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MONTHLY WEIGHT AND BALANCE REPORT

FOR THE APOLLO SPACECRAFT

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1 June 1963

Prepared by

Weight Control

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NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

FORM M158-D-3 VELLUM REV. 2-61

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INTRODUCTION

The June report reflects a spacecraft weight increase of 145 pounds at injection and 60 pounds at Service Module burnout.

The major changes in the Command Module were due to calculation of current released structure drawings and the incorporation of MIT status reports. Numerous format changes were made to reflect additional detail.

The major changes in the Service Module were due to an increase in space radiator skin gauge and due to changing from titanium to aluminum for the oxidizer and fuel tank skirts. The Service Module main propellant residual is now based on the current mission requirement propellant rounded to 38000 pounds in lieu of 45000 pounds max capacity.

The major change in the Launch Escape System was due to the increase in ballast weight, consistent with combined Command Module and Launch Escape System balance requirement.

The current injected weight of 83300 pounds is based on the Service Module loaded with sufficient propellant at a specific impulse of 313.0 to provide 10 per cent ΔV margin. This is also based on a LEM weight, including crew, of 25000 pounds.

The earth orbital mission weight summary reflects a two stage booster to orbit injection without the use of Service Module propulsion and is based on a complete Service Module loaded with 2450 pounds of propellant.

Center of gravity data and excursions for the Command Module are based on single position couch concept. Subsequent equipment relocations for center of gravity improvement will be incorporated in the July report.

APOLLO LOR MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT.^{2})		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	9170	1043.6	0.4	9.3	4226	3634	3541
SERVICE MODULE - Less Propellant	9620	909.5	0.8	-0.8	6266	10082	9927
TOTAL - Less Propellant	18790	974.9	0.6	4.1	10596	32042	31690
PROPELLANT - S/M**	36940	905.6	6.0	-2.6	19208	19908	25911
TOTAL - With Propellant	55730	929.0	4.2	-0.3	30004	64999	70606
LUNAR EXCURSION MODULE	24460	623.0	0.0	0.0	13616	12776	13247
ADAPTER - LEM - C-5	3110	640.1	0.0	0.0	6991	8599	8599
TOTAL - Injected	83300	828.3	2.8	-0.2	50801	454659	460806
LAUNCH ESCAPE SYSTEM	6390	1297.5	0.0	-0.1	217	7923	7924
TOTAL - Spacecraft Launch	89690	861.8	2.6	-0.2	50908	744529	750686

NOTES: *Center 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 36940 pounds provides approximately 10% ΔV margin, and excludes 210 pounds of ΔV propellants tanked in the service module reaction control system. The propellant weight is based on a specific impulse of 313.0.

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APOLLO EARTH ORBIT MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY			MOMENTS OF INERTIA (SLUG-FT.2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	9170	1043.6	0.4	9.3	4226	3634	3541
SERVICE MODULE - Less Propellant	9620	909.5	0.8	-0.8	6266	10082	9927
TOTAL - Less Propellant	18790	974.9	0.6	4.1	10596	32042	31690
PROPELLANT - S/M**	2450	849.2	27.0	-11.7	895	497	646
TOTAL - With Propellant	21240	960.4	3.6	2.3	11934	40077	40083
ADAPTER - C-1	630	779.8	0.0	0.0	545	599	599
TOTAL - Injected	21870	955.2	3.5	2.2	12481	44984	44991
LAUNCH ESCAPE SYSTEM	6390	1297.5	0.0	-0.1	217	7923	7924
TOTAL - Spacecraft Launch	28260	1032.6	2.7	1.7	12718	177966	177981

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 include 2450 pounds of propellant for an orbital altitude of about 129 nautical miles with a payload launch azimuth of 72°.

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT.^{2})		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	9170	1043.6	0.4	9.3	4226	3634	3541
LAUNCH ESCAPE SYSTEM	6390	1297.5	0.0	-0.1	217	7923	7924
TOTAL - Launch Abort	15560	1147.9	0.2	5.4	4516	64028	63863
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3210	1296.5	0.0	0.0	-69	-1330	-1330
TOTAL - LES Burnout	12350	1109.2	0.3	6.9	4421	43388	43249

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.

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LUNAR ORBIT RENDEZVOUS MISSION

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
EARTH LAUNCH	9170	1043.6	0.4	9.3	4226	3634	3541	15	-195	-20
ADJUSTMENTS (NET)	88	—	—	—						
Boost & Mission Coolants										
Food & Water Consumation										
Mission Waste Pickup										
Fuel Cell Water Pickup										
PRIOR TO ENTRY	9258	1043.6	-0.1	9.9	4267	3664	3544	32	-218	-44
Less: Propellant	-258	1022.6	-6.2	56.6						
Ablator Burnoff	-223	1019.7	0.0	11.2						
Entry Coolant	-6	1022.5	-21.1	61.8						
Forward Heat Shield	-364	1100.0	0.0	1.9						
Drogue Chute	-25	1090.0	11.0	-22.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	8382	1042.3	0.1	8.9	3845	3041	3011	22	-119	-40
Less: Main Chutes (3)	-440	1089.9	0.3	6.7						
LANDING	7942	1039.7	0.1	9.0	3799	2795	2747	21	-109	-40

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

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COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

HIGH ALTITUDE ABORT CONDITION

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
EARTH LAUNCH	9170	1043.6	0.4	9.3	4226	3634	3541	15	-195	-20
Less: Boost Coolants	-14	1019.4	-38.9	1.4						
PRIOR TO ENTRY	9156	1043.6	0.5	9.3	4217	3628	3534	12	-196	-23
Less: Propellant	-258	1022.6	-6.2	56.6						
Ablator Burnoff	-223	1019.7	0.0	11.2						
Entry Coolant	-6	1022.5	-21.1	61.8						
Forward Heat Shield	-364	1100.0	0.0	1.9						
Drogue Chute	-25	1090.0	11.0	-22.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	8280	1042.3	0.7	8.2	3792	3002	3001	4	-99	-18
Less: Main Chutes (3)	-440	1089.9	0.3	6.7						
LANDING	7840	39.7	0.7	8.3	3747	2757	2736	5	-92	-18

