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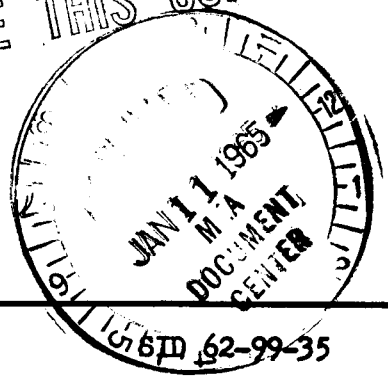

SID 62-99-35

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MONTHLY WEIGHT AND BALANCE REPORT

FOR THE APOLLO SPACECRAFT

CONTRACT NAS 9-150

(U)

PARAGRAPH 8.10 EXHIBIT I

1 JANUARY 1965

Prepared By

WEIGHT CONTROL

[redacted]

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

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ACCESSION NUMBER							DOCUMENT SECURITY CLASSIFICATION	
							[redacted]	

TITLE OF DOCUMENT

Monthly Weight and Balance Report for the Apollo Spacecraft

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AUTHOR(S)

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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. The Block II Mass Properties Design Data reference document will be listed at a later date.

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INTRODUCTION

The January report continues to reflect the current Block II LOR spacecraft. The current weight status summarizes the changes from the previous Block II status in addition to the changes from the previous Block I status. A Government Furnished Equipment List has been included reflecting the current requirements in the Block I and Block II Technical Specifications. The Command Module Weight, Center of Gravity and Inertia Summary for the Lunar Orbit Rendezvous Mission has been revised to omit the return of the Thermal Garment and (1) PLSS to the Command Module after LEM docking.

The current status reflects an unballasted Command Module L/D at entry of .34 for Block I and .38 for Block II. The current report reflects a Block II LOR spacecraft decrease of 340 pounds at injection and 225 pounds at the injected spacecraft condition less Service Module propellant. The current injected weight of 90390 pounds is based on a Service Module propellant loading for a specific impulse of 313.0 seconds, a ΔV budget as defined in SID 64-1341. This is based on a Lunar Excursion Module of 29,500 pounds, excluding crew for Block II.

The current Block I status reflects a standard manned vehicle based on a 10.6 day mission. The major changes in the Block I are:

Command Module - Incorporation of potential change items ELS-1 increasing sea dye marker life to 12 hours, EPS-2 increasing entry and post landing batteries based on current requirements, C & D-2 deleting the Entry Monitoring Indicator and an increase in the flotation system due to reliability requirements.

Service Module - Increase in the fuel cell per current subcontractor information, a decrease in the SPS fuel and oxidizer tanks based on current subcontractor status and a reduction in the metabolic oxygen based on 10.6 day reference mission.

Launch Escape System - Increase in ballast consistent with Command Module and LES balance requirements.

Adapter - Incorporation of potential change item ADP-1 deleting the propellant dispersal system.

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

Command Module - Increases in the flotation system due to reliability requirements, the PCM unit per current Collins information, the main display panel based on current analysis and a decrease in the SCS due to incorporation of the Guidance and Control System and a reduction in lithium hydroxide due to off loading to the 8.3 day reference mission.

Service Module - Increase in the fuel cell per current subcontractor information, a decrease in the SPS fuel and oxidizer tanks based on current subcontractor information, deletion of SPS isolation valves and a reduction in the metabolic oxygen based on an 8.3 reference mission.

Adapter - Deletion of the propellant dispersal system consistent with NASA requirements.

The Earth Orbit Mission Weight Summary has been revised to reflect a payload capability in orbit of 32,500 pounds in lieu of 33,500 pounds consistent with SID 63-313, Block I Apollo Command Module and Service Module System Specification. The payload capability has been increased by 5 pounds to 32,505 pounds due to the effective weight of the Launch Escape System at 8,155 pounds in lieu of 8,200 pounds. The Service Module is loaded with 8345 pounds of propellant.

BLOCK I

APOLLO EARTH ORBIT MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 JANUARY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT.^{2})		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10720	1042.6	0.7	5.3	5178	4504	4082
SERVICE MODULE - Less Propellant	9790	909.6	0.8	-1.3	6355	10196	9964
TOTAL - Less Propellant	20510	979.1	0.7	2.1	11581	34285	33582
PROPELLANT - S/M**	8345	867.7	27.3	-11.5	2778	1849	2288
TOTAL - Weight Propellant	28855	946.9	8.4	-1.8	15500	52265	52666
ADAPTER - S-IV B	3650	645.4	0.5	-2.3	9041	12437	12327
TOTAL - Injected	32505	913.0	7.5	-1.9	24586	128273	128607
LAUNCH ESCAPE SYSTEM	8155	1299.6	0.0	0.0	528	20965	20966
TOTAL - Spacecraft Launch	40660	990.6	6.0	-1.5	25198	359515	359925

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 earth orbital weights are based on a complete Service Module and includes 8345 pounds of propellant. The propellant loading allocation is based on a payload in orbit of 32,500 pounds. The payload capability has been increased by 5 pounds to include the effective weight of the Launch Escape System decrease from 8200 pounds to 8155 pounds.

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BLOCK II

APOLLO LOR MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 JANUARY STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10070	1043.1	0.5	6.1	4677	4202	3855
SERVICE MODULE - Less Propellant	10000	915.3	-4.3	7.7	6963	10666	10637
TOTAL - Less Propellant	20070	979.4	-1.9	6.9	11668	32559	32205
PROPELLANT - S/M**	37245	900.6	2.9	-1.3	19362	17666	24341
TOTAL - With Propellant	57315	928.2	1.2	1.6	31283	67904	74100
LUNAR EXCURSION MODULE	29500	588.5	0.0	0.0	19409	21485	21219
ADAPTER - LEM - S-IV B	3575	646.9	0.7	-2.4	8989	12347	12235
TOTAL - Injected	90390	806.0	0.8	0.9	59707	608629	614435
LAUNCH ESCAPE SYSTEM	7980	1296.3	0.0	0.0	547	20230	20224
TOTAL - SPACECRAFT LAUNCH	98370	845.8	0.7	0.8	60257	1009259	1015059

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 37245 pounds is determined from an estimated time line analysis. The propellant weight is based on a specific impulse of 313.0, and includes 310 pounds of loading tolerance allowance.

