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BI-MONTHLY WEIGHT AND BALANCE STATUS REPORT FOR CSM 011

CONTRACT NAS 9-150

(U)

1 JUNE 1965

Exhibit I, Paragraph 8.10

Prepared by

Weight and Electrical Power Control

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FORM M158 VELLUM REV. 2-61

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TECHNICAL REPORT INDEX/ABSTRACT

[redacted]

ACCESSION NUMBER							DOCUMENT SECURITY CLASSIFICATION Confidential	

TITLE OF DOCUMENT

Bi-Monthly Weight and Balance Status Report for CSM 011

LIBRARY USE ONLY

AUTHOR(S)

D. D. Morgan

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ABSTRACT

The Weight and Balance Status Report for CSM 011 presents summary mass property data for each module in addition to the usable SPS propellant required for the nominal 325 second total burn time. Mass property data also includes the total vehicle from launch to CSM at SPS burnout, the LEV abort phase to CM at impact and the normal CM entry mission. The CM is ballasted to meet the required lift to drag ratio of 0.34 at entry. The LES is ballasted to 8200 pounds resulting in a center of gravity for the LEV at LEV burnout of X_a 1122.0.

[redacted]

FORM 131-V REV. 6-64

INTRODUCTION

The June report incorporates changes to the CSM 011 subsequent to the April report (SID 65-336). The change descriptions are included in the current weight status section.

The Command Module status includes 183 pounds of aft heat shield ballast to maintain the Y center of gravity requirements and the lift to drag ratio of 0.34 at entry. The Command Module has exceeded the design weight by 200 pounds at the expense of maintaining the center of gravity requirements.

The ballast in the Launch Escape System has been increased by eight pounds in order to maintain the control weight of 8200 pounds. This change and the increase in the Command Module weight result in a LEV burnout center of gravity along the X axis of 1122.0.

The Service Module weight status is currently 104 pounds under the design weight of 10,200 pounds. The fluid residuals, which are a part of the burned out SM weight of 10,096 pounds, include 0.5% loading tolerance as well as the start and restart losses. The total usable SPS propellant of 22,500 pounds is the desired amount as referenced in the Apollo Trajectory Document No. 65-FMP-1, Apollo Mission 202, Joint Reference Trajectory dated 12 April 1965, and is consistent with the nominal specific impulse as noted in SID 64-1237, Apollo Vehicle Model Specification-Basic, Block I.

The Mass Properties data reflected herein are based on the status as of 21 May 1965.

A list of potential changes for each module is as follows:

	Weight (Lbs.)	Estimated Effective Date
COMMAND MODULE	(+290)	
Redesign the air vent-heat sink requirements.	+4	10-1-65
Incorporate a cabin water separation to prevent water accumulation.	+5	10-1-65
Incorporate an RCS rapid fuel dump system.	+15	8-1-65
Add real time radio command relays to provide additional capability for MSFN to command certain spacecraft functions.	+14	8-1-65

	Weight (Lbs.)	Estimated Effective Date
COMMAND MODULE (Cont.)		
Incorporate an additional VHF transmitter required for flight qualification data.	+7	10-1-65
Add wiring provisions such as string, clamps, varnish, etc. based on actual weighing of harness installations.	+75	8-1-65
Incorporate additional aft heat shield ballast pending release of revised aerodynamic data.	+170	8-1-65
SERVICE MODULE	(+32)	
Add edge isolating materials for ECS radiators.	+7	8-1-65
Increase wiring and connectors based on revised wiring lengths and increased wiring provisions such as string, clamps, varnish, etc.	+25	8-1-65

CSM 011

MODULE MASS PROPERTIES SUMMARY

ITEM	CONTROL WEIGHT	WEIGHT	CENTER OF GRAVITY*			MOMENT OF INERTIA**			PRODUCT OF INERTIA**		
			X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
LAUNCH ESCAPE SYSTEM	8200	8200	1299.5	-0.1	-0.2	575.0	21351.9	21351.3	27.4	112.8	0.0
COMMAND MODULE	11000	11200	1041.5	0.3	4.7	5461.2	4802.6	4355.6	-37.2	-282.8	16.6
SERVICE MODULE***	10200	10096	908.7	1.6	-0.7	6138.6	10421.2	10218.0	208.1	-449.5	-587.1
ADAPTER	3900	3505	645.9	0.3	-1.6	8426.9	11844.1	11601.7	27.9	-42.1	-15.0

*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.

