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REPORT FOR THE APOLLO SPACECRAFT, MAY 1965  
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FOR THE APOLLO SPACECRAFT  
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1 MAY 1965



Prepared By  
WEIGHT CONTROL

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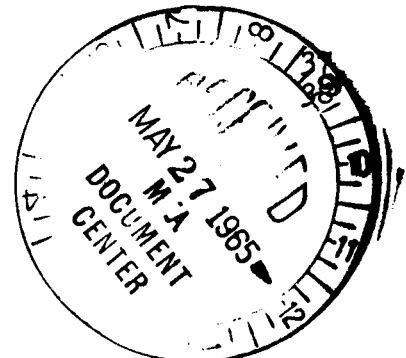
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INTRODUCTION

The May report incorporates changes to the Block I and Block II standard manned vehicles subsequent to the April report. The change descriptions are included in the current weight status section. The current Block I status is based on the drawing release for CSM 012 and 014, and the Block II status is based on estimated data consistent with the CSM Master End Item Specification, SID 64-1345. The government furnished equipment lists have been revised to reflect a control weight column in addition to a current weight status column. The June report will reflect a control weight column in the current weight status section. The potential weight change section has been modified to include the center of gravity of each item.

The Mission Weight, Center of Gravity and Inertia Summary section reflects the Block I CSM launch weight consistent with a booster payload capability in orbit of 32,500 pounds, as listed in SID 63-313. The entry center of gravity data reflects an unballasted Command Module L/D of 0.38 for Block I and 0.40 for Block II. Studies are in progress to relocate items in the Block II Command Module to constrain the L/D to a nominal value of 0.34 at entry. The Block I and Block II LES status weights have been constrained to the 8200 pound Control Weight with a related LEV burnout center of gravity change from 1125.0 to 1123.4 for Block I pending actual verification by future tests and 1125.0 to 1127.0 for Block II.

The current report reflects a Block II LOR Spacecraft decrease of 280 pounds at injection and 140 pounds at the injected spacecraft condition less Service Module propellant. The current weight of 90,650 pounds is based on a Service Module propellant loading for a specific impulse of 313.0 seconds and a delta V budget as defined in SID 64-1344. The propellant weight also includes a loading tolerance of 210 pounds. A pending change is under consideration to increase the specific impulse of the SPS propellant above 313.0 seconds which reflects the three sigma low value at burnout. The pending change would offset the loading tolerance penalty to the useable propellant.

The LEM weight utilized is 29,500 pounds, excluding crew. Per direction of NASA-MSD via CCA 290, the 32,000 pound LEM is being incorporated into the spacecraft design, however, J. L. Bullard NASA-MSD requested that this change not be reflected in the Block II mass properties summary until the delta V budget with the increased LEM weight is redefined.

The current Block I status reflects an Airframe 012 drawing release based on a 10.6 day EO mission. The major changes in Block I are:

Command Module - Incorporation of potential change item G & N-1 decrease in Guidance and Navigation equipment per current MIT status, COM-1 replacing HF whip antenna with a DeHavilland HF stem recovery antenna, the addition of insulation to the pressure suit plumbing to control condensation and an increase in coax antenna cabling based on calculation of released drawings.



Service Module - Incorporation of potential change item MPS-1 addition of external propellant retention screens, STR-2 removing RCS plume heat shields and replacing with cork insulation and an increase in the propellant utilization and gauging system based on vendor actual weights.

Adapter - Decrease in rings at Station 583 and 502 based on actual weights.

The current Block II status reflects an 8.3 day LOR mission. The major changes in the Block II are:

Command Module - Incorporation of potential change items G & N-1 decrease in Guidance and Navigation equipment per current MIT status, EPS-6 deletion of wiring provisions for rendezvous radar, deletion of the teleprinter and a reduction in the main display panel and aft compartment wire supports based on calculations of design layouts.

Service Module - Incorporation of potential change items STR-4, ECS-3, EPS-6 and RR-1 deletion of rendezvous radar equipment, also STR-1 increase of forward bulkhead based on calculation of preliminary layout drawings, ECS-1 increase in the Environmental Control System radiator area based on current system requirements, MPS-1 addition of external propellant retention screens, and an increase in the propellant utilization and gauging system based on vendor actual weights.

Launch Escape System - Consistent with the Flight Dynamics Groups' desire to keep the center of gravity of the Launch Escape Vehicle as far forward as possible, sufficient ballast has been added to bring the Launch Escape System up to the control weight of 8200 pounds.

Adapter - Decrease in rings at Station 583 and 502 based on actual weights.

TECHNICAL REPORT INDEX/ABSTRACT

ACCESSION NUMBER				DOCUMENT SECURITY CLASSIFICATION CONFIDENTIAL			
TITLE OF DOCUMENT Monthly Weight and Balance Report for the Apollo Spacecraft						LIBRARY USE ONLY	
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ABSTRACT

The Monthly Weight and Balance Report for the Apollo Spacecraft is filed in accordance with Paragraph 8.10 Exhibit I and is a summary type weight report. This report reflects the current weight of the Block I and Block II manned vehicles and explains the changes in weight from the previous report. This report also reflects the mission weight, center of gravity, inertia summary and dimensional diagrams.

For Block I Mass Properties Design Data refer to SID 64-1700, dated 16 October 1964 and for Block II Mass Properties Design Data refer to SID 64-2142, dated 15 February 1965.

AIRFRAME 014

APOLLO EARTH ORBIT MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 MAY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT. <sup>2</sup> )		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10890	1041.7	0.1	6.1	5374	4710	4334
SERVICE MODULE - Less Usable Propellant	9925	909.5	1.1	0.5	6292	10834	10549
SIA Attachment Ring	75	837.1	0.0	-1.8	93	48	46
TOTAL - Less SPS Usable Propellant	20890	978.2	0.6	2.9	11810	35551	34841
SPS USABLE PROPELLANT - S/M**	8225	867.3	27.3	-11.5	2738	1840	2243
TOTAL - With Usable Propellant	29115	946.8	8.1	-1.1	15728	53314	55001
SIA - Less SM Attaching Ring	3385	642.7	0.9	-2.0	8422	11213	10944
TOTAL - Injected	32500	915.2	7.4	-1.2	24184	125077	126592
LAUNCH ESCAPE SYSTEM	8200	1298.6	-0.1	-0.2	576	21270	21270
TOTAL - Spacecraft Launch	40700	992.4	5.9	-1.0	24841	354144	355672

NOTES: \*Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

\*\*The propellant weight of 8225 is based on an Airframe 014 in orbit payload capability of 32,500 pounds consistent with SID 63-313.

