C65-7988

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Accession No. 07063-65

SID 62-99-40

# MONTHLY WEIGHT AND BALANCE REPORT

# FOR THE APOLLO SPACECRAFT

CONTRACT NAS 9-150

(U)

PARAGRAPH 8.10 EXHIBIT I

1 JUNE 1965

Prepared By

WEIGHT CONTROL

**CLASSIFICATION CHANGE**

To UNCLASSIFIED
By authority of GDS-Ex 11652
Changed by L. Shirley Date 12/31/72
Classified Document Master Control Station, NASA
Scientific and Technical Information Facility

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NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

[redacted]

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

# TECHNICAL REPORT INDEX/ABSTRACT

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DESCRIPTIVE TERMS


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 a standard manned Block I and Block II vehicle as defined in SID 64-1237 and SID 64-1345, CSM Master End Item Specifications, and describes the changes in weight from the previous report. This report also reflects the mission weight, centers of gravity, inertia summary and dimensional diagrams.

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


FORM 131-V REV. 6-64

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## INTRODUCTION

The June report incorporates changes to the Block I and Block II standard manned vehicles subsequent to the May report. The change descriptions are included in the Current Weight Status Section. The current Block I status is based on the drawing release for CSM 012 and 014, and the Block II status is based on estimated data consistent with the CSM Master End Item Specification, SID 64-1345. The Current Weight Status Section Tables have been revised to include a column listing the system and module control weights.

In this report the Block I Command Module and the Block II Service Module weights have exceeded the respective control weights. A weight reduction program is being initiated to offset this growth trend.

The Mission Weight, Center of gravity and Inertia Summary Section reflects the Block I CSM launch weight consistent with a booster payload capability in orbit of 32,500 pounds, as listed in SID 63-313. The SPS propellant weight reported is the available propellant within the noted booster capability. The entry centers of gravity data reflects an unballasted Command Module L/D of .43 for Block I and .42 for Block II. The L/D increase of .05 for Block I was due to utilizing revised L/D center of gravity requirements. The L/D increase of .02 for the Block II was due primarily to the center of gravity change associated with the increase in wiring weight. Studies are in progress to relocate items in the Block II Command Module to constrain the entry L/D to the heat shield ablator design range of .3 to .4 as stated in the Block II CSM Technical Specification SID 64-1344. The Block I LES status weight has been constrained to the 8200 pound control weight with a related LEV burnout center of gravity change from 1125.0 to 1122.8 for Block I pending actual verification by future test. The Block II LES is ballasted to reflect the Station 1125.0 burnout requirement for the LEV.

The current report reflects a Block II LOR Spacecraft increase of 3350 pounds at injection and 3145 pounds at the injected spacecraft condition less Service Module usable propellant. The current injected weight of 94,000 pounds equals the Saturn V injected payload capability consistent with NASA Letter R-P&VE-VAW-65-16, dated 5 February 1965, subject - Saturn V Design Mass Characteristics. The SPS propellant weight reported is the available propellant within the noted booster capability. The SPS propellant will be revised to reflect specific mission requirements when the delta V budget is redefined by NASA consistent with the 32,000 pound LEM.

The LEM weight utilized is 32,000 pounds, excluding crew, per CCA 290.

The current Block I status reflects an Airframe 014 drawing release based on a 10.6 day EO Missiom. The major changes in Block I are:

Command Module - Incorporation of potential change items STR-3 increase in the uprighting system based on calculations of preliminary drawings, STR-5 addition of doublers to the forward cylinder due to impact loads, Crew-2 increase in the pressure suit umbilical based on actual weight of prototype, EPS-7 increase in wire installation provisions based on Airframe 009 requirements, EPS-8 increase in wiring based on revised lengths per Airframe 009, RCS-1 addition of vent lines to propellant tanks to increase service life and C&D-4 increase in lighting based on utilizing fluorescent lamps in lieu of incandescent.

