B1001.	CREW STATION - RIGHT	5.1	84.9 -14.5 124.5

TABLE 3.1-3.1 (CONTINUED)

LRV MASS PROPERTIES - FIRST TRAVERSE

LRV AT DEPARTURE WITH TWO CREW RIDING

DESCRIPTION	STOW, ITEM REF NO.	STORAGE LOCATION	WEIGHT	LRV COORDINATES		
				X-C.G.	Y-C.G.	Z-C.G.
OXYGEN PURGE SYSTEM (OPS)	B1012.	CREW STATION - LEFT	35.9	84.9	-14.5	124.5
L.E.V.A.	B1014.	CREW STATION - LEFT	5.6	84.9	-14.5	124.5
L.E.V.A.	B1014.	CREW STATION - RIGHT	5.6	84.9	-14.5	124.5
GLOVES - EVA	B1015.	CREW STATION - LEFT	2.7	84.9	-14.5	124.5
GLOVES - EVA	B1015.	CREW STATION - RIGHT	2.7	84.9	-14.5	124.5
OVERSHOES (PAIR)	B1018.	CREW STATION - LEFT	4.5	84.9	-14.5	124.5
OVERSHOES (PAIR)	B1018.	CREW STATION - RIGHT	4.5	84.9	-14.5	124.5
TETHER, WAIST EVA	B1020.6	CREW STATION - LEFT	.5	84.9	-14.5	124.5
TETHER, WAIST EVA	B1020.7	CREW STATION - RIGHT	.5	84.9	-14.5	124.5
PLSS/EVCS ASSY	B1024.	CREW STATION - LEFT	101.8	84.9	-14.5	124.5
PLSS/EVCS ASSY	B1025.	CREW STATION - RIGHT	101.8	84.9	-14.5	124.5
GARMENT, LIQUID COOLING	B1030.	CREW STATION - LEFT	4.3	84.9	-14.5	124.5
GARMENT, LIQUID COOLING	B1030.	CREW STATION - RIGHT	4.3	84.9	-14.5	124.5
SAFETY LINE, L.S. (100 FT)	B1041.	LEFT OF ZONE A5	1.3	120.5	-19.0	116.5
BRUSH, LUNAR DUST	B1045.	ZONE A5	1.4	122.2	7.2	124.2
BAG, L.S. SAFETY LINE	B1047.	LEFT OF ZONE A5	.1	120.5	-19.0	116.5
BAG, DRINKING (IN SUIT)	B1048.	CREW STATION - LEFT	2.8	84.9	-14.5	124.5
BAG, DRINKING (IN SUIT)	B1048.	CREW STATION - RIGHT	2.8	84.9	-14.5	124.5
BUDDY SLSS ASSY	B1052.	ZONE C1	10.9	99.2	14.5	119.8
OXYGEN PURGE SYSTEM (OPS)	B1059.	CREW STATION - RIGHT	35.9	84.9	14.5	124.5
HARNES, GEOL. EQUIP. (CDR)	B1063.	CREW STATION - LEFT	1.5	84.9	-14.5	124.5
HARNES, GEOL. EQUIP. (LMP)	B1064.	CREW STATION - RIGHT	1.5	84.9	-14.5	124.5
BIOINSTRUMENTATION ASSY	C0201.	CREW STATION - LEFT	1.1	84.9	-14.5	124.5
BIOINSTRUMENTATION ASSY	C0201.	CREW STATION - RIGHT	1.1	84.9	-14.5	124.5
DOSIMETER, PERSONAL	D0200.	CREW STATION - LEFT	.4	84.9	-14.5	124.5
DOSIMETER, PERSONAL	D0200.	CREW STATION - RIGHT	.4	84.9	-14.5	124.5
LM PILOT	T8D	CREW STATION - RIGHT	162.0	84.9	14.5	124.5
COMMANDER	T8D	CREW STATION - LEFT	183.0	84.9	-14.5	124.5

LRV FIRST TRAVERSE DEPARTURE - TWO CREW

LESS ONE CREW AND EQUIPMENT - ZONE C

PLUS FOLLOWING ITEMS:

CABLE, LCRU/CTV	E1001.4	BELOW RT. CREW STA.	1.4	84.5	14.5	104.0
BUDDY SLSS ASSY	B1052.	ZONE C1	10.9	99.2	14.5	119.8
REFLECTOR, LASER RANGING	G4034	CREW STATION - RIGHT	80.2	84.9	14.5	124.5
DRILL ASSY, APOLLO L.S.	G4047	CREW STATION - RIGHT	26.5	84.9	14.5	124.5

LRV FIRST TRAVERSE DEPARTURE - ONE CREW

1474.80	72.36	-0.13	110.71
-394.10	85.29	14.50	124.30

1199.70	69.49	-3.48	114.93
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TABLE 3.1-3.1 (CONTINUED)

LRV MASS PROPERTIES - FIRST TRAVERSE

LRV CREW SYSTEM

DESCRIPTION	STCM.	ITEM	REF	NO.	ZONE	STORAGE	LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
LUNAR SURFACE MAPS,LM	A0114.	A10		1	ZONE A10			1.5	84.9	0.0	124.5
CHRONOGRAPH	A0202.			1	CREW STATION - LEFT			.1	84.9	-14.5	124.5
CHRONOGRAPH	A0202.			1	CREW STATION - RIGHT			.1	84.9	14.5	124.5
SUBSYSTEM,FECAI CONTAINMENT	P0113.			1	CREW STATION - LEFT			.3	84.9	-14.5	124.5
SUBSYSTEM,FECAI CONTAINMENT	P0113.			1	CREW STATION - RIGHT			.3	84.9	14.5	124.5
UCTA	P0205.			1	CREW STATION - LEFT			.5	84.9	-14.5	124.5
UCTA	P0205.			1	CREW STATION - RIGHT			.5	84.9	14.5	124.5
ASSY,BIOBELT	P0207.			1	CREW STATION - LEFT			.2	84.9	-14.5	124.5
ASSY,BIOBELT	P0207.			1	CREW STATION - RIGHT			.2	84.9	14.5	124.5
ITLSA (CDR)	P0211.			1	CREW STATION - LEFT			45.0	84.9	-14.5	124.5
ITLSA (LMP)	P0211.			1	CREW STATION - RIGHT			45.0	84.9	14.5	124.5
GLOVES,EV	P0213.			1	CREW STATION - LEFT			2.1	84.9	-14.5	124.5
GLOVES,EV	P0213.			1	CREW STATION - RIGHT			2.1	84.9	14.5	124.5
HELMET ASSY	P0214.			1	CREW STATION - LEFT			2.6	84.9	-14.5	124.5
HELMET ASSY	P0214.			1	CREW STATION - RIGHT			2.6	84.9	14.5	124.5
HARNES,ELEC - SUIT	P0215.			1	CREW STATION - LEFT			.5	84.9	-14.5	124.5
HARNES,ELEC - SUIT	P0215.			1	CREW STATION - RIGHT			.5	84.9	14.5	124.5
HARNES,BIOINSTRUMENTION	P0216.			1	CREW STATION - LEFT			.3	84.9	-14.5	124.5
HARNES,BIOINSTRUMENTION	P0216.			1	CREW STATION - RIGHT			.3	84.9	14.5	124.5
COMMUNICATION CARRIER	P0217.			1	CREW STATION - LEFT			1.6	84.9	-14.5	124.5
COMMUNICATION CARRIER	P0217.			1	CREW STATION - RIGHT			1.6	84.9	14.5	124.5
POCKET,CHECKLIST AND SCISSORS	P0218.			1	CREW STATION - LEFT			.2	84.9	-14.5	124.5
POCKET,CHECKLIST AND SCISSORS	P0218.			1	CREW STATION - RIGHT			.2	84.9	14.5	124.5
POCKET,CHECKLIST	P0219.			1	CREW STATION - LEFT			.2	84.9	-14.5	124.5
POCKET,CHECKLIST	P0219.			1	CREW STATION - RIGHT			.2	84.9	14.5	124.5
REMOTE CONTROL UNIT,PLSS	R1001.			1	CREW STATION - LEFT			5.1	84.9	-14.5	124.5
REMOTE CONTROL UNIT,PLSS	R1001.			1	CREW STATION - RIGHT			5.1	84.9	14.5	124.5
OXYGEN PURGE SYSTEM (OPS)	R1012.			1	CREW STATION - LEFT			35.9	84.9	-14.5	124.5
OXYGEN PURGE SYSTEM (OPS)	R1012.			1	CREW STATION - RIGHT			35.9	84.9	14.5	124.5
L.E.V.A.	R1014.			1	CREW STATION - LEFT			5.6	84.9	-14.5	124.5
L.E.V.A.	R1014.			1	CREW STATION - RIGHT			5.6	84.9	14.5	124.5
GLOVES - EVA	R1015.			1	CREW STATION - LEFT			2.7	84.9	-14.5	124.5
GLOVES - EVA	R1015.			1	CREW STATION - RIGHT			2.7	84.9	14.5	124.5

TABLE 3.1-3.1 (CONTINUED)

LRV MASS PROPERTIES - FIRST TRAVERSE

LRV CREW SYSTEM

DESCRIPTION	STOW. ITEM REF NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
OVERSHOES (PAIR)	B1018.	CREW STATION - LEFT	4.5	84.9	-14.5	124.5
OVERSHOES (PAIR)	P1018.	CREW STATION - RIGHT	4.5	84.9	14.5	124.5
TETHER, WAIST EVA	B1020.6	CREW STATION - LEFT	.5	84.9	-14.5	124.5
TETHER, WAIST EVA	B1020.7	CREW STATION - RIGHT	.5	84.9	14.5	124.5
PLSS/EVCS ASSY	B1024.	CREW STATION - LEFT	101.8	84.9	-14.5	124.5
PLSS/EVCS ASSY	B1025.	CREW STATION - RIGHT	101.8	84.9	14.5	124.5
GARMENT, LIQUID COOLING	B1030.	CREW STATION - LEFT	4.3	84.9	-14.5	124.5
GARMENT, LIQUID COOLING	B1030.	CREW STATION - RIGHT	4.3	84.9	14.5	124.5
SAFETY LINE, L.S. (1100 FT)	B1041.	LEFT OF ZONE A5	1.3	120.5	-19.0	114.5
BRUSH, LUNAR DUST	B1045.	ZONE A5	1.4	122.2	7.2	124.2
BAG, L.S. SAFETY LINE	B1047.	LEFT OF ZONE A5	.1	120.5	-19.0	114.5
BAG, DRINKING (IN SUIT)	B1048.	CREW STATION - LEFT	2.8	84.9	-14.5	124.5
BAG, DRINKING (IN SUIT)	B1048.	CREW STATION - RIGHT	2.8	84.9	14.5	124.5
BUDDY SLSS ASSY	B1052.	ZONE C1	10.9	99.2	14.5	119.8
OXYGEN PURGE SYSTEM (OPS)	B1059.	CREW STATION - RIGHT	35.9	84.9	14.5	124.5
HARNES, GEOL. EQUIP. (ICDR)	B1063.	CREW STATION - LEFT	1.5	84.9	-14.5	124.5
HARNES, GEOL. EQUIP. (LMP)	B1064.	CREW STATION - RIGHT	1.5	84.9	14.5	124.5
BIOINSTRUMENTATION ASSY	C0201.	CREW STATION - LEFT	1.1	84.9	-14.5	124.5
BIOINSTRUMENTATION ASSY	C0201.	CREW STATION - RIGHT	1.1	84.9	14.5	124.5
DOSIMETER, PERSONAL	D0200.	CREW STATION - LEFT	.4	84.9	-14.5	124.5
DOSIMETER, PERSONAL	D0200.	CREW STATION - RIGHT	.4	84.9	14.5	124.5
LM PILOT	TBD	CREW STATION - RIGHT	162.0	84.9	14.5	124.5
COMMANDER	TBD	CREW STATION - LEFT	183.0	84.9	-14.5	124.5
<b>-CREW SYS TOTAL</b>			<b>799.80</b>	<b>85.22</b>	<b>-0.20</b>	<b>124.92</b>

Current Weight and c.g. by Loading Zone (for Limit Weight per Zone Reference LRV Operations Handbook, Appendix A)

Weight	$\bar{X}$	$\bar{Y}$	$\bar{Z}$	
Zone A (Aft of Seat)	98.0	115.2	0.6	117.8
Zone B (Left Crew & Equipment)	402.8	84.9	-14.5	123.6
Zone C (Right Crew & Equipment)	381.8	85.3	14.5	124.3
Zone D (Console Area Right Side)	11.4	62.0	8.0	138.3
Zone E (Console Area Left Side)	3.0	71.7	-6.6	135.8
Zone F (Forward Vehicle Area)	88.0	10.0	2.0	116.7
Zone C (Without LMP)	119.0	86.2	14.5	123.8



TABLE 3.1-4

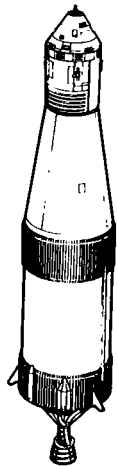
HIGH ALTITUDE ABORT MASS PROPERTIES

To be Supplied at a Later Date

TABLE 3.1-5

PAD ABORT MASS PROPERTIES

To be Supplied at a Later Date



LV COORDINATES  
SIVB EXPECTED SEQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>		
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ
SIVB POST E.C.I.		200873.9	2833.0	1.0	-0.8	1464651	940980	937974			
CSM		66586.7	3650.5	4.9	4.8	36354	79950	81614			
LM IN SLA		36206.8	3340.2	.4	-0.9	25510	27057	25853			
SIVB+CSM+LM POST E.O.I.		304067.4	3082.3	1.8	.4	1527051	9610335	9607607			
SIVB PRE T.L.I.		198435.9	2830.6	1.0	-0.8	1458047	918334	915614			
CSM PRE T.L.I.		66563.6	3650.5	4.9	4.8	36344	79952	81609			
LM IN SLA		36206.8	3340.2	.4	-0.9	25510	27057	25853			
SIVB+CSM+LM PRE T.L.I.		301606.3	3082.7	1.8	.4	1520437	9605921	9603486			
SIVB POST Y.L.I.		36942.9	2560.0	5.0	-4.0	88543	562135	559096			
CSM POST T.L.I.		66963.6	3650.5	4.9	4.8	36344	79952	81609			
LM IN SLA		36206.8	3340.2	.4	-0.9	25510	27057	25853			
SIVB+CSM+LM POST T.L.I.		140113.3	3407.4	3.8	1.0	150955	3459273	3456366			
SIVB (EXCL. SLA PANELS)		34122.9	2921.8	5.6	-4.3	81987	405668	403364			
LM IN SLA		36206.8	3340.2	.4	-0.9	25510	27057	25853			
SIVB+LM PRE DOCKING		70329.7	3137.2	2.9	-2.5	107642	1096566	1092918			

NOTE: Products of inertia are not presently available for the S-IVB. This table will be updated to include products of inertia when data is available.



XA COORDINATES  
 TABLE 3-1-6 (CONTINUED)  
 SIVB EXPECTED SQUENTIAL MASS PROPERTIES

DESCRIPTION	S	WEIGHT POUNDS	C. G. INCHES			INERTIAS SLUG-FT <sup>2</sup>			PRODUCTS SLUG-FT <sup>2</sup>		
			X	Y	Z	IXX	IYY	IZZ	PXY	PXZ	PYZ
SIVB (EXCL. SLA PANELS)		34122.9	1657.0	-9	7.0	81987	403928	405302			
CSM AT TRANS/DOCK		66893.0	933.9	4.5	4.8	36268	75502	81569			
LM AT TRANS/DOCK		36204.1	1238.1	-6	.8	25505	25891	26807			
CSM/LM/SIVB DOCKED		137220.0	1194.0	2.0	4.3	144150	3080383	3084424			
CSM/LM DOCKED		103097.1	1040.7	3.0	3.4	62008	575057	577712			

NOTE: Products of inertia are not presently available for the S-IVB. This table will be updated to include products of inertia when data is available.

TABLE 3.1-7

## CSM 112 CONSUMABLES WEIGHT CHANGE SUMMARY

(To be used in conjunction with CSM sequential mass properties Tables 3.1-2).

From	EVENT	To	Consumable	Weight Change (Pounds)	Amount Remaining (Pounds)	Total Usage (Pounds)
Earth Orbit		Pre Trans/Dock	SM-Hydrogen			
			Tank 1 & 2	-0.8	54.4	-0.8
			Tank 3	-0.8	26.8	-0.8
			SM-Oxygen			
			Tank 1 & 2	-18.2	615.0	-18.2
			Tank 3	-4.1	312.5	-4.1
			CM-Waste H <sub>2</sub> O	+0.8	18.8	
Pre Trans/Dock		Post Trans/Dock	SM-RCS	-70.6	1,271.8	-70.6
Post Trans/Dock		Pre L.O.I.	SM-Hydrogen			
			Tank 1 & 2	-3.8	50.6	-4.6
			Tank 3	-9.9	16.9	-10.7
			SM-Oxygen			
			Tank 1 & 2	-57.8	557.2	-76.0
			Tank 3	-83.2	229.3	-87.3
			SM-RCS	-111.3	1,160.5	-181.9
			CM-Waste H <sub>2</sub> O	+21.2	40.0	
			CM-LiOH	+24.0	24.0	
			CM-Food	-6.2		-6.2
			Fecal	+2.0	2.0	
Pre L.O.I.		Post L.O.I.	SM-SPS	-26,370.0	14,223.7	-26,370.0
Post L.O.I.		Pre D.O.I.	SM-Hydrogen			
			Tank 1 & 2	-0.8	49.8	-5.4
			Tank 3	-0.3	16.6	-11.0
			SM-Oxygen			
			Tank 1 & 2	-3.0	554.2	-79.0
			Tank 3	-7.7	221.6	-95.0
			SM-RCS	-41.1	1,119.4	-223.0

TABLE 3.1-7 (CONTINUED)

## CSM 112 CONSUMABLES WEIGHT CHANGE SUMMARY

(To be used in conjunction with CMS sequential mass properties Table 3.1-2).

EVENT		Consumable	Weight Change (Pounds)	Amount Remaining (Pounds)	Total Usage (Pounds)
From	To				
Pre D.O.I.	Post D.O.I.	SM-SPS	-1,565.2	12,658.5	-27,935.2
Post D.O.I.	CSM/LM Sep.	SM-Hydrogen			
		Tank 1 & 2	-3.0	46.8	-8.4
		Tank 3	-0.7	15.9	-11.7
		SM-Oxygen			
		Tank 1 & 2	-10.2	544.0	-89.2
		Tank 3	-24.1	197.5	-119.1
		SM-RCS	-113.3	1,006.1	-336.3
		CM-LiOH	+6.0	30.0	
		CM-Food	-3.8		-10.0
		Fecal	+3.0	5.0	
CSM/LM Sep.	Pre Circularization	SM-Hydrogen			
		Tank 1 & 2	-0.2	46.6	-8.6
		Tank 3	-0.1	15.8	-11.8
		SM-Oxygen			
		Tank 1 & 2	-1.2	542.8	-90.4
		Tank 3	-1.2	196.3	-120.3
		SM-RCS	-22.5	983.6	-358.8
Pre Circularization	Post Circularization	SM-SPS	-278.8	12,379.7	-28,214.0
Post Circularization	Pre Plane Change	SM-Hydrogen			
		Tank 1 & 2	-11.2	35.4	-19.8
		Tank 3	-1.7	14.1	-13.5
		SM-Oxygen			
		Tank 1 & 2	-79.4	463.4	-169.8
		Tank 3	-43.0	153.3	-163.3
		SM-RCS	-110.4	873.2	-469.2
		Fecal	+3.0	8.0	

TABLE 3.1-7 (CONTINUED)

CSM 112 CONSUMABLES WEIGHT CHANGE SUMMARY

(To be used in conjunction with CSM sequential mass properties Table 3.1-2).

From	EVENT	To	Consumable	Weight Change (Pounds)	Amount Remaining (Pounds)	Total Usage (Pounds)
Pre Plane Change		Post Plane Change	SM-SPS	-1,133.2	11,246.5	-29,347.2
Post Plane Change		CSM/ASCT Dock	SM-Hydrogen			
			Tank 1 & 2	-1.4	34.0	-21.2
			Tank 3	-0.4	13.7	-13.9
			SM-Oxygen			
			Tank 1 & 2	-11.0	452.4	-180.8
			Tank 3	-5.3	148.0	-168.6
			SM-RCS	-86.7	786.5	-555.9
			CM-Food	-4.3		-14.3
			CM-LiOH	+12.0	42.0	
			CM-Fecal	+3.1	11.1	
CSM/ASCT Docking		Pre T.E.I.	SM-Hydrogen			
			Tank 1 & 2	-8.6	25.4	-29.8
			Tank 3	-2.2	11.5	-16.1
			SM-Oxygen			
			Tank 1 & 2	-68.6	383.8	-249.4
			Tank 3	-32.6	115.4	-201.2
			SM-RCS	-90.7	695.8	-646.6
			CM-LiOH	+5.0	47.0	
			CM-Fecal	+3.0	14.1	
			CM-Food	-3.8		-18.1
Pre T.E.I.		Post T.E.I.	SM-SPS	-9,442.5	1,804.0	-38,789.7
Post T.E.I.		SM Jettison	SM-Hydrogen			
			Tank 1 & 2	-9.8	15.6	-39.6
			Tank 3	-3.1	8.4	-19.2
			SM-Oxygen			
			Tank 1 & 2	-99.6	284.2	-349.0
			Tank 3	-51.1	64.3	-252.3

TABLE 3.1-7 (CONTINUED)

## CSM 112 CONSUMABLES WEIGHT CHANGE SUMMARY

(To be used in conjunction with CSM sequential mass properties Table 3.1-2).

From	EVENT To	Consumable	Weight Change (Pounds)	Amount Remaining (Pounds)	Total Usage (Pounds)
Post T.E.I. (Continued)	SM Jettison	SM-RCS	-112.6	583.2	-759.2
		CM-LiOH	+17.0	64.0	
		CM-Food	-7.3		-25.4
		CM-Fecal	+4.6	18.7	
SM Jettison	CM @ Entry	CM-RCS	-11.6	233.4	-11.6
CM @ Entry	CM @ M.C. Deploy	CM-RCS	-30.7	202.7	-42.3
CM @ M.C. Deploy	CM @ Impact	CM-RCS	-202.7	0.0	-245.0



TABLE 3.1-8

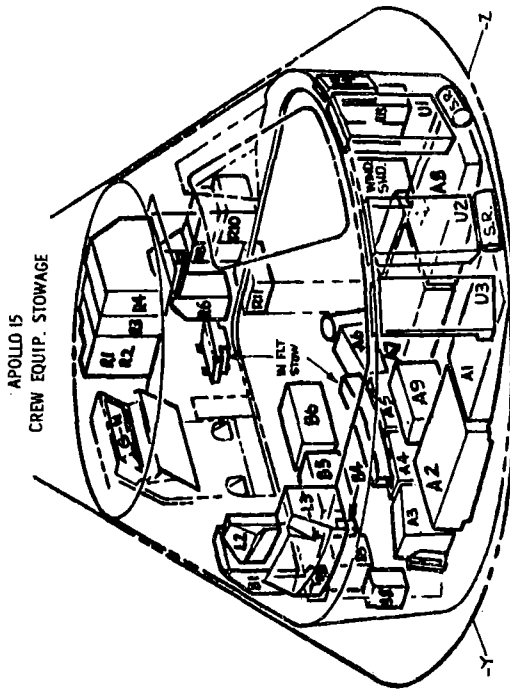
## LM-10 CONSUMABLES CHANGE SUMMARY

(To be used in conjunction with the LM sequential mass properties Table 3.1-3)

EVENT		Consumable	Weight	Amount	Total
From	To		Change (Pounds)	Remaining (Pounds)	Usage (Pounds)
Earth Orbit	CSM/LM Separation	D/S-Oxygen	-1.0	95.0	-1.0
		D/S-Water	-15.0	375.0	-15.0
		LM-RCS	-5.0	599.9	-5.0
CSM/LM Separation	Pre P.D.I.	D/S-Oxygen	-0.6	94.4	-1.6
		D/S-Water	-20.0	355.0	-25.0
		LM-RCS	-61.5	538.4	-66.5
Pre P.D.I.	LM @ Touchdown	D/S-Oxygen	-0.1	94.3	-1.7
		D/S-Water	-2.0	353.0	-27.0
		LM-RCS	-98.0	440.4	-164.5
		LM-DPS	-18,741.4	764.9	-18,741.4
LM @ Touch- down	A/S @ Lift-Off	LM-RCS	-5.0	435.4	-169.5
LM @ Lift-Off	A/S in Orbit	LM-APS	-4,894.2	334.5	-4,894.2
A/S in Orbit	A/S Pre T.P.I.	A/S-Water	-4.2	90.8	-4.2
		A/S-Oxygen	-0.2	4.6	-0.2
		LM-RCS	-47.4	388.0	-216.9
A/S Pre T.P.I.	A/S Post T.P.I.	LM-APS	-32.1	302.4	-4,926.3
A/S Post T.P.I.	A/S @ Docking	A/S-Water	-9.2	81.6	-13.4
		A/S-Oxygen	-0.3	4.3	-0.5
		LM-RCS	-70.2	317.8	-287.1
A/S @ Docking	A/S Jettison	A/S-Water	-11.0	70.6	-24.4

TABLE 3.1-9

MISSION J-1 COMMAND MODULE STOWAGE VOLUME CENTROID



APOLLO 15  
CREW EQUIP. STOWAGE

SIC 112 "J-SERIES" LAUNCH STOWAGE LIST

Item Description	Location
TV CAMERA, COLOR	A-1
20MM LENS, WITH COVER	A-1
TV MONITOR CABLE	A-1
TV MONITOR CABLE	A-1
TV POWER CABLE	A-1
TV CAMERA BRACKET	A-1
TV MOUNTING BRACKET	A-1
16MM CAMERA SEXTANT ADAPTER	A-1
70MM REMOTE CONTROL CABLE	A-1
16MM FILM MAGS AND 2 BAGS - 7	A-1
70MM FILM MAGAZINES AND BAG - 2	A-1
2 SPEED INTERVAL TIMER	A-1
VOICE RECORDER W/CASS. & BATT.	A-1
UV FILTER ASSY (105MM LENS)	A-1
UV CAMERA MOUNT	A-1
UV 70MM MAGAZINE	A-1
INFLIGHT RETAINER STRAPS - 3	A-2
35 MM CAMERA BRACKET	A-2
PPK'S - 3	A-3
TISSUE DISPENSERS - 8	A-3
FECAL CONTAINMENT SUBSYSTEM - 3	A-3
HEAD REST PADS - 3	A-3
HEEL RESTRAINTS - 3 PK	A-3
HEEL RESTRAINT CONTAINER	A-3
JETTISON STOWAGE BAGS - 5 (2 OFF)	A-3
EVA GLOVES (CMP)	A-3
EVA EQUIPMENT CONTAINER	A-3
PGA ADAPTER	A-3
WINGS/TETHER	A-3
WINGS/TETHER	A-3
OPS PCA STRAPS - 4	A-3
OPS PCA STRAPS - 4	A-3
OPS CONTROL VALVE	A-3
STRAPS - 2	A-3
ENTRY TIEDOWN ROPES AND BAG - 5	A-3
ENTRY BOOTS CONTAINER	A-3
GAUGE ASSY. (PANEL 603)	A-3
70MM MASSELBLAD DECOM. BAG	A-3
VACUUM CLEANER BAG - 2	A-3
VACUUM CLEAN POWER CABLE	A-3
TOP OF A-2	A-3
DECONTAMINATION BAGS*	A-3
15X DECONTAMINATION BAG*	A-3
CONTINGENCY LUNAR SAMPLE RETURN	A-3
L5 MASSELBLAD MAGS - 4	A-3
SRC NO. 1 AND NO. 2	A-3
LUNAR SAMPLE (B/S/SS AREA)	A-3
16MM DAC	A-3
PENETROMETER	A-3
CO2 ABSORBERS - 4	A-3
FIRE EXTINGUISHER (ON A-3)	A-3
CO2 ABSORBERS - 4	A-3
CO2 ABSORBERS - 4	A-3
CO2 ABSORBERS - 4	A-3
CO2 ABSORBERS - 4	A-3
VACUUM CLEANER	A-3
FOOD, PACKAGED	A-3
FECAL COLLECTION ASSY. - 30 (12*)	A-3
FECAL COLLECTION ASSY. BAGS - 2 (1*)	A-3
SIDE OF A-7	A-3
INFLIGHT RETAINER STRAP	A-3
EVA UMBILICAL & BAG	A-3
BAG - HOSE, URINE, VACUUM ETC.	A-3
VACUUM BRUSH	A-3
URINE HOSE ASSY.	A-3
EVA GUARDS (LEFT, CENTER, RIGHT)	A-3
UTILITY STRAP	A-3
UNIPOD POLE	A-3
IN-FLIGHT EXERCISER	A-8
CMG 9	A-8
EMG MAINTENANCE KIT	A-8
LIGHT WEIGHT HEADSETS - 3	A-8
CMG ELECTRICAL ADAPTERS - 4	A-8
CMG ELECTRICAL ADAPTERS BAG	A-8
RELIEF RECEPTACLE ASSY.	A-8
RELIEF RECEPTACLE RESTRAINT, STRAP	A-8
QD GAS FILTER ASSY. - 3	A-8
TOOL SET ASSEMBLY	A-8
PLV INUITS - 3	A-8
PLV CONTAINER	A-8
70MM FILM MAGAZINES AND BAG - 3	A-8
CM TOWELS (RED, WHITE, BLUE) - 9	A-8
H2 GAS SEPARATOR	A-8
H2 GAS SEPARATOR BAG	A-8
PGA O2 UMBILICAL INTERCONN. - 3 (1*)	A-8
O2 INTERCONNECT CONTAINER	A-8
SWAG LINE	A-8
SWAG LINE CONTAINER	A-8
INFLIGHT RETAINER STRAP	A-8
WATER PANEL COUPLING ASSY.	A-8
WMS WATER PANEL QD	A-8
WMS POWER CABLE	A-8
WMS QD PRESSURE CAP	A-8
WMS B/U CONTAINER	A-8
QD ECS CONTAINER	A-8
TAPE CASSETTE KIT	A-8
ACOUSTIC TONE BOOSTER	A-8
ACOUSTIC TONE BOOSTER BAG	A-8
16MM FILM MAGS AND BAG - 2	A-8
16MM FILM MAGS AND BAG - 2	A-8
URINE FILTER ASSY AND BAG - 3	A-8
URINE FILTER ASSY AND BAG - 3	A-8
TAPE RECORDER BATTERIES BAG (PK)	A-8
TAPE RECORDER BATTERIES BAG (PK)	A-8
SIDE OF A-8	A-8
BAG - HOSE, URINE, VACUUM ETC.	A-8
VACUUM BRUSH	A-8
URINE HOSE ASSY.	A-8
EVA GUARDS (LEFT, CENTER, RIGHT)	A-8
UTILITY STRAP	A-8
UNIPOD POLE	A-8
RESQUE BOOK	R-3
EARTH ORBITAL MAP	R-3
DATA CARD KIT	R-3
EYEPATCH	R-3
METER COVERS - 2	R-3
VERB-HOURS, G AND H PANEL	R-3
FUSE (16MM CAMERA)	R-3
FLIGHT DATA FILE CLIPS - 6	R-3
LM XFR DATA CARD KIT	R-3
LM DATA CARD BOOK	R-3
LM LUNAR SURFACE CHECKLIST	R-3
LM ACTIVATION CHECKLIST	R-3
LM TIMELINE BOOK	R-3
LM ORBIT CHARTS (A, B, C, D)	R-3
RESUE BOOK	R-3
EARTH ORBITAL MAP	R-3
DATA CARD KIT	R-3
EYEPATCH	R-3
METER COVERS - 2	R-3
VERB-HOURS, G AND H PANEL	R-3
FUSE (16MM CAMERA)	R-3
FLIGHT DATA FILE CLIPS - 6	R-3
LM XFR DATA CARD KIT	R-3
LM DATA CARD BOOK	R-3
LM LUNAR SURFACE CHECKLIST	R-3
LM ACTIVATION CHECKLIST	R-3
LM TIMELINE BOOK	R-3
LM ORBIT CHARTS (A, B, C, D)	R-3
CSM LUNAR LANDMARK MAP	R-12
CSM SYSTEM DATA	R-12
CSM MAINTENANCE PROCEDURES	R-12
FLIGHT PLAN	R-12
CMP SOLD BOOK	R-12
RUCKSACK SURVIVAL KIT NO. 1	R-4
RUCKSACK SURVIVAL KIT NO. 2	R-4
PROBE STOWAGE STRAPS - 2	R-5
INFLIGHT RETAINER STRAPS - 7 (3*)	R-5
URINE FILTER BAG	R-5
COUCH RESTRAINING STRAPS - 2	R-5
TAPE	R-6
QUA HIGH DENSITY SUIFILTERS - 2	R-6
CHLOR. SYRINGE KNIB	R-6
CHLOR. SYRINGE CASING	R-6
CHLOR. NEEDLE	R-6
CHLOR. SYRINGE CONTAINER	R-6
PENLIGHTS AND CONTAINER - 5	R-6
MEDICAL KIT	R-6
URINE TRANSFER SYSTEMS - 3	R-11
URINE RECEIVER ASSY. (SPARE)	R-11
ROLL ON CUFFS (RED, WHITE, BLUE)	R-11
URINE FILTER, HI CAP. & BAG	R-11
16MM MAGAZINES AND TRANS. BAG - 6*	R-13
16 MM MAG. AND TRANS. BAG - 2*	R-13
70 MM MAGAZINES AND TRANS. BAG - 6*	R-13
70 MM MAG. AND TRANS. BAG - 3*	R-13
RADIATION DOSIMETER	R-13
70 MM MAG. AND TRANS. BAG - 3*	R-13
CONTINGENCY FEEDING VALVE	R-13
CONTINGENCY FEEDING VALVE	R-13
CONTINGENCY CHECKLIST	R-13
ENTRY CHECKLIST	R-13
SYSTEMS CHECKLIST	R-13
SYSTEMS UPDATE	R-13
G&C CHECKLIST	R-13
LAUNCH CHECKLIST	R-2
CSM UPDATES	R-2
CSM LM ORBIT MONITOR CHARTS	R-2
TV CAMERA, COLOR	A-1
20MM LENS, WITH COVER	A-1
TV MONITOR CABLE	A-1
TV MONITOR CABLE	A-1
TV POWER CABLE	A-1
TV CAMERA BRACKET	A-1
TV MOUNTING BRACKET	A-1
16MM CAMERA SEXTANT ADAPTER	A-1
70MM REMOTE CONTROL CABLE	A-1
16MM FILM MAGS AND 2 BAGS - 7	A-1
70MM FILM MAGAZINES AND BAG - 2	A-1
2 SPEED INTERVAL TIMER	A-1
VOICE RECORDER W/CASS. & BATT.	A-1
UV FILTER ASSY (105MM LENS)	A-1
UV CAMERA MOUNT	A-1
UV 70MM MAGAZINE	A-1
INFLIGHT RETAINER STRAPS - 3	A-2
35 MM CAMERA BRACKET	A-2
PPK'S - 3	A-3
TISSUE DISPENSERS - 8	A-3
FECAL CONTAINMENT SUBSYSTEM - 3	A-3
HEAD REST PADS - 3	A-3
HEEL RESTRAINTS - 3 PK	A-3
HEEL RESTRAINT CONTAINER	A-3
JETTISON STOWAGE BAGS - 5 (2 OFF)	A-3
EVA GLOVES (CMP)	A-3
EVA EQUIPMENT CONTAINER	A-3
PGA ADAPTER	A-3
WINGS/TETHER	A-3
WINGS/TETHER	A-3
OPS PCA STRAPS - 4	A-3
OPS PCA STRAPS - 4	A-3
OPS CONTROL VALVE	A-3
STRAPS - 2	A-3
ENTRY TIEDOWN ROPES AND BAG - 5	A-3
ENTRY BOOTS CONTAINER	A-3
GAUGE ASSY. (PANEL 603)	A-3
70MM MASSELBLAD DECOM. BAG	A-3
VACUUM CLEANER BAG - 2	A-3
VACUUM CLEAN POWER CABLE	A-3
TOP OF A-2	A-3
DECONTAMINATION BAGS*	A-3
15X DECONTAMINATION BAG*	A-3
CONTINGENCY LUNAR SAMPLE RETURN	A-3
L5 MASSELBLAD MAGS - 4	A-3
SRC NO. 1 AND NO. 2	A-3
LUNAR SAMPLE (B/S/SS AREA)	A-3
16MM DAC	A-3
PENETROMETER	A-3
CO2 ABSORBERS - 4	A-3
FIRE EXTINGUISHER (ON A-3)	A-3
CO2 ABSORBERS - 4	A-3
CO2 ABSORBERS - 4	A-3
CO2 ABSORBERS - 4	A-3
VACUUM CLEANER	A-3
FOOD, PACKAGED	A-3
FECAL COLLECTION ASSY. - 30 (12*)	A-3
FECAL COLLECTION ASSY. BAGS - 2 (1*)	A-3
SIDE OF A-7	A-3
INFLIGHT RETAINER STRAP	A-3
EVA UMBILICAL & BAG	A-3
BAG - HOSE, URINE, VACUUM ETC.	A-3
VACUUM BRUSH	A-3
URINE HOSE ASSY.	A-3
EVA GUARDS (LEFT, CENTER, RIGHT)	A-3
UTILITY STRAP	A-3
UNIPOD POLE	A-3
IN-FLIGHT EXERCISER	A-8
CMG 9	A-8
EMG MAINTENANCE KIT	A-8
LIGHT WEIGHT HEADSETS - 3	A-8
CMG ELECTRICAL ADAPTERS - 4	A-8
CMG ELECTRICAL ADAPTERS BAG	A-8
RELIEF RECEPTACLE ASSY.	A-8
RELIEF RECEPTACLE RESTRAINT, STRAP	A-8
QD GAS FILTER ASSY. - 3	A-8
TOOL SET ASSEMBLY	A-8
PLV INUITS - 3	A-8
PLV CONTAINER	A-8
70MM FILM MAGAZINES AND BAG - 3	A-8
CM TOWELS (RED, WHITE, BLUE) - 9	A-8
H2 GAS SEPARATOR	A-8
H2 GAS SEPARATOR BAG	A-8
PGA O2 UMBILICAL INTERCONN. - 3 (1*)	A-8
O2 INTERCONNECT CONTAINER	A-8
SWAG LINE	A-8
SWAG LINE CONTAINER	A-8
INFLIGHT RETAINER STRAP	A-8
WATER PANEL COUPLING ASSY.	A-8
WMS WATER PANEL QD	A-8
WMS POWER CABLE	A-8
WMS QD PRESSURE CAP	A-8
WMS B/U CONTAINER	A-8
QD ECS CONTAINER	A-8
TAPE CASSETTE KIT	A-8
ACOUSTIC TONE BOOSTER	A-8
ACOUSTIC TONE BOOSTER BAG	A-8
16MM FILM MAGS AND BAG - 2	A-8
16MM FILM MAGS AND BAG - 2	A-8
URINE FILTER ASSY AND BAG - 3	A-8
URINE FILTER ASSY AND BAG - 3	A-8
TAPE RECORDER BATTERIES BAG (PK)	A-8
TAPE RECORDER BATTERIES BAG (PK)	A-8
SIDE OF A-8	A-8
BAG - HOSE, URINE, VACUUM ETC.	A-8
VACUUM BRUSH	A-8
URINE HOSE ASSY.	A-8
EVA GUARDS (LEFT, CENTER, RIGHT)	A-8
UTILITY STRAP	A-8
UNIPOD POLE	A-8
RESQUE BOOK	R-3
EARTH ORBITAL MAP	R-3
DATA CARD KIT	R-3
EYEPATCH	R-3
METER COVERS - 2	R-3
VERB-HOURS, G AND H PANEL	R-3
FUSE (16MM CAMERA)	R-3
FLIGHT DATA FILE CLIPS - 6	R-3
LM XFR DATA CARD KIT	R-3
LM DATA CARD BOOK	R-3
LM LUNAR SURFACE CHECKLIST	R-3
LM ACTIVATION CHECKLIST	R-3
LM TIMELINE BOOK	R-3
LM ORBIT CHARTS (A, B, C, D)	R-3
CSM LUNAR LANDMARK MAP	R-12
CSM SYSTEM DATA	R-12
CSM MAINTENANCE PROCEDURES	R-12
FLIGHT PLAN	R-12
CMP SOLD BOOK	R-12
RUCKSACK SURVIVAL KIT NO. 1	R-4
RUCKSACK SURVIVAL KIT NO. 2	R-4
PROBE STOWAGE STRAPS - 2	R-5
INFLIGHT RETAINER STRAPS - 7 (3*)	R-5
URINE FILTER BAG	R-5
COUCH RESTRAINING STRAPS - 2	R-5
TAPE	R-6
QUA HIGH DENSITY SUIFILTERS - 2	R-6
CHLOR. SYRINGE KNIB	R-6
CHLOR. SYRINGE CASING	R-6
CHLOR. NEEDLE	R-6
CHLOR. SYRINGE CONTAINER	R-6
PENLIGHTS AND CONTAINER - 5	R-6
MEDICAL KIT	R-6
URINE TRANSFER SYSTEMS - 3	R-11
URINE RECEIVER ASSY. (SPARE)	R-11
ROLL ON CUFFS (RED, WHITE, BLUE)	R-11
URINE FILTER, HI CAP. & BAG	R-11
16MM MAGAZINES AND TRANS. BAG - 6*	R-13
16 MM MAG. AND TRANS. BAG - 2*	R-13
70 MM MAGAZINES AND TRANS. BAG - 6*	R-13
70 MM MAG. AND TRANS. BAG - 3*	R-13
RADIATION DOSIMETER	R-13
70 MM MAG. AND TRANS. BAG - 3*	R-13
CONTINGENCY FEEDING VALVE	R-13
CONTINGENCY FEEDING VALVE	R-13
CONTINGENCY CHECKLIST	R-13
ENTRY CHECKLIST	R-13
SYSTEMS CHECKLIST	R-13
SYSTEMS UPDATE	R-13
G&C CHECKLIST	R-13
LAUNCH CHECKLIST	R-2
CSM UPDATES	R-2
CSM LM ORBIT MONITOR CHARTS	R-2

TABLE 3.1-9 (CONTINUED)  
MISSION J-1 COMMAND MODULE STORAGE VOLUME CENTROID

LAUNCH STOWAGE	ITEM	RETURN STOWAGE	LAUNCH STOWAGE	ITEM	RETURN STOWAGE
LM	PPK'S - 3	A-8	A-9	CONTAINERS	Offloaded TO LM
LM	CONTINGENCY LUNAR SAMPLE	ON TOP A-2 IN ISA	B-5	CONTAINERS	Offloaded TO LM
LM	OXYGEN PURGE SYSTEM	A-7	B-6	CONTAINERS	Offloaded TO LM
LM	EMU MAINTENANCE KIT	In CDR Helmet Stowage Bag in PGA Bag	A-9	CO <sub>2</sub> ABSORBERS - 4	A-9 Offloaded Inside Container
LM	PURGE VALVE ASSY.	A-7	B-5	CO <sub>2</sub> ABSORBERS - 4	B-5 Offloaded Inside Container
LM	STANDARD FLAG KIT	A-8	B-6	CO <sub>2</sub> ABSORBERS - 4	B-6 Offloaded Inside Container
LM	CONTINGENCY IV SAFETY TETHER	A-7	TOP A-2	SRC DECON. BAGS - 3	1 - A-9
LM	SR C NO. 1	B-5			1 - B-5
LM	2	B-6			1 - B-6
LM	SOLAR WIND COMPOSITION	ON TOP A-2 IN ISA	U-2	ICG JACKETS - 3	On Crew
LM	IV CREWMAN TETHERS - 2	A-7	U-2	ICG TROUSERS - 3	On Crew
LM	ISA	Inside ISA Decon. Bag on Top of A-2	U-2	ICG BOOTS (RIGHT) - 3	On Crew
LM	SAMPLE RETURN BAG (B/S/SS AREA - 36 lb)	Inside Sample Return Decon. Bag on Top of A-7	U-2	ICG BOOTS (LEFT) - 3	On Crew
LM	PRENEMETER DRUM	A-7	ON CREW	PGA EQUIPMENT	
TOP A-2	PENETROMETER DECONTAM. BAG	A-7	ON CREW	PRESSURE HELMETS - 3	2 - In PGA Bag
A-2	603 GAUGE ASSY	A-7			1 - On PGA, Sleep Restraint on Top A-7 and A-8
A-2	SAMPLE RETURN DECON. BAG (B/S/SS AREA)	A-7			2 - In PGA Bag
A-2	70 MM HASSEL. HANDLE/TRIGGER	ON TOP OF A-7	LM	LEVA'S - 2	1 - In Sleep Restraint on Top A-7 and A-8
A-2	VACUUM CLEANER BAGS-2	A-7			1 - On Helmet, on PGA on Top A-7 and A-8
A-2	VACUUM CLEANER POWER CABLE	A-7	A-2	EV GLOVES (CMP)	1 - On Helmet in PGA Bag
A-2	VACUUM CLEANER DECOM. BAG	A-7			In Helmet in Accessory Bag
A-2	HEAD REST PADS - 3	On Couch	LM	EV GLOVES - 2 PR.	On Top of A-7 & A-8
A-2	HEEL CLIPS - 3 PR.	On Crew	ON CREW	IV GLOVES - 3 PR.	In Helmet in Accessory Bags in PGA Bag
A-2	OPS CONTROL UNIT ADAPTER	A-7			2 - In PGA's in PGA Bag
A-2	GPS ATTACH. STRAPS - 4	A-7	U-2	ACCESSORY BAGS - 3	1 - In PGA in Sleep Restraint on Top of A-7 and A-8
A-2	EVA EQUIPMENT CONTAINER	A-7			2 - In Helmets in PGA Bag
A-7	FECAL COLLECTION ASSY. - 30	12 - Offloaded Unused A-7	LM	HELMET STOWAGE BAGS - 2	1 - In Helmet in LEVA on Top of A-7 and A-8
A-8	CWG ELECTRICAL ADAPTERS - 4	3 - On Crew			1 - On Helmet in PGA Bag
SM SIM BAY	24" PAN CAMERA MAGAZINE	1 - A-8	PGA BAG	HELMET PROTECTIVE SHIELD	1 - Loose in PGA Bag
SM SIM BAY	3" MAPPING CAMERA MAGAZINE	A-2			On Helmet (Without LEVA) in Helmet Stowage Bag in PGA Bag

TABLE 3.1-9 (CONTINUED)

## MISSION J-1 COMMAND MODULE STOWAGE VOLUME CENTROIDS

## SPACECRAFT 112

<u>AREA</u>	<u>X</u>	<u>Y</u>	<u>Z</u>
A1	1011.0	-21.0	-22.0
2	1011.0	-22.0	8.0
3	1016.0	-24.0	28.0
4	1015.0	-7.0	28.0
5	1015.0	9.0	28.0
6	1017.0	26.0	28.0
7	1011.0	22.0	8.0
8	1011.0	21.0	-23.0
9	1013.0	0.0	16.0
B1	1050.0	-27.0	39.0
2	1039.0	-38.0	37.0
3	1031.0	-28.0	40.0
4	1031.0	-20.0	40.0
5	1031.0	-8.0	39.0
6	1031.0	13.0	39.0
8	1024.0	-38.0	37.0
L2	1059.0	-44.0	14.0
3	1048.0	-47.0	12.0
R1	1072.0	26.0	21.0
2	1072.0	26.0	14.0
3	1072.0	26.0	9.0
4	1075.0	28.0	3.0
5	1059.0	44.0	15.0
6	1048.0	46.0	29.0
8	1052.0	46.0	12.0
11	1038.0	47.0	26.0
13	1024.0	45.0	-26.0
U1	1033.0	23.0	-50.0
2	1033.0	-23.0	-50.0
3	1033.0	-36.0	-44.0
4	1038.0	39.0	-43.0

TABLE 3.1-9 (CONCLUDED)

MISSION J-1 COMMAND MODULE STOWAGE VOLUME CENTROID

The following stowage locations have unique volume centroids not associated with stowage volumes.

<u>NOMENCLATURE</u>	<u>LOCATION</u>	<u>X</u>	<u>Y</u>	<u>Z</u>
G&N Signal Cond. Panel	LEB	1069.0	25.0	29.0
Display Keyboard	LEB	1060.0	26.0	32.0
Sleep Restraint Assy - Rt. & Center	Aft UEB	1018.0	23.0	-50.0
Sleep Restraint Assy - Left	Aft UEB	1018.0	-23.0	-50.0 .
Entry Locations				
Sleep Restraint - RH & Center	Top of Area A8	1020.0	25.0	-8.0
ITLSA - IV (CMP)	On RH & Ctr			
	Sleep Restraint	1020.0	25.0	-22.0
Food Container	L3	1048.0	-47.0	12.0
Food Container	B1	1050.0	-27.0	39.0
Food Container	A7	1011.0	22.0	8.0
Fecal Stowage Container	RHEB	1039.0	47.0	12.0
PGA Container	On Aft Bulkhead	1015.0	0.0	-20.0
	Under Center			
	Couch			
Forward Hatch Container	Under LH Couch	1018.0	-24.5	-15.0
Container, R12				
(In-flight Location)	RH Girth Ring	1034.0	41.0	-21.0
Helmet Stowage & Accessory				
Bags (In-flight Location) - LH	U2	1033.0	-23.0	-50.0
Helmet Stowage and Accessory				
Bags (In-flight Location) - Ctr.	B1	1050.0	-27.0	39.0
Helmet Stowage and Accessory				
Bags (In-flight Location) - RH	L3	1048.0	-47.0	12.0
CO2 Absorbers (2)	In ECU	1031.0	-48.3	19.6
CO2 Absorbers (2)	A1	1011.0	-21.0	-22.0
CO2 Absorbers (4)	A3	1016.0	-24.0	28.0
CO2 Absorbers (4)	A4	1015.0	-7.0	28.0
CO2 Absorbers (4)	A5	1015.0	9.0	28.0
CO2 Absorbers (4)	A6	1017.0	26.0	28.0
CO2 Absorbers (4)	A9	1013.0	0.0	16.0
CO2 Absorbers (4)	B5	1031.0	-8.0	39.0
CO2 Absorbers (4)	B6	1031.0	13.0	39.0
	Order of Locations Used in Sequential Mass Properties Tables for CO2 Absorbed			
First 8.0 lb CO2 Absorbed	B5	1031.0	-8.0	39.0
Second 16.0 lb CO2 Absorbed	(B6, A9)	1022.0	6.5	27.5
Remainder CO2 Absorbed	Composite Location	1016.8	-6.1	22.2

TABLE 3.1-9.1

## MISSION J-1 LUNAR MODULE STOWAGE VOLUME CENTROIDS

LM-10

<u>AREA</u>	<u>X</u>	<u>Y</u>	<u>Z</u>
A1B	262.8	-20.8	15.4
A1C ICG Assy	240.5	-15.3	13.3
A1C	240.5	-18.0	13.3
A1D	270.3	-15.0	19.0
A1E	265.9	-20.7	-6.0
A1F	257.4	-20.7	-6.0
A1G	257.5	-20.0	-18.0
A1H	265.9	-20.0	-18.0
A1K	281.0	-20.0	-8.5
A1L	273.7	-20.0	-8.5
A2	260.0	-37.0	28.0
A3	280.0	0	-10.0
A4	244.1	-3.5	13.5
A5	224.3	-1.5	29.3
A10	250.0	8.8	-11.8
A11 PLSS L1OH Cart	263.6	18.8	-2.4
A11 ECS L1OH Cart	261.2	20.7	5.9
A12	272.0	0	-18.0
A13	300.0	0	0
A14A	238.0	-9.2	-14.8
F1A	244.5	-36.6	31.4
F1B	235.5	-35.5	38.5
F1C	242.5	-35.6	38.6
F1D	242.8	-35.4	47.2
F1E	237.9	-33.6	55.0
F1F	235.5	-37.6	46.6
F1G	228.0	-40.2	43.2
F5	286.0	17.8	66.6
F6	270.3	0	52.8
F6B	270.3	0	52.8
F6C	270.3	0	52.8
F7A	238.0	38.0	49.8
F7B	238.0	38.0	49.8
F7C	238.0	38.0	41.0
F7D	238.0	38.0	38.4
F7E	238.0	38.0	32.7
F7F	238.0	38.0	31.6
F7H	238.0	38.0	45.5
F7J	238.0	38.0	39.2
F7K	238.0	38.0	42.7

TABLE 3.1-9.1 (CONCLUDED)  
MISSION J-1 LUNAR MODULE STOWAGE VOLUME CENTROIDS

LM-10

<u>AREA</u>	<u>X</u>	<u>Y</u>	<u>Z</u>
F7L	236.0	36.0	48.0
F7N	238.0	38.0	53.1
F7P	238.0	38.0	53.4
F8	221.0	18.0	51.0
F9	219.7	0	44.7
F10	221.0	-18.0	51.0

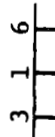
TABLE 3.1-9.2

MISSION J-1 TRANSFERABLE EQUIPMENT

REFERENCE CODE EXPLANATION

The reference table used with this Transferable Equipment List is a directory of information sources from which data for each item were obtained. It is intended to define the exact source for each portion of the data used. This reference table is correlated to each item in the Transferable Equipment List by a 3-digit reference code number.