BLOCK I

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 MAY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT. <sup>2</sup> )		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10890	1041.7	0.1	6.1	5374	4710	4334
LAUNCH ESCAPE SYSTEM	8200	1298.6	-0.1	-0.2	576	21270	21270
TOTAL - Launch Abort	19090	1152.0	0.0	3.4	5991	92655	92239
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3198	1294.3	0.0	0.0	-71	-1285	-1285
TOTAL - LES Burnout	15892	1123.4	0.0	4.1	5910	74581	71174

NOTE: \*Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

BLOCK I

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

EARTH ORBITAL MISSION

1 MAY STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG FT. <sup>2</sup> )						
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz	
COMMAND MODULE	10890	1041.7	0.1	6.1	5374	4710	4334	30	-272	-17	
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4							
Food	-59	1053.0	-28.6	37.0							
Add: Waste-Fecal	17	1039.0	47.0	12.0							
CO <sub>2</sub> Absorbed (22 Cart.)	51	1016.8	-4.2	27.7							
Potable Water	30	1022.6	-63.4	-16.4							
Waste Water	56	1022.5	-21.1	61.8							
PRIOR TO ENTRY	10977	1041.4	0.0	6.3	5435	4758	4368	43	-293	-18	
Less: Propellant	-135	1022.6	-5.6	57.0							
Ablator Burnoff	-365	1016.2	-0.4	15.7							
Entry Coolant	-6	1022.6	-63.4	-16.4							
Forward Heat Shield	-414	1098.5	0.0	0.4							
Drogue Chutes	-56	1089.1	0.0	-21.0							
PRIOR TO MAIN CHUTE DEPLOYMENT	10001	1039.9	0.1	5.7	4978	4031	3715	38	-202	-11	
Less: Main Chutes (3)	-409	1090.8	-1.8	6.2							
Propellant	-135	1022.6	-5.6	57.0							
LANDING	9457	1038.0	0.3	5.0	4821	3684	3406	45	-181	-2	

NOTE: Mass inertia data are shown for accumulative totals only.

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SID 62-99-39



BLOCK I

COMMAND MODULE

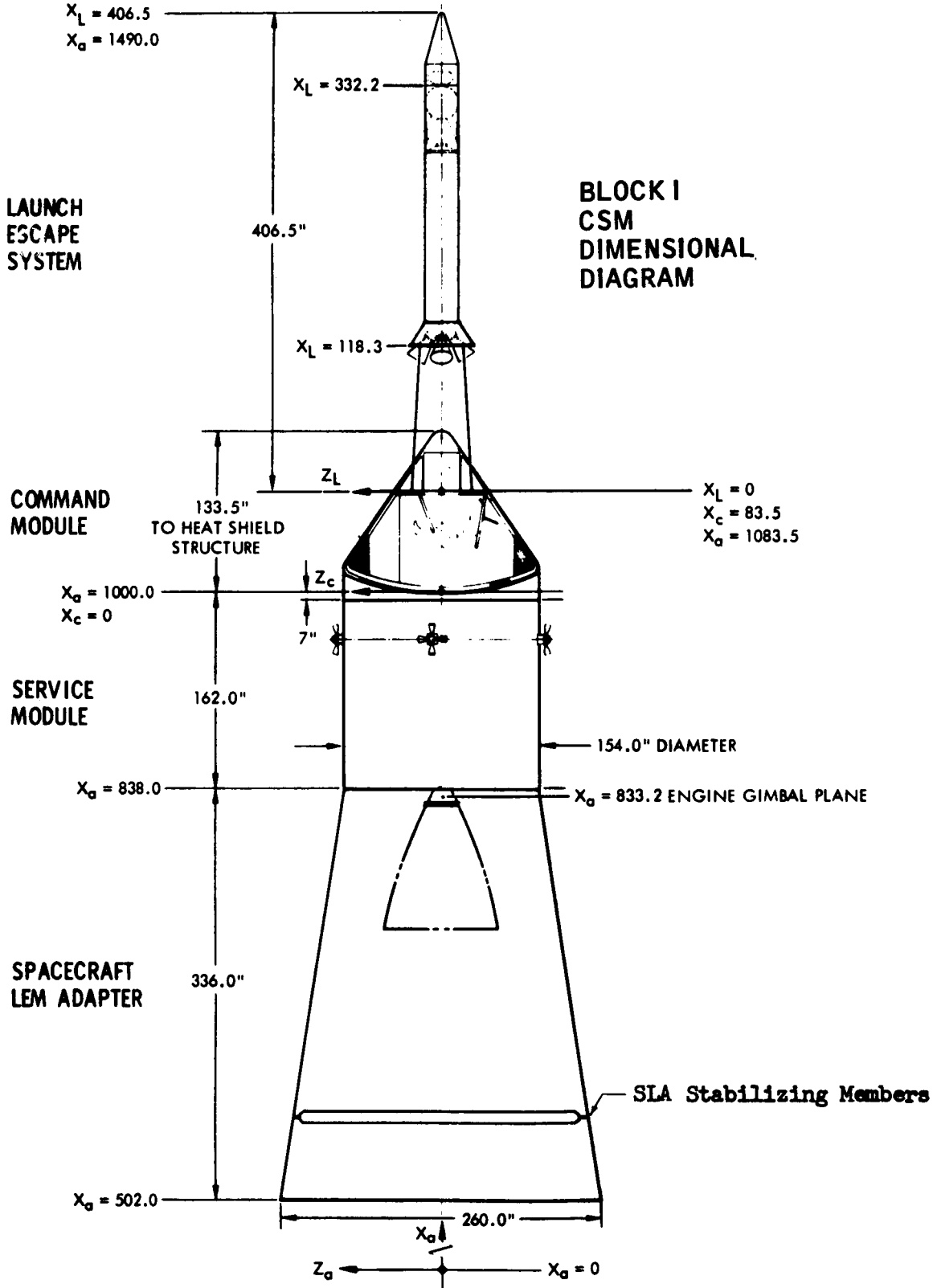
WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 MAY STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.2)						
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz	
COMMAND MODULE, LAUNCH	10890	1041.7	0.1	6.1	5374	4710	4334	30	-272	-17	
Less: Oxidant	-180	1022.6	14.5	63.7							
Forward Heat Shield	-414	1098.5	0.0	0.4							
Drogue Chutes	-56	1089.1	0.0	-21.0							
PRIOR TO MAIN CHUTE DEPLOYMENT	10240	1039.5	-0.1	5.5	5143	4185	3930	40	-189	-48	
Less: Main Chutes (3)	-409	1090.8	-1.8	6.2							
Fuel	-90	1022.6	-45.8	45.8							
LANDING	9741	1037.5	0.3	5.1	5018	3884	3604	35	-180	-12	