**Moments and products of inertia units are slug feet squared about the center of gravity.

***Includes unusable SPS residuals but excludes the usable SPS propellant.

[redacted]

CSM 011 MISSION

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY*			MOMENT OF INERTIA**			PRODUCT OF INERTIA**		
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE	11200	1041.5	0.3	4.7	5461.2	4802.6	4355.6	-37.2	-282.8	16.6
SERVICE MODULE***	10096	908.7	1.6	-0.7	6138.6	10421.2	10218.0	208.1	-449.5	-587.1
SLA ATTACHMENT RING	75	837.1	0.0	-1.8	93.3	47.6	45.7	0.0	0.0	0.0
TOTAL-LESS PROPELLANT***	21371	978.0	0.9	2.1	11729.1	35839.3	35155.7	-24.9	98.6	-578.5
PROPELLANT - SPS USABLE	22500	912.8	27.3	-11.5	7490.8	12023.4	13126.7	-28.9	-24.9	3676.4
TOTAL - WITH PROPELLANT	43871	944.6	14.4	-4.9	21306.6	58372.6	60000.9	-4126.7	2176.9	2247.3
ADAPTER-LESS ATTACHMENT RING	3430	641.7	0.4	-1.6	8333.6	11191.8	10951.3	29.0	-41.5	-15.0
TOTAL INJECTED	47301	922.6	13.4	-4.6	29783.3	132564.5	134080.0	-1176.5	1456.9	2200.8
LAUNCH ESCAPE SYSTEM	8200	1299.5	-0.1	-0.2	575.0	21351.9	21351.3	27.4	112.8	0.0
TOTAL AT LAUNCH	55501	978.3	11.4	-4.0	30663.9	368199.2	369960.2	-8839.3	4085.7	2110.5

*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.

**Moments and products of inertia units are slug feet squared about the center of gravity.

***Includes unusable SPS residuals but excludes the usable SPS propellant.

[redacted]

CSM 011

CM ENTRY MISSION

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENT OF INERTIA**			PRODUCT OF INERTIA**		
		X	Y	Z	I_{xx}	I_{yy}	I_{zz}	I_{xy}	I_{xz}	I_{yz}
COMMAND MODULE	11200	1041.5	0.3	4.7	5461.2	4802.6	4355.6	-37.2	-282.8	16.6
LESS: PROPELLANT	-135	1022.6	-5.6	57.0						
ABLATOR BURNOFF***	-123	1008.9	0.0	10.1						
FORWARD HEAT SHIELD	-395	1100.5	-0.4	1.3						
DROGUE CHUTES	-58	1089.1	0.0	-21.1						
COMMAND MODULE - PRIOR TO MAIN CHUTE DEPLOYMENT	10489	1039.6	0.4	4.2	5181.0	4238.1	3854.6	0.6	64.1	2.5
LESS: MAIN CHUTES (3)	-409	1090.5	-0.8	6.4						
PROPELLANT	-135	1022.6	-5.6	57.0						
COMMAND MODULE - IMPACT	9945	1037.8	0.5	3.4	5017.9	3887.5	3545.2	3.6	77.3	5.8

*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.

**Moments and products of inertia units are slug feet squared about the center of gravity. Mass inertia data are shown for accumulative totals only.