The code is the form



Item Identification Source

1. The Apollo Stowage List for each mission prepared bi-weekly for MSC by the Boeing Company
2. The Apollo Flight Plan prepared for each mission by the Flight Planning Branch of NASA
3. The LM Lunar Surface Checklist prepared by EVA branch of NASA
4. Telecom with responsible MSC Apollo Division/Contractor
5. Apollo Operations Handbook

Weight Source

1. The Apollo Stowage List
2. The Boeing Company
3. North American Rockwell
4. Grumman Company
5. Telecom with Responsible MSC Apollo Division/Contractor
6. Estimated by TRW

Center of Gravity Source

1. Command module stowage volume centroids supplied by NR
2. The Boeing Company
3. Grumman Company
4. Telecom with responsible MSC Apollo Division/Contractor
5. Determined from mock-up
6. Estimated by TRW
7. Data response from NR



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (1)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CREW-COMMAND MODULE PILOT (CMP)	TBD	227	1	ON COUCH(CTR CRW-STA	155.0	1043.0	.0	-10.4	
CREW-COMMANDER (CDR)	TBD	227	1	ON COUCH(LH CREW STA	183.0	1043.0	-24.5	-10.4	
SUNGLASSES	A0200.	111	1	ON CREW-CDR(LH STA)	.1	1043.0	-24.5	-10.4	
SUNGLASSES	A0200.	111	1	ON CREW-CMP(CTR STA)	.1	1043.0	.0	-10.4	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CDR(LH STA)	NEGL	1043.0	-24.5	-10.4	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CMP(CTR STA)	NEGL	1043.0	.0	-10.4	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CDR(LH STA)	.1	1043.0	-24.5	-10.4	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CMP(CTR STA)	.1	1043.0	.0	-10.4	
WATCHBAND	A0203.	111	1	ON CREW-CDR(LH STA)	NEGL	1043.0	-24.5	-10.4	
WATCHBAND	A0203.	111	1	ON CREW-CMP(CTR STA)	NEGL	1043.0	.0	-10.4	
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CDR(LH STA)	.1	1043.0	-24.5	-10.4	
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CMP(CTR STA)	.1	1043.0	.0	-10.4	
PEN, MARKER	A0205.	111	1	ON CREW-CDR(LH STA)	NEGL	1043.0	-24.5	-10.4	
PEN, MARKER	A0205.	111	1	ON CREW-CMP(CTR STA)	NEGL	1043.0	.0	-10.4	
PENCIL	A0206.	111	1	ON CREW-CDR(LH STA)	.1	1043.0	-24.5	-10.4	
PENCIL	A0206.	111	1	ON CREW-CMP(CTR STA)	.1	1043.0	.0	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA(CREW-CTR STA)	.1	1043.0	.0	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-LH STA)	.1	1043.0	-24.5	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-RH STA)	.1	1043.0	24.5	-10.4	
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA U2	.6	1033.0	-23.0	-50.0	
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA U2	.6	1033.0	-23.0	-50.0	
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA U2	.6	1033.0	-23.0	-50.0	
BAG, HELMET STOW, INFLIGHT	B0105.1	115	1	IN HSB (U2)	.3	1033.0	-23.0	-50.0	
BAG, HELMET STOW, INFLIGHT	B0105.1	115	1	IN HSB (U2)	.3	1033.0	-23.0	-50.0	
BAG, ACCESSORY	B0105.1	115	1	IN HSB (U2)	.3	1033.0	-23.0	-50.0	
BAG, ACCESSORY	B0105.1	115	1	IN HSB (U2)	.3	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (1)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
HARNES, CWG ELECTRICAL (CMP)	B0135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
HARNES, CWG ELECTRICAL (CDR)	B0135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
HARNES, CWG ELECTRICAL (LMP)	B0135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
OPS CONTROL UNIT ADAPTER	B0151.	111	1	AREA A2	1.4	1011.0	-22.0	8.0	
STRAPS, ATTACH, OPS/PGA	B0152.	111	2	AREA A2	NEGL	1011.0	-22.0	8.0	
STRAPS, ATTACH, OPS/PGA	B0153.	111	1	AREA A2	NEGL	1011.0	-22.0	8.0	
VEST, DUAL LIFE	B0202.	111	1	ON CREW-CMP(CTR STA)	2.4	1043.0	.0	-10.4	
VEST, DUAL LIFE	B0202.	111	1	ON CREW-CDR(LH STA)	2.4	1043.0	-24.5	-10.4	
VEST, DUAL LIFE	B0202.	111	1	ON CREW-LMP(RH STA)	2.4	1043.0	24.5	-10.4	
VEST, DUAL LIFE	B0205.	111	1	ON CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
VEST, DUAL LIFE	B0205.	111	1	ON CREW-CDR(LH STA)	.5	1043.0	-24.5	-10.4	
VEST, DUAL LIFE	B0205.	111	1	ON CREW-CMP(CTR STA)	.5	1043.0	.0	-10.4	
UCTA	B0206.	111	1	ON CREW-CDR(LH STA)	.3	1043.0	-24.5	-10.4	
UCTA	B0206.	111	1	ON CREW-CMP(CTR STA)	.3	1043.0	.0	-10.4	
PENLIGHTS	B0207.	111	1	ON CREW-CDR(LH STA)	.2	1043.0	-24.5	-10.4	
PENLIGHTS	B0207.	111	1	ON CREW-CDR(LH STA)	.2	1043.0	.0	-10.4	
BIOBELT ASSY	B0208.	111	1	ON CREW-CDR(LH STA)	.8	1043.0	-24.5	-10.4	
BIOBELT ASSY	B0208.	111	1	ON CREW-CMP(CTR STA)	.8	1043.0	.0	-10.4	
GARMENT, CONSTANT WEAR	B0210.	111	1	ON CREW-CMP(CTR STA)	.8	1043.0	.0	-10.4	
GARMENT, CONSTANT WEAR	B0210.	111	1	ON CREW-CDR(LH STA)	NEGL	1043.0	-24.5	-10.4	
EARPLUGS, PAIR	B0211.	111	1	ON CREW-CDR(LH STA)	45.2	1043.0	-24.5	-10.4	
ITLSA - EV	B0211.	111	1	ON CREW-CDR(LH STA)	45.2	1043.0	-24.5	-10.4	
ITLSA - EV	B0211.	111	1	ON CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA, IV CMP	B0212.	111	1	ON CREW-CMP(CTR STA)	39.9	1043.0	.0	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-CMP(CTR STA)	2.0	1043.0	.0	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-CDR(LH STA)	2.0	1043.0	-24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (1)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOM. ITEM	REF	NC.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
HELMET ASSY, PRESSURE	B0214.	111	1	CN CREW-CMP(CTR STA)	2.6	1043.0	.0	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	CN CREW-CDR(LH STA)	2.6	1043.0	-24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	ON CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
HARNES, ELEC.-SUIT	B0215.	111	1	ON CREW-CDR(LH STA)	.5	1043.0	-24.5	-10.4	
HARNES, ELEC.-SUIT	B0215.	111	1	ON CREW-CMP(CTR STA)	.5	1043.0	.0	-10.4	
HARNES, BIOINSTRUMENTATION	B0216.	111	1	ON CREW-CDR(LH STA)	.3	1043.0	-24.5	-10.4	
HARNES, BIOINSTRUMENTATION	B0216.	111	1	CN CREW-CMP(CTR STA)	.3	1043.0	.0	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	ON CREW-LMP(RH STA)	1.6	1043.0	24.5	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	ON CREW-CDR(LH STA)	1.6	1043.0	-24.5	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	ON CREW-CMP(CTR STA)	1.6	1043.0	.0	-10.4	
POCKET,SCISSORS (CMP)	B0218.	111	1	ON CREW-CMP(CTR STA)	.2	1043.0	.0	-10.4	
POCKET,SCISSORS (CDR)	B0218.	111	1	CN CREW-CDR(LH STA)	.2	1043.0	-24.5	-10.4	
POCKET,SCISSORS (LMP)	B0218.	111	1	CN CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CDR)	B0219.	111	1	ON CREW-CDR(LH STA)	.2	1043.0	-24.5	-10.4	
POCKET,CHECKLIST (LMP)	B0219.	111	1	ON CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
POCKET,DATA (CDR)	B0220.	111	1	ON CREW-CDR(LH STA)	TBD	1043.0	-24.5	-10.4	
POCKET,DATA (LMP)	B0220.	111	1	ON CREW-LMP(RH STA)	TBD	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CMP)	B0221.	111	1	ON CREW-CMP(CTR STA)	.2	1043.0	.0	-10.4	
POCKET,DATA (CMP)	B0222.	111	1	ON CREW-CMP(CTR STA)	TBD	1043.0	.0	-10.4	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-CMP(CTR STA)	1.1	1043.0	.0	-10.4	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-CDR(LH STA)	1.1	1043.0	-24.5	-10.4	
DOSIMETER,PERSONAL	D0200.	117	1	ON CREW-CDR(LH STA)	.4	1043.0	-24.5	-10.4	
DOSIMETER,PERSONAL	D0200.	117	1	ON CREW-CMP(CTR STA)	.4	1043.0	.0	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	NEGL	1015.0	.0	-19.0	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	NEGL	1015.0	.0	-19.0	
HEADSET,LIGHTWEIGHT	E0111.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET,LIGHTWEIGHT	E0112.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET,LIGHTWEIGHT	E0113.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
EARTUBE,UNIVERSAL (CMP)	E0114.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (CDR)	E0115.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (1)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
EARPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4	
PANEL IND.-VERB/NCUN LIST	H0104.	115	1	GNIC PANEL	.2	1050.0	.0	22.0	
CONTAINER, R12	00344.	115	1	AREA R3	2.7	1072.0	26.0	9.0	
CM EQUIP. RELOC. 1					531.75	1042.62	-9.14	-11.48	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST						APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (2)						X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. IYEH	REF	NO.	STORAGE LOCATION	WEIGHT			
CREW-COMMAND MODULE PILOT(CMP)	TBD	227	1	ON COUCH(LH CREW STA)	159.0	1043.0	-24.5	-10.4
CREW-COMMANDER (CDR)	TBD	227	1	ON COUCH(CTR CRM STA)	183.0	1043.0	.0	-10.4
SUNGLASSES	A0200.	111	1	ON CREW-CDR(CTR STA)	.1	1043.0	.0	-10.4
SUNGLASSES	A0200.	111	1	ON CREW-CMP(LH STA)	.1	1043.0	-24.5	-10.4
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CDR(CTR STA)	NEGL	1043.0	.0	-10.4
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CDR(CTR STA)	.1	1043.0	.0	-10.4
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CMP(LH STA)	.1	1043.0	-24.5	-10.4
WATCHBAND	A0203.	111	1	ON CREW-CDR(CTR STA)	NEGL	1043.0	.0	-10.4
WATCHBAND	A0203.	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CDR(CTR STA)	.1	1043.0	.0	-10.4
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CMP(LH STA)	.1	1043.0	-24.5	-10.4
PEN, MARKER	A0205.	111	1	ON CREW-CDR(CTR STA)	NEGL	1043.0	.0	-10.4
PEN, MARKER	A0205.	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4
PENCIL	A0206.	111	1	ON CREW-CDR(CTR STA)	.1	1043.0	.0	-10.4
PENCIL	A0206.	111	1	ON CREW-CMP(LH STA)	.1	1043.0	-24.5	-10.4
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA U2	.6	1033.0	-23.0	-50.0
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA B1	.6	1050.0	-27.0	39.0
BAG, HELMET STOW, INFLIGHT	B0105.	115	1	AREA L3	.6	1048.0	-47.0	12.0
BAG, ACCESSORY	B0105.1	115	1	AREA U2	.3	1033.0	-23.0	-50.0
BAG, ACCESSORY	B0105.1	115	1	AREA B1	.3	1050.0	-27.0	39.0
BAG, ACCESSORY	B0105.1	115	1	AREA L3	.3	1048.0	-47.0	12.0
JACKET ASSY, ICG	B0112.1	111	1	ON CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4
JACKET ASSY, ICG	B0112.1	111	1	ON CREW-CDR(CTR STA)	1.8	1043.0	.0	-10.4
JACKET ASSY, ICG	B0112.1	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4
TROUSER ASSY, ICG	B0112.2	111	1	ON CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4
TROUSER ASSY, ICG	B0112.2	111	1	ON CREW-CDR(CTR STA)	1.8	1043.0	.0	-10.4
TROUSER ASSY, ICG	B0112.2	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (2)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT				
BOOT, RIGHT, ICG	B0112.3	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
BOOT, RIGHT, ICG	B0112.3	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4	
BOOT, RIGHT, ICG	B0112.3	111	1	CN CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	CN CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
HARNESS, CMG ELECTRICAL (CMP)	B0135.	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
HARNESS, CMG ELECTRICAL (CDR)	B0135.	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4	
HARNESS, CMG ELECTRICAL (LMP)	B0135.	111	1	CN CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
OPS CONTROL UNIT ADAPTER	B0151.	111	1	AREA A7	1.4	1011.0	22.0	8.0	
STRAPS, ATTACH, CPS/PGA	B0152.	111	2	AREA A7	NEGL	1011.0	22.0	8.0	
STRAPS, ATTACH, CPS/PGA	B0153.	111	1	AREA A7	NEGL	1011.0	22.0	8.0	
VEST, DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
VEST, DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
VEST, DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
PENLIGHTS	B0206.	111	1	CN CREW-CDR(CTR. STA)	.3	1043.0	.0	-10.4	
PENLIGHTS	B0206.	111	1	ON CREW-CMP(LH STA)	.3	1043.0	-24.5	-10.4	
BIOBELT ASSY	B0207.	111	1	CN CREW-CDR(CTR. STA)	.2	1043.0	.0	-10.4	
BIOBELT ASSY	B0207.	111	1	ON CREW-CMP(LH STA)	.2	1043.0	-24.5	-10.4	
GARMENT, CONSTANT WEAR	B0208.	111	1	ON CREW-CDR(CTR. STA)	.8	1043.0	.0	-10.4	
GARMENT, CONSTANT WEAR	B0208.	111	1	ON CREW-CMP(LH STA)	.8	1043.0	-24.5	-10.4	
EARPLUGS, PAIR	B0210.	111	1	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
ITLSA - EV	B0211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	
ITLSA - EV	B0211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	
ITLSA, IV CMP	B0212.	111	1	ITLSA IN PGA CONT.	39.9	1011.0	.0	-20.0	
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0	1033.0	-23.0	-50.0	
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0	1033.0	-23.0	-50.0	
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0	1033.0	-23.0	-50.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (2)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
HELMET ASSY, PRESSURE	B0214.	111	1	IN HSB (U2)	2.6	1033.0	-23.0	-56.0	
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOW BAG (B1)	2.6	1050.0	-27.0	39.0	
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOW BAG (L3)	2.6	1048.0	-47.0	12.0	
HARNESS, ELEC.-SUIT	B0215.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
HARNESS, ELEC.-SUIT	B0215.	111	1	ON CREW-CMP(LH STA)	.5	1043.0	-24.5	-10.4	
HARNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
HARNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW-CMP(LH STA)	.3	1043.0	-24.5	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	IN HSB (U2)	1.6	1033.0	-23.0	-50.0	
COMMUNICATION CARRIER	B0217.	111	1	HELMET STOW BAG (B1)	1.6	1050.0	-27.0	39.0	
COMMUNICATION CARRIER	B0217.	111	1	HELMET STOW BAG (L3)	1.6	1048.0	-47.0	12.0	
POCKET, SCISSORS (CMP)	B0218.	111	1	ON ICG-CMP./LH STA.	.2	1043.0	-24.5	-10.4	
POCKET, SCISSORS (CDR)	B0218.	111	1	ON ICG-CDR./CTR.STA.	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	B0218.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CDR)	B0219.	111	1	ON ICG-CDR./CTR.STA.	.2	1043.0	.0	-10.4	
POCKET, CHECKLIST (LMP)	B0219.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4	
POCKET, DATA (CDR)	B0220.	111	1	ON ICG-CDR./CTR.STA.	TBD	1043.0	.0	-10.4	
POCKET, DATA (LMP)	B0220.	111	1	ON ICG-LMP./RH STA.	TBD	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CMP)	B0221.	111	1	ON ICG-LMP./RH STA.	TBD	1043.0	24.5	-10.4	
POCKET, DATA (CMP)	B0222.	111	1	ON ICG-CMP./LH STA.	TBD	1043.0	-24.5	-10.4	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-CMP(LH STA)	1.1	1043.0	-24.5	-10.4	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-CDR(CTR.STA)	1.1	1043.0	.0	-10.4	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET (CREW-CDR)	NEGL	1043.0	.0	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET (CREW-LMP)	NEGL	1043.0	24.5	-10.4	
HEADSET, LIGHTWEIGHT	E0111.	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
HEADSET, LIGHTWEIGHT	E0112.	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
HEADSET, LIGHTWEIGHT	E0113.	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
EARTUBE, UNIVERSAL (CMP)	E0114.	111	1	ON ICG-CMP./LH STA.	NEGL	1043.0	-24.5	-10.4	
EARTUBE, UNIVERSAL (CDR)	E0115.	111	1	ON ICG-CDR./CTR.STA.	NEGL	1043.0	.0	-10.4	
EARTUBE, UNIVERSAL (LMP)	E0116.	111	1	ON ICG-LMP./RH STA.	NEGL	1043.0	24.5	-10.4	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO FIRST MID-COURSE CORRECTION (2)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOM. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL	1033.C	-23.0	-50.0	
EARPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	HELMET STOW BAG (B1)	NEGL	1050.0	-27.0	39.0	
EARTUBE (COM.CARRIER)	E0200.2	111	1	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
PANEL IND.--VERB/NOUN LIST	H0104.	115	1	DATA CARD KIT (R3)	.2	1072.0	26.0	9.0	
CONTAINER,R12	00344.	115	1	RH GIRTH RING	2.7	1034.0	41.0	-21.0	
CM EQUIP.RELOC.1					531.75	1034.71	-8.74	-13.45	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APCLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (3)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
GARMENT, LIQUID COOLING CDR	B0107.	111	1	AREA U1	4.3	1033.0	23.0	-50.0	
GARMENT, LIQUID COOLING LMP	B0107.	111	1	AREA U1	4.3	1033.0	23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	CN CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4	
JACKET ASSY, ICG	B0112.1	111	1	CN CREW-CDR(CTR.STA)	1.8	1043.0	.0	-10.4	
JACKET ASSY, ICG	B0112.1	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4	
TROUSER ASSY, ICG	B0112.2	111	1	ON CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4	
TROUSER ASSY, ICG	B0112.2	111	1	ON CREW-CDR(CTR.STA)	1.8	1043.0	.0	-10.4	
TROUSER ASSY, ICG	B0112.2	111	1	CN CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4	
BOOT, RIGHT, ICG	B0112.3	111	1	CN CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
BOOT, RIGHT, ICG	B0112.3	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
BOOT, RIGHT, ICG	B0112.3	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
BOOT, LEFT, ICG	B0112.4	111	1	CN CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	1	AREA A2	.3	1011.0	-22.0	8.0	
HARNESS, CWG ELECTRICAL (CMP)	B0135.	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
HARNESS, CWG ELECTRICAL (CDR)	B0135.	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
HARNESS, CWG ELECTRICAL (LMP)	B0135.	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
GARMENT, CONSTANT WEAR	B0208.	111	1	ON CREW-LMP(RH STA)	.8	1043.0	24.5	-10.4	
GARMENT, CONSTANT WEAR	B0208.	111	1	ON CREW-CDR(CTR.STA)	.8	1043.0	.0	-10.4	
ITLSA - EV	B0211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (3)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT				
ITLSA - EV	B0211.	111	1	ITLSA IN PGA CONT.	45.2		1011.0	.0	-20.0
ITLSA, IV CMP	B0212.	111	1	ITLSA IN PGA CONT.	39.9		1011.0	.0	-20.0
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0		1033.0	-23.0	-50.0
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0		1033.0	-23.0	-50.0
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0		1033.0	-23.0	-50.0
GLOVES, IV PAIR	B0213.	111	1	IN HSB (U2)	2.0		1033.0	-23.0	-50.0
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOW BAG (B1)	2.6		1050.0	-27.0	39.0
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOW BAG (L3)	2.6		1048.0	-47.0	12.0
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOW BAG (L3)	2.6		1048.0	-47.0	12.0
COMMUNICATION CARRIER	B0217.	111	1	IN HSB (U2)	1.6		1033.0	-23.0	-50.0
COMMUNICATION CARRIER	B0217.	111	1	HELMET STOW BAG (B1)	1.6		1050.0	-23.0	39.0
COMMUNICATION CARRIER	B0217.	111	1	HELMET STOW BAG (L3)	1.6		1048.0	-47.0	12.0
POCKET, SCISSORS (CMP)	B0218.	111	1	ON ICG-CMP./LH STA.	.2		1043.0	-24.5	-10.4
POCKET, SCISSORS (CDR)	B0218.	111	1	ON ICG-CMP./CTR.STA.	.2		1043.0	.0	-10.4
POCKET, SCISSORS (LMP)	B0218.	111	1	ON ICG-LMP./RH STA.	.2		1063.0	24.5	-10.4
POCKET, CHECKLIST (CDR)	B0219.	111	1	ON ICG-CMP./CTR.STA.	.2		1043.0	.0	-10.4
POCKET, CHECKLIST (LMP)	B0219.	111	1	ON ICG-LMP./RH STA.	.2		1043.0	24.5	-10.4
POCKET, DATA (CDR)	B0220.	111	1	ON ICG-CMP./LH STA.	TBD		1043.0	.0	-10.4
POCKET, DATA (LMP)	B0220.	111	1	ON ICG-CMP./CTR.STA.	TBD		1043.0	24.5	-10.4
POCKET, CHECKLIST (CMP)	B0221.	111	1	ON ICG-LMP./RH STA.	.2		1043.0	-24.5	-10.4
POCKET, DATA (CMP)	B0222.	111	1	ON ICG-LMP./LH STA.	.2		1043.0	-24.5	-10.4
DOSIMETER, PASSIVE	D0201.	117	3	CMG POCKET (CREW-CDR)	NEGL		1043.0	.0	-10.4
DOSIMETER, PASSIVE	D0201.	117	3	CMG POCKET (CREW-LMP)	NEGL		1043.0	.0	-10.4
HEADSET, LIGHTWEIGHT	E0111.	111	1	ON CREW-CMP (LH STA)	.4		1043.0	24.5	-10.4
HEADSET, LIGHTWEIGHT	E0112.	111	1	ON CREW-CMP (CTR.STA)	.4		1043.0	-24.5	-10.4
HEADSET, LIGHTWEIGHT	E0113.	111	1	ON CREW-CMP (RH STA)	.4		1043.0	.0	-10.4
HEADSET, UNIVERSAL (CMP)	E0114.	111	1	ON ICG-CMP./LH STA.	NEGL		1043.0	24.5	-10.4
HEADSET, UNIVERSAL (CDR)	E0115.	111	1	ON ICG-CMP./CTR.STA.	NEGL		1043.0	-24.5	-10.4
HEADSET, UNIVERSAL (LMP)	E0116.	111	1	ON ICG-LMP./RH STA.	NEGL		1043.0	24.5	-10.4
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL		1033.0	-23.0	-50.0

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (3)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STORAGE LOCATION	WEIGHT				
EARPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL	1033.C	-23.0	-50.0	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	HELMET STOW BAG (B1)	NEGL	1050.0	-27.0	35.0	
EARTUBE (COM.CARRIER)	E0200.2	111	1	IN HSB (U2)	NEGL	1033.0	-23.0	-50.0	
WATER SYS ASSY, RETURN CONTIN.	06444.	111	1	IN CM PGA CONTAINER	9.0	1015.0	.0	-20.0	
CM EQUIP. RELOC.2					187.64	1018.27	-1.85	-19.88	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (4)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG, MOTION SICKNESS	A0208.	111	1	CN PGA (CREW-RH STA)	.1	1043.0	24.5	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-LH STA)	.1	1043.0	-24.5	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-CTR STA)	.1	1043.0	.0	-10.4	
GARMENT, LIQUID COOLING	B0107.	111	1	ON CREW-CDR (CTR. STA)	4.3	1043.0	.0	-10.4	
GARMENT, LIQUID COOLING	B0107.	111	1	CN CREW-LMP (RH STA)	4.3	1043.0	24.5	-10.4	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	CN CREW-CDR (CTR. STA)	.3	1043.0	.0	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	CN CREW-LMP (RH STA)	.3	1043.0	24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	1	ON CREW-CMP (LH STA)	.3	1043.0	-24.5	-10.4	
HARNESS, CWG ELECTRICAL (CMP)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (CMP)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (CDR)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (LMP)	B0205.	111	1	ON CREW-LMP (RH STA)	.5	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	CN CREW-CDR (CTR. STA)	.5	1043.0	.0	-10.4	
UCTA	B0205.	111	1	ON CREW-CMP (LH STA)	.5	1043.0	-24.5	-10.4	
GARMENT, CONSTANT WEAR	B0208.	111	1	AREA U2	.8	1033.0	-23.0	-50.0	
GARMENT, CONSTANT WEAR	B0208.	111	1	AREA U2	.8	1033.0	-23.0	-50.0	
ITLSA - EV	B0211.	111	1	CN CREW-CDR (CTR. STA)	45.2	1043.0	.0	-10.4	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (4)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
ITLSA - EV	80211.	111	1	ON CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA,IV CMP	80212.	111	1	ON CREW-CMP(LH STA)	39.9	1043.0	-24.5	-10.4	
GLOVES,IV PAIR	80213.	111	1	ON CREW-CMP(LH STA)	2.0	1043.0	-24.5	-10.4	
GLOVES,IV PAIR	80213.	111	1	ON CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	
GLOVES,IV PAIR	80213.	111	1	CN CREW-CDR(CTR.STA)	2.0	1043.0	.0	-10.4	
HELMET ASSY, PRESSURE	80214.	111	1	CN CREW-CMP(LH STA)	2.6	1043.0	-24.5	-10.4	
HELMET ASSY, PRESSURE	80214.	111	1	ON CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
HELMET ASSY, PRESSURE	80214.	111	1	ON CREW-CDR(CTR.STA)	2.6	1043.0	.0	-10.4	
COMMUNICATION CARRIER	80217.	111	1	ON CREW-CMP(LH STA)	1.6	1043.0	-24.5	-10.4	
COMMUNICATION CARRIER	80217.	111	1	CN CREW-LMP(RH STA)	1.6	1043.0	24.5	-10.4	
COMMUNICATION CARRIER	80217.	111	1	CN CREW-CDR(CTR.STA)	1.6	1043.0	.0	-10.4	
POCKET,SCISSORS (CMP)	80218.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET,SCISSORS (CDR)	80218.	111	1	ON PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET,SCISSORS (LMP)	80218.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CDR)	80219.	111	1	ON PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET,CHECKLIST (LMP)	80219.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET,DATA (CDR)	80220.	111	1	CN PGA (CREW-CTR STA)	TBD	1043.0	.0	-10.4	
POCKET,DATA (LMP)	80220.	111	1	ON PGA (CREW-RH STA)	TBD	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CMP)	80221.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET,DATA (CMP)	80222.	111	1	ON PGA (CREW-LH STA)	TBD	1043.0	-24.5	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	NEGL	1015.0	.0	-19.0	
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	NEGL	1015.0	.0	-19.0	
HEADSET,LIGHTWEIGHT	E0111.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET,LIGHTWEIGHT	E0112.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET,LIGHTWEIGHT	E0113.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
EARTUBE,UNIVERSAL (CMP)	E0114.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (CDR)	E0115.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE,UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARPIECE,MOULDED (COM.CARRIER)	E0200.1	111	1	CN CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO LM ACTIVATION (4)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
EARPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	CN CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	CN CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4	
WATER SYS ASSY, RETURN CONTIN.	06444.	111	1	AFT UEB CENTER (APRX	9.0	1018.0	.0	-48.9	
CM EQUIP.RELOC.2					187.64	1040.60	-2.29	-15.53	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST						APCLLC COORDINATES		
ITEMS TRANSFERRED FROM CM INTO LM AT LM ACTIVATION (5)						X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
CREW-COMMANDER (CDR)	TBD	227	1	ON COUCH(CTR CRW.STA	183.0	1043.0	.0	-10.4
CREW-LM PILOT (LMP)	TBD	227	1	CN COUCH(RH CREW STA	162.0	1043.0	24.5	-10.4
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	5	AREA R13	5.0	1024.0	45.0	-26.0
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	AREA R13	2.0	1024.0	45.0	-26.0
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	AREA R13	1.0	1024.0	45.0	-26.0
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	AREA R13	4.2	1024.0	45.0	-26.0
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	AREA R13	1.4	1024.0	45.0	-26.0
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	AREA R13	4.2	1024.0	45.0	-26.0
MAGAZINE, L.S. HASSELBLAD	A0108.1	111	6	VOLUME CENTROID CM	8.4	1040.6	.0	.0
LM LUNAR SURFACE CHECKLIST	A0114.10	114	1	IN FDF (R3)	1.0	1072.0	26.0	9.0
LM SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	IN FDF (R3)	.5	1072.0	26.0	9.0
LP SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	IN FDF (R3)	.5	1072.0	26.0	9.0
LM LUNAR SURFACE MAPS	A0114.13	114	1	IN FDF (R3)	1.5	1072.0	26.0	9.0
LM TIMELINE BOOK	A0114.14	114	1	IN FDF (R3)	.5	1072.0	26.0	9.0
LM XFR DATA CARD KIT	A0114.18	114	1	IN FDF (R3)	.6	1072.0	26.0	9.0
LM DATA CARD BOOK	A0114.19	114	1	IN FDF (R3)	.3	1072.0	26.0	9.0
LM RNDZ/ABORT BOOK	A0114.22	114	1	IN FDF (R3)	.3	1072.0	26.0	9.0
MONOCULAR 10X4C	A0130.	116	1	AREA U4	.7	1038.0	39.0	-43.0
SUNGLASSES	A0200.	111	1	ON CREW-CDR(CTR.STA)	.1	1043.0	.0	-10.4
SUNGLASSES	A0200.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CDR(CTR.STA)	.1	1043.0	.0	-10.4
CHRONOGRAPH - 002	A0202.	111	1	CN CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4
WATCHBAND	A0203.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4
WATCHBAND	A0203.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CDR(CTR.STA)	.1	1043.0	.0	-10.4
PENS, DATA RECORDING	A0204.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4
PEN, MARKER	A0205.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4
PEN, MARKER	A0205.	111	1	CN CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4
PENCIL	A0206.	111	1	CN CREW-CDR(CTR.STA)	.1	1043.0	.0	-10.4
PENCIL	A0206.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS TRANSFERRED FROM CM INTO LM AT LM ACTIVATION (5)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
GARMENT, LIQUID COOLING CDR	80107.	111	1	CN CREW-CDR(CTR.STA)	4.3	1043.0	.0	-10.4	
GARMENT, LIQUID COOLING LMP	80107.	111	1	ON CREW-LMP(RH STA)	4.3	1043.0	24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	CN CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	CN CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
HARNESS, CWG ELECTRICAL (CDR)	80135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (LMP)	80135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
SCISSORS	80204.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
UCTA	80205.	111	1	ON CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
UCTA	80205.	111	1	CN CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
PENLIGHTS	80206.	111	1	CN CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
PENLIGHTS	80206.	111	1	ON CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
BIOBELT ASSY	80207.	111	1	ON CREW-CDR(CTR.STA)	.2	1043.0	.0	-10.4	
BIOBELT ASSY	80207.	111	1	ON CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
EARPLUGS, PAIR	80210.	111	1	CN CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
EARPLUGS, PAIR	80210.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
ITLSA - EV	80211.	111	1	CN CREW-CDR(CTR.STA)	45.2	1043.0	.0	-10.4	
ITLSA - EV	80211.	111	1	ON CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
GLOVES, IV PAIR	80213.	111	1	ON CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	
GLOVES, IV PAIR	80213.	111	1	CN CREW-CDR(CTR.STA)	2.0	1043.0	.0	-10.4	
HELMET ASSY, PRESSURE	80214.	111	1	CN CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
HELMET ASSY, PRESSURE	80214.	111	1	ON CREW-CDR(CTR.STA)	2.6	1043.0	.0	-10.4	
HARNESS, ELEC.-SUIT	80215.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
HARNESS, ELEC.-SUIT	80215.	111	1	ON CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
HARNESS, BIOINSTRUMENTATION	80216.	111	1	ON CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
HARNESS, BIOINSTRUMENTATION	80216.	111	1	ON CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
COMMUNICATION CARRIER	80217.	111	1	CN CREW-LMP(RH STA)	1.6	1043.0	24.5	-10.4	
COMMUNICATION CARRIER	80217.	111	1	ON CREW-CDR(CTR.STA)	1.6	1043.0	.0	-10.4	
POCKET, SCISSORS (CDR)	80218.	111	1	ON PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	80218.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CDR)	80219.	111	1	ON PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET, CHECKLIST (LMP)	80219.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET, DATA (CDR)	80220.	111	1	CN PGA (CREW-CTR STA)	TBD	1043.0	.0	-10.4	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST		APOLLO COORDINATES						
ITEMS TRANSFERRED FROM CM INTO LM AT LM ACTIVATION (5)		WEIGHT	X-C.G.	Y-C.G.	Z-C.G.			
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION				
POCKET, DATA (LMP)	B0220.	111	1	ON PGA (CREW-RH STA)	1043.0			
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-CDR(CTR.STA)	1043.0			
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW-LMP(RH STA)	1043.0			
DOSIMETER, PASSIVE RADIATION	D0101.	111	1	IN XFR BAG (R13)	1024.0			
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-CDR(CTR.STA)	1043.0			
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-LMP(RH STA)	1043.0			
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	1015.0			
DOSIMETER, PASSIVE	D0201.	117	3	CWG POCKET(STOWED)	1015.0			
HEADSET, LIGHTWEIGHT	E0112.	111	1	AREA A8	1011.0			
HEADSET, LIGHTWEIGHT	E0113.	111	1	AREA A8	1011.0			
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-CDR(CTR.STA)	1043.0			
EARPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	ON CREW-LMP(RH STA)	1043.0			
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-CDR(CTR.STA)	1043.0			
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-LMP(RH STA)	1043.0			
BAG, XFER, 16MM MAG (6)	06397.	111	1	IN XFR BAG (R13)	1024.0			
BAG, XFER, 70MM MAG (4)	06398.	111	1	IN XFR BAG (R13)	1024.0			
BAG, TRANSFER-16MM MAG.(2)	06432.	111	#1	AREA R13	1024.0			
BAG, TRANSFER-70MM MAG (3)	06434.	111	#1	AREA R13	1024.0			
2 CREW+EQUIP,CM-LM					500.63	1042.43	12.97	-10.70

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS TRANSFERRED FROM CM INTO LM AT LM ACTIVATION (6)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CREW-COMMANDER (CDR)	TBD	227	1	LH CREW STATION-	183.0	252.0	-22.0	43.0	
CREW-LM PILOT (LMP)	TBD	227	1	RH CREW STATION-	162.0	252.0	22.0	43.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	5	F7L	5.0	236.0	38.0	48.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (F6)	2.0	270.0	.0	52.8	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	F5	1.0	286.0	17.8	66.6	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	F7D	4.2	238.0	36.0	38.4	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	F7C	1.4	238.0	38.0	41.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	F7P	1.4	238.0	38.0	53.4	
MAGAZINE, L.S. HASSELBLAD	A0108.1	111	6	VOLUME CENTROID AS	8.4	254.0	.0	.0	
LM LUNAR SURFACE CHECKLIST	A0114.10	114	1	LM XFR DATA CARD KIT	1.0	280.8	-20.0	14.0	
LM SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
LM SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
LM LUNAR SURFACE MAPS	A0114.13	114	1	LM XFR DATA CARD KIT	1.5	280.8	-20.0	14.0	
LM TIMELINE BOOK	A0114.14	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
LM XFR DATA CARD KIT	A0114.18	114	1	LM XFR DATA CARD KIT	.6	280.8	-20.0	14.0	
LM DATA CARD BOOK	A0114.19	114	1	LM XFR DATA CARD KIT	.3	280.8	-20.0	14.0	
LM RNDZ/ABORT BOOK	A0114.22	114	1	LM XFR DATA CARD KIT	.3	280.8	-20.0	14.0	
MONOCULAR 10X40	A0130.	116	1	F7B	.7	238.0	38.0	49.0	
SUNGLASSES	A0200.	111	1	ON CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
SUNGLASSES	A0200.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
WATCHBAND	A0203.	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
WATCHBAND	A0203.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
PENS, DATA RECORDING	A0204.	111	1	ON CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
PENS, DATA RECORDING	A0204.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
PEN, MARKER	A0205.	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
PEN, MARKER	A0205.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
PENCIL	A0206.	111	1	ON CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
PENCIL	A0206.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST		LM COORDINATES						
ITEMS TRANSFERRED FROM CM INTO LM AT LM ACTIVATION (6)								
DESCRIPTION	STOW. ITEM	REF	NG.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
GARMENT, LIQUID COOLING CDR	80107.	111	1	DN CREW(LH CREW STA)	4.3	252.0	-22.0	43.0
GARMENT, LIQUID COOLING LMP	80107.	111	1	DN CREW(RH CREW STA)	4.3	252.0	22.0	43.0
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	DN CREW(LH CREW STA)	.3	252.0	-22.0	43.0
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	DN CREW(RH CREW STA)	.3	252.0	22.0	43.0
HARNESS, CMG ELECTRICAL (CDR)	80135.	111	1	FILE	.4	237.9	-33.6	55.0
HARNESS, CMG ELECTRICAL (LMP)	80135.	111	1	FILE	.4	237.9	-33.6	55.0
SCISSORS	80204.	111	1	DN CREW(LH CREW STA)	.5	252.0	-22.0	43.0
UCTA	80205.	111	1	DN CREW(LH CREW STA)	.5	252.0	22.0	43.0
UCTA	80205.	111	1	DN PGA-LMP(ON CREW)	.5	252.0	-22.0	43.0
PENLIGHTS	80206.	111	1	DN CREW(LH CREW STA)	.3	252.0	-22.0	43.0
PENLIGHTS	80206.	111	1	DN CREW(RH CREW STA)	.3	252.0	22.0	43.0
BIOBELT ASSY	80207.	111	1	DN CREW(LH CREW STA)	.2	252.0	-22.0	43.0
BIOBELT ASSY	80207.	111	1	DN CREW(RH CREW STA)	.2	252.0	22.0	43.0
EARPLUGS, PAIR	80210.	111	1	DN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0
EARPLUGS, PAIR	80210.	111	1	DN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0
ITLSA - EV	80211.	111	1	DN CREW(LH CREW STA)	45.2	252.0	-22.0	43.0
ITLSA - EV	80211.	111	1	DN CREW(RH CREW STA)	45.2	252.0	22.0	43.0
GLOVES, IV PAIR	80213.	111	1	DN CREW(LH CREW STA)	2.0	252.0	-22.0	43.0
GLOVES, IV PAIR	80213.	111	1	DN CREW(RH CREW STA)	2.0	252.0	22.0	43.0
HELMET ASSY, PRESSURE	80214.	111	1	DN CREW(LH CREW STA)	2.6	252.0	-22.0	43.0
HELMET ASSY, PRESSURE	80214.	111	1	DN CREW(RH CREW STA)	2.6	252.0	22.0	43.0
HARNESS, ELEC.-SUIT	80215.	111	1	DN CREW(LH CREW STA)	.5	252.0	-22.0	43.0
HARNESS, ELEC.-SUIT	80215.	111	1	DN CREW(RH CREW STA)	.5	252.0	22.0	43.0
HARNESS, BIOINSTRUMENTATION	80216.	111	1	DN CREW(LH CREW STA)	.3	252.0	-22.0	43.0
HARNESS, BIOINSTRUMENTATION	80216.	111	1	DN CREW(RH CREW STA)	.3	252.0	22.0	43.0
COMMUNICATION CARRIER	80217.	111	1	DN CREW(LH CREW STA)	1.6	252.0	-22.0	43.0
COMMUNICATION CARRIER	80217.	111	1	DN CREW(RH CREW STA)	1.6	252.0	22.0	43.0
POCKET, SCISSORS (CDR)	80218.	111	1	DN CREW(LH CREW STA)	.2	252.0	-22.0	43.0
POCKET, SCISSORS (LMP)	80218.	111	1	DN CREW(RH CREW STA)	.2	252.0	22.0	43.0
POCKET, CHECKLIST (CDR)	80219.	111	1	DN CREW(LH CREW STA)	.2	252.0	-22.0	43.0
POCKET, CHECKLIST (LMP)	80219.	111	1	DN CREW(RH CREW STA)	.2	252.0	22.0	43.0
POCKET, DATA (CDR)	80220.	111	1	DN CREW(LH CREW STA)	TBD	252.0	-22.0	43.0

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS TRANSFERRED FROM CM INTC LM AT LM ACTIVATION (6)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STGW. ITEM	REF	NC.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
POCKET, DATA (LMP)	B0220.	111	1	CN CREW(RH CREW STA)	TBD	252.0	22.0	43.0	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	GN CREW(LH CREW STA)	1.1	252.0	-22.0	43.0	
ASSY, BIOINSTRUMENTATION	C0201.	111	1	ON CREW(RH CREW STA)	1.1	252.0	22.0	43.0	
DOSIMETER, PASSIVE RADIATION	D0101.	111	1	F7L	NEGL	236.0	38.0	48.0	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW(RH CREW STA)	.4	252.0	22.0	43.0	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW(LH CREW STA)	.4	252.0	-22.0	43.0	
DOSIMETER, PASSIVE	D0201.	117	3	CN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
DOSIMETER, PASSIVE	D0201.	117	3	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
HEADSET, LIGHTWEIGHT	E0112.	111	1	F1B	.4	235.5	-35.5	38.5	
HEADSET, LIGHTWEIGHT	E0113.	111	1	F1B	.4	235.5	-35.5	38.5	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	CN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
BAG, XFER, 16MM MAG (6)	O6397.	111	1	F7L	.3	236.0	38.0	48.0	
BAG, XFER, 70MM MAG (4)	O6398.	111	1	F7C	.3	238.0	38.0	38.4	
BAG, TRANSFER-16MM MAG.(2)	O6432.	111	*1	ISA (F6)	.1	270.0	.0	52.8	
BAG, TRANSFER-70MM MAG (3)	O6434.	111	*1	F7P	.5	238.0	38.0	53.4	
2 CREW+EQUIP, CM-LM					500.63	251.94	.03	42.19	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS TRANSFERRED FROM LM INTO CM AT LM ACTIVATION (7)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CSM/LM UMBILICAL	T80	222	1	IN LM TUNNEL	1.1	300.0	.0	.0	
EQUIP.XFR,LM-CM 1							1.10	300.00	.00

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS TRANSFERRED FROM LM INTO CM AT LM ACTIVATION (8)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	HEIGHT				
CSM/LM UMBILICAL	TBD	222	1	UNDER RH COUCH	1.1	1018.0	24.5	-15.0	

EQUIP. XFR, LM-CM 1

1.10 1018.00 24.50 -15.00

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN LM PRIOR TO LM ACTIVATION (9)									
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (F6)	2.0	270.0	.0	52.8	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	ISA (F6)	1.0	270.0	.0	52.8	
BRACKET, WEDGE, 16MM CAMERA	A1041.	115	1	F7A	1.3	238.0	38.0	49.8	
OXYGEN PURGE SYSTEM (OPS)	B1059.	111	1	A1F	35.9	257.4	-20.7	-6.0	
INTERIM STOWAGE ASSY.	03007.	111	* 1	F6	6.4	270.0	.0	52.8	
BAG, TRANSFER-16MM MAG. (2)	06432.	111	* 1	ISA (F6)	.1	270.0	.0	52.8	
LM EQUIP. RELOC. 1					46.70	259.42	-14.86	7.51	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN LM PRIOR TO LM ACTIVATION (10)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (AID)	2.0	270.3	-15.0	19.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	ISA (AID)	1.0	270.3	-15.0	19.0	
BRACKET, WEDGE, 16MM CAMERA	A1041.	115	1	F5	1.3	286.0	17.8	66.6	
OXYGEN PURGE SYSTEM (OPS)	B1059.	111	1	A9 (APPROX.)	35.9	278.0	.0	-20.0	
INTERIM STOWAGE ASSY.	C3007.	111	*1	AID	6.4	270.3	-15.0	19.0	
BAG, TRANSFER-16MM MAG. (2)	O6432.	111	*1	ISA (AID)	.1	270.3	-15.0	19.0	
<b>LM EQUIP. RELOC. 1</b>						<b>46.70</b>	<b>-2.56</b>	<b>-9.66</b>	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERREC CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS OFFLOADED FROM ASC. STAGE PRIOR TO LUNAR LIFT-OFF (11)							X-C.G.	W-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	W-C.G.	Z-C.G.	
ARM RESTS	T8D	346	2	LH CREW STATION-	2.2	252.0	-22.0	43.0	
ARM RESTS	T8D	346	2	RH CREW STATION-	2.2	252.0	-22.0	43.0	
LM SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
CAMERA,HASSELBLAD-ELEC DATA	A015.	111	1	F7C	3.6	238.0	38.0	41.0	
LENS, 60 MM	A016.	115	1	F7C	1.7	238.0	38.0	41.0	
PROTECTIVE COVERA, RESEAU	A023.	115	1	F7C	.2	238.0	38.0	41.0	
PROTECTIVE COVER,RESEAU	A023.	111	1	A14A	.2	238.0	-9.2	-14.8	
TRIGGER, ELECT. HASSELBLAD	A027.	115	1	F7C	.2	238.0	38.0	41.0	
TRIGGER,HASSELBLAD-ELEC DATA	A027.	111	1	A14A	.2	238.0	-9.2	-14.8	
HANDLE,, ELECT. HASSELBLAD	A028.	115	1	F7C	.5	238.0	38.0	41.0	
HANDLE,HASSELBLAD-ELEC DATA	A028.	111	1	A14A	.5	238.0	-9.2	-14.8	
TETHER, EVA RETRACTABLE	A1029.	115	1	A18	.2	262.8	-20.8	15.4	
CHECKLIST, EVA CUFF	A1040.	115	1	F8	.3	221.0	18.0	51.0	
CHECKLIST, EVA CUFF	A1040.	115	1	F10	.3	221.0	-18.0	51.0	
TETHER,EVA RETRACTABLE	A1044.	111	1	F9	.7	219.7	.0	44.7	
CAMERA,L.S.ELECTRIC	A1045.	111	1	A14A	3.1	238.0	-9.2	-14.8	
LENS,500MM	A1046.	111	1	A14A	4.6	238.0	-9.2	-14.8	
RINGSIGHT	A1047.	111	1	A14A	.1	238.0	-9.2	-14.8	
GARMENT,LIQUID COOLING CDR	B0107.	111	1	ON CREW(LH CREW STA)	4.3	252.0	-22.0	43.0	
GARMENT,LIQUID COOLING LMP	B0107.	111	1	CN CREW(RH CREW STA)	4.3	252.0	22.0	43.0	
EARPLUGS, PAIR	B0210.	111	1	DN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
EARPLUGS,PAIR	B0210.	111	1	CN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
REMOTE CONTROL UNIT-PLSS	B1001.1	115	2	A12	10.2	272.0	.0	-18.0	
BRACKET, CAMERA MOUNT	B1001.1	115	1	F7F	.6	238.0	38.0	31.6	
BRACKET,CAMERA POUNT	B1001.1	111	1	A14A	.6	238.0	-9.2	-14.8	
UTILITY TOWEL ASSEMBLY, LM	B1008.	115	2	F1D	.6	242.8	-35.4	47.2	
DEFECATION COLLECTION DEVICE	B1009.	115	6	F1F	1.2	235.5	-37.6	46.6	
BCOTS,LUNAR PAIR	B1018.	115	1	A1L	4.5	273.7	-20.0	-8.5	
BOOTS, LUNAR PAIR	B1018.	115	1	A1K	4.5	281.0	-20.0	-8.5	
BAG ASSY, LEC + M.T.	B1020.1	115	1	F7N	.2	238.0	38.0	53.1	
CCNVEYOR ASSY, LUNAR EQUIP.	B1020.2	115	1	F7N	1.3	238.0	38.0	53.1	
BAG. DEPLOYMENT, LEC	B1020.3	115	1	F7A	.1	238.0	38.0	53.1	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
PLSS/EVCS ASSY	B1024.	114	1	F9	89.6	219.7	.0	44.7	
PLSS/EVCS ASSY	B1025.	114	1	A18	89.6	262.8	-20.8	15.4	
BAG, JETTISON STOWAGE	B1027.	115	3	A1G	2.7	257.5	-20.0	-18.0	
DISPENSER, TISSUE	B1033.	116	1	F1E	1.4	237.9	-33.6	55.0	
ADAPTER, LIQUID COOLING GARMENT	B1036.	116	2	F7E	.4	238.0	38.0	32.7	
JACKET ASSY, ICG	B1039.1	116	2	A1C (ICG ASSY)	3.6	240.5	-15.3	13.3	
TROUSER ASSY, ICG	B1039.2	116	2	A1C (ICG ASSY)	3.6	240.5	-15.3	13.3	
BOOT, RIGHT, ICG	B1039.3	116	2	A1C (ICG ASSY)	.8	240.5	-15.3	13.3	
BOOT, LEFT, ICG	B1039.4	116	2	A1C (ICG ASSY)	.8	240.5	-15.3	13.3	
TOWELS, LM UTILITY (RED)	B1043.	115	2	F1G	.2	228.0	-40.2	43.2	
TOWELS, LM UTILITY (BLUE)	B1044.	115	2	F1G	.2	228.0	-40.2	43.2	
DEVICE, IN-SUIT DRINKING	B1048.	114	2	F6	1.6	270.0	.0	52.8	
BUDDY SLSS ASSY SPLY (BUD. SYS.)	B1052.	116	1	A5	10.9	224.3	-1.5	29.3	
SLEEP RESTRAINT ASSY	B1061.	111	2	VOLUME CENTROID AS	5.2	254.0	.0	.0	
HARNES, GEOLOGICAL EQUIP (CDR)	B1063.	111	1	A5	1.5	224.3	-1.5	29.3	
HARNES, GEOLOGICAL EQUIP (LMP)	B1064.	111	1	A5	1.5	224.3	-1.5	29.3	
FOOD ASSY, LM	C1002.	165	1	A9 (APPROX.)	3.3	278.0	.0	-20.0	
WIPES, WET, FACIAL	C1005.0	115	5	F1A	NEGL	244.5	-36.6	31.4	
CONTR. CONTINGENCY, LUN. SAM. RTN.	G4016.	115	1	A1G	.6	257.5	-20.0	-18.0	
SCALE, SAMPLE	G4031.	115	1	F7K	.5	238.0	38.0	42.7	
ADAPTER, SRC/DPS	G3004.	115	1	A1F	2.4	257.4	-20.7	-6.0	
ADAPTER, SRC/DPS	G3004.	115	1	VOLUME CENTROID AS	2.4	254.0	.0	.0	
CANNISTER, ECS LIQH	G3008.	115	1	A1D	9.2	270.3	-15.0	19.0	
URINE COLLECTION ASSY.	G3009.	115	3	F1F	.3	235.5	-37.6	46.6	
BAG, EMESIS	G3011.	115	1	F1F	.2	235.5	-37.6	46.6	
STRAP, ECS LICH CANNISTER	G3024.	115	1	A1C	.1	250.0	8.8	-11.8	
URINE RECEPTACLE SYSTEM	G3039.	115	1	F1C	.6	242.5	-35.6	38.5	
HAMMOCK ASSY.	G3048.	115	1	F1G	4.1	228.0	-40.2	43.2	
HAMMOCK ASSY.	G3050.	115	1	F1G	3.9	228.0	-40.2	43.2	
CONTAINER, BUDDY SLSS ASSY, STOW	G3059.	111	1	A5	4.0	224.3	-1.5	29.3	
SUPPORT ASSY, EQUIPMENT	G3073.	111	1	A14A	TBD	238.0	-9.2	-14.8	
LEFT AT LUNAR SITE					298.91	244.28	-9.02	24.56	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS UNLOADED INTO ASC. STAGE PRIOR TO LUNAR LIFT-OFF (12)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STCW. ITEM	REF	NO.	STCWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CONTAINER, SAMPLE RET NO 1 (LD)	G4003.	115	1	A1E	39.1	265.9	-20.7	-6.0	
CONTAINER, SAMPLE RET NO 2 (LD)	G4004.	115	1	A1F	39.1	257.4	-20.7	-6.0	
EXP, SOLAR WIND COMPOSITION	G4011.	111	1	ISA (A3)	.2	280.0	.0	-10.0	
CONTR. CONTINGENCY, LUN. SAM. RTN.	G4016.	115	1	A1G	2.6	257.5	-20.0	-18.0	
BAG, EXTRA SAMPLE COLLECTION	G4048.	115	4	ISA (A3)	4.8	280.0	.0	-10.0	
PENETROMETER, RECORDING	G4049.	111	1	VOLUME CENTROID AS	2.0	254.0	.0	.0	
BAG, SMC EXPERIMENT -- STOWAGE	G4055.	111	1	ISA (A3)	.2	280.0	.0	-10.0	
BAG, SAMPLE RETURN	O3060.	115	1	GN PLUS Z27 BULKHEAD	15.0	260.0	-37.0	28.0	
CONTAINER, CORE TUBE + SAMPLE	O3074.	115	1	A14A	18.0	238.0	-9.2	-14.8	
SAMPLES IN G4048.	G4048.1	115	1	ISA (A3)	35.2	280.0	.0	-10.0	
BAG, CORE TUBE	O3074.1	115	1	A14A	2.0	238.0	-9.2	-14.8	
ONLCAD AT LUN. SITE						158.20	263.02	-15.23	-5.03