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

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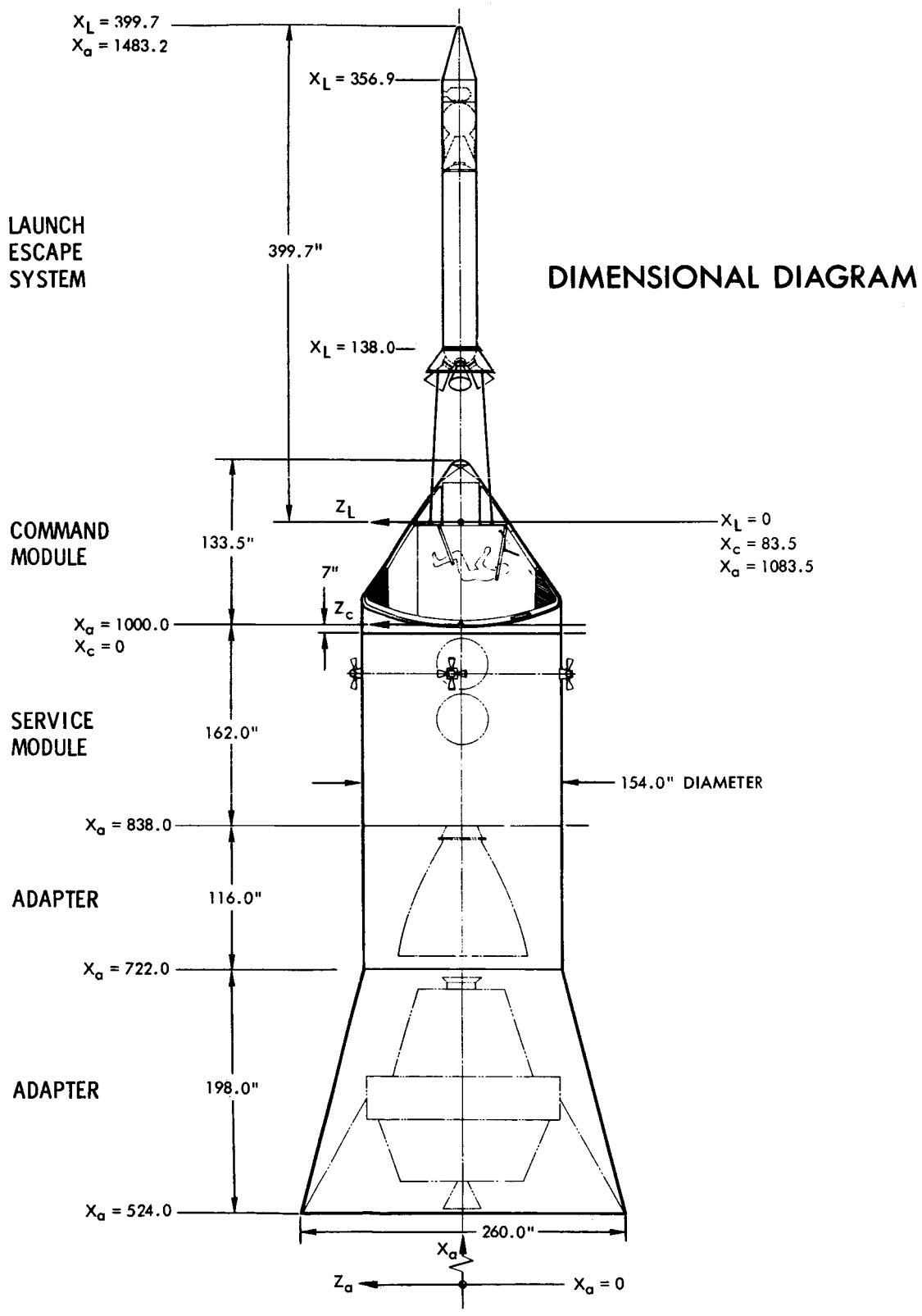
COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.2)					
		X	Y	Z	Ixx	Iyy	Ixz	Ixy	Ixz	Iyz
EARTH LAUNCH	9170	1043.6	0.4	9.3	4226	3634	3541	15	-195	-20
Less: Propellant	-258	1022.6	-6.2	56.6						
Forward Heat Shield	-375	1097.8	-0.3	3.2						
Drogue Chute	-25	1090.0	11.0	-22.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	8512	1041.7	0.6	8.2	3957	3170	3159	9	-109	-17
Less: Main Chutes (3)	-440	1089.9	0.3	6.7						
LANDING	8072	1039.1	0.6	8.3	3912	2918	2889	10	-101	-17

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


DIMENSIONAL DIAGRAM
X_L = 399.7
X_a = 1483.2
X_L = 356.9
LAUNCH ESCAPE SYSTEM
399.7"
X_L = 138.0
Z_L
X_L = 0
X_c = 83.5
X_a = 1083.5
COMMAND MODULE
133.5"
7"
Z_c
X_a = 1000.0
X_c = 0
SERVICE MODULE
162.0"
154.0" DIAMETER
X_a = 838.0
ADAPTER
116.0"
X_a = 722.0
ADAPTER
198.0"
X_a = 524.0
260.0"
X_a
Z_a
X_a = 0

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SPACECRAFT

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 5-1-63	CHANGE TO CURRENT	CURRENT WEIGHT 6-1-63	BASIS FOR CURRENT		
				%EST	%CAL	%ACT
COMMAND MODULE	9000	+170	9170	60	38	2
SERVICE MODULE	46585	-25	46560	5	95	
LES	6350	+40	6390	34	68	
ADAPTER	3110		3110	100		
TOTAL	65045	+185	65230	20	80	-

[redacted]

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 5-1-63	CHANGE TO CURRENT	CURRENT WEIGHT 6-1-63	BASIS FOR CURRENT		
				%EST	%CAL	%ACT
Structure	(4235)	(+112)	(4347)			
Structure - Less Ablator	2975	+95	3070	35	65	
Ablation Material	1260	+17	1277	100		
Crew Systems	329	-2	327	99	1	
Communication and Instrumentation	782	-70	712	100		
Guidance and Navigation	406	+61	467	100		
Stabilization and Control	209		209	100		
Reaction Control	267	+23	290	84	16	
Electrical Power	381	+10	391	100		
Environmental Control	258	+11	269	30	70	
Earth Landing	552	+16	568	11	64	25
WEIGHT EMPTY	7419	+161	7580	64	34	2
Crew (3), (50, 70, 90 Percentile)	528		528		100	
Crew System Equipment	297	+2	299	93	3	4
Food and Containers	90		90	100		
Reaction Control Propellant	259		259		100	
Environmental Control Chemicals	157	+7	164		100	
Scientific Payload	250		250	100		
GROSS WEIGHT	9000	+170	9170	60	38	2

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

STRUCTURE		(+112)
Decrease basic body structure due to the following:		-6
Redesign forward pitch engine support due to change from 40:1 to 10:1 engine expansion ratio.	-4	
New gusset design resulting from parachute fitting redesign and weight reduction effort.	-6	
Calculation of attachment hardware on top assembly drawing.	+4	
Incorporate part of crew hatch area redesign to beam loads around crew hatch.	+4	
Incorporation of high temperature window panes in lieu of window covers removes actuation mechanism provision from basic body structure.	-4	
Increase secondary structure due to the following:		+74
Increase right hand equipment bay due to the addition of doors and drawers.	+20	
Increase right hand equipment bay structure due to calculations of released drawings.	+6	
Increase LH equipment bay due to the addition of a crew couch attenuation load frame.	+25	
Increase lower equipment bay coldplates due to revised estimates	+3	
Increase aft equipment bay due to calculations of the present doors and dividers.	+20	

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

STRUCTURE (Continued)