***Ablator burnoff based on entry condition for CM 011 only.

CSM 011

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT CSM 011 STATUS		
				%EST	%CALC	%ACT
LAUNCH ESCAPE SYSTEM	8200	0	8200	3	18	79
COMMAND MODULE	11000	+200	11200	4	64	32
SERVICE MODULE	9840	+256	10096	3	46	51
ADAPTER	3480	+25	3505	6	64	30
TOTAL LAUNCH WEIGHT*	32520	+481	33001	4	47	49

*Less SPS usable propellant.

CSM 011

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT CSM 011 STATUS		
				%EST	%CALC	%ACT
LAUNCH ESCAPE SYSTEM	8200	0	8200	3	18	79
COMMAND MODULE	11000	+200	11200	4	64	32
SERVICE MODULE	9840	+256	10096	3	46	51
ADAPTER	3480	+25	3505	6	64	30
TOTAL LAUNCH WEIGHT*	32520	+481	33001	4	47	49

*Less SPS usable propellant.

LAUNCH ESCAPE SYSTEM 011

WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT LES 011 STATUS		
				%EST	%CALC	%ACT
Structure-Includes Q-Ball	1537.4	-4.4	1533.0		25	75
Ballast-Installation Provisions	29.0		29.0		100	
Electrical	52.5	+20.2	72.7		100	
Propulsion System	5368.6	-22.8	5345.8			100
Separation Provisions	16.2	-1.0	15.2		100	
C/M Boost Protective Cover	580.0		580.0	40	60	
LES-NO BALLAST	7583.7	-8.0	7575.7	3	11	86
BALLAST	616.3	+8.0	624.3		100	
TOTAL LAUNCH ESCAPE SYSTEM	8200.0	0.0	8200.0	3	18	79

COMMAND MODULE 011

WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGE TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT CM 011 STATUS		
				%EST	%CALC	%ACT
Structure	5388.1	+51.0	5439.1		65	35
Stabilization & Control	190.0		190.0			100
Guidance & Navigation	430.0	-13.0	417.0	33	32	35
Environmental Control	401.0	+17.0	418.0	4	35	61
Earth Recovery	593.8	-4.0	589.8		10	90
Instrumentation	274.7		274.7	18	71	11
Electrical Power	1347.8	+209.0	1556.8	10	90	
Reaction Control	306.0	+3.0	309.0		57	43
Communication	346.3	+21.0	367.3	9	75	16
Displays & Control	204.7		204.7		100	
Useful Load - Reaction Control	270.0		270.0		100	
Useful Load - ECS	16.7	+2.0	18.7		100	
Items for AFRM 011	52.0		52.0		100	
Platform	910.0		910.0	9	63	28
Simulated Systems - Ballast	53.8	-53.8	-			
Ballast Aft Heat Shield	215.1	-32.2	182.9		100	
TOTAL COMMAND MODULE	11000.0	+200.0	11200.0	4	64	32

SERVICE MODULE 011

WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT SM 011 STATUS		
				%EST	%CALC	%ACT
Structure	2633.0	+14.0	2647.0	5	41	54
Environmental Control	70.4	0.0	70.4	10	80	10
Instrumentation	214.4	+2.0	216.4	15	75	10
Electrical Power	1554.9	+80.0	1634.9	5	29	66
Service Propulsion	2907.5	+147.0	3054.5		16	84
Reaction Control	345.4	+13.0	358.4		62	38
Fluid Residuals*	717.2	0.0	717.2		100	
Usable Fluids	1397.2	0.0	1397.2		100	
TOTAL SERVICE MODULE	9840.0	+256.0	10096.0	3	46	51

*Fluid Residuals Total		((717.2))
Propulsion Residuals		(565.3)
Helium	(99.0)	
Propellant	(466.3)	
Trapped in System	178.9	
Trapped in Engine	68.6	
Mixture Ratio Tolerance	133.2	
Loading Tolerance - Oxidizer Only	37.2	
Restart Losses (4 Starts)	48.4	
RCS Residuals		(48.0)
Helium	(3.0)	
Propellant	(45.0)	
Trapped in System	4.0	
Mixture Ratio Tolerance	9.0	
Expulsion Efficiency	24.0	
Loading Tolerance	3.0	
EPS - ECS Residuals		(103.9)
Hydrogen - EPS	(7.9)	
Oxygen - EPS - ECS	(96.0)	