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN LM PRIOR TO LUNAR LIFT-OFF (13)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (A1D)	2.0	270.3	-15.C	19.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	ISA (A1D)	1.0	270.3	-15.0	19.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	F7C	1.4	238.0	38.0	41.0	
OXYGEN PURGE SYSTEM	B1012.	115	1	A1E	35.9	265.9	-20.7	-6.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	F8	5.6	221.0	18.0	51.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	F10	5.6	221.0	-18.0	51.0	
GLOVES, EV-PAIR	B1015.	115	1	F8	2.7	221.0	18.0	51.0	
GLOVES, EV-PAIR	B1015.	115	1	F10	2.7	221.0	-18.0	51.0	
KIT, EMU MAINTENANCE	B1016.	115	1	F10	.5	221.0	-18.C	51.0	
PURGE VALVE ASSY.	B1017.	115	1	A1L	.6	273.7	-2C.0	-8.5	
PURGE VALVE ASSY.	B1017.	115	1	A1K	.6	281.0	-20.0	-8.5	
STRAPS, ATTACH, PLSS, LOWER(LH)	B1021.	115	1	F9	.2	219.7	.0	44.7	
STRAPS, ATTACH, PLSS, LOWER(LH)	B1021.	115	1	A1B	.2	262.8	-20.8	15.4	
STRAPS, ATTACH, PLSS, LOWER(RH)	B1022.	115	1	F9	.3	219.7	.0	44.7	
STRAPS, ATTACH, PLSS, LOWER(RH)	B1022.	115	1	A1B	.3	262.8	-20.8	15.4	
GARMENT, LIQUID COOLING	B1030.	111	1	A1C	4.3	240.5	-18.0	13.3	
GARMENT, LIQUID COOLING	B1030.	111	1	A1C	4.3	240.5	-18.0	13.3	
BAG, HELMET STOWAGE	B1058.	115	* 1	F8	1.4	221.0	18.C	51.0	
BAG, HELMET STOWAGE	B1058.	115	1	F10	1.4	221.0	-18.0	51.0	
INTERIM STOWAGE ASSY.	O3007.	111	* 1	A1C	6.4	270.3	-15.0	19.0	
BAG, TEMPORARY STOWAGE	O3031.	111	1	F6B	.9	270.3	.0	52.8	
BAG, TRANSFER-16MM MAG.(2)	O6432.	111	* 1	ISA (A1D)	.1	270.3	-15.0	19.0	
LM EQUIP.RELOC.2					78.40	251.66	-13.15	15.55	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN LM PRIOR TO LUNAR LIFT-OFF (14)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STCW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (A3)	2.0	280.0	.0	-10.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	ISA (A3)	1.0	280.0	.0	-10.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	F7D	1.4	238.0	38.0	38.4	
OXYGEN PURGE SYSTEM	B1012.	115	1	F9	35.9	219.7	.0	44.7	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	A3	5.6	280.0	.0	-10.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	A3	5.6	280.0	.0	-10.0	
GLOVES, EV-PAIR	B1015.	115	1	A3	2.7	280.0	.0	-10.0	
GLOVES, EV-PAIR	B1015.	115	1	A3	2.7	280.0	.0	-10.0	
KIT, EMU MAINTENANCE	B1016.	115	1	A3	.5	280.0	.0	-10.0	
PURGE VALVE ASSY.	B1017.	115	1	F7P	.6	238.0	38.0	53.4	
PURGE VALVE ASSY.	B1017.	115	1	F7P	.6	238.0	38.0	53.4	
STRAPS, ATTACH, PLSS, LOWER(LH)	B1021.	115	1	F7P	.2	238.0	38.0	53.4	
STRAPS, ATTACH, PLSS, LOWER(LH)	B1021.	115	1	F7P	.2	238.0	38.0	53.4	
STRAPS, ATTACH, PLSS, LOWER(RH)	B1022.	115	1	F7P	.3	238.0	38.0	53.4	
STRAPS, ATTACH, PLSS, LOWER(RH)	B1022.	115	1	F7P	.3	238.0	38.0	53.4	
GARMENT, LIQUID COOLING	B1030.	111	1	DN CREW(RH CREW STA)	4.3	252.0	22.0	43.0	
GARMENT, LIQUID COOLING	B1030.	111	1	DN CREW(LH CREW STA)	4.3	252.0	-22.0	43.0	
BAG, HELMET STOWAGE	B1058.	115	*	A3	1.4	280.0	.0	-10.0	
BAG, HELMET STOWAGE	B1058.	115	1	A3	1.4	280.0	.0	-10.0	
INTERIM STOWAGE ASSY.	03007.	111	*	A3	6.4	280.0	.0	-10.0	
BAG, TEMPORARY STOWAGE	03031.	111	1	A3	.9	280.0	.0	-10.0	
BAG, TRANSFER-16MM MAG.(2)	06432.	111	#1	ISA (A3)	.1	280.0	.0	-10.0	
LM EQUIP.RELOC.2					78.40	247.39	1.74	23.50	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (15)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STON. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CREW-COMMANDER (CDR)	TBD	227	1	LH CREW STATION-	183.0	252.0	-22.0	43.0	
CREW-LM PILOT (LMP)	TBD	227	1	RH CREW STATION-	162.0	252.0	22.0	43.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	5	F7L	5.0	236.0	38.0	48.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	ISA (A3)	2.0	280.0	.0	-10.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	ISA (A3)	1.0	280.0	.0	-10.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	F7D	4.2	238.0	38.0	38.4	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	F7D	1.4	238.0	38.0	38.4	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	F7D	4.2	238.0	38.0	38.4	
MAGAZINE, L.S. HASSELBLAD	A0108.1	111	6	VOLUME CENTROID AS	8.4	254.0	.0	.0	
LM LUNAR SURFACE CHECKLIST	A0114.10	114	1	LM XFR DATA CARD KIT	1.0	280.8	-20.0	14.0	
LM SYSTEMS ACTIVATION CHK.LST.	A0114.12	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
LM LUNAR SURFACE MAPS	A0114.13	114	1	LM XFR DATA CARD KIT	1.5	280.8	-20.0	14.0	
LM TIMELINE BOOK	A0114.14	114	1	LM XFR DATA CARD KIT	.5	280.8	-20.0	14.0	
LM XFR DATA CARD KIT	A0114.18	114	1	LM XFR DATA CARD KIT	.6	280.8	-20.0	14.0	
LM DATA CARD BOOK	A0114.19	114	1	LM XFR DATA CARD KIT	.3	280.8	-20.0	14.0	
LM RNDZ/ABORT BOOK	A0114.22	114	1	LM XFR DATA CARD KIT	.7	280.8	-20.0	14.0	
MONOCLULAR 10X40	A0130.	116	1	F7R	.3	238.0	38.0	49.0	
SUNGLASSES	A0200.	111	1	GN CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
SUNGLASSES	A0200.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
CHRONOGRAPH - 002	A0202.	111	1	GN CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
WATCHBAND	A0203.	111	1	GN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
WATCHBAND	A0203.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
PENS, DATA RECORDING	A0204.	111	1	GN CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
PENS, DATA RECORDING	A0204.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
PEN, MARKER	A0205.	111	1	GN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
PEN, MARKER	A0205.	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
PENCIL	A0206.	111	1	GN CREW(LH CREW STA)	.1	252.0	-22.0	43.0	
PENCIL	A0206.	111	1	ON CREW(RH CREW STA)	.1	252.0	22.0	43.0	
KIT, PILOTS PREFERENCE	A1007.	111	2	A1H	1.8	265.9	-20.0	-18.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (15)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
KIT, PILCTS PREFERENCE	A1007.	111	1	A1H	.9	265.9	-20.0	-18.0	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	CN CREW(LH CREW STA)	.3	252.0	-22.0	43.0	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	CN CREW(RH CREW STA)	.3	252.0	22.0	43.0	
HARNNESS,CWG ELECTRICAL (CDR)	B0135.	111	1	F1E	.4	237.9	-33.6	55.0	
HARNNESS,CWG ELECTRICAL (LMP)	B0135.	111	1	F1E	.4	237.9	-33.6	55.0	
SCISSORS	B0204.	111	1	ON CREW(LH CREW STA)	.5	252.0	-22.0	43.0	
UCTA	B0205.	111	1	ON CREW(RH CREW STA)	.5	252.0	22.0	43.0	
UCTA	B0205.	111	1	CN CREW(LH CREW STA)	.5	252.0	-22.0	43.0	
PENLIGHTS	B0206.	111	1	CN CREW(RH CREW STA)	.3	252.0	22.0	43.0	
PENLIGHTS	B0206.	111	1	ON CREW(LH CREW STA)	.3	252.0	-22.0	43.0	
BIOBELT ASSY	B0207.	111	1	ON CREW(RH CREW STA)	.2	252.0	22.0	43.0	
BIOBELT ASSY	B0207.	111	1	ON CREW(LH CREW STA)	.2	252.0	-22.0	43.0	
ITLSA - EV	B0211.	111	1	CN CREW(RH CREW STA)	45.2	252.0	22.0	43.0	
ITLSA - EV	B0211.	111	1	CN CREW(LH CREW STA)	45.2	252.0	-22.0	43.0	
HARNNESS, ELEC.-SUIT	B0215.	111	1	ON CREW(RH CREW STA)	.5	252.0	22.0	43.0	
HARNNESS, ELEC.-SUIT	B0215.	111	1	ON CREW(LH CREW STA)	.5	252.0	-22.0	43.0	
HARNNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW(RH CREW STA)	.3	252.0	22.0	43.0	
HARNNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW(LH CREW STA)	.3	252.0	-22.0	43.0	
POCKET,DATA (LMP)	B0220.	111	1	ON CREW(RH CREW STA)	TBD	252.0	22.0	43.0	
OXYGEN PURGE SYSTEM	B1012.	115	1	F9	35.9	219.7	.0	44.7	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	A3	5.6	280.0	.0	-10.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	A3	5.6	280.0	.0	-10.0	
GLOVES,EV-PAIR	B1015.	115	1	A3	2.7	280.0	.0	-10.0	
GLOVES,EV-PAIR	B1015.	115	1	A3	2.7	280.0	.0	-10.0	
KIT,EMU MAINTENANCE	B1016.	115	1	A3	.5	280.0	.0	-10.0	
PURGE VALVE ASSY.	B1017.	115	1	F7P	.6	238.0	38.0	53.4	
TETHER, WAIST EVA	B1020.6	115	1	F7N	.6	238.0	38.0	53.1	
TETHER, WAIST EVA	B1020.7	115	1	F7N	.6	238.0	38.0	53.1	
GARMENT,LIQUID COOLING	B1030.	111	1	ON CREW(RH CREW STA)	4.3	252.0	22.0	43.0	
GARMENT,LIQUID COOLING	B1030.	111	1	ON CREW(LH CREW STA)	4.3	252.0	-22.0	43.0	
BAG, HELMET STOWAGE	B1058.	115	*1	A3	1.4	280.0	.0	-10.0	
BAG, HELMET STOWAGE	B1058.	115	1	A3	1.4	280.0	.0	-10.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST									
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (15)									
LM COORDINATES									
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
ASSY, BIOINSTRUMENTATION	G0201.	111	1	DN CREW(LH CREW STA)	1.1	252.0	-22.0	43.0	
ASSY, RICHINSTRUMENTATION	G0201.	111	1	CN CREW(RH CREW STA)	1.1	252.0	22.0	43.0	
DOSIMETER, PASSIVE RADIATION	C0101.	111	1	F7L	NEGL	236.0	38.0	48.0	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW(RH CREW STA)	.4	252.0	22.0	43.0	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW(LH CREW STA)	.4	252.0	-22.0	43.0	
DOSIMETER, PASSIVE	D0201.	117	3	CN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
DOSIMETER, PASSIVE	D0201.	117	3	CN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
HEADSET, LIGHTWEIGHT	E0111.	111	1	F1B	.4	235.5	-35.5	38.5	
HEADSET, LIGHTWEIGHT	E0112.	111	1	F1B	.4	235.5	-35.5	38.5	
EAPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
EAPIECE, MOULDER (COM.CARRIER)	E0200.1	111	1	ON CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	CN CREW(RH CREW STA)	NEGL	252.0	22.0	43.0	
EARTUBE (COM.CARRIER)	E0200.2	111	2	CN CREW(LH CREW STA)	NEGL	252.0	-22.0	43.0	
CONTAINER, SAMPLE RET NO 1 (LD)	G4003.	115	1	A1E	39.1	265.9	-20.7	-6.0	
CONTAINER, SAMPLE RET NO 2 (LD)	G4004.	115	1	A1F	39.1	257.4	-20.7	-6.0	
EXP.SOLAR WIND COMPOSITION	G4011.	111	1	ISA (A3)	.2	280.0	.0	-10.0	
CONTR.CONTINGENCY,LUN.SAM.RTN.	G4016.	115	1	A1G	2.6	257.5	-20.0	-18.0	
BAG,EXTRA SAMPLE COLLECTION	G4048.	115	4	ISA (A3)	4.8	280.0	.0	-10.0	
PENETROMETER, RECORDING	G4049.	111	1	VOLUME CENTROID AS	2.0	254.0	.0	.0	
FLAG KIT,STANDARD	N1002.	166	1	ISA (A3)	.2	280.0	.0	-10.0	
DSEA	O3005.	115	1	A1H	.8	265.9	-20.0	-18.0	
INTERIM STOWAGE ASSY.	O3007.	111	1	VOLUME CENTROID AS	2.3	254.0	.0	.0	
BAG,SAMPLE RETURN	O3060.	115	* 1	A3	6.4	280.0	.0	-10.0	
CONTAINER,CORE TUBE + SAMPLE	O3074.	115	1	ON PLUS Z27 BULKHEAD	15.0	260.0	-37.0	28.0	
BAG,XFER, 16MM MAG (6)	O6397.	111	1	A14A	18.0	238.0	-9.2	-14.8	
BAG,XFER, 70MM MAG (4)	O6398.	111	1	F7L	.3	236.0	38.0	48.0	
BAG, TRANSFER-16MM MAG.(2)	O6432.	111	*1	F7C	.3	238.0	38.0	38.4	
BAG, TRANSFER-70MM MAG (3)	O6434.	111	*1	ISA (A3)	.5	238.0	38.0	-10.0	
SAMPLES IN G4048.	G4048.1	115	1	F7P	35.2	238.0	38.0	53.4	
BAG,CORE TUBE	O3074.1	115	1	ISA (A3)	2.0	238.0	-9.2	-14.8	
2 CREW+EQUIP,LM-CM					714.92	253.85	-3.36	25.16	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST									
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (16)									
APOLLO COORDINATES									
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CREW-COMMANDER (CDR)	TBD	227	1	ON COUCH(CTR CRM. STA	183.0	1043.0	.0	-10.4	
CREW-LM PILOT (LMP)	TBD	227	1	ON COUCH(RH CREW STA	162.0	1043.0	24.5	-10.4	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	5	IN XFR. BAG (R13)	5.0	1024.0	45.0	-26.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	2	AREA R13	2.0	1024.0	45.0	-26.0	
MAGAZINE, 16MM DATA ACQ.	A0101.1	116	1	AREA R13	1.0	1024.0	45.0	-26.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	AREA R13	4.2	1024.0	45.0	-26.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	1	AREA R13	1.4	1024.0	45.0	-26.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	116	3	AREA R13	4.2	1024.0	45.0	-26.0	
MAGAZINE, L.S. HASSELBLAD	A0108.1	111	6	VOLUME CENTROID CM	8.4	1040.6	.0	.0	
LM LUNAR SURFACE CHECKLIST	A0114.10	114	1	IN FDF (R3)	1.0	1072.0	26.0	9.0	
LM SYSTEMS ACTIVATION CHK. LIST.	A0114.12	114	1	IN FDF (R3)	.5	1072.0	26.0	9.0	
LM LUNAR SURFACE MAPS	A0114.13	114	1	IN FDF (R3)	1.5	1072.0	26.0	9.0	
LM TIMELINE BOOK	A0114.14	114	1	IN FDF (R3)	.5	1072.0	26.0	9.0	
LM XFR DATA CARD KIT	A0114.18	114	1	IN FDF (R3)	.6	1072.0	26.0	9.0	
LM DATA CARD BOOK	A0114.19	114	1	IN FDF (R3)	.3	1072.0	26.0	9.0	
LM RNDZ/ABORT BOOK	A0114.22	114	1	IN FDF (R3)	.3	1072.0	26.0	9.0	
MONOCULAR 10X40	A0130.	116	1	AREA U4	.7	1038.0	39.0	-43.0	
SUNGLASSES	A0200.	111	1	ON CREW-CDR(CTR. STA)	.1	1043.0	.0	-10.4	
SUNGLASSES	A0200.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
POUCH, SUNGLASSES	A0201.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-CDR(CTR. STA)	.1	1043.0	.0	-10.4	
CHRONOGRAPH - 002	A0202.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4	
WATCHBAND	A0203.	111	1	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
WATCHBAND	A0203.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
PENS, DATA RECORDING	A0204.	111	1	ON CREW-CDR(CTR. STA)	.1	1043.0	.0	-10.4	
PENS, DATA RECORDING	A0204.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4	
PEN, MARKER	A0205.	111	1	ON CREW-CDR(CTR. STA)	NEGL	1043.0	.0	-10.4	
PEN, MARKER	A0205.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
PENCIL	A0206.	111	1	ON CREW-CDR(CTR. STA)	.1	1043.0	.0	-10.4	
PENCIL	A0206.	111	1	ON CREW-LMP(RH STA)	.1	1043.0	24.5	-10.4	
KIT, PILOTS PREFERENCE	A1007.	111	2	AREA AB	1.8	1011.0	21.0	-23.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APCLLO COORDINATES		
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (16)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
KIT, PILOTS PREFERENCE	A1007.	111	1	AREA A8	.9	1011.0	21.0	-23.0	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	ON CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	ON CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
HARNESS,CWG ELECTRICAL (CDR)	B0135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
HARNESS,CWG ELECTRICAL (LMP)	B0135.	111	1	IN ADAPTER BAG(A8)	.4	1011.0	21.0	-23.0	
SCISSORS	B0204.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
UCTA	B0205.	111	1	ON CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
PENLIGHTS	B0206.	111	1	ON CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
PENLIGHTS	B0206.	111	1	ON CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
BIOBELT ASSY	B0207.	111	1	ON CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
BIOBELT ASSY	B0207.	111	1	ON CREW-CDR(CTR.STA)	.2	1043.0	.0	-10.4	
ITLSA - EV	B0211.	111	1	ON CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA - EV	B0211.	111	1	ON CREW-CDR(CTR.STA)	45.2	1043.0	.0	-10.4	
HARNESS, ELEC.-SUIT	B0215.	111	1	ON CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
HARNESS, ELEC.-SUIT	B0215.	111	1	ON CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
HARNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
HARNESS, BIOINSTRUMENTATION	B0216.	111	1	ON CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
POCKET, DATA (LMP)	B0220.	111	1	ON CREW-LMP(RH STA)	TBD	1043.0	24.5	-10.4	
OXYGEN PURGE SYSTEM	B1012.	115	1	AREA A7	35.9	1011.0	22.0	8.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	IN CM PGA CONTAINER	5.6	1015.0	.0	-20.0	
LUNAR EXTRAVEHICULAR VISOR	B1014.	115	1	IN CM PGA CONTAINER	5.6	1015.0	.0	-20.0	
GLOVES,EV-PAIR	B1015.	115	1	IN CM PGA CONTAINER	2.7	1015.0	.0	-20.0	
GLOVES,EV-PAIR	B1015.	115	1	IN CM PGA CONTAINER	2.7	1015.0	.0	-20.0	
KIT,EMU MAINTENANCE	B1016.	115	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
PURGE VALVE ASSY.	B1017.	115	1	AREA A7	.6	1011.0	22.0	8.0	
TETHER, WAIST EVA	B1020.6	115	1	AREA A7	.6	1011.0	22.0	8.0	
TETHER, WAIST EVA	B1020.7	115	1	AREA A7	.6	1011.0	22.0	8.0	
GARMENT,LIQUID COOLING	B1030.	111	1	ON CREW-LMP(RH STA)	4.3	1043.0	24.5	-10.4	
GARMENT,LIQUID COOLING	B1030.	111	1	ON CREW-CDR(CTR.STA)	4.3	1043.0	.0	-10.4	
BAG, HELMET STOWAGE	B1058.	115	*1	IN CM PGA CONTAINER	1.4	1015.0	.0	-20.0	
BAG, HELMET STOWAGE	B1058.	115	1	IN CM PGA CONTAINER	1.4	1015.0	.0	-20.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APCLO COORDINATES		
ITEMS TRANSFERRED FROM ASC. STAGE INTO CM PRIOR TO ASC. STAGE JETTISON (16)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NG.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
ASSY, BIODINSTRUMENTATION	C0201.	111	1	ON CREW-CDR(CTR.STA)	1.1	1043.0	.0	-10.4	
ASSY, BIODINSTRUMENTATION	C0201.	111	1	ON CREW-LMP(RH STA)	1.1	1043.0	24.5	-10.4	
DOSIMETER, PASSIVE RADIATION	D0101.	111	1	IN XFR BAG (R13)	NEGL	1024.0	45.0	-26.0	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
DOSIMETER, PERSONAL	D0200.	117	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
DOSIMETER, PASSIVE	D0201.	117	3	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
HEADSET, LIGHTWEIGHT	E0111.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET, LIGHTWEIGHT	E0112.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
EARPIECE, MOULDED (COM.CARRIER)	E0200.1	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-CDR(CTR.STA)	NEGL	1043.0	.0	-10.4	
EARTUBE (COM.CARRIER)	E0200.2	111	2	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4	
CONTAINER, SAMPLE RET NO 1 (LD)	G4003.	115	1	AREA B5	39.1	1031.0	-8.0	39.0	
CONTAINER, SAMPLE RET NO 2 (LD)	G4004.	115	1	AREA B6	39.1	1031.0	13.0	39.0	
EXP, SOLAR WIND COMPOSITION	G4011.	111	1	ISA (A2)	.2	1019.0	-22.0	8.0	
CONTR, CONTINGENCY, LUN.SAM.RTN.	G4016.	115	1	AREA R13	2.6	1024.0	45.0	-26.0	
BAG, EXTRA SAMPLE COLLECTION	G4048.	115	4	ISA (A2)	4.8	1019.0	-22.0	8.0	
PENETROMETER, RECORDING	G4049.	111	1	AREA A7	2.0	1011.0	22.0	8.0	
BAG, SMC EXPERIMENT - STOWAGE	G4055.	111	1	ISA (A2)	.2	1019.0	-22.0	8.0	
FLAG KIT, STANDARD	N1002.	166	1	AREA A8	.8	1011.0	21.0	-23.0	
DSEA	O3005.	115	1	AREA A8	2.3	1011.0	21.0	-23.0	
INTERIM STOWAGE ASSY.	O3007.	111	* 1	AREA A2	6.4	1011.0	-22.0	8.0	
BAG, SAMPLE RETURN	O3060.	115	1	ON AREA A7	15.0	1019.0	22.0	8.0	
CONTAINER, CORE TUBE + SAMPLE	O3074.	115	1	AREA A9	18.0	1013.0	.0	16.0	
BAG, XFER, 16MM MAG (6)	O6397.	111	1	AREA R13	.3	1024.0	45.0	-26.0	
BAG, XFER, 70MM MAG (4)	O6398.	111	1	AREA R13	.3	1024.0	45.0	-26.0	
BAG, TRANSFER-16MM MAG. (2)	O6432.	111	*1	AREA R13	.1	1024.0	45.0	-26.0	
BAG, TRANSFER-70MM MAG (3)	O6434.	111	*1	AREA R13	.5	1024.0	45.0	-26.0	
SAMPLES IN G4048.	G4048.1	115	1	ISA (A2)	35.2	1019.0	-22.0	8.0	
BAG, CORE TUBE	O3074.1	115	1	AREA A9	2.0	1013.0	.0	16.0	
2 CREW+EQUIP, LM-CM					714.92	1035.4C	5.69	-2.30	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST								
ITEMS TRANSFERRED FROM CM INTO ASC. STAGE PRIOR TO ASC. STAGE JETTISON (17)					APOLLO COORDINATES			
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
CSM/LM UMBILICAL	TBD	222	1	UNDER RH COUCH	1.1	1018.0	24.5	-15.0
BAG, JETTISON STOWAGE	80147.	111	1	AREA A2	.9	1011.0	-22.0	8.0
FOOD PACKAGE	C0111.	111	1	AREA A7	50.0	1011.0	22.0	8.0
CO2 ABORBER USED	00327.	121	4	AREA B5	28.0	1031.0	-8.0	39.0
CO2 ABORBER USED	00327.	121	4	AREA B6	28.0	1031.0	13.0	39.0
CO2 ABORBER USED	00327.	121	4	AREA A9	28.0	1013.0	.0	16.0
SHIM, CO2 ABSORBER	00328.	161	4	AREA B5	.8	1031.0	-8.0	39.0
SHIM, CO2 ABSORBER	00328.	161	4	AREA B6	.8	1031.0	13.0	39.0
SHIMS, CO2 ABSORBER	00328.	161	4	AREA A9	.8	1013.0	.0	16.0
CONTAINER, B5	00342.	111	1	AREA B5	14.5	1031.0	-8.0	39.0
CONTAINER, B6	00343.	111	1	AREA B6	14.5	1031.0	13.0	39.0
DOCKING PROBE AND MECHANISM	00349.	222	1	IN CM TUNNEL	199.3	1110.3	.0	.0
CONTAINER, A9	06348.	111	1	AREA A9	14.7	1013.0	.0	16.0
BAG, FECAL COLLECTION ASSY.	06418.	111	1	AREA A7	1.1	1011.0	22.0	8.0
BAG, FECAL BAG XFR	06453.	111	1	IN CM PGA CONTAINER	2.0	1015.0	.0	-20.0
EQUIP. XFR. CP-LM					384.50	1067.24	3.51	11.53

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST						
ITEMS TRANSFERRED FROM CM INTO ASC. STAGE PRIOR TO ASC. STAGE JETTISON (18) LM COORDINATES						
DESCRIPTION	STOW. ITEM	REF	NC.	STORAGE LOCATION	WEIGHT	Z-C.G.
DOCKING STRUCTURE	T8D	111	1	IN LM TUNNEL	111.7	314.7
CSM/LM UMBILICAL	T8D	222	1	IN LM TUNNEL	1.1	300.0
BAG, JETTISON STORAGE	80147.	111	1	VOLUME CENTROID AS	.5	254.0
FOOD PACKAGE	C0111.	111	1	VOLUME CENTROID AS	50.0	254.0
CO2 ABORBER USED	00327.	121	4	VOLUME CENTROID AS	28.0	254.0
CO2 ABORBER USED	00327.	121	4	VOLUME CENTROID AS	28.0	254.0
CO2 ABORBER USED	00327.	121	4	VOLUME CENTROID AS	28.0	254.0
SHIM, CO2 ABSORBER	00328.	161	4	VOLUME CENTROID AS	.8	254.0
SHIM, CO2 ABSORBER	00328.	161	4	VOLUME CENTROID AS	.8	254.0
SHIMS, CO2 ABSORBER	00328.	161	4	VOLUME CENTROID AS	.8	254.0
CONTAINER, B5	00342.	111	1	VOLUME CENTROID AS	14.5	254.0
CONTAINER, B6	00343.	111	1	VOLUME CENTROID AS	14.5	254.0
DOCKING PROBE	00349.	222	1	VOLUME CENTROID AS	87.6	254.0
CONTAINER, A9	06348.	111	1	VOLUME CENTROID AS	14.7	254.0
BAG, FECAL COLLECTION ASSY.	06418.	111	1	VOLUME CENTROID AS	1.1	254.0
BAG, FECAL BAG XFR	06453.	111	1	VOLUME CENTROID AS	2.0	254.0
EQUIP. XFR. CM-LM					384.50	271.77
						.00

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN ASC. STAGE PRIOR TO ASC. STAGE JETTISON (19)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
DUCKING DROGUE	F1000.	112	1	IN LM TUNNEL	21.4	300.0	.0	.0	
LM EQUIP. RELOC. 3							21.40	300.00	.00

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							LM COORDINATES		
ITEMS REARRANGED IN OSC. STAGE PRIOR TO ASC. STAGE JETTISON (20)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT				
DOCKING DROGUE	F1000.	112	1	ON CABN FLOOR/DROGUE	21.4	218.5	-19.6	47.6	
LM EQUIP. RELOC. 3							21.4	218.5	47.6

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM POST A/S JETTISCN (21)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-LH STA)	.1	1043.0	-24.5	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-RH STA)	.1	1043.0	24.5	-10.4	
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-CTR STA)	.1	1043.0	.0	-10.4	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	ON CREW-LMP (RH STA)	.3	1043.0	24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	ON CREW-CMP (CTR. STA)	.3	1043.0	.0	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	1	ON CREW-CMP (LH STA)	.3	1043.0	-24.5	-10.4	
HARNESS, CWG ELECTRICAL (CMP)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (CDR)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
HARNESS, CWG ELECTRICAL (LMP)	B0135.	111	1	IN ADAPTER BAG (A8)	.4	1011.0	21.0	-23.0	
TETHER, WRIST EVA, WITH BAG	B1054.	111	1	AREA A2	.3	1011.0	-22.0	8.0	
UCTA	B0205.	111	1	ON CREW-LMP (RH STA)	.5	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	ON CREW-CMP (CTR. STA)	.5	1043.0	.0	-10.4	
UCTA	B0205.	111	1	ON CREW-CMP (LH STA)	.5	1043.0	-24.5	-10.4	
GARMENT, CONSTANT WEAR	B0208.	111	1	AREA U2	.8	1033.0	-23.0	-50.0	
GARMENT, CONSTANT WEAR	B0208.	111	1	AREA U2	.8	1033.0	-23.0	-50.0	
ITLSA - EV	B0211.	111	1	ON CREW-LMP (RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA - EV	B0211.	111	1	ON CREW-CMP (CTR. STA)	45.2	1043.0	.0	-10.4	
ITLSA, IV CMP	B0212.	111	1	ON CREW-CMP (LH STA)	39.9	1043.0	-24.5	-10.4	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST		APOLLO COORDINATES						
ITEMS REARRANGED IN CM POST A/S JETTISON (21)								
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
GLOVES, IV PAIR	B0213.	111	1	DN CREW-CMP(LH STA)	2.0	1043.0	-24.5	-10.4
GLOVES, IV PAIR	B0213.	111	1	DN CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4
GLOVES, IV PAIR	B0213.	111	1	DN CREW-CMP(CTR. STA)	2.0	1043.0	.0	-10.4
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-CMP(LH STA)	2.6	1043.0	-24.5	-10.4
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-CMP(CTR. STA)	2.6	1043.0	.0	-10.4
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-LMP(RH STA)	1.6	1043.0	-24.5	-10.4
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-CMP(LH STA)	1.6	1043.0	24.5	-10.4
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-CMP(CTR. STA)	1.6	1043.0	.0	-10.4
POCKET, SCISSORS (CMP)	B0218.	111	1	DN PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4
POCKET, SCISSORS (CDR)	B0218.	111	1	DN PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4
POCKET, SCISSORS (LMP)	B0218.	111	1	DN PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4
POCKET, CHECKLIST (CDR)	B0219.	111	1	DN PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4
POCKET, CHECKLIST (LMP)	B0219.	111	1	DN PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4
POCKET, DATA (CDR)	B0220.	111	1	DN PGA (CREW-CTR STA)	TBD	1043.0	.0	-10.4
POCKET, DATA (LMP)	B0220.	111	1	DN PGA (CREW-RH STA)	TBD	1043.0	24.5	-10.4
POCKET, CHECKLIST (CMP)	B0221.	111	1	DN PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4
POCKET, CHECKLIST (CDR)	B0222.	111	1	DN PGA (CREW-LH STA)	TBD	1043.0	-24.5	-10.4
POCKET, CHECKLIST (LMP)	B0222.	111	1	DN CREW-LMP(RH STA)	4.3	1043.0	24.5	-10.4
GARMENT, LIQUID COOLING	B1030.	111	1	DN CREW-CMP(CTR. STA)	4.3	1043.0	.0	-10.4
GARMENT, LIQUID COOLING	B1030.	111	1	AREA A8	.4	1011.0	21.0	-23.0
HEADSET, LIGHTWEIGHT	E0111.	111	1	AREA A8	.4	1011.0	21.0	-23.0
HEADSET, LIGHTWEIGHT	E0112.	111	1	AREA A8	.4	1011.0	21.0	-23.0
HEADSET, LIGHTWEIGHT	E0113.	111	1	AREA A8	.4	1011.0	21.0	-23.0
HEAR TUBE, UNIVERSAL (CMP)	E0114.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0
HEAR TUBE, UNIVERSAL (CDR)	E0115.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0
HEAR TUBE, UNIVERSAL (LMP)	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0
DECON. BAG, CONT IN. LUNAR SRC	D6329.	111	1	AREA A2	.1	1011.0	-22.0	8.0
DECON. BAG, L. S. HASSELBLAD MAG.	D6330.	111	1	AREA A2	.2	1011.0	-22.0	8.0
BAG, DECONTAMINATION, SRC NO. 1	C6331.	111	1	AREA A2	.5	1011.0	-22.0	8.0
BAG, DECONTAMINATION, SRC NO. 2	D6331.	111	1	AREA A2	.9	1011.0	-22.0	8.0

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM POST A/S JETTISON (21)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	MC.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CONTAINGR, EVA EQUIPMENT	06358	111	1	AREA A2	2.5	1011.0	-22.0	8.0	
CARRIER ASSY, CONT. A9	06403.	111	1	AREA A9	NEGL	1013.0	.0	16.0	
BAG, DECON, LUNAR SAMPLE	06426.	111	1	AREA A2	5.0	1011.0	-22.0	8.0	
BAG, DECON, ISA	06427.	111	1	AREA A2	5.0	1011.0	-22.0	8.0	
TETHER, IV CREWMAN	06429.	111	1	AREA A2	.5	1011.0	-22.0	8.0	
BAG, DECONTAMINATION 16MM MAG.	06433.	111	1	AREA A2	.3	1011.0	-22.0	8.0	
BAG, DECONTAMINATION 70MM MAG.	06435.	111	1	AREA A2	.3	1011.0	-22.0	8.0	
CM EQUIP. RELOC. 3					194.63	1039.21	-2.09	-12.05	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST						APOLLO COORDINATES		
ITEMS REARRANGED IN CM POST A/S JETTISON (22)						X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STON. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
BAG, MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0
JACKET ASSY, ICG	80112.1	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4
JACKET ASSY, ICG	80112.1	111	1	ON CREW-CDR(CTR. STA)	1.8	1043.0	.0	-10.4
JACKET ASSY, ICG	80112.1	111	1	ON CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4
TROUSER ASSY, ICG	80112.2	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4
TROUSER ASSY, ICG	80112.2	111	1	ON CREW-CDR(CTR. STA)	1.8	1043.0	.0	-10.4
TROUSER ASSY, ICG	80112.2	111	1	ON CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4
BOOT, RIGHT, ICG	80112.3	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4
BOOT, RIGHT, ICG	80112.3	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4
BOOT, RIGHT, ICG	80112.3	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4
BOOT, LEFT, ICG	80112.4	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4
BOOT, LEFT, ICG	80112.4	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4
BOOT, LEFT, ICG	80112.4	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0
SUBSYSTEM, FECAL CONTAINMENT	80113.	111	1	AREA A2	.3	1011.0	-22.0	8.0
HARNES, CWG ELECTRICAL (CMP)	80135.	111	1	ON CREW-CMP (LH STA)	.4	1043.0	-24.5	-10.4
HARNES, CWG ELECTRICAL (CDR)	80135.	111	1	ON CREW-CDR(CTR. STA)	.4	1043.0	.0	-10.4
HARNES, CWG ELECTRICAL (LMP)	80135.	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4
YETHER, WRIST EVA, WITH BAG	81054.	111	1	AREA A7	.3	1011.0	22.0	8.0
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0
GARMENT, CONSTANT WEAR	80208.	111	1	ON CREW-LMP(RH STA)	.8	1043.0	24.5	-10.4
GARMENT, CONSTANT WEAR	80208.	111	1	ON CREW-CDR(CTR. STA)	.8	1043.0	.0	-10.4
ITLSA - EV	80211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0
ITLSA - EV	80211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0
ITLSA, IV CMP	80212.	111	1	SLEEP RESTRAINT - RT	39.9	1018.0	23.0	-50.0

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APCELLD COORDINATES		
ITEMS REARRANGED IN CM POST A/S JETTISON (22)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOM. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
GLOVES, IV PAIR	B0213.	111	1	HELMET STOM.BAG (L3)	2.0	1048.0	-47.0	12.0	
GLOVES, IV PAIR	B0213.	111	1	HELMET STOM BAG (B1)	2.0	1050.0	-27.0	39.0	
GLOVES, IV PAIR	B0213.	111	1	AFT UPR EQUIP.BAY-RH	2.0	1020.0	25.0	-22.0	
HELMET ASSY, PRESSURE	B0214.	111	1	AFT UPR EQUIP.BAY-RH	2.6	1020.0	25.0	-22.0	
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOM BAG (B1)	2.6	1050.0	-27.0	39.0	
HELMET ASSY, PRESSURE	B0214.	111	1	HELMET STOM.BAG (L3)	2.6	1048.0	-47.0	12.0	
COMMUNICATION CARRIER	B0217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0	
COMMUNICATION CARRIER	B0217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0	
COMMUNICATION CARRIER	B0217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0	
POCKET, SCISSORS (CMP)	B0218.	111	1	ON ICG-CMP./LH STA.	.2	1043.0	-24.5	-10.4	
POCKET, SCISSORS (CDR)	B0218.	111	1	ON ICG-CDR./CTR.STA.	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	B0218.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CDR)	B0219.	111	1	ON ICG-CDR./CTR.STA.	.2	1043.0	.0	-10.4	
POCKET,CHECKLIST (LMP)	B0219.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4	
POCKET,DATA (CDR)	B0220.	111	1	ON ICG-CDR./CTR.STA.	TBD	1043.0	.0	-10.4	
POCKET,DATA (LMP)	B0220.	111	1	ON ICG-LMP./RH STA.	TBD	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CMP)	B0221.	111	1	ON ICG-CMP./LH STA.	.2	1043.0	-24.5	-10.4	
POCKET,DATA (CMP)	B0222.	111	1	ON ICG-CMP./LH STA.	TBD	1043.0	-24.5	-10.4	
GARMENT, LIQUID COOLING	B1030.	111	1	AREA U1	4.3	1033.0	23.0	-50.0	
GARMENT, LIQUID COOLING	B1030.	111	1	AREA U1	4.3	1033.0	23.0	-50.0	
HEADSET, LIGHTWEIGHT	E0111.	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
HEADSET, LIGHTWEIGHT	E0112.	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
HEADSET, LIGHTWEIGHT	E0113.	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
HEADSET, LIGHTWEIGHT	E0114.	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4	
EARTUBE, UNIVERSAL (CMP)	E0115.	111	1	ON CREW-CMP(CTR.STA)	NEGL	1043.0	.0	-10.4	
EARTUBE, UNIVERSAL (CDR)	E0116.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	24.5	-10.4	
EARTUBE, UNIVERSAL (LMP)	E0116.	111	1	ON CREW-CDR(CTR.STA)	NEGL	1043.0	24.5	-10.4	
DECON.BAG, CONTIN. LUNAR SRC	06329.	111	1	AREA R13	.1	1024.0	45.0	-26.0	
DECON.BAG, L.S. HASSELBLAD MAG.	06330.	111	1	AREA R13	.2	1024.0	45.0	-26.0	
BAG, DECONTAMINATION, SRC NO. 1	06331.	111	1	AREA B5	.9	1031.0	-8.0	39.0	
BAG, DECONTAMINATION, SRC NO. 2	06331.	111	1	AREA B6	.9	1031.0	13.0	39.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APCLO COORDINATES		
ITEMS REARRANGED IN CM POST A/S JETTISON (22)									
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
CONTAINGR, EVA EQUIPMENT	06358	111	1	AREA A7	2.5	1011.0	22.0	8.0	
CARRIER ASSY, CONT. A9	06403.	111	1	AREA A9	NEGL	1013.0	.0	16.0	
BAG, DECON, LUNAR SAMPLE	06426.	111	1	AREA A7	5.0	1011.0	22.0	8.0	
BAG, DECON, ISA	06427.	111	1	AREA A2	5.0	1011.0	-22.0	8.0	
TETTER, IV CREWMAN	06429.	111	1	AREA A7	.5	1011.0	22.0	8.0	
BAG, DECONTAMINATION 16MM MAG.	06433.	111	1	AREA R13	.3	1024.0	45.0	-26.0	
BAG, DECONTAMINATION 70MM MAG.	06435.	111	1	AREA R13	.3	1024.0	45.0	-26.0	
CM EQUIP. RELOC. 3					194.63	1019.68	5.18	-20.86	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLC COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO PRE CSM AT EVA (23)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG,MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
BAG,MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
BAG,MOTION SICKNESS	A0208.	111	1	ON PGA (PGA CONT)	.1	1011.0	.0	-14.0	
JACKET ASSY,ICG	80112.1	111	1	CN CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4	
JACKET ASSY,ICG	80112.1	111	1	ON CREW-CDR(CTR.STA)	1.8	1043.0	.0	-10.4	
JACKET ASSY,ICG	80112.1	111	1	CN CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4	
TROUSER ASSY,ICG	80112.2	111	1	ON CREW-LMP(RH STA)	1.8	1043.0	24.5	-10.4	
TROUSER ASSY,ICG	80112.2	111	1	ON CREW-CDR(CTR.STA)	1.8	1043.0	.0	-10.4	
TROUSER ASSY,ICG	80112.2	111	1	CN CREW-CMP(LH STA)	1.8	1043.0	-24.5	-10.4	
BOOT,RIGHT,ICG	80112.3	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
BOOT,RIGHT,ICG	80112.3	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
BOOT,RIGHT,ICG	80112.3	111	1	CN CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
BOOT,LEFT,ICG	80112.4	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4	
BOOT,LEFT,ICG	80112.4	111	1	ON CREW-CDR(CTR.STA)	.4	1043.0	.0	-10.4	
BOOT,LEFT,ICG	80112.4	111	1	CN CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4	
SUBSYSTEM,FECAL CONTAINMENT	80113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0	
SUBSYSTEM,FECAL CONTAINMENT	80113.	111	*1	AREA A2	.3	1011.0	-22.0	8.0	
SUBSYSTEM,FECAL CONTAINMENT	80113.	111	1	AREA A2	.3	1011.0	-22.0	8.0	
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
UCTA	80205.	111	1	IN CM PGA CONTAINER	.5	1015.0	.0	-20.0	
ITLSA - EV	80211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	
ITLSA - EV	80211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	
ITLSA,IV CMP	80212.	111	1	SLEEP RESTRAINT - RT	39.9	1018.0	23.0	-50.0	
GLOVES,IV PAIR	80213.	111	1	HELMET STOW.BAG (L3)	2.0	1048.0	-47.0	12.0	
GLOVES,IV PAIR	80213.	111	1	HELMET STOW.BAG (B1)	2.0	1050.0	-27.0	39.0	
GLOVES,IV PAIR	80213.	111	1	AFT UPR EQUIP.BAY-RH	2.0	1020.0	25.0	-22.0	
GLOVES,IV PAIR	80214.	111	1	AFT UPR EQUIP.BAY-RH	2.6	1020.0	25.0	-22.0	
HELMET ASSY, PRESSURE	80214.	111	1	HELMET STOW.BAG (B1)	2.6	1050.0	-27.0	39.0	
HELMET ASSY, PRESSURE	80214.	111	1	HELMET STOW.BAG (B1)	2.6	1048.0	-47.0	12.0	
HELMET ASSY, PRESSURE	80217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0	
COMMUNICATION CARRIER	80217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APELCC COORDINATES					
ITEMS REARRANGED IN CM PRIOR TO PRE CSM AT EVA (23)												
DESCRIPTION	STOW. ITEM	REF	NO.	STOWAGE LOCATION	HEIGHT	X-C.G.	Y-C.G.	Z-C.G.				
COMMUNICATION CARRIER	80217.	111	1	GNIC PANEL	1.6	1050.0	.0	22.0				
POCKET, SCISSORS (CMP)	80218.	111	1	ON ICG-CMP./LH STA.	.2	1043.0	-24.5	-10.4				
POCKET, SCISSORS (CDR)	80218.	111	1	ON ICG-CDR./CTR. STA.	.2	1043.0	.0	-10.4				
POCKET, SCISSORS (LMP)	80218.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4				
POCKET, CHECKLIST (CDR)	80219.	111	1	ON ICG-CDR./CTR. STA.	.2	1043.0	.0	-10.4				
POCKET, CHECKLIST (LMP)	80219.	111	1	ON ICG-LMP./RH STA.	.2	1043.0	24.5	-10.4				
POCKET, DATA (CDR)	80220.	111	1	ON ICG-CDR./CTR. STA.	TBD	1043.0	.0	-10.4				
POCKET, DATA (LMP)	80220.	111	1	ON ICG-LMP./RH STA.	TBD	1043.0	24.5	-10.4				
POCKET, CHECKLIST (CMP)	80221.	111	1	ON ICG-CMP./LH STA.	.2	1043.0	-24.5	-10.4				
POCKET, DATA (CMP)	80222.	111	1	ON ICG-CMP./LH STA.	TBD	1043.0	-24.5	-10.4				
HEADSET, LIGHTWEIGHT	E0111.	111	1	ON CREW-LMP(RH STA)	.4	1043.0	24.5	-10.4				
HEADSET, LIGHTWEIGHT	E0112.	111	1	ON CREW-CMP(CTR. STA)	.4	1043.0	.0	-10.4				
HEADSET, LIGHTWEIGHT	E0113.	111	1	ON CREW-CMP(LH STA)	.4	1043.0	-24.5	-10.4				
EARTUBE, UNIVERSAL (CMP)	E0114.	111	1	ON CREW-CMP(LH STA)	NEGL	1043.0	-24.5	-10.4				
EARTUBE, UNIVERSAL (CDR)	E0115.	111	1	ON CREW-CMP(CTR. STA)	NEGL	1043.0	.0	-10.4				
EARTUBE, UNIVERSAL (LMP)	E0116.	111	1	ON CREW-LMP(RH STA)	NEGL	1043.0	24.5	-10.4				
CM EQUIP. RELOC. 4					167.23	1019.15	4.02	-22.45				

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO PRE CSM AT EVA (24)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (CREW-LH STA)	.1	1043.C	-24.5	-10.4	
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (CREW-RH STA)	.1	1043.0	24.5	-10.4	
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (CREW-CTR STA)	.1	1043.0	.0	-10.4	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY, ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY, ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.C	-23.0	-50.0	
BOOT, RIGHT, ICG	B0112.3	111	1	AREA U2	.4	1033.C	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT, LEFT, ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	DN CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	*1	DN CREW-CDR(CTR. STA)	.3	1043.0	.C	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	1	DN CREW-CMP(LH STA)	.3	1043.0	-24.5	-10.4	
SUBSYSTEM, FECAL CONTAINMENT	B0113.	111	1	DN CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	DN CREW-CDR(CTR. STA)	.5	1043.0	.0	-10.4	
UCTA	B0205.	111	1	DN CREW-CMP(LH STA)	.5	1043.0	-24.5	-10.4	
UCTA	B0205.	111	1	DN CREW-CMP(LH STA)	.5	1043.0	-24.5	-10.4	
ITLSA - EV	B0211.	111	1	DN CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA - EV	B0211.	111	1	DN CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	
ITLSA, IV CMP	B0211.	111	1	DN CREW-CDR(CTR. STA)	39.9	1043.0	.0	-10.4	
GLOVES, IV PAIR	B0212.	111	1	DN CREW-CMP(LH STA)	2.0	1043.0	-24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	DN CREW-CMP(LH STA)	2.0	1043.0	-24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	DN CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	DN CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-CDK(CTR. STA)	2.6	1043.0	.0	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-CMP(LH STA)	2.6	1043.0	-24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	DN CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-CDR(CTR. STA)	1.6	1043.0	.0	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-CMP(LH STA)	1.6	1043.0	-24.5	-10.4	
COMMUNICATION CARRIER	B0217.	111	1	DN CREW-CMP(LH STA)	1.6	1043.0	-24.5	-10.4	



TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO PRE CSM AT EVA (24)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOM. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
COMMUNICATION CARRIER	80217.	111	1	ON CREW-CDR(CTR.STA)	1.6	1043.0	.0	-10.4	
POCKET, SCISSORS (CMP)	80218.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET, SCISSORS (CDR)	80218.	111	1	ON PGA(CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	80218.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CDR)	80219.	111	1	CN PGA(CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET,CHECKLIST (LMP)	80219.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET, DATA (CDR)	80220.	111	1	ON PGA(CREW-CTR STA)	TBD	1043.0	.0	-10.4	
POCKET, DATA (LMP)	80220.	111	1	ON PGA (CREW-RH STA)	TBD	1043.0	24.5	-10.4	
POCKET,CHECKLIST (CMP)	80221.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET, DATA (CMP)	80222.	111	1	ON PGA (CREW-LH STA)	TBD	1043.0	-24.5	-10.4	
HEADSET, LIGHTWEIGHT	E0111.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET, LIGHTWEIGHT	E0112.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
HEADSET, LIGHTWEIGHT	E0113.	111	1	AREA A8	.4	1011.0	21.0	-23.0	
EARTUBE, UNIVERSAL	E0114.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE, UNIVERSAL	E0115.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
EARTUBE, UNIVERSAL	E0116.	111	1	AREA U2	NEGL	1033.0	-23.0	-50.0	
CM EQUIP. RELOC.4					167.23	1041.98	-69	-13.62	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS TRANSFERRED FROM SM TO CM DURING SIM EVA (25)									
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 24 IN. PAN. CAMERA	P0400.	115	1	IN SIM BAY (3IN)	76.0	945.5	34.5	-52.5	
MAGAZINE, 3 IN. MAP CAMERA	P0401.	111	1	IN SIM BAY (24 IN)	24.0	886.0	53.0	-56.0	
EQUIP. XFR. SM-CM						100.00	931.22	38.94	-53.34

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APGLLC COORDINATES		
ITEMS TRANSFERRED FROM SM TO CM DURING SIM EVA (26)									
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
MAGAZINE, 24 IN. PAN. CAMERA	P0400.	115	1	AREA A2	76.0	1011.0	-22.0	8.0	
MAGAZINE, 3 IN. MAP CAMERA	P0401.	111	1	BAG, RETURN EQUIP(B1)	24.0	1050.0	-27.0	39.0	
EQUIP. XFR. SM-CM					100.00	1020.36	-23.20	15.44	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APGLC COORDINATES		
ITEMS OFFLOADED FROM CSM POST SIM EVA (27)									
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG, JETTISON STORAGE ITEMS, FOOD + HYGIENE	B0147.	111	2	AREA A2	1.8	1011.0	-22.0	8.0	
	C0100.	111	1	AREA B1	30.8	1050.0	-27.0	39.0	
EVA CFFLOAD						32.60	1047.85	-26.72	37.29

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
DESCRIPTION	STOM. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
BAG,MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-LH STA)	.1	1043.0	-24.5	-10.4	
BAG,MOTION SICKNESS	A0208.	111	1	ON PGA (CREW-RH STA)	.1	1043.0	24.5	-10.4	
BAG,MOTION SICKNESS	A0208.	111	1	CN PGA (CREW-CTR STA)	.1	1043.0	.0	-10.4	
JACKET ASSY,ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
JACKET ASSY,ICG	B0112.1	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY,ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY,ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
TROUSER ASSY,ICG	B0112.2	111	1	AREA U2	1.8	1033.0	-23.0	-50.0	
BOOT,RIGHT,ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT,RIGHT,ICG	B0112.3	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT,LEFT,ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT,LEFT,ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
BOOT,LEFT,ICG	B0112.4	111	1	AREA U2	.4	1033.0	-23.0	-50.0	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	CN CREW-LMP(RH STA)	.3	1043.0	24.5	-10.4	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	CN CREW-CDR(CTR.STA)	.3	1043.0	.0	-10.4	
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	1	ON CREW-CMP(LH STA)	.3	1043.0	-24.5	-10.4	
PAD,HEADREST	B0130.	117	1	AREA A2	1.1	1011.0	-22.0	8.0	
PAD,HEADREST	B0130.	117	1	AREA A2	1.1	1011.0	-22.0	8.0	
PAD,HEADREST	B0130.	117	1	AREA A2	1.1	1011.0	-22.0	8.0	
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	AREA A2	1.2	1011.0	-22.0	8.0	
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	AREA A2	1.2	1011.0	-22.0	8.0	
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	AREA A2	1.2	1011.0	-22.0	8.0	
GLOVES,EV-(CMP)	B0150.	111	1	AREA A2	2.7	1011.0	-22.0	8.0	
VEST,DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
VEST,DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
VEST,DUAL LIFE	B0202.	111	1	IN HSB (U2)	2.4	1033.0	-23.0	-50.0	
UCTA	B0205.	111	1	CN CREW-LMP(RH STA)	.5	1043.0	24.5	-10.4	
UCTA	B0205.	111	1	CN CREW-CDR(CTR.STA)	.5	1043.0	.0	-10.4	
UCTA	B0205.	111	1	ON CREW-CMP(LH STA)	.5	1043.0	-24.5	-10.4	
ITLSA - EV	B0211.	111	1	CN CREW-LMP(RH STA)	45.2	1043.0	24.5	-10.4	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO ENTRY (28)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
ITLSA - EV	B0211.	111	1	ON CREW-CDR(CTR.STA)	45.2	1043.0	.0	-10.4	
ITLSA, IV CMP	B0212.	111	1	ON CREW-CMP(LH STA)	39.9	1043.0	-24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-CMP(LH STA)	2.0	1043.0	-24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-LMP(RH STA)	2.0	1043.0	24.5	-10.4	
GLOVES, IV PAIR	B0213.	111	1	ON CREW-CDR(CTR.STA)	2.0	1043.0	.0	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	CN CREW-CMP(LH STA)	2.6	1043.0	-24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	CN CREW-LMP(RH STA)	2.6	1043.0	24.5	-10.4	
HELMET ASSY, PRESSURE	B0214.	111	1	CN CREW-CDR(CTR.STA)	2.6	1043.0	.0	-10.4	
POCKET, SCISSORS (CMP)	B0218.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET, SCISSORS (CDR)	B0218.	111	1	ON PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	B0218.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CDR)	B0219.	111	1	CN PGA (CREW-CTR STA)	.2	1043.0	.0	-10.4	
POCKET, CHECKLIST (LMP)	B0219.	111	1	ON PGA (CREW-RH STA)	.2	1043.0	24.5	-10.4	
POCKET, DATA (CDR)	B0220.	111	1	ON PGA (CREW-CTR STA)	TBD	1043.0	.0	-10.4	
POCKET, DATA (LMP)	B0220.	111	1	ON PGA (CREW-RH STA)	TBD	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CMP)	B0221.	111	1	ON PGA (CREW-LH STA)	.2	1043.0	-24.5	-10.4	
POCKET, DATA (CMP)	B0222.	111	1	ON PGA (CREW-LH STA)	TBD	1043.0	-24.5	-10.4	
CONTAINER, R12	00344.	115	1	RH GIRTH RING	2.7	1034.0	41.0	-21.0	
FILTER, CABIN FAN	06395.	111	1	AREA U2	2.4	1033.0	-23.0	-50.0	
RESTRAINT ASSY, SLEEP (RIGHT)	00322.	111	1	AFT UPR EQUIP. BAY	3.8	1018.0	23.0	-50.0	
RESTRAINT ASSY, SLEEP (CENTER)	00324.	111	1	AFT UPR EQUIP. BAY	2.7	1018.0	23.0	-50.0	
CM EQUIP. RELOC. 5					189.63	1039.19	-1.82	-15.74	

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STORAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO ENTRY (29)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NO.	STORAGE LOCATION	WEIGHT				
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (PGA CONT)	.1		1011.0	.0	-14.0
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (PGA CONT)	.1		1011.0	.0	-14.0
BAG,MOTION SICKNESS	A0208.	111	1	DN PGA (PGA CONT)	.1		1011.0	.0	-14.0
JACKET ASSY,ICG	B0112.1	111	1	DN CREW-LMP(RH STA)	1.8		1043.0	24.5	-10.4
JACKET ASSY,ICG	B0112.1	111	1	DN CREW-CDR(CTR.STA)	1.8		1043.0	.0	-10.4
JACKET ASSY,ICG	B0112.1	111	1	DN CREW-LMP(RH STA)	1.8		1043.0	-24.5	-10.4
TROUSER ASSY,ICG	B0112.2	111	1	DN CREW-LMP(RH STA)	1.8		1043.0	24.5	-10.4
TROUSER ASSY,ICG	B0112.2	111	1	DN CREW-CDR(CTR.STA)	1.8		1043.0	.0	-10.4
TROUSER ASSY,ICG	B0112.2	111	1	DN CREW-LMP(RH STA)	1.8		1043.0	-24.5	-10.4
BOOT,RIGHT,ICG	B0112.3	111	1	DN CREW-LMP(RH STA)	.4		1043.0	24.5	-10.4
BOOT,RIGHT,ICG	B0112.3	111	1	DN CREW-CDR(CTR.STA)	.4		1043.0	.0	-10.4
BOOT,RIGHT,ICG	B0112.3	111	1	DN CREW-LMP(RH STA)	.4		1043.0	-24.5	-10.4
BOOT,LEFT,ICG	B0112.4	111	1	DN CREW-LMP(RH STA)	.4		1043.0	24.5	-10.4
BOOT,LEFT,ICG	B0112.4	111	1	DN CREW-CDR(CTR.STA)	.4		1043.0	.0	-10.4
BOOT,LEFT,ICG	B0112.4	111	1	DN CREW-LMP(RH STA)	.4		1043.0	-24.5	-10.4
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	AREA A2	.3		1011.0	-22.0	8.0
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	*1	AREA A2	.3		1011.0	-22.0	8.0
SUBSYSTEM,FECAL CONTAINMENT	B0113.	111	1	AREA A2	.3		1011.0	-22.0	8.0
PAD,HEADREST	B0130.	117	1	DN COUCH(RH CREW STA)	1.1		1043.0	24.5	-10.4
PAD,HEADREST	B0130.	117	1	DN COUCH(CTR CRW.STA)	1.1		1043.0	.0	-10.4
PAD,HEADREST	B0130.	117	1	DN COUCH(LH CREW STA)	1.1		1043.0	-24.5	-10.4
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	DN CREW-LMP(RH STA)	1.2		1043.0	24.5	-10.4
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	DN CREW-CDR(CTR.STA)	1.2		1043.0	.0	-10.4
HEEL RESTRAINT,L.H. AND R.H.	B0132.	117	1	DN CREW-LMP(RH STA)	1.2		1043.0	-24.5	-10.4
GLOVES,EV-(CMP)	B0150.	111	1	DN CREW-CMP(LH STA)	2.7		1018.0	-21.0	-49.9
VEST,DUAL LIFE	B0202.	111	1	AFT UPR EQUIP.BAY-LH	2.4		1043.0	.0	-10.4
VEST,DUAL LIFE	B0202.	111	1	DN CREW-CDR(CTR.STA)	2.4		1043.0	-24.5	-10.4
VEST,DUAL LIFE	B0202.	111	1	DN CREW-LMP(RH STA)	2.4		1043.0	24.5	-10.4
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5		1015.0	.0	-20.0
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5		1015.0	.0	-20.0
UCTA	B0205.	111	1	IN CM PGA CONTAINER	.5		1015.0	.0	-20.0
ITLSA - EV	B0211.	111	1	ITLSA IN PGA CONT.	45.2		1011.0	.0	-20.0

TABLE 3.1-9.2 (CONTINUED)

MISSION J-1 TRANSFERRED CREW AND EQUIPMENT STOWAGE LIST							APOLLO COORDINATES		
ITEMS REARRANGED IN CM PRIOR TO ENTRY (29)							X-C.G.	Y-C.G.	Z-C.G.
DESCRIPTION	STOW. ITEM	REF	NC.	STOWAGE LOCATION	WEIGHT	X-C.G.	Y-C.G.	Z-C.G.	
ITLSA - EV	80211.	111	1	ITLSA IN PGA CONT.	45.2	1011.0	.0	-20.0	
ITLSA, IV CMP	80212.	111	1	ON RH+CTR SLEEP REST	39.9	1020.0	25.0	-22.0	
GLOVES, IV PAIR	80213.	111	1	HELMET STOW-BAG (L3)	2.0	1048.0	-47.0	12.0	
GLOVES, IV PAIR	80213.	111	1	HELMET STOW BAG (B1)	2.0	1050.0	-27.0	39.0	
GLOVES, IV PAIR	80213.	111	1	AFT UPR EQUIP-BAY-RH	2.0	1020.0	25.0	-22.0	
HELMET ASSY, PRESSURE	80214.	111	1	AFT UPR EQUIP-BAY-RH	2.6	1020.0	25.0	-22.0	
HELMET ASSY, PRESSURE	80214.	111	1	HELMET STOW BAG (B1)	2.6	1050.0	-27.0	39.0	
HELMET ASSY, PRESSURE	80214.	111	1	HELMET STOW-BAG (L3)	2.6	1048.0	-47.0	12.0	
POCKET, SCISSORS (CMP)	80218.	111	1	GN CREW-CMP(ILH STA)	.2	1043.0	-24.5	-10.4	
POCKET, SCISSORS (CDR)	80218.	111	1	CN CREW-CDR(CTR-STB)	.2	1043.0	.0	-10.4	
POCKET, SCISSORS (LMP)	80218.	111	1	CN CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CDR)	80219.	111	1	CN CREW-COR(CTR-STB)	.2	1043.0	.0	-10.4	
POCKET, CHECKLIST (LMP)	80219.	111	1	CN CREW-LMP(RH STA)	.2	1043.0	24.5	-10.4	
POCKET, DATA (CDR)	80220.	111	1	CN CREW-COR(CTR-STB)	TBD	1043.0	.0	-10.4	
POCKET, DATA (LMP)	80220.	111	1	CN CREW-LMP(RH STA)	TBD	1043.0	24.5	-10.4	
POCKET, CHECKLIST (CMP)	80221.	111	1	CN CREW-CMP(ILH STA)	.2	1043.0	-24.5	-10.4	
POCKET, DATA (CMP)	80222.	111	1	CN CREW-COR(CTR-STB)	TBD	1043.0	.0	-10.4	
CONTAINER, R12	00344.	115	1	AREA R3	2.7	1072.0	26.0	9.0	
FILTER, CABIN FAN	06395.	111	1	AREA A1	2.4	1011.0	-21.0	-22.0	
RESTRAINT ASSY, SLEEP (RIGHT)	00322.	111	1	ON TOP OF AREA A8	3.8	1020.0	25.0	-8.0	
RESTRAINT ASSY, SLEEP (CENTER)	00324.	111	1	ON TOP OF AREA A8	2.7	1020.0	25.0	-8.0	
CM EQUIP. RELOC. 5					189.63	1021.08	4.63	-16.30	



TABLE 3.1-10  
CONSUMABLES LOADING REQUIREMENTS AND TOLERANCES

MISSION J-1  
SPS PROPELLANT

Pressure (PSIA)		Temperature (°F)		Quantity Readout (%)	
Fuel	Oxidizer	Fuel	Oxidizer	Fuel	Oxidizer
110±4	110±4	70±5	70±5	See Figure 4.1-3	See Figure 4.1-4

SPS Propellant Load (lb)	Loading Requirement		Actual	
	Fuel	Oxidizer	Fuel	Oxidizer
<sup>1</sup> Load	15704.0	25092.0		
<sup>2</sup> Trapped Outside Tanks	78.6	123.7		
Tanked	15625.4	24968.3		
<sup>2</sup> Trapped Inside Tanks	67.6	171.5		
<sup>3</sup> Nominal Deliverable	15557.8	24796.8		

<sup>4</sup>Service Module RCS Propellant

Secondary Fuel - Quads A, B, C, D - See Loading Window - Figure 4.3-1.