Increase heat shield substructure due to the following:		+34
Add new steel honeycomb substructure to replace adapter skirt and radome removed as a part of the antenna relocation from the radome to strakes.	+17	
Revise Command Module to Launch Escape interface due to evaluation of layout reflecting an increase in structure and high density insulation.	+11	
Incorporated high temperature window panes in lieu of window covers.	+5	
Remove actuation and latching mechanism for window covers due to using high temperature window panes in lieu of window covers.	-45	
Add material (ablator, teflon and fiberglas) required to protect antennas in strakes.	+22	
Increase crew compartment aft ring due to thermal expansion loads and manufacturing requirements.	+4	
Increase aft heat shield panel due to the addition of densified core on the edges per impact load analysis.	+10	
Increase aft bulkhead due to change in chem-mill values from $.008 \pm .001$ to $.008 \pm {}^{.002}_{.001}$ inches.	+10	
Increase ablation material to cover new nose cone section previously covered by radome.		+17
Increase insulation to cover new nose cone section.		+3
Transfer parachute attach fittings to earth landing system.		-10

[redacted]

[redacted]

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

CREW SYSTEMS	(-2.0)
Transfer portable crewman light assembly from weight empty to useful load.	-1.0
Transfer relief receptacle from weight empty to useful load.	-1.0
COMMUNICATION & INSTRUMENTATION	(-70.0)
Relocate VHF/2KMC omni antenna from nose area to strakes.	-49.0
Add antenna selector to insure maximum signal reception capability of strake antennas.	+8.0
Decrease C-Band antenna transmission lines and connectors per revised estimate.	-2.0
Increase loudspeaker per revised estimate. (Note: Requirements for loudspeaker cancelled per CCA No. 14 Revision 1 and will be deleted in the July report.)	+0.8
Increase mode select and gimbal angle indicator to incorporate latest display requirements.	+4.7
Increase audio panels per latest vendor estimate.	+2.5
Relocate clock and add event timer to the lower equipment bay.	+0.8
Revise inflight test system to incorporate new simplified system concept.	-35.8
GUIDANCE & NAVIGATION	(+61.0)
Increase in computer weight to reflect addition of power supply, trays for spares and relocation of cabling to front panel.	+36.3
Increase in power servo amplifier to include addition of pulse torquing, backup electronics and temperature controller electronics. Growth of electronic module reflected in revised circuitry.	+24.7
REACTION CONTROL SYSTEM	(+23.0)
Decrease engine weights to reflect Rocketdyne specification weights.	-19.0
Add engine nozzle extension - ablative material.	+42.0
ELECTRICAL POWER SYSTEM	(+10.0)
Add two pyrotechnic batteries per NASA letter SSS/CSM/63-121 (304 MA)	+8.0
Add provisions for pyrotechnic batteries.	+2.0

[redacted]

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

ENVIRONMENTAL CONTROL SYSTEM		(+11.0)
Increase pressure suit circuit due to the following:		+2.5
Calculate weight versus estimated weight of valves and sensor.	-0.3	
Deleted suit compressor selector switch consistent with present requirements.	-0.2	
Suit hose connection per AiResearch status report.	+0.2	
Increase from 35 to 78g load requirement on controls and heat exchanger package.	+0.8	
Add CO_2 sensor.	+2.0	
Increase water glycol circuit due to the following:		+0.2
Deletion of glycol pump selector switch.	-0.2	
Deletion of glycol quick disconnect.	-0.4	
Deletion of manual shut-off valve.	-0.8	
Increase from 35 to 78g load on components.	+2.3	
Calculated weight versus estimate of two valves.	-0.9	
Addition of two glycol pressure relief valves per AiResearch status.	+0.2	
Increase pressure and temperature control due to the following:		+2.3
Redesign of cabin outflow pressure regulator to add cam operated teleflex cable override control.	+2.2	
Deletion of cabin blower selector switch.	-0.2	
Increase from 35 to 78g load on controls.	+0.3	

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

ENVIRONMENTAL CONTROL SYSTEM (Continued)

Increase oxygen supply system due to the following:		+3.9
Calculated versus estimated weight.	+0.1	
Actual weight of re-entry O_2 supply system.	+4.4	
Addition of main O_2 supply check valve per AiResearch status.	+0.2	
Reduced weight/AiResearch status.	-0.4	
Delete O_2 quick disconnect.	-0.4	
Increase water supply system due to the following:		+2.8
AiResearch weight estimate over SID estimate on reduced potable water tank size.	+0.8	
Deletion of water and Freon quick disconnect.	-0.5	
Increase in water chiller to prevent too high a pressure change.	+0.7	
Calculated versus estimated weight of potable water assembly.	+1.3	
AiResearch weight estimate over SID estimate on additional Freon system.	+0.8	
Reduced water shut-off valve per AiResearch status.	-0.3	
Decrease subcontractor common items due to the following:		-4.3
Brackets increase due to load change from 35 to 78g.	+0.5	
Reduced allowance for radio noise filter, solder and connector specs.	-5.9	
Numerous changes in instrumentation due to 78 g and new specification.	+1.1	
Added push-pull control to open and close the redundant side of the compartment pressure regulator.		+3.6

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COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

EARTH LANDING SYSTEM	(+16.0)
Decrease drogue chute system due to revised calculations.	-0.7
Increase main cluster harness due to redesign for greater loads.	+10.1
Decrease main cluster harness attach fittings due to calculations in lieu of estimated weights.	-4.6
Increase ringsail parachute and links due to redesign which includes the deployment bag.	+1.1
Decrease pilot chute system due to calculated in lieu of estimated weights.	-0.3
Decrease sequencer control assembly due to calculated in lieu of estimated weights.	-3.1
Increase attach provisions due to redesign of fittings to eliminate interference with forward cylinder ring and to strengthen pins.	+3.5
Transfer parachute attach fittings from structure page.	+10.0
TOTAL COMMAND MODULE WEIGHT EMPTY CHANGES	+161.0

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COMMAND MODULE

CURRENT USEFUL LOAD CHANGES

Transfer portable crewman light assembly from weight empty.	+1.0
Transfer relief receptacle from weight empty.	+1.0
Revise RCS propellant breakdown to show usable and residual propellants.	0.0
Increase container for LiOH and charcoal due to load requirement change from 35 to 78g.	+7.0
TOTAL COMMAND MODULE CURRENT USEFUL LOAD CHANGES	+9.0

[redacted]

[redacted]

SERVICE MODULE WEIGHT STATUS

	PREVIOUS STATUS 5-1-63	CHANGE TO CURRENT	CURRENT WEIGHT 6-1-63	BASIS FOR CURRENT		
				¢EST	%CAL	%ACT
Structure	2366	-56	2310	20	80	
Electronics	151		151	100		
Reaction Control	593	-3	590	75	25	
Electrical Power	1190	+ 54	1244	25	73	2
Environmental Control	78	+50	128	30	70	
Propulsion System	(3106)	(-123)	(2983)			
Engine Installation	666		666	85	15	
Propulsion System	2440	-123	2317		87	
WEIGHT EMPTY	7484	-78	7406	31	69	0
RCS Propellant	835	+3	838		100	
Electrical Power Supercritical Fluids	487		487		100	
Environmental Control Supercritical Fluids	208		208		100	
Main Propulsion Helium	99		99		100	
Main Propellant Residuals	(617)		(582)		100	
Trapped - System	225	-35	190			
Trapped - Engine	67		67			
Mixture Ratio Tolerance	100		100			
Loading Tolerance	225		225			
BURNOUT WEIGHT	9730	-110	9620	24	76	0
Main Propellant	36855	+85	36940		100	
GROSS WEIGHT	46585	-25	46560	5	95	