BLOCK I

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 JANUARY STATUS

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10720	1042.6	0.7	5.3	5178	4504	4082
LAUNCH ESCAPE SYSTEM	8155	1299.6	0.0	0.0	528	20965	20966
TOTAL - Launch Abort	18875	1153.6	0.4	3.0	5735	91526	91078
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3198	1294.3	0.0	0.0	-71	-1337	-1337
TOTAL - LES Burnout	15677	1125.0	0.5	3.6	5656	73737	73296

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 II

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 JANUARY STATUS

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10070	1043.1	0.5	6.1	4677	4202	3855
LAUNCH ESCAPE SYSTEM	7980	1296.3	0.0	0.0	547	20230	20224
TOTAL - Launch Abort	18050	1155.0	0.3	3.4	5260	86073	85685
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3198	1294.3	0.0	0.0	-71	-1337	-1337
TOTAL - LES Burnout	14852	1125.0	0.3	4.1	5179	68457	68078

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 ORBIT MISSION

1 JANUARY 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	10720	1042.6	0.7	5.3	5178	4504	4082	10	-225	14
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4						
Food	-62	1053.0	-28.6	37.0						
Add: Waste-Fecal	17	1039.0	47.0	12.0						
CO_2 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	10804	1042.3	0.7	5.5	5241	4550	4124	25	-248	19
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	9828	1040.9	0.9	4.8	4780	3826	3477	22	-159	27
Less: Main Chutes (3)	-427	1090.8	-1.8	6.2						
Propellant	-135	1022.6	-5.6	57.0						
LANDING	9266	1038.8	1.1	3.9	4617	3472	3162	33	-141	35

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

BLOCK II

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LUNAR ORBIT RENDEZVOUS MISSION

1 JANUARY 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	10070	1043.0	0.5	6.1	4677	4202	3855	11	-278	26
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4						
Food	-42	1049.8	-4.9	40.0						
Docking	-150	1110.0	0.0	0.0						
Thermal Garments	-13	1054.2	-47.0	19.0						
PLSS (1)	-53	1012.1	-0.2	-32.8						
Add: Waste-Fecal	14	1039.0	47.0	12.0						
CO_2 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	9943	1041.9	0.4	6.6	4707	4065	3725	25	-296	21
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	9081	1041.4	0.6	5.9	4273	3496	3229	20	-217	29
Less: Main Chutes (3)	-417	1090.4	-1.2	7.5						
Propellant	-135	1022.6	-5.6	57.0						
LANDING	8529	1039.3	0.7	5.0	4115	3162	2929	25	-200	40

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

BLOCK I

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 JANUARY 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	10720	1042.6	0.7	5.3	5178	4504	4082	10	-225	14
Less: Oxidant	-180	1022.6	14.5	62.7						
Forward Heat Shield	-414	1098.5	0.0	0.4						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	10070	1040.4	0.5	4.6	4945	3985	3687	24	-145	-16
Less: Main Chutes (3)	-427	1090.8	-1.8	6.2						
Fuel	-90	1022.6	-45.8	45.8						
LANDING	9553	1038.3	1.0	4.2	4814	3679	3355	21	-139	18