Primary Fuel - Quads A, B, C, D - See Loading Window - Figure 4.3-2.

Primary and Secondary Oxidizer - Quads A, B, C, D - See Loading Window - Figure 4.3-3.

<sup>5</sup>Command Module RCS Propellant

Fuel - System A and B - See Loading Window - Figure 4.3-4.

Oxidizer - System A and B - See Loading Window - Figure 4.3-5.

<sup>9</sup>Helium and Nitrogen

Consumable	Loading Requirement				Actual	
	Pressure (PSIA)	Temp (°F)	Weight (lb)	Earth Launch Weight (lb)	Pressure (PSIA)	Temp (°F)
Helium - SPS Bottles	3600	70	87.6	87.6		
Helium - Fuel Tanks	178	70	5.4			
Helium - N <sub>2</sub> O <sub>4</sub> Tanks	178	70				
Helium - SM/RCS						
Quads A	4150	70	6.0	6.0		
Quads B	4150	70				
Quads C	4150	70				
Quads D	4150	70				
Helium - CM/RCS						
System A	4150	70	1.0	1.0		
System B	4150	70				
Nitrogen - SM						
Primary	2500	85	1.3	1.3		
Secondary	2500	85				

TABLE 3.1-10 (CONTINUED)

Command Module Water and GOX

	Pressure (PSIA)	Loading Requirement Weight (lb)	Earth Launch Weight (lb)	Actual
Waste Water <sup>6</sup>			18.0	
Potable Water <sup>7</sup>			36.0	
CM/GOX	900±50	3.7	6.7 (Entry)	

<sup>8</sup>Service Module Hydrogen and Oxygen

	Loading Req. Per Tank (pounds)	Earth Launch Weight Per Tank (lb)
Hydrogen		
Tank 1	29.3	27.6
Tank 2	29.3	27.6
Tank 3	29.3	27.6
Oxygen		
Tank 1	330.1	316.6
Tank 2	330.1	316.6
Tank 3	330.1	316.6

## NOTES:

<sup>1</sup>Indicated propellant load is based on nominal pressure and temperature prior to actual loading. This number will be updated after loading is accomplished.

<sup>2</sup>See Section 4.1 for explanation of trapped SPS propellant.

<sup>3</sup>See Table 3.1-13 for loading uncertainties.

<sup>4</sup>See Section 4.2 for SM/RCS loads and uncertainties to be used in Mission Planning. Actual SM/RCS loads and uncertainties will be published in Table 3.1-15.

<sup>5</sup>See Section 4.2 for CM/RCS loads and uncertainties to be used in Mission Planning. Actual CM/RCS loads and uncertainties will be published in Table 3.1-14.

<sup>6</sup>Launch Rule Redlines determine lift-off values.

<sup>7</sup>Launch Rule Redlines determine lift-off values.

<sup>8</sup>Launch Mission Rules will determine minimum lift-off quantities for H<sub>2</sub> and O<sub>2</sub>.

<sup>9</sup>CSM helium and nitrogen should be loaded in accordance with loading windows contained in CSM/LM Spacecraft Operational Data Book, Volume I, Part 2, SNA-8-D-027(1) P2.

TABLE 3.1-11

SPS PROPELLANT LOAD CALCULATION

	<u>FUEL</u>	<u>OXIDIZER</u>
1. Enter SPS Quantity Readout at 110 PSIA (Table 3.1-12 item C - Percent)	_____	_____
2. Use Figures 4.1-3 and 4.1-4 to obtain propellant load for above quantity readout.	_____	_____
3. Nominal propellant density at loading temperature (use temperature - density graph below) (lb/ft <sup>3</sup> )	_____	_____
4. Cubic feet of propellant (item 2 divided by item 3)	_____	_____
5. Calculated density from Table 3.1-12 item f (lb/ft <sup>3</sup> )	_____	_____
6. Adjustment due to PUGS zero adjust (pounds)	_____	_____
7. Resulting actual propellant load (item 4 times item 5, less item 6) (pounds)	_____	_____

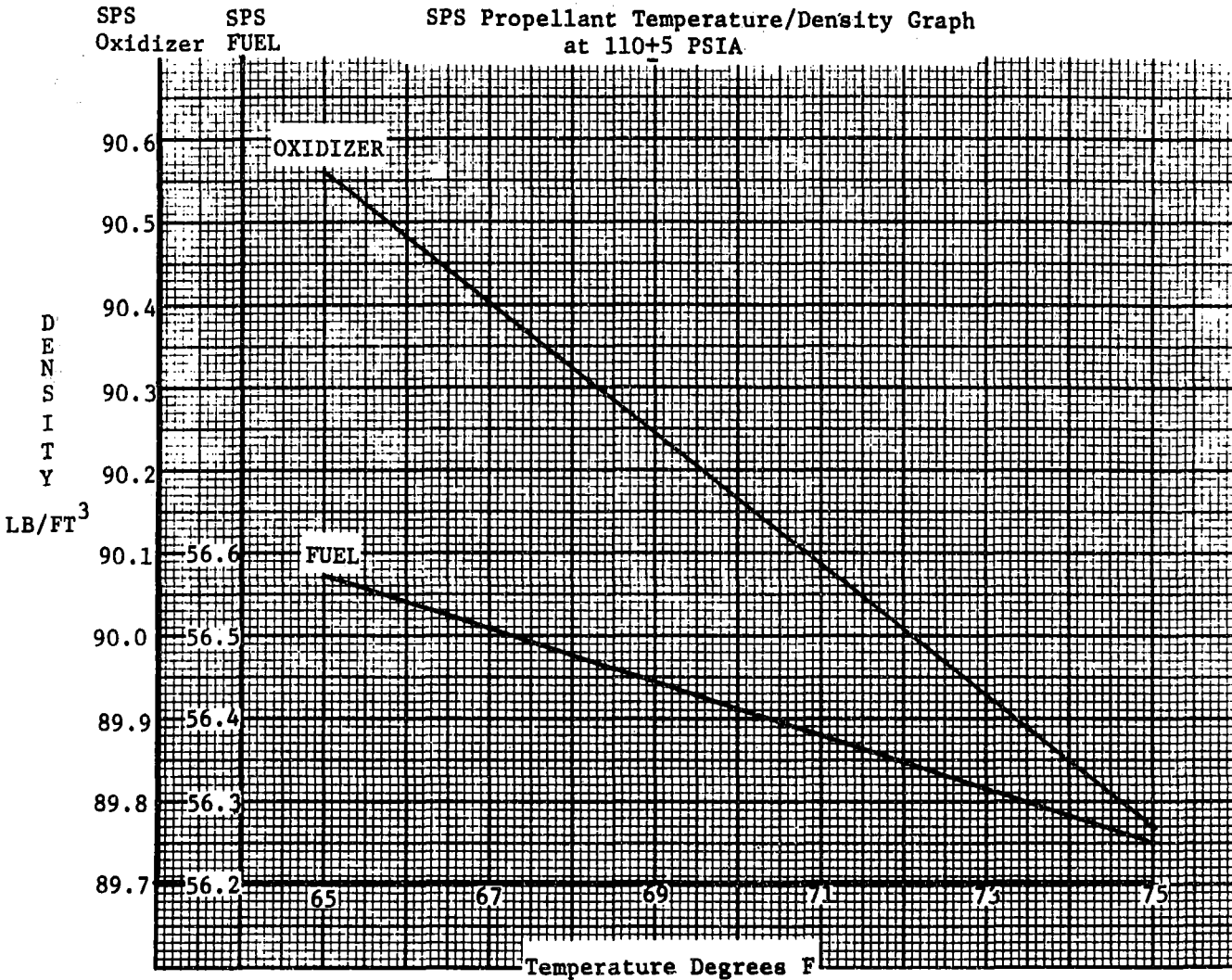


TABLE 3.1-12

MISSION J-1 SPS PROPELLANT LOAD PARAMETERS  
(To be provided by KSC following loading)

Enter the following information at zero adjust - time

<u>Fuel</u>	<u>Oxidizer</u>
Adjusted quantity fuel readout - Percent _____	Adjusted quantity oxidizer readout - Percent _____
Fuel storage voltage reading taken from _____	Oxidizer storage voltage reading taken from _____
ACE to three significant digits - volts _____	ACE to three significant digits - volts _____
Fuel sump voltage reading taken from _____	Oxidizer sump voltage reading taken from _____
ACE to three significant digits - volts _____	ACE to three significant digits - volts _____

Enter the following information at Sump Tank Full Adjust  
(Propellant at top of standpipe)

<u>Fuel</u>	<u>Oxidizer</u>
Fuel sump tank pressure - PSIA _____	Oxidizer sump tank pressure - PSIA _____
Fuel temperature - °F _____	Oxidizer temperature - °F _____
Adjusted quantity fuel readout - Percent _____	Adjusted quantity oxidizer readout - % _____
Fuel sump voltage reading taken from _____	Oxidizer sump voltage reading taken from _____
ACE to three significant digits - volts _____	ACE to three significant digits - volts _____

Enter the following information at Storage Tank Full Adjust  
(Propellant at Point Sensor #1)

<u>Fuel</u>	<u>Oxidizer</u>
Fuel storage tank pressure - PSIA _____	Oxidizer storage tank pressure - PSIA _____
Fuel temperature - °F _____	Oxidizer temperature - °F _____
Adjusted quantity fuel readout - % _____	Adjusted quantity oxidizer readout - % _____
Fuel storage voltage reading taken from _____	Oxidizer storage voltage reading taken from _____
ACE to three significant digits - volts _____	ACE to three significant digits - volts _____
Fuel sump voltage reading taken from _____	Oxidizer sump voltage reading taken from _____
ACE to three significant digits - volts _____	ACE to three significant digits - volts _____

TABLE 3.1-12 (CONTINUED)  
MISSION J-1 SPS PROPELLANT LOAD PARAMETERS  
(To be provided by KSC following loading)

Enter the following information when tanking is complete (110±5 PSIA) Time	
Fuel	Oxidizer
a. System pressure - PSIA _____	a. System pressure - PSIA _____
b. Fuel temperature - °F _____	b. Oxidizer temperature - °F _____
c. Quantity fuel readout - % _____	c. Quantity oxidizer readout - % _____
d. Fuel measured specific gravity @ °C - 14.7 PSIA _____	d. Oxidizer measured specific gravity @ °C - 14.7 PSIA _____
e. Fuel measured density °C - 14.7 PSIA (Item d times 62.428) - lb/ft <sup>3</sup> _____	e. Oxidizer measured density @ °C - 14.7 PSIA (Item d times 62.428) - lb/ft <sup>3</sup> _____
f. Calculated density - lb/ft <sup>3</sup> - at system pressure and temperature Items a and b above. Use density equation outlined in Section 4.1. _____	f. Calculated density - lb/ft <sup>3</sup> - at system pressure and temperature, Item a and b above. Use density equation outlined in Section 4.1. _____
g. Fuel storage voltage reading from ACE _____	g. Oxidizer storage voltage reading from ACE _____
h. Fuel sump voltage reading from ACE _____	h. Oxidizer sump voltage reading from ACE _____

Enter the following information at leak check pressure	
Fuel	Oxidizer
System pressure - PSIA _____	System pressure - PSIA _____
Quantity fuel readout - % _____	Quantity oxidizer readout - % _____
Fuel storage voltage reading from ACE _____	Oxidizer storage voltage readout from ACE _____
Fuel sump voltage reading from ACE _____	Oxidizer sump voltage readout from ACE _____

TABLE 3.1-13

SPS PROPELLANT UNCERTAINTIES

ITEM	FUEL	OXIDIZER
	(lb)	(lb)
<u>LOADING UNCERTAINTIES</u>		
Tank Volume	±24	±39
Temperature Gauge (±2.0°F)	±18	±46
Standpipe Height	± 6	±10
Propellant Gauge (±0.35% of Gaugeable)	±54	±86
Density Measurement (1)	± 0	± 0
Batch Density (1)	±94	±75
Loading Pressure (1)	± 8	±14
RSS	±113	±130
TOTAL RSS	±172	
Loading Specification (1) (2)	±16	±24
Tolerance on Propellant Temperature of Flight Load	+0.0 -46.0	+0.0 -113.0
TOTAL LOADING UNCERTAINTY	+212 -371	

NOTES: (1) Data will be known after loading is accomplished.

(2) Loading specification is an allowable tolerance about nominal, this number is added to the loading uncertainty variable.

TABLE 3.1-14

COMMAND MODULE RCS LOADING PARAMETERS AND CALCULATIONS

This table will be completed when loading is accomplished. For Mission Planning, reference should be made to Section 4.2 for nominal load, loading tolerances, trapped and deliverable propellants.

	<u>FUEL</u>		<u>OXIDIZER</u>	
	<u>Tank A</u>	<u>Tank B</u>	<u>Tank A</u>	<u>Tank B</u>
A. Tank Volume @0.0 PSIA (in <sup>3</sup> )	_____	_____	_____	_____
B. Liquid Line Volume (in <sup>3</sup> )	_____	_____	_____	_____
C. Total A + B (in <sup>3</sup> )	_____	_____	_____	_____
D. Initial Weight in Bleed Unit Prior to Loading (lb)	_____	_____	_____	_____
E. Final Weight in Bleed Unit After Loading (lb)	_____	_____	_____	_____
F. Propellant Load (item D less than E Weigh Tank)	_____	_____	_____	_____
G. Propellant Load by P.V.	_____	_____	_____	_____
H. Loading Temperature (°F)	_____	_____	_____	_____
I. Specification Propellant Load @ 70±5°F (lb)	_____		_____	
J. Total CM/RCS Propellant Load from Item G above (lb)	_____		_____	
K. Maximum Trapped Propellant (lb)	_____		_____	
L. Nominal Deliverable (lb)	_____		_____	

TABLE 3.1-15

## SERVICE MODULE RCS LOADING SUMMATION

This table will be completed when loading is accomplished. For Mission Planning, reference should be made to Section 4.2, for nominal load, loading tolerances, and nominal deliverable propellants.

<u>Quad A (1b)</u>		<u>Quad B (1b)</u>	
Secondary Fuel	_____	Secondary Fuel	_____
Primary Fuel	_____	Primary Fuel	_____
Total Fuel	_____ ±0.7	Total Fuel	_____ ±0.7
Maximum Trapped	<u>2.1</u>	Maximum Trapped	<u>2.1</u>
Nominal Deliverable	_____	Nominal Deliverable	_____
Total Oxidizer	_____ ±2.3	Total Oxidizer	_____ ±2.3
Maximum Trapped	<u>4.5</u>	Maximum Trapped	<u>4.5</u>
Nominal Deliverable	_____	Nominal Deliverable	_____
<u>Quad C (1b)</u>		<u>Quad D (1b)</u>	
Secondary Fuel	_____	Secondary Fuel	_____
Primary Fuel	_____	Primary Fuel	_____
Total Fuel	_____ ±0.7	Total Fuel	_____ ±0.7
Maximum Trapped	<u>2.1</u>	Maximum Trapped	<u>2.1</u>
Nominal Deliverable	_____	Nominal Deliverable	_____
Total Oxidizer	_____ ±2.3	Total Oxidizer	_____ ±2.3
Maximum Trapped	<u>4.5</u>	Maximum Trapped	<u>4.5</u>
Nominal Deliverable	_____	Nominal Deliverable	_____
<u>Total SM/RCS Propellant Load (1b)</u>			
Total Fuel	_____ ±1.4	Total Oxidizer	_____ ±4.6
Maximum Trapped	<u>8.4</u>	Maximum Trapped	<u>18.0</u>
Nominal Deliverable	_____	Nominal Deliverable	_____



TABLE 3.1-16

LM-10 CONSUMABLE LOADING REQUIREMENTSLM-10 APS PROPELLANT

	<u>Fuel (lb)</u>	<u>Oxidizer (lb)</u>
Propellant Load	<u>2017.2</u>	<u>3225.7</u>
Trapped Outside Tanks	<u>5.9</u>	<u>8.3</u>
Tanked	<u>2011.3</u>	<u>3217.4</u>
Trapped Inside Tanks	<u>10.1</u>	<u>27.6</u>
Nominal Deliverable	<u>2001.2</u>	<u>3189.8</u>
Outage	<u>TBD</u>	<u>TBD</u>
Total APS Propellant	<u>TBD</u>	<u>TBD</u>

The following table should be used to determine the amount of propellant to be off-loaded from a full condition to arrive at the indicated load. The allowable tolerance for the calculated off-load is  $\pm 0.5$  pounds per weigh tank.

A. Final tank pressure at overfill (PSIG)	_____	_____
B. Propellant loading temperature ( $^{\circ}$ F)	_____	_____
C. Nominal overfill quantity (lb)	<u>TBD</u>	<u>TBD</u>
D. Correction for tank pressure (lb)	_____	_____
Fuel = 0.09 (Item A-40)		
Oxidizer = 0.15 (Item A-40)		
<sup>1</sup> E. Correction for loading temperature (lb)	_____	_____
Fuel = 1.16 (Item B-65)		
Oxidizer = -2.84 (Item B-65)		
<sup>2</sup> F. Measured density (GM/CC)	_____	_____
<sup>2</sup> G. Nominal density (GM/CC)	<u>0.8994</u>	<u>1.4824</u>
H. Delta density (GM/CC) (Item F-G)	_____	_____
<sup>3</sup> I. Correction for measured density	_____	_____
Fuel = 2300 (Item H)		
Oxidizer = 2300 (Item H)		
J. Propellant in GSE	_____	_____
K. Overfill quantity (C+D+E+I+J)	_____	_____
L. Target loading	<u>2017.2</u>	<u>3225.7</u>
M. Quantity required to fill RCS manifolds	<u>10.0</u>	<u>15.8</u>
N. Quantity to be off-loaded (Item K-L-M)	_____	_____

## NOTES:

<sup>1</sup>Loading temperature correction will always be negative.

<sup>2</sup>To calculate the nominal density solve the following equation where T = temperature in  $^{\circ}$ C of the measured density (usually  $4^{\circ}$ C for oxidizer and  $25^{\circ}$ C for fuel). This equation is valid for 14.7 PSIA. Therefore, the measured density must also be at 14.7 PSIA.

Nominal fuel density =  $0.922904 - 0.0009377 (^{\circ}\text{C})$

Nominal oxidizer density =  $1.491539 - 0.0022832 (^{\circ}\text{C})$

<sup>3</sup>Correction for measured density may be either positive or negative.

TABLE 3.1-16 (CONTINUED)  
LM-10 CONSUMABLE LOADING REQUIREMENTS

LM-10 DPS PROPELLANT

	<u>Fuel (lb)</u>	<u>Oxidizer (lb)</u>
Propellant Load	7541.1	12042.1
Trapped Outside Tanks	27.7	49.2
Tanked	7513.4	11992.9
Trapped Inside Tanks	21.9	39.6
Nominal Deliverable	7491.5	11953.3
Outage	TBD	TBD
Total DPS Propellant	<u>TBD</u>	

The following table should be used to determine the amount of propellant to be off-loaded from a full condition to arrive at the indicated load. The allowable tolerance for the calculated off-load is  $\pm 0.5$  pounds per weigh tank.

A1. Final tank pressure at overfill (PSIG)	_____	_____
B1. Propellant loading temperature (°F)	_____	_____
C1. Nominal overfill quantity (lb)	TBD	TBD
D1. Correction for tank pressure (lb)	_____	_____
Fuel = TBD		
Oxidizer = TBD		
<sup>1</sup> E1. Correction for loading temperature (lb)	_____	_____
Fuel = TBD		
Oxidizer = TBD		
<sup>2</sup> F1. Measured density (GM/CC)	_____	_____
<sup>2</sup> G1. Nominal density (GM/CC)	0.8994	1.4824
H1. Delta density (GM/CC) (Item F1-Item G1)	_____	_____
<sup>3</sup> I1. Correction for measured density	_____	_____
Fuel = TBD		
Oxidizer = TBD		
J1. Propellant in GSE	_____	_____
K1. Overfill quantity (C1+D1+E1+I1+J1)	_____	_____
L1. Target loading	7541.1	12042.1
M1. Quantity required to fill RCS manifolds (APS only)	xxxxxxx	xxxxxxx
N1. Quantity to be off-loaded (Items K1-L1-M1)	_____	_____

NOTES:

<sup>1</sup>Loading temperature correction will always be negative.

<sup>2</sup>To calculate the nominal density solve the following equation where T = temperature in °C of the measured density (usually 4°C for oxidizer and 25°C for fuel). This equation is valid for 14.7 PSIA. Therefore, the measured density must also be at 14.7 PSIA.

$$\text{Nominal fuel density} = 0.922904 - 0.0009377 (^\circ\text{C})$$

$$\text{Nominal oxidizer density} = 1.491539 - 0.0022832 (^\circ\text{C})$$

<sup>3</sup>Correction for measured density may be either positive or negative.

TABLE 3.1-16 (CONTINUED)  
LM-10 - RCS PROPELLANT (2) (3)

	Required Load (lb) <sup>5</sup>	Ullage Requirement (in <sup>3</sup> )		<sup>1</sup> Actual <sup>5</sup> Load (lb)	<sup>1</sup> Actual <sup>4</sup> Ullage (in <sup>3</sup> )
		Minimum <sup>4</sup>	Maximum <sup>4</sup>		
System A Fuel	107.4±0.9	152.5	164.5		
System A Oxidizer	208.2±1.9	267.0	279.0		
System B Fuel	107.4±0.9	152.5	164.5		
System B Oxidizer	208.2±1.9	267.0	279.0		

	FUEL	OXIDIZER
Propellant Load	214.8	416.4
Trapped Outside Tanks	10.5	15.8
Tanked	204.3	400.6
Trapped in Tanks	4.2	8.0
Nominal Deliverable	200.1	392.6

LM-10 - Helium & Nitrogen

Consumable	Nominal Loading Requirement			Actual		
	Pressure (PSIA)	Temp (°F)	Weight (lb)	Pressure (PSIA)	Temp (°F)	Weight (lb)
Helium - APS tank #1 (6)	3050	70	6.6			
- APS tank #2 (6)	3050	70	6.6			
- RCS tank #1 (6)	3050	70	1.05			
- RCS tank #2 (6)	3050	70	1.05			
- DPS (SHe)	80±2	N/A	48.5			
- DPS (Ambient)(6)	1600	70	1.1			
Nitrogen - Ascent			0.1			
- Descent			0.6			

LM-10 - Water & GOX

Consumable	Nominal Loading Requirement		Actual	
	Pressure (PSIA)	Weight (lb)	Pressure (PSIA)	Weight (lb)
Ascent Water - tank #1	N/A	42.5	N/A	
- tank #2	N/A	42.5	N/A	
Descent Water - tank #1	N/A	(7)	N/A	
- tank #2	N/A	(7)	N/A	
Ascent GOX - tank #1 (6)	830	2.4		
- tank #2 (6)	830	2.4		
Descent GOX - tank #1 (6)	2700	48.0		
- tank #2 (6)	2700	48.0		

NOTES:

- <sup>1</sup>See Table 3.1-17 for actual propellant load calculation.
- <sup>2</sup>See Section 5.6 for explanation of trapped propellants.
- <sup>3</sup>See Table 3.1-18 for loading uncertainties.
- <sup>4</sup>PV ullage calculation should be 166.5±50 cubic inches for LM/RCS fuel and 280±50 cubic inches for LM/RCS oxidizer per tank.
- <sup>5</sup>LM/RCS required load includes propellant required to fill RCS manifolds to isolation valves. See Table 3.1-16. See Section 5.6 for trapped propellants.
- <sup>6</sup>The indicated items should be loaded in accordance with loading windows contained in the CSM/LM Spacecraft Operational Data Book, Volume II, Part 2, SNA-8-D-027PT2.
- <sup>7</sup>LM-10 Descent Water shall be loaded to provide 390-0.0±10.0 pounds at Earth Launch. Initial load will be determined by sampling requirements.

TABLE 3.1-17

LOAD CALCULATION

	<u>Fuel</u>	<u>Oxidizer</u>
<u>APS PROPELLANT</u>		
1. Full tank - Item K, Table 3.1-16 (lb)	_____	_____
<sup>1</sup> 2. Density of off-load tables at loading temperature and pressure (lb/ft <sup>3</sup> )	_____	_____
<sup>1</sup> 3. Propellant volume (divide item 1 by item 2. (ft <sup>3</sup> ))	_____	_____
<sup>1</sup> 4. Measured density (from Table 3.1-19) (lb/ft <sup>3</sup> )	_____	_____
5. Resulting full tank load (lb)	_____	_____
6. Off-load amount (lb)	_____	_____
7. Propellant required to fill RCS manifolds (lb)	_____	_____
8. Propellant load (lb)	_____	_____
<u>DPS PROPELLANT</u>		
9. Full tank - Item K1 Table 3.1-16	_____	_____
<sup>1</sup> 10. Density of off-load tables at loading temperature and pressure (lb/ft <sup>3</sup> )	_____	_____
<sup>1</sup> 11. Propellant volume (divide Item 9 by Item 10)(ft <sup>3</sup> )	_____	_____
<sup>1</sup> 12. Measured density (from Table 3.1-19). (lb/ft <sup>3</sup> )	_____	_____
13. Resulting full tank load (lb)	_____	_____
14. Off-load amount (lb)	_____	_____
15. Propellant load (lb)	_____	_____

RCS PROPELLANT

P. V. Calculations

	<u>Fuel</u>		<u>Oxidizer</u>	
	<u>Tank A</u>	<u>Tank B</u>	<u>Tank A</u>	<u>Tank B</u>
A. GSE Volume (in <sup>3</sup> )	_____	_____	_____	_____
B. Initial Ullage Pressure (PSIG)	_____	_____	_____	_____
C. Initial GSE Pressure (PSIG)	_____	_____	_____	_____
D. Final GSE - S/C Pressure (PSIG)	_____	_____	_____	_____
E. Ullage Volume (in <sup>3</sup> ) - Solve the following equation by substituting the values in the indicated steps. Ullage Volume = $\frac{(D-C)(A)}{B-D}$	_____	_____	_____	_____

NOTE: <sup>1</sup>These items will be completed only if a density sample is not made prior to loading. If a density sample is made prior to loading, then the items will be left blank.

TABLE 3.1-18

LM-10 PROPELLANT LOADING UNCERTAINTIESLM-10 APS PROPELLANT

	<u>Fuel (lb)</u>	<u>Oxidizer (lb)</u>
Vent Line Volume	<u>±0.2</u>	<u>±0.3</u>
Tank Volume	<u>±0.8</u>	<u>±1.3</u>
Pressure Measurement (±5 PSIA)	<u>±0.5</u>	<u>±0.8</u>
Temperature Measurement (±1.5°F)	<u>±1.7</u>	<u>±4.3</u>
Measured Density	<u>±0.7</u>	<u>±0.5</u>
Weight Measurement	<u>±0.5</u>	<u>±0.5</u>
<sup>1</sup> Loading Tolerance	<u>±0.5</u>	<u>±0.5</u>
Total Loading Uncertainty	<u>±4.8</u>	<u>±8.2</u>

LM-10 DPS PROPELLANT

Vent Line Volume	<u>±0.2</u>	<u>±0.3</u>
Tank Volume	<u>±3.62</u>	<u>±5.96</u>
Pressure Measurement (±5 PSIA)	<u>±1.70</u>	<u>±2.77</u>
Temperature Measurement (1.5°F)	<u>±6.49</u>	<u>±15.76</u>
Measured Density	<u>±2.55</u>	<u>±1.70</u>
Weight Measurement	<u>±0.5</u>	<u>±0.5</u>
<sup>1</sup> Loading Tolerance	<u>±0.5</u>	<u>±0.5</u>
Total Loading Uncertainty	<u>±15.6</u>	<u>±27.5</u>

LM-10 RCS PROPELLANT

Loading Temperature	<u>±0.6</u>	<u>±1.8</u>
Ullage Calculation	<u>±0.4</u>	<u>±0.6</u>
Tank and Manifold Volume	<u>±0.8</u>	<u>±1.4</u>
Total	<u>±1.8</u>	<u>±3.8</u>

<sup>1</sup>These will be known quantities after loading is accomplished.

TABLE 3.1-19

LM-10 APS PROPELLANT LOADING PARAMETERS  
(To Be Completed by KSC at Loading)

	<u>Fuel</u>	<u>Oxidizer</u>
Loading Pressure - PSIA	_____	_____
Loading Temperature - Fill Line - Degrees F	TT 58 Fuel TT258 Oxidizer	_____
Loading Temperature - Return Line - Degrees F	TT 59 Fuel TT259 Oxidizer	_____
Loading Temperature - Tank - Degrees F	GP0718 Fuel GP1218 Oxidizer	_____
Number of Times Weigh Tank Used (Flow Meter Not Used)	_____	_____
Total Pounds Off-Loaded Using Weigh Tank (Flow Meter Not Used)	_____	_____
Pounds Off-Loaded Using Flow Meter (Weigh Tank Not Used)	_____	_____
Measured Fuel Density @     °C; @     PSIA    GM/CC	_____	_____
Measured Oxidizer Density @     °C; @     PSIA    GM/CC	_____	_____

TABLE 3.1-19 (CONTINUED)

LM-10 DPS PROPELLANT LOADING PARAMETERS

	<u>Fuel</u>	<u>Oxidizer</u>
Loading Pressure - PSIA	_____	_____
Loading Temperature - Fill Line - Degrees F	TT 58 Fuel TT258 Oxidizer	_____
Loading Temperature - Return Line - Degrees F	TT 59 Fuel TT259 Oxidizer	_____
Loading Temperature - Tank One - Degrees F	GQ3718 Fuel GQ4218 Oxidizer	_____
Loading Temperature - Tank Two - Degrees F	GQ3719 Fuel GQ4219 Oxidizer	_____
Number of Times Weigh Tank Used (Flow Meter Not Used)	_____	_____
Total Pounds Off-Loaded Using Weigh Tank (Flow Meter Not Used)	_____	_____
Pounds Off-Loaded Using Flow Meter (Weigh Tank Not Used)	_____	_____
Measured Fuel Density @    °C; @    PSIA    GM/CC	_____	_____
Measured Oxidizer Density @    °C; @    PSIA    GM/CC	_____	_____

## MISSION J-1 MASS PROPERTY DATA TABLES

- Table 3.1-20** presents the CSM-112/LM-10 (docked) mass properties, in Apollo coordinates, as a function of spacecraft weight for L.O.I. SM/SPS burn.
- Table 3.1-21** presents the CSM-112/LM-10 (docked) mass properties, in Apollo coordinates, as a function of spacecraft weight for the D.O.I. SM/SPS burn.
- Table 3.1-22** presents the CSM-112 mass properties, in Apollo coordinates, as a function of CSM weight for the Circularization I SM/SPS burn.
- Table 3.1-23** presents the CSM-112 mass properties, in Apollo coordinates, as a function of CSM weight for the Plane Change I SM/SPS burn.
- Table 3.1-24** presents the CSM-112 mass properties, in Apollo coordinates, as a function of CSM weight for the T.E.I. SM/SPS burn.
- Table 3.1-25** presents the LM-10 mass properties, in LM coordinates, as a function of LM weight for the P.D.I. DPS burn.
- Table 3.1-26** presents the LM-10 ascent stage mass properties, in LM coordinates, as a function of weight for the lunar liftoff APS burn.
- Table 3.1-27** presents the LM-10 mass properties, in LM coordinates, as a function of LM weight for the T.P.I. to docking LM/RCS burn.



CSM-112/ LM-10 L.O.I. BURN

TABLE 3.1-20

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
102718.8	1041.18	2.94	3.52	61633	573550	576257	-10811	-6037	2036	1.181	-.140	574903	1.570
101718.8	1041.93	2.94	3.45	61109	571836	574977	-10803	-5912	1891	1.204	-.144	573407	1.560
100718.8	1042.77	2.93	3.37	60584	569826	573402	-10795	-5773	1746	1.228	-.148	571614	1.549
99718.8	1043.70	2.93	3.29	60060	567493	571504	-10785	-5618	1600	1.253	-.153	569498	1.536
98718.8	1044.72	2.92	3.22	59535	564806	569252	-10774	-5448	1455	1.279	-.158	567029	1.522
97718.8	1045.84	2.92	3.14	59010	561734	566616	-10762	-5262	1309	1.305	-.164	564175	1.506
96718.8	1047.06	2.91	3.06	58484	558245	563562	-10750	-5055	1164	1.331	-.170	560904	1.489
95718.8	1048.38	2.91	2.97	57959	554302	560055	-10736	-4840	1018	1.358	-.176	557179	1.470
94718.8	1049.81	2.90	2.89	57433	549869	556058	-10721	-4602	873	1.386	-.182	552964	1.450
93718.8	1051.34	2.90	2.80	56907	544905	551531	-10705	-4347	727	1.414	-.189	548218	1.427
92718.8	1052.99	2.89	2.71	56380	539368	546431	-10688	-4073	582	1.443	-.196	542899	1.403
91718.8	1054.75	2.89	2.62	55853	533213	540713	-10669	-3780	436	1.472	-.204	536963	1.376
90718.8	1056.63	2.88	2.53	55326	526393	534331	-10650	-3467	291	1.501	-.212	530362	1.348
89718.8	1058.64	2.87	2.44	54798	518859	527234	-10629	-3133	145	1.531	-.220	523046	1.317
88718.8	1060.78	2.87	2.34	54271	510555	519369	-10606	-2778	0	1.561	-.228	514962	1.285
87718.8	1063.05	2.86	2.24	53742	501424	510677	-10582	-2400	-145	1.591	-.237	506051	1.250
86718.8	1065.45	2.86	2.14	53214	491467	501159	-10558	-2001	-291	1.622	-.246	496313	1.213
85718.8	1068.00	2.85	2.04	52685	480502	490633	-10531	-1577	-436	1.653	-.255	485567	1.174
84718.8	1069.94	2.79	1.99	52169	473376	483508	-10432	-1389	-543	1.667	-.274	478442	1.147
83718.8	1071.15	2.69	2.00	51668	471199	480849	-10251	-1399	-608	1.669	-.302	476024	1.136
82718.8	1072.47	2.59	2.01	51167	468617	477784	-10052	-1411	-672	1.670	-.330	473200	1.123
81718.8	1073.90	2.49	2.01	50665	465639	474321	-9836	-1424	-736	1.671	-.358	469980	1.109
80718.8	1075.43	2.38	2.02	50163	462264	470462	-9603	-1437	-801	1.673	-.387	466363	1.093
79718.8	1077.08	2.27	2.02	49660	458487	466201	-9353	-1452	-865	1.675	-.417	462344	1.076
78718.8	1078.84	2.16	2.03	49158	454291	461520	-9085	-1467	-929	1.677	-.447	457905	1.058
77718.8	1080.72	2.04	2.04	48654	449654	456397	-8801	-1483	-993	1.675	-.477	453025	1.039
76718.8	1082.72	1.92	2.04	48150	444543	450801	-8498	-1501	-1057	1.681	-.508	447672	1.019
75718.8	1084.84	1.80	2.05	47646	438923	444694	-8177	-1520	-1121	1.683	-.536	441809	.997
74718.8	1087.09	1.68	2.06	47141	432750	438034	-7835	-1539	-1185	1.686	-.571	435352	.974
73718.8	1089.49	1.55	2.06	46636	425975	430771	-7473	-1560	-1250	1.688	-.603	428373	.945
72718.8	1092.02	1.42	2.07	46130	418545	422854	-7088	-1583	-1314	1.691	-.636	420700	.923
71718.8	1094.72	1.28	2.08	45624	410406	414227	-6679	-1606	-1378	1.694	-.669	412316	.895
70718.8	1097.57	1.15	2.09	45117	401502	404833	-6246	-1631	-1441	1.698	-.702	403168	.866
69718.8	1100.60	1.00	2.10	44609	391777	394619	-5786	-1658	-1505	1.701	-.735	393198	.835
68718.8	1103.80	.86	2.10	44101	381178	383529	-5300	-1686	-1569	1.704	-.769	382354	.802
67718.8	1107.19	.70	2.11	43592	369658	371518	-4785	-1715	-1633	1.708	-.803	370588	.768
66718.8	1110.77	.55	2.12	43082	357177	358546	-4240	-1746	-1697	1.712	-.837	357861	.732

CSM-112/ LM-10 L.C.I. BURN

TABLE 3.1-20(CONTINUED)

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
65718.8	1114.55	.39	2.13	42572	343658	344534	-3671	-1780	-1761	1.716	-.871	344096	.694
64718.8	1118.54	.22	2.14	42061	329029	329413	-3061	-1814	-1824	1.720	-.905	329221	.655
63718.8	1122.76	.05	2.15	41549	313219	313109	-2420	-1851	-1888	1.724	-.940	313164	.614
62718.8	1127.23	-.13	2.16	41036	295955	295350	-1739	-1890	-1952	1.729	-.974	295653	.571

TABLE 3.1-21

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
102665.9	1041.24	2.94	3.52	61586	573392	576106	-10813	-6041	2048	1.180	-1.140	574749	1.569
101665.9	1041.98	2.94	3.45	61061	571677	574825	-10805	-5917	1903	1.204	-1.144	573251	1.559
100665.9	1042.82	2.93	3.37	60537	569665	573248	-10796	-5777	1757	1.228	-1.148	571457	1.548
99665.9	1043.75	2.93	3.30	60013	567329	571347	-10787	-5623	1612	1.253	-1.153	569338	1.535
98665.9	1044.78	2.92	3.22	59488	564640	569093	-10776	-5452	1467	1.278	-1.158	566867	1.521
97665.9	1045.90	2.92	3.14	58963	561566	566454	-10764	-5266	1321	1.304	-1.164	564010	1.506
96665.9	1047.12	2.91	3.06	58437	558073	563398	-10751	-5063	1176	1.331	-1.170	560735	1.488
95665.9	1048.44	2.91	2.98	57912	554127	559887	-10738	-4844	1030	1.358	-1.176	557007	1.469
94665.9	1049.87	2.90	2.89	57386	549690	555887	-10723	-4607	885	1.386	-1.182	552788	1.449
93665.9	1051.40	2.90	2.80	56860	544722	551355	-10707	-4351	739	1.414	-1.189	548039	1.426
92665.9	1053.05	2.89	2.72	56333	539181	546251	-10690	-4078	594	1.442	-1.196	542716	1.402
91665.9	1054.82	2.88	2.63	55806	533021	540529	-10671	-3784	448	1.471	-1.204	536775	1.375
90665.9	1056.70	2.88	2.53	55279	526197	534141	-10652	-3471	303	1.501	-1.212	530169	1.347
89665.9	1058.71	2.87	2.44	54751	518656	527039	-10631	-3137	157	1.530	-1.220	522848	1.316
88665.9	1060.85	2.87	2.34	54224	510347	519168	-10608	-2782	11	1.560	-1.228	514757	1.284
87665.9	1063.12	2.86	2.24	53695	501209	510469	-10584	-2404	-133	1.591	-1.237	505839	1.249
86665.9	1065.53	2.86	2.14	53167	491246	500944	-10560	-2005	-279	1.622	-1.246	496095	1.212
85665.9	1068.08	2.85	2.04	52638	480273	490410	-10533	-1580	-424	1.652	-1.255	485341	1.173
84665.9	1070.03	2.79	2.00	52122	473140	483280	-10434	-1393	-532	1.667	-1.274	478210	1.147
83665.9	1071.23	2.69	2.00	51621	470961	480617	-10253	-1404	-596	1.668	-1.302	475789	1.135
82665.9	1072.55	2.59	2.01	51120	468374	477548	-10054	-1415	-660	1.669	-1.330	472961	1.122
81665.9	1073.98	2.49	2.01	50618	465351	474081	-9837	-1428	-724	1.671	-1.358	469736	1.108
80665.9	1075.53	2.38	2.02	50116	462012	470217	-9604	-1441	-789	1.672	-1.387	466115	1.092
79665.9	1077.18	2.27	2.03	49613	458229	465950	-9354	-1456	-853	1.674	-1.417	462090	1.075
78665.9	1078.94	2.16	2.03	49111	454028	461264	-9086	-1471	-917	1.676	-1.447	457646	1.057
77665.9	1080.82	2.04	2.04	48607	449384	456134	-8802	-1488	-981	1.678	-1.477	452759	1.038
76665.9	1082.82	1.93	2.05	48103	444267	450532	-8499	-1506	-1045	1.680	-1.508	447400	1.018
75665.9	1084.94	1.80	2.05	47599	438640	444418	-8177	-1524	-1109	1.683	-1.539	441529	.996
74665.9	1087.20	1.68	2.06	47094	432459	437750	-7835	-1544	-1174	1.685	-1.571	435105	.973
73665.9	1089.60	1.55	2.07	46589	425676	430479	-7473	-1565	-1238	1.688	-1.603	428077	.948
72665.9	1092.14	1.42	2.08	46083	418237	422553	-7087	-1588	-1302	1.691	-1.636	420395	.922
71665.9	1094.83	1.28	2.08	45577	410089	413516	-6679	-1611	-1366	1.694	-1.669	412002	.894
70665.9	1097.69	1.15	2.09	45070	401174	404512	-6245	-1637	-1430	1.697	-1.702	402843	.865
69665.9	1100.72	1.00	2.10	44562	391438	394286	-5785	-1662	-1493	1.700	-1.735	392862	.834
68665.9	1103.93	.86	2.11	44054	380827	383185	-5298	-1691	-1557	1.704	-1.769	382006	.801
67665.9	1107.32	.70	2.12	43545	369294	371161	-4783	-1721	-1621	1.708	-1.803	370227	.767
66665.9	1110.91	.55	2.13	43035	356799	358174	-4238	-1752	-1685	1.712	-1.837	357486	.731

CSM-112/ LM-10 D.O.I. BURN

TABLE 3.1-21(CONTINUED)

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
65665.9	1114.69	.39	2.13	42525	343264	344148	-3668	-1786	-1749	1.716	-.871	343706	.693
64665.9	1118.69	.22	2.14	42014	328619	329010	-3058	-1821	-1812	1.720	-.906	328814	.654
63665.9	1122.91	.05	2.15	41502	312792	312688	-2417	-1857	-1876	1.724	-.940	312740	.613
62665.9	1127.39	-.13	2.16	40989	295508	294910	-1735	-1897	-1940	1.729	-.575	295209	.570

X(A) COORDINATES		TABLE 3.1-22										CSM-112 CIRCULARIZATION BURN									
WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT <sup>2</sup> SO	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO								
65784.3	933.20	4.81	5.15	35624	78185	79962	-2069	276	2425	-.797	1.806	79073	.449								
64784.3	932.71	4.84	5.06	35104	77512	79719	-2059	235	2282	-.760	1.832	78616	.449								
63784.3	932.32	4.86	4.96	34584	76923	79560	-2051	203	2139	-.717	1.856	78241	.448								
62784.3	932.04	4.88	4.87	34064	76397	79464	-2045	181	1996	-.670	1.877	77930	.448								
61784.3	931.87	4.91	4.77	33543	75916	79412	-2042	167	1854	-.618	1.856	77664	.447								
60784.3	931.81	4.93	4.67	33022	75457	79384	-2040	163	1711	-.560	1.912	77420	.446								
59784.3	931.87	4.96	4.56	32501	74999	79357	-2042	165	1569	-.497	1.925	77178	.444								
58784.3	932.06	4.98	4.45	31980	74519	79307	-2045	185	1426	-.428	1.935	76913	.442								
57784.3	932.39	5.01	4.34	31458	73992	79211	-2051	213	1284	-.355	1.941	76601	.439								
56784.3	932.85	5.04	4.22	30936	73390	79040	-2060	253	1142	-.276	1.944	76215	.434								
55784.3	933.47	5.07	4.10	30413	72685	78767	-2072	305	1000	-.192	1.943	75726	.429								
54784.3	934.23	5.10	3.97	29891	71846	78361	-2087	370	857	-.103	1.938	75103	.422								
53784.3	935.17	5.13	3.84	29367	70840	77787	-2106	448	715	-.009	1.929	74314	.414								
52784.3	936.28	5.16	3.71	28843	69632	77012	-2128	542	574	.090	1.916	73322	.404								
51784.3	937.58	5.20	3.57	28319	68182	75995	-2153	651	432	.192	1.899	72089	.392								
50784.3	939.07	5.23	3.42	27795	66445	74692	-2182	777	290	.299	1.878	70569	.378								
49784.3	940.77	5.27	3.27	27269	64396	73078	-2216	918	148	.409	1.853	68737	.363								
48784.3	942.70	5.31	3.11	26744	61944	71060	-2254	1080	7	.523	1.824	66502	.345								
47784.3	943.52	5.26	3.06	26233	60391	69511	-2309	1158	-97	.563	1.777	64951	.334								
46784.3	942.57	5.13	3.09	25739	60294	68939	-2344	1166	-160	.538	1.726	64617	.334								
45784.3	942.56	5.00	3.12	25245	60229	68399	-2371	1172	-223	.514	1.668	64314	.334								
44784.3	942.26	4.86	3.16	24751	60192	67886	-2390	1177	-286	.491	1.603	64039	.333								
43784.3	942.09	4.72	3.20	24256	60176	67394	-2401	1180	-349	.468	1.532	63785	.333								
42784.3	942.05	4.57	3.24	23760	60174	66916	-2404	1180	-412	.447	1.455	63545	.331								
41784.3	942.14	4.41	3.28	23264	60176	66441	-2400	1179	-474	.427	1.371	63309	.330								
40784.3	942.36	4.25	3.32	22768	60170	65958	-2387	1175	-537	.408	1.280	63064	.328								
39784.3	943.27	4.08	3.37	22271	60141	65451	-2365	1169	-599	.390	1.182	62796	.326								
38784.3	943.98	3.90	3.41	21773	60071	64903	-2334	1160	-662	.374	1.078	62487	.322								
37784.3	944.88	3.71	3.46	21275	59939	64293	-2293	1149	-724	.359	.966	62116	.318								
36784.3	944.88	3.50	3.52	20777	59723	63598	-2239	1134	-786	.347	.848	61661	.314								
35784.3	946.00	3.29	3.57	20277	59396	62790	-2173	1117	-847	.336	.722	61093	.308								
34784.3	947.35	3.07	3.63	19777	58929	61842	-2092	1095	-909	.328	.589	60385	.300								
33784.3	948.97	2.83	3.69	19276	58288	60720	-1996	1069	-970	.322	.450	59504	.292								
32784.3	950.87	2.58	3.76	18773	57441	59391	-1882	1039	-1032	.320	.305	58416	.282								
31784.3	953.09	2.31	3.83	18270	56350	57817	-1748	1004	-1093	.320	.200	57083	.270								
30784.3	955.64	2.02	3.91	17766	54979	55962	-1594	963	-1153	.323	-.004	55470	.257								
29784.3	958.57	1.72	3.99	17261	53290	53788	-1417	917	-1213	.329	-.165	53539	.242								

TABLE 3-1-22(CONTINUED)

CSM-112 CIRCULARIZATION BURN

WEIGHT LBS.	X(A) COORDINATES			CSM-112 CIRCULARIZATION BURN									
	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IVY	IZZ SLUG-FT SQ	PXY SQ	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
28784.3	961.92	1.39	4.07	16754	51228	51240	-1221	663	-1273	.338	-.331	51234	.226
27784.3	965.72	1.04	4.16	16245	48725	48248	-988	803	-1333	.350	-.500	48487	.208
26784.3	570.04	.67	4.26	15735	45718	44752	-727	734	-1392	.366	-.671	45235	.188
25784.3	975.00	.26	4.37	15223	42064	40608	-427	656	-1451	.385	-.845	41336	.166