[redacted]

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SERVICE MODULE

CURRENT WEIGHT EMPTY CHANGES

STRUCTURE	(-56.0)
Decrease outer shell weight due to transfer of the outer face sheet in the space radiator area to Electrical Power System (-13) and Environmental Control (-20).	-33.0
Decrease outer shell weight due to calculated in lieu of estimated weight.	-3.0
Decrease Command Module to Service Module fairing weight due to calculation of released drawings.	- 20.0
REACTION CONTROL SYSTEM	(-3.0)
Transfer helium weight from the pressure system to useful load.	-3.0
ELECTRICAL POWER	(+54.0)
Decrease fuel cell power pack based on current status.	-2.3
Increase fuel cell plumbing due to reorientation of fuel cell modules for the addition of vertical stabilization webs.	+4.0
Increase fuel cell hydrogen system based on current Beech status reflecting heater change.	+4.3
Increase fuel cell oxygen system based on current Beech status reflecting heater change.	+6.1
Increase space radiators due to the following:	
Transfer of outer face sheet weight from Structures Group for integral radiators.	+13.0
Increase of space radiator weight due to change in material from 7178 aluminum to 6061 aluminum and reduce chem-mill area.	+15.8
Add fuel cell module stabilization webs to prevent a structural weight penalty of 18 pounds.	+2.4

[redacted]

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SERVICE MODULE

CURRENT WEIGHT EMPTY CHANGES

ELECTRICAL POWER (Continued)	
Increase power distribution supports due to miscellaneous design changes.	+0.8
Add Command Module to Service Module electrical mating disconnects.	+9.9
ENVIRONMENTAL CONTROL SYSTEM	(+50.0)
Decrease subcontractor components due to miscellaneous design changes and deletion of components per revised weight list from AiResearch.	-1.6
Increase plumbing and hardware per revised layouts.	+2.8
Increase water-glycol estimate per revised layouts.	+6.6
Transfer outer face sheet weight from Structure's Group for integral radiators.	+20.0
Increase space radiator weight due to change in material from 7178 aluminum to 6061 aluminum and reduce chem-mill area.	+23.5
Delete water supply quick disconnect from subcontractor components.	- 0.3
Delete oxygen supply quick disconnect from subcontractor components.	-0.4
Delete supports per revised weight list from AiResearch.	-0.6
PROPULSION GROUP	(-123.0)
Increase oxidizer and fuel tanks weight for redesigned weld lands and for rivet attachment of the aluminum skirts.	+19.0
Decrease oxidizer and fuel tank skirts due to change in material from titanium to aluminum.	-116.0
Decrease helium tank weight due to reduction in tank pressure from 4500 PSI to 4400 PSI.	-26.0
TOTAL SERVICE MODULE CURRENT WEIGHT EMPTY CHANGES	-78.0

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SERVICE MODULE

CURRENT USEFUL LOAD CHANGES

REACTION CONTROL	(+3)
Expand breakdown of the residual RCS propellants	0
Reallocate helium weight from the pressure system weight empty to useful load.	+3
PROPULSION	(-35)
Decrease loading tolerance weight to reflect reduction of propellant loading from 45,000 pounds to 38,000 pounds.	-35
TOTAL SERVICE MODULE CURRENT USEFUL LOAD CHANGES	-32

[redacted]

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LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

ITEM	PREVIOUS STATUS 5-1-63	CHANGE TO CURRENT	CURRENT WEIGHT 6-1-63	BASIS FOR CURRENT		
				%EST	%CAL	%ACT
Structure	874	-8	866	4	95	1
Electrical System	36	+5	41	100		
Propulsion System						
Main Thrust	4764		4764	40	60	
Jettison	440		440	1	99	
Jettison Motor Skirt	94		94		100	
Pitch Control	55		55	60	40	
LES - NO BALLAST	6263	-3	6260	32	68	-
BALLAST	87	+43	130	100		
TOTAL L.E.S.	6350	+40	6390	34	66	

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LAUNCH ESCAPE SYSTEM

CURRENT WEIGHT CHANGES

STRUCTURE	(-8)
Decrease escape motor skirt due to calculations based on released drawings	-8
ELECTRICAL SYSTEM	(+5)
Increase electrical wiring based on revised estimates	+5
BALLAST	(+43)
Increase Ballast weight consistent with combined command module and launch escape system balance requirements	+43
TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES	+40

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ADAPTER

WEIGHT STATUS

	PREVIOUS STATUS 5-1-63	CHANGE TO CURRENT	CURRENT WEIGHT 6-1-63	BASIS FOR CURRENT		
				%EST	%CAL	%ACT
Structure	2892		2892			
Electrical	76		76			
Separation System	142		142			
TOTAL ADAPTER	3110		3110	100		

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WEIGHT HISTORY COMMENTS

LAUNCH ESCAPE SYSTEM

The target weight established for the LES is 6,300 pounds, excluding ballast. This weight was based on the September 1962 status weight of 6,600 pounds including the necessary ballast to provide currently determined aerodynamic stability to prevent tumbling.

The original target of 5,900 pounds, as reported in the June Status, SID 62-99-5, was based on an attitude controlled configuration. The current configuration weight includes a pitch motor and ballast not included in the original target weight.

COMMAND MODULE

The target weight established for the Command Module is 8,500 pounds. An estimated weight breakdown for the target weight is provided for comparative purposes.

The original target weight of 8,340 pounds, as reported in the June Status, SID 62-99-5, did not include the proposed increases nor the Category I reductions presented in the July briefing and incorporated in the July Status Report.

SERVICE MODULE

The target weight established for the Service Module less usable propellant is 11,000 pounds. An estimated weight breakdown for the target weight is provided for comparative purposes. This configuration is sized for 45,000 pounds usable propellant for the 25,000 pound LEM.

The original target weight of 8,595 for the burnout condition was based on a lunar landing configuration sized for 31,000 pounds usable propellant.