NOTE: Mass inertia data are shown for accumulative totals only.



BLOCK II

APOLLO LOR MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 MAY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY			MOMENTS OF INERTIA (SLUG-FT. <sup>2</sup> )		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10270	1042.1	-0.3	6.5	4821	4329	4001
SERVICE MODULE - Less Usable Propellant	10030	915.3	-5.4	9.0	6394	11125	10860
SLA Attachment Ring	75	837.1	0.0	-1.8	93	48	46
TOTAL - Less SPS Usable Propellant	20375	978.9	-2.8	7.7	11345	33446	32872
SPS USABLE PROPELLANT - S/M**	37420	900.8	2.8	-1.2	19462	17777	24490
TOTAL - With Usable Propellant	57795	928.3	0.8	1.9	31122	68828	74831
LUNAR EXCURSION MODULE	29500	588.5	0.0	0.0	19409	21485	21219
SLA - Less SM Attaching Ring	3355	645.3	1.6	-2.3	8379	11347	11072
TOTAL - Injected	90650	807.3	0.6	1.1	58938	608285	613725
LAUNCH ESCAPE SYSTEM	8200	1298.6	-0.1	-0.2	576	21270	21270
TOTAL - SPACECRAFT LAUNCH	98850	848.0	0.5	1.0	59518	1021376	1026814

NOTES: \*Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

\*\*The 37420 pounds of SPS propellant includes the amount necessary for the 75 pound SLA ring, which remains with the Service Module after separation from the booster, and 210 pounds of loading tolerance allowance. This quantity is determined from an estimated time line analysis and the specific impulse of 313.0 seconds.

BLOCK II

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 MAY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY			MOMENTS OF INERTIA (SLUG-FT. <sup>2</sup> )		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10270	1042.1	-0.3	6.5	4821	4329	4001
LAUNCH ESCAPE SYSTEM	8200	1298.6	-0.1	-0.2	576	21270	21270
TOTAL - Launch Abort	18470	1156.0	-0.2	3.5	5441	90392	90020
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3198	1294.3	0.0	0.0	-71	-1285	-1285
TOTAL - LES Burnout	15272	1127.0	-0.3	4.3	5359	73123	72761

NOTES: \*Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

BLOCK II

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LUNAR ORBIT RENDEZVOUS MISSION

1 MAY STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT. <sup>2</sup> )					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10270	1042.1	-0.3	6.5	4821	4329	4001	6	-292	27
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4						
Food	-48	1049.0	-38.6	25.8						
Docking	-150	1110.0	0.0	-2.5						
PLSS (1)	-53	1009.4	-0.2	-6.5						
Add: Waste-Fecal	14	1039.0	47.0	12.0						
CO <sub>2</sub> Absorbed (17 Cart.)	39	1016.6	-4.2	27.5						
Potable Water	30	1022.6	-63.4	-16.4						
Waste Water	56	1022.5	-21.1	61.8						
PRIOR TO ENTRY	10150	1041.0	-0.3	6.9	4870	4205	3864	18	-293	27
Less: Propellant	-135	1022.6	-5.6	57.0						
Ablator Burnoff	-365	1016.2	-0.4	15.7						
Entry Coolant	-6	1022.6	-63.4	-16.4						
Forward Heat Shield	-300	1090.0	0.0	1.0						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	9288	1040.4	-0.2	6.3	4437	3635	3366	13	-216	34
Less: Main Chutes (3)	-399	1090.4	-1.2	7.5						
Propellant	-135	1022.6	-5.6	57.0						
LANDING	8754	1038.4	-0.1	5.4	4283	3305	3070	15	-198	42

NOTE: Mass inertia data are shown for accumulative totals only.