CSM-112 PLANE CHANGE 1

TABLE 3.1-23

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
65464.3	933.27	4.83	5.20	35385	77972	79831	-2065	249	2496	-.826	1.813	78901	-.448
64464.3	932.78	4.85	5.11	34870	77301	79589	-2055	209	2353	-.789	1.839	78445	-.447
63464.3	932.39	4.87	5.02	34350	76712	79430	-2047	177	2210	-.748	1.863	78071	-.446
62464.3	932.11	4.90	4.92	33830	76187	79334	-2041	155	2068	-.701	1.885	77761	-.446
61464.3	931.93	4.92	4.83	33309	75706	79283	-2037	141	1925	-.648	1.904	77494	-.446
60464.3	931.88	4.95	4.72	32789	75247	79255	-2036	137	1783	-.591	1.920	77251	-.445
59464.3	931.94	4.97	4.62	32268	74790	79228	-2037	143	1640	-.528	1.933	77009	-.443
58464.3	932.14	5.00	4.51	31746	74310	79178	-2041	160	1498	-.460	1.943	76744	-.440
57464.3	932.46	5.03	4.40	31225	73761	79081	-2047	188	1355	-.386	1.950	76431	-.437
56464.3	932.93	5.06	4.28	30703	73179	78910	-2056	227	1213	-.307	1.953	76044	-.433
55464.3	933.55	5.09	4.16	30180	72473	78635	-2068	278	1071	-.223	1.952	75554	-.428
54464.3	934.32	5.12	4.03	29658	71633	78227	-2084	343	929	-.134	1.947	74930	-.421
53464.3	935.27	5.15	3.90	29134	70625	77652	-2102	421	787	-.040	1.938	74138	-.412
52464.3	936.39	5.18	3.77	28611	69414	76873	-2125	514	645	.059	1.925	73144	-.402
51464.3	937.69	5.22	3.63	28087	67961	75854	-2150	622	503	.162	1.908	71908	-.391
50464.3	939.20	5.25	3.48	27562	66221	74546	-2180	748	361	.269	1.887	70383	-.377
49464.3	940.91	5.29	3.33	27037	64167	72927	-2214	888	220	.379	1.862	68547	-.361
48464.3	942.86	5.33	3.17	26512	61709	70904	-2253	1045	78	.493	1.833	66306	-.343
47464.3	943.69	5.38	3.12	26002	60153	69352	-2308	1126	-25	.534	1.786	64752	-.333
46464.3	943.14	5.45	3.15	25508	60058	68782	-2343	1135	-88	.508	1.734	64420	-.333
45464.3	942.72	5.52	3.19	25013	59994	68243	-2369	1141	-151	.483	1.676	64119	-.332
44464.3	942.43	4.89	3.23	24519	59958	67731	-2388	1146	-214	.458	1.611	63844	-.332
43464.3	942.26	4.74	3.27	24024	59942	67240	-2398	1149	-277	.435	1.540	63591	-.331
42464.3	942.22	4.59	3.31	23528	59941	66761	-2401	1145	-340	.413	1.463	63351	-.330
41464.3	942.31	4.44	3.35	23033	59942	66286	-2397	1148	-402	.392	1.378	63114	-.328
40464.3	942.55	4.27	3.39	22536	59935	65802	-2384	1144	-465	.372	1.287	62869	-.326
39464.3	942.93	4.10	3.44	22039	59905	65294	-2362	1137	-527	.353	1.189	62600	-.324
38464.3	943.47	3.92	3.49	21542	59833	64744	-2331	1128	-589	.336	1.084	62289	-.321
37464.3	944.19	3.72	3.54	21044	59699	64132	-2289	1116	-651	.321	.972	61516	-.317
36464.3	945.11	3.52	3.60	20545	59480	63434	-2235	1101	-713	.307	.852	61457	-.312
35464.3	946.24	3.31	3.66	20045	59149	62622	-2169	1082	-775	.296	.726	60886	-.306
34464.3	947.62	3.08	3.72	19545	58676	61669	-2088	1060	-836	.287	.592	60172	-.299
33464.3	949.26	2.84	3.79	19044	58028	60560	-1991	1033	-897	.281	.452	59284	-.290
32464.3	951.18	2.59	3.86	18542	57173	59203	-1876	1001	-958	.278	.306	58188	-.280
31464.3	953.43	2.32	3.93	18038	56072	57619	-1743	964	-1019	.277	.153	56845	-.268
30464.3	956.03	2.03	4.01	17534	54688	55751	-1588	922	-1080	.280	-.005	55219	-.255
29464.3	959.00	1.72	4.10	17028	52983	53562	-1410	873	-1140	.286	-.167	53273	-.240

CSM-112 PLANE CHANGE 1

TABLE 3.1-23 (CONTINUED)

WEIGHT LBS.	X(Y) COORDINATES			TABLE 3.1-23 (CONTINUED)				CSM-112 PLANE CHANGE 1				AVERAGE MOMENT	INERTIA/THRUST RATIO	
	X-BAR	Y-BAR	Z-BAR	IXX	IYY	IZZ	SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES			YAW DEGREES
28464.3	962.40	1.39	4.19	16521	50902	50994	-1213	816	916	-1199	.294	-.334	50948	.224
27464.3	966.27	1.03	4.28	16013	48374	47979	-979	753	753	-1259	.306	-.504	48176	.206
26464.3	970.65	.65	4.39	15503	45337	44453	-717	682	682	-1318	.322	-.677	44895	.185
25464.3	975.71	.24	4.50	14991	41646	40271	-415	599	599	-1376	.341	-.852	40958	.163



CSM-112 T.E.I. BURN

TABLE 3.1-24

X(A) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PITCH DEGREES	YAW DEGREES	AVERAGE MOMENT	INERTIA/THRUST RATIO
65502.2	933.57	4.56	5.05	35223	77688	79552	-1927	96	2534	-732	1.875	78620	.445
64502.2	933.08	4.98	4.96	34703	77021	79315	-1916	55	2391	-693	1.907	78168	.444
63502.2	932.70	5.01	4.87	34182	76435	79159	-1907	23	2249	-650	1.932	77797	.444
62502.2	932.42	5.04	4.77	33662	75912	79065	-1901	1	2106	-601	1.955	77489	.443
61502.2	932.25	5.06	4.67	33141	75432	78915	-1897	-12	1964	-547	1.975	77224	.443
60502.2	932.20	5.09	4.56	32620	74973	78988	-1896	-15	1821	-488	1.993	76980	.442
59502.2	932.27	5.12	4.45	32098	74515	78960	-1897	-9	1679	-424	2.007	76737	.440
58502.2	932.47	5.15	4.34	31576	74032	78908	-1897	8	1537	-355	2.018	76470	.437
57502.2	932.80	5.18	4.23	31054	73501	78808	-1908	37	1395	-280	2.025	76155	.434
56502.2	933.28	5.21	4.11	30531	72894	78633	-1918	77	1253	-200	2.029	75763	.430
55502.2	933.90	5.24	3.98	30008	72182	78353	-1932	131	1111	-115	2.029	75268	.424
54502.2	934.68	5.27	3.85	29485	71335	77938	-1948	197	969	-025	2.025	74637	.418
53502.2	935.63	5.31	3.72	28961	70319	77355	-1969	278	828	.070	2.017	73837	.409
52502.2	936.75	5.35	3.58	28437	69098	76567	-1993	374	686	.169	2.005	72833	.399
51502.2	938.07	5.38	3.44	27912	67634	75537	-2022	486	545	.272	1.989	71585	.388
50502.2	939.58	5.42	3.29	27387	65880	74217	-2055	615	403	.379	1.968	70048	.374
49502.2	941.29	5.46	3.13	26861	63812	72583	-2092	759	262	.490	1.943	68197	.358
48502.2	943.25	5.51	2.97	26335	61337	70543	-2135	925	121	.604	1.914	65940	.340
47502.2	944.09	5.46	2.91	25824	59774	68985	-2191	1004	16	.645	1.869	64379	.330
46502.2	943.55	5.34	2.94	25331	59683	68419	-2224	1012	-46	.622	1.820	64051	.330
45502.2	943.14	5.21	2.97	24837	59623	67884	-2249	1017	-109	.600	1.764	63754	.329
44502.2	942.86	5.08	3.01	24344	59589	67375	-2266	1021	-173	.579	1.702	63482	.328
43502.2	942.70	4.94	3.04	23849	59575	66886	-2276	1023	-236	.559	1.633	63231	.328
42502.2	942.67	4.80	3.08	23354	59574	66409	-2279	1024	-299	.540	1.558	62991	.327
41502.2	942.78	4.64	3.11	22859	59575	65933	-2274	1022	-362	.522	1.476	62754	.325
40502.2	943.02	4.48	3.15	22364	59566	65448	-2260	1018	-425	.505	1.388	62507	.323
39502.2	943.41	4.32	3.20	21868	59533	64937	-2239	1013	-488	.489	1.293	62235	.321
38502.2	943.96	4.14	3.24	21371	59456	64384	-2208	1005	-550	.475	1.190	61920	.317
37502.2	944.70	3.95	3.28	20874	59317	63766	-2166	994	-613	.462	1.081	61542	.313
36502.2	945.43	3.76	3.33	20376	59090	63061	-2114	980	-675	.452	.964	61076	.308
35502.2	946.78	3.55	3.38	19877	58750	62241	-2049	964	-737	.443	.840	60496	.302
34502.2	948.16	3.33	3.44	19378	58266	61277	-1969	944	-799	.437	.710	59771	.295
33502.2	949.82	3.10	3.50	18878	57606	60136	-1874	920	-861	.433	.572	58871	.287
32502.2	951.76	2.85	3.56	18377	56734	58783	-1762	892	-923	.432	.428	57759	.277
31502.2	954.03	2.59	3.62	17875	55615	57182	-1632	860	-984	.433	.278	56399	.265
30502.2	956.64	2.31	3.69	17372	54211	55295	-1481	822	-1045	.438	.123	54753	.252
29502.2	959.63	2.01	3.76	16868	52483	53083	-1308	780	-1106	.445	-.038	52783	.237

TABLE 3.1-24 (CONTINUED)

CSM-112 T.E.I. BURN

WEIGHT LBS.	X(A) COORDINATES			Z-BAR	IXX	IYY	IZZ	PXY	PXZ	PYZ	PITCH DEGREES	YAW	AVERAGE MOMENT	INERTIA/THRUST RATIO
	X-BAR	Y-BAR INCHES	Z-BAR											
28502.2	963.04	1.69	3.84	16363	50375	50489	-1115	730	-1167	.455	-.203	50432	.221	
27502.2	966.93	1.35	3.93	15856	47817	47445	-887	675	-1227	.468	-.371	47631	.202	
26502.2	971.33	.98	4.02	15347	44746	43886	-632	612	-1287	.484	-.542	44316	.182	
25502.2	976.41	.59	4.12	14837	41016	39666	-338	539	-1347	.504	-.715	40341	.160	

TABLE 3.1-25

X (E) COORDINATES

WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ	PXY	PXZ	PYZ	PILOT RCLL DEGREES	PILOT PITCH
36607.1	185.02	.43	-.33	26877	28142	26749	-16	852	166	.791	.616
36083.3	185.27	.43	-.34	26547	27931	26612	-17	852	167	.793	.617
35559.5	185.51	.44	-.34	26217	27716	26472	-17	852	167	.797	.619
35035.7	185.73	.44	-.34	25887	27499	26329	-17	852	168	.800	.621
34511.9	185.94	.45	-.35	25557	27281	26185	-18	853	169	.804	.624
33988.1	186.15	.45	-.35	25227	27061	26040	-18	853	170	.809	.626
33464.3	186.35	.46	-.36	24897	26841	25894	-18	853	170	.814	.629
32940.5	186.57	.47	-.36	24567	26619	25747	-19	853	171	.818	.633
32416.6	186.79	.47	-.36	24237	26397	25599	-19	853	172	.823	.636
31892.8	187.03	.48	-.37	23907	26173	25449	-19	853	173	.828	.639
31369.0	187.29	.48	-.37	23577	25946	25297	-20	853	174	.832	.641
30845.2	187.57	.49	-.38	23247	25716	25141	-20	854	174	.837	.644
30321.4	187.88	.50	-.38	22917	25482	24981	-21	854	175	.840	.646
29797.6	188.21	.50	-.39	22587	25241	24815	-21	854	176	.844	.648
29273.8	188.58	.51	-.39	22257	24994	24642	-22	855	177	.847	.650
28750.0	188.99	.52	-.40	21927	24737	24460	-23	855	177	.849	.651
28226.2	189.44	.53	-.40	21597	24470	24267	-24	856	178	.851	.652
27702.4	189.92	.53	-.41	21268	24192	24063	-25	857	179	.853	.652
27178.5	190.45	.54	-.41	20938	23899	23844	-26	857	180	.854	.652
26654.7	191.03	.55	-.42	20608	23588	23608	-27	858	181	.854	.652
26130.9	191.66	.55	-.43	20278	23269	23364	-29	859	181	.854	.651
25607.1	192.33	.57	-.43	19948	22935	23104	-30	860	182	.853	.649
25083.3	193.06	.58	-.44	19618	22585	22828	-32	862	183	.851	.647
24559.5	193.84	.59	-.45	19288	22219	22537	-34	863	184	.849	.645
24035.7	194.68	.60	-.46	18958	21837	22229	-36	864	184	.847	.643
23511.9	195.58	.61	-.46	18628	21438	21904	-38	866	185	.844	.640
22988.1	196.53	.62	-.47	18298	21022	21563	-41	869	186	.841	.637
22464.3	197.55	.64	-.48	17968	20589	21204	-43	869	187	.838	.633
21940.4	198.63	.65	-.49	17638	20138	20827	-46	871	188	.834	.630
21416.6	199.78	.66	-.50	17308	19669	20433	-49	874	188	.830	.626
20892.8	201.00	.68	-.51	16978	19182	20020	-52	876	189	.826	.622
20369.0	202.29	.69	-.52	16648	18677	19589	-56	878	190	.821	.618
19845.2	203.66	.71	-.53	16318	18149	19136	-59	881	191	.817	.614
19321.4	205.11	.72	-.54	15988	17604	18665	-63	883	191	.812	.609
18797.6	206.64	.74	-.56	15658	17040	18176	-67	886	192	.807	.605
18273.8	208.25	.76	-.57	15328	16457	17666	-71	889	193	.803	.601
17750.8	209.96	.78	-.58	14998	15852	17136	-75	892	194	.798	.597

TABLE 3.1-26 LM-10 AS LUNAR LIFTOFF TO INSERTION

X(E)COORDINATES		Y(E)COORDINATES									
WEIGHT LBS.	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	IZZ SLUG-FT SQ.	PXY SQ.	PXZ	PYZ	ROLL OFFSET (DEG./SEC. SQ.)	PITCH MCMENT (DEG./SEC. SQ.)
10754.8	244.00	.06	2.48	6696	3345	5896	-11	195	47	.162	7.696
10494.8	244.40	.06	2.54	6518	3330	5703	-11	192	47	.175	7.477
10234.8	244.62	.06	2.61	6339	3314	5510	-11	190	47	.188	7.245
9974.8	245.26	.07	2.68	6161	3297	5315	-11	188	47	.204	6.998
9714.8	245.72	.07	2.75	5982	3279	5120	-11	185	47	.220	6.736
9454.8	246.21	.07	2.82	5804	3261	4924	-11	182	47	.239	6.456
9194.8	246.72	.07	2.90	5625	3241	4727	-12	179	47	.260	6.156
8934.8	247.26	.08	2.99	5446	3221	4528	-12	176	47	.283	5.836
8674.8	247.84	.08	3.08	5268	3199	4329	-12	173	47	.309	5.491
8414.8	248.46	.08	3.17	5089	3175	4128	-12	169	47	.339	5.120
8154.8	249.11	.09	3.27	4910	3151	3926	-12	165	47	.373	4.719
7894.8	249.80	.09	3.38	4732	3124	3722	-12	161	47	.412	4.285
7634.8	250.55	.10	3.50	4553	3096	3516	-12	157	47	.458	3.813
7374.8	251.34	.10	3.62	4374	3066	3308	-13	152	47	.510	3.298
7114.8	252.19	.11	3.75	4195	3033	3098	-13	148	47	.572	2.734
6854.8	253.11	.11	3.89	4016	2998	2886	-13	142	47	.646	2.114
6594.8	254.10	.12	4.05	3837	2961	2671	-13	137	47	.735	1.428
6334.8	255.17	.13	4.21	3658	2920	2453	-13	130	47	.843	.666
6074.8	256.33	.13	4.39	3479	2876	2232	-14	124	47	.979	-.185
5814.8	257.60	.14	4.59	3300	2827	2007	-14	116	47	1.151	-1.143

WEIGHT LBS.	XE COORDINATES			TABLE 3.1-27			LM-10 T.P.I.		
	X-BAR	Y-BAR INCHES	Z-BAR	IXX	IYY	SLUG-FT SQ	PXY	PXZ	PYZ
5798.8	257.20	.14	4.61	3308	2823	2015	-14	119	49
5772.8	257.33	.14	4.63	3290	2819	1993	-14	118	49
5766.8	257.47	.14	4.65	3272	2814	1970	-14	117	49
5720.8	257.60	.14	4.67	3254	2809	1947	-14	117	49
5694.8	257.73	.14	4.69	3236	2803	1924	-14	116	49
5668.8	257.87	.14	4.71	3218	2798	1902	-14	115	49
5642.8	258.01	.14	4.73	3200	2793	1879	-14	114	49
5616.8	258.15	.14	4.75	3182	2788	1856	-14	113	49
5590.8	258.29	.14	4.78	3164	2783	1833	-14	113	49
5564.8	258.43	.15	4.80	3146	2777	1810	-14	112	49
5538.8	258.57	.15	4.82	3128	2772	1787	-14	111	49
5512.8	258.72	.15	4.84	3110	2767	1764	-14	110	49
5486.8	258.86	.15	4.87	3092	2761	1741	-14	109	49

#### 4.0 CSM REFERENCE CONSUMABLE MASS PROPERTIES DATA

The data presented in this section will enable the user to obtain the separate centers-of-gravity and moments-of-inertia for those spacecraft consumables on-board that significantly affect overall CSM and CM performance. CSM consumables mass property data must be compared to the current on-board consumable loading data for each mission provided in Section 3.0. The mass property data are presented in the following sections:

- 4.1 SPS Tank Consumables Mass Properties, Trapped Propellants, SPS Density Equations and Graphs, and SPS Loading Windows.
- 4.2 RCS/ECS/EPS Consumables Mass Properties, and SM RCS Quad Mass Properties
- 4.3 CSM RCS Load Calculation Tables and Loading Windows
- 4.4 CM Ablator Data

TABLE 4.1-1

Table 4.1-1 presents the mass characteristics for the SM/SPS propellant tanks.

The following units apply to the indicated headings:

Height of Propellant - Inches	Mass of Propellant - Pounds
Tank Volume Unstretched - Ft <sup>3</sup>	Center of Mass - X <sub>A</sub> Coordinates - Inches
Tank Volume Stretched - Ft <sup>3</sup>	Moment of Inertia (I <sub>YY</sub> ) - Slug-ft <sup>2</sup>

Further, Moment of Inertia I<sub>ZZ</sub> = Moment of Inertia I<sub>YY</sub>; Moment of Inertia I<sub>XX</sub> = 0.0 for all propellant weights; tank pressure used in calculating this table was 175±5 PSIA, propellant temperature was 70°F, density for fuel was 56.43 lb/ft<sup>3</sup>, and oxidizer density was 90.21 lb/ft<sup>3</sup>.

The Y<sub>A</sub> and Z<sub>A</sub> Center of Mass components for the individual tanks are constant and are as follows:

	Y <sub>A</sub> (inches)	Z <sub>A</sub> (inches)
Fuel Storage	-14.8	-47.8
Fuel Sump	-48.3	-6.6
Oxidizer Storage	14.8	47.8
Oxidizer Sump	48.3	6.6

TABLE 4.1-1 (CONTINUED)

FUEL STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIAL(I <sub>XX</sub> )
2.00	0.09	0.09	5.0	834.21	0.0
3.00	0.28	0.28	16.0	834.2	0.0
4.00	0.54	0.55	30.9	834.8	0.0
5.00	0.87	0.88	49.8	835.4	0.0
6.00	1.27	1.28	72.2	836.1	1.0
7.00	1.72	1.74	98.1	836.7	1.5
8.00	2.23	2.25	127.1	837.3	1.8
9.00	2.79	2.82	159.2	838.0	2.5
10.00	3.41	3.43	194.1	838.6	3.0
11.00	4.06	4.10	231.6	839.2	3.5
12.00	4.76	4.80	271.4	839.8	4.0
13.00	5.50	5.55	313.4	840.5	4.5
14.00	6.27	6.32	357.4	841.1	5.0
15.00	7.07	7.13	403.2	841.7	6.0
16.00	7.90	7.97	450.5	842.3	7.0
17.00	8.76	8.83	499.2	842.9	8.0
18.00	9.63	9.71	549.0	843.5	9.0
19.00	10.52	10.61	599.7	844.1	10.0
20.00	11.42	11.52	651.2	844.7	11.0
21.00	12.34	12.44	703.2	845.2	12.0
22.00	13.25	13.37	755.4	845.8	12.8
22.50	13.71	13.83	781.6	846.1	13.9
23.00	14.17	14.29	807.8	846.4	14.8
24.00	15.09	15.22	860.2	846.9	15.7
25.00	16.01	16.15	912.6	847.5	16.8
26.00	16.93	17.08	965.1	848.0	17.3
27.00	17.85	18.00	1017.5	848.5	18.2
28.00	18.77	18.93	1069.9	849.1	19.0
29.00	19.69	19.86	1122.3	849.6	20.0
30.00	20.61	20.78	1174.7	850.1	21.1
31.00	21.53	21.71	1227.1	850.7	22.6
32.00	22.45	22.64	1279.5	851.2	23.9
33.00	23.37	23.57	1331.9	851.7	25.0
34.00	24.28	24.49	1384.3	852.2	26.5
35.00	25.20	25.42	1436.7	852.7	27.7
36.00	26.12	26.35	1489.1	853.3	29.0
37.00	27.04	27.27	1541.5	853.8	30.6



TABLE 4.1-1 (CONTINUED)

FUEL STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
38.00	27.96	28.20	1593.9	854.3	32.0
39.00	28.88	29.13	1646.3	854.8	33.8
40.00	29.80	30.06	1698.7	855.3	35.7
41.00	30.72	30.98	1751.1	855.8	37.0
42.00	31.64	31.91	1803.5	856.3	38.7
43.00	32.56	32.84	1855.9	856.9	40.5
44.00	33.48	33.76	1908.3	857.4	42.6
45.00	34.40	34.69	1960.7	857.9	44.9
46.00	35.32	35.62	2013.1	858.4	47.5
47.00	36.24	36.55	2065.5	858.9	50.3
48.00	37.15	37.47	2117.9	859.4	53.3
49.00	38.07	38.40	2170.3	859.9	56.6
50.00	38.99	39.33	2222.7	860.4	60.2
51.00	39.91	40.25	2275.1	860.9	64.0
52.00	40.83	41.18	2327.5	861.4	68.1
53.00	41.75	42.11	2379.9	861.9	72.4
54.00	42.67	43.04	2432.3	862.5	77.0
55.00	43.59	43.96	2484.7	863.0	81.8
56.00	44.51	44.89	2537.1	863.5	87.0
57.00	45.43	45.82	2589.5	864.0	92.4
58.00	46.35	46.74	2641.9	864.5	98.1
59.00	47.27	47.67	2694.3	865.0	104.1
60.00	48.19	48.60	2746.7	865.5	110.4
61.00	49.11	49.53	2799.1	866.0	117.0
62.00	50.02	50.45	2851.5	866.5	124.0
63.00	50.94	51.38	2903.9	867.0	131.2
64.00	51.86	52.31	2956.3	867.5	138.7
65.00	52.78	53.23	3008.7	868.0	146.6
66.00	53.70	54.16	3061.1	868.5	154.8
67.00	54.62	55.09	3113.5	869.0	163.3
68.00	55.54	56.02	3165.9	869.5	172.2
69.00	56.46	56.94	3218.3	870.0	181.4
70.00	57.38	57.87	3270.7	870.5	191.0
71.00	58.30	58.80	3323.1	871.0	201.0
72.00	59.22	59.72	3375.5	871.5	211.3
73.00	60.14	60.65	3427.9	872.0	221.9
74.00	61.06	61.58	3480.3	872.5	233.0

TABLE 4.1-1 (CONTINUED)

FUEL STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
75.00	61.98	62.51	3532.7	873.0	244.4
76.00	62.89	63.43	3585.1	873.5	256.2
77.00	63.81	64.36	3637.5	874.0	268.4
78.00	64.73	65.29	3689.9	874.6	281.1
79.00	65.65	66.21	3742.3	875.1	294.1
80.00	66.57	67.14	3794.8	875.6	307.5
81.00	67.49	68.07	3847.2	876.1	321.3
82.00	68.41	69.00	3899.6	876.6	335.6
83.00	69.33	69.92	3952.0	877.1	350.3
84.00	70.25	70.85	4004.4	877.6	365.4
85.00	71.17	71.78	4056.8	878.1	381.0
86.00	72.09	72.70	4109.2	878.6	397.0
87.00	73.01	73.63	4161.6	879.1	413.4
88.00	73.93	74.56	4214.0	879.6	430.3
89.00	74.85	75.49	4266.4	880.1	447.7
90.00	75.76	76.41	4318.8	880.6	465.5
91.00	76.68	77.34	4371.2	881.1	483.8
92.00	77.60	78.27	4423.6	881.6	502.6
93.00	78.52	79.19	4476.0	882.1	521.9
94.00	79.44	80.12	4528.4	882.6	541.7
95.00	80.36	81.05	4580.8	883.1	561.9
96.00	81.28	81.97	4633.2	883.6	582.7
97.00	82.20	82.90	4685.6	884.1	603.9
98.00	83.12	83.83	4738.0	884.6	625.7
99.00	84.04	84.76	4790.4	885.1	648.0
100.00	84.96	85.68	4842.8	885.6	670.8
101.00	85.88	86.61	4895.2	886.1	694.2
102.00	86.80	87.54	4947.6	886.6	718.1
103.00	87.71	88.46	5000.0	887.1	742.5
104.00	88.63	89.39	5052.4	887.6	767.5
105.00	89.55	90.32	5104.8	888.1	793.0
106.00	90.47	91.25	5157.2	888.6	819.1
107.00	91.39	92.17	5209.6	889.1	845.8
108.00	92.31	93.10	5262.0	889.6	873.0
109.00	93.23	94.03	5314.4	890.1	900.8
110.00	94.15	94.95	5366.8	890.6	929.2
111.00	95.07	95.88	5419.2	891.1	958.2

TABLE 4.1-1 (CONTINUED)  
FUEL STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA (IYY)
112.00	95.99	96.81	5471.6	891.6	987.7
113.00	96.91	97.74	5524.0	892.1	1017.9
114.00	97.83	98.66	5576.4	892.6	1048.7
115.00	98.75	99.59	5628.8	893.1	1080.1
116.00	99.67	100.52	5681.2	893.6	1112.1
117.00	100.58	101.44	5733.6	894.1	1144.7
118.00	101.50	102.37	5786.0	894.6	1177.9
119.00	102.42	103.30	5838.4	895.1	1211.8
120.00	103.34	104.23	5890.8	895.6	1246.3
121.00	104.26	105.15	5943.2	896.1	1281.5
122.00	105.18	106.08	5995.6	896.6	1317.3
123.00	106.10	107.01	6048.0	897.1	1353.8
124.00	107.02	107.93	6100.4	897.6	1390.9
125.00	107.94	108.86	6152.8	898.1	1428.7
126.00	108.86	109.79	6205.2	898.6	1467.2
127.00	109.78	110.72	6257.6	899.1	1506.4
128.00	110.70	111.64	6310.0	899.6	1546.2
129.00	111.62	112.57	6362.4	900.1	1586.8
130.00	112.54	113.50	6414.8	900.6	1628.0
131.00	113.45	114.42	6467.2	901.1	1669.9
132.00	114.37	115.35	6519.6	901.6	1712.6
132.20	114.56	115.54	6530.1	901.7	1721.2
133.00	115.29	116.28	6572.0	902.1	1755.9
134.00	116.21	117.20	6624.3	902.6	1799.8
135.00	117.12	118.12	6676.1	903.1	1844.1
136.00	118.02	119.03	6727.4	903.6	1888.7
137.00	118.90	119.92	6777.8	904.1	1933.2
138.00	119.77	120.80	6827.3	904.6	1977.5
139.00	120.62	121.65	6875.6	905.0	2021.4
140.00	121.44	122.48	6922.5	905.5	2064.6
141.00	122.23	123.28	6967.7	905.9	2106.9
142.00	123.00	124.05	7011.2	906.3	2148.0
143.00	123.72	124.78	7052.6	906.7	2187.7
144.00	124.41	125.47	7091.7	907.1	2225.7
145.00	125.05	126.12	7128.4	907.5	2261.8
146.00	125.65	126.73	7162.5	907.8	2295.5
147.00	126.20	127.28	7193.7	908.1	2326.7

TABLE 4.1-1 (CONTINUED)

FUEL STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA (IYY)
148.00	126.69	127.78	7221.8	908.4	2355.1
149.00	127.13	128.22	7246.7	908.6	2380.4
150.00	127.50	128.59	7268.1	908.9	2402.3
151.00	127.81	128.91	7285.7	909.0	2420.5
152.00	128.06	129.15	7299.5	909.2	2434.7
153.00	128.23	129.32	7309.2	909.3	2444.7
154.00	128.32	129.42	7314.6	909.3	2450.3
154.70	128.34	129.44	7315.7	909.3	2451.5

TABLE 4.1-1 (CONTINUED)

FUEL SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
4.00	5.02	5.02	283.7	860.5	12.0
5.00	5.31	5.31	300.3	859.1	12.0
6.00	5.67	5.68	321.2	857.7	12.0
7.00	6.11	6.12	346.1	856.3	12.0
8.00	6.61	6.63	374.9	855.0	12.0
9.00	7.18	7.21	407.3	853.9	12.0
10.00	7.81	7.84	443.1	852.9	12.0
11.00	8.49	8.53	482.1	852.0	12.0
12.00	9.23	9.27	524.1	851.3	12.1
13.00	10.01	10.07	568.9	850.8	12.2
14.00	10.85	10.91	616.3	850.4	12.3
15.00	11.72	11.79	666.1	850.1	12.4
16.00	12.63	12.71	718.1	849.9	12.5
17.00	13.57	13.66	772.0	849.8	12.7
18.00	14.55	14.65	827.7	849.8	12.8
19.00	15.56	15.66	885.0	849.8	13.0
20.00	16.58	16.70	943.6	849.9	13.3
21.00	17.63	17.75	1003.3	850.1	13.5
22.00	18.69	18.83	1064.0	850.2	13.8
23.00	19.77	19.91	1125.4	850.5	14.0
24.00	20.86	21.01	1187.3	850.7	14.3
25.00	21.95	22.11	1249.5	851.0	14.6
25.50	22.49	22.66	1280.7	851.2	14.9
26.00	23.04	23.21	1311.8	851.3	15.2
27.00	24.13	24.31	1374.0	851.6	15.4
28.00	25.22	25.41	1436.2	852.0	15.7
29.00	26.31	26.51	1498.4	852.3	16.0
30.00	27.41	27.61	1560.7	852.7	16.7
31.00	28.50	28.71	1622.9	853.1	17.1
32.00	29.59	29.82	1685.1	853.5	17.6
33.00	30.68	30.92	1747.3	853.8	18.2
34.00	31.77	32.02	1809.5	854.2	18.7
35.00	32.86	33.12	1871.8	854.7	19.2
36.00	33.96	34.22	1934.0	855.1	20.0
37.00	35.05	35.32	1996.2	855.5	20.6
38.00	36.14	36.42	2058.4	855.9	21.2
39.00	37.23	37.52	2120.6	856.3	22.1

TABLE 4.1-1 (CONTINUED)

FUEL SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
40.00	38.32	38.62	2182.9	856.8	23.0
41.00	39.41	39.72	2245.1	857.2	24.3
42.00	40.51	40.82	2307.3	857.6	25.8
43.00	41.60	41.92	2369.5	858.1	27.7
44.00	42.69	43.03	2431.7	858.5	29.9
45.00	43.78	44.13	2494.0	859.0	32.3
46.00	44.87	45.23	2556.2	859.4	35.1
47.00	45.96	46.33	2618.4	859.9	38.1
48.00	47.06	47.43	2680.6	860.3	41.5
49.00	48.15	48.53	2742.8	860.8	45.1
50.00	49.24	49.63	2805.1	861.2	49.0
51.00	50.33	50.73	2867.3	861.7	53.2
52.00	51.42	51.83	2929.5	862.2	57.7
53.00	52.51	52.93	2991.7	862.6	62.5
54.00	53.61	54.03	3053.9	863.1	67.6
55.00	54.70	55.13	3116.2	863.6	73.1
56.00	55.79	56.24	3178.4	864.0	78.8
57.00	56.88	57.34	3240.6	864.5	84.9
58.00	57.97	58.44	3302.8	865.0	91.4
58.02	57.99	58.46	3304.1	865.0	91.5
59.00	59.15	59.62	3369.8	865.5	100.8
60.00	60.33	60.81	3436.9	866.0	108.2
61.00	61.50	62.00	3504.1	866.5	115.9
62.00	62.68	63.18	3571.2	867.0	123.9
63.00	63.86	64.37	3638.3	867.5	132.4
64.00	65.04	65.56	3705.4	868.0	141.2
65.00	66.21	66.75	3772.5	868.5	150.5
66.00	67.39	67.93	3839.6	869.0	160.1
67.00	68.57	69.12	3906.7	869.5	170.2
68.00	69.75	70.31	3973.8	870.0	180.7
69.00	70.92	71.50	4040.9	870.5	191.6
70.00	72.10	72.68	4108.0	871.0	203.0
71.00	73.28	73.87	4175.1	871.5	214.8
72.00	74.46	75.06	4242.3	872.0	227.1
73.00	75.63	76.25	4309.4	872.6	239.8
74.00	76.81	77.43	4376.5	873.1	253.0
75.00	77.99	78.62	4443.6	873.6	266.7

TABLE 4.1-1 (CONTINUED)  
FUEL SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
76.00	79.16	79.81	4510.7	874.1	280.8
77.00	80.34	81.00	4577.8	874.6	295.5
78.00	81.52	82.18	4644.9	875.1	310.7
79.00	82.70	83.37	4712.0	875.6	326.4
80.00	83.87	84.56	4779.1	876.1	342.6
81.00	85.05	85.74	4846.2	876.6	359.3
82.00	86.23	86.93	4913.3	877.1	376.5
83.00	87.41	88.12	4980.4	877.6	394.3
84.00	88.58	89.31	5047.6	878.1	412.7
85.00	89.76	90.49	5114.7	878.6	431.6
86.00	90.94	91.68	5181.8	879.1	451.1
87.00	92.12	92.87	5248.9	879.6	471.1
88.00	93.29	94.06	5316.0	880.1	491.7
89.00	94.47	95.24	5383.1	880.6	512.9
90.00	95.65	96.43	5450.2	881.1	534.7
91.00	96.83	97.62	5517.3	881.6	557.2
92.00	98.00	98.81	5584.4	882.1	580.2
93.00	99.18	99.99	5651.5	882.6	603.8
94.00	100.36	101.18	5718.6	883.1	628.1
95.00	101.54	102.37	5785.8	883.6	653.0
96.00	102.71	103.55	5852.9	884.1	678.5
97.00	103.89	104.74	5920.0	884.6	704.7
98.00	105.07	105.93	5987.1	885.1	731.5
99.00	106.25	107.12	6054.2	885.6	759.0
100.00	107.42	108.30	6121.3	886.1	787.2
101.00	108.60	109.49	6188.4	886.6	816.1
102.00	109.78	110.68	6255.5	887.1	845.6
103.00	110.96	111.87	6322.6	887.6	875.9
104.00	112.13	113.05	6389.7	888.1	906.8
105.00	113.31	114.24	6456.8	888.7	938.4
106.00	114.49	115.43	6523.9	889.2	970.8
107.00	115.67	116.62	6591.1	889.7	1003.9
108.00	116.84	117.80	6658.2	890.2	1037.7
109.00	118.02	118.99	6725.3	890.7	1072.2
110.00	119.20	120.18	6792.4	891.2	1107.5
111.00	120.38	121.36	6859.5	891.7	1143.6
112.00	121.55	122.55	6926.6	892.2	1180.4

TABLE 4.1-1 (CONTINUED)  
FUEL SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
113.00	122.73	123.74	6993.7	892.7	1218.0
114.00	123.91	124.93	7060.8	893.2	1256.4
115.00	125.09	126.11	7127.9	893.7	1295.5
116.00	126.26	127.30	7195.0	894.2	1335.4
117.00	127.44	128.49	7262.1	894.7	1376.2
118.00	128.62	129.68	7329.2	895.2	1417.7
119.00	129.79	130.86	7396.4	895.7	1460.0
120.00	130.97	132.05	7463.5	896.2	1503.2
121.00	132.15	133.24	7530.6	896.7	1547.2
122.00	133.33	134.43	7597.7	897.2	1592.0
123.00	134.50	135.61	7664.8	897.7	1637.7
124.00	135.68	136.80	7731.9	898.2	1684.2
125.00	136.86	137.99	7799.0	898.7	1731.6
126.00	138.04	139.17	7866.1	899.2	1779.8
127.00	139.21	140.36	7933.2	899.7	1829.0
128.00	140.39	141.55	8000.3	900.2	1879.0
128.30	140.75	141.91	8020.5	900.3	1894.1
129.00	141.57	142.74	8067.4	900.7	1929.8
130.00	142.74	143.92	8134.4	901.2	1981.5
131.00	143.91	145.10	8201.0	901.7	2033.8
132.00	145.07	146.27	8267.0	902.2	2086.5
132.90	146.10	147.31	8325.8	902.6	2134.1
133.00	146.22	147.42	8332.3	902.7	2139.5
134.00	147.35	148.56	8396.8	903.2	2192.7
135.00	148.46	149.69	8460.2	903.6	2245.8
136.00	149.55	150.78	8522.2	904.1	2298.5
137.00	150.61	151.85	8582.5	904.6	2350.7
138.00	151.63	152.89	8641.1	905.0	2402.0
139.00	152.63	153.89	8697.6	905.4	2452.3
140.00	153.58	154.85	8752.0	905.8	2501.2
141.00	154.49	155.77	8803.9	906.2	2548.6
142.00	155.36	156.64	8853.2	906.6	2594.0
143.00	156.17	157.46	8899.6	907.0	2637.4
144.00	156.93	158.23	8943.0	907.3	2678.3
145.00	157.64	158.94	8983.1	907.6	2716.6
146.00	158.28	159.59	9019.8	907.9	2751.8
147.00	158.86	160.17	9052.8	908.1	2783.8



TABLE 4.1-1 (CONTINUED)

FUEL SUMP TANK		TANK VOLUME		TANK VOLUME		CENTER OF		MOMENT OF	
HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	PROPELLANT MASS	MASS OF PROPELLANT	MASS	INERTIA(IYY)	MASS	INERTIA(IYY)	
148.00	159.37	160.69	9082.0	9107.0	908.4	2812.2	908.6	2836.8	
149.00	159.81	161.13	9127.8	9144.0	908.7	2857.3	908.9	2873.4	
150.00	160.17	161.50	9155.6	9162.2	909.0	2884.9	909.0	2891.5	
151.00	160.46	161.78	9163.9		909.0	2893.1	909.0		
152.00	160.66	161.99							
153.00	160.78	162.11							
153.80	160.81	162.14							

TABLE 4.1-1-1 (CONTINUED)

OXIDIZER STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
2.00	0.09	0.09	8.0	834.2	0.1
3.00	0.28	0.28	25.5	834.2	0.4
4.00	0.54	0.55	49.4	834.8	0.9
5.00	0.87	0.88	79.4	835.4	1.6
6.00	1.27	1.28	115.2	836.1	2.3
7.00	1.72	1.74	156.4	836.7	3.1
8.00	2.23	2.25	202.8	837.3	4.1
9.00	2.79	2.82	254.0	838.0	5.2
10.00	3.41	3.43	309.6	838.6	6.3
11.00	4.06	4.10	369.4	839.2	7.6
12.00	4.76	4.80	432.9	839.8	8.9
13.00	5.50	5.55	500.0	840.5	10.3
14.00	6.27	6.32	570.2	841.1	11.6
15.00	7.07	7.13	643.1	841.7	13.2
16.00	7.90	7.97	718.6	842.3	14.7
17.00	8.76	8.83	796.2	842.9	16.4
18.00	9.63	9.71	875.7	843.5	18.0
19.00	10.52	10.61	956.6	844.1	19.8
20.00	11.42	11.52	1038.7	844.7	21.4
21.00	12.34	12.44	1121.6	845.2	23.2
22.00	13.25	13.37	1205.0	845.8	24.9
22.50	13.71	13.83	1246.8	846.1	25.8
23.00	14.17	14.29	1288.5	846.4	26.7
24.00	15.09	15.22	1372.1	846.9	28.5
25.00	16.01	16.15	1455.7	847.5	30.3
26.00	16.93	17.08	1539.3	848.0	32.8
27.00	17.85	18.00	1622.9	848.5	33.7
28.00	18.77	18.93	1706.5	849.1	35.5
29.00	19.69	19.86	1790.0	849.6	37.3
30.00	20.61	20.78	1873.6	850.1	39.0
31.00	21.53	21.71	1957.2	850.7	40.7
32.00	22.45	22.64	2040.8	851.2	42.6
33.00	23.37	23.57	2124.4	851.7	44.3
34.00	24.28	24.49	2207.9	852.2	46.0
35.00	25.20	25.42	2291.5	852.7	47.8
36.00	26.12	26.35	2375.1	853.3	49.5
37.00	27.04	27.27	2458.7	853.8	51.3

TABLE 4.1-1 (CONTINUED)

OXIDIZER STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
38.00	27.96	28.20	2542.3	854.3	53.2
39.00	28.88	29.13	2625.9	854.8	55.2
40.00	29.80	30.06	2709.4	855.3	56.9
41.00	30.72	30.98	2793.0	855.8	59.1
42.00	31.64	31.91	2876.6	856.3	61.7
43.00	32.56	32.84	2960.2	856.9	64.6
44.00	33.48	33.76	3043.8	857.4	66.0
45.00	34.40	34.69	3127.3	857.9	71.7
46.00	35.32	35.62	3210.9	858.4	75.8
47.00	36.24	36.55	3294.5	858.9	80.2
48.00	37.15	37.47	3378.1	859.4	85.1
49.00	38.07	38.40	3461.7	859.9	90.4
50.00	38.99	39.33	3545.2	860.4	96.0
51.00	39.91	40.25	3628.8	860.9	102.1
52.00	40.83	41.18	3712.4	861.4	108.6
53.00	41.75	42.11	3796.0	861.9	115.5
54.00	42.67	43.04	3879.6	862.5	122.8
55.00	43.59	43.96	3963.2	863.0	130.6
56.00	44.51	44.89	4046.7	863.5	138.8
57.00	45.43	45.82	4130.3	864.0	147.4
58.00	46.35	46.74	4213.9	864.5	156.5
59.00	47.27	47.67	4297.5	865.0	166.1
60.00	48.19	48.60	4381.1	865.5	176.2
61.00	49.11	49.53	4464.6	866.0	186.7
62.00	50.02	50.45	4548.2	866.5	197.7
63.00	50.94	51.38	4631.8	867.0	209.3
64.00	51.86	52.31	4715.4	867.5	221.3
65.00	52.78	53.23	4799.0	868.0	233.9
66.00	53.70	54.16	4882.6	868.5	246.9
67.00	54.62	55.09	4966.1	869.0	260.6
68.00	55.54	56.02	5049.7	869.5	274.7
69.00	56.46	56.94	5133.3	870.0	289.4
70.00	57.38	57.87	5216.9	870.5	304.7
71.00	58.30	58.80	5300.5	871.0	320.6
72.00	59.22	59.72	5384.0	871.5	337.0
73.00	60.14	60.65	5467.6	872.0	354.0
74.00	61.06	61.58	5551.2	872.5	371.6

TABLE 4.1-1-1 (CONTINUED)

OXIDIZER STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
75.00	61.98	62.51	5634.8	873.0	389.9
76.00	62.89	63.43	5718.4	873.5	408.7
77.00	63.81	64.36	5802.0	874.0	428.2
78.00	64.73	65.29	5885.5	874.6	448.3
79.00	65.65	66.21	5969.1	875.1	469.1
80.00	66.57	67.14	6052.7	875.6	490.5
81.00	67.49	68.07	6136.3	876.1	512.5
82.00	68.41	69.00	6219.9	876.6	535.3
83.00	69.33	69.92	6303.4	877.1	558.7
84.00	70.25	70.85	6387.0	877.6	582.8
85.00	71.17	71.78	6470.6	878.1	607.6
86.00	72.09	72.70	6554.2	878.6	633.2
87.00	73.01	73.63	6637.8	879.1	659.4
88.00	73.93	74.56	6721.3	879.6	686.4
89.00	74.85	75.49	6804.9	880.1	714.1
90.00	75.76	76.41	6888.5	880.6	742.5
91.00	76.68	77.34	6972.1	881.1	771.7
92.00	77.60	78.27	7055.7	881.6	801.7
93.00	78.52	79.19	7139.3	882.1	832.4
94.00	79.44	80.12	7222.8	882.6	864.0
95.00	80.36	81.05	7306.4	883.1	896.3
96.00	81.28	81.97	7390.0	883.6	929.4
97.00	82.20	82.90	7473.6	884.1	963.3
98.00	83.12	83.83	7557.2	884.6	998.1
99.00	84.04	84.76	7640.7	885.1	1033.6
100.00	84.96	85.68	7724.3	885.6	1070.0
101.00	85.88	86.61	7807.9	886.1	1107.3
102.00	86.80	87.54	7891.5	886.6	1145.4
103.00	87.71	88.46	7975.1	887.1	1184.4
104.00	88.63	89.39	8058.7	887.6	1224.2
105.00	89.55	90.32	8142.2	888.1	1264.9
106.00	90.47	91.25	8225.8	888.6	1306.6
107.00	91.39	92.17	8309.4	889.1	1349.1
108.00	92.31	93.10	8393.0	889.6	1392.5
109.00	93.23	94.03	8476.6	890.1	1436.8
110.00	94.15	94.95	8560.1	890.6	1482.1
111.00	95.07	95.88	8643.7	891.1	1528.3

TABLE 4.1-1 (CONTINUED)  
OXIDIZER STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
112.00	95.99	96.81	8727.3	891.6	1575.5
113.00	96.91	97.74	8810.9	892.1	1623.6
114.00	97.83	98.66	8894.5	892.6	1672.7
115.00	98.75	99.59	8978.0	893.1	1722.7
116.00	99.67	100.52	9061.6	893.6	1773.8
117.00	100.58	101.44	9145.2	894.1	1825.8
118.00	101.50	102.37	9228.8	894.6	1878.8
119.00	102.42	103.30	9312.4	895.1	1932.9
120.00	103.34	104.23	9396.0	895.6	1988.0
121.00	104.26	105.15	9479.5	896.1	2044.0
122.00	105.18	106.08	9563.1	896.6	2101.2
123.00	106.10	107.01	9646.7	897.1	2159.4
124.00	107.02	107.93	9730.3	897.6	2218.6
125.00	107.94	108.86	9813.9	898.1	2278.9
126.00	108.86	109.79	9897.4	898.6	2340.3
127.00	109.78	110.72	9981.0	899.1	2402.7
128.00	110.70	111.64	10064.6	899.6	2466.3
129.00	111.62	112.57	10148.2	900.1	2530.9
130.00	112.54	113.50	10231.8	900.6	2596.7
131.00	113.45	114.42	10315.4	901.1	2663.6
132.00	114.37	115.35	10398.9	901.6	2731.6
132.20	114.56	115.54	10415.7	901.7	2745.3
133.00	115.29	116.28	10482.5	902.1	2800.7
134.00	116.21	117.20	10565.8	902.6	2870.8
135.00	117.12	118.12	10648.5	903.1	2941.4
136.00	118.02	119.03	10730.2	903.6	3012.5
137.00	118.90	119.92	10810.7	904.1	3083.5
138.00	119.77	120.80	10889.7	904.6	3154.2
139.00	120.62	121.65	10966.7	905.0	3224.2
140.00	121.44	122.48	11041.4	905.5	3293.1
141.00	122.23	123.28	11113.6	905.9	3360.6
142.00	123.00	124.05	11182.9	906.3	3426.2
143.00	123.72	124.78	11248.9	906.7	3489.5
144.00	124.41	125.47	11311.4	907.1	3550.1
145.00	125.05	126.12	11369.9	907.5	3607.6
146.00	125.65	126.73	11424.3	907.8	3661.4
147.00	126.20	127.28	11474.0	908.1	3711.2

TABLE 4.1-1 (CONTINUED)

OXIDIZER STORAGE TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
148.00	126.69	127.78	11518.9	908.4	3756.5
149.00	127.13	128.22	11558.6	908.6	3796.8
150.00	127.50	128.59	11592.7	908.9	3831.7
151.00	127.81	128.91	11620.9	909.0	3860.7
152.00	128.06	129.15	11642.9	909.2	3883.4
153.00	128.23	129.32	11658.3	909.3	3899.4
154.00	128.32	129.42	11666.9	909.3	3908.3
154.70	128.34	129.44	11668.6	909.3	3910.1

TABLE 4.1-1 (CONTINUED)  
OXIDIZER SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA (I <sub>YY</sub> )
4.00	5.02	5.02	452.5	860.5	19.3
5.00	5.31	5.31	479.0	859.1	20.1
6.00	5.67	5.68	512.3	857.7	20.5
7.00	6.11	6.12	552.1	856.3	20.8
8.00	6.61	6.63	598.0	855.0	21.0
9.00	7.18	7.21	649.6	853.9	21.4
10.00	7.81	7.84	706.7	852.9	21.8
11.00	8.49	8.53	768.9	852.0	22.1
12.00	9.23	9.27	836.0	851.3	22.4
13.00	10.01	10.07	907.4	850.8	23.0
14.00	10.85	10.91	983.1	850.4	23.5
15.00	11.72	11.79	1062.5	850.1	24.0
16.00	12.63	12.71	1145.4	849.9	24.4
17.00	13.57	13.66	1231.4	849.8	25.1
18.00	14.55	14.65	1320.2	849.8	25.6
19.00	15.56	15.66	1411.6	849.8	25.9
20.00	16.58	16.70	1505.0	849.9	26.1
21.00	17.63	17.75	1600.3	850.1	26.4
22.00	18.69	18.83	1697.1	850.2	26.8
23.00	19.77	19.91	1795.0	850.5	27.1
24.00	20.86	21.01	1893.8	850.7	27.5
25.00	21.95	22.11	1993.0	851.0	27.9
25.50	22.49	22.66	2042.7	851.2	28.2
26.00	23.04	23.21	2092.3	851.3	28.4
27.00	24.13	24.31	2191.6	851.6	28.6
28.00	25.22	25.41	2290.8	852.0	28.8
29.00	26.31	26.51	2390.1	852.3	29.0
30.00	27.41	27.61	2489.3	852.7	29.3
31.00	28.50	28.71	2588.5	853.1	29.8
32.00	29.59	29.82	2687.8	853.5	30.3
33.00	30.68	30.92	2787.0	853.8	31.9
34.00	31.77	32.02	2886.3	854.2	31.6
35.00	32.86	33.12	2985.5	854.7	32.1
36.00	33.96	34.22	3084.8	855.1	32.9
37.00	35.05	35.32	3184.0	855.5	33.9
38.00	36.14	36.42	3283.2	855.9	34.3
39.00	37.23	37.52	3382.5	856.3	35.2

TABLE 4.1-1 (CONTINUED)

## OXIDIZER SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
43.00	38.32	38.62	3481.7	856.8	36.7
41.00	39.41	39.72	3581.0	857.2	38.7
42.00	40.51	40.82	3680.2	857.6	41.2
43.00	41.60	41.92	3779.4	858.1	44.2
44.00	42.69	43.03	3878.7	858.5	47.7
45.00	43.78	44.13	3977.9	859.0	51.6
46.00	44.87	45.23	4077.2	859.4	56.0
47.00	45.96	46.33	4176.4	859.9	60.8
48.00	47.06	47.43	4275.7	860.3	66.1
49.00	48.15	48.53	4374.9	860.8	71.9
50.00	49.24	49.63	4474.1	861.2	78.1
51.00	50.33	50.73	4573.4	861.7	84.9
52.00	51.42	51.83	4672.6	862.2	92.0
53.00	52.51	52.93	4771.9	862.6	99.7
54.00	53.61	54.03	4871.1	863.1	107.9
55.00	54.70	55.13	4970.3	863.6	116.6
56.00	55.79	56.24	5069.6	864.0	125.8
57.00	56.88	57.34	5168.8	864.5	135.5
58.00	57.97	58.44	5268.1	865.0	145.7
58.02	57.99	58.46	5270.1	865.0	146.0
59.00	59.15	59.62	5375.0	865.5	160.9
60.00	60.33	60.81	5482.0	866.0	172.5
61.00	61.50	62.00	5589.0	866.5	184.8
62.00	62.68	63.18	5696.1	867.0	197.7
63.00	63.86	64.37	5803.1	867.5	211.2
64.00	65.04	65.56	5910.1	868.0	225.3
65.00	66.21	66.75	6017.2	868.5	240.0
66.00	67.39	67.93	6124.2	869.0	255.4
67.00	68.57	69.12	6231.3	869.5	271.5
68.00	69.75	70.31	6338.3	870.0	288.2
69.00	70.92	71.50	6445.3	870.5	305.6
70.00	72.10	72.68	6552.4	871.0	323.8
71.00	73.28	73.87	6659.4	871.5	342.6
72.00	74.46	75.06	6766.5	872.0	362.2
73.00	75.63	76.25	6873.5	872.6	382.5
74.00	76.81	77.43	6980.5	873.1	403.5
75.00	77.99	78.62	7087.6	873.6	425.4



TABLE 4.1-1 (CONTINUED)  
OXIDIZER SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(I <sub>YY</sub> )
76.00	79.16	79.81	7194.6	874.1	448.0
77.00	80.34	81.00	7361.7	874.6	471.4
78.00	81.52	82.18	7408.7	875.1	495.6
79.00	82.70	83.37	7515.7	875.6	520.6
80.00	83.87	84.56	7622.8	876.1	546.4
81.00	85.05	85.74	7729.8	876.6	573.1
82.00	86.23	86.93	7836.9	877.1	600.6
83.00	87.41	88.12	7943.9	877.6	629.0
84.00	88.58	89.31	8050.9	878.1	658.3
85.00	89.76	90.49	8158.0	878.6	688.4
86.00	90.94	91.68	8265.0	879.1	719.5
87.00	92.12	92.87	8372.0	879.6	751.4
88.00	93.29	94.06	8479.1	880.1	784.3
89.00	94.47	95.24	8586.1	880.6	818.2
90.00	95.65	96.43	8693.2	881.1	853.0
91.00	96.83	97.62	8800.2	881.6	888.7
92.00	98.00	98.81	8907.2	882.1	925.4
93.00	99.18	99.99	9014.3	882.6	963.1
94.00	100.36	101.18	9121.3	883.1	1001.8
95.00	101.54	102.37	9228.4	883.6	1041.5
96.00	102.71	103.55	9335.4	884.1	1082.3
97.00	103.89	104.74	9442.4	884.6	1124.0
98.00	105.07	105.93	9549.5	885.1	1166.8
99.00	106.25	107.12	9656.5	885.6	1210.7
100.00	107.42	108.30	9763.6	886.1	1255.7
101.00	108.60	109.49	9870.6	886.6	1301.7
102.00	109.78	110.68	9977.6	887.1	1348.8
103.00	110.96	111.87	10084.7	887.6	1397.0
104.00	112.13	113.05	10191.7	888.1	1446.4
105.00	113.31	114.24	10298.8	888.7	1496.8
106.00	114.49	115.43	10405.8	889.2	1548.5
107.00	115.67	116.62	10512.8	889.7	1601.2
108.00	116.84	117.80	10619.9	890.2	1655.2
109.00	118.02	118.99	10726.9	890.7	1710.3
110.00	119.20	120.18	10833.9	891.2	1766.6
111.00	120.38	121.36	10941.0	891.7	1824.1
112.00	121.55	122.55	11048.0	892.2	1882.8

TABLE 4.1-1 (CONTINUED)

OXIDIZER SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRETCHED	TANK VOLUME STRETCHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
113.00	122.73	123.74	11155.1	892.7	1942.7
114.00	123.91	124.93	11262.1	893.2	2003.9
115.00	125.09	126.11	11369.1	893.7	2066.4
116.00	126.26	127.30	11476.2	894.2	2130.0
117.00	127.44	128.49	11583.2	894.7	2195.0
118.00	128.62	129.68	11690.3	895.2	2261.3
119.00	129.79	130.86	11797.3	895.7	2328.8
120.00	130.97	132.05	11904.3	896.2	2397.7
121.00	132.15	133.24	12011.4	896.7	2467.8
122.00	133.33	134.43	12118.4	897.2	2539.3
123.00	134.50	135.61	12225.5	897.7	2612.2
124.00	135.68	136.80	12332.5	898.2	2686.4
125.00	136.86	137.99	12439.5	898.7	2762.0
126.00	138.04	139.17	12546.6	899.2	2838.9
127.00	139.21	140.36	12653.6	899.7	2917.2
128.00	140.39	141.55	12760.6	900.2	2997.0
128.30	140.75	141.91	12792.8	900.3	3021.2
129.00	141.57	142.74	12867.7	900.7	3078.1
130.00	142.74	143.92	12974.5	901.2	3160.5
131.00	143.91	145.10	13080.7	901.7	3243.9
132.00	145.07	146.27	13186.0	902.2	3328.0
133.00	146.10	147.31	13279.8	902.6	3404.0
134.00	146.22	147.42	13290.2	902.7	3412.5
135.00	147.35	148.56	13393.1	903.2	3497.4
136.00	148.46	149.69	13494.1	903.6	3582.1
137.00	149.55	150.78	13593.0	904.1	3666.2
138.00	150.61	151.85	13689.2	904.6	3749.4
139.00	151.63	152.89	13782.7	905.0	3831.3
140.00	152.63	153.89	13872.9	905.4	3911.4
141.00	153.58	154.85	13959.5	905.8	3989.5
142.00	154.49	155.77	14042.3	906.2	4065.0
143.00	155.36	156.64	14120.9	906.6	4137.6
144.00	156.17	157.46	14195.0	907.0	4206.7
145.00	156.93	158.23	14264.2	907.3	4272.0
146.00	157.64	158.94	14328.2	907.6	4333.0
147.00	158.28	159.59	14386.7	907.9	4389.2
	158.86	160.17	14439.4	908.1	4440.2

TABLE 4.1-1 (CONTINUED)

OXIDIZER SUMP TANK

HEIGHT OF PROPELLANT	TANK VOLUME UNSTRECHED	TANK VOLUME STRECHED	MASS OF PROPELLANT	CENTER OF MASS	MOMENT OF INERTIA(IYY)
148.00	159.37	160.69	14485.8	908.4	4485.5
149.00	159.81	161.13	14525.8	908.6	4524.7
150.00	160.17	161.50	14558.9	908.7	4557.4
151.00	160.46	161.78	14584.9	908.9	4583.1
152.00	160.66	161.99	14603.3	909.0	4601.4
153.00	160.78	162.11	14613.9	909.0	4612.0
153.80	160.81	162.14	14616.5	909.0	4614.6

TABLE 4.1-2

TRAPPED SPS MASS PROPERTIES

<u>SERVICE MODULE</u>	Weight Pounds	Center of Gravity Inches		
		X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>
<sup>1</sup> SPS - Trapped Outside Tanks				
Engine - Fuel	29.6	846.9	6.6	0.4
- Oxidizer	47.4	843.0	-7.1	1.6
Feedline - Fuel	29.5	832.0	-48.0	-25.0
- Oxidizer	44.7	832.0	48.0	25.0
Transfer Line - Fuel	19.5	829.0	-27.0	-24.0
- Oxidizer	31.6	829.0	27.0	24.0
Total Outside Tanks	202.3	836.0	4.5	3.7
<sup>2</sup> Trapped in Tanks				
Retention Reservoir - Fuel	61.4			
- Oxidizer	97.5			
Vapor - Fuel	6.2			
- Oxidizer	74.0			
Total Inside Tanks	239.1			

<sup>1</sup> SPS propellant trapped outside tanks should be subtracted from the total SPS propellant load for a particular mission to arrive at the tanked SPS propellant. This tanked amount is then used in the preceding tables to arrive at the appropriate SPS propellant Mass Properties.