Service Module - Incorporation of potential change items EPS-2 increase in wiring due to adding potting, EPS-7 increase in wire installation provisions based on Airframe 009 requirements, EPS-8 increase in wiring based on revised lengths per Airframe 009, MPS-2 incorporation of pneumatic action propellant valves and a reduction in SPS residuals based on Airframe 012 requirements.

Adapter - Incorporation of potential change items ADP-12 based on 45° panel deployment requirement and the addition of cork insulation to the forward section of the SLA due to boost heating requirements.

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

Command Module - Incorporation of potential change items STR-3 increase in the uprighting system based on calculations of preliminary drawings, STR-5 addition of doublers to the forward cylinder due to impact loads, Crew-2 increase in the pressure suit umbilical based on actual weight of prototype, EPS-7 increase in wire installation provisions based on Airframe 009 requirements, EPS-8 increase in wiring based on revised lengths per Airframe 009, RCS-1 addition of vent lines to propellant tanks to increase service life, C&D-4 increase in lighting based on utilizing fluorescent lamps in lieu of incandescent and an increase in the parachute system consistent with current specification requirements.

Service Module - Incorporation of potential change items EPS-2, increase in wiring due to adding potting, EPS-7, increase in wire installation provisions based on actual data derived on Airframe 009, EPS-8, increase in wiring based on revised lengths per Airframe 009 actual data, MPS-2, incorporation of pneumatic action propellant valves and an increase in SPS residuals based on adding loading tolerance and propellant for restart losses per current requirements.

Launch Escape System - Reduction in ballast over previous report based on maintaining an LEV burnout center of gravity of 1125.0. This philosophy will be maintained until the control weight is attained. Then the LEV center of gravity will be degraded to a maximum aft limit of 1122.0 consistent with Block I data.

Adapter - Incorporation of potential change items ADP-2 addition of auxiliary GSE work platform provisions, ADP-3 revising the size and quantity of LEM servicing access holes, ADP-4 increase in size of +Z LEM access door, ADP-5 and ADP-12 addition of provisions for 45° panel deployment, ADP-10 increase in structure for heavy LEM and the addition of cork insulation to the forward section of the SLA due to boost heating requirements.

At the request of NASA a potential weight change page has been added to reflect the weight impact of a 14 day mission for CSM 012.

# CSM 012 & 014

## APOLLO EARTH ORBIT MISSION

## WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

## 1 JUNE STATUS

| ITEM | WEIGHT POUNDS | CENTER OF GRAVITY* | | | MOMENTS OF INERTIA (SLUG-FT.$^2$) | | |
|---|---|---|---|---|---|---|---|
| | | X | Y | Z | ROLL (X) | PITCH (Y) | YAW (Z) |
| COMMAND MODULE | 11035 | 1041.8 | 0.1 | 6.0 | 5384 | 4740 | 4357 |
| SERVICE MODULE - Less Usable Propellant | 10000 | 909.8 | 1.1 | -0.5 | 6294 | 10842 | 10560 |
| SLA Attachment Ring** | 62 | 837.1 | 0.0 | -1.8 | 77 | 40 | 38 |
| TOTAL - Less SPS Usable Propellant | 21097 | 978.5 | 0.6 | 2.9 | 11820 | 35733 | 35018 |
| SPS AVAILABLE PROPELLANT - S/M*** | 7973 | 866.5 | 27.3 | -11.5 | 2650 | 1756 | 2146 |
| TOTAL - With Usable Propellant | 29070 | 947.9 | 7.9 | -1.0 | 15620 | 53410 | 53718 |
| SLA - Less SM Attaching Ring | 3430 | 643.0 | 1.1 | -1.8 | 8440 | 11355 | 11086 |
| TOTAL - Injected | 32500 | 915.7 | 7.2 | -1.1 | 24090 | 126292 | 126362 |
| LAUNCH ESCAPE SYSTEM | 8200 | 1298.6 | -0.1 | -0.2 | 576 | 21270 | 21270 |
| TOTAL - Spacecraft Launch | 40700 | 992.8 | 5.7 | -0.9 | 24743 | 354781 | 354924 |

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 62 pound SLA attachment ring is retained by the CSM after separation from the Adapter.
***The 7973 pounds of SPS propellant is the propellant weight available within the constraints of the injected booster capability.