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

BLOCK II

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

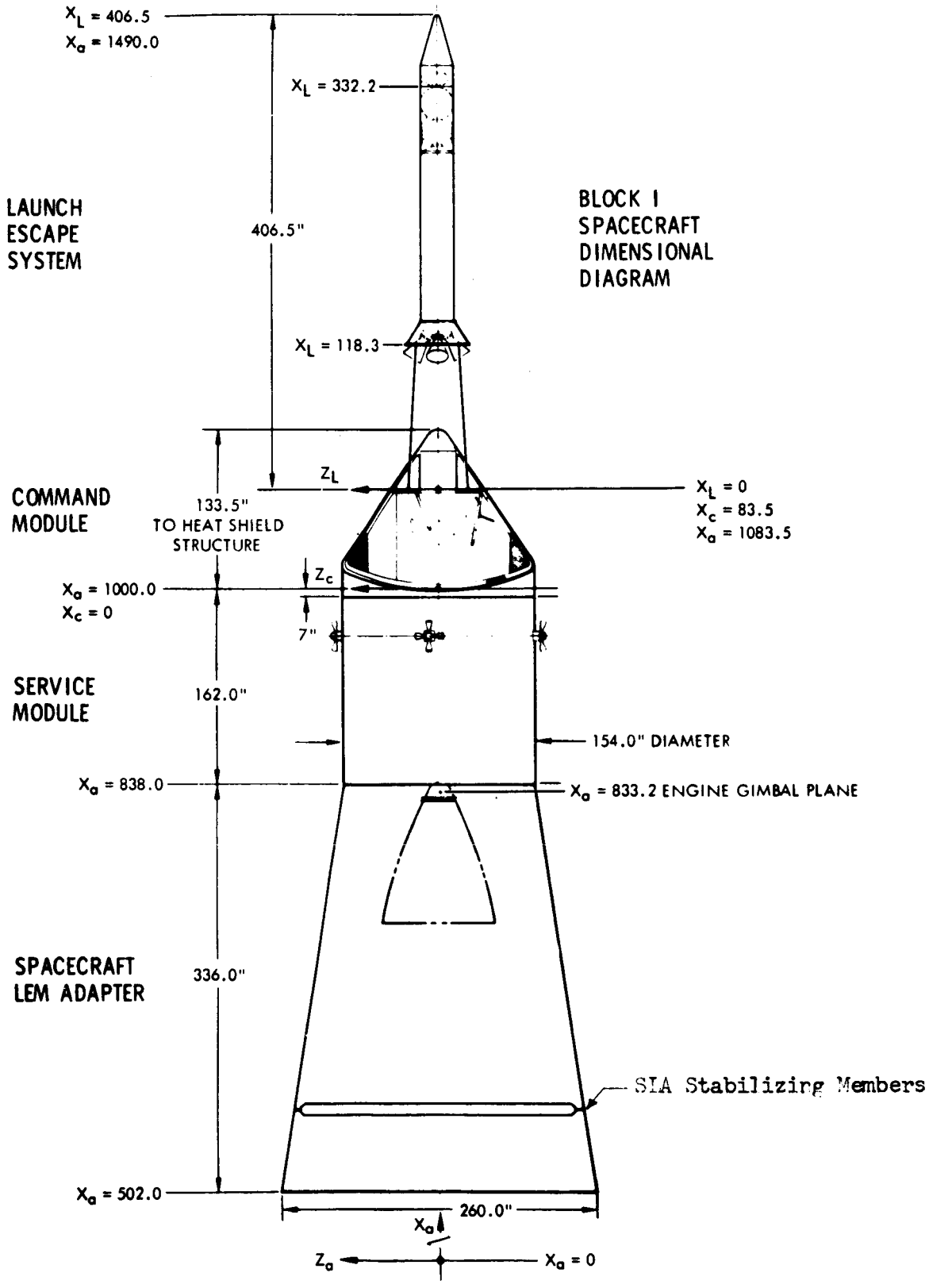
LOW ALTITUDE ABORT CONDITION

1 JANUARY STATUS

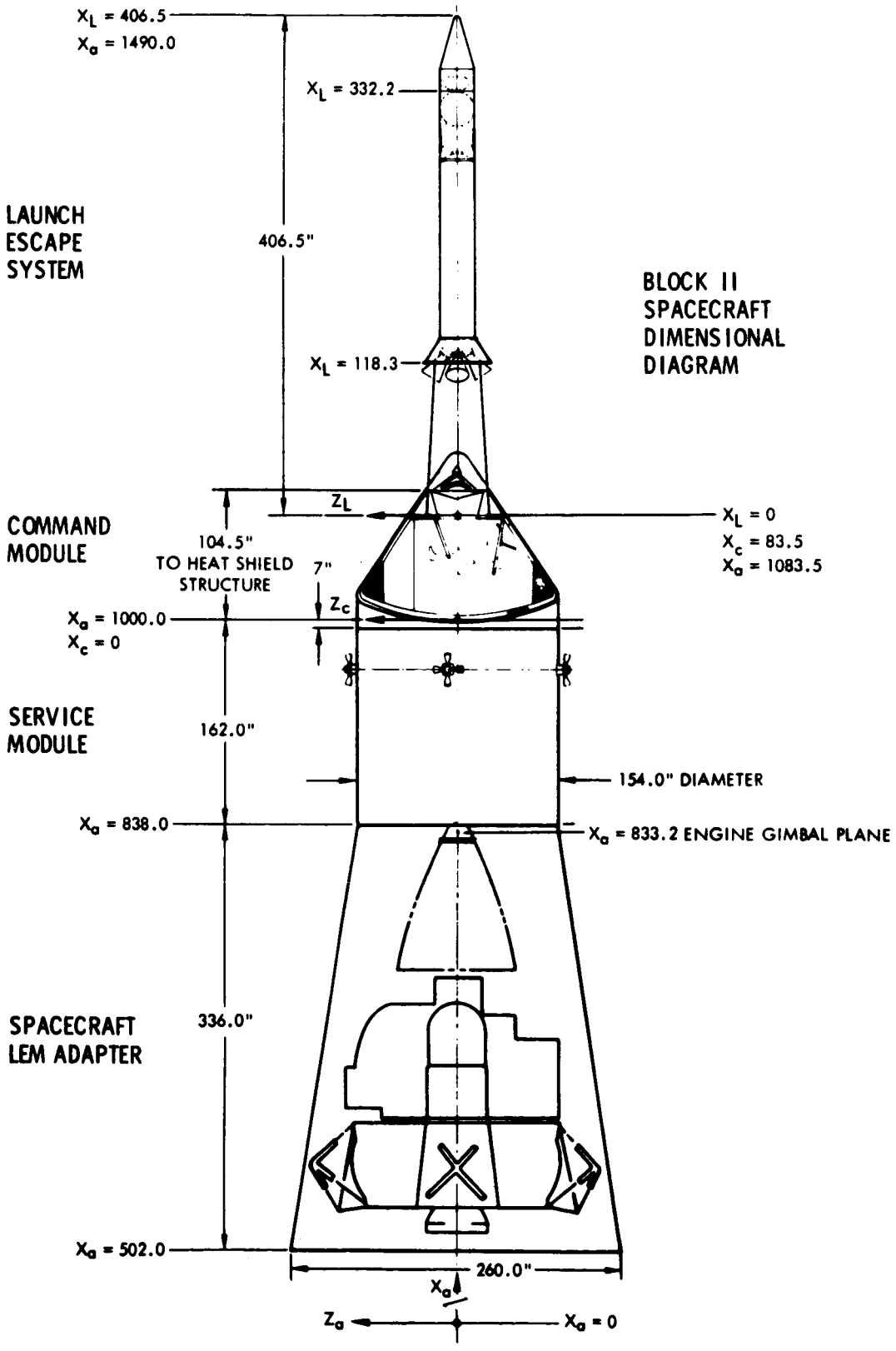
VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10070	1043.1	0.5	6.1	4677	4202	3855	11	-278	26
Less: Oxidant	-180	1022.6	14.5	62.7						
Forward Heat Shield	-300	1090.0	0.0	1.0						
Docking Provisions	-150	1110.0	0.0	0.0						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	9384	1040.6	0.3	5.4	4464	3684	3459	24	-192	-4
Less: Main Chutes (3)	-417	1090.4	-1.2	7.5						
Fuel	-90	1022.6	-45.8	45.8						
LANDING	8877	1038.5	0.8	4.9	4337	3393	3139	16	-189	33

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

BLOCK I SPACECRAFT DIMENSIONAL DIAGRAM



BLOCK II SPACECRAFT DIMENSIONAL DIAGRAM



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BLOCK I

SPACECRAFT

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10700	+20	10720	24	74	2
SERVICE MODULE	9850	-60	9790	9	80	11
LAUNCH ESCAPE SYSTEM	8145	+10	8155	15	8	77
ADAPTER	3750	-100	3650	25	75	
TOTAL WEIGHT LAUNCH - LESS SPS PROPELLANT	32445	-130	32315	17	60	23

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BLOCK II

SPACECRAFT

WEIGHT STATUS SUMMARY

(LESS LEM)