<sup>2</sup> The total SPS propellant load for a particular mission less trapped in tanks and outside tanks equals nominal deliverable SPS propellant.

## SPS Propellant Density Equations (S/C 107 and Subsequent)

Equations for calculating SPS fuel and oxidizer densities are given below. In order to calculate the density for fuel or oxidizer of a given load on a particular mission using the measured density furnished by KSC the following steps are necessary:

- A. Use the appropriate equation below and calculate the fuel or oxidizer density at the given pressure and temperature of the KSC sample. This will usually be 14.7 PSIA and 25°C for fuel, and 14.7 PSIA and 4°C for oxidizer.
- B. Use the appropriate equation below and calculate the fuel or oxidizer density at the final system pressure and temperature. This will usually be 110±5 PSIA and 70±5°F.
- C. Subtract the density obtained in step A from the measured density of the KSC sample, and add this amount (may be either positive or negative) to the density obtained from step B.

A-50 DENSITY EQUATION

$$\rho_F = [57.6095 - 0.058533(^{\circ}\text{C})](C_F)$$

where:  $\rho_F$  = A-50 density in lb/ft<sup>3</sup>

$^{\circ}\text{C}$  = Temperature in degrees centigrade

$C_F$  = Compressibility factor - obtain this number from the pressure - compressibility graph on Figure 4.1-1 of this section.

N<sub>2</sub>O<sub>4</sub> DENSITY EQUATION

$$\rho_O = [93.1048 - 0.14252(^{\circ}\text{C})](C_O)$$

where:  $\rho_O$  = N<sub>2</sub>O<sub>4</sub> density in lb/ft

$^{\circ}\text{C}$  = Temperature in degrees centigrade

$C_O$  = Compressibility factor - obtain this number from the pressure - compressibility graph on Figure 4.1-2 of this section.

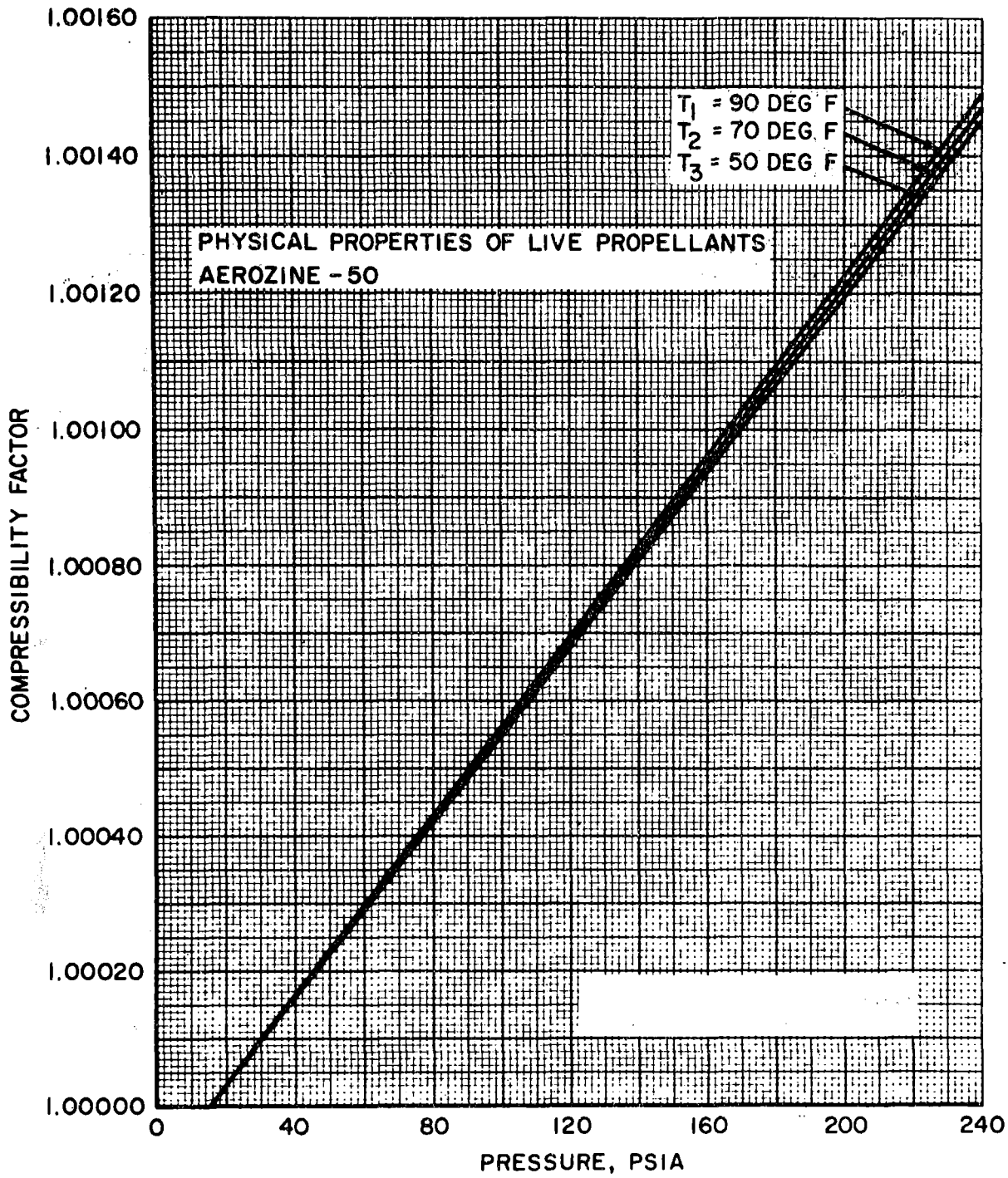


FIGURE 4.1-1. AEROZINE-50 COMPRESSIBILITY CORRECTION FACTOR

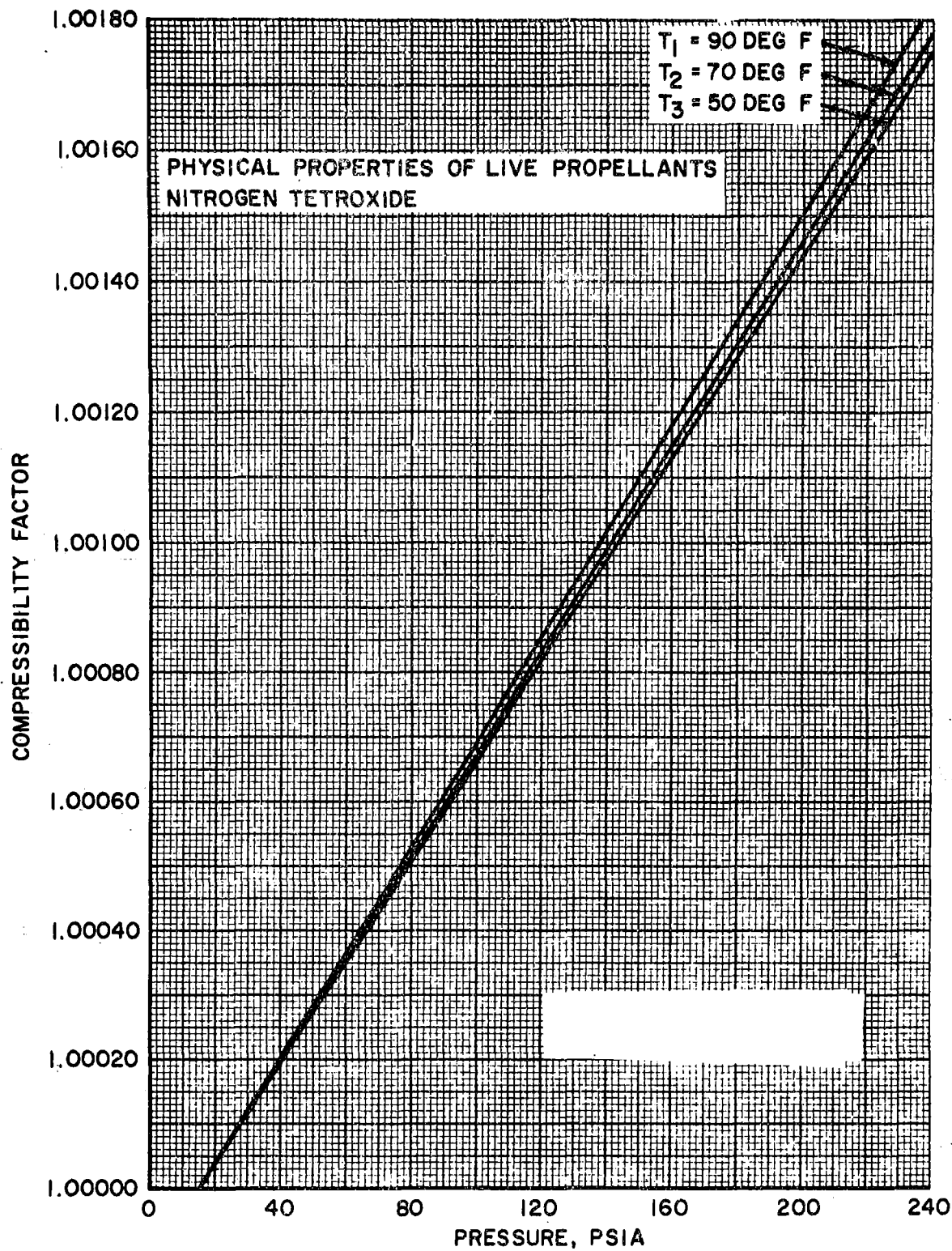


FIGURE 4.1-2. NITROGEN TETROXIDE COMPRESSIBILITY CORRECTION FACTOR

FUEL

FOR ULLAGE LOADING PRESSURE OF 110±4 PSIA

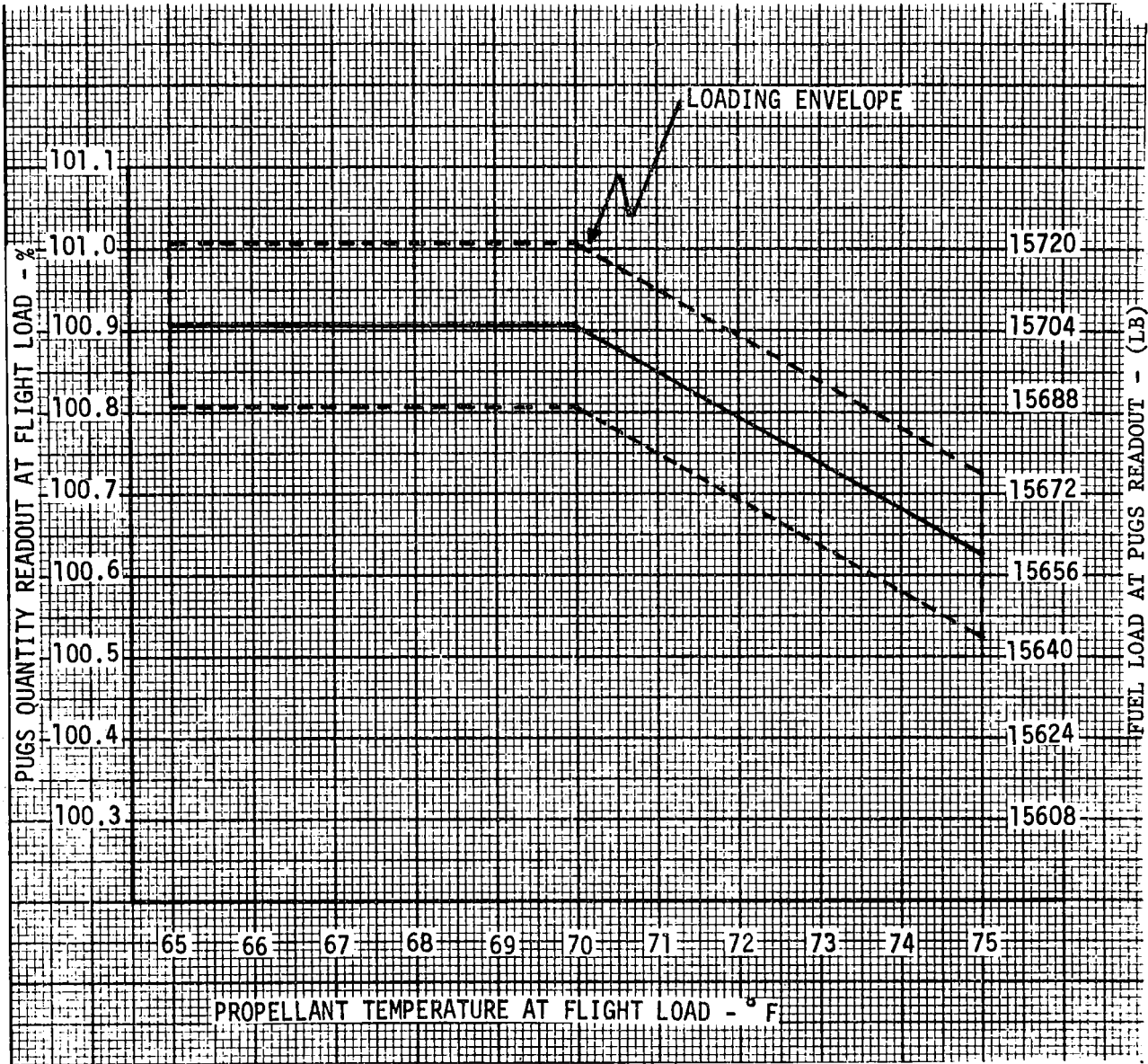


FIGURE 4.1-3. SERVICE MODULE SPS FUEL LOADING WINDOW FOR SM 107 AND SUBSEQUENT



FUEL

FOR ULLAGE LOADING PRESSURE OF 110±4 PSIA

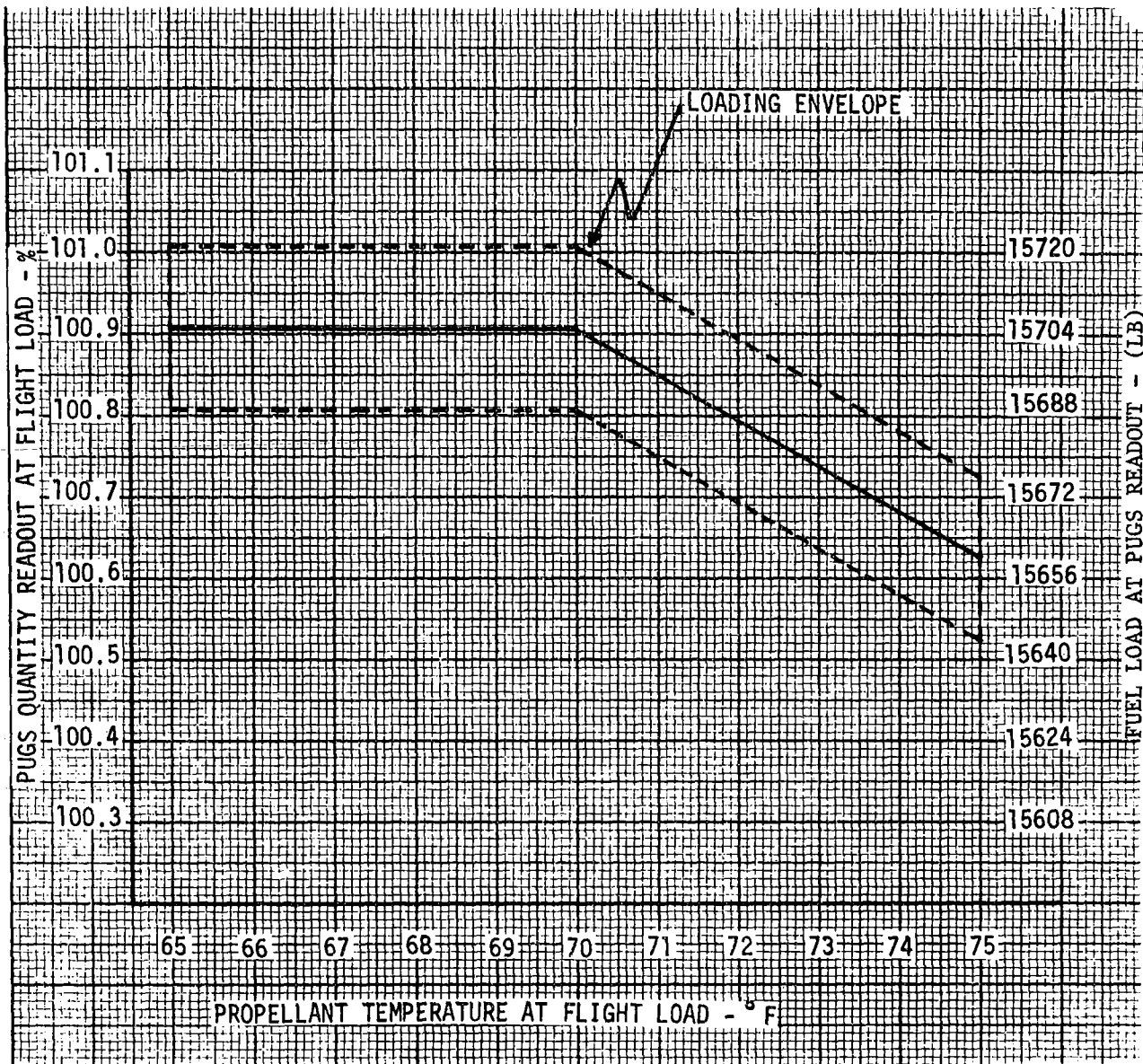


FIGURE 4.1-3. SERVICE MODULE SPS FUEL LOADING WINDOW FOR SM 107 AND SUBSEQUENT

OXIDIZER

FOR ULLAGE LOADING PRESSURE OF 110±4 PSIA

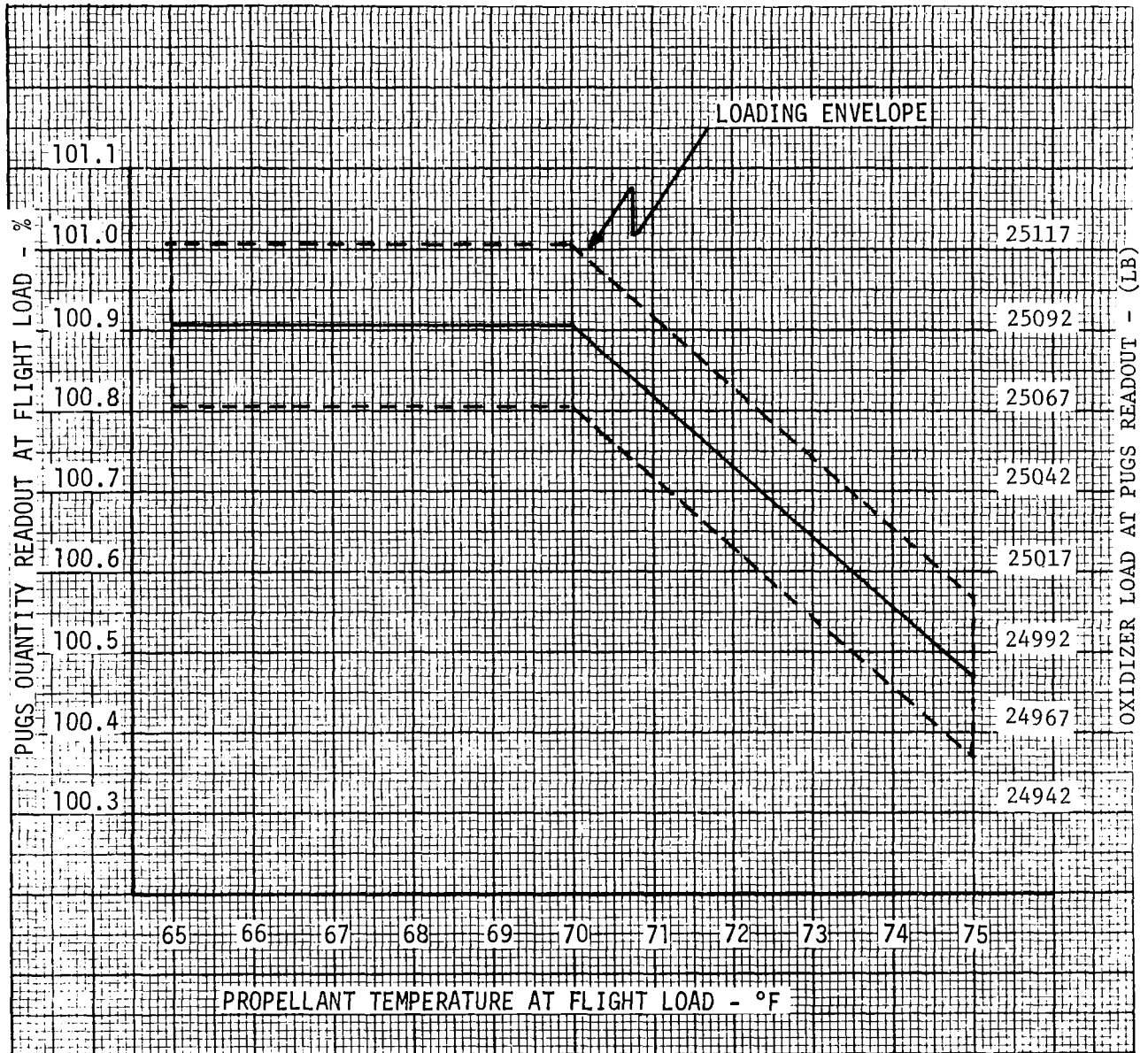


FIGURE 4.1-4. SERVICE MODULE SPS OXIDIZER LOADING WINDOW FOR SM 107 AND SUBSEQUENT

TABLE 4.2-1  
CSM - CONSUMABLE LOADS AND UNCERTAINTIES

This table contains the consumable loads, associated tolerances, and/or uncertainties at nominal loading temperatures and pressures.

	WEIGHT POUNDS	(1) CENTER OF GRAVITY INCHES		
		X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>
<b>COMMAND MODULE</b>				
Nominal Load				
RCS (2)				
Loaded System 1 - Fuel	44.2±0.9	1022.6	-38.7	52.8
System 1 - Oxidizer	78.3±1.6	1022.6	26.6	59.8
System 2 - Fuel	44.2±0.9	1022.6	-52.8	38.7
System 2 - Oxidizer	78.3±1.6	1022.6	2.3	65.5
Loaded - Fuel	88.4±1.3	1022.6	-45.8	45.8
- Oxidizer	156.6±2.3	1022.6	14.5	62.7
Total Loaded	245.0±2.6	1022.6	-7.3	57.0
Maximum Trapped				
System 1 - Fuel	6.9	1022.6	-38.7	52.8
System 1 - Oxidizer	11.7	1022.6	26.6	59.8
System 2 - Fuel	6.4	1022.6	-52.8	38.7
System 2 - Oxidizer	11.4	1022.6	2.3	65.5
Trapped - Fuel	13.3	1022.6	-45.5	46.0
- Oxidizer	23.1	1022.6	14.6	62.6
Total Trapped (Maximum)	36.4	1022.6	-7.3	56.5
Deliverable (6)				
System 1 - Fuel	37.3±0.9	1022.6	-38.7	52.8
System 1 - Oxidizer	66.6±1.6	1022.6	26.6	59.8
System 2 - Fuel	37.8±0.9	1022.6	-52.8	38.7
System 2 - Oxidizer	66.9±1.6	1022.6	2.3	65.5
Deliverable - Fuel	75.1±1.3	1022.6	-45.8	45.7
- Oxidizer	133.5±2.3	1022.6	14.4	62.7
Total Deliverable	208.6±2.6	1022.6	-7.3	56.5

TABLE 4.2-1 (CONTINUED)

SERVICE MODULE - Nominal Load RCS(2)	Weight Pounds	(1)Center of Gravity Inches		
		X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>
Quad A - Loaded Primary - Fuel	69.9±0.8	964.8	8.0	-68.5
Secondary-Fuel	40.3±0.8	985.1	-7.0	-69.0
Oxidizer	225.4±3.4	926.9	8.0	-68.5
Quad B - Loaded Primary - Fuel	69.9±0.8	964.8	64.5	-26.5
Secondary-Fuel	40.3±0.8	985.1	68.0	-11.0
Oxidizer	225.4±3.4	926.9	64.5	-26.5
Quad C - Loaded Primary - Fuel	69.9±0.8	964.8	-8.0	68.5
Secondary-Fuel	40.3±0.8	985.1	7.0	69.0
Oxidizer	225.4±3.4	926.9	-8.0	68.5
Quad D - Loaded Primary - Fuel	69.9±0.8	964.8	-64.5	26.5
Secondary-Fuel	40.3±0.8	985.1	-68.0	11.0
Oxidizer	225.4±3.4	926.9	-64.5	26.5
Loaded Primary - Fuel	279.6±1.6	964.8	0.0	0.0
Secondary-Fuel	161.2±1.6	985.1	0.0	0.0
Oxidizer	901.6±6.8	926.9	0.0	0.0
Loaded - Fuel	440.8±2.3	972.9	0.0	0.0
-Oxidizer	901.6±6.8	926.9	0.0	0.0
TOTAL LOADED	1342.4±7.2	942.1	0.0	0.0
Max. Trapped--Quad A - Primary Fuel	1.4	964.8	8.0	-68.5
- Secondary Fuel	0.7	985.1	-7.0	-69.0
- Oxidizer	4.5	926.9	8.0	-68.5
Quad B - Primary Fuel	1.4	964.8	64.5	-26.5
- Secondary Fuel	0.7	985.1	68.0	-11.0
- Oxidizer	4.5	926.9	64.5	-26.5
Quad C - Primary Fuel	1.4	964.8	-8.0	68.5
- Secondary Fuel	0.7	985.1	7.0	69.0
- Oxidizer	4.5	926.9	-8.0	68.5
Quad D - Primary Fuel	1.4	964.8	-64.5	26.5
- Secondary Fuel	0.7	985.1	-68.0	11.0
- Oxidizer	4.5	926.9	-64.5	26.5
Trapped Primary Fuel	5.6	964.8	0.0	0.0
Secondary Fuel	2.8	985.1	0.0	0.0
Oxidizer	18.0	926.9	0.0	0.0
Trapped Fuel	8.4	971.6	0.0	0.0
Oxidizer	18.0	926.9	0.0	0.0
TOTAL TRAPPED (MAXIMUM)	26.4	940.9	0.0	0.0

TABLE 4.2-1 (CONTINUED)

	Weight Pounds	Center of Gravity Inches		
		X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>
<b>Deliverable (6)</b>				
Quad A - Primary Fuel	68.5±0.8	964.8	8.0	-68.5
- Secondary Fuel	39.6±0.8	985.1	-7.0	-69.0
- Oxidizer	220.9±3.4	926.9	8.0	-68.5
Quad B - Primary Fuel	68.5±0.8	964.8	64.5	-26.5
- Secondary Fuel	39.6±0.8	985.1	68.0	-11.0
- Oxidizer	220.9±3.4	926.9	64.5	-26.5
Quad C - Primary Fuel	68.5±0.8	964.8	-8.0	68.5
- Secondary Fuel	39.6±0.8	985.1	7.0	69.0
- Oxidizer	220.9±3.4	926.9	-8.0	68.5
Quad D - Primary Fuel	68.5±0.8	964.8	-64.5	26.5
- Secondary Fuel	39.6±0.8	985.1	-68.0	11.0
- Oxidizer	220.9±3.4	926.9	-64.5	26.5
Deliverable Primary Fuel	274.0±1.6	964.8	0.0	0.0
Secondary Fuel	158.4±1.6	985.1	0.0	0.0
Oxidizer	883.6±6.8	926.9	0.0	0.0
Deliverable Fuel	432.4±2.3	972.9	0.0	0.0
Oxidizer	883.6±6.8	926.9	0.0	0.0
<b>Total Deliverable (6)</b>	<b>1316.0±7.2</b>	<b>942.1</b>	<b>0.0</b>	<b>0.0</b>

TABLE 4.2-1 (CONTINUED)

## CSM 112 AND SUBSEQUENT MISCELLANEOUS CONSUMABLES

CSM MISCELLANEOUS CONSUMABLES	WEIGHT POUNDS	CENTER OF GRAVITY INCHES		
		X <sub>A</sub>	Y <sub>A</sub>	Z <sub>A</sub>
CM/RCS - HELIUM	1.0	1022.6	-3.1	25.8
CM/ECS				
Oxygen - Entry	(7)	1031.1	-26.9	-34.2
Potable Water (3)	(7)	1022.6	-63.5	-16.4
Waste Water (4)	(7)	1022.6	-19.7	62.5
SM/RCS - Helium	6.0	983.9	0.0	0.0
SM/SPS Helium - Storage Bottles	87.6	954.7	0.0	0.0
- Tanks (5)	5.4	976.0	2.7	8.9
SM/Nitrogen	1.3	874.0	0.0	0.0
SM/EPS/ECS				
Oxygen - Hydrogen <sup>1</sup>				
H <sub>2</sub>	29.3	974.6	37.0	-46.0
H <sub>2</sub>	29.3	859.4	-40.7	41.2
H <sub>2</sub>	29.3	892.9	-40.7	41.2
O <sub>2</sub>	330.1	920.8	-20.9	26.9
O <sub>2</sub>	330.1	920.8	-27.4	54.5
O <sub>2</sub>	330.1	938.0	22.5	-30.0
Total - H <sub>2</sub>	87.9	909.0	-14.8	12.1
- O <sub>2</sub>	990.3	926.6	-8.6	17.1
Total on Board	1078.2	925.1	-9.1	16.7
Unusable - H <sub>2</sub>	1.2	974.6	37.0	-46.0
- H <sub>2</sub>	1.2	859.4	-40.7	41.2
- H <sub>2</sub>	1.2	892.9	-40.7	41.2
- O <sub>2</sub>	6.6	920.8	-20.9	26.9
- O <sub>2</sub>	6.6	920.8	-27.4	54.5
- O <sub>2</sub>	6.6	938.0	22.5	-30.0
Unusable - H <sub>2</sub>	3.6	909.0	-14.8	12.1
- O <sub>2</sub>	19.8	926.6	-8.6	17.1
Total Unusable	23.4	923.8	-9.6	16.4
Usable - H <sub>2</sub>	28.1	974.6	37.0	-46.0
- H <sub>2</sub>	28.1	859.4	-40.7	41.2
- H <sub>2</sub>	28.1	892.9	-40.7	41.2
- O <sub>2</sub>	323.5	920.8	-20.9	26.9
- O <sub>2</sub>	323.5	920.8	-27.4	54.5
- O <sub>2</sub>	323.5	938.0	22.5	-30.0
Usable - H <sub>2</sub>	84.3	909.0	-14.8	12.1
- O <sub>2</sub>	970.5	926.6	-8.6	17.1
Total Usable	1054.8	925.1	-9.1	16.7

<sup>1</sup>Nominal Loading. For Liftoff values see individual Mission Section.

TABLE 4.2-1 (CONTINUED)

- NOTES:
- (1) Referenced to the Apollo Coordinate System.
  - (2) All RCS propellant weight uncertainties prior to loading are based on the maximum and minimum permissible load deviation for the nominal load at 70°F.
  - (3) Potable water tank nominal capacity is 40 pounds.
  - (4) Waste water tank nominal capacity is 60 pounds.
  - (5) Based on full SPS propellant load.
  - (6) Deliverable SM/RCS propellant is that amount which can be expelled from the tanks assuming nominal mixture ratio. For pre-mission budget planning the minimum guaranteed usable propellant equals deliverable, less 20.0 pounds loading uncertainty, and less 80 pounds gauging inaccuracy.
  - (7) See appropriate mission dependent section.

TABLE 4.2-2

SM RCS QUAD A MASS PROPERTIES

The following table presents the mass properties for SM RCS Quad A as a function of propellant remaining. For all weights Z-c.g. = -68.6 inches, IXZ = 0.0, PXZ = PYZ = 0.0.

TOTAL WT. Pounds	X-c.g. Inches	Y-c.g. Inches	IYY Slug Ft <sup>2</sup>	IZZ Slug Ft <sup>2</sup>	PXY Slug Ft <sup>2</sup>	PROPELLANT REMAINING (Pounds)			
						Pri. Fuel	Sec. Fuel	Sec. Oxidizer	
335.6	941.8	6.2	45.1	46.8	-5.7	69.9	40.3	140.4	85.0
326.6	941.9	6.2	44.0	45.7	-5.6	66.9	40.3	137.4	82.0
317.6	942.0	6.1	42.9	44.6	-5.6	63.9	40.3	134.4	79.0
308.6	942.2	6.0	41.9	43.6	-5.6	60.9	40.3	131.4	76.0
299.6	942.3	6.0	40.8	42.5	-5.6	57.9	40.3	128.4	73.0
290.6	942.5	5.9	39.7	41.4	-5.6	54.9	40.3	125.4	70.0
281.6	942.7	5.9	38.6	40.3	-5.5	51.9	40.3	122.4	67.0
272.6	942.9	5.8	37.5	39.2	-5.5	48.9	40.3	119.4	64.0
263.6	943.0	5.7	36.4	38.1	-5.5	45.9	40.3	116.4	61.0
254.6	943.3	5.6	35.3	37.0	-5.5	42.9	40.3	113.4	58.0
245.6	943.5	5.5	34.2	35.9	-5.4	39.9	40.3	110.4	55.0
236.6	943.7	5.5	33.1	34.7	-5.4	36.9	40.3	107.4	52.0
227.6	944.0	5.3	32.0	33.6	-5.4	33.9	40.3	104.4	49.0
218.6	944.3	5.2	30.9	32.5	-5.3	30.9	40.3	101.4	46.0
209.6	944.6	5.1	29.7	31.3	-5.3	27.9	40.3	98.4	43.0
200.6	944.9	5.0	28.6	30.2	-5.2	24.9	40.3	95.4	40.0
191.6	945.3	4.8	27.5	29.0	-5.2	21.9	40.3	92.4	37.0
182.6	945.7	4.7	26.3	27.8	-5.1	18.9	40.3	89.4	34.0
173.6	946.1	4.5	25.1	26.6	-5.1	15.9	40.3	86.4	31.0
164.6	946.6	4.3	23.9	25.4	-5.0	12.9	40.3	83.4	28.0
155.6	947.2	4.1	22.7	24.2	-4.9	9.9	40.3	80.4	25.0
146.6	947.8	3.9	21.5	22.9	-4.9	6.9	40.3	77.4	22.0
137.6	948.5	3.6	20.2	21.6	-4.8	3.9	40.3	74.4	19.0
130.1	949.1	3.4	19.1	20.5	-4.7	1.4	40.3	71.9	16.5
121.1	949.5	3.4	17.1	18.4	-4.3	1.4	37.3	68.9	13.5
112.1	950.0	3.4	15.1	16.3	-3.9	1.4	34.3	65.9	10.5
103.1	950.5	3.5	13.1	14.2	-3.5	1.4	31.3	62.9	7.5
86.6	951.8	3.5	9.4	10.3	-2.8	1.4	25.8	57.4	2.0
77.6	951.6	3.6	8.4	9.2	-2.5	1.4	22.8	51.4	2.0
68.6	951.3	3.7	7.5	8.1	-2.2	1.4	19.8	45.4	2.0
59.6	950.9	3.8	6.5	7.1	-1.9	1.4	16.8	39.4	2.0
50.6	950.4	3.9	5.5	6.0	-1.5	1.4	13.8	33.4	2.0
41.6	949.7	4.1	4.5	4.9	-1.2	1.4	10.8	27.4	2.0
32.6	948.6	4.4	3.5	3.8	-.9	1.4	7.8	21.4	2.0
23.6	946.7	5.0	2.5	2.7	-.6	1.4	4.8	15.4	2.0
11.3	939.0	7.1	0.9	1.0	-.1	1.4	0.7	7.2	2.0



TABLE 4.2-2 (CONTINUED)

SM RCS QUAD B MASS PROPERTIES

The following table presents the mass properties for SM RCS Quad B as a function of propellant remaining. For all weights Y-c.g. = 64.9 inches, IXX = 0.0, PXY = PYZ = 0.0.

TOTAL WT. Pounds	X-c.g. Inches	Z-c.g. Inches	IYY Slug Ft <sup>2</sup>	IZZ Slug Ft <sup>2</sup>	PXZ Slug Ft <sup>2</sup>	PROPELLANT REMAINING (Pounds)			
						Pri. Fuel	Sec. Fuel	Sec. Oxidizer	
335.6	941.8	-24.6	46.9	45.2	5.8	69.9	40.3	140.4	85.0
326.6	941.9	-24.6	45.8	44.1	5.8	66.9	40.3	137.4	82.0
317.6	942.0	-24.5	44.8	43.0	5.8	63.9	40.3	134.4	79.0
308.6	942.2	-24.5	43.7	41.9	5.8	60.9	40.3	131.4	76.0
299.6	942.3	-24.4	42.6	40.9	5.8	57.9	40.3	128.4	73.0
290.6	942.5	-24.4	41.5	39.8	5.7	54.9	40.3	125.4	70.0
281.6	942.7	-24.3	40.4	38.7	5.7	51.9	40.3	122.4	67.0
272.6	942.9	-24.2	39.3	37.6	5.7	48.9	40.3	119.4	64.0
263.6	943.0	-24.1	38.2	36.5	5.7	45.9	40.3	116.4	61.0
254.6	943.3	-24.1	37.1	35.4	5.6	42.9	40.3	113.4	58.0
245.6	943.5	-24.0	36.0	34.3	5.6	39.9	40.3	110.4	55.0
236.6	943.7	-23.9	34.8	33.2	5.6	36.9	40.3	107.4	52.0
227.6	944.0	-23.8	33.7	32.1	5.5	33.9	40.3	104.4	49.0
218.6	944.3	-23.6	32.6	31.0	5.5	30.9	40.3	101.4	46.0
209.6	944.6	-23.5	31.4	29.8	5.5	27.9	40.3	98.4	43.0
200.6	944.9	-23.4	30.3	28.7	5.4	24.9	40.3	95.4	40.0
191.6	945.3	-23.2	29.1	27.5	5.4	21.9	40.3	92.4	37.0
182.6	945.7	-23.1	27.9	26.4	5.3	18.9	40.3	89.4	34.0
173.6	946.1	-22.9	26.7	25.2	5.3	15.9	40.3	86.4	31.0
164.6	946.6	-22.7	25.5	24.0	5.2	12.9	40.3	83.4	28.0
155.6	947.2	-22.5	24.3	22.8	5.1	9.9	40.3	80.4	25.0
146.6	947.8	-22.2	23.0	21.5	5.0	6.9	40.3	77.4	22.0
137.6	948.5	-22.0	21.7	20.3	4.9	3.9	40.3	74.4	19.0
130.1	949.1	-21.7	20.6	19.2	4.8	1.4	40.3	71.9	16.5
121.1	949.5	-21.7	18.5	17.2	4.4	1.4	37.3	68.9	13.5
112.1	950.0	-21.8	16.4	15.2	4.0	1.4	34.3	65.9	10.5
103.1	950.5	-21.8	14.3	13.2	3.6	1.4	31.3	62.9	7.5
86.6	951.8	-21.9	10.3	9.4	2.9	1.4	25.8	57.4	2.0
77.6	951.6	-22.0	9.3	8.5	2.6	1.4	22.8	51.4	2.0
68.6	951.3	-22.0	8.2	7.5	2.2	1.4	19.8	45.4	2.0
59.6	950.9	-22.1	7.1	6.5	1.9	1.4	16.8	39.4	2.0
50.6	950.4	-22.3	6.0	5.5	1.6	1.4	13.8	33.4	2.0
41.6	949.7	-22.5	4.9	4.6	1.3	1.4	10.8	27.4	2.0
32.6	948.6	-22.8	3.8	3.6	1.0	1.4	7.8	21.4	2.0
23.6	946.7	-23.4	2.7	2.5	0.6	1.4	4.8	15.4	2.0
11.3	939.0	-25.5	1.0	0.9	0.1	1.4	0.7	7.2	2.0

TABLE 4.2-2 (CONTINUED)

SM RCS QUAD C MASS PROPERTIES

The following table presents the mass properties for SM RCS Quad C as a function of propellant remaining. For all weights Z-c.g. = 68.6 inches, IX = 0.0, PXZ = PYZ = 0.0.

TOTAL WT. Pounds	X-c.g. Inches	Y-c.g. Inches	IY Slug Ft <sup>2</sup>	IZZ Slug Ft <sup>2</sup>	PXY Slug Ft <sup>2</sup>	PROPELLANT REMAINING (Pounds)			
						Pri. Fuel	Sec. Fuel	Sec. Oxidizer	
335.6	941.8	-6.2	45.1	46.8	5.7	69.9	40.3	140.4	85.0
326.6	941.9	-6.2	44.0	45.7	5.6	66.9	40.3	137.4	82.0
317.6	942.0	-6.1	42.9	44.6	5.6	63.9	40.3	134.4	79.0
308.6	942.2	-6.0	41.9	43.6	5.6	60.9	40.3	131.4	76.0
299.6	942.3	-6.0	40.8	42.5	5.6	57.9	40.3	128.4	73.0
290.6	942.5	-5.9	39.7	41.4	5.6	54.9	40.3	125.4	70.0
281.6	942.7	-5.9	38.6	40.3	5.5	51.9	40.3	122.4	67.0
272.6	942.9	-5.8	37.5	39.2	5.5	48.9	40.3	119.4	64.0
263.6	943.0	-5.7	36.4	38.1	5.5	45.9	40.3	116.4	61.0
254.6	943.3	-5.6	35.3	37.0	5.5	42.9	40.3	113.4	58.0
245.6	943.5	-5.5	34.2	35.9	5.4	39.9	40.3	110.4	55.0
236.6	943.7	-5.5	33.1	34.7	5.4	36.9	40.3	107.4	52.0
227.6	944.0	-5.3	32.0	33.6	5.4	33.9	40.3	104.4	49.0
218.6	944.3	-5.2	30.9	32.5	5.3	30.9	40.3	101.4	46.0
209.6	944.6	-5.1	29.7	31.3	5.3	27.9	40.3	98.4	43.0
200.6	944.9	-5.0	28.6	30.2	5.2	24.9	40.3	95.4	40.0
191.6	945.3	-4.9	27.5	29.0	5.2	21.9	40.3	92.4	37.0
182.6	945.7	-4.7	26.3	27.8	5.1	18.9	40.3	89.4	34.0
173.6	946.1	-4.5	25.1	26.6	5.1	15.9	40.3	86.4	31.0
164.6	946.6	-4.3	23.9	25.4	5.0	12.9	40.3	83.4	28.0
155.6	947.2	-4.1	22.7	24.2	4.9	9.9	40.3	80.4	25.0
146.6	947.8	-3.9	21.5	22.9	4.9	6.9	40.3	77.4	22.0
137.6	948.5	-3.6	20.2	21.6	4.8	3.9	40.3	74.4	19.0
130.1	949.1	-3.4	19.1	20.5	4.7	1.4	40.3	71.9	16.5
121.1	949.5	-3.4	17.1	18.4	4.3	1.4	37.3	68.9	13.5
112.1	950.0	-3.4	15.1	16.3	3.9	1.4	34.3	65.9	10.5
103.1	950.5	-3.5	13.1	14.2	3.5	1.4	31.3	62.9	7.5
86.6	951.8	-3.5	9.4	10.3	2.8	1.4	25.8	57.4	2.0
77.6	951.6	-3.6	8.4	9.2	2.5	1.4	22.8	51.4	2.0
68.6	951.3	-3.7	7.5	8.1	2.2	1.4	19.8	45.4	2.0
59.6	950.9	-3.8	6.5	7.1	1.9	1.4	16.8	39.4	2.0
50.6	950.4	-3.9	5.5	6.0	1.5	1.4	13.8	33.4	2.0
41.6	949.7	-4.1	4.5	4.9	1.2	1.4	10.8	27.4	2.0
32.6	948.6	-4.4	3.5	3.8	0.9	1.4	7.8	21.4	2.0
23.6	946.7	-5.0	2.5	2.7	0.6	1.4	4.8	15.4	2.0
11.3	939.0	-7.1	0.9	1.0	0.1	1.4	0.7	7.2	2.0

TABLE 4.2-2 (CONTINUED)

SM RCS QUAD D MASS PROPERTIES

The following table presents the mass properties for SM RCS Quad D as a function of propellant remaining. For all weights Y-c.g. = -66.9 inches  
 IXX = 0.0, PXY = PYZ = 0.0.

TOTAL WT. Pounds	X-c.g. Inches	Z-c.g. Inches	IYY Slug Ft <sup>2</sup>	IZZ slug Ft <sup>2</sup>	PXZ Slug Ft <sup>2</sup>	PROPELLANT REMAINING (Pounds)			
						Pri. Fuel	Sec. Fuel	Sec. Oxidizer	
335.6	941.8	24.6	46.9	45.2	-5.8	69.9	40.3	140.4	85.0
326.6	941.9	24.6	45.8	44.1	-5.8	66.9	40.3	137.4	82.0
317.6	942.0	24.5	44.8	43.0	-5.8	63.9	40.3	134.4	79.0
308.6	942.2	24.5	43.7	41.9	-5.8	60.9	40.3	131.4	76.0
299.6	942.3	24.4	42.6	40.9	-5.8	57.9	40.3	128.4	73.0
290.6	942.5	24.4	41.5	39.8	-5.7	54.9	40.3	125.4	70.0
281.6	942.7	24.3	40.4	38.7	-5.7	51.9	40.3	122.4	67.0
272.6	942.9	24.2	39.3	37.6	-5.7	48.9	40.3	119.4	64.0
263.6	943.0	24.1	38.2	36.5	-5.7	45.9	40.3	116.4	61.0
254.6	943.3	24.1	37.1	35.4	-5.6	42.9	40.3	113.4	58.0
245.6	943.5	24.0	36.0	34.3	-5.6	39.9	40.3	110.4	55.0
236.6	943.7	23.9	34.8	33.2	-5.6	36.9	40.3	107.4	52.0
227.6	944.0	23.8	33.7	32.1	-5.5	33.9	40.3	104.4	49.0
218.6	944.3	23.6	32.6	31.0	-5.5	30.9	40.3	101.4	46.0
209.6	944.6	23.5	31.4	29.8	-5.5	27.9	40.3	98.4	43.0
200.6	944.9	23.4	30.3	28.7	-5.4	24.9	40.3	95.4	40.0
191.6	945.3	23.2	29.1	27.5	-5.4	21.9	40.3	92.4	37.0
182.6	945.7	23.1	27.9	26.4	-5.3	18.9	40.3	89.4	34.0
173.6	946.1	22.9	26.7	25.2	-5.3	15.9	40.3	86.4	31.0
164.6	946.6	22.7	25.5	24.0	-5.2	12.9	40.3	83.4	28.0
155.6	947.2	22.5	24.3	22.8	-5.1	9.9	40.3	80.4	25.0
146.6	947.8	22.2	23.0	21.5	-5.0	6.9	40.3	77.4	22.0
137.6	948.5	22.0	21.7	20.3	-4.9	3.9	40.3	74.4	19.0
130.1	949.1	21.7	20.6	19.2	-4.8	1.4	40.3	71.9	16.5
121.1	949.5	21.7	18.5	17.2	-4.4	1.4	37.3	68.9	13.5
112.1	950.0	21.8	16.4	15.2	-4.0	1.4	34.3	65.9	10.5
103.1	950.5	21.8	14.3	13.2	-3.6	1.4	31.3	62.9	7.5
86.6	951.8	21.9	10.3	9.4	-2.9	1.4	25.8	57.4	2.0
77.6	951.6	22.0	9.3	8.5	-2.6	1.4	22.8	51.4	2.0
68.6	951.3	22.0	8.2	7.5	-2.2	1.4	19.8	45.4	2.0
59.6	950.9	22.1	7.1	6.5	-1.9	1.4	16.8	39.4	2.0
50.6	950.4	22.3	6.0	5.5	-1.6	1.4	13.8	33.4	2.0
41.6	949.7	22.5	4.9	4.6	-1.3	1.4	10.8	27.4	2.0
32.6	948.6	22.8	3.8	3.6	-1.0	1.4	7.8	21.4	2.0
23.6	946.7	23.4	2.7	2.5	-0.6	1.4	4.8	15.4	2.0
11.3	939.0	25.5	1.0	0.9	-0.1	1.4	0.7	7.2	2.0

### 4.3 CM/RCS AND SM/RCS LOAD CALCULATION TABLES AND LOADING WINDOWS

#### 4.3.1 CM/RCS

Table 4.3-1 is the CM/RCS load calculation table to be completed by KSC for each mission. Figures 4.3-4 and 4.3-5 are the CM/RCS fuel and oxidizer loading windows to be used by KSC for Mission F and subsequent.

#### 4.3.2 SM/RCS

Table 4.3-2 is the SM/RCS load summary table to be completed by KSC for each mission. Tables 4.3-3 through 4.3-6 are the load calculation tables to be used by KSC to transmit to MSC the PV parameters and calculations for each quad. All of these tables are mission independent. Figures 4.3-1 through 4.3-3 are the SM/RCS loading windows to be used by KSC for Mission F and subsequent.