BLOCK II

COMMAND MODULE

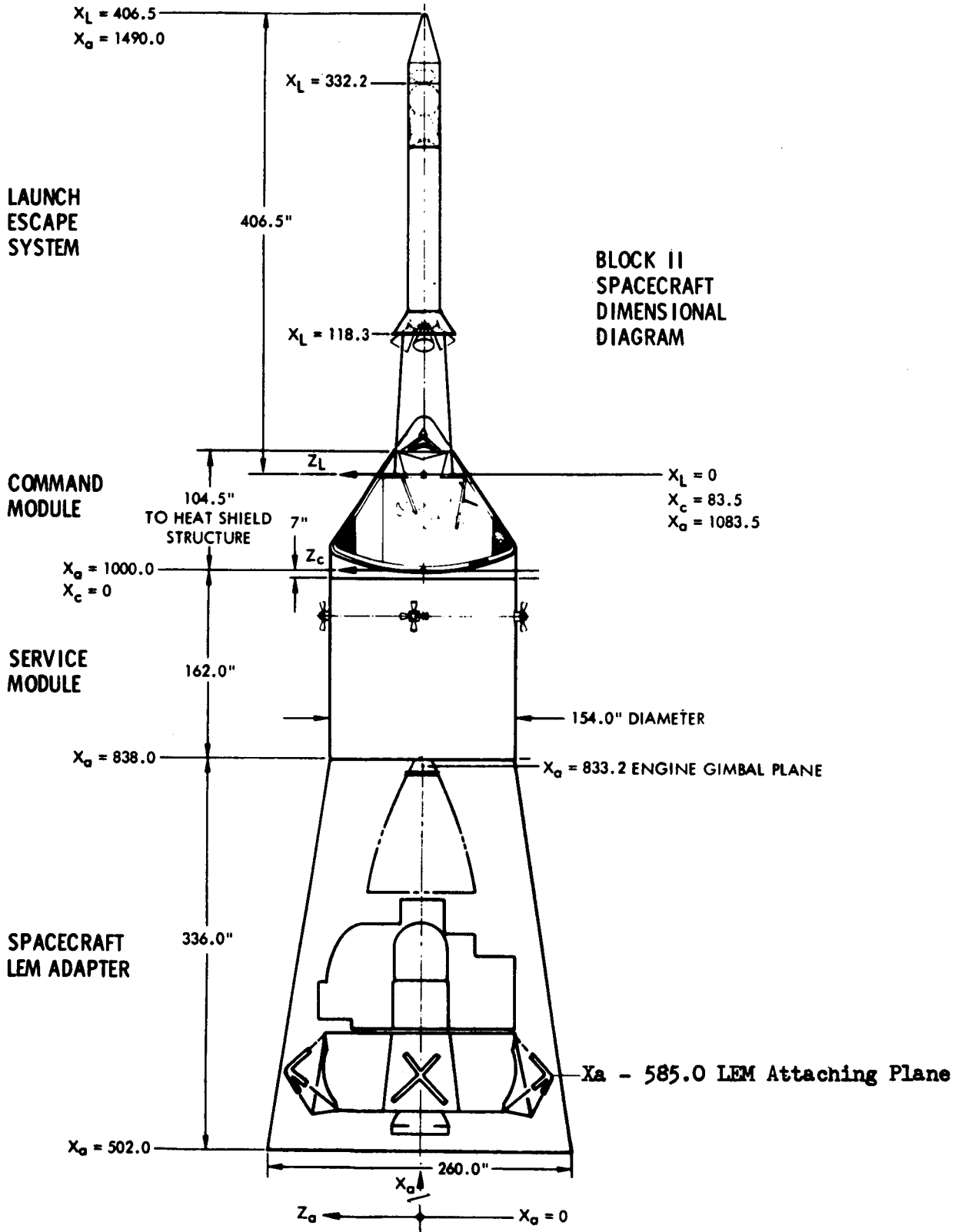
WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 MAY STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT. <sup>2</sup> )						
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz	
COMMAND MODULE, LAUNCH	10270	1042.1	-0.3	6.5	4821	4329	4001	6	-292	27	
Less: Oxidant	-180	1022.6	14.6	62.7							
Forward Heat Shield	-300	1090.0	0.0	1.0							
Docking Provisions	-150	1110.0	0.0	-2.5							
Drogue Chutes	-56	1089.1	0.0	-21.0							
PRIOR TO MAIN CHUTE DEPLOYMENT	9584	1039.6	-0.6	5.9	4608	3801	3594	14	-200	-4	
Less: Main Chutes (3)	-399	1090.4	-1.2	7.5							
Fuel	-90	1022.6	-45.8	45.8							
LANDING	9095	1037.6	-0.1	5.5	4486	3513	3279	4	-196	31	

NOTE: Mass inertia data are shown for accumulative totals only.





BLOCK I

CSM

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10880	+10	10890	19	77	4
SERVICE MODULE	9865	+60	9925	6	82	12
LAUNCH ESCAPE SYSTEM	8200		8200	15	8	77
ADAPTER	3480	-20	3460	24	58	18
TOTAL WEIGHT LAUNCH - LESS SPS USABLE PROPELLANT	32425	+50	32475	15	59	26





BLOCK I

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
<u>WEIGHT EMPTY</u>	(9570)	(+10)	(9580)	(21)	(74)	(5)
Structure	5739	+4	5743	12	85	3
Stabilization & Control	196		196	10	90	
Guidance & Navigation	430	-13	417		100	
Crew Systems	89		89	44	56	
Environmental Control	395	+10	405	18	32	50
Earth Landing System	594		594	4	76	20
Instrumentation	123		123	50	50	
Electrical Power	1095	+1	1096	90	10	
Reaction Control	303		303	14	86	
Communication	384	+7	391	25	75	
Controls & Displays	222	+1	223	2	96	2
<u>USEFUL LOAD</u>	(1310)		(1310)	(4)	(96)	
Scientific Equipment	80		80		100	
Crew Systems	835		835	7	93	
Reaction Control	270		270		100	
Environmental Control	125		125		100	
GROSS WEIGHT	10880	+10	10890	19	77	4





BLOCK I

SERVICE MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
<u>WEIGHT EMPTY</u>	(7797)	(+60)	(7857)	(8)	(77)	(15)
Structure	2734	+1857	4591	3	89	8
Environmental Control	74		74		100	
Instrumentation	57	+2	59	100		
Electrical Power	1541	+12	1553	24	30	46
Main Propulsion	3022	-1811	1211		94	6
Reaction Control	365		365	13	87	
Communication	4		4	100		
<u>USEFUL LOAD</u>	(2068)		(2068)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	157		157		100	
Main Propulsion	570		570		100	
<b>TOTAL SERVICE MODULE BURNOUT</b>	<b>9865</b>	<b>+60</b>	<b>9925</b>	<b>6</b>	<b>82</b>	<b>12</b>