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10070		10070	54	46	
SERVICE MODULE	10100	-100	10000	30	65	5
LAUNCH ESCAPE SYSTEM	7980		7980	13	9	78
ADAPTER	3700	-125	3575	23	77	
TOTAL LESS PROPELLANT	31850	-225	31625	33	46	21
PROPELLANT	37360	-115	37245		100	
GROSS WEIGHT	69210	-340	68870	15	75	10

INJECTED SPACECRAFT

WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65
COMMAND MODULE	10070		10070
SERVICE MODULE	10100	-100	10000
ADAPTER	3700	-125	3575
LEM	29500		29500
TOTAL S/C INJECTED LESS PROPELLANT	53370	-225	53145
PROPELLANT	37360	-115	37245
TOTAL INJECTED WEIGHT	90730	-340	90390

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BLOCK I

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(9391)	(+16)	(9407)	(27)	(71)	(2)
Structure	5228	+15	5243	12	85	3
Stabilization & Control	198	-4	194	10	90	
Guidance & Navigation	430		430		100	
Crew Systems	304		304	86	14	
Environmental Control	311	+3	314	35	57	8
Earth Landing System	597	+1	598	12	88	
Instrumentation	275		275	84	16	
Electrical Power	1223	+21	1244	91	9	
Reaction Control	300		300	14	86	
Communication	325		325	2	98	
Controls & Displays	200	-20	180	13	87	
USEFUL LOAD	(1309)	(+4)	(1313)	(4)	(96)	
Scientific Equipment	80		80		100	
Crew Systems	840	+4	844	7	93	
Reaction Control	270		270		100	
Environmental Control	119		119		100	
GROSS WEIGHT	10700	+20	10720	24	74	2

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BLOCK II

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(8647)	(+17)	(8664)	(62)	(38)	
Structure	4915	+10	4925	54	46	
Stabilization & Control	177	-38	139	100		
Guidance & Navigation	397	+3	400	100		
Crew Systems	298		298	93	7	
Environmental Control	337	+3	340	60	40	
Earth Landing System	577	+1	578	20	80	
Instrumentation	81	+18	99	100		
Electrical Power	1053		1053	93	7	
Reaction Control	300		300	14	86	
Communication	269	+5	274	100		
Controls & Displays	243	+15	258	70	30	
USEFUL LOAD	(1423)	(-17)	(1406)	(4)	(96)	
Scientific Equipment	80		80		100	
Crew Systems	963	-3	960	6	94	
Reaction Control	270		270		100	
Environmental Control	110	-14	96		100	
GROSS WEIGHT	10070	-	10070	54	46	

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
STRUCTURE	(+15.0)	(+10.0)
Increase the single point flotation system due to the addition of a redundant inflation pump and motor for reliability per NASA direction.	+15.0	+15.0
Decrease the main display panel secondary structure based on revised estimate of Block II display panel installation requirements.	-	-5.0
STABILIZATION AND CONTROL	(-4.0)	(-38.0)
Decrease electronic control packages due to revised estimate for the SCS humidity fix per Honeywell status.	-4.0	-
Decrease the SCS equipment based on incorporating the integrated Guidance and Control System consistent with Block II requirements.	-	-38.0
GUIDANCE AND NAVIGATION	(-)	(+3.0)
Increase the G & N equipment based on incorporating the integrated Guidance and Control System consistent with Block II requirements.	-	+3.0
ENVIRONMENTAL CONTROL SYSTEM	(+3.0)	(+3.0)
Increase oxygen control system surge tank based on actual weight of tank assembly.	+1.4	+1.4
Increase waste management system due to beef-up of vacuum cleaner hose based on test information.	+1.6	+1.6
EARTH LANDING SYSTEM	(+1.0)	(+1.0)
Increase sea dye marker life to 12 hours in lieu of six hours per NASA/NAA Recovery Aids Meetings. This change incorporates potential item ELS-1.	+1.0	+1.0
INSTRUMENTATION	-	(+18.0)
Increase PCM unit based on Collins information reflecting revised packaging concept for Block II in which Block I modules will be used and the utilization of larger connectors.	-	+17.2

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
INSTRUMENTATION (CONT'D)		
Increase TV camera based on current GFE list which changes responsibility from NAA to NASA.	-	+0.8
ELECTRICAL POWER SYSTEM	(+21.0)	(-)
Increase entry and post landing batteries based on replacing 25 ampere hour batteries with 40 ampere hour batteries due to current landing and post landing loads. This change incorporates potential item EPS-2.	+21.0	-
Decrease entry and post landing batteries based on revised specification weight.	-3.0	-3.0
Increase lighting equipment based on actual weights of primary and lower equipment bay area flood lights.	+2.4	+2.4
Decrease pyrotechnic batteries based on actual weights.	-1.4	-1.4
Increase earth landing system sequencers based on Northrop status reflecting additional potting required to prevent cracking.	+2.0	+2.0
COMMUNICATIONS	(-)	(+5.0)
Increase Communications Equipment based on current Collins information reflecting revised estimates for Block II.	-	+5.0
CONTROLS AND DISPLAYS	(-20.0)	(+15.0)
Increase SCS controls and displays based on Honeywell status reflecting estimate of humidity fix.	+2.0	-
Delete entry monitor indicator and replace with a G- meter for the Block I vehicles. This change incorporates potential item C & D -2.	- 22.0	-

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
CONTROLS AND DISPLAYS (CONT'D)		
Increase the controls and displays based on calculation of preliminary drawings of the main display panels reflecting latest configuration including Guidance and Control System.	-	+15.0
TOTAL COMMAND MODULE CURRENT WEIGHT EMPTY CHANGES (To be brought forward)	+16.0	+17.0

COMMAND MODULE

CURRENT USEFUL LOAD CHANGES

	BLOCK I	BLOCK II
CREW SYSTEMS	(+4.0)	(-3.0)
Decrease the crew equipment based on current Block I specification weight.	-1.0	-
Decrease the crew equipment based on current Block II specification weights reducing food to 8.3 days, deleting back-pack mounted communications as a separate item and adding thermal coveralls.	-	-7.0
Increase personal hygiene equipment based on current specification requirements.	+4.0	+4.0
ENVIRONMENTAL CONTROL	(-)	(-14.0)
Decrease the lithium hydroxide based on off-loading for the 8.3 day design reference mission.	-	-14.0
TOTAL COMMAND MODULE CURRENT USEFUL LOAD CHANGES	+4.0	-17.0
TOTAL COMMAND MODULE CURRENT WEIGHT EMPTY CHANGES	+16.0	+17.0
TOTAL COMMAND MODULE CURRENT WEIGHT CHANGES	+20.0	-