[redacted]

[redacted]



SID 62-99-40

BLOCK I

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 JUNE STATUS

| ITEM | WEIGHT POUNDS | CENTER OF GRAVITY* | | | MOMENTS OF INERTIA (SLUG-FT.$^2$) | | |
|---|---|---|---|---|---|---|---|
| | | X | Y | Z | ROLL (X) | PITCH (Y) | YAW (Z) |
| COMMAND MODULE | 11035 | 1041.8 | 0.1 | 6.0 | 5384 | 4740 | 4357 |
| LAUNCH ESCAPE SYSTEM | 8200 | 1298.6 | -0.1 | -0.2 | 576 | 21270 | 21270 |
| TOTAL - Launch Abort | 19235 | 1151.3 | 0.0 | 3.4 | 5999 | 93010 | 92588 |
| LESS - MAIN AND PITCH MOTOR PROPELLANTS | -3198 | 1294.3 | 0.0 | 0.0 | -71 | -1285 | -1285 |
| TOTAL - LES Burnout | 16037 | 1122.8 | 0.0 | 4.0 | 5918 | 74779 | 74366 |

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

BLOCK I

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

EARTH ORBITAL MISSION

1 JUNE 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 | 11035 | 1041.8 | 0.1 | 6.0 | 5384 | 4740 | 4357 | 28 | -272 | -18 |
| Less: Boost & Mission Water | -8 | 1022.6 | -63.4 | -16.4 | | | | | | |
| Food | -59 | 1053.0 | -28.6 | 37.0 | | | | | | |
| Add: Waste-Fecal | 17 | 1039.0 | 47.0 | 12.0 | | | | | | |
| $CO_2$ 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 | 11122 | 1041.5 | 0.0 | 6.2 | 5445 | 4789 | 4391 | 41 | -292 | -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 | -58 | 1089.1 | 0.0 | -21.1 | | | | | | |
| PRIOR TO MAIN CHUTE DEPLOYMENT | 10144 | 1040.0 | 0.1 | 5.6 | 4987 | 4061 | 3738 | 36 | -202 | -12 |
| Less: Main Chutes (3) | -409 | 1090.5 | -0.8 | 6.4 | | | | | | |
| Propellant | -135 | 1022.6 | -5.6 | 57.0 | | | | | | |
| LANDING | 9600 | 1038.1 | 0.3 | 4.9 | 4830 | 3718 | 3433 | 38 | -182 | -3 |