BLOCK I  
LAUNCH ESCAPE SYSTEM  
WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure	1537	-1	1536		43	57
Ballast Installation Provisions	29		29		100	
Electrical System	58		58	73	22	5
Propulsion System						
Main Thrust	4794		4794			100
Jettison	438	-1	437			100
Jettison Motor Skirt	90		90			100
Pitch Control	49		49			100
Separation Provisions	16	-1	15	53	47	
C/M Boost Protective Cover	580		580	100		
LES - NO BALLAST	7591	-3	7588	8	9	83
BALLAST	609	+3	612	100		
TOTAL LAUNCH ESCAPE SYSTEM	8200	-	8200	15	8	77



BLOCK I

ADAPTER WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure (Includes Stabilizing Members)	3117	-20	3097	17	63	20
Electrical	61		61	82	18	
Separation System	302		302	83	17	
TOTAL ADAPTER	3480	-20	3460	24	58	18



BLOCK II  
SPACECRAFT  
WEIGHT STATUS SUMMARY  
(LESS LEM)

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10370	-100	10270	56	43	1
SERVICE MODULE	10050	-20	10030	40	55	5
LAUNCH ESCAPE SYSTEM	8140	+60	8200	15	8	77
ADAPTER	3450	-20	3430	24	58	18
TOTAL LESS SPS USABLE PROPELLANT	32010	-80	31930	37	39	24
SPS PROPELLANT	37560	-140	37420		100	
GROSS WEIGHT	69570	-220	69350	17	72	11

INJECTED SPACECRAFT  
WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65
COMMAND MODULE	10370	-100	10270
SERVICE MODULE	10050	-20	10030
ADAPTER	3450	-20	3430
LEM	29500		29500
TOTAL S/C INJECTED LESS PROPELLANT	53370	-140	53230
PROPELLANT	37560	-140	37420
TOTAL INJECTED WEIGHT	90930	-280	90650





BLOCK II

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
<u>WEIGHT EMPTY</u>	(8968)	(-100)	(8868)	(64)	(35)	(1)
Structure	5410	-37	5373	60	40	
Stabilization & Control	139	-4	135	100		
Guidance & Navigation	400	-46	354	100		
Crew Systems	88		88	71	29	
Environmental Control	400		400	62	38	
Earth Landing System	575		575	14	74	12
Instrumentation	44		44	100		
Electrical Power	968	-9	959	93	7	
Reaction Control	303		303	13	87	
Communication	346	-9	337	100		
Controls & Displays	295	+5	300	100		
<u>USEFUL LOAD</u>	(1402)		(1402)	(4)	(96)	
Scientific Equipment	80		80		100	
Crew Systems	951		951	6	94	
Reaction Control	270		270		100	
Environmental Control	101		101		100	
GROSS WEIGHT	10370	-100	10270	56	43	1



BLOCK II

SERVICE MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 5-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
<u>WEIGHT EMPTY</u>	(7953)	(-20)	(7933)	(50)	(44)	(6)
Structure	2891	+1599	4490	65	35	
Environmental Control	105	+29	134	35	65	
Instrumentation	48	-2	46	100		
Electrical Power	1533	+2	1535	40	30	30
Main Propulsion	2808	-1568	1240	10	90	
Reaction Control	371		371	20	80	
Communications & Rendezvous Radar	197	-80	117	100		
<u>USEFUL LOAD</u>	(2097)		(2097)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	150		150		100	
Main Propulsion	606		606		100	
TOTAL SERVICE MODULE BURNOUT	10050	-20	10030	40	55	5



COMMAND MODULECURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
<u>STRUCTURE</u>	(+4.0)	(-37.0)
Decrease the main display panel support structure based on calculations of design layouts.	-	-23.0
Decrease the aft compartment wire supports based on calculations of design layout reflecting a new method of routing the smaller wire bundles through the frames in lieu of below the frames.	-	-14.0
Increase the left hand and right hand equipment bays due to loads imposed on the system support platforms by the Apollo checkout equipment.	+4.0	-
<u>STABILIZATION AND CONTROL</u>	(-)	(-4.0)
Decrease the SCS equipment based on Minneapolis-Honeywell status reflecting preliminary calculations for the Block II equipment.	-	-4.0
<u>GUIDANCE AND NAVIGATION</u>	(-13.0)	(-46.0)
Decrease the Guidance and Navigation equipment based on reflecting the current MIT status weights in lieu of the Control Weight allowances. This change incorporates potential item G&N-1, the deletion of the Map and Data Viewer.	-13.0	-46.0
<u>ENVIRONMENTAL CONTROL</u>	(+10.0)	(-)
Increase the pressure suit circuit due to adding insulation on the plumbing that normally functions at temperatures low enough to cause condensation, based on free condensate control requirements.	+10.0	



COMMAND MODULECURRENT WEIGHT EMPTY CHANGES

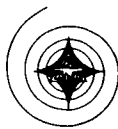
	BLOCK I	BLOCK II
<u>ELECTRICAL POWER</u>	(+1.0)	(-9.0)
Increase the master event sequencer control based on changes required to eliminate a potential single point failure hazard.	+1.0	+1.0
Decrease wiring provisions due to deleting rendezvous radar equipment per CCA 303. This change incorporates potential item EPS-6.	-	-10.0
<u>COMMUNICATIONS</u>	(+7.0)	(-9.0)
Increase the C-band and S-band transponders due to revised estimates based on actual weights of the Command Module 006 equipment per current Collins status.	+1.9	-
Delete the teleprinter consistent with NASA direction per TWX-W3031MA.	-	-9.0
Increase the antenna coax and connectors based on calculated in lieu of estimated weights per current released drawings.	+7.1	-
Decrease the HF antenna due to utilizing the HF stem recovery antenna from DeHavilland in lieu of the HF whip antenna. This change incorporates potential item COM-1.	-2.0	-
<u>CONTROLS AND DISPLAYS</u>	(+1.0)	(+5.0)
Increase the SPS control panel based on current vendor status weights.	+1.0	+1.0
Increase the lighting controls due to revised estimates based on current lighting requirements for the Block II vehicle.	-	+3.2
Delete the teleprinter control panel consistent with NASA direction per TWX-W3031MA.	-	-0.8
Add a mounting panel to support the relocated circuit breaker and timers at the location previously occupied by the map and data viewer.	-	+1.6
<b>TOTAL COMMAND MODULE CURRENT WEIGHT CHANGES</b>	<b>+10.0</b>	<b>-100.0</b>