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BLOCK I

SERVICE MODULE WEIGHT STATUS

	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(7731)	(-9)	(7722)	(11)	(75)	(14)
Structure	2355		2355	8	77	15
Environmental Control	92		92		100	
Instrumentation	34		34	100		
Electrical Power	1615	+12	1627	24	30	46
Main Propulsion	3057	-17	3040	4	96	
Reaction Control	566		566	20	80	
Communication & Rendezvous Radar	12	-4	8	100		
USEFUL LOAD	(2119)	(-51)	(2068)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	208	-51	157		100	
Main Propulsion	570		570		100	
TOTAL SERVICE MODULE BURNOUT	9850	-60	9790	9	80	11

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BLOCK II

SERVICE MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(7945)	(-43)	(7903)	(38)	(56)	(6)
Structure	2495		2495	36	64	
Environmental Control	117		117	20	80	
Instrumentation	37		37	100		
Electrical Power	1600	+12	1612	38	30	32
Main Propulsion	2883	-57	2826	36	64	
Reaction Control	577		577	30	70	
Communications & Rendezvous Radar	236	+3	239	100		
USEFUL LOAD	(2155)	(-58)	(2097)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	208	-58	150		100	
Main Propulsion	606		606		100	
TOTAL SERVICE MODULE BURNOUT	10100	-100	10000	30	65	5

SERVICE MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
ELECTRICAL POWER SYSTEM	(+12.0)	(+12.0)
Increase fuel cell system subcontractor items due to reflecting current electrolyte weight based on average weight of recent cells per Pratt and Whitney status.	+12.0	+12.0
MAIN PROPULSION SYSTEM	(-17.0)	(-57.0)
Decrease oxidizer and fuel tanks based on current average actual weight per Allison status.	-10.0	-10.0
Decrease oxidizer and fuel tanks due to a manufacturing revision of cylinder section of tank assemblies from four welded sections to two welded sections eliminating two weld lands per tank.	-7.0	-7.0
Delete the isolation valves from the Block II weight consistent with the current requirements.	-	-40.0
REACTION CONTROL SYSTEM	(-)	(-)
Increase the propellant tank system due to the addition of tank vents required to increase the service life of the propellant tank by reducing the cycling of the bladder during the fill and drain operation. This change incorporates potential item RCS-2.	+4.0	+4.0
Decrease the propellant system plumbing supports based on calculation of current drawing changes.	-4.0	-4.0
COMMUNICATION & RENDEZVOUS RADAR	(-4.0)	(+3.0)
Decrease the orbital HF antenna and coax based on calculation of current system requirements.	-4.0	-
Decrease the high gain antenna coax and connectors based on current estimates of system requirements.	-	-3.0
Increase X-Band antenna coax based on current estimates of system requirements.	-	+6.0
TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES (To be brought forward.)	-9.0	-42.0

SERVICE MODULE

CURRENT USEFUL LOAD CHANGE

	BLOCK I	BLOCK II
ENVIRONMENTAL CONTROL SYSTEM	(-51.0)	(-58.0)
Decrease the ECS oxygen based on off-loading for the deisgn reference mission durations of 10.6 day for Block I and 8.3 day including lunar mission requirements for Block II.	-51.0	-58.0
TOTAL SERVICE MODULE CURRENT USEFUL LOAD CHANGES	-51.0	-58.0
TOTAL SERVICE MODULE CURRENT WEIGHT EMPTY CHANGES	-9.0	-42.0
TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES	-60.0	-100.0

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BLOCK I

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure	1534	+2	1536		43	57
Ballast Instl. Prov.	29		29		100	
Electrical System	53		53	73	27	
Propulsion System						
Main Thrust	4794		4794			100
Jettison	434		434			100
Jettison Motor Skirt	92		92			100
Pitch Control	49		49			100
Separation Provisions	16		16	53	47	
C/M Boost Prot. Cover	535		535	100		
LES - NO BALLAST	7536	+2	7538	8	9	83
BALLAST	609	+8	617	100		
TOTAL LAUNCH ESCAPE SYSTEM	8145	+10	8155	15	8	77

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BLOCK II

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
Structure	1534	+2	1536		43	57
Ballast Instl. Prov.	29		29		100	
Electrical	53		53	73	27	
Propulsion System						
Main Thrust	4794		4794			100
Jettison	434		434			100
Jettison Motor Skirt	92		92			100
Pitch Control	49		49			100
Separation Provisions	16		16	53	47	
C/M Boost Prot. Cover	535		535	100		
LES - NO BALLAST	7536	+2	7538	8	9	83
BALLAST	444	-2	442	100		
TOTAL LAUNCH ESCAPE SYSTEM	7980	-	7980	13	9	78

LAUNCH ESCAPE SYSTEM

CURRENT WEIGHT CHANGES

	BLOCK I	BLOCK II
STRUCTURE	(+2.0)	(+2.0)
Increase the Q-Ball based on the current Block I and Block II GFE weights in the Model Specification.	+2.0	+2.0
BALLAST	(+8.0)	(-2.0)
Decrease ballast consistent with increased Q-Ball weight supplanting ballast weight.	-2.0	-2.0
Increase ballast consistent with Command Module and LES balance requirement.	+10.0	-
TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES	+10.0	-

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BLOCK I

ADAPTER WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure (Includes Stabilizing Members)	3250		3250	17	83	
Electrical	70		70	82	18	
Separation System	330		330	90	10	
Propellant Dispersal System	100	-100				
TOTAL ADAPTER	3750	-100	3650	25	75	

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BLOCK II

ADAPTER WEIGHT STATUS

ITEM	PREVIOUS STATUS 12-1-64	CHANGES TO CURRENT	CURRENT STATUS 1-1-65	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
Structure	3175		3175	15	85	
Electrical	70		70	82	18	
Separation System	330		330	90	10	
Propellant Dispersal System	125	-125				
TOTAL ADAPTER	3700	-125	3575	23	77	