ADAPTER 011

WEIGHT STATUS

ITEM	PREVIOUS STATUS 4-1-65	CHANGES TO CURRENT	CURRENT STATUS 6-1-65	BASIS FOR CURRENT ADP 011 STATUS		
				%EST	%CALC	%ACT
Structure (Includes Stabilizing Members)	3117.0	+20.0	3137.0	5	62	33
Electrical	61.0	0.0	61.0	8	92	
Separation System	302.0	+5.0	307.0	9	81	
TOTAL ADAPTER	3480.0	+25.0	3505.0	6	64	30

[redacted]

CSM 011

LAUNCH ESCAPE VEHICLE

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY*			MOMENT OF INERTIA**			PRODUCT OF INERTIA**		
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE	11200	1041.5	0.3	4.7	5461.2	4802.6	4355.6	-37.2	-282.8	16.6
LAUNCH ESCAPE SYSTEM	8200	1299.5	-0.1	-0.2	575.0	21351.9	21351.3	27.4	112.8	0.0
TOTAL - ABORT INITIAL	19400	1150.6	0.1	2.6	6060.9	94194.5	93722.2	-115.3	-1461.8	18.6
LESS: MAIN AND PITCH MOTOR PROPELLANTS	-3192	1295.3	0.0	0.0	71.4	1279.6	1279.6	0.0	0.0	0.0
TOTAL LEV AT BURNOUT	16208	1122.0	0.2	3.1	5983.8	75630.9	75164.3	-99.6	-1148.0	18.3

*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.

**Moments and products of inertia units are slug feet squared about the center of gravity.

[redacted]