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

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BLOCK I

COMMAND MODULE

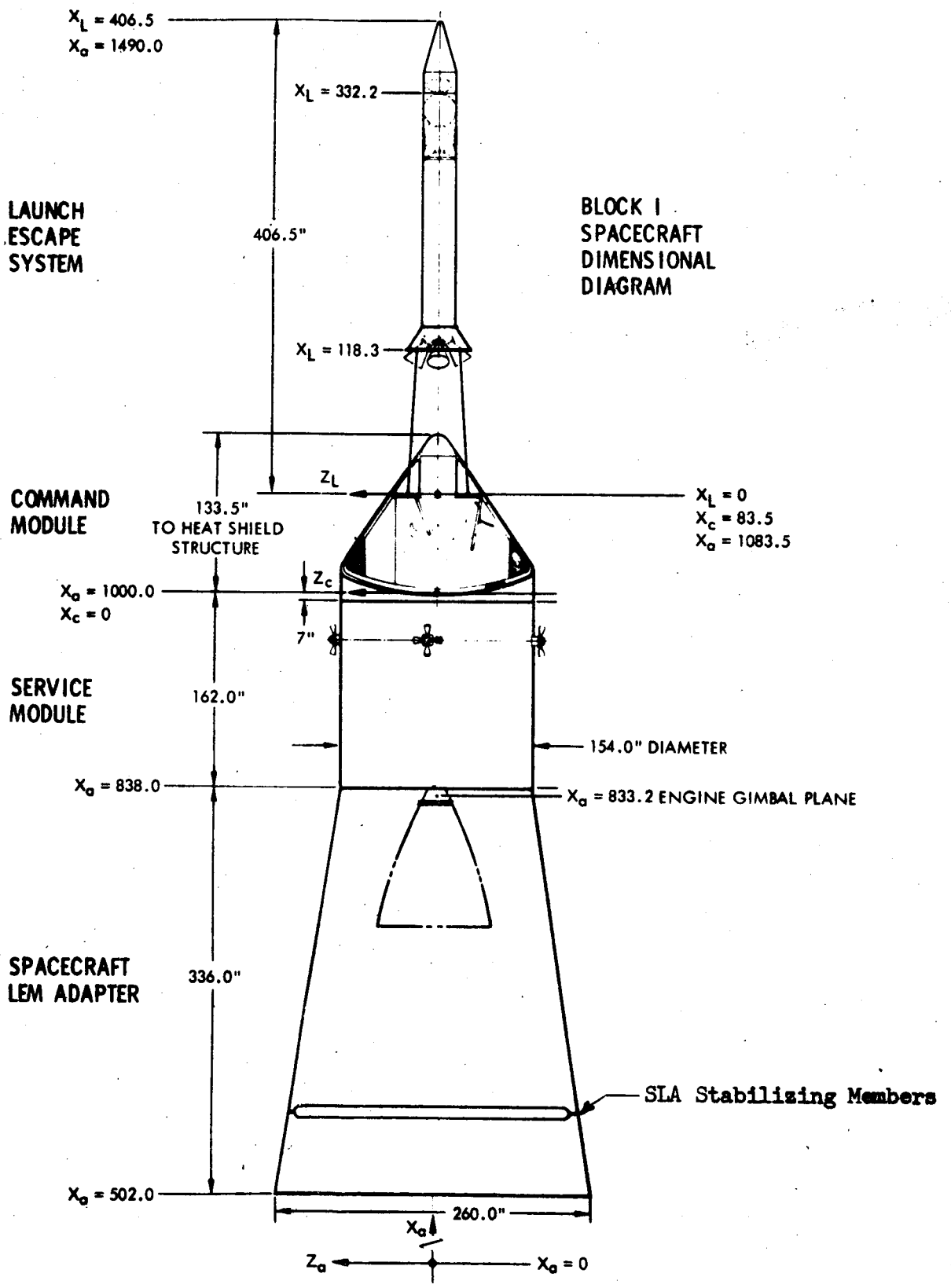
WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 JUNE 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 | 11035 | 1041.8 | 0.1 | 6.0 | 5384 | 4740 | 4357 | 28 | -272 | -18 |
| Less: Oxidant | -180 | 1022.6 | 14.5 | 63.7 | | | | | | |
| Forward Heat Shield | -414 | 1098.5 | 0.0 | 0.4 | | | | | | |
| Drogue Chutes | -58 | 1089.1 | 0.0 | -21.1 | | | | | | |
| PRIOR TO MAIN CHUTE DEPLOYMENT | 10383 | 1039.6 | -0.1 | 5.4 | 5152 | 4214 | 3953 | 38 | -189 | -48 |
| Less: Main Chutes (3) | -409 | 1090.5 | -0.8 | 6.4 | | | | | | |
| Fuel | -90 | 1022.6 | -45.8 | 45.8 | | | | | | |
| LANDING | 9884 | 1037.7 | 0.3 | 5.0 | 5027 | 3918 | 3631 | 28 | -181 | -13 |