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ADAPTER

CURRENT WEIGHT CHANGES

	BLOCK I	BLOCK II
Delete the Service Module - LEM propellant dispersal system based on NASA direction. This change incorporates potential Item ADP-1.	-100.0	-125.0
TOTAL ADAPTER CURRENT WEIGHT CHANGES	-100.0	-125.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE	(-318.0)
Decrease ablator due to incorporating a boost protective cover to carry the boost and abort loads and allow the ablator to be designed for entry temperature only, also add a thermal control coating which allows a reduction in temperature of the ablator prior to entry from +250 to +100 F and allows a reduction of required ablator thickness.	-265.0
Decrease ablator based on reduced ablator thickness accomplished by changing the backface design temperature criteria of +600 F at impact to +600 F at parachute deployment for the aft heat shield ablator.	-50.0
Decrease ablator due to redesign incorporating a flat top forward heat shield that is cut back to Station 104.5 and allows external mounting of the docking system which is protected by the Boost Protective Cover.	-20.0
Decrease forward heat shield due to redesign incorporating a flat top forward heat shield that is cut back to Station 104.5 and allows external mounting of the docking system.	-35.0
Increase side hatch cover due to adding provisions to operate the hatch cover latches from the outside and add an aluminum inner sheet which will compensate for thermal distortion experienced when it is opened in deep space.	+10.0
Decrease inner structure due to redesign utilizing a single-point "static gimbal" (flower-pot) chute riser attachment. This arrangement removes the concentrated chute loads from the longerons, and elimirates the main chute riser wrap-around loads from the bulkhead gussets and from the forward cylinder.	-79.0
Decrease the side access hatch and hatch cover due to deleting the window which will not be used for any Apollo lunar landing missions.	-25.0
Increase parachute attach fittings consistent with Block II single-point attachment.	+13.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE (CONT'D)

Increase center section heat shield substructure due to the attachment of the relocated horizontally mounted forward pitch motor assembly.	+7.0
Decrease crew compartment heat shield substructure due to utilizing titanium in lieu of steel for the aft compartment (pork chop) frames.	-41.0
Decrease main display panel due to integrating the various subpanels originally provided to allow design flexibility.	-9.0
Decrease lower equipment bay structure and coldplates due to redesign incorporating full electronic repackaging and method of mounting equipment to the frames at X_c 42 and 20 thus reducing the number of vertical members required.	-45.0
Decrease forward heat shield due to removal of access door to pitch motor.	-5.0
Add lower equipment bay supports required for food compartment which were previously provided by Crew Systems.	+8.0
Add a docking system consisting of a probe and drogue mechanism required to transfer two crewman from CM vehicle to the LEM vehicle in lunar rendezvous.	+150.0
Increase secondary structure heat shield equipment area due to the relocation of the Command Module to Service Module umbilical.	+30.0
Delete secondary structure supports required for Block I R & D equipment. (R & D provisions will be defined for each end item Block II vehicle.)	-27.0
Add weight reduction contingency.	+60.0
Add mounting and stowage provisions for PLSS's and expendables.	+5.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STABILIZATION & CONTROL	(-55.0)
Decrease equipment due to repackaging for the ring mounted lower equipment bay concept and incorporating Guidance and Control System.	-60.0
Add weight reduction contingency.	+5.0
GUIDANCE AND NAVIGATION	(-30.0)
Decrease equipment due to incorporating the Block II G & N system for the lunar spacecraft.	-30.0
CREW SYSTEMS	(-6.0)
Increase egress accessories due to adding aids for extra vehicular activities.	+10.0
Delete food storage box supports as this requirement has been integrated with secondary structure design.	-17.0
Add weight reduction contingency.	+1.0
ENVIRONMENTAL CONTROL	(+26.0)
Add a free condensate control required to minimize the amount of condensation in the cabin which if excessively accumulated would harmfully affect the respiration of the crew and cause degradation of electronic equipment.	+10.0
Provide the CO_2 absorber elements with a bypass in order to attain minimum oxygen flow of 10 CFM/Man in 3.5 psia (suited) condition.	+10.0
Add a LEM water transfer system.	+5.0
Add weight reduction contingency.	+1.0
EARTH LANDING SYSTEM	(-20.0)
Incorporate Block II configuration utilizing a single point parachute attachment and repackaging of chutes.	-20.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

INSTRUMENTATION	(-176.0)
Delete R & D instrumentation required for flight qualifications. (R & D provisions will be defined for each end item Block II vehicle.)	-188.0
Increase PCM equipment based on Block II requirements.	+5.2
Add weight reduction contingency.	+6.0
Increase TV camera based on current GFE weights.	+0.8
ELECTRICAL POWER	(-191.0)
Add a DC-DC line voltage regulator to regulate the output at 28 $\pm$ 0.5 volts for postlanding loads.	+4.0
Increase electrical wiring and connectors consistent with the 1300 wire umbilical requirements.	+159.0
Decrease wiring and connectors based on reduced wire gauges and utilizing small connectors.	-240.0
Decrease wiring based on relocating CM to SM umbilical.	- 60.0
Decrease crew compartment wire channel covers based on relocated umbilical.	-6.0
Delete wiring provisions for Service Module temperature control system.	-4.0
Delete R & D instrumentation wiring and provisions. (R & D provisions will be defined for each end item Block II vehicle.)	-136.0
Add wiring provisions for the rendezvous radar equipment.	+17.0
Decrease wiring due to reducing requirement of the controls and displays computer keyboard.	-5.0
Add wiring to provide connection between the caution and warning panel and the units previously tested with the in-flight test system.	+5.0
Add Nuclear Radiation Detection Wiring provisions required for the lunar vehicle.	+1.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

ELECTRICAL POWER (CONT'D.)	
Add provisions for S-IV B EDS interface.	+20.0
Add checkout provisions for the LEM in the stowed and docked position.	+31.0
Add wiring for the up data link display.	+3.0
Add wiring for the high gain control.	+6.0
Decrease wiring based on lower equipment bay repackaging.	-20.0
Add wiring required for Block II Controls and Displays modifications.	+4.0
Add weight reduction contingency.	+30.0
COMMUNICATIONS	(-51.0)
Delete C-Band antenna and utilize S-Band for low altitude tracking.	-19.7
Decrease equipment and wiring due to repackaging for the ring mounted lower equipment bay concept incorporating humidity and EMI proofing consistent with no inflight maintenance.	-27.7
Replace the scimitar antenna with the "S" band antenna.	+17.9
Transfer the VHF antenna to the Service Module.	-26.4
Decrease VHF recovery antenna based on new configuration of antenna for the Block II vehicle.	-4.5
Add coax cabling required for the high gain antenna.	+2.4
Delete orbital HF voice communication capability.	-2.0
Add weight reduction contingency.	+9.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