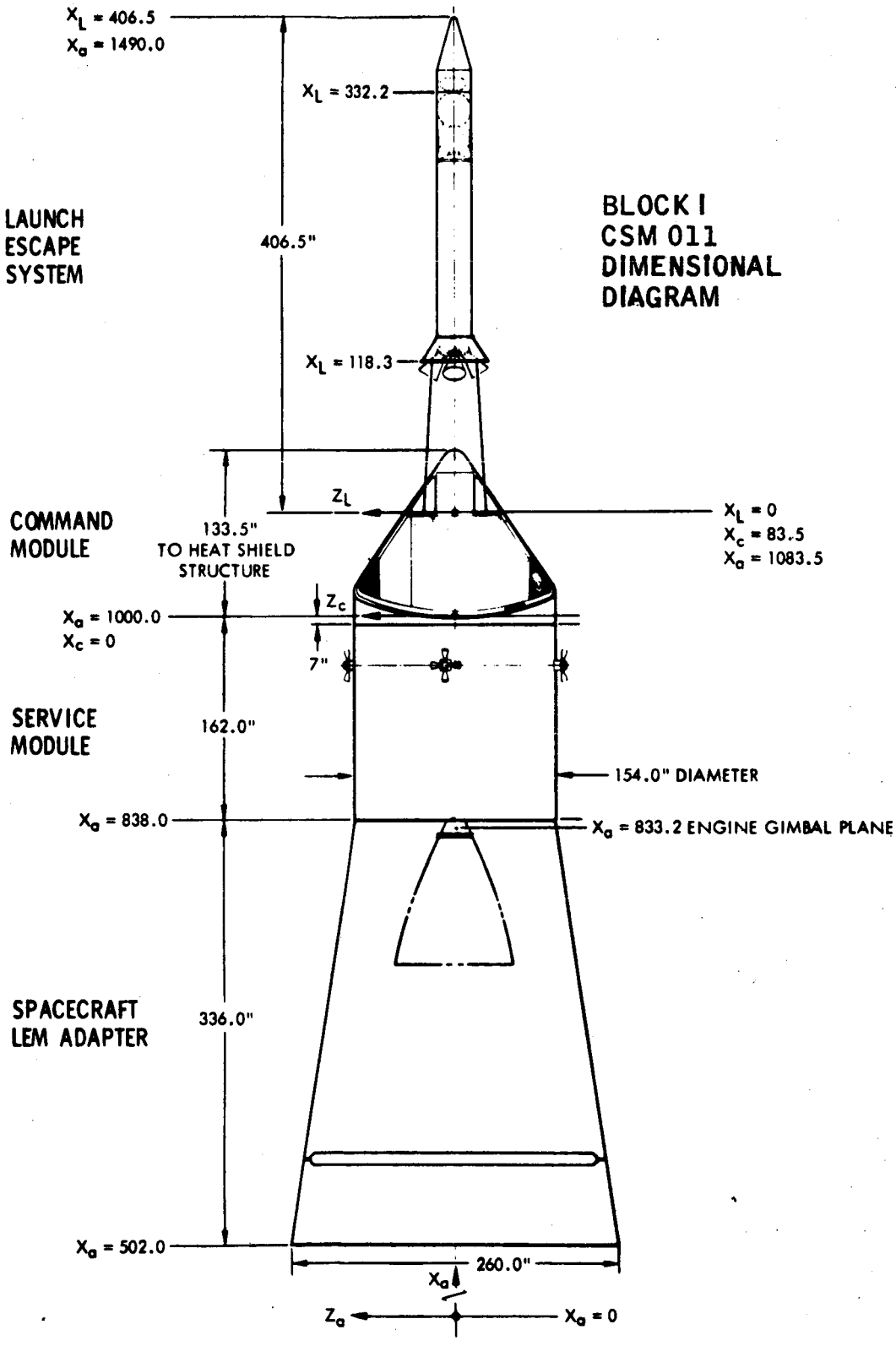
CSM 011

CM LOW ALTITUDE ABORT CONFIGURATION

VEHICLE MODE	WEIGHT	CENTER OF GRAVITY*			MOMENT OF INERTIA**			PRODUCT OF INERTIA**		
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE	11200	1041.5	0.3	4.7	5461.2	4802.6	4355.6	-37.2	-282.8	16.6
LESS: RCS OXIDIZER	-180	1022.6	14.5	62.6						
FORWARD HEAT SHIELD	-395	1100.5	-0.4	1.3						
DROGUE CHUTES	-58	1089.1	0.0	-21.1						
COMMAND MODULE - PRIOR TO MAIN CHUTE DEPLOYMENT	10567	1039.4	0.1	4.0	5238.7	4258.2	3937.3	-24.2	-211.2	-14.6
LESS: RCS FUEL	-90	1022.6	-45.8	45.8						
MAIN CHUTES (3)	-409	1090.5	-0.8	6.4						
COMMAND MODULE - IMPACT	10068	1037.4	0.5	3.5	5111.0	3956.9	3613.4	-33.2	-210.5	22.3

*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.

**Moments and products of inertia units are slug feet squared about the center of gravity. Mass inertia data are shown for accumulative totals only.


BLOCK I
CSM 011
DIMENSIONAL
DIAGRAM
LAUNCH
ESCAPE
SYSTEM
X_L = 406.5
X_a = 1490.0
X_L = 332.2
406.5"
X_L = 118.3
COMMAND
MODULE
133.5"
TO HEAT SHIELD
STRUCTURE
Z_L
X_L = 0
X_c = 83.5
X_a = 1083.5
Z_c
X_a = 1000.0
X_c = 0
7"
SERVICE
MODULE
162.0"
154.0" DIAMETER
X_a = 838.0
X_a = 833.2 ENGINE GIMBAL PLANE
SPACECRAFT
LEM ADAPTER
336.0"
X_a = 502.0
260.0"
X_a
Z_a
X_a = 0