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WEIGHT HISTORY

COMMAND MODULE

	ORIGINAL TARGET WT.	TARGET WEIGHT	AUTHORIZED CHANGES	AUTHORIZED WEIGHT 6-1-63
Structure	3670	3720		3720
Crew Systems	565	690	+2	692
Communication & Instrumentation	944	785		785
Guidance & Navigation	310	310	+141	451
Stabilization & Control	175	195		195
Reaction Control	183	195		195
Electrical Power	354	390		390
Environment Control	228	255		255
Earth Landing	530	610	-106	504
WEIGHT EMPTY	6959	7150	+37	7187
Crew	528	528		528
Suits & Personal Equipment	82	126		126
Survival Water	54	18		18
Food & Containers	90	90		90
Reaction Control Propellant	210	210		210
Environmental Control Fluids	167	128		128
Scientific Payload	250	250		250
GROSS WEIGHT	8340	8500	+37	8537

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COMMAND MODULE WEIGHT HISTORY

WEIGHT EMPTY AUTHORIZED CHANGES

CREW SYSTEM	(+2)
Add a loudspeaker in the crew compartment per NASA request.	+2
GUIDANCE & NAVIGATION	(+141)
Increase the Guidance and Navigation per recent weight report from M.I.T. Since NAA does not have weight control responsibility for the M.I.T. design, the weight changes in their Weight and Balance Report will be considered as authorized changes.	141
EARTH LANDING	(-106)
Remove the impact attenuation system per TWX SM 032. dated 23 July 1960, reported in the 1 November 1962 Weight and Balance Report.	-106
TOTAL COMMAND MODULE WEIGHT EMPTY CHANGES	+37

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WEIGHT HISTORY

SERVICE MODULE

	ORIGINAL TARGET WT.	TARGET WEIGHT	AUTHORIZED CHANGES	AUTHORIZED WEIGHT 6-1-63
Structure	2810	3203		3203
Electronics	216	145		145
Reaction Control	254	737		737
Electrical Power	1076	1203		1203
Environmental Control	413	250		250
Propulsion System				
Engine Installation	375	606		606
Propellant System	1928	2456		2456
WEIGHT EMPTY	7072	8600		8600
Usable RCS Propellant	400	611		611
Usable Fuel Cell Reactants	280	479		479
Environmental Control Fluids	288	193		193
Main Propulsion Helium	97	139		139
Main Prop. Residuals	300	900		900
Unusable RCS Propellant	20	61		61
Unusable Fuel Cell Reactants	38	17		17
BURNOUT WEIGHT	8595	11000		11000
Main Propellant	31000	45000		45000
GROSS WEIGHT	39595	56000		56000

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POTENTIAL WEIGHT AND CENTER OF GRAVITY CHANGES

COMMAND MODULE

STRUCTURE	(+103)
Increase basic body structure center section due to the addition of crew hatch area structure to beam loads around hatch.	+70
Increase basic body structure forward longerons due to parachute attach relocation and new 66,000 pound parachute loads.	+40
Increase heat shield substructure due to new aft heat shield to aft bulkhead attachments.	+8
Remove secondary structure doors and drawers by redesign.	-10
Redesign of nose cone contour.	-5
CREW SYSTEMS	(+54)
Increase portable life support system per Hamilton Standard letter to NASA.	+36
Increase radiation dosimeter per new NASA weights.	+10
Increase suit wiring and umbilicals.	+3
Remove food and personal preference items from survival kit.	-5
Increase waste management system based on calculation of released drawings.	+10
COMMUNICATION & INSTRUMENTATION	(+77)
Add electrical provisions for test instrumentation to monitor C-1 and C-5 booster per NASA.	+16
Add spacecraft digital up-data link per NASA.	+35
Add R & D PCM per NASA.	+26
REACTION CONTROL SYSTEM	(+35)
Add command module reaction control propellant disposal system. This system is designed to dispose of the Command Module propellant prior to impact to eliminate potential explosion and/or fire.	+35

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POTENTIAL WEIGHT AND CENTER OF GRAVITY CHANGES

COMMAND MODULE

ELECTRICAL POWER SYSTEM	(+27)
Increase power distribution and common utility due to a complete re-estimate of electrical equipment supports and addition of motor switches and distribution boxes increases.	+27
ENVIRONMENTAL CONTROL SYSTEM	(0)
Delete cabin vent valves.	-2
Delete regenerative heat exchanges.	-7
Increase AiResearch components per status reflecting 78g all directions requirement.	+9
EARTH LANDING SYSTEM	(-108)
Decrease parachute weight consistent with incorporation of solid conical parachutes.	-105
Decrease parachute supports and attach structure due to reduced loads imposed by the proposed solid conical parachutes.	-3
LEM INTEGRATION	(+163)
Modify structure to incorporate mating and docking capabilities and to strengthen hatch for mating impact loads.	+113
Add inflight test wiring for LEM checkout.	+25
Add rendezvous beacon radar installation as an aid during the rendezvous phase.	+25
TOTAL POTENTIAL WEIGHT CHANGES COMMAND MODULE	+351

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POTENTIAL WEIGHT AND CENTER OF GRAVITY CHANGES

SERVICE MODULE

STRUCTURE		(+15)
Add provisions for nitrogen purging of the Service Module to prevent accidental explosion on the pad.		+15
REACTION CONTROL SYSTEM		(+35)
Increase system for incorporation of provisions for RCS propellant quantity indication.		+35
ELECTRICAL POWER		(+16)
Revise the Supercritical Gas Storage System, based on co-ordination with the subcontractor (Beech Aircraft), to include the following changes:		-40
Reduction of insulation preloading from 2 to 1/2 psi, H_2 tank.	-7	
Aluminum outer shell for H_2 tank in lieu of titanium.	-5	
Aluminum skirt for H_2 tank in lieu of titanium.	-3	
Pulsating heaters in lieu of electrofilm heaters - cryogenic system.	-14	
Signal conditioners - new source - cryogenic system.	-8	
Magnetic latching fuel cell valves.	-2	
Deletion of cryogenic tank shut-off solenoid valve.	-6	
Increased wall thickness tolerance - manufacturing considerations - cryogenic pressure vessels.	+5	
Change space radiator material from 6061 aluminum to 7178 aluminum.		-11
Revise estimate of power distribution and utility electrical system.		+67
Wiring increase	+27	
Motor switches, electrical boxes and conduits, etc.	+40	

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POTENTIAL WEIGHT AND CENTER OF GRAVITY CHANGES

SERVICE MODULE

ENVIRONMENTAL CONTROL SYSTEM	(-41)
Delete electrical provisions consistent with present design.	-23
Change space radiators material from 6061 aluminum to 7178 aluminum.	-19
MAIN PROPULSION	(-12)
Redesign main propellant internal tank supports for a reduced gauge.	-12
TOTAL POTENTIAL WEIGHT CHANGES - SERVICE MODULE	+13

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

SUMMARY

ITEM		CURRENT WEIGHT 6-1-63
WEIGHT EMPTY		7580
Structure	4347	
Crew Systems	327	
Communication & Instrumentation	712	
Guidance & Navigation	467	
Stabilization & Control	209	
Reaction Control	290	
Electrical Power	391	
Environmental Control	269	
Earth Landing	568	
USEFUL LOAD		1590
Crew Systems	917	
Reaction Control	259	
Environmental Control	164	
Scientific Payload	250	
GROSS WEIGHT		9170