#### 4.3.3 CSM/RCS Mass Calculations for Horizontal Tanks

The primary method for determining the amount of RCS propellant loaded in the CSM horizontal tanks is by actual propellant weight as determined by using the bleed unit scales. The weight as determined by the bleed unit scales is verified by PV calculation as outlined in Tables 4.3-1, and 4.3-3 through 4.3-6. If for an individual tank the propellant weight as determined by the bleed unit scales and the propellant weight as determined by the PV calculation do not correlate, then KSC, ASPO, and the appropriate sub-system manager will jointly determine which of the above methods will be used.

TABLE 4.3-1  
 COMMAND MODULE RCS LOADING REQUIREMENTS,  
 PARAMETERS AND CALCULATIONS

	<u>Load Parameters and Calculations</u>			
	<u>Fuel</u>		<u>Oxidizer</u>	
	<u>Tank A</u>	<u>Tank B</u>	<u>Tank A</u>	<u>Tank B</u>
A. Tank Volume @ 0.0 PSIG (in <sup>3</sup> )	_____	_____	_____	_____
A1. Liquid Line Volume (in <sup>3</sup> )	_____	_____	_____	_____
A2. Total A + A1 (in <sup>3</sup> )	_____	_____	_____	_____
B. Initial Weight in Bleed Unit Prior to Loading (lb)	_____	_____	_____	_____
C. Final Weight in Bleed Unit After Loading (lb)	_____	_____	_____	_____
D. Propellant Load by Weight Tank; Item B less Item C (lb)	_____	_____	_____	_____
E. Loading Temperature (°F)	_____	_____	_____	_____
F. Specification Load @ 70 ±5°F (lb)	_____	_____	_____	_____
G. Total CM/RCS Propellant Load from Item D above or Item P below (lb)	_____	±0.3	_____	±0.3

Ullage Calculation

G1. Density (lb/in <sup>3</sup> ); solve the following equation where T = Temperature in E above and $\rho_F$ = fuel density; $\rho_O$ = oxidizer density.	_____	_____	_____	_____
$\rho_F = 0.0329456 - (0.186979)(10^{-4})(T)$				
$\rho_O = 0.451591(10^{-4})(11.8-T)+0.05475906$				
H. Specification Ullage @ E above; Maximum	_____	_____	_____	_____
Minimum	_____	_____	_____	_____
I. Tank Stretch Factor (in <sup>3</sup> /PSI)	_____	_____	_____	_____
J. Volume of GHE-GSE Line (in <sup>3</sup> )	_____	_____	_____	_____
K. Volume of S/C GHE Line (in <sup>3</sup> )	_____	_____	_____	_____
L. GSE Line Pressure (PSIG)	_____	_____	_____	_____
M. Bladder Pressure (PSIG)	_____	_____	_____	_____
N. Stabilized Equilibrium Pressure (PSIG)	_____	_____	_____	_____
O. Ullage Volume (in <sup>3</sup> ); solve the following equation by substituting the values contained in the above indicated steps.	_____	_____	_____	_____
Ullage Volume = $J \left( \frac{L - N}{N - M} \right) - I (N + M + 14.7) - K$				
P. Propellant load by P.V. (lb)	_____	_____	_____	_____

TABLE 4.3-2

SERVICE MODULE RCS PROPELLANT LOAD SUMMATION

Actual:

QUAD A  
(Pounds)

Secondary Fuel	_____		
Primary Fuel	_____	Total Oxidizer	_____ + 2.3
Total	_____ + 0.7		

QUAD B  
(Pounds)

Secondary Fuel	_____		
Primary Fuel	_____	Total Oxidizer	_____ + 2.3
Total	_____ + 0.7		

QUAD C  
(Pounds)

Secondary Fuel	_____		
Primary Fuel	_____	Total Oxidizer	_____ + 2.3
Total	_____ + 0.7		

QUAD D  
(Pounds)

Secondary Fuel	_____		
Primary Fuel	_____	Total Oxidizer	_____ + 2.3
Total	_____ + 0.7		

Total SM/RCS Propellant Loaded (lb)

Fuel	_____ + 1.4	Oxidizer	_____ + 4.6
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TABLE 4.3-3

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD A

Fuel

Secondary Fuel

- A. Loading Temperature (°F) \_\_\_\_\_
- B. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- B1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- C. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.034
- D. Initial Weight of Bleed Unit Prior to Loading (lb) \_\_\_\_\_
- E. Final Weight of Bleed Unit After Loading (lb) \_\_\_\_\_
- \*F. Resulting Load (lb) (Item D less Item E) \_\_\_\_\_
- G. Specification Nominal Load at 70 ±5° F (lb) \_\_\_\_\_
- H. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- I. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- J. GSE Line Pressure (PSIG) \_\_\_\_\_
- K. Bladder Pressure (PSIG) \_\_\_\_\_
- L. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- M. Primary Liquid Close-Out Pressure (PSIG) \_\_\_\_\_
- N. Specification Ullage @ A Above  
 Maximum \_\_\_\_\_  
 Minimum \_\_\_\_\_
- O. Ullage Volume (in<sup>3</sup>). Solve the following equation by substituting the values contained in the indicated steps.

$$\text{Ullage Volume} = H \left( \frac{J - L}{L - K} \right) -$$

$$(C + S)(L + K + 14.7) + S(M) - I$$

Primary Fuel

- P. Loading Temperature (°F) \_\_\_\_\_
- Q. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- R. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- S. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.0652

Oxidizer

Secondary Oxidizer

- A. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- A1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- B. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.045

Primary Oxidizer

- C. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- C1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- D. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.088

PV Parameters for Combined Primary and Secondary Oxidizer Tanks

- E. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- F. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- G. GSE Line Pressure (PSIG) \_\_\_\_\_
- H. Bladder Pressure (PSIG) \_\_\_\_\_
- I. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- J. Loading Temperature (°F) \_\_\_\_\_
- K. Oxidizer Density (lb/in<sup>3</sup>); solve equation (4) below where T = Temperature @ J above \_\_\_\_\_
- L. Specification Value @ Temperature J above (lb)  
 Maximum \_\_\_\_\_  
 Minimum \_\_\_\_\_
- M. PV Calculated Oxidizer Load (lb); solve equation (5) and (6) below by substituting the values contained in the above indicated steps where U = Volume of tank gas (in<sup>3</sup>) in both tanks and He system, and F<sub>O</sub> = PV calculated oxidizer load for both tanks  
 \_\_\_\_\_ ±2.3
- N. Specification Nominal Value @ Temperature J above (lb) \_\_\_\_\_

$$(4) \text{ Oxidizer Density} = 0.451591(10^{-4}) (11.8 - T) + 0.05475906$$

$$(5) U = E \left( \frac{G - I}{I - H} \right) - (B+D)(I+H+14.7)$$

$$(6) F_O = K(A + C + A1 + C1 - U + F)$$

TABLE 4.3-3 (CONTINUED)

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD A

T. Fuel Density (lb/in<sup>3</sup>); solve equation (1) below where T = Temperature @ P above \_\_\_\_\_

PV Parameters for Combined Primary and Secondary Fuel Tanks

U. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_

V. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_

W. GSE Line Pressure (PSIG) \_\_\_\_\_

X. Bladder Pressure (PSIG) \_\_\_\_\_

Y. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_

Z. Specification PV Value @ Temperature P above (lb)

Maximum \_\_\_\_\_

Minimum \_\_\_\_\_

Z1. PV calculated fuel load (lb) \_\_\_\_\_  
Solve equations (2) and (3) below by substituting the values contained in the above indicated steps where U<sub>V</sub> = Volume of tanked gas (in<sup>3</sup>) in the primary tank and F<sub>L</sub> = PV calculated fuel load.

Z2. Specification Nominal value @ temperature H above (lb) \_\_\_\_\_

Z3. Total fuel load (lb) \_\_\_\_\_ ±0.7  
(Item F plus Item Z1)

$$(1) \text{ Fuel density} = 0.0329456 - (0.186979)(10^{-4})(T)$$

$$(2) U_V = U \left( \frac{W - Y}{Y - X} \right) - (C + S)(Y + X + 14.7)$$

$$*(3) F_L = T (Q + R - U_V + V + B + B1 - \frac{F}{T})$$

\*Z4. Secondary Fuel Load by P.V. (lb) \_\_\_\_\_

\* If secondary fuel load is determined by P.V. calculation, then in Equation Three (3), substitute item Z4 for item F.



TABLE 4.3-4

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD B

<u>Fuel</u>	<u>Oxidizer</u>
<u>Secondary Fuel</u>	<u>Secondary Oxidizer</u>
A. Loading Temperature (°F) _____	A. Tank Volume (in <sup>3</sup> ) @ 0.0 PSIG _____
B. Tank Volume (in <sup>3</sup> ) @ 0.0 PSIG _____	A1. Liquid Line Volume (in <sup>3</sup> ) _____
B1. Liquid Line Volume (in <sup>3</sup> ) _____	B. Tank Stretch Factor (in <sup>3</sup> /PSI) <u>0.045</u>
C. Tank Stretch Factor (in <sup>3</sup> /PSI) <u>0.034</u>	<u>Primary Oxidizer</u>
D. Initial Weight of Bleed Unit Prior to Loading (lb) _____	C. Tank Volume (in <sup>3</sup> ) @ 0.0 PSIG _____
E. Final Weight of Bleed Unit After Loading (lb) _____	C1. Liquid Line Volume (in <sup>3</sup> ) _____
*F. Resulting Load (lb) (Item D less Item E) _____	D. Tank Stretch Factor (in <sup>3</sup> /PSI) <u>0.088</u>
G. Specification Nominal Load at 70 ±5° F (lb) _____	<u>PV Parameters for Combined Primary and Secondary Oxidizer Tanks</u>
H. Volume of GHE-GSE Line (in <sup>3</sup> ) _____	E. Volume of GHE-GSE Line (in <sup>3</sup> ) _____
I. Volume of S/C GHE Line (in <sup>3</sup> ) _____	F. Volume of S/C GHE Line (in <sup>3</sup> ) _____
J. GSE Line Pressure (PSIG) _____	G. GSE Line Pressure (PSIG) _____
K. Bladder Pressure (PSIG) _____	H. Bladder Pressure (PSIG) _____
L. Stabilized Equilibrium Pressure (PSIG) _____	I. Stabilized Equilibrium Pressure (PSIG) _____
M. Primary Liquid Close-Out Pressure (PSIG) _____	J. Loading Temperature (°F) _____
N. Specification Ullage @ A Above	K. Oxidizer Density (lb/in <sup>3</sup> ); solve equation (4) below where T = Tempera- ture @ J above _____
Maximum _____	L. Specification Value @ Temperature J above (lb) Maximum _____
Minimum _____	Minimum _____
O. Ullage Volume (in <sup>3</sup> ). Solve the following equation by substituting the values contained in the indi- cated steps. _____	M. PV Calculated Oxidizer Load (lb); solve equation (5) and (6) below by sub- stituting the values contained in the above indicated steps where U = Volume of tank gas (in <sup>3</sup> ) in both tanks and He system, and F <sub>O</sub> = PV calculated oxidizer load for both tanks _____
Ullage Volume = $H \left( \frac{J - L}{L - K} \right) -$	<u>±2.3</u>
(C + S)(L + K + 14.7) + S(M) - I	N. Specification Nominal Value @ Tempera- ture J above (lb) _____
<u>Primary Fuel</u>	(4) Oxidizer Density = $0.451591(10^{-4})$ (11.8 - T) + 0.05475906
P. Loading Temperature (°F) _____	(5) $U = E \left( \frac{G - I}{I - H} \right) - (B+D)(I+H+14.7)$
Q. Tank Volume (in <sup>3</sup> ) @ 0.0 PSIG _____	(6) $F_O = K(A + C + A1 + C1 - U + F)$
R. Liquid Line Volume (in <sup>3</sup> ) _____	
S. Tank Stretch Factor (in <sup>3</sup> /PSI) <u>0.0652</u>	

TABLE 4.3-4 (CONTINUED)

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD B

T. Fuel Density (lb/in<sup>3</sup>); solve equation (1) below where T = Temperature @ P above \_\_\_\_\_

PV Parameters for Combined Primary and Secondary Fuel Tanks

U. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_

V. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_

W. GSE Line Pressure (PSIG) \_\_\_\_\_

X. Bladder Pressure (PSIG) \_\_\_\_\_

Y. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_

Z. Specification PV Value @ Temperature P above (lb)

Maximum \_\_\_\_\_

Minimum \_\_\_\_\_

Z1. PV calculated fuel load (lb) \_\_\_\_\_  
Solve equations (2) and (3) below by substituting the values contained in the above indicated steps where U<sub>V</sub> = Volume of tanked gas (in<sup>3</sup>) in the primary tank and F<sub>L</sub> = PV calculated fuel load.

Z2. Specification Nominal value @ temperature H above (lb) \_\_\_\_\_

Z3. Total fuel load (lb) \_\_\_\_\_ ±0.7  
(Item F plus Item Z1)

$$(1) \text{ Fuel density} = 0.0329456 - (0.186979)(10^{-4})(T)$$

$$(2) U_V = U \left( \frac{W - Y}{Y - X} \right) - (C + S)(Y + X + 14.7)$$

$$*(3) F_L = T \left( Q + R - U_V + V + B + B1 - \frac{F}{T} \right)$$

\*Z4. Secondary Fuel Load by P.V. (lb) \_\_\_\_\_

\*If secondary fuel load is determined by P.V. calculation, then in Equation Three (3), substitute item Z4 for item F.

TABLE 4.3-5

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD C

Fuel

Secondary Fuel

- A. Loading Temperature (°F) \_\_\_\_\_
- B. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- B1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- C. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.034
- D. Initial Weight of Bleed Unit Prior to Loading (lb) \_\_\_\_\_
- E. Final Weight of Bleed Unit After Loading (lb) \_\_\_\_\_
- \*F. Resulting Load (lb) (Item D less Item E) \_\_\_\_\_
- G. Specification Nominal Load at 70 ±5° F (lb) \_\_\_\_\_
- H. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- I. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- J. GSE Line Pressure (PSIG) \_\_\_\_\_
- K. Bladder Pressure (PSIG) \_\_\_\_\_
- L. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- M. Primary Liquid Close-Out Pressure (PSIG) \_\_\_\_\_
- N. Specification Ullage @ A Above  
 Maximum \_\_\_\_\_  
 Minimum \_\_\_\_\_
- O. Ullage Volume (in<sup>3</sup>). Solve the following equation by substituting the values contained in the indicated steps.

$$\text{Ullage Volume} = H \left( \frac{J - L}{L - K} \right) -$$

$$(C + S)(L + K + 14.7) + S(M) - I$$

Primary Fuel

- P. Loading Temperature (°F) \_\_\_\_\_
- Q. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- R. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- S. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.0652

Oxidizer

Secondary Oxidizer

- A. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- A1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- B. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.045

Primary Oxidizer

- C. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- C1. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- D. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.088

PV Parameters for Combined Primary and Secondary Oxidizer Tanks

- E. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- F. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- G. GSE Line Pressure (PSIG) \_\_\_\_\_
- H. Bladder Pressure (PSIG) \_\_\_\_\_
- I. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- J. Loading Temperature (°F) \_\_\_\_\_
- K. Oxidizer Density (lb/in<sup>3</sup>); solve equation (4) below where T = Temperature @ J above \_\_\_\_\_
- L. Specification Value @ Temperature J above (lb)  
 Maximum \_\_\_\_\_  
 Minimum \_\_\_\_\_
- M. PV Calculated Oxidizer Load (lb); solve equation (5) and (6) below by substituting the values contained in the above indicated steps where U = Volume of tank gas (in<sup>3</sup>) in both tanks and He system, and F<sub>O</sub> = PV calculated oxidizer load for both tanks \_\_\_\_\_

±2.3

- N. Specification Nominal Value @ Temperature J above (lb) \_\_\_\_\_

$$(4) \text{ Oxidizer Density} = 0.451591(10^{-4}) (11.8 - T) + 0.05475906$$

$$(5) U = E \left( \frac{G - I}{I - H} \right) - (B+D)(I+H+14.7)$$

$$(6) F_O = K(A + C + A1 + C1 - U + F)$$

TALBE 4.3-5 (CONTINUED)

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD C

T. Fuel Density (lb/in<sup>3</sup>); solve equation (1) below where T = Temperature @ P above \_\_\_\_\_

PV Parameters for Combined Primary and Secondary Fuel Tanks

U. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_

V. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_

W. GSE Line Pressure (PSIG) \_\_\_\_\_

X. Bladder Pressure (PSIG) \_\_\_\_\_

Y. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_

Z. Specification PV Value @ Temperature P above (lb)

Maximum \_\_\_\_\_

Minimum \_\_\_\_\_

Z1. PV calculated fuel load (lb) \_\_\_\_\_  
Solve equations (2) and (3) below by substituting the values contained in the above indicated steps where U<sub>V</sub> = Volume of tanked gas (in<sup>3</sup>) in the primary tank and F<sub>L</sub> = PV calculated fuel load.

Z2. Specification Nominal value @ temperature H above (lb) \_\_\_\_\_

Z3. Total fuel load (lb) \_\_\_\_\_ ±0.7  
(Item F plus Item Z1)

$$(1) \text{ Fuel density} = 0.0329456 - (0.186979)(10^{-4})(T)$$

$$(2) U_V = U \left( \frac{W - Y}{Y - X} \right) - (C + S)(Y + X + 14.7)$$

$$*(3) F_L = T \left( Q + R - U_V + V + B + B1 - \frac{F}{T} \right)$$

\*Z4. Secondary Fuel Load by P.V. (lb) \_\_\_\_\_

\*If secondary fuel load is determined by P.V. calculation, then in Equation Three (3), substitute item Z4 for item F.

TABLE 4.3-6

SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD D

Fuel

Secondary Fuel

- A. Loading Temperature (°F) \_\_\_\_\_
- B. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- Bl. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- C. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.034
- D. Initial Weight of Bleed Unit Prior to Loading (lb) \_\_\_\_\_
- E. Final Weight of Bleed Unit After Loading (lb) \_\_\_\_\_
- \* F. Resulting Load (lb) (Item D less Item E) \_\_\_\_\_
- G. Specification Nominal Load at 70 ±5° F (lb) \_\_\_\_\_
- H. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- I. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- J. GSE Line Pressure (PSIG) \_\_\_\_\_
- K. Bladder Pressure (PSIG) \_\_\_\_\_
- L. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- M. Primary Liquid Close-Out Pressure (PSIG) \_\_\_\_\_
- N. Specification Ullage @ A Above  
Maximum \_\_\_\_\_  
Minimum \_\_\_\_\_
- O. Ullage Volume (in<sup>3</sup>). Solve the following equation by substituting the values contained in the indicated steps.

$$\text{Ullage Volume} = H \left( \frac{J - L}{L - K} \right) -$$

$$(C + S)(L + K + 14.7) + S(M) - I$$

Primary Fuel

- P. Loading Temperature (°F) \_\_\_\_\_
- Q. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- R. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- S. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.0652

Oxidizer

Secondary Oxidizer

- A. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- Al. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- B. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.045

Primary Oxidizer

- C. Tank Volume (in<sup>3</sup>) @ 0.0 PSIG \_\_\_\_\_
- Cl. Liquid Line Volume (in<sup>3</sup>) \_\_\_\_\_
- D. Tank Stretch Factor (in<sup>3</sup>/PSI) 0.088

PV Parameters for Combined Primary and Secondary Oxidizer Tanks

- E. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- F. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- G. GSE Line Pressure (PSIG) \_\_\_\_\_
- H. Bladder Pressure (PSIG) \_\_\_\_\_
- I. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- J. Loading Temperature (°F) \_\_\_\_\_
- K. Oxidizer Density (lb/in<sup>3</sup>); solve equation (4) below where T = Temperature @ J above \_\_\_\_\_
- L. Specification Value @ Temperature J above (lb) Maximum \_\_\_\_\_  
Minimum \_\_\_\_\_
- M. PV Calculated Oxidizer Load (lb); solve equation (5) and (6) below by substituting the values contained in the above indicated steps where U = Volume of tank gas (in<sup>3</sup>) in both tanks and He system, and F<sub>O</sub> = PV calculated oxidizer load for both tanks \_\_\_\_\_ ±2.3

- N. Specification Nominal Value @ Temperature J above (lb) \_\_\_\_\_

(4) Oxidizer Density =  $0.451591(10^{-4})$   
 $(11.8 - T) + 0.05475906$

(5)  $U = E \left( \frac{G - I}{I - H} \right) - (B+D)(I+H+14.7)$

(6)  $F_O = K(A + C + Al + Cl - U + F)$

TABLE 4.3-6 (CONTINUED)

## SERVICE MODULE RCS LOADING PARAMETERS AND CALCULATIONS - QUAD D

- T. Fuel Density (lb/in<sup>3</sup>); solve equation (1) below where T = Temperature @ P above \_\_\_\_\_

PV Parameters for Combined Primary and Secondary Fuel Tanks

- U. Volume of GHE-GSE Line (in<sup>3</sup>) \_\_\_\_\_
- V. Volume of S/C GHE Line (in<sup>3</sup>) \_\_\_\_\_
- W. GSE Line Pressure (PSIG) \_\_\_\_\_
- X. Bladder Pressure (PSIG) \_\_\_\_\_
- Y. Stabilized Equilibrium Pressure (PSIG) \_\_\_\_\_
- Z. Specification PV Value @ Temperature P above (lb)
- Maximum \_\_\_\_\_
- Minimum \_\_\_\_\_

- Z1. PV calculated fuel load (lb) \_\_\_\_\_  
Solve equations (2) and (3) below by substituting the values contained in the above indicated steps where U<sub>V</sub> = Volume of tanked gas (in<sup>3</sup>) in the primary tank and F<sub>L</sub> = PV calculated fuel load.

- Z2. Specification Nominal value @ temperature H above (lb) \_\_\_\_\_

- Z3. Total fuel load (lb) \_\_\_\_\_ ±0.7  
(Item F plus Item Z1)

$$(1) \text{ Fuel density} = 0.0329456 - (0.186979)(10^{-4})(T)$$

$$(2) U_V = U \left( \frac{W - Y}{Y - X} \right) - (C + S)(Y + X + 14.7)$$

$$*(3) F_L = T \left( Q + R - U_V + V + B + B1 - \frac{F}{T} \right)$$

- \*Z4. Secondary Fuel Load by P.V. (lb) \_\_\_\_\_

\*If secondary fuel load is determined by P.V. calculation, then in Equation Three (3), substitute item Z4 for item F.

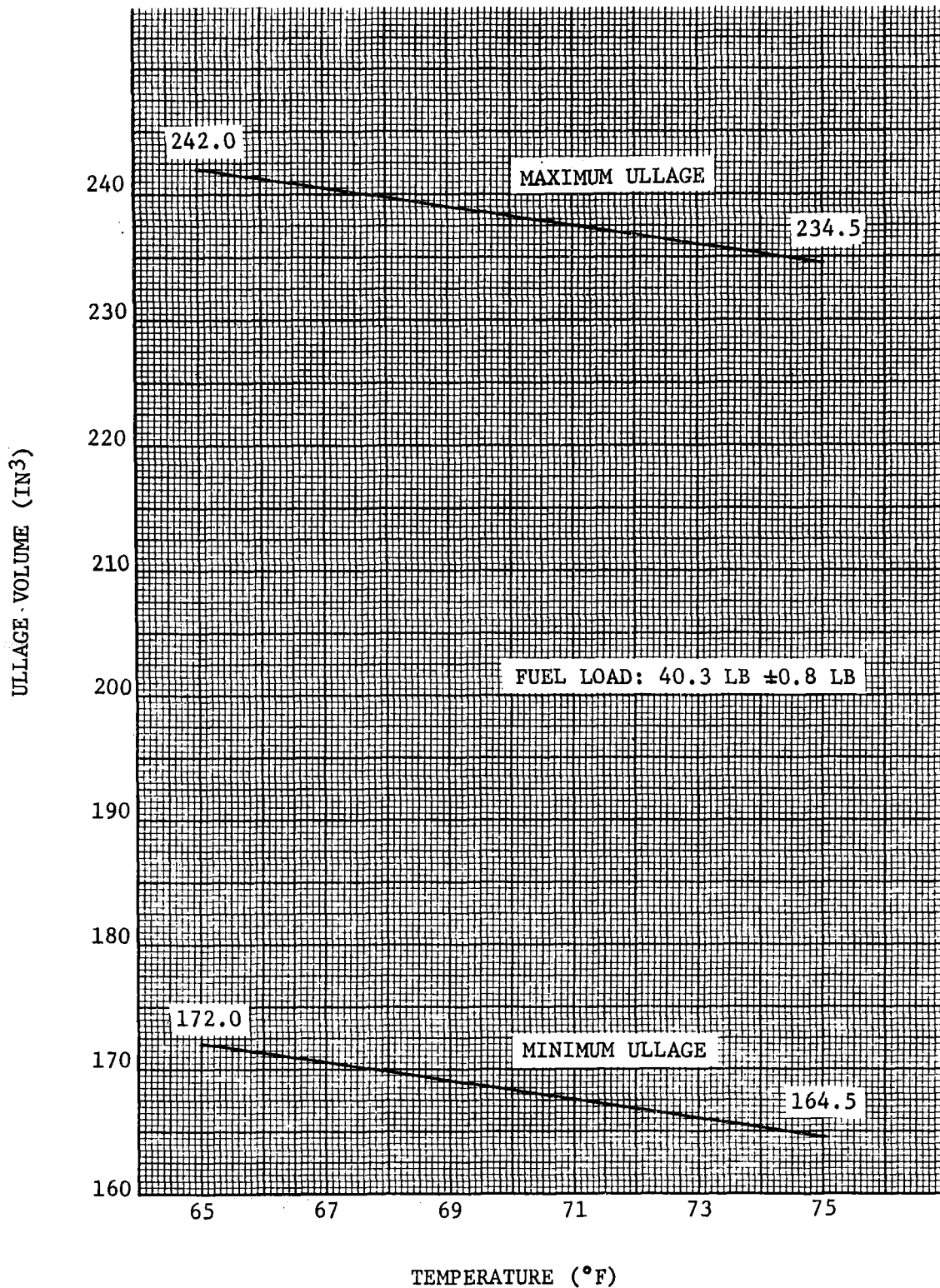


FIGURE 4.3-1. CSM 104 AND SUBSEQUENT SECONDARY FUEL TANK ULLAGE VOLUME RANGE

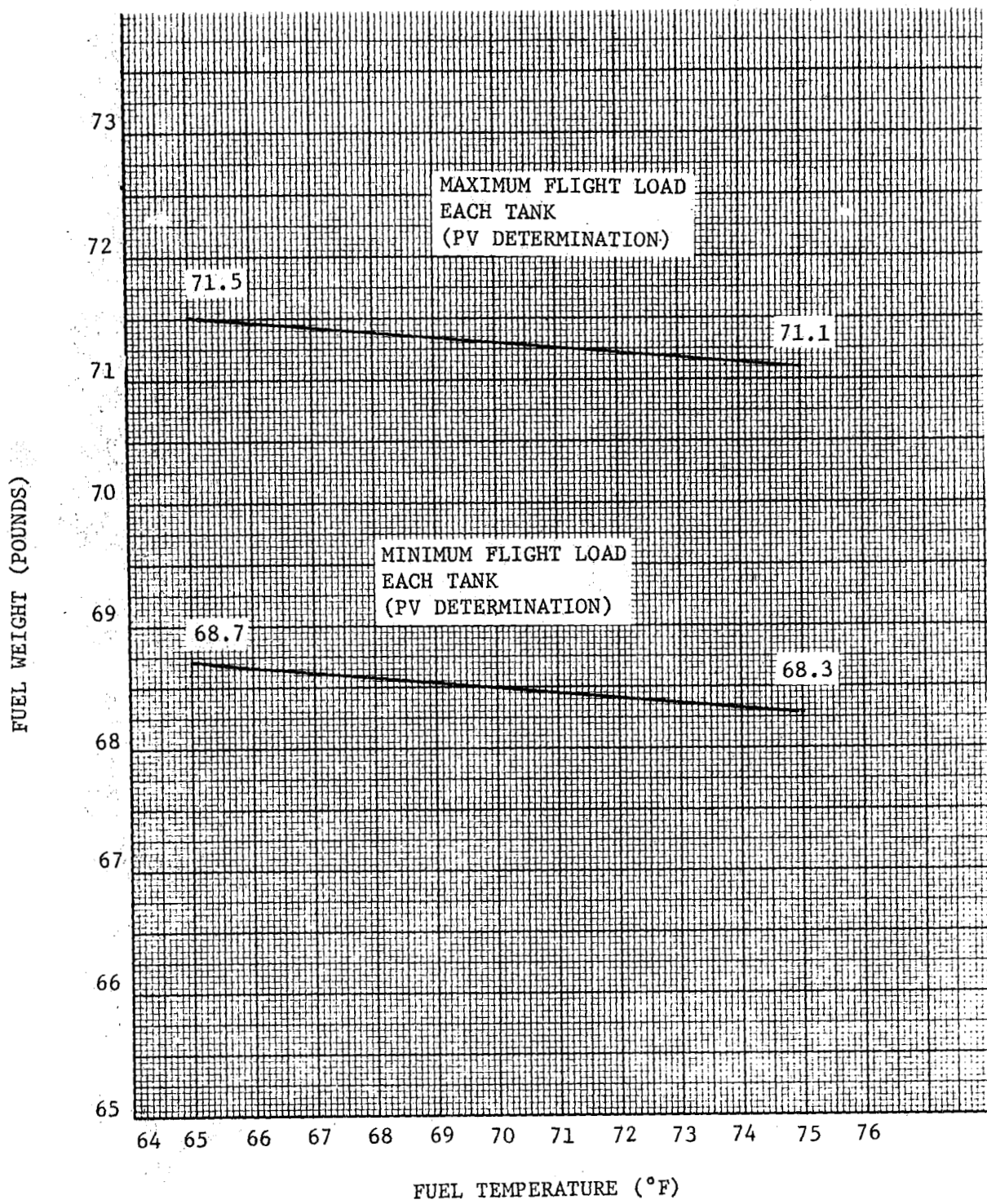


FIGURE 4.3-2. SM RCS PRIMARY FUEL TANK LOAD WINDOW



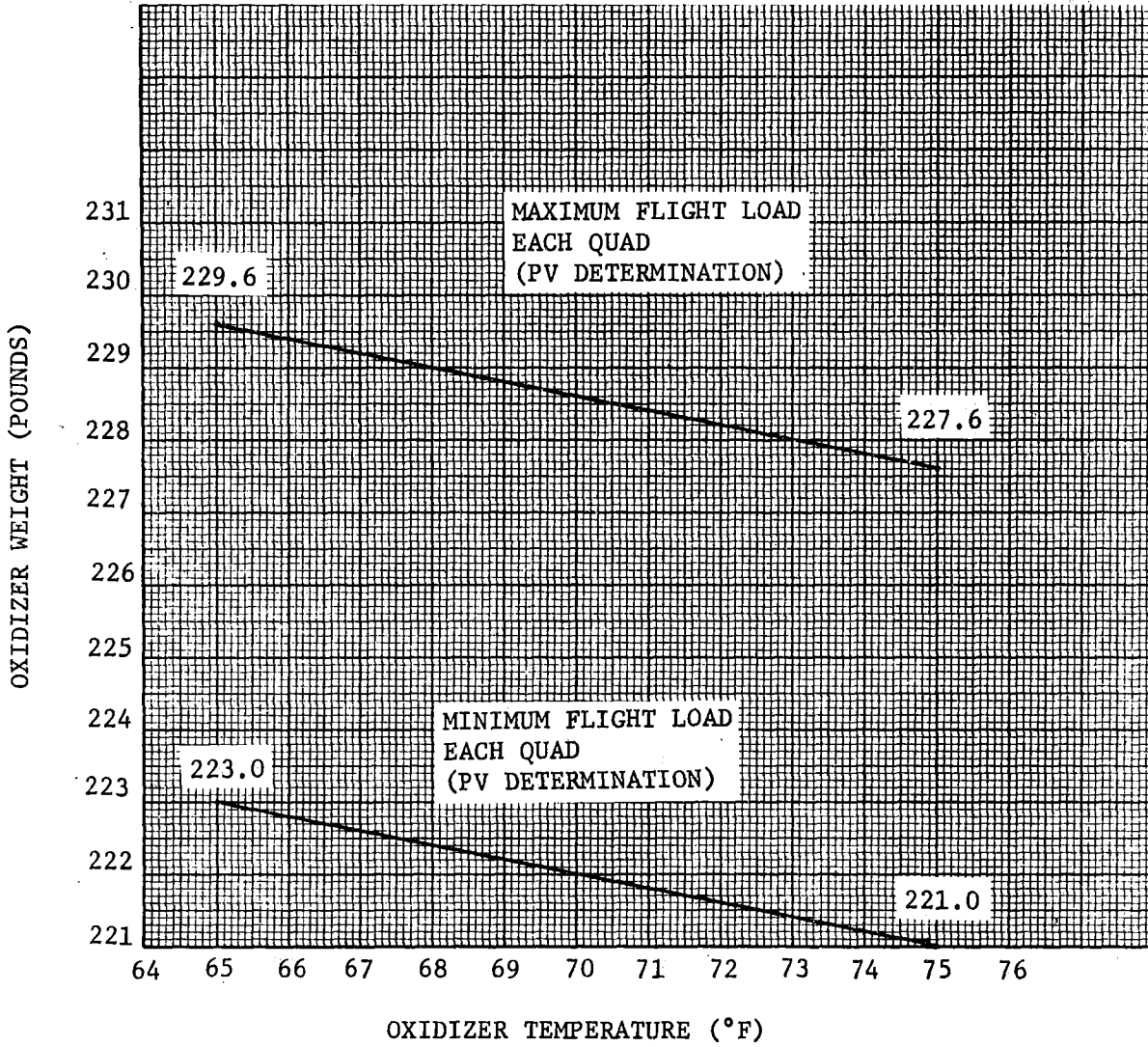


FIGURE 4.3-3. SM RCS COMBINED PRIMARY-SECONDARY OXIDIZER TANK LOAD WINDOW

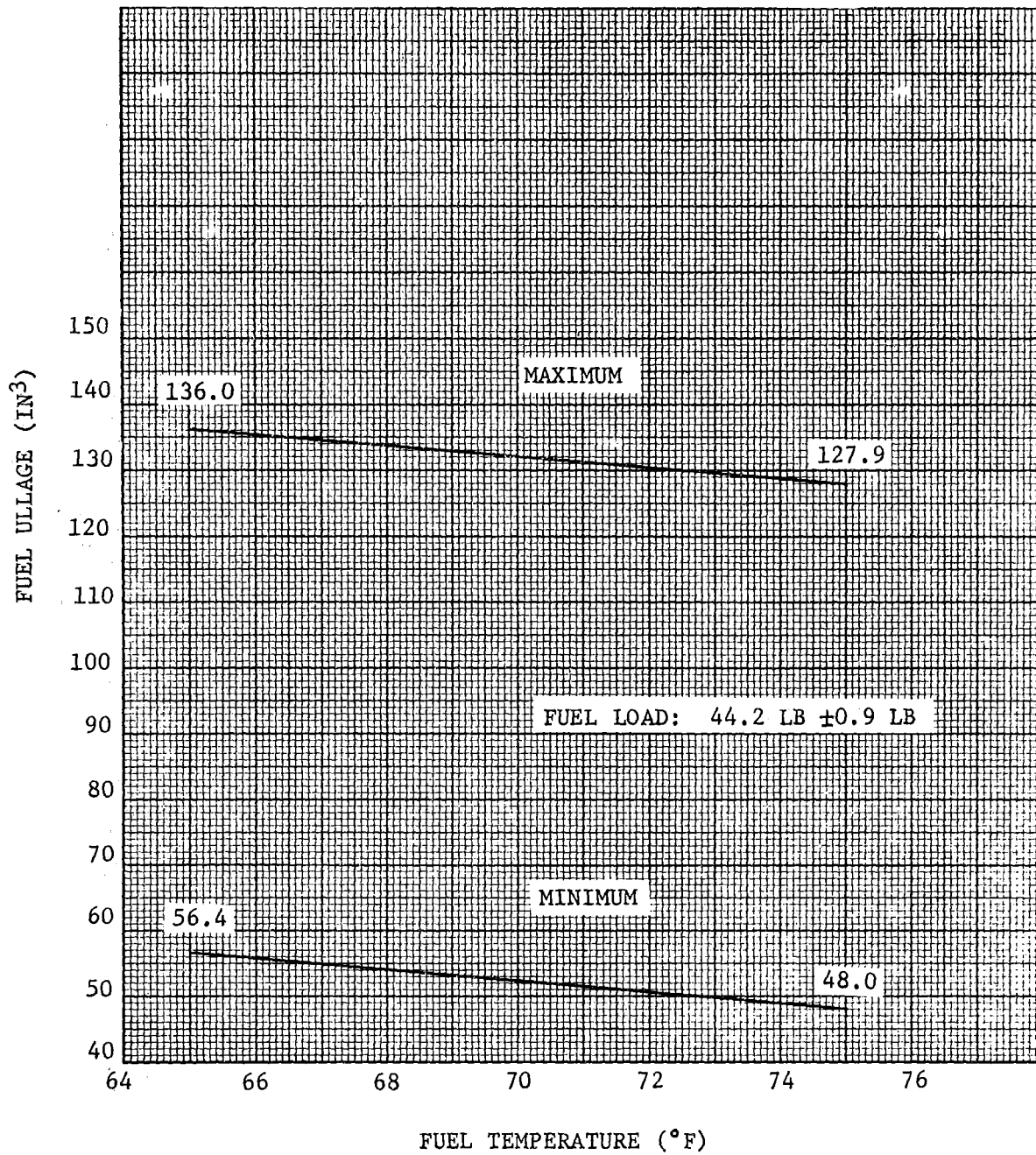


FIGURE 4.3-4. CSM 104 AND SUBSEQUENT CM RCS FUEL TANK ULLAGES VS. TEMPERATURE

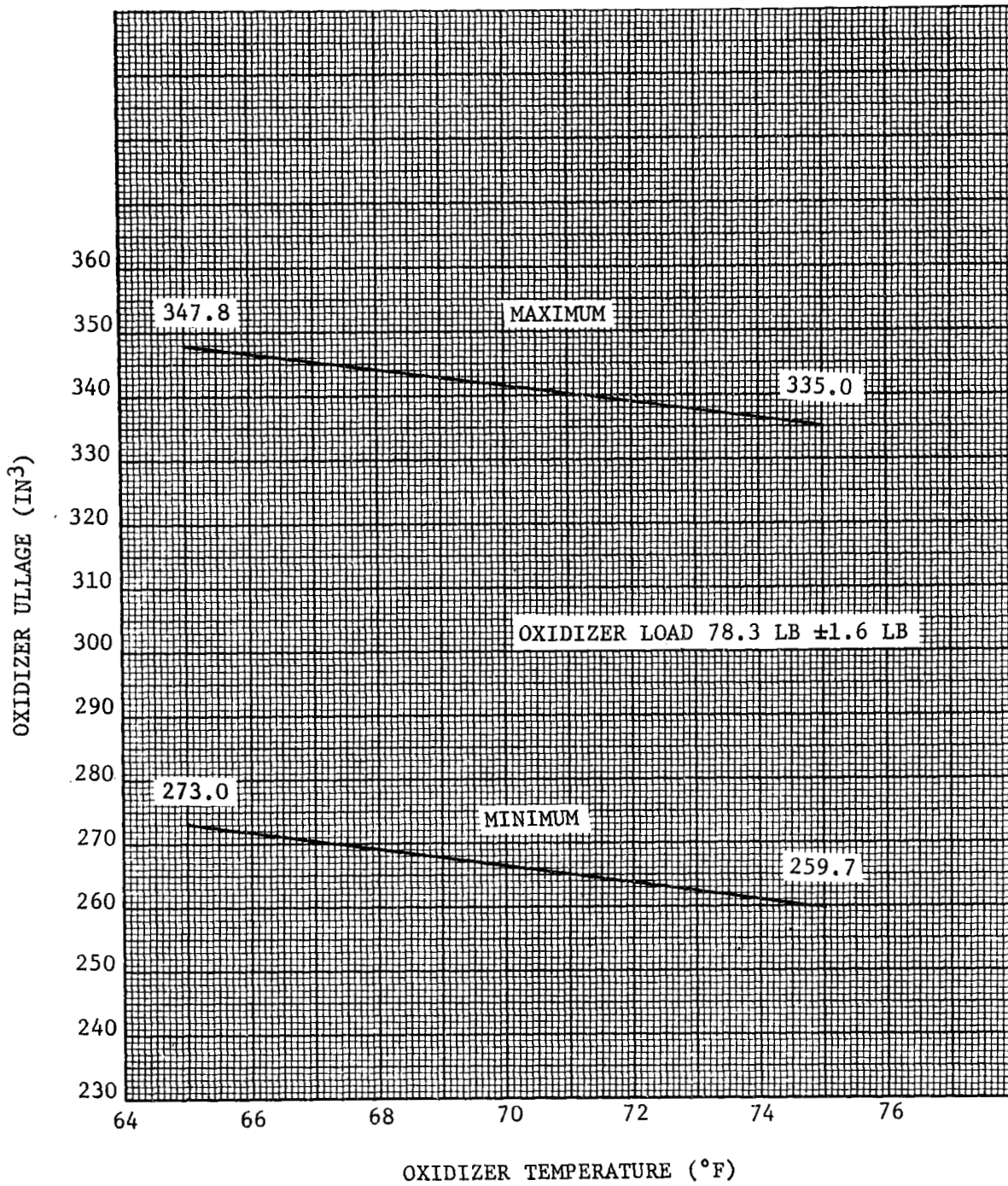


FIGURE 4.3-5. CSM 104 AND SUBSEQUENT CM RCS OXIDIZER TANK ULLAGE VS. TEMPERATURE

TO BE SUPPLIED.

CM ABLATOR DATA

## 5.0 LM REFERENCE CONSUMABLES MASS PROPERTIES DATA

The data presented in this section will enable the user to obtain the separate centers-of-gravity and moments-of-inertia for those LM spacecraft consumables that significantly affect overall LM performance. LM consumables mass property data must be compared to the current on-board consumable loading data for each mission provided in Section 3.0. The mass property data are presented in the following sections:

### 5.1 LM Descent Tank Mass Properties

Table 5.1-1 LM 10 and Subsequent DPS Fuel Mass Properties

Table 5.1-2 LM 10 and Subsequent DPS Oxidizer Mass Properties

### 5.2 LM Ascent Tank Mass Properties

### 5.3 LM RCS Tank Mass Properties

### 5.4 LM Descent Water Tank Mass Properties

Table 5.4-1 LM 10 and Subsequent Descent Water Tank Mass Properties

### 5.5 LM Ascent Water Tank Mass Properties

### 5.6 LM Trapped and Residual Propellants, and Miscellaneous Consumables

# LUNAR MODULE DESCENT PROPELLANT

## MASS PROPERTIES

### NOTE:

1. Mass Properties are given for liquid in individual tanks.
2. Moments of Inertia are about center of gravity of propellant in individual tanks, coordinates of which are given.
3. Centers of Gravity in Y and Z directions are given at top of each page.
4. The number of tanks of a particular kind is indicated by the last number on the first line of each page.

TABLE 5.1-1  
LM 10 AND SUBSEQUENT DPS FUEL MASS PROPERTIES

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 56.46 lbs/cu. ft.  
Y-CG = + OR - 54.0 in. (Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = 0.0 in. (Const)  
Pressurized Radius = 25.61 in.  
Ixx = 0.0

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq) Iyy - Izz	Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
3822.6	160.8	0.00	100.0	73.96	3822.6	0.0	1.44
3784.3	160.5	6.16	99.0	70.06	3587.6	196.7	1.37
3746.1	160.3	8.81	98.0	68.38	3477.7	268.5	1.33
3707.9	160.2	11.14	97.0	67.05	3380.0	327.8	1.31
3669.7	160.1	13.17	96.0	65.92	3292.6	377.0	1.29
3631.4	160.1	14.97	95.0	64.90	3213.3	418.2	1.27
3593.2	160.0	16.68	94.0	63.95	3140.4	452.8	1.25
3555.0	160.0	17.83	93.0	63.09	3072.3	482.6	1.23
3516.8	159.9	18.67	92.0	62.26	3008.1	508.7	1.22
3478.5	159.8	19.22	91.0	61.48	2946.8	531.7	1.20
3440.3	159.7	19.49	90.0	60.72	2888.1	552.2	1.19
3402.1	159.6	19.51	89.0	60.00	2831.5	570.6	1.17
3363.8	159.4	19.29	88.0	59.29	2776.6	587.2	1.16
3325.6	159.3	18.85	87.0	58.61	2723.3	602.3	1.14
3287.4	159.2	18.21	86.0	57.94	2671.4	616.0	1.13
3249.2	159.0	17.37	85.0	57.29	2620.5	628.7	1.12
3210.9	158.8	16.37	84.0	56.65	2570.7	640.3	1.11
3172.7	158.6	15.24	83.0	56.02	2521.8	651.0	1.09
3134.5	158.5	14.37	82.0	55.40	2473.6	660.9	1.08
3096.3	158.3	13.51	81.0	54.79	2426.1	670.2	1.07
3058.0	158.1	12.68	80.0	54.19	2379.2	678.8	1.06
3019.8	157.9	11.86	79.0	53.59	2332.9	687.0	1.05
2981.6	157.7	11.08	78.0	53.00	2286.9	694.6	1.04
2943.4	157.6	10.32	77.0	52.42	2241.4	701.9	1.02
2905.1	157.4	9.80	76.0	51.84	2196.2	708.9	1.01
2866.9	157.2	8.90	75.0	51.26	2151.3	715.6	1.00
2828.7	157.0	8.24	74.0	50.69	2106.7	722.0	0.99
2790.5	156.8	7.60	73.0	50.11	2063.8	726.7	0.98
2752.2	156.6	6.99	72.0	49.55	2021.2	731.0	0.97
2714.0	156.4	6.41	71.0	48.98	1979.0	735.0	0.96
2675.8	156.3	5.86	70.0	48.41	1937.0	738.8	0.95

TABLE 5.1-1 (CONTINUED)  
LM 10 AND SUBSEQUENT DPS FUEL MASS PROPERTIES

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 56.46 lbs/cu. ft.  
Y-CG = + OR - 54.0 in. (Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = 0.0 IN. (CONST)  
Pressurized Radius = 25.61 in.  
Ixx = 0.0

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq) I <sub>YY</sub> - I <sub>ZZ</sub>	Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
2637.6	156.1	5.33	69.0	47.84	1895.2	742.4	0.93
2599.3	155.9	4.83	58.0	47.27	1853.5	745.8	0.92
2561.1	155.7	4.37	67.0	46.70	1812.2	748.9	0.91
2522.9	155.5	3.95	66.0	46.12	1771.1	751.8	0.90
2484.7	155.3	3.55	65.0	45.55	1730.3	754.4	0.89
2446.4	155.1	3.18	64.0	44.98	1689.7	756.7	0.88
2408.2	154.9	2.85	63.0	44.41	1649.5	758.7	0.87
2370.0	154.7	2.54	62.0	43.84	1609.5	760.5	0.86
2331.8	154.5	2.26	61.0	43.27	1569.8	762.0	0.84
2293.5	154.3	2.00	60.0	42.70	1530.4	763.1	0.83
2255.3	154.1	1.77	59.0	42.13	1491.3	764.0	0.82
2217.1	153.9	1.56	58.0	41.56	1452.5	764.8	0.81
2178.9	153.7	1.37	57.0	40.99	1414.0	764.9	0.80
2140.6	153.6	1.20	56.0	40.42	1375.8	764.8	0.79
2102.4	153.4	1.05	55.0	39.84	1337.9	764.5	0.78
2064.2	153.2	0.91	54.0	39.27	1300.3	763.9	0.77
2026.0	153.0	0.79	53.0	38.70	1263.0	762.9	0.76
1987.7	152.9	0.69	52.0	38.13	1226.1	761.7	0.74
1949.5	152.7	0.60	51.0	37.56	1189.4	760.1	0.73
1911.3	152.5	0.52	50.0	36.99	1153.1	758.2	0.72
1873.1	152.4	0.45	49.0	36.42	1117.1	756.0	0.71
1834.8	152.2	0.39	48.0	35.85	1081.4	753.4	0.70
1796.6	152.1	0.33	47.0	35.28	1046.0	750.6	0.69
1758.4	151.9	0.29	46.0	34.71	1011.0	747.3	0.68
1720.2	151.8	0.25	45.0	34.13	976.3	743.8	0.67
1681.9	151.6	0.21	44.0	33.56	942.0	739.9	0.66
1643.7	151.5	0.18	43.0	32.99	908.0	735.7	0.64
1605.5	151.4	0.16	42.0	32.42	874.3	731.1	0.63
1567.2	151.3	0.13	41.0	31.85	841.0	726.2	0.62
1529.0	151.1	0.11	40.0	31.28	808.1	720.9	0.61
1490.8	151.0	0.10	39.0	30.71	775.5	715.3	0.60
1452.6	150.9	0.08	38.0	30.14	743.2	709.3	0.59



TABLE 5.1-1 (CONTINUED)  
LM 10 AND SUBSEQUENT DPS FUEL MASS PROPERTIES

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 56.46 lbs/cu. ft.  
Y-CG = + OR - 54.0 in. (Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = 0.0 in. (Const)  
Pressurized Radius = 25.61 in.  
Ixx = 0.0

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq) Iyy - Izz	Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
1414.3	150.8	0.07	37.0	29.57	711.3	703.0	0.58
1376.1	150.7	0.06	36.0	29.00	679.8	696.3	0.57
1337.9	150.6	0.05	35.0	28.42	648.7	689.2	0.55
1299.7	150.5	0.04	34.0	27.85	617.9	681.8	0.54
1261.4	150.4	0.04	33.0	27.28	587.4	674.0	0.53
1223.2	150.4	0.03	32.0	26.71	557.4	665.8	0.52
1185.0	150.3	0.03	31.0	26.14	527.7	657.3	0.51
1146.8	150.2	0.02	30.0	25.57	498.8	648.0	0.50
1108.5	150.1	0.02	29.0	25.00	471.2	637.3	0.49
1070.3	150.0	0.02	28.0	24.43	444.3	626.0	0.48
1032.1	150.0	0.01	27.0	23.86	417.9	614.2	0.47
993.9	149.9	0.01	26.0	23.29	392.1	601.7	0.45
955.6	149.8	0.01	25.0	22.72	366.9	588.7	0.44
917.4	149.8	0.01	24.0	22.14	342.3	575.2	0.43
879.2	149.7	0.01	23.0	21.56	318.2	561.0	0.42
841.0	149.7	0.00	22.0	20.98	294.6	546.4	0.41
802.7	149.6	0.00	21.0	20.39	271.6	531.1	0.40
764.5	149.6	0.00	20.0	19.79	249.2	515.3	0.39
726.3	149.5	0.00	19.0	19.19	227.3	499.0	0.37
688.1	149.5	0.00	18.0	18.58	206.1	482.0	0.36
649.8	149.5	0.00	17.0	17.98	185.4	464.5	0.35
611.6	149.5	0.00	16.0	17.33	165.3	446.3	0.34
573.4	149.5	0.00	15.0	16.69	145.9	427.5	0.33
535.2	149.5	0.00	14.0	16.04	127.1	408.1	0.31
496.9	149.5	0.00	13.0	15.37	109.0	387.9	0.30
458.7	149.5	0.00	12.0	14.69	91.7	367.0	0.29
420.5	149.5	0.00	11.0	13.98	75.2	345.3	0.27
382.3	149.5	0.00	10.0	13.26	59.5	322.8	0.26
344.0	149.5	0.00	9.0	12.50	44.8	299.2	0.24
305.8	149.5	0.00	8.0	11.72	31.1	274.7	0.23
267.6	149.5	0.00	7.0	10.89	18.7	248.9	0.21
229.4	149.5	0.00	6.0	10.02	7.7	221.6	0.20

TABLE 5.1-1 (CONCLUDED)

LM 10 AND SUBSEQUENT DPS FUEL MASS PROPERTIES

Pressure = 235.0 psia - 2 Tanks  
 Cylinder Height = 22.64 in.  
 Density = 56.46 lbs/cu. ft.  
 Y-CG = + OR - 54.0 in. (Const)  
 Pressurized Height = 22.75 in.

Temperature = 70.0 F  
 Tank Radius = 25.50 in.  
 Bottom of Tank = 123.84 in.  
 Z-CG = 0.0 in. (Const)  
 Pressurized Radius = 25.61 in.  
 Ixx = 0.0

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq)		Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
		Iyy	Izz					
191.1	149.5	0.00	0.00	5.0	9.08	0.0	191.1	0.18
152.9	149.5	0.00	0.00	4.0	8.06	0.0	152.9	0.16
114.7	149.5	0.00	0.00	3.0	6.92	0.0	114.7	0.14
76.5	149.5	0.00	0.00	2.0	5.60	0.0	76.5	0.11
38.2	149.5	0.00	0.00	1.0	3.91	0.0	38.2	0.08
0.0	149.5	0.00	0.00	0.0	0.00	0.0	0.0	0.00

TABLE 5.1-2

## LM 10 AND SUBSEQUENT DPS OXIDIZER MASS PROPERTIES

Pressure = 235.0 psia - 2 Tanks  
 Cylinder Height = 22.64 in.  
 Density = 90.26 lbs/cu. ft.  
 Y-CG = 0.0 in. (Const)  
 Pressurized Height = 22.75 in.