CONTROLS AND DISPLAYS	(+77.0)
Add rendezvous radar panel required for LOR mission.	+1.2
Add Nuclear Radiation Display.	+3.5
Add high gain antenna control required for deep space communication.	+2.4
Increase caution and warning detector.	+6.5
Modify control and display for the lunar vehicle.	+12.9
Add a teleprinter display which shall display messages and data directed to it from the up-data link equipment.	+10.0
Increase mounting panels consistent with Block II configuration reflecting elimination of subpanels.	+15.3
Incorporate display functions associated with the Guidance and Control System including an Entry Monitoring Display.	+23.2
Add weight reduction contingency.	+2.0
TOTAL COMMAND MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II (to be brought forward).	-744.0

COMMAND MODULE

CURRENT ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II

CREW SYSTEM	(+117.0)
Add two portable life support systems based on the current requirements of the LOR vehicle and LEM.	+106.0
Utilize Apollo spacesuits in lieu of Gemini.	+18.0
Add spare glove, repair kit and ring seals for the Apollo spacesuit per NASA.	+4.0
Decrease survival kit based on NASA information reflecting (1) three men life raft in lieu of (3) one man life rafts and their associated equipment.	-8.1
Decrease food based on current NASA requirements.	-11.0
Add two charged water cooled constant wear garments per current NASA list.	+9.0
Add emergency oxygen system (2) required on Block II.	+6.5
Add an external thermal garment required per the Block II vehicle requirements.	+13.4
Increase constant wear garments per NASA Block II information.	+0.9
Delete Block I GFE Growth Allowance.	-18.7
Decrease hygiene and medical storage boxes based on redesign of containers that cannot be accomplished on early Block I vehicles.	-6.5
Increase portable light based on current LOR requirements.	+1.5
Add weight reduction contingency.	+2.0
ENVIRONMENTAL CONTROL	(-23.0)
Decrease lithium hydroxide based on lunar mission analysis based on a 8.3 day mission.	-23.0
TOTAL COMMAND MODULE ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II	+94.0
TOTAL COMMAND MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II	-744.0
TOTAL COMMAND MODULE ESTIMATED CHANGES FROM BLOCK I TO BLOCK II	-650.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE	(+140.0)
Add structural beef-up required to support the rendezvous radar equipment.	+35.0
Add structural provisions for supporting the high gain antenna required for deep space communication.	+30.0
Increase structural provisions for the C/M to S/M umbilical fairing due to enlarging the capacity to 1300 wires.	+9.0
Increase engine mount and backup structure due to stiffness requirements.	+50.0
Add micrometeoroid protection in outboard sectors of the four propellant tanks to afford the greatest reliability. The shielding will be of an internal type mounted directly to the outboard panels.	+110.0
Decrease structure due to reducing factor of safety from 1.5 to 1.4 on all structures requiring redesign.	-25.0
Decrease outer shell panel based on redesign to a simi-arched structure with a lesser end moment requirement and a change in the helium pressurization access door from structural to nonstructural.	-50.0
Decrease radial beams due to reduction in web gauges, stiffener cap area, and inner and outer cap areas.	-6.0
Decrease forward bulkhead due to redesigning to a spider truss structure in lieu of honeycomb panels.	-84.0
Decrease aft bulkhead due to a reduction of face sheet thickness, density of honeycomb core, and the outer ring.	-10.0
Add support shelves for relocated equipment from Sector I.	+50.0
Decrease insulation on aft bulkhead due to reduction in Q-felt density.	-9.0
Decrease outer shell panel due to an increase in radiator size required by philosophy change allowing selective freezing.	-10.0
Add weight reduction contingency.	+20.0
Add EVT provisions including platform and attach handles.	+30.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

ENVIRONMENTAL CONTROL	(+25.0)
Increase radiator size based on philosophy change allowing selective freezing.	+25.0
INSTRUMENTATION	(+3.0)
Add radiation detection sensors to the Service Module.	+3.0
ELECTRICAL POWER	(-15.0)
Increase intermodular plumbing due to adding radiator valves required on the Block II vehicles.	+9.0
Increase wiring, connectors and shape charge consistent with the 1300 wire umbilical.	+106.0
Decrease wiring and connectors based on reduced wire gauges and utilizing small connectors.	-130.0
Increase shape change based on relocated umbilical requirement.	+20.0
Decrease wiring based on relocating CM to SM umbilical.	-10.0
Decrease cryogenic tanks due to utilizing super insulation.	-31.0
Decrease sequencer based on removing battery and utilizing fuel cell power for pyrotechnics.	-7.0
Decrease oxygen tank support shelf consistent with Block II relocated shelf allowance.	-6.0
Delete wiring provisions for Service Module TCS.	-5.0
Add provisions for LEM monitoring in stowed position.	+22.0
Add wiring provisions for high gain antenna.	+13.0
Add wiring provision for rendezvous radar equipment.	+6.0
Delete support shelf for the power distribution panel based on Block II requirement for Bay I empty configuration.	-19.0
Add weight reduction contingency.	+17.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

PROPULSION	(-214.0)
Decrease propellant and oxidizer tank gauges based on refined tank pressure regulation by utilizing precision valves which allow design for pressure relief at 225 psi rather than 240 psi.	-50.0
Decrease propellant and oxidizer tanks due to shortening the tanks for a 41,000 pound usable propellant.	-191.0
Add weight reduction contingency.	+27.0
REACTION CONTROL SYSTEM	(+11.0)
Increase reflectors and insulation based on Service Module boost heating and RCS plume impingement.	+15.0
Reduce attachments for structural closeouts on RCS panels.	-8.0
Delete electric heaters required for RCS temperature control not required for Block II.	-2.0
Add weight reduction contingency.	+6.0
COMMUNICATIONS & RENDEZVOUS RADAR	(+231.0)
Add high gain antenna system required for deep space communications.	+60.0
Add rendezvous radar equipment consistent with the LOR requirements.	+149.0
Transfer VHF communication antenna from the Command Module.	+30.0
Delete orbital HF antenna required for Block I only.	-8.0
TOTAL SERVICE MODULE ESTIMATED WEIGHT EMPTY CHANGES TO BLOCK II (To be brought forward)	+181.0