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DETAIL WEIGHT STATEMENT
COMMAND MODULE
STRUCTURE

ITEM		CURRENT WEIGHT 6-1-63
STRUCTURE		
Basic Body Structure		(950)
Forward Section		161
Honeycomb Panels	45	
Frames, Rings and Hatches	46	
Fittings and Attachments	70	
Center Section		596
Honeycomb Panels	204	
Longerons, Frames and Rings	217	
Window and Hatches	107	
Fittings and Attachments	68	
Aft Section		193
Honeycomb Panel	116	
Ring	77	
Secondary Structure		(541)
RH Equipment Bay and Coldplates		80
LH Equipment Bay		60
Fwd. LH Equipment Bay		15
Fwd. RH Equipment Bay and Coldplates		25
Main Display Panel and Coldplates		72
Lower Equipment Bay and Coldplates		195
Aft Equipment Bay		44
Crew Area		25
Heat Shield Equipment Area		25
Heat Shield Substructure		(1366)
Forward Section		208
Honeycomb Panels	113	
Frames and Rings	27	
Fittings and Mechanism	52	
Strake	16	
Center Section		674
Honeycomb Panels	234	
Frames and Rings	101	
Doors and Covers	198	
Fittings, Mechanism and Attachments	104	
Strake	37	
Aft Section		484
Honeycomb Panels	357	
Frames and Rings	34	
Fittings and Attachments	53	
Toroidal Assembly	40	
Ablation Material		(1277)
Forward Section		139
Center Section		540
Aft Section		598
Insulation		(189)
Separation Provisions and Attachments		(24)
TOTAL STRUCTURE		4347

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

CREW SYSTEMS

ITEM	CURRENT WEIGHT 6-1-63
CREW SYSTEMS	
Crew Couch Support and Restraint System	30.0
Waste Management	15.0
Lighting Equipment	10.3
Egress Accessories - Hatch	3.0
Case Assembly - Map and Manual	2.0
Structural Seats & Supports	258.0
Nuclear Radiation Detectors	7.0
Shelf Assy - Work/Food Preparation	1.7
TOTAL CREW SYSTEMS	327.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

COMMUNICATIONS & INSTRUMENTATION

ITEM	CURRENT WEIGHT 6-1-63
TELECOMMUNICATION	
Lower Bay	(249.5)
C-Band Transponder	20.3
Unified S-Band	25.0
S-Band Power Amplifier	20.5
VHF FM Transmitter/HF Transceiver	15.9
VHF AM Trans. -Rec./VHF Rec. Bea.	16.0
Multiplexer	12.0
Spares	19.0
PCM Telemetry Unit No. 1	22.5
PCM Telemetry Unit No. 2	17.5
Signal Conditioner	32.8
Recorder	22.0
Audio Center	8.0
Premodulation Processor	10.0
Central Timing Equipment	8.0
Remote Equipment	(100.3)
VHF/2-KMC OMNI Antenna & Transmission	7.0
HF Recovery Antenna & Transmission	15.0
C-Band Antenna & Transmission	14.0
VHF Recovery Antenna & Transmission	14.5
TV Camera	4.0
Instrumentation Sensors	35.0
Loudspeaker	2.8
Antenna Selector	8.0
Electrical Provisions	(96.0)
TOTAL TELECOMMUNICATIONS (to be brought forward)	445.8

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DETAIL WEIGHT STATEMENT
COMMAND MODULE
COMMUNICATION AND INSTRUMENTATION

ITEM	CURRENT WEIGHT 6-1-63
CONTROLS AND DISPLAYS	
Main Display Panel Control Station	(65.2)
Computer Data Insert & Display	15.0
Event Timer	.8
Mode Select	6.9
Delta Velocity	2.5
Flight Director Attitude Indicator	10.5
Gimbal Angle Indicator	6.0
Entry Monitoring Indicator	8.0
Launch Vehicle Emergency Detection System	6.0
Engine Gimbal Control	.7
Command Module Sequencer Control	.5
ELS Sequencer Control & Barometric Indicator	4.2
Launch Escape Control	.6
Crew Safety System	.9
Abort Light	.1
Caution Indicators	2.5
Main Display Panel Center Station	(27.9)
Audio Panel	2.1
Abort Light	.1
CO_2 Warning Lights	.3
Reaction Control	6.7
Service Propulsion	8.6
Central Timing	.2
GMT Clock	.8
Thermal Profile	.5
ECS Liquid Control	2.8
ECS Gas Control	5.8
Main Display Panel System Management Station	(41.6)
Communications Control Panel	8.1
Antenna Control	3.0
Abort Light	.1
Caution Indicators	2.5
Power Distribution	11.0
Fuel Cells	8.6
Cryogenics	6.5
Event Timer	.8
Miscellaneous Telecommunication	1.0
Main Display Panel RH Console	(6.8)
Motor Control Switches	3.6
Audio Panel	2.1
Lighting Control	1.1
Main Display Panel LH Console	(4.9)
Sequencer Arming & Post Landing Control	.9
SCS Power Control	.8
Lighting Control	1.1
Audio Panel	2.1
Electrical Provisions	(29.0)
Lower Equipment Bay	(1.6)
Clock	.8
Event Timer	.8
TOTAL CONTROLS AND DISPLAYS (to be brought forward)	177.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

COMMUNICATION AND INSTRUMENTATION

ITEM	CURRENT WEIGHT 6-1-63
IN-FLIGHT TEST (RIGHT BAY FORWARD)	(89.2)
Comparator & Power Supply	34.5
Lamps	4.0
Switches	1.4
Meter	1.0
Chassis	8.3
In-Flight Test - GSE Electrical Provisions	40.0
TOTAL IN-FLIGHT TEST & CREW AREA CONTROLS	89.2
TOTAL CONTROLS AND DISPLAYS	177.0
TOTAL TELECOMMUNICATION	445.8
TOTAL COMMUNICATIONS AND INSTRUMENTATION	712.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

GUIDANCE & NAVIGATION

ITEM	CURRENT WEIGHT 6-1-63
GUIDANCE & NAVIGATION	
Lower Equipment Bay	
Inertial Platform	58.5
Sextant	12.0
Telescope - Scanning	9.0
Map & Visual Display	8.5
Display & Control - Navigation	23.2
Display & Control - Computer	15.0
Navigation Base	24.0
Computer	97.0
Power Servo Assy	54.7
Coupling Display Unit	16.5
Junction Box	12.2
Cabling - MIT	25.0
Cabling - NAA	16.4
Spares	52.0
Optical Base	19.0
Eye Pieces	5.0
Bellows and Adapter	8.0
Loose Stored Items	11.0
TOTAL GUIDANCE AND NAVIGATION	467.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

STABILIZATION AND CONTROL

ITEM	CURRENT WEIGHT 6-1-63
STABILIZATION AND CONTROL	
Lower Equipment Bay	(178.0)
Rate Gyro Package	6.5
Body Mounted Gyro Package	10.5
Electronic Control Package - Pitch	28.4
Electronic Control Package - Roll	29.1
Electronic Control Package - Yaw	28.4
Electronic Control Package - Auxiliary	30.5
Display/BMAG ECA Package	29.8
Spare Gyro - BMAG (2)	2.0
Spare Gyro - Rate	0.8
Spare Plug-in Module	12.0
Crew Area Controls	(15.0)
Manual Controls - 3 Axis	7.0
Manual Controls - Translation & Thrust	8.0
Electrical Provisions	(15.0)
TOTAL STABILIZATION AND CONTROL	209.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