Temperature = 70.0 F  
 Tank Radius = 25.50 in.  
 Bottom of Tank = 123.84 in.  
 Z-CG = + OR - 54.0 in. (Const)  
 Pressurized Radius = 25.61 in.  
 Ixx = 0.0

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq)		Percent Full	Height (in.)	Rigid (lbs)	Slush (lbs)	H/2R
		Iyy - Izz	Iyy - Izz					
6110.9	160.8	0.00	0.00	100.0	73.96	6110.9	0.0	1.44
6049.8	160.5	9.84	9.84	99.0	70.06	5735.3	314.5	1.37
5988.7	160.3	14.09	14.09	98.0	68.38	5559.5	429.2	1.33
5927.6	160.2	17.80	17.80	97.0	67.05	5403.5	524.1	1.31
5866.5	160.1	21.06	21.06	96.0	65.92	5263.7	602.8	1.29
5805.4	160.1	23.93	23.93	95.0	64.90	5136.9	668.5	1.27
5744.3	160.0	26.67	26.67	94.0	63.98	5020.4	723.9	1.25
5683.2	160.0	28.51	28.51	93.0	63.09	4911.6	771.6	1.23
5622.0	159.9	29.85	29.85	92.0	62.26	4808.8	813.2	1.22
5560.9	159.8	30.72	30.72	91.0	61.48	4711.0	850.0	1.20
5499.8	159.7	31.16	31.16	90.0	60.72	4617.1	882.8	1.19
5438.7	159.6	31.19	31.19	89.0	60.00	4526.6	912.2	1.17
5377.6	159.4	30.84	30.84	88.0	59.29	4438.9	938.7	1.16
5316.6	159.3	30.14	30.14	87.0	58.61	4353.7	962.8	1.14
5255.4	159.2	29.10	29.10	86.0	57.94	4270.6	984.8	1.13
5194.3	159.0	27.77	27.77	85.0	57.29	4189.3	1005.0	1.12
5133.2	158.8	26.18	26.18	84.0	56.65	4109.6	1023.5	1.11
5072.1	158.6	24.37	24.37	83.0	56.02	4031.4	1040.7	1.09
5011.0	158.5	22.97	22.97	82.0	55.40	3954.4	1056.6	1.08
4949.8	158.3	21.60	21.60	81.0	54.79	3878.5	1071.4	1.07
4888.7	158.1	20.26	20.26	80.0	54.19	3803.5	1085.2	1.06
4827.6	157.9	18.97	18.97	79.0	53.59	3729.4	1098.2	1.05
4766.5	157.7	17.71	17.71	78.0	53.00	3656.0	1110.5	1.03
4705.4	157.6	16.51	16.51	77.0	52.42	3583.3	1122.2	1.02
4644.3	157.4	15.35	15.35	76.0	51.84	3511.0	1133.3	1.01
4583.2	157.2	14.23	14.23	75.0	51.26	3439.2	1143.9	1.00
4522.1	157.0	13.17	13.17	74.0	50.69	3367.9	1154.2	0.99
4461.0	156.8	12.14	12.14	73.0	50.11	3299.2	1161.7	0.98
4399.9	156.6	11.17	11.17	72.0	49.55	3231.2	1168.7	0.97
4338.8	156.4	10.24	10.24	71.0	48.98	3163.7	1175.1	0.96
4277.6	156.3	9.37	9.37	70.0	48.41	3096.6	1181.0	0.95

TABLE 5.1-2 (CONTINUED)  
LM 10 AND SUBSEQUENT DPS OXIDIZER MASS PROPERTIES

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq)		Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
		Iyy - Izz	Ixx					
4216.5	156.1	8.52	69.0	47.84	3029.7	1186.8	0.93	
4155.4	155.9	7.73	68.0	47.27	2963.1	1192.3	0.92	
4094.3	155.7	6.99	67.0	46.70	2897.0	1197.3	0.91	
4033.2	155.5	6.31	66.0	46.12	2831.3	1201.9	0.90	
3972.1	155.3	5.67	65.0	45.55	2766.1	1206.0	0.89	
3911.0	155.1	5.09	64.0	44.98	2701.3	1209.7	0.88	
3849.9	154.9	4.55	63.0	44.41	2636.9	1213.0	0.87	
3788.8	154.7	4.06	62.0	43.84	2573.0	1215.8	0.86	
3727.7	154.5	3.61	61.0	43.27	2509.6	1218.1	0.84	
3666.6	154.3	3.20	60.0	42.70	2446.6	1220.0	0.83	
3605.4	154.1	2.83	59.0	42.13	2384.1	1221.4	0.82	
3544.3	153.9	2.49	58.0	41.56	2322.0	1222.3	0.81	
3483.2	153.7	2.19	57.0	40.99	2260.5	1222.7	0.80	
3422.1	153.6	1.91	56.0	40.42	2199.4	1222.7	0.79	
3361.0	153.4	1.67	55.0	39.84	2138.8	1222.2	0.78	
3299.9	153.2	1.46	54.0	39.27	2078.7	1221.2	0.77	
3238.8	153.0	1.27	53.0	38.70	2019.1	1219.7	0.76	
3177.7	152.9	1.10	52.0	38.13	1960.0	1217.7	0.74	
3116.6	152.7	0.96	51.0	37.56	1901.4	1215.1	0.73	
3055.5	152.5	0.83	50.0	36.99	1843.4	1212.1	0.72	
2994.4	152.4	0.72	49.0	36.42	1785.8	1208.5	0.71	
2933.2	152.2	0.62	48.0	35.85	1728.8	1204.5	0.70	
2872.1	152.1	0.54	47.0	35.28	1672.3	1199.9	0.69	
2811.0	151.9	0.46	46.0	34.71	1616.3	1194.7	0.68	
2749.9	151.8	0.40	45.0	34.13	1560.8	1189.1	0.67	
2688.8	151.6	0.34	44.0	33.56	1505.9	1182.9	0.66	
2627.7	151.5	0.29	43.0	32.99	1451.6	1176.1	0.64	
2566.6	151.4	0.25	42.0	32.42	1397.8	1168.8	0.63	
2505.5	151.3	0.21	41.0	31.85	1344.5	1161.0	0.62	
2444.4	151.1	0.18	40.0	31.28	1291.8	1152.5	0.61	
2383.3	151.0	0.16	39.0	30.71	1239.7	1143.5	0.60	
2322.2	150.9	0.13	38.0	30.14	1188.2	1134.0	0.59	

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 90.26 lbs/cu. ft.  
Y-CG = 0.0 in.(Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = + OR - 54.0 in.(Const)  
Pressurized Radius = 25.61 in.  
Ixx = 0.0

TABLE 5.1-2 (CONTINUED)  
LM 10 AND SUBSEQUENT DPS OXIDIZER MASS PROPERTIES

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq)		Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
		I <sub>yy</sub> - I <sub>zz</sub>						
2261.0	150.8	0.11		37.0	29.57	1137.2	1123.9	0.58
2199.9	150.7	0.10		36.0	29.00	1086.8	1113.1	0.57
2138.8	150.6	0.08		35.0	28.42	1037.0	1101.9	0.55
2077.7	150.5	0.07		34.0	27.85	987.7	1090.0	0.54
2016.6	150.4	0.08		33.0	27.28	939.1	1077.5	0.53
1955.5	150.4	0.05		32.0	26.71	891.1	1064.4	0.52
1894.4	150.3	0.04		31.0	26.14	843.7	1050.7	0.51
1833.3	150.2	0.04		30.0	25.57	797.3	1035.9	0.50
1772.2	150.1	0.03		29.0	25.00	753.3	1018.8	0.49
1711.1	150.0	0.03		28.0	24.43	710.3	1000.8	0.48
1649.9	150.0	0.02		27.0	23.85	668.1	981.8	0.47
1588.8	149.9	0.02		26.0	23.29	626.9	961.9	0.45
1527.7	149.8	0.02		25.0	22.72	586.6	941.2	0.44
1466.6	149.8	0.01		24.0	22.14	547.1	919.5	0.43
1405.5	149.7	0.01		23.0	21.55	508.6	896.9	0.42
1344.4	149.7	0.01		22.0	20.98	471.0	873.4	0.41
1283.3	149.6	0.00		21.0	20.39	434.2	849.1	0.40
1222.2	149.6	0.00		20.0	19.79	398.4	823.8	0.39
1161.1	149.5	0.00		19.0	19.19	363.4	797.7	0.37
1100.0	149.5	0.00		18.0	18.58	329.4	770.6	0.36
1038.9	149.5	0.00		17.0	17.96	296.4	742.5	0.35
977.7	149.5	0.00		16.0	17.33	264.3	713.5	0.34
916.6	149.5	0.00		15.0	16.69	233.2	683.4	0.33
855.5	149.5	0.00		14.0	16.04	203.2	652.3	0.31
794.4	149.5	0.00		13.0	15.37	174.3	620.1	0.30
733.3	149.5	0.00		12.0	14.69	146.6	586.7	0.29
672.2	149.5	0.00		11.0	13.96	120.2	552.0	0.27
611.1	149.5	0.00		10.0	13.26	95.1	516.0	0.26
550.0	149.5	0.00		9.0	12.50	71.6	478.4	0.24

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 90.26 lbs/cu. ft.  
Y-CG = 0.0 in. (Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = + OR - 54.0 in. (Const)  
Pressurized Radius = 25.61 in.  
I<sub>xx</sub> = 0.0

TABLE 5.1-2 (CONCLUDED)  
LM 10 AND SUBSEQUENT DPS OXIDIZER MASS PROPERTIES

Weight (lbs)	XCG (in.)	Inertia (Slug-Ft Sq)		Percent Full	Height (in.)	Rigid (lbs)	Slosh (lbs)	H/2R
		I <sub>yy</sub> - I <sub>zz</sub>						
488.9	149.5	0.00		8.0	11.72	49.8	439.1	0.23
427.8	149.5	0.00		7.0	10.89	29.9	397.9	0.21
366.7	149.5	0.00		6.0	10.02	12.3	354.3	0.20
305.5	149.5	0.00		5.0	9.08	0.0	305.5	0.18
244.4	149.5	0.00		4.0	8.06	0.0	244.4	0.16
183.3	149.5	0.00		3.0	6.92	0.0	183.3	0.14
122.2	145.5	0.00		2.0	5.60	0.0	122.2	0.11
61.1	149.5	0.00		1.0	3.91	0.0	61.1	0.08
0.0	149.5	0.00		0.0	0.00	0.0	0.0	0.00

Pressure = 235.0 psia - 2 Tanks  
Cylinder Height = 22.64 in.  
Density = 90.26 lbs/cu. ft.  
Y-CG = 0.0 in. (Const)  
Pressurized Height = 22.75 in.

Temperature = 70.0 F  
Tank Radius = 25.50 in.  
Bottom of Tank = 123.84 in.  
Z-CG = + OR - 54.0 in. (Const)  
Pressurized Radius = 25.61 in.  
I<sub>xx</sub> = 0.0

TABLE 5.2-1

## APS TANKED FUEL MASS PROPERTIES

The following mass properties are to be used over the entire range of tanked fuel quantity:

$X_{cg}$	-	228.0 inches
$Y_{cg}$	-	-71.3 inches
$Z_{cg}$	-	0.0 inches
$I_{xx}$	-	0 slug-feet <sup>2</sup>
$I_{yy}$	-	0 slug-feet <sup>2</sup>
$I_{zz}$	-	0 slug-feet <sup>2</sup>
$I_{xy}$	-	0 slug-feet <sup>2</sup>
$I_{xz}$	-	0 slug-feet <sup>2</sup>
$I_{yz}$	-	0 slug-feet <sup>2</sup>

TABLE 5.2-2

## APS TANKED OXIDIZER MASS PROPERTIES

The following mass properties are to be used over the entire range of tanked oxidizer quantity:

$X_{cg}$	-	228.0	inches
$Y_{cg}$	-	44.5	inches
$Z_{cg}$	-	0.0	inches
$I_{xx}$	-	0	slug-feet <sup>2</sup>
$I_{yy}$	-	0	slug-feet <sup>2</sup>
$I_{zz}$	-	0	slug-feet <sup>2</sup>
$I_{xy}$	-	0	slug-feet <sup>2</sup>
$I_{xz}$	-	0	slug-feet <sup>2</sup>
$I_{yz}$	-	0	slug-feet <sup>2</sup>



LUNAR MODULE RCS PROPELLANT

MASS PROPERTIES

NOTE:

1. Mass Properties are given for liquid in individual tanks.
2. Moments of Inertia are about center of gravity of propellant in individual tanks, coordinates of which are given.
3. Centers of Gravity in Y and Z directions are given at top of each page.
4. The number of tanks of a particular kind is indicated by the last number on the first line of each page.

LM RCS FUEL MASS PROPERTIES-70°F-2 TANKS

Y-CG = + OR - 44.6 (CONST) Z-CG = + OR - 14.5

RADIUS= 6.250 CYLINDRICAL SECITON= 18.650. WEIGHT= 103.7

DENSITY= 56.330 LBS/CU.FT.

(ULLAGE/(VOL.OF LIQUID))x100= 4.093

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
103.7	279.3	0.0	0.4
103.2	279.2	0.0	0.5
102.7	279.2	0.0	0.5
102.1	279.1	0.0	0.5
101.6	279.0	0.0	0.5
101.1	279.0	0.0	0.5
100.6	278.9	0.0	0.5
100.1	278.8	0.0	0.5
99.6	278.8	0.0	0.4
99.0	278.7	0.0	0.4
98.5	278.7	0.0	0.3
98.0	278.6	0.0	0.4
97.5	278.5	0.0	0.4
97.0	278.5	0.0	0.4
96.4	278.4	0.0	0.4
95.9	278.3	0.0	0.4
95.4	278.3	0.0	0.4
94.9	278.2	0.0	0.4
94.4	278.1	0.0	0.4
93.8	278.1	0.0	0.4
93.3	278.0	0.0	0.4
92.8	277.9	0.0	0.4
92.3	277.9	0.0	0.4
91.8	277.8	0.0	0.3
91.3	277.7	0.0	0.3
90.7	277.7	0.0	0.3
90.2	277.6	0.0	0.3
89.7	277.5	0.0	0.3
89.2	277.5	0.0	0.3
88.7	277.4	0.0	0.3
88.1	277.4	0.0	0.3
87.6	277.3	0.0	0.3
87.1	277.2	0.0	0.3
86.6	277.2	0.0	0.3
86.1	277.1	0.0	0.3
85.6	277.0	0.0	0.3
85.0	277.0	0.0	0.3
84.5	276.9	0.0	0.2
84.0	276.8	0.0	0.2
83.5	276.8	0.0	0.2
83.0	276.7	0.0	0.2
82.4	276.6	0.0	0.2
81.9	276.6	0.0	0.2

LM RCS FUEL MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = + OR - 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 18.650, WEIGHT= 103.7  
 DENSITY= 56.330 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
81.4	276.5	0.0	0.2
80.9	276.4	0.0	0.2
80.4	276.4	0.0	0.2
79.8	276.3	0.0	0.2
79.3	276.2	0.0	0.2
78.8	276.2	0.0	0.2
78.3	276.1	0.0	0.2
77.8	276.0	0.0	0.2
77.3	276.0	0.0	0.2
76.7	275.9	0.0	0.2
76.2	275.9	0.0	0.2
75.7	275.8	0.0	0.1
75.2	275.7	0.0	0.1
74.7	275.7	0.0	0.1
74.1	275.6	0.0	0.1
73.6	275.5	0.0	0.1
73.1	275.5	0.0	0.1
72.6	275.4	0.0	0.1
72.1	275.3	0.0	0.1
71.6	275.3	0.0	0.1
71.0	275.2	0.0	0.1
70.5	275.1	0.0	0.1
70.0	275.1	0.0	0.1
69.5	275.0	0.0	0.1
69.0	274.9	0.0	0.1
68.4	274.9	0.0	0.1
67.9	274.8	0.0	0.1
67.4	274.7	0.0	0.1
66.9	274.7	0.0	0.1
66.4	274.6	0.0	0.1
65.8	274.5	0.0	0.1
65.3	274.5	0.0	0.1
64.8	274.4	0.0	0.1
64.3	274.4	0.0	0.1
63.8	274.3	0.0	0.1
63.3	274.2	0.0	0.1
62.7	274.2	0.0	0.1
62.2	274.1	0.0	0.1
61.7	274.0	0.0	0.0
61.2	274.0	0.0	0.0
60.7	273.9	0.0	0.0
60.1	273.8	0.0	0.0
59.6	273.8	0.0	0.0

LM RCS FUEL MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = + OR - 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 18.650. WEIGHT = 103.7  
 DENSITY= 56.330 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
59.1	273.7	0.0	0.0
58.6	273.6	0.0	0.0
58.1	273.6	0.0	0.0
57.6	273.5	0.0	0.0
57.0	273.4	0.0	0.0
56.5	273.4	0.0	0.0
56.0	273.3	0.0	0.0
55.5	273.2	0.0	0.0
55.0	273.2	0.0	0.0
54.4	273.1	0.0	0.0
53.9	273.0	0.0	0.0
53.4	273.0	0.0	0.0
52.9	272.9	0.0	0.0
52.4	272.8	0.0	0.0
51.8	272.8	0.0	0.0
51.3	272.7	0.0	0.0
50.8	272.6	0.0	0.0
50.3	272.6	0.0	0.0
49.8	272.5	0.0	0.0
49.3	272.5	0.0	0.0
48.7	272.4	0.0	0.0
48.2	272.3	0.0	0.0
47.7	272.3	0.0	0.0
47.2	272.2	0.0	0.0
46.7	272.1	0.0	0.0
46.1	272.1	0.0	0.0
45.6	272.0	0.0	0.0
45.1	271.9	0.0	0.0
44.6	271.9	0.0	0.0
44.1	271.8	0.0	0.0
43.6	271.7	0.0	0.0
43.0	271.7	0.0	0.0
42.5	271.6	0.0	0.0
42.0	271.5	0.0	0.0
41.5	271.5	0.0	0.0
41.0	271.4	0.0	0.0
40.4	271.3	0.0	0.0
39.9	271.3	0.0	0.0
39.4	271.2	0.0	0.0
38.9	271.1	0.0	0.0
38.4	271.1	0.0	0.0
37.9	271.0	0.0	0.0
37.3	270.9	0.0	0.0

LM RCS FUEL MASS PROPERTIES-70°F-2 TANKS  
Y-CG = + OR - 44.6 (CONST) Z-CG = + OR - 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 18.560. WEIGHT= 103.7  
DENSITY= 56.330 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
36.8	270.9	0.0	0.0
36.3	270.8	0.0	0.0
35.8	270.7	0.0	0.0
35.3	270.7	0.0	0.0
34.7	270.6	0.0	0.0
34.2	270.5	0.0	0.0
33.7	270.5	0.0	0.0
33.2	270.4	0.0	0.0
32.7	270.3	0.0	0.0
32.1	270.3	0.0	0.0
31.6	270.2	0.0	0.0
31.1	270.1	0.0	0.0
30.6	270.1	0.0	0.0
30.1	270.0	0.0	0.0
29.6	269.9	0.0	0.0
29.0	269.9	0.0	0.0
28.5	269.8	0.0	0.0
28.0	269.7	0.0	0.0
27.5	269.7	0.0	0.0
27.0	269.6	0.0	0.0
26.4	269.5	0.0	0.0
25.9	269.5	0.0	0.0
25.4	269.4	0.0	0.0
24.9	269.3	0.0	0.0
24.4	269.3	0.0	0.0
23.9	269.2	0.0	0.0
23.3	269.1	0.0	0.0
22.8	269.0	0.0	0.0
22.3	269.0	0.0	0.0
21.8	268.9	0.0	0.0
21.3	268.8	0.0	0.0
20.7	268.8	0.0	0.0
20.2	268.7	0.0	0.0
19.7	268.6	0.0	0.0
19.2	268.6	0.0	0.0
18.7	268.5	0.0	0.0
18.1	268.4	0.0	0.0
17.6	268.3	0.0	0.0
17.1	268.3	0.0	0.0
16.6	268.2	0.0	0.0
16.1	268.1	0.0	0.0
15.6	268.0	0.0	0.0
15.0	268.0	0.0	0.0

LM RCS FUEL MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = + OR - 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 18.650. WEIGHT= 103.7  
 DENSITY= 56.330 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
14.5	267.9	0.0	0.0
14.0	267.8	0.0	0.0
13.5	267.7	0.0	0.0
13.0	267.7	0.0	0.0
12.4	267.6	0.0	0.0
11.9	267.5	0.0	0.0
11.4	267.4	0.0	0.0
10.9	267.3	0.0	0.0
10.4	267.3	0.0	0.0
9.9	267.2	0.0	0.0
9.3	267.1	0.0	0.0
8.8	267.0	0.0	0.0
8.3	266.9	0.0	0.0
7.8	266.8	0.0	0.0
7.3	266.7	0.0	0.0
6.7	266.6	0.0	0.0
6.2	266.5	0.0	0.0
5.7	266.4	0.0	0.0
5.2	266.3	0.0	0.0
4.7	266.2	0.0	0.0
4.1	266.1	0.0	0.0
3.6	266.0	0.0	0.0
3.1	265.8	0.0	0.0
2.6	265.7	0.0	0.0
2.1	265.5	0.0	0.0
1.6	265.4	0.0	0.0
1.0	265.2	0.0	0.0
0.5	264.9	0.0	0.0

LM RCS OXIDIZER MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = - OR + 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 25.260. WEIGHT= 203.4  
 DENSITY= 90.050 LBS/CU.FT.

(ULLAGE/(VOL.OF LIQUID))x100= 5.621

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
203.4	275.7	0.0	1.4
202.4	275.6	0.0	1.4
201.4	275.5	0.0	1.4
200.3	275.4	0.0	1.4
199.3	275.3	0.0	1.4
198.3	275.3	0.0	1.3
197.3	275.2	0.0	1.3
196.3	275.1	0.0	1.3
195.3	275.0	0.0	1.3
194.2	274.9	0.0	1.3
193.2	274.9	0.0	1.2
192.2	274.8	0.0	1.2
191.2	274.7	0.0	1.2
190.2	274.6	0.0	1.2
189.2	274.5	0.0	1.2
188.1	274.5	0.0	1.2
187.1	274.4	0.0	1.1
186.1	274.3	0.0	1.1
185.1	274.2	0.0	1.1
184.1	274.1	0.0	1.1
183.1	274.1	0.0	1.0
182.0	274.0	0.0	1.0
181.0	273.9	0.0	1.0
180.0	273.8	0.0	1.0
179.0	273.7	0.0	1.0
178.0	273.7	0.0	0.9
177.0	273.6	0.0	0.9
175.9	273.5	0.0	0.9
174.9	273.4	0.0	0.9
173.9	273.3	0.0	0.8
172.9	273.3	0.0	0.8
171.9	273.2	0.0	0.8
170.9	273.1	0.0	0.8
169.8	273.0	0.0	0.8
168.8	272.9	0.0	0.8
167.8	272.9	0.0	0.7
166.8	272.8	0.0	0.7
165.8	272.7	0.0	0.7
164.8	272.6	0.0	0.7
163.7	272.5	0.0	0.7
162.7	272.5	0.0	0.7
161.7	272.4	0.0	0.6
160.7	272.3	0.0	0.6

LM RCS OXIDIZER MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = - OR + 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 25.260. WEIGHT= 203.4  
 DENSITY= 90.050 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
159.7	272.2	0.0	0.6
158.7	272.1	0.0	0.6
157.6	272.1	0.0	0.6
156.6	272.0	0.0	0.6
155.6	271.9	0.0	0.5
154.6	271.8	0.0	0.5
153.6	271.7	0.0	0.5
152.5	271.7	0.0	0.5
151.5	271.6	0.0	0.5
150.5	271.5	0.0	0.5
149.5	271.4	0.0	0.5
148.5	271.3	0.0	0.5
147.5	271.3	0.0	0.4
146.4	271.2	0.0	0.4
145.4	271.1	0.0	0.4
144.4	271.0	0.0	0.4
143.4	270.9	0.0	0.4
142.4	270.9	0.0	0.4
141.4	270.8	0.0	0.4
140.3	270.7	0.0	0.4
139.3	270.6	0.0	0.3
138.3	270.5	0.0	0.3
137.3	270.5	0.0	0.3
136.3	270.4	0.0	0.3
135.3	270.3	0.0	0.3
134.2	270.2	0.0	0.3
133.2	270.1	0.0	0.3
132.2	270.1	0.0	0.3
131.2	270.0	0.0	0.3
130.2	269.9	0.0	0.3
129.2	269.8	0.0	0.3
128.1	269.7	0.0	0.2
127.1	269.7	0.0	0.2
126.1	269.6	0.0	0.2
125.1	269.5	0.0	0.2
124.1	269.4	0.0	0.2
123.1	269.3	0.0	0.2
122.0	269.3	0.0	0.2
121.0	269.2	0.0	0.2
120.0	269.1	0.0	0.2
119.0	269.0	0.0	0.2
118.0	268.9	0.0	0.2
117.0	268.9	0.0	0.2



LM RCS OXIDIZER MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = - OR + 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 25.260. WEIGHT= 203.4  
 DENSITY= 90.050 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
115.9	268.8	0.0	0.2
114.9	268.7	0.0	0.2
113.9	268.6	0.0	0.1
112.9	268.5	0.0	0.1
111.9	268.5	0.0	0.1
110.9	268.4	0.0	0.1
109.8	268.3	0.0	0.1
108.8	268.2	0.0	0.1
107.8	268.1	0.0	0.1
106.8	268.1	0.0	0.1
105.8	268.0	0.0	0.1
104.8	267.9	0.0	0.1
103.7	267.8	0.0	0.1
102.7	267.7	0.0	0.1
101.7	267.7	0.0	0.1
100.7	267.6	0.0	0.1
99.7	267.5	0.0	0.1
98.6	267.4	0.0	0.1
97.6	267.3	0.0	0.1
96.6	267.3	0.0	0.1
95.6	267.2	0.0	0.1
94.6	267.1	0.0	0.1
93.6	267.0	0.0	0.1
92.5	266.9	0.0	0.0
91.5	266.9	0.0	0.0
90.5	266.8	0.0	0.0
89.5	266.7	0.0	0.0
88.5	266.6	0.0	0.0
87.5	266.5	0.0	0.0
86.4	266.5	0.0	0.0
85.4	266.4	0.0	0.0
84.4	266.3	0.0	0.0
83.4	266.2	0.0	0.0
82.4	266.1	0.0	0.0
81.4	266.1	0.0	0.0
80.3	266.0	0.0	0.0
79.3	265.9	0.0	0.0
78.3	265.8	0.0	0.0
77.3	265.7	0.0	0.0
76.3	265.7	0.0	0.0
75.3	265.6	0.0	0.0
74.2	265.5	0.0	0.0
73.2	265.4	0.0	0.0

LM RCS OXIDIZER MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = - OR + 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 25.260. WEIGHT= 203.4  
 DENSITY= 90.050 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
72.2	265.3	0.0	0.0
71.2	265.3	0.0	0.0
70.2	265.2	0.0	0.0
69.2	265.1	0.0	0.0
68.1	265.0	0.0	0.0
67.1	264.9	0.0	0.0
66.1	264.8	0.0	0.0
65.1	264.8	0.0	0.0
64.1	264.7	0.0	0.0
63.1	264.6	0.0	0.0
62.0	264.5	0.0	0.0
61.0	264.4	0.0	0.0
60.0	264.4	0.0	0.0
59.0	264.3	0.0	0.0
58.0	264.2	0.0	0.0
57.0	264.1	0.0	0.0
55.9	264.0	0.0	0.0
54.9	264.0	0.0	0.0
53.9	263.9	0.0	0.0
52.9	263.8	0.0	0.0
51.9	263.7	0.0	0.0
50.8	263.6	0.0	0.0
49.8	263.5	0.0	0.0
48.8	263.5	0.0	0.0
47.8	263.4	0.0	0.0
46.8	263.3	0.0	0.0
45.8	263.2	0.0	0.0
44.7	263.1	0.0	0.0
43.7	263.0	0.0	0.0
42.7	263.0	0.0	0.0
41.7	262.9	0.0	0.0
40.7	262.8	0.0	0.0
39.7	262.7	0.0	0.0
38.6	262.6	0.0	0.0
37.6	262.5	0.0	0.0
36.6	262.5	0.0	0.0
35.6	262.4	0.0	0.0
34.6	262.3	0.0	0.0
33.6	262.2	0.0	0.0
32.5	262.1	0.0	0.0
31.5	262.0	0.0	0.0
30.5	261.9	0.0	0.0
29.5	261.9	0.0	0.0

LM RCS OXIDIZER MASS PROPERTIES-70°F-2 TANKS  
 Y-CG = + OR - 44.6 (CONST) Z-CG = - OR + 14.5

RADIUS= 6.250 CYLINDRICAL SECTION= 25.260. WEIGHT= 203.4  
 DENSITY= 90.050 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ)	IYY or IZZ(S-FT.SQ)
28.5	261.8	0.0	0.0
27.5	261.7	0.0	0.0
26.4	261.6	0.0	0.0
25.4	261.5	0.0	0.0
24.4	261.4	0.0	0.0
23.4	261.3	0.0	0.0
22.4	261.2	0.0	0.0
21.4	261.1	0.0	0.0
20.3	261.0	0.0	0.0
19.3	260.9	0.0	0.0
18.3	260.8	0.0	0.0
17.3	260.7	0.0	0.0
16.3	260.6	0.0	0.0
15.3	260.5	0.0	0.0
14.2	260.4	0.0	0.0
13.2	260.3	0.0	0.0
12.2	260.2	0.0	0.0
11.2	260.1	0.0	0.0
10.2	260.0	0.0	0.0
9.2	259.8	0.0	0.0
8.1	259.7	0.0	0.0
7.1	259.6	0.0	0.0
6.1	259.4	0.0	0.0
5.1	259.3	0.0	0.0
4.1	259.1	0.0	0.0
3.1	258.9	0.0	0.0
2.0	258.7	0.0	0.0
1.0	258.4	0.0	0.0

## LUNAR MODULE DESCENT WATER

### MASS PROPERTIES

#### NOTE:

1. Mass Properties are given for liquid in individual tanks.
2. Moments of Inertia are about center of gravity of water in individual tanks, coordinates of which are given.
3. Centers of Gravity in Y and Z directions are given at top of each page.
4. The number of tanks of a particular kind is indicated by the last number on the first line of each page.

TABLE 5.4-1

## LM 10 AND SUBSEQUENT DESCENT STAGE WATER MASS PROPERTIES

RADIUS = 14.2 INCHES                      DENSITY = 62.4 LBS/CU. FT.    WEIGHT = 323.8 POUNDS  
 TANK NO. 1 Y-CG = -43.2 (CONSTANT)    TANK NO. 2 Y-CG = 43.2 (CONSTANT)  
                     Z-CG = -43.2 (CONSTANT)                      Z-CG = 43.2 (CONSTANT)  
 (ULLAGE/(VOLUME OF LIQUID)) X 100 = 37.757

<u>Weight Pounds</u>	<u>Tank-1 X-CG</u>	<u>Tank-2 X-CG</u>	<u>Height Inches</u>
333.0	166.0	142.9	19.542
323.8	165.8	142.7	19.080
322.2	165.8	142.7	19.000
320.6	165.8	142.7	18.921
318.9	165.7	142.6	18.841
317.3	165.7	142.6	18.762
315.7	165.6	142.5	18.683
314.1	165.6	142.5	18.605
312.5	165.6	142.5	18.527
310.8	165.5	142.4	18.449
309.2	165.5	142.4	18.371
307.6	165.4	142.3	18.294
806.0	165.4	142.3	18.217
304.4	165.4	142.3	18.140
302.8	165.3	142.2	18.064
301.1	165.3	142.2	17.987
299.5	165.3	142.2	17.911
297.9	165.2	142.1	17.835
296.3	165.2	142.1	17.760
294.7	165.1	142.0	17.684
293.0	165.1	142.0	17.609
291.4	165.1	142.0	17.534
289.8	165.0	141.9	17.459
288.2	165.0	141.9	17.385
286.6	165.0	141.9	17.310
284.9	164.9	141.8	17.236
283.3	164.9	141.8	17.162
281.7	164.8	141.7	17.088
280.1	164.8	141.7	17.014
278.5	164.8	141.7	16.941
276.8	164.7	141.6	16.867
275.2	164.7	141.6	16.794
273.6	164.6	141.5	16.721
272.0	164.6	141.5	16.648
270.4	164.6	141.5	16.575
268.8	164.5	141.4	16.502
267.1	164.5	141.4	16.430
265.5	164.5	141.4	16.357

TABLE 5.4-1 (CONTINUED)

LM 10 AND SUBSEQUENT DESCENT STAGE WATER MASS PROPERTIES

RADIUS = 14.2 INCHES

DENSITY = 62.4 LBS/CU. FT. WEIGHT = 323.8 POUNDS

TANK NO. 1 Y-CG = -43.2 (CONSTANT) TANK NO. 2 Y-CG = 43.2 (CONSTANT)

Z-CG = -43.2 (CONSTANT) Z-CG = 43.2 (CONSTANT)

(ULLAGE/(VOLUME OF LIQUID)) X 100 = 37.757

<u>Weight</u> <u>Pounds</u>	<u>Tank-1</u> <u>X-CG</u>	<u>Tank-2</u> <u>X-CG</u>	<u>Height</u> <u>Inches</u>
263.9	164.4	141.3	16.285
262.3	164.4	141.3	16.212
260.7	164.3	141.2	16.140
259.0	164.3	141.2	16.068
257.4	164.3	141.2	15.996
255.8	164.2	141.1	15.924
254.2	164.2	141.1	15.852
252.6	164.1	141.0	15.781
250.9	164.1	141.0	15.709
249.3	164.1	141.0	15.638
247.7	164.0	140.9	15.566
246.1	164.0	140.9	15.495
244.5	164.0	140.9	15.423
242.8	163.9	140.8	15.352
241.2	163.9	140.8	15.281
239.6	163.8	140.7	15.210
238.0	163.8	140.7	15.139
236.4	163.8	140.7	15.068
234.8	163.7	140.6	14.997
233.1	163.7	140.6	14.926
231.5	163.6	140.5	14.855
229.9	163.6	140.5	14.784
228.3	163.6	140.5	14.713
226.7	163.5	140.4	14.642
225.0	163.5	140.4	14.571
223.4	163.4	140.3	14.500
221.8	163.4	140.3	14.430
220.2	163.4	140.3	14.359
218.6	163.3	140.2	14.288
216.9	163.3	140.2	14.217
215.3	163.2	140.1	14.146
213.7	163.2	140.1	14.076
212.1	163.2	140.1	14.005
210.5	163.1	140.0	13.934
208.9	163.1	140.0	13.863
207.2	163.0	139.9	13.792
205.6	163.0	139.9	13.722
204.0	163.0	139.9	13.651

TABLE 5.4-1 (CONTINUED)

LM 10 AND SUBSEQUENT DESCENT STAGE WATER MASS PROPERTIES

RADIUS = 14.2 INCHES                          DENSITY = 62.4 LBS/CU. FT.      WEIGHT = 323.8 POUNDS  
TANK NO. 1 Y-CG = -43.2 (CONSTANT)      TANK NO. 2 Y-CG = 43.2 (CONSTANT)  
    Z-CG = -43.2 (CONSTANT)                  Z-CG = 43.2 (CONSTANT)  
(ULLAGE/(VOLUME OF LIQUID)) X 100 = 37.757

<u>Weight Pounds</u>	<u>Tank-1 X-CG</u>	<u>Tank-2 X-CG</u>	<u>Height Inches</u>
77.7	159.4	136.3	7.670
76.1	159.3	136.2	7.580
74.5	159.3	136.2	7.489
72.9	159.2	136.1	7.398
71.2	159.1	136.0	7.306
69.6	159.1	136.0	7.213
68.0	159.0	135.9	7.119
66.4	159.0	135.9	7.024
64.8	158.9	135.8	6.929
63.1	158.8	135.7	6.832
61.5	158.8	135.7	6.735
59.9	158.7	135.6	6.637
58.3	158.7	135.6	6.538
56.7	158.6	135.5	6.437
55.0	158.5	135.4	6.336
53.4	158.5	135.4	6.233
51.8	158.4	135.3	6.129
50.2	158.3	135.2	6.024
48.6	158.3	135.2	5.917
47.0	158.2	135.1	5.809
45.3	158.1	135.0	5.700
43.7	158.1	135.0	5.589
42.1	158.0	134.9	5.476
40.5	157.9	134.8	5.361
38.9	157.8	134.7	5.245
37.2	157.8	134.7	5.126
35.6	157.7	134.6	5.005
34.0	157.6	134.5	4.882
32.4	157.5	134.4	4.757
30.8	157.4	134.3	4.628
29.1	157.4	134.3	4.497
27.5	157.3	134.2	4.363
25.9	157.2	134.1	4.225
24.3	157.1	134.0	4.083
22.7	157.0	133.9	3.937
21.0	156.9	133.8	3.787
19.4	156.8	133.7	3.631
17.8	156.7	133.6	3.469
16.2	156.6	133.5	3.301
14.6	156.5	133.4	3.124

TABLE 5.4-1 (CONTINUED)

LM 10 AND SUBSEQUENT DESCENT STAGE WATER MASS PROPERTIES

RADIUS = 14.2 INCHES                      DENSITY = 62.4 LBS/CU. FT.    WEIGHT = 323.8 POUNDS  
 TANK NO. 1 Y-CG = -43.2 (CONSTANT)    TANK NO. 2 Y-CG = 43.2 (CONSTANT)  
                     Z-CG = -43.2 (CONSTANT)                      Z-CG = 43.2 (CONSTANT)  
 (ULLAGE/(VOLUME OF LIQUID)) X 100 = 37.757

<u>Weight Pounds</u>	<u>Tank-1 X-CG</u>	<u>Tank-2 X-CG</u>	<u>Height Inches</u>
13.0	156.3	133.2	2.939
11.3	156.2	133.1	2.742
9.7	156.1	133.0	2.532
8.1	155.9	132.8	2.305
6.5	155.8	132.7	2.055
4.9	155.6	132.5	1.774
3.2	155.4	132.3	1.442
1.6	155.1	132.0	1.015



# LUNAR MODULE ASCENT WATER

## MASS PROPERTIES

### NOTE:

1. Mass Properties are given for liquids in individual tanks.
2. Moments of Inertia are about center of gravity of water in individual tanks, coordinates of which are given.
3. Centers of Gravity in Y and Z directions are given at top of each page.
4. The number of tanks of a particular kind is indicated by the last number on the first line of each page.

LM ASCENT WATER MASS PROPERTIES-2 TANKS

Y-CG = + OR - 25.0 (CONST) Z-CG = + OR - 13.7 (CONST)

RADIUS=7.155 CYLINDRICAL SECTION= 0.0 WEIGHT= 41.2

DENSITY=62.400 LBS/CU.FT.

(ULLAGE/(VOL. OF LIQUID))x100= 34.481

WEIGHT	X-CG	IXX(S-FT.SQ.)	IYY or IZZ(S-FT.SQ.)
41.2	300.3	0.0	0.0
41.0	300.3	0.0	0.0
40.8	300.3	0.0	0.0
40.6	300.3	0.0	0.0
40.4	300.3	0.0	0.0
40.2	300.2	0.0	0.0
40.0	300.2	0.0	0.0
39.8	300.2	0.0	0.0
39.6	300.2	0.0	0.0
39.3	300.2	0.0	0.0
39.1	300.1	0.0	0.0
38.9	300.1	0.0	0.0
38.7	300.1	0.0	0.0
38.5	300.1	0.0	0.0
36.3	300.1	0.0	0.0
38.1	300.1	0.0	0.0
37.9	300.0	0.0	0.0
37.7	300.0	0.0	0.0
37.5	300.0	0.0	0.0
37.3	300.0	0.0	0.0
37.1	300.0	0.0	0.0
36.9	299.9	0.0	0.0
36.7	299.9	0.0	0.0
36.5	299.9	0.0	0.0
36.3	299.9	0.0	0.0
36.0	299.9	0.0	0.0
35.8	299.8	0.0	0.0
35.6	299.8	0.0	0.0
35.4	299.8	0.0	0.0
35.2	299.8	0.0	0.0
35.0	299.8	0.0	0.0
34.8	299.7	0.0	0.0
34.6	299.7	0.0	0.0
34.4	299.7	0.0	0.0
34.2	299.7	0.0	0.0
34.0	299.6	0.0	0.0
33.8	299.6	0.0	0.0
33.6	299.6	0.0	0.0
33.4	299.6	0.0	0.0
33.2	299.6	0.0	0.0
33.0	299.6	0.0	0.0
32.8	299.6	0.0	0.0
32.5	299.5	0.0	0.0

LM ASCENT WATER MASS PROPERTIES-2 TANKS

Y-CG = + OR - 25.0 (CONST) Z-CG = + OR - 13.7 (CONST)

RADIUS= 7.155 CYLINDRICAL SECTION= 0.0 WEIGHT= 41.2  
 DENSITY= 62.400 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ.)	IYY or IZZ(S-FT.SQ.)
32.3	299.5	0.0	0.0
32.1	299.5	0.0	0.0
31.9	299.5	0.0	0.0
31.7	299.5	0.0	0.0
31.5	299.4	0.0	0.0
31.3	299.4	0.0	0.0
31.1	299.4	0.0	0.0
30.9	299.4	0.0	0.0
30.7	299.4	0.0	0.0
30.5	299.3	0.0	0.0
30.3	299.3	0.0	0.0
30.1	299.3	0.0	0.0
29.9	299.3	0.0	0.0
29.7	299.3	0.0	0.0
29.5	299.2	0.0	0.0
29.3	299.2	0.0	0.0
29.0	299.2	0.0	0.0
28.8	299.2	0.0	0.0
28.6	299.2	0.0	0.0
28.4	299.1	0.0	0.0
28.2	299.1	0.0	0.0
28.0	299.1	0.0	0.0
27.8	299.1	0.0	0.0
27.6	299.1	0.0	0.0
27.4	299.0	0.0	0.0
27.2	299.0	0.0	0.0
27.0	299.0	0.0	0.0
26.8	299.0	0.0	0.0
26.6	299.0	0.0	0.0
26.4	298.9	0.0	0.0
26.2	298.9	0.0	0.0
26.0	298.9	0.0	0.0
25.7	298.9	0.0	0.0
25.5	298.9	0.0	0.0
25.3	298.8	0.0	0.0
25.1	298.8	0.0	0.0
24.9	298.8	0.0	0.0
24.7	298.8	0.0	0.0
24.5	298.8	0.0	0.0
24.3	298.7	0.0	0.0
24.1	298.7	0.0	0.0
23.9	298.7	0.0	0.0
23.7	298.7	0.0	0.0

LM ASCENT WATER MASS PROPERTIES-2 TANKS

Y-CG = + OR - 25.0 (CONST) Z-CG = + OR - 13.7 (CONST)

RADIUS= 7.155 CYLINDRICAL SECTION= 0.0 WEIGHT= 41.2

DENSITY= 62.400 LBS/CU. FT.

WEIGHT	X-CG	IXX(S-FT.SQ.)	IYY or IZZ(S-FT.SQ.)
23.5	298.7	0.0	0.0
23.3	298.6	0.0	0.0
23.1	298.6	0.0	0.0
22.9	298.6	0.0	0.0
22.7	298.6	0.0	0.0
22.5	298.6	0.0	0.0
22.2	298.5	0.0	0.0
22.0	298.5	0.0	0.0
21.8	298.5	0.0	0.0
21.6	298.5	0.0	0.0
21.4	298.4	0.0	0.0
21.2	298.4	0.0	0.0
21.0	298.4	0.0	0.0
20.8	298.4	0.0	0.0
20.6	298.4	0.0	0.0
20.4	298.3	0.0	0.0
20.2	298.3	0.0	0.0
20.0	298.3	0.0	0.0
19.8	298.3	0.0	0.0
19.6	298.2	0.0	0.0
19.4	298.2	0.0	0.0
19.2	298.2	0.0	0.0
19.0	298.2	0.0	0.0
18.7	298.2	0.0	0.0
18.5	298.1	0.0	0.0
18.3	298.1	0.0	0.0
18.1	298.1	0.0	0.0
17.9	298.1	0.0	0.0
17.7	298.0	0.0	0.0
17.5	298.0	0.0	0.0
17.3	298.0	0.0	0.0
17.1	298.0	0.0	0.0
16.0	298.0	0.0	0.0
16.7	297.9	0.0	0.0
16.5	297.9	0.0	0.0
16.3	297.9	0.0	0.0
16.1	297.9	0.0	0.0
15.9	297.8	0.0	0.0
15.7	297.8	0.0	0.0
15.4	297.8	0.0	0.0
15.2	297.8	0.0	0.0
15.0	297.7	0.0	0.0
14.8	297.7	0.0	0.0

LM ASCENT WATER MASS PROPERTIES-2 TANKS

Y-CG = + OR - 25.0 (CONST) Z-CG = + OR - 13.7 (CONST)

RADIUS= 7.155 CYLINDRICAL SECTION= 0.0 WEIGHT= 41.2

DENSITY= 62.400 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ.)	IYY or IZZ(S-FT.SQ.)
14.6	297.7	0.0	0.0
14.4	297.7	0.0	0.0
14.2	297.6	0.0	0.0
14.0	297.6	0.0	0.0
13.8	297.6	0.0	0.0
13.6	297.6	0.0	0.0
13.4	297.5	0.0	0.0
13.2	297.5	0.0	0.0
13.0	297.5	0.0	0.0
12.8	297.5	0.0	0.0
12.6	297.4	0.0	0.0
12.4	297.4	0.0	0.0
12.2	297.4	0.0	0.0
11.9	297.4	0.0	0.0
11.7	297.3	0.0	0.0
11.5	297.3	0.0	0.0
11.3	297.3	0.0	0.0
11.1	297.3	0.0	0.0
10.9	297.2	0.0	0.0
10.7	297.2	0.0	0.0
10.5	297.2	0.0	0.0
10.3	297.2	0.0	0.0
10.1	297.1	0.0	0.0
9.9	297.1	0.0	0.0
9.7	297.1	0.0	0.0
9.5	297.0	0.0	0.0
9.3	297.0	0.0	0.0
9.1	297.0	0.0	0.0
8.9	297.0	0.0	0.0
8.7	296.9	0.0	0.0
8.4	296.9	0.0	0.0
8.2	296.9	0.0	0.0
8.0	296.8	0.0	0.0
7.8	296.8	0.0	0.0
7.6	296.8	0.0	0.0
7.4	296.7	0.0	0.0
7.2	296.7	0.0	0.0
7.0	296.7	0.0	0.0
6.8	296.6	0.0	0.0
6.6	296.6	0.0	0.0
6.4	296.6	0.0	0.0
6.2	296.5	0.0	0.0
6.0	296.5	0.0	0.0

LM ASCENT WATER MASS PROPERTIES-2 TANKS

Y-CG = + OR - 25.0 (CONST) Z-CG = + OR - 13.7 (CONST)

RADIUS= 7.155 CYLINDRICAL SECTION= 0.0 WEIGHT= 41.2  
 DENSITY= 62.400 LBS/CU.FT.

WEIGHT	X-CG	IXX(S-FT.SQ.)	IYY or IZZ (S-FT.SQ.)
5.8	296.5	0.0	0.0
5.6	296.4	0.0	0.0
5.4	296.4	0.0	0.0
5.1	296.4	0.0	0.0
4.9	296.3	0.0	0.0
4.7	296.3	0.0	0.0
4.5	296.2	0.0	0.0
4.3	296.2	0.0	0.0
4.1	296.2	0.0	0.0
3.9	296.1	0.0	0.0
3.7	296.1	0.0	0.0
3.5	296.0	0.0	0.0
3.3	296.0	0.0	0.0
3.1	295.9	0.0	0.0
2.9	295.9	0.0	0.0
2.7	295.9	0.0	0.0
2.5	295.8	0.0	0.0
2.3	295.7	0.0	0.0
2.1	295.7	0.0	0.0
1.9	295.6	0.0	0.0
1.6	295.6	0.0	0.0
1.4	295.5	0.0	0.0
1.2	295.4	0.0	0.0
1.0	295.4	0.0	0.0
0.8	295.3	0.0	0.0
0.6	295.2	0.0	0.0
0.4	295.1	0.0	0.0
0.2	294.9	0.0	0.0

LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS  
AND MISCELLANEOUS CONSUMABLES

TABLE 5.6-1

LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS

	WEIGHT (Pounds)	CENTER OF GRAVITY (Inches)		
		X <sub>E</sub>	Y <sub>E</sub>	Z <sub>E</sub>
<u>APS - Trapped Outside Tanks</u>				
Fill and Drain Lines - Fuel	0.2	218.5	-36.3	16.7
- Oxidizer	0.8	216.0	23.2	14.0
Engine (to SOV) - Fuel	0.2	235.8	0.0	10.5
- Oxidizer	0.3	235.8	0.0	10.5
Isolation Squib - Fuel	0.2	218.5	-36.3	16.7
- Oxidizer	0.1	216.0	23.2	14.0
APS/RCS Interconnect - Fuel	1.6	218.5	-36.3	16.7
- Oxidizer	2.3	216.0	23.2	14.0
<sup>1</sup> Feed Lines - Fuel	3.7	218.5	-36.3	16.7
- Oxidizer	4.8	216.0	23.2	14.0
Total Outside Tanks - Fuel	5.9	219.1	-35.0	16.5
- Oxidizer	8.3	216.7	22.4	13.9

<sup>1</sup>APS and DPS propellant trapped in feed lines is considered usable for depletion burns.



TABLE 5.6-1 (CONTINUED)  
 LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS

	WEIGHT (Pounds)
<u>APS - Trapped Inside Tanks</u>	
Tank Wetting - Fuel	1.0
- Oxidizer	1.0
Propellant Vapor - Fuel	1.0
- Oxidizer	13.8
Unporting Prevention - Fuel	7.1
- Oxidizer	11.3
"Zero-G" Cans - Fuel	1.2
- Oxidizer	2.0
Thrust Vector Deviation from Vehicle Center Line - Fuel	0.4
- Oxidizer	0.6
Engine and Valve Operation - Fuel	3.1
- Oxidizer	3.7
Feed Lines - Fuel	-3.7
- Oxidizer	-4.8
Total Trapped in Tanks - Fuel	10.1
- Oxidizer	27.6

APS and DPS propellant trapped in feed lines is considered usable for depletion burns.

TABLE 5.6-1 (CONTINUED)

## LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS

	WEIGHT (Pounds) <u>LM-10</u>	CENTER OF GRAVITY (Inches)		
		<u>X</u> E	<u>Y</u> E	<u>Z</u> E
<u>DPS - Trapped Outside Tanks</u>				
Fill and Drain Lines - Fuel	0.1	133.5	-5.3	-24.8
- Oxidizer	0.2	133.3	25.0	-1.9
Balance Lines - Fuel	0.0			
- Oxidizer	0.0			
Branch Lines - Fuel	4.0	133.5	-5.3	-24.8
- Oxidizer	8.5	133.3	25.0	-1.9
Engine (to SOV) - Fuel	6.4	154.0	0.0	0.0
- Oxidizer	12.2	154.0	0.0	0.0
Isolation Squib - Fuel	0.7	133.5	-5.3	-24.8
- Oxidizer	0.8	133.3	25.0	-1.9
<sup>1</sup> Feed Lines - Fuel	12.1	133.5	-5.3	-24.8
- Oxidizer	27.5	133.3	25.0	-1.9
<sup>1</sup> Heat Exchanger - Fuel	4.4	155.2	-15.0	-21.3
- Oxidizer	0.0			
Total Trapped Outside Tanks - Fuel	27.7	140.0	-5.6	-19.8
- Oxidizer	49.2	137.5	19.9	-1.5

<sup>1</sup>APS and DPS propellant trapped in feed lines is considered usable for depletion burns.

TABLE 5.6-1 (CONTINUED)

LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS

	WEIGHT (Pounds)		
	<u>LM-10</u>	<u>LM-11</u>	<u>LM-12</u>
<u>DPS - Trapped Inside Tanks</u>			
Tank Wetting - Fuel	2.0	2.0	2.0
- Oxidizer	2.0	2.0	2.0
Propellant Vapor - Fuel	2.5	2.5	2.5
- Oxidizer	19.0	19.0	19.0
"Zero-G" Cans - Fuel	4.5	4.5	4.5
- Oxidizer	7.2	7.2	7.2
<sup>2</sup> Thrust Vector Deviation from Vehicle Center Line - Fuel (+Y Tank)	19.8±4.2	23.0±11.5	23.0±11.5
- Oxidizer (-Z Tank)	31.2±13.2	48.0±24.0	48.0±24.0
Engine and Valve Operation - Fuel	2.9	2.9	2.9
- Oxidizer	2.6	2.6	2.6
Branch Line Orificing - Fuel	6.7±17.3	2.4±12.0	7.3±8.3
- Oxidizer	5.1±16.6	2.2±18.0	9.8±19.9
<sup>1</sup> Feed Lines and Heat Exchanger - Fuel	-16.5	-16.5	-16.5
- Oxidizer	-27.5	-27.5	-27.5
Total Trapped Inside Tanks - Fuel	21.9±18.0	20.8±16.6	25.7±14.2
- Oxidizer	39.6±21.2	53.5±30.0	61.1±31.2

<sup>1</sup>APS and DPS propellant trapped in feed lines is considered usable for depletion burns.

<sup>2</sup>LM-11 and 12 reflect c.g. limit of ±1" in Y and/or Z. Location is in fuel and oxidizer tanks which are furthest from c.g.

TABLE 5.6-1 (CONCLUDED)

LUNAR MODULE TRAPPED AND RESIDUAL PROPELLANTS

	WEIGHT (Pounds)		CENTER OF GRAVITY (Inches)		
	<u>LM-8</u>	<u>LM-10</u>	<u>X<sub>E</sub></u>	<u>Y<sub>E</sub></u>	<u>Z<sub>E</sub></u>
<u>RCS - Trapped Outside Tanks</u>					
System Residuals - Fuel	10.8	10.5	268.0	0.0	-5.0
- Oxidizer	17.6	15.8	268.0	0.0	-5.0
<u>RCS - Trapped Inside Tanks</u>					
Expulsion Efficiency - Fuel	4.2	4.2			
- Oxidizer	8.0	8.0			

TABLE 5.6-2

## LM-10 AND SUBSEQUENT MISCELLANEOUS CONSUMABLES

<u>ECS COOLANT:</u>	<u>WEIGHT</u> <u>(Pounds)</u>	<u>CENTER OF GRAVITY</u> <u>(Inches)</u>		
		<u>X<sub>E</sub></u>	<u>Y<sub>E</sub></u>	<u>Z<sub>E</sub></u>
Ascent - <u>Primary</u>	32.1	251.9	9.9	-2.4
- <u>Redundant</u>	3.3	251.0	9.9	-2.4
Descent - <u>Primary</u>	1.7	163.5	25.0	38.0
- <u>Redundant</u>	0.0			
<u>GOX:</u>				
Ascent - <u>Tank #1</u>	2.4	266.1	15.1	-53.5
- <u>Tank #2</u>	2.4	266.1	-15.1	-53.5
Descent - <u>Tank #1</u>	48.0	185.6	38.9	-53.5
- <u>Tank #2</u>	48.0	185.2	41.5	48.2
<u>WATER:</u>				
Ascent - <u>Tank #1</u>	42.5	300.4	25.0	13.7
- <u>Tank #2</u>	42.5	300.4	-25.0	-13.7
*Descent - <u>Tank #1</u>		166.0	-43.2	-43.2
- <u>Tank #2</u>		141.9	43.2	43.2
<u>NITROGEN:</u>				
Ascent	0.1	301.5	+25.0	13.7
	0.1	301.5	-25.0	-13.7
Descent	0.6	169.4	-43.2	-43.2
<u>HELIUM:</u>				
APS - <u>Tank #1</u>	6.6	246.2	12.2	-48.6
- <u>Tank #2</u>	6.6	246.2	-12.2	-48.6
RCS - <u>Tank #1</u>	1.05	263.0	46.1	0.6
- <u>Tank #2</u>	1.05	263.0	-46.1	-0.6
DPS - <u>(SHe)</u>	48.5	148.3	47.2	-47.8
- <u>(Ambient)</u>	1.1	175.8	59.2	-37.0

\*See Mission Loading information in Section 3.0 for the required Descent Water load for each mission.