SERVICE MODULECURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
<u>STRUCTURE</u>	(+1857.0)	(+1599.0)
Decrease the insulation due to removing RCS plume heat shields and adding cork sheet for thermal protection against RCS engine boost heating. This change incorporates potential item STR-2.	-5.0	-
Increase the forward bulkhead based on calculations of preliminary layout drawings. This change incorporates potential item STR-1.	-	+16.0
Delete the support structure for the rendezvous radar installation per CCA 303. This change incorporates potential item STR-4.	-	-23.0
Delete the splice frame in sector IV due to designing this sector as one panel in lieu of two panels as a result of design review at the drawing board level.	-	-4.0
Transfer the fuel, oxidizer and pressurization tanks from the Main Propulsion System due to recoding consistent with system design responsibility.	+1862.0	+1619.0
Decrease the aft bulkhead due to deletion of the 0.10 inch thick shim on the Service Module at Station 838 per current Block II configuration.	-	-9.0
<u>ENVIRONMENTAL CONTROL</u>	(-)	(+29.0)
Increase the ECS radiators from 90 square feet to 148 square feet based on prereleased drawings reflecting current system requirements. This change incorporates potential item ECS-1.	-	+32.0
Delete the cooling provisions for the rendezvous radar equipment per CCA 303. This change incorporates potential item ECS-3.	-	-3.0
<u>INSTRUMENTATION</u>	(-)	(-2.0)
Decrease the radiation detection system based on revised procurement specification weights.	-	-2.0
Increase the flight qualification sensors based on revised estimate of current sensor and signal conditioner weights.	+2.0	

SERVICE MODULECURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
<u>ELECTRICAL POWER</u>	(+12.0)	(+2.0)
Increase the fuel cell based on Pratt and Whitney status reflecting actual weight of the insulation.	+2.1	+2.1
Add a fuel cell remote control panel required by the Pratt and Whitney fuel cell load sharing control change.	+5.5	+5.5
Add a cryogenic control box due to redesign of the cryogenic system valve module pressure switches to meet reliability requirements.	+3.6	+3.6
Decrease the radiators on the Block II vehicles due to relocation to the fairing and reducing the size from 63 square feet to 40 square feet based on current Block II requirements.	-	-7.0
Increase the power distribution box based on calculation of miscellaneous drawing changes.	+0.8	+0.8
Delete the wiring provisions for the rendezvous radar equipment per CCA 303. This change incorporates potential item EPS-6.	-	-3.0
<u>MAIN PROPULSION</u>	(-1811.0)	(-1568.0)
Transfer the fuel, oxidizer and pressurization tanks to Structure due to recoding consistent with system design responsibility.	-1862.0	-1619.0
Increase the fuel and oxidizer system due to adding dual propellant retention screens external to the existing reservoirs to increase the reliability of the SPS. This change incorporates potential item MPS-1.	+38.0	+38.0
Increase the propellant utilization and gauging system based on end item actual weight for the oxidizer and fuel probes and controls.	+19.0	+19.0
Decrease the engine based on Aerojet status reflecting average actual weights of three nozzles.	-6.0	-6.0

SERVICE MODULECURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
<u>COMMUNICATION AND RENDEZVOUS RADAR</u>	(-)	(-80.0)
Delete the rendezvous radar equipment per CCA 303. This change incorporates potential item RR-1	-	-80.0
	<hr/>	
TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES	+60.0	-20.0

LAUNCH ESCAPE SYSTEMCURRENT WEIGHT CHANGES

	BLOCK I	BLOCK II
<u>STRUCTURE</u>	(-1.0)	(-1.0)
Decrease the tower structure based on calculation of miscellaneous drawing changes.	-1.0	-1.0
<u>SEPARATION PROVISIONS</u>	(-1.0)	(-1.0)
Decrease the separation provisions based on calculation of miscellaneous drawing changes.	-1.0	-1.0
<u>PROPULSION SYSTEM</u>	(-1.0)	(-1.0)
Decrease the jettison motor per Thiokol status reflecting average actual weights.	-1.0	-1.0
<u>BALLAST</u>	(+3.0)	(+63.0)
Increase the ballast to the control weight limit of 8200 pounds to provide maximum forward center of gravity of the LEV at burnout.	+3.0	+63.0
 	<hr/>	<hr/>
TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES	-	+60.0



ADAPTER  
CURRENT WEIGHT CHANGES

	BLOCK I	BLOCK II
<u>STRUCTURE</u>	(-20.0)	(-20.0)
Decrease the rings at Station 583 and 502 based on actual in lieu of calculated weights.	-20.0	-20.0
TOTAL ADAPTER CURRENT WEIGHT CHANGES	-20.0	-20.0

COMMAND MODULE

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>STRUCTURE</u>						
Increase the flotation system based on evaluation of current system requirements which necessitate rigid canisters with related latching. (Item STR-3, Dtd. 2-1-65)	(+37)	(+37)	1085.7	-4.5	9.5	6-1-65
Increase the inner structure forward section due to adding bonded doublers to the forward cylinder base on current impact criteria. (Item STR-5, Dtd. 4-1-65)	+17	+17	1094.5	0.0	-1.6	6-1-65
<u>CREW SYSTEM</u>						
Increase the pressure suit assembly electrical umbilical based on actual weights of prototype item. (Crew-2, Dtd. 4-1-65)	+2	+2	1054.4	-8.7	-5.8	6-1-65
<u>ENVIRONMENTAL CONTROL</u>						
Add water for the cooling during earth orbit based on the inability of the radiators to supply sufficient cooling. (Item ECS-1, Dtd. 10-1-65)	(+85)	(+7)				
Add a suit compressor inverter to the pressure suit circuit due to Block II requirements to maintain an oxygen flow of 12 CFM/Man in lieu of 10 CFM/Man in a 3.5 psia (suited) condition per current specification requirements. (Item ECS-4, Dtd. 4-1-65)	+78	-	1022.6	-33.0	39.7	7-1-65
Modify the pressure suit heat exchanger evaporator per CCA 308 (Item ECS-5, Dtd. 5-1-65)	-	+5	1027.8	-48.3	5.5	8-1-65
	+2	+2	1027.8	-48.3	5.5	8-1-65