LAUNCH ESCAPE SYSTEM

CURRENT WEIGHT CHANGES

Decrease bolt installation separation system, tower to CM based on calculated in lieu of estimated.	-1.0
Decrease LES body group installation based on revised drawings.	-0.3
Increase tower assembly based on revised drawings.	+1.0
Decrease tower structure based on incorporating revised structures drawings.	-1.8
Decrease skirt based on deletion of bracket no longer required.	-2.8
Decrease rocket motor based on receipt of vendor actual weight.	-22.8
Increase tower wiring based on calculated in lieu of estimated.	+7.7
Increase motor wire harness based on calculated in lieu of estimated.	+8.2
Decrease tower electrical installation based on calculated in lieu of estimated.	-4.5
Increase motor electrical installation based on calculated in lieu of estimated.	+8.5
Decrease ordnance installation canard thruster based on calculated in lieu of estimated.	-0.5
Increase ballast installation to maintain control weight.	+8.0
Add miscellaneous for electrical installation complete.	+0.3
TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES	0.0

COMMAND MODULE

CURRENT WEIGHT CHANGES

STRUCTURE	(+51.0)
Increase in inner structure forward section - nullification due to parachute wrap around loads.	+10.0
Increase on L.H. and R.H. equipment bay - loads imposed on system support platforms by Apollo checkout equipment.	+4.0
Increase in inner structure forward section - added bonded doublers to the forward cylinder based on current impact loads.	+17.0
Increase in uprighting system - calculation of layout drawings which incorporate rigid canisters with related latches.	+20.0
GUIDANCE & NAVIGATION	(-13.0)
Decrease in Guidance & Navigation equipment - MIT status	-13.0
ENVIRONMENTAL CONTROL	(+17.0)
Increase in post-landing ventilation system revised estimate of current system requirements.	+8.0
Decrease of Waste Management System - miscellaneous plumbing attachments.	-1.0
Increase the ECS plumbing due to addition of insulation to plumbing and added brackets.	+10.0
EARTH LANDING SYSTEM	(-4.0)
Increase forward heat shield release system - added umbilical tension separation cylinder required to inspect and attach instrumentation.	+5.0
Decrease the main parachute system main cluster and pilot chute system - Northrop Status.	-4.0
Decrease the main parachute system attach provisions.	-3.0
Decrease drogue disconnect installation - titanium in lieu of steel blades.	-2.0

COMMAND MODULE

CURRENT WEIGHT CHANGES

ELECTRICAL POWER SYSTEM	(+209.0)
Increase the wire installation provisions such as string, clamps and varnish.	+35.0
Increase the wire based on revised lengths.	+65.0
Increase wire based on pneumatic in lieu of hydraulic actuated propellant valves.	+1.0
Increase the wire necessary to service the platform.	+40.0
Revised estimate of Guidance and Navigation wiring.	+20.0
Rerouting of wire over calculated based on E.M.I. effects.	+50.0
Increase the master event sequencer - eliminate a potential single point failure hazard.	+1.0
Increase the RCS Controller due to utilizing relays in lieu of motor switches.	-3.0
REACTION CONTROL	(+3.0)
Add a vent line to each fuel and oxidizer tank - increase service life of tank.	+3.0
COMMUNICATIONS	(+21.0)
Increase the C-band and S-band transponder - Collins status.	+13.0
Increase the antenna coax and connectors based on calculated in lieu of estimated weights.	+7.0
Add supports to Res coax cable - calculated current drawings.	+4.0
Decrease the communications equipment - Collins status.	-3.0
ENVIRONMENTAL CONTROL SYSTEM - USEFUL LOAD	(+2.0)
Increase Lithium Hydroxide containers based on added by-pass requirements.	+1.0
Add oxygen for back-up of surge tank oxygen.	+1.0

COMMAND MODULE

CURRENT WEIGHT CHANGES

PREVIOUS BALLAST INSTALLATIONS	(-53.3)
Removed crew system thermal garment, food & packaging and medical equipment simulated ballast.	-53.8
Removed aft heat shield ballast.	-215.1
Replaced aft heat shield ballast at different center of gravities	+215.6
TOTAL COMMAND MODULE CURRENT WEIGHT CHANGES	232.7