REACTION CONTROL SYSTEM

ITEM		CURRENT WEIGHT 6-1-63
REACTION CONTROL SYSTEM		
Propellant Systems		(73.8)
Oxidizer System	(36.8)	
Tanks & Expulsion Devices	14.6	
Plumbing, Fittings & Insulation	11.4	
Valves & Regulators	10.3	
Sensors	.5	
Fuel System	(37.0)	
Tanks & Expulsion Devices	14.8	
Plumbing, Fittings & Insulation	11.4	
Valves & Regulators	10.3	
Sensors	.5	
Pressure System		(55.2)
Tanks (4500 psi)		9.5
Plumbing, Fittings & Insulation		4.8
Valves & Regulators		38.4
Sensors		2.5
Engine System		(138.0)
Engines		96.0
Nozzle Extension		42.0
Electrical Provisions		(23.0)
TOTAL REACTION CONTROL SYSTEM		290.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

ELECTRICAL POWER

ITEM	CURRENT WEIGHT 6-1-63
ELECTRICAL POWER	
Energy Source	(64.0)
Battery - Main (2)	36.0
Battery - Recovery (1)	18.0
Battery - Pyrotechnic - Installation	10.0
Power Conversion	(110.0)
Inverter (3) & Control	105.0
Battery Charger & Controls	5.0
Power Distribution & Control	(150.0)
Power Distribution Equipment	
Circuit Breakers	6.0
Battery Controls	5.0
No. 1 and No. 2 AC Bus Control	15.0
DC Busses (Diodes, etc.)	10.0
AC Busses	5.0
Utility System Controls	15.0
Mounting Hardware	2.0
Sequencer	20.0
Right Hand Circuit Breaker Panel	13.0
Terminal Panels	5.0
Power Distribution Wiring & Provisions	40.0
Lighting Wiring & Provisions	5.0
Ground Power Provisions	6.0
Power Control Panel Connectors	3.0
Electrical - Common Utility	(67.0)
Utility Wiring and Circuit Components	20.0
Left Hand Circuit Breaker Panel	7.0
Umbilicals	23.5
Adapter Separation System	5.0
Launch Escape System Separation	3.5
Service Module Electrical Initiation	3.0
Installation Provisions	5.0
TOTAL ELECTRICAL POWER	391.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

ENVIRONMENTAL CONTROL SYSTEM

ITEM	CURRENT WEIGHT 6-1-63
ENVIRONMENTAL CONTROL SYSTEM	
Pressure Suit Circuit	(82.7)
Subcontractor Components	68.6
Ducting, Conn., Clamps, etc.	12.1
CO_2 Sensor	2.0
Water-Glycol Circuit	(49.6)
Subcontractor Components	27.6
Water-Glycol	18.4
Plumbing, etc.	3.6
Pressure & Temp. Control	(20.5)
Subcontractor Components	19.7
Ducting	0.8
Oxygen Supply System	(18.6)
Subcontractor Components	15.6
Plumbing	3.0
Water Supply System	(31.4)
Subcontractor Components	26.6
Plumbing	4.8
Subcontractor Common Items	(31.6)
Brackets, Plumbing, Elect. Wiring	11.8
Instrumentation	15.7
Radio Noise Filter Spec. Allowance	4.1
Supports	(10.0)
Electrical Provisions	(21.0)
Manual Controls - Push Pull	(3.6)
TOTAL ENVIRONMENTAL CONTROL SYSTEM	269.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

EARTH LANDING SYSTEM

ITEM	CURRENT WEIGHT 6-1-63
EARTH LANDING SYSTEM	
Parachute System	(537.9)
Drogue Chute System	35.5
Drogue Disconnect Inst.	9.4
Main Cluster	419.0
Disconnect Main Cluster	9.7
Pilot Chute System	29.3
Sequence Control	10.5
Attach Provisions	24.5
Location Aids	(9.3)
Forward Heat Shield Release System	(15.8)
Electrical Pyrotechnic Initiation Provisions	(5.0)
TOTAL EARTH LANDING SYSTEM	568.0

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DETAIL WEIGHT STATEMENT

COMMAND MODULE

USEFUL LOAD

ITEM			CURRENT WEIGHT 6-1-63
CREW SYSTEMS			(917.0)
Crew (3) (50, 70, 90 Percentile)			528.0
Pressure Garment Assy (3)(NASA)			90.0
Food			75.0
Food Containers			15.0
Personal Hygiene Equipment			15.5
Biomedical Instrumentation (NASA)			2.0
Medical Equipment			15.3
Waste Management			6.9
Personal Radiation Dosimeter (NASA)			5.0
Shoe Straps			2.0
Garments - Constant Wear (NASA)			9.0
Hose Assembly-Umbilical			17.9
Hose Assembly-Recharging Backpack			2.8
Belt Assy Inflight Maintenance, Crewman			1.0
Map & Maintenance Manual			4.0
Log Book Assy.			1.0
Lap Board Assy.			2.0
Tool Set Inflight Maintenance			1.0
Portable Life Support System (NASA)			60.0
Personal Communications			3.0
Mouthpiece - Food, Personal			2.0
Delivery Assy. - Water, Personal			1.5
Provision Assy. - Crewman Survival (Collective)			56.1
Light Assembly - Portable			1.0
REACTION CONTROL			(259.0)
RCS Propellant			258.0
Usable		215.0	
Residual		43.0	
Trapped-System	30.6		
Mixture Ratio	2.4		
Expulsion Efficiency	7.6		
Loading Tolerance	2.4		
RCS Helium			1.0
ENVIRONMENTAL CONTROL			(164.0)
Lithium Hydroxide			112.0
Activated Charcoal			4.0
Containers for LiOH & Charcoal			13.0
Oxygen - Re-Entry			2.0
Water-Launch & Re-Entry Cooling			10.0
Freon			10.0
Water-Earth Orbit Cooling			4.0
Water - Drinking			4.0
Water - Mission Cooling			5.0
SCIENTIFIC PAYLOAD			(250.0)
TOTAL COMMAND MODULE USEFUL LOAD			1590.0

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

SUMMARY

ITEM		CURRENT WEIGHT 6-1-63
WEIGHT EMPTY		7406
Structure	2310	
Electronics	151	
Reaction Control	590	
Electrical Power	1244	
Environmental Control	128	
Propulsion	2983	
USEFUL LOAD		2214
Reaction Control	838	
Electrical Power	487	
Environmental Control	208	
Propulsion	681	
BURNOUT WEIGHT		9620
MAIN PROPELLANT		36940
GROSS WEIGHT		46560

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

STRUCTURE

ITEM	CURRENT WEIGHT 6-1-63
STRUCTURE	
Basic Body Structure	(1657)
Honeycomb Panels - Shell	787
Radial Beams	393
Internal Structure and Engine Compartment Closeout	45
Forward Bulkhead	155
Aft Bulkhead	277
Secondary Structure	(234)
Tank Support Shelf	33
Engine Support	41
Antenna Support	30
Heat Shields	130
Insulation	(253)
Separation Provisions and Attach	(20)
Fairing	(146)
TOTAL STRUCTURE	2310