COMMAND MODULE

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>ENVIRONMENTAL CONTROL (Continued)</u>						
Incorporate a cabin water separator to prevent water accumulation. (Item ECS-6, Dtd. 5-1-65)	+5	-	1027.8	-48.3	5.5	8-1-65
<u>INSTRUMENTATION</u>	(+5)	(+5)				
Add a runaway RCS engine detection unit to detect possible failures within the SCS and RCS. (Item Instr.-2, Dtd. 1-1-65)	+5	+5	1050.0	0.0	-25.0	8-1-65
<u>ELECTRICAL POWER SYSTEM</u>	(+100)	(+100)				
Increase wire installation provisions such as strings, clamps and varnish based on revised estimates of Airframe 009 requirements. (Item EPS-7, Dtd. 5-1-65)	+40	-	1035.0	5.1	-20.0	6-1-65
Increase wiring based on revised lengths. (Item EPS-8, Dtd. 5-1-65)	-	+40	1036.3	3.3	20.0	6-1-65
<u>REACTION CONTROL SYSTEM</u>	(+19)	(+19)				
Add a vent line to each fuel and oxidizer tank to increase the service life by reducing cycling of bladder during fill and drain operations. (Item RCS-1, Dtd. 2-1-65)	+4	+60	1035.0	5.1	-7.1	6-1-65
Incorporate an RCS rapid fuel dumping system. (Item RCS-2, Dtd. 5-1-65)	+15	+4	1022.6	-5.6	57.0	6-1-65
			1022.6	-5.6	57.0	8-1-65



COMMAND MODULE

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>COMMUNICATIONS</u>						
Increase the TV camera and equipment based on current estimates for the current GFE design. (Item COM-2, Dtd. 5-1-65)	(+21)	(+6)				
Add real time radio command relays to provide additional capability for MSFN to command certain spacecraft functions. (Item COM-3, Dtd. 5-1-65)	-	+6	1064.7	14.3	-6.3	8-1-65
Incorporate an additional VHF transmitter required for flight qualification data. (Item COM-4, Dtd. 5-1-65)	+14	-	1036.0	18.1	30.2	8-1-65
<u>CONTROLS &amp; DISPLAYS</u>						
Add radiation detection provisions. (Item C&D-3, Dtd. 1-1-65)	+7	-	1030.0	44.0	-2.0	8-1-65
Increase the crew compartment flood lighting based on a calculation of current drawings reflecting a change to fluorescent in lieu of incandescent light and an increased quantity. (Item C&D-4, Dtd. 5-1-65)	(+7)	(+7)				
Incorporate display functions of the launch vehicle oxidizer pressure. (Item C&D-5, Dtd. 5-1-65)	+2	-	1066.0	0.0	-20.0	9-1-65
TOTAL COMMAND MODULE POTENTIAL WEIGHT CHANGES	+276	+183				

SERVICE MODULE

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>STRUCTURE</u>	(+19)	(-17)				
Add support structure for supplemental water supply system required for extended earth orbital missions. (Item STR-3, Dtd. 4-1-65)	+12	-	916.0	-22.5	41.9	7-1-65
Replace the thixotropic paste of core edges with foaming paste in the fuel bay areas of the aft bulkhead based on current allowables. (Item STR-5, Dtd. 5-1-65)	-	-17	839.5	0.0	0.0	7-1-65
Add edge isolating material to the ECS radiators. (Item STR-6, Dtd. 5-1-65)	+7	-	893.4	0.0	0.0	8-1-65
<u>ENVIRONMENTAL CONTROL SYSTEM</u>	(+150)	(-)				
Add a water supply storage system (includes 112 pounds of water) to be used as a supplement to the existing Command Module ECS waste water supply during extended earth-orbital flights. The mission duration cannot be fulfilled with present ECS heat rejection capabilities. (Item ECS-2, Dtd. 4-1-65)	+150	-	925.0	-22.5	41.9	7-1-65
<u>INSTRUMENTATION</u>	(+3)	(-)				
Add radiation detection provisions. (Item Instr.-2, Dtd. 1-1-65)	+3	-	993.8	61.5	35.8	9-1-65

SERVICE MODULE

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>ELECTRICAL POWER</u>	(+73)	(+75)				
Increase wiring provisions based on potting connectors due to humidity requirements. (Item EPS-2, Dtd. 11-1-64)	+15	+15	943.9	-0.9	-1.2	6-1-65
Increase fuel cell based on the addition of start-up potassium hydroxide wetting agent. (Item EPS-4, Dtd. 2-1-65)	+8	-	860.4	-33.1	42.0	7-1-65
	-	+8	964.8	-33.1	42.7	7-1-65
Increase wire installation provisions such as strings, clamps and varnish based on revised estimates of Airframe 009 requirements. (Item EPS-7, Dtd. 5-1-65)	+20	-	943.9	-0.9	-1.2	6-1-65
	-	+20	957.5	-8.5	18.7	6-1-65
Increase wiring based on revised lengths. (Item EPS-8, Dtd. 5-1-65)	+30	-	943.9	-0.9	-1.2	6-1-65
	-	+30	957.5	-8.5	18.7	6-1-65
Add wiring provisions for launch vehicle oxidizer pressure display function. (Item EPS-9, Dtd. 5-1-65)	-	+2	957.5	-8.5	18.7	8-1-65
	(+20)	(+20)				
<u>PROPULSION SYSTEM</u>						
Modify SPS engine to use pneumatic action for the propellant valves to meet Apollo requirements for reliability and start or shutdown impulse accuracy. (Item MPS-2, Dtd. 1-1-65)	+20	+20	873.0	0.0	0.0	6-1-65
<b>TOTAL SERVICE MODULE POTENTIAL WEIGHT CHANGES</b>	<b>+265</b>	<b>+78</b>				