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


$X_L$ = 406.5
$X_a$ = 1490.0
$X_L$ = 332.2
LAUNCH ESCAPE SYSTEM
406.5"
BLOCK I SPACECRAFT DIMENSIONAL DIAGRAM
$X_L$ = 118.3
$Z_L$
COMMAND MODULE
133.5" TO HEAT SHIELD STRUCTURE
$X_L$ = 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"
SLA Stabilizing Members
$X_a$ = 502.0
260.0"
$X_a$
$Z_a$
$X_a$ = 0

[redacted]

## BLOCK II

## APOLLO LOR MISSION

## WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

## 1 JUNE STATUS

| ITEM | WEIGHT POUNDS | CENTER OF GRAVITY* | | | MOMENTS OF INERTIA (SLUG-FT.$^2$) | | |
|---|---|---|---|---|---|---|---|
| | | X | Y | Z | ROLL (X) | PITCH (Y) | YAW (Z) |
| COMMAND MODULE | 10415 | 1042.3 | -0.3 | 6.7 | 4818 | 4358 | 4026 |
| SERVICE MODULE - Less Usable Propellant | 10365 | 913.8 | -4.4 | 8.8 | 6545 | 11469 | 11305 |
| SLA Attachment Ring** | 75 | 837.1 | 0.0 | -1.8 | 93 | 48 | 46 |
| TOTAL - Less SPS Usable Propellant | 20855 | 977.7 | -2.3 | 7.7 | 11482 | 34717 | 34232 |
| SPS AVAILABLE PROPELLANT - S/M*** | 37625 | 901.8 | 2.4 | -1.0 | 19587 | 17913 | 24676 |
| TOTAL - With Usable Propellant | 58480 | 928.9 | 0.7 | 2.1 | 31353 | 69533 | 75656 |
| LUNAR EXCURSION MODULE | 32000 | 586.5 | 0.0 | 0.0 | 21400 | 23350 | 23450 |
| SLA - Less SM Attaching Ring | 3520 | 643.3 | 1.8 | -1.5 | 8463 | 11700 | 11384 |
| TOTAL - Injected | 94000 | 801.6 | 0.5 | 1.3 | 61245 | 647673 | 653557 |
| LAUNCH ESCAPE SYSTEM | 8140 | 1297.4 | -0.1 | -0.2 | 576 | 20952 | 20952 |
| TOTAL - SPACECRAFT LAUNCH | 102140 | 841.1 | 0.5 | 1.1 | 61825 | 1066146 | 1072028 |

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 75 Lb. SLA attachment ring is retained by the CSM after separation from the Adapter. This ring differs from S/C 012 and 014 in that it is designed for Saturn V loads.
***The 37,625 pounds of SPS propellant is the propellant weight available within the constraints of the injected booster capability.





[redacted]

S1

# BLOCK II

## APOLLO LAUNCH ABORT CONFIGURATION

## WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

## 1 JUNE STATUS

| ITEM | WEIGHT POUNDS | CENTER OF GRAVITY* | | | MOMENTS OF INERTIA (SLUG-FT.2) | | |
|---|---|---|---|---|---|---|---|
| | | X | Y | Z | ROLL (X) | PITCH (Y) | YAW (Z) |
| COMMAND MODULE | 10415 | 1042.3 | -0.3 | 6.7 | 4818 | 4358 | 4026 |
| LAUNCH ESCAPE SYSTEM | 8140 | 1297.4 | -0.1 | -0.2 | 576 | 20952 | 20952 |
| TOTAL -Launch Abort | 18555 | 1154.2 | -0.2 | 3.7 | 5441 | 89559 | 89180 |
| LESS - MAIN AND PITCH MOTOR PROPELLANTS | -3198 | 1294.3 | 0.0 | 0.0 | -71 | -1285 | -1285 |
| TOTAL - LES Burnout | 15357 | 1125.0 | -0.3 | 4.4 | 5358 | 71900 | 71532 |