SERVICE MODULE

CURRENT ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II

MAIN PROPULSION	(+36.0)
Decrease Helium quantity based on reduced volume.	-11.0
Increase residuals consistent with current propellant requirements.	+47.0
ENVIRONMENTAL CONTROL SYSTEM	(-7.0)
Decrease the ECS oxygen due to off-loading for the design reference mission duration of 8.3 days in lieu of 10.6 days.	-24.0
Increase the ECS oxygen due to adding capability for repressurizing the LEM and PLSS's.	+17.0
TOTAL SERVICE MODULE ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II	+29.0
TOTAL SERVICE MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II	+181.0
TOTAL SERVICE MODULE ESTIMATED CHANGES FROM BLOCK I TO BLOCK II	+210.0

LAUNCH ESCAPE SYSTEM

CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II

BALLAST	(-175.0)
Decrease ballast consistent with current Command Module LES balance requirements.	-175.0
TOTAL LAUNCH ESCAPE SYSTEM ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II	-175.0

ADAPTER

CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II

Decrease S-IV B Adapter utilized on the Block I vehicles due to removing the structure trusses required to stiffen the Adapter when the LEM is not installed.	-75
TOTAL ADAPTER CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II	-75

BLOCK I

COMMAND MODULE

POTENTIAL WEIGHT CHANGES

STRUCTURE	(+207)
Relocate equipment on aft bulkhead providing new stowage containers for lithium hydroxide. (Item STR-1)	+7
Redesign the aft heat shield to survive water impact loads. (Item STR-2)	+200
ENVIRONMENTAL CONTROL	(+80)
Add water for the cooling during earth orbit based on the inability of the radiators to supply sufficient cooling. (Item ECS-1)	+78
Add restrictors and filters to surge tank subsystem to limit the oxygen demand flow on the cryogenic system when the ECS oxygen subsystem is in the high flow condition. (Item ECS-2)	+1
Add an oxygen tank required for backup of surge tank during re-entry for vehicles which do not carry PLSS's. (Item ECS-3)	+1
INSTRUMENTATION	(-178)
Delete R & D instrumentation from the manned airframes. (Item Instr.-1)	-186
Add runaway RCS engine detection unit to detect possible failures within the SCS and RCS. (Item Instr.-2)	+8
ELECTRICAL POWER	(-98)
Increase wiring provisions based on potting connectors due to humidity requirements. (Item EPS-1)	+30
Provide a communication adapter cable to facilitate use of the Apollo Block I spacesuit. (Item EPS-3)	+2
Delete wiring provisions for R & D instrumentation from the manned airframes. (Item EPS-4)	-130
COMMUNICATIONS	(-3)
Study implementation of utilizing HF recovery Antenna from DeHavilland Aircraft Ltd. (Item COM-1)	-3
CONTROLS & DISPLAYS	(+5)
Incorporate integral illumination of FDAI. (Item C&D-1)	+3
Add Radiation detection provisions. (Item C&D-3)	+2
TOTAL COMMAND MODULE POTENTIAL WEIGHT CHANGES	+13

BLOCK I

SERVICE MODULE

POTENTIAL WEIGHT CHANGES

INSTRUMENTATION	(+3)
Add R & D flight qualification sensors and signal conditioners required for Block I vehicles. (Item Instr.-1) A pending decision to delete the R & D instrumentation may eleminate this 15 pound potential.	-
Add radiation detection provisions. (Item Instr.-2)	+3
ELECTRICAL POWER	(+34)
Increase fuel cell based on latest vendor status reflecting provisions for parallel module operation and addition of start-up potasium hydroxide wetting agent. (Item EPS-1)	+19
Increase wiring provisions based on potting connectors due to humidity requirements. (Item EPS-2)	+15
Add R & D flight qualification wiring required for Block I vehicles. (Item EPS-3) A pending decision to delete the R & D instrumentation may eliminate this 15 pound potential.	-
PROPULSION SYSTEM	(+60)
Add dual propellant retention screens external to the existing reservoir to increase the reliability of the SPS. (Item MPS-1)	+40
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)	+20
REACTION CONTROL	(-5)
Remove RCS plume heat shields and add cork sheet for improved thermal protection against RCS engine boost heating. (Item RCS-1)	-5
TOTAL BLOCK I SERVICE MODULE POTENTIAL WEIGHT CHANGES	+92

BLOCK I

LAUNCH ESCAPE SYSTEM

POTENTIAL WEIGHT CHANGES

C/M BOOST PROTECTIVE COVER	(+45)
Increase boost cover due to redesign replacing zipper closures with solid laminate edge members, doublers and screws. (Item LES-1)	+45
TOTAL BLOCK I LAUNCH ESCAPE SYSTEM POTENTIAL WEIGHT CHANGES	+45

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BLOCK I

GOVERNMENT FURNISHED EQUIPMENT

The following GFE items and associated weights are consistent with SID 63-313 Apollo Command Module and Service Module System Specification.

Item		Weight Pounds
GFE Total		(1348.5)
Guidance and Navigation		430.0
Crew (50, 70, 90)		528.0
Crew Equipment		251.0
Pressure Garment Assembly (3)	84.0	
Constant Wear Garments - Gas Cooled (6)	5.6	
Radiation Dosimeters	5.0	
Food Set (10.6 Days)	60.5	
Probe	0.5	
Medical Kit - Emergency	2.6	
Clinical Instrumentation	2.1	
Biomedical Instrumentation	3.9	
Survival Equipment	68.1	
GFE Growth Allowance	18.7	
Instrumentation (R&D)		34.5
PAM/FM/FM Package	16.0	
Gas Chromatogaph	9.5	
Commutators (3)	9.0	
Scientific Equipment		80.0
Q-Ball		25.0

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BLOCK II

GOVENMENT FURNISHED EQUIPMENT

The following GFE items and associated weights are consistent with SID 64-1344 Command/Service Module Technical Specification.

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

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