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

ELECTRONIC SUBSYSTEM

ITEM	CURRENT WEIGHT 6-1-63
ELECTRONICS SUBSYSTEM	
Communications	(72)
Antenna Dish	10
Antenna Gimbals	13
Antenna Deployment Booms	5
Antenna Coax Cabling	16
Antenna Coax Supports	3
Antenna Control Electrical Provisions	5
Antenna Locking Provisions	20
Instrumentation	(49)
Sensors	30
Electrical Provisions	14
Supports	5
Inflight Test Provisions	(30)
In-Flight Test & GSE Electrical Provisions	30
TOTAL ELECTRONICS SUBSYSTEMS	151

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

REACTION CONTROL

ITEM		CURRENT WEIGHT 6-1-63
REACTION CONTROL SYSTEM		
Propellant Systems		(149.0)
Oxidizer System	(74.3)	
Tanks & Expulsion Devices	28.8	
Plumbing, Fittings & Insulation	8.5	
Valves & Regulators	16.0	
Sensors	3.0	
Supports	18.0	
Fuel System	(74.7)	
Tanks & Expulsion Devices	29.2	
Plumbing, Fittings & Insulation	8.5	
Valves & Regulators	16.0	
Sensors	3.0	
Supports	18.0	
Pressure System		(128.0)
Tanks (4500 psi)		19.0
Plumbing, Fittings & Insulation		6.0
Valves & Regulators		76.0
Sensors		7.0
Supports		20.0
Engine System		(175.0)
Engines		65.0
Reflectors & Insulation		110.0
Structural Provisions		(80.0)
Electrical Provisions		(58.0)
TOTAL REACTION CONTROL SYSTEM		590.0

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

ELECTRICAL POWER

ITEM	CURRENT WEIGHT 6-1-63
ELECTRICAL POWER	
Fuel Cell Power System	(1148.8)
Fuel Cell Power Pack (Incl. Mount & Instrumentation)	731.2
Intermodular - Radiator Plumbing	16.0
Fuel Cell Module Mount Attach.	2.0
Fuel Cell H_2 System	
Subcontractor Components	142.7
Plumbing and Valves	3.0
Fuel Cell and RCS O_2 System	
Subcontractor Components	171.3
Plumbing and Valves and Supports	22.0
Water Glycol - Fuel Cell Heat Transfer System	7.0
Elect. Wiring - Supercritical Gas	13.0
Space Radiator (Outer Skin)	38.2
Fuel Cell Module Stabilization Webs	2.4
Power Distribution	(51.3)
Relays & Diodes	10.0
Power Switch	5.4
Motor Switch	1.5
Umbilicals	14.4
Wiring & Busses	15.0
Supports	5.0
Electrical Utilities	(43.9)
Command - Service Separation System	5.0
Adapter Separation System	7.0
Electrical Initiation of Pyrotechnics	12.0
Supports	2.0
Sequencer	8.0
Command - Service Mating Disconnects	9.9
TOTAL ELECTRICAL POWER	1244.0

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

ENVIRONMENTAL CONTROL SYSTEM

ITEM	CURRENT WEIGHT 6-1-63
ENVIRONMENTAL CONTROL SYSTEM	
Water-Glycol Circuit	(94.9)
Subcontractor Components	6.9
Plumbing and Hardware	12.8
Water - Glycol	10.0
Supports	4.7
Space Radiator (Outer Skin)	60.5
Water Supply System	(7.2)
Subcontractor Components	.2
Plumbing and Hardware	6.0
Supports	1.0
Oxygen Supply System	(3.0)
Plumbing and Supports	3.0
Electrical Provision	(22.9)
TOTAL ENVIRONMENTAL CONTROL SYSTEM	128.0

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

MAIN PROPULSION

ITEM		CURRENT WEIGHT 6-1-63
MAIN PROPULSION		
Propellant Systems		(1376.0)
Oxidizer System		765.3
Tanks & Doors	551.0	
Skirts	59.8	
Plumbing, Fittings & Insulation	53.0	
Valves	4.5	
Quantity Indication	35.0	
Mixture Ratio Control	12.0	
Supports - Plumbing & Equipment	50.0	
Fuel System		610.7
Tanks & Doors	458.0	
Skirts	33.2	
Plumbing, Fittings & Insulation	42.0	
Valves	4.5	
Quantity Indication	35.0	
Supports - Plumbing & Equipment	38.0	
Pressure System		(915.0)
Tanks (4400 psi)		774.0
Tank Supports		30.0
Plumbing, Fittings & Insulation		24.0
Valves, Regulators & Heat Exchanger		49.0
Supports - Plumbing & Equipment		38.0
Engine System		(666.0)
Engine		666.0
Electrical Provisions		(26.0)
TOTAL MAIN PROPULSION SYSTEM		2983.0

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DETAIL WEIGHT STATEMENT

SERVICE MODULE

USEFUL LOAD

ITEM			CURRENT WEIGHT 6-1-63
REACTION CONTROL			(838.0)
RCS Propellant			835.0
Usable		790.0	
Residual		45.0	
Trapped System	4.0		
Mixture Ratio	9.0		
Expulsion Efficiency	24.0		
Loading Tolerance	8.0		
RCS Helium			3.0
ELECTRICAL POWER (Normal Mission)			(487.0)
Hydrogen - Supercritical Gas			56.5
Usable (Electrochemical Incl. Tolerance)		44.0	
Unusable (Residual & Instrument Error)		3.2	
Emergency Provisions		4.7	
Expended (Leakage & Purge)		4.6	
Oxygen - Supercritical Gas			430.5
Usable (Electrochemical Incl. Tolerance)		363.0	
Unusable (Residual & Instrument Error)		17.5	
Emergency Provisions		44.0	
Expended (Leakage & Purge)		6.0	
ENVIRONMENTAL CONTROL (Normal Mission)			(208.0)
Oxygen - Supercritical Gas			208.0
Usable (Metabolic)		76.5	
Unusable (Residual & Instrument Error)		9.1	
Emergency Provisions		25.3	
Expended (Leakage, LEM, PLS, Repress.)		97.1	
PROPULSION			(681.0)
Main Propulsion Helium			99.0
Main Propellant Residuals			582.0
Trapped - System		225.0	
Trapped - Engine		67.0	
Mixture Ratio Tolerance		100.0	
Loading Tolerance		190.0	
Total Useful Load (Less Main Propellant)			2214.0

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DETAIL WEIGHT STATEMENT

LAUNCH ESCAPE SYSTEM

SUMMARY

ITEM	CURRENT WEIGHT 6-1-63
LAUNCH ESCAPE SYSTEM	
Structure	(866)
Tower Assy	269
Escape Motor Skirt	229
Pitch Motor Structure	157
Nose Cone and Ballast Support	111
Attaching Parts	29
Tower Insulation	45
Skirt Insulation	26
Ballast	(130)
Propulsion	(5353)
Escape Motor	4764
Jettison Motor	440
Jettison Motor Skirt	94
Pitch Control Motor	55
Electrical Power	(41)
TOTAL LAUNCH ESCAPE SYSTEM	6390

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DETAIL WEIGHT STATEMENT

ADAPTER

SUMMARY

ITEM	CURRENT WEIGHT 6-1-63
ADAPTER	
Structure	(2892)
Panels	1914
Frames	422
Thermal Insulation	556
Electrical Power	(76)
Separation System	(142)
TOTAL ADAPTER	3110

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