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

## BLOCK II

## COMMAND MODULE

## WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

## LUNAR ORBIT RENDEZVOUS MISSION

## 1 JUNE 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 | 10415 | 1042.3 | -0.3 | 6.7 | 4818 | 4358 | 4026 | 4 | -295 | 32 |
| Less: Boost & Mission Water | -8 | 1022.6 | -63.4 | -16.4 | | | | | | |
| Food | -48 | 1049.0 | -38.6 | 25.8 | | | | | | |
| Docking | -150 | 1110.0 | 0.0 | -2.5 | | | | | | |
| PLSS (1) | -53 | 1009.4 | -0.2 | -6.5 | | | | | | |
| Add: Waste-Fecal | 14 | 1039.0 | 47.0 | 12.0 | | | | | | |
| $CO_2$ 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 | 10295 | 1041.2 | -0.3 | 7.1 | 4866 | 4235 | 3890 | 17 | -295 | 33 |
| 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 | -58 | 1089.1 | 0.0 | -21.1 | | | | | | |
| PRIOR TO MAIN CHUTE DEPLOYMENT | 9431 | 1040.6 | -0.2 | 6.5 | 4434 | 3666 | 3392 | 11 | -217 | 39 |
| Less: Main Chutes (3) | -419 | 1090.4 | -1.2 | 7.5 | | | | | | |