SERVICE MODULE

CURRENT WEIGHT CHANGES

STRUCTURE	(+14.0)
Increase the aft bulkhead - increase in amount of thixotropic paste based on edge member to core shear requirement and manufacturing technique.	+18.0
Increase the separation provisions - replace shear linear change by guillotine cutter system.	+1.0
Decrease the insulation - replaced RCS plume heat shield and added cork sheet for thermal insulation.	-5.0
INSTRUMENTATION	(+2.0)
Increase the flight qualification sensors - revision of estimate.	+2.0
ELECTRICAL POWER EQUIPMENT	(+32.0)
Decrease the fuel cells - P&W status report	-9.0
Add fuel cell remote control panel - required by P&W fuel cell load sharing control change.	+6.0
Add cryogenic control box - redesign of the cryogenic system valve module pressure switches to meet reliability requirements.	+4.0
Increase the power distribution box - detail changes.	+1.0
Increase the wire installation provisions such as string, clamps, & varnish.	+22.0
Increase in fuel cell - addition of Potassium Hydroxide as wetting agent in start up.	+8.0
ELECTRICAL POWER SYSTEM WIRING	(+48.0)
Increase the wire based on pneumatic in lieu of hydraulic actuated propellant valves.	+3.0
Increase wiring provisions - potting connectors for humidity requirements.	+15.0
Increase the wire based on revised lengths.	+30.0

SERVICE MODULE

CURRENT WEIGHT CHANGES

SERVICE PROPULSION SYSTEM	(+147.0)
Increase pressure system tanks - weld bands added.	+4.0
Increase SPS engine weight - Aerojet status.	+7.0
Increase the fuel and oxidizer system - added dual propellant retention screens external to existing reservoirs to increase the reliability.	+38.0
Increase the SPS engine due to utilizing a pneumatic action in lieu of hydraulic action in the valving - meets Apollo requirements for reliability.	+16.0
Added quantity gauging as a requirement.	+66.0
Add propellant utilization valving.	+16.0
REACTION CONTROL SYSTEM	(+13.0)
Increase quantity gauging - Gianinni Status	+1.0
Increase engine mounts - redesigned to heat sink type mount.	+8.0
Increase the engines - added valve thermal isolator to meet passive thermal control requirement.	+5.0
Decrease the fuel and oxidizer tanks - Beel status.	-1.0
TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES	+256.0

ADAPTER

CURRENT WEIGHT CHANGES

STRUCTURE	(+20.0)
Decrease the rings at Station 583 and 502 - Actual in lieu of calculated weight.	-20.0
Add backup structure for 45° panel deployment requirements.	+24.0
Add cork insulation to the forward section of SLA due to boost heating requirements.	+16.0
SEPARATION PROVISIONS	(+5.0)
Increase the provisions - Beef up in the attenuation system for the 45° panel deployment requirement.	+5.0
TOTAL ADAPTER CURRENT WEIGHT CHANGES	+25.0

CSM 011

DETAIL WEIGHT STATEMENT

GOVERNMENT FURNISHED EQUIPMENT

	CURRENT STATUS	CONTROL WEIGHT ALLOWANCE
Command Module	(563.3)	(576.3)
Guidance & Navigation	417.0	430.0
PAM/FM/FM Package	16.0	16.0
Commutators (3)	13.0	13.0
Survival VHF Beacon/Transceiver	5.2	5.2
Gas Chromotoraph	9.5	9.5
Cameras (2) (included film & lens)	34.0	34.0
Battery	54.0	54.0
Control Unit	8.0	8.0
Tri Pulse Generator	2.5	2.5
Calibrator (installed in flight qual. tape recorder)	2.1	2.1
Junction Box	2.0	2.0
Service Module	(25.1)	(25.1)
PAM/FM/FM System	25.1	25.1
Launch Escape System	(25.0)	(25.0)
"Q" Ball	25.0	25.0
TOTAL GOVERNMENT FURNISHED EQUIPMENT	(613.4)	(626.4)