ADAPTER

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>STRUCTURE</u>						
Add auxiliary (CSE) work platform provisions at Station Xa 525 per NASA Letter 14292MA, dated 11-19-64. (Item ADP-2, Dtd. 3-1-65)	(-)	(+144)	525.0	0.0	0.0	6-1-65
Revise access hold sizes and quantity per RECP No. CSM 64-21. (Item ADP-3, Dtd. 3-1-65)	-	+32	603.2	0.0	0.0	6-1-65
Increase size of SLA-LEM +Z access door per RECP No. CSM 65-7. (Item ADP-4, Dtd. 3-1-65)	-	+20	634.5	0.0	108.2	6-1-65
Add a retracting capability for the SLA-LEM Umbilical mechanism to provide clearance for withdrawal of the LEM when the panels are deployed at 45 degrees. (Item ADP-5, Dtd. 3-1-65)	-	+5	642.0	110.0	-27.0	6-1-65
Increase the aft section honeycomb panel face sheets based on increased LEM weight consistent with CCA 290. (Item ADP-10, Dtd. 4-1-65)	-	+58	541.8	0.0	0.0	7-1-65
Add backup structure for the 45° SLA panel deployment requirement per CCA 304. (Item ADP-12, Dtd. 5-1-65)	-	+24	585.0	0.0	0.0	6-1-65
<u>ELECTRICAL POWER</u>	(-)	(+3)				
Increase electrical provisions to provide for mounting the LEM pyrotechnic sequencer system on the SLA. This item includes boxes, structure and wire. (Item ADP-6, Dtd. 3-1-65)	-	+26	580.0	0.0	0.0	9-1-65

ADAPTER

POTENTIAL WEIGHT CHANGES

ITEM	BLOCK I WEIGHT	BLOCK II WEIGHT	CENTER OF GRAVITY			EFFECTIVE DATE
			X	Y	Z	
<u>ELECTRICAL POWER</u> (Continued)						
Reroute wiring from -Z axis to +Z axis to reduce length of wire. (Item ADP-9, Dtd. 4-1-65)	-	-25	835.0	49.3	0.0	8-1-65
Add wiring provisions for launch vehicle oxidizer display function. (Item ADP-11, Dtd. 5-1-65)	(-)	+2 (+5)	670.0	0.0	-112.0	8-1-65
<u>SEPARATION PROVISIONS</u>						
Increase the separation provisions due to adding stops to provide for 45° SIA panel deployment per CCA 304. (Item ADP-10, Dtd. 5-1-65)	-	+5	585.0	0.0	0.0	6-1-65
<u>TOTAL ADAPTER POTENTIAL WEIGHT CHANGES</u>	-	+152				

BLOCK IGOVERNMENT FURNISHED EQUIPMENT

The following table reflects the GFE weights included in the current status and the Control Weight allowance associated with SID 63-313, CSM Technical Specification.

<u>ITEM</u>	<u>CONTROL WEIGHTS</u>	<u>CURRENT STATUS</u>
GFE List		
Guidance and Navigation	(430.0)	(417.0)**
Crew (50, 70, 90)	(528.0)	(528.0)
Crew Equipment	(251.0)	(251.0)
Pressure Garment Assembly (3)	84.0	84.0
Constant Wear Garments - Gas Cooled (6)	5.6	5.6
Radiation Dosimeters	5.0	5.0
Food Set (10.6 Days)	60.5	60.5
Probe	0.5	0.5
Medical Kit - Emergency	2.6	2.6
Clinical Instrumentation	2.1	2.1
Biomedical Instrumentation	3.9	3.9
Survival Equipment	68.1	68.1
GFE Growth Allowance	18.7	18.7
Instrumentation (R&D)	(34.5)	(9.5)
Gas Chromatograph	9.5	9.5
GFE Growth Allowance	25.0*	-
Scientific Equipment	(80.0)	(80.0)
Q-Ball	(25.0)	(25.0)
TOTAL GFE	1348.5	1310.5

\*The current status weight does not include this allowance.

\*\*MIT status report dated 15 February 1965.



BLOCK IIGOVERNMENT FURNISHED EQUIPMENT

The following table reflects the GFE weights included in the current status and the Control Weight allowance associated with SID 64-1344 CSM Technical Specification.

<u>ITEM</u>	<u>CONTROL WEIGHTS</u>	<u>CURRENT STATUS</u>
GFE List		
LEM	(29500.0)	(29500.0)
Guidance and Navigation	(400.0)	(354.0)***
Crew (50, 70, 90)	(528.0)	(528.0)
Crew Equipment	(371.0)	(371.0)
Pressure Garment Assembly (3) (Incl. Comm.)	102.0	102.0
Portable Life Support System (2) (Incl. Comm.)	106.0	106.0
Emergency Oxygen System (2)	6.5	6.5
Constant Wear Garments - Gas Cooled (7)	6.5	6.5
Liquid Cooled Garments (2)	9.0	9.0
External Thermal Garment	13.4	13.4
Radiation Dosimeters	5.0	5.0
Food Set (8.3 days)	49.5	49.5
Probe	0.5	0.5
Medical Kit-Emergency	2.8	2.8
Clinical Instrumentation	1.5	1.5
Biomedical Instrumentation	4.3	4.3
Spacesuit Assembly Spare Parts	4.0	4.0
Survival Equipment	60.0	60.0
TV Camera	(8.8)	(8.8)
Scientific Equipment	(80.0)	(80.0)
Rendezvous Radar	(106.0)	*(20.1)**
Q-Ball	(25.0)	(25.0)
TOTAL GFE	31018.8	30886.9

\*Reduced to 84.4 pounds per NASA letter PPS1/L137-64-822.

\*\*Reduced to 20.1 pounds per CCA 303 deleting rendezvous radar equipment.

\*\*\*MIT Status Report dated 15 February 1965.