| Propellant | -135 | 1022.6 | -5.6 | 57.0 | | | | | | |
| LANDING | 8877 | 1038.5 | -0.1 | 5.7 | 4279 | 3325 | 3085 | 13 | -199 | 47 |

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

BLOCK II

COMMAND MODULE

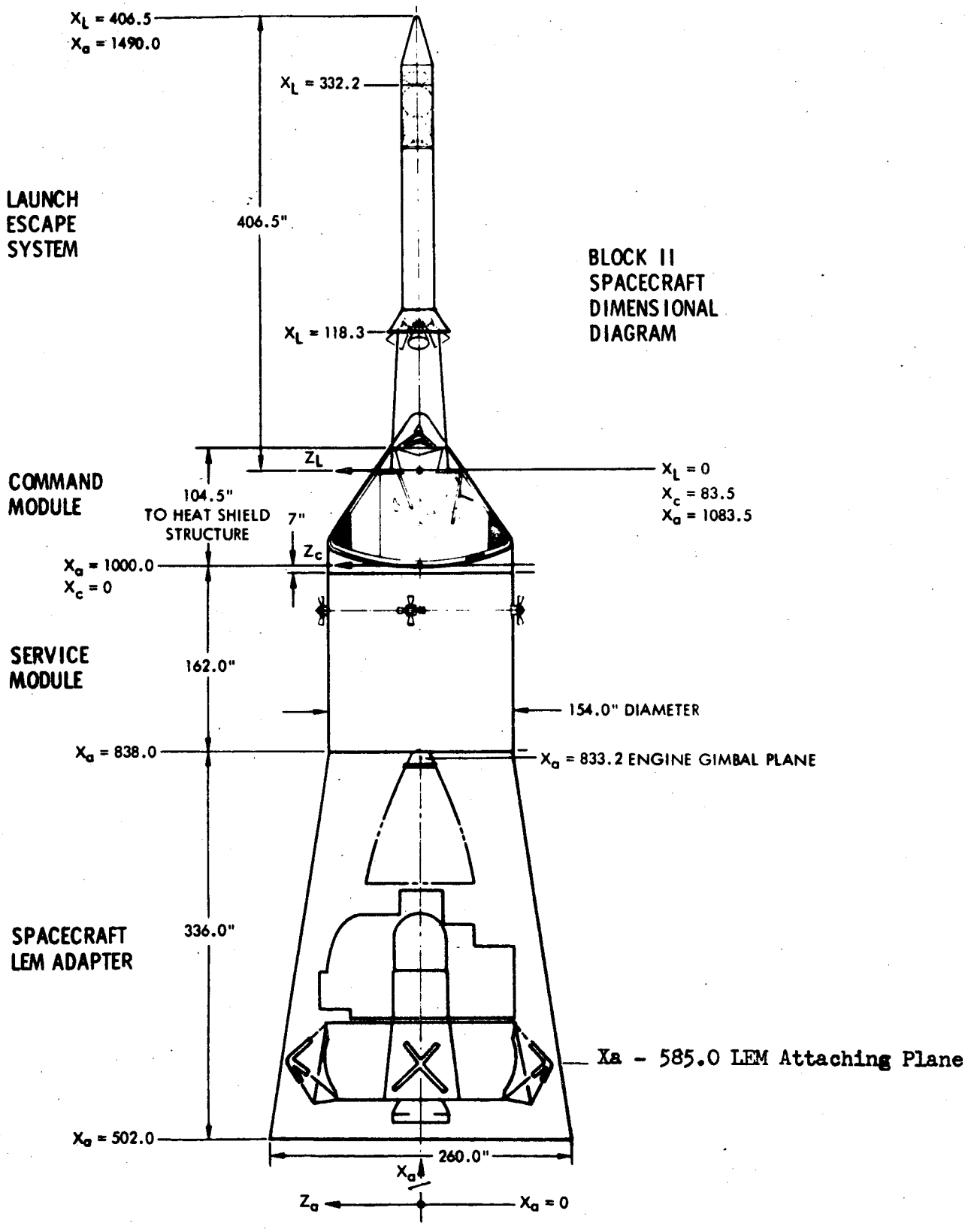
WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 JUNE 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 | 10415 | 1042.3 | -0.3 | 6.7 | 4818 | 4358 | 4026 | 4 | -295 | 32 |
| Less: Oxidant | -180 | 1022.6 | 14.6 | 62.7 | | | | | | |
| Forward Heat Shield | -300 | 1090.0 | 0.0 | 1.0 | | | | | | |
| Docking Provisions | -150 | 1110.0 | 0.0 | -2.5 | | | | | | |
| Drogue Chutes | -58 | 1089.1 | 0.0 | -21.1 | | | | | | |
| PRIOR TO MAIN CHUTE DEPLOYMENT | 9727 | 1039.9 | -0.6 | 6.1 | 4605 | 3831 | 3620 | 12 | -200 | 2 |
| Less: Main Chutes (3) | -419 | 1090.4 | -1.2 | 7.5 | | | | | | |
| Fuel | -90 | 1022.6 | -45.8 | 45.8 | | | | | | |
| LANDING | 9218 | 1037.7 | -0.1 | 5.7 | 4481 | 3533 | 3294 | 2 | -195 | 36 |

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


$X_L$ = 406.5
$X_a$ = 1490.0
$X_L$ = 332.2
LAUNCH ESCAPE SYSTEM
406.5"
BLOCK II SPACECRAFT DIMENSIONAL DIAGRAM
$X_L$ = 118.3
$Z_L$
$X_L$ = 0
$X_c$ = 83.5
$X_a$ = 1083.5
COMMAND MODULE
104.5" TO HEAT SHIELD STRUCTURE
7"
$Z_c$
$X_a$ = 1000.0
$X_c$ = 0
SERVICE MODULE
162.0"
154.0" DIAMETER
$X_a$ = 838.0
$X_a$ = 833.2 ENGINE GIMBAL PLANE
SPACECRAFT LEM ADAPTER
336.0"
Xa - 585.0 LEM Attaching Plane
$X_a$ = 502.0
260.0"
$X_a$
$Z_a$
$X_a$ = 0

SPACECRAFT WEIGHT STATUS

BLOCK I CSM 012 & 014

JUNE 1965

| ITEM | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | POTENTIAL CHANGES | POTENTIAL TOTAL | CONTROL WEIGHT |
|---|---|---|---|---|---|---|
| COMMAND MODULE | 10890 | +145 | 11035 | * +235 | 11270 | 11000 |
| SERVICE MODULE | 9925 | +75 | 10000 | * +179 | 10179 | 10200 |
| ADAPTER | 3460 | +45 | 3505 | | 3505 | 3900 |
| TOTAL LESS PROPELLANT | 24275 | +265 | 24540 | +414 | 24954 | 25100 |
| SPS PROPELLANT AVAILABLE | 8225 | -265 | 7960 | -414 | 7546 | 7400 |
| TOTAL INJECTED | 32500 | | 32500 | | 32500 | 32500 |
| LAUNCH ESCAPE SYSTEM | 8200 | | 8200 | | 8200 | 8200 |
| TOTAL SPACECRAFT AT LAUNCH | 40700 | | 40700 | | 40700 | 40700 |

NOTE: *Excluding 14 day capability

[redacted]

## BLOCK I

## COMMAND MODULE WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK I STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| WEIGHT EMPTY | (9686) | (9580) | (+145) | (9725) | (21) | (74) | (5) |
| Structure | 5679 | 5743 | +37 | 5780 | 12 | 85 | 3 |
| Stabilization & Control | 200 | 196 | | 196 | 10 | 90 | |
| Guidance & Navigation | 430 | 417 | | 417 | | 100 | |
| Crew Systems | 94 | 89 | -2 | 87 | 44 | 56 | |
| Environmental Control | 374 | 405 | | 405 | 18 | 32 | 50 |
| Earth Landing System | 617 | 594 | +5 | 599 | 4 | 76 | 20 |
| Instrumentation | 127 | 123 | | 123 | 50 | 50 | |
| Electrical Power | 1215 | 1096 | +98 | 1194 | 85 | 15 | |
| Reaction Control | 328 | 303 | +3 | 306 | 14 | 86 | |
| Communication | 378 | 391 | -3 | 388 | 20 | 80 | |
| Controls & Displays | 244 | 223 | +7 | 230 | 2 | 96 | 2 |
| USEFUL LOAD | (1314) | (1310) | | (1310) | (4) | (96) | |
| Scientific Equipment | 80 | 80 | | 80 | | 100 | |
| Crew Systems | 834 | 835 | | 835 | 7 | 93 | |
| Reaction Control | 270 | 270 | | 270 | | 100 | |
| Environmental Control | 130 | 125 | | 125 | | 100 | |
| GROSS WEIGHT | 11000 | 10890 | +145 | 11035 | 19 | 77 | 4 |

BLOCK I

SERVICE MODULE WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK I STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| WEIGHT EMPTY | (8132) | (7857) | (+90) | (7947) | (7) | (78) | (15) |
| Structure | 4767 | 4591 | +6 | 4597 | 3 | 89 | 8 |
| Environmental Control | 201 | 74 | | 74 | | 100 | |
| Instrumentation | 44 | 59 | | 59 | 100 | | |
| Electrical Power | 1577 | 1553 | +70 | 1623 | 20 | 34 | 46 |
| Main Propulsion | 1181 | 1211 | +10 | 1221 | | 94 | 6 |
| Reaction Control | 358 | 365 | +4 | 369 | 13 | 87 | |
| Communication | 4 | 4 | | 4 | 100 | | |
| USEFUL LOAD | (2068) | (2068) | (-15) | (2053) | | (100) | |
| Reaction Control | 838 | 838 | | 838 | | 100 | |
| Electrical Power | 503 | 503 | | 503 | | 100 | |
| Environmental Control | 157 | 157 | | 157 | | 100 | |
| Main Propulsion | 570 | 570 | -15 | 555 | | 100 | |
| TOTAL SERVICE MODULE BURNOUT | 10200 | 9925 | +75 | 10000 | 5 | 83 | 12 |

BLOCK I

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK I STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| Structure | 1537 | 1536 | | 1536 | | 43 | 57 |
| Ballast Installation Prov. | 29 | 29 | | 29 | | 100 | |
| Electrical System | 55 | 58 | | 58 | 73 | 22 | 5 |
| Propulsion System | | | | | | | |
| Main Thrust | 4826 | 4794 | | 4794 | | | 100 |
| Jettison | 445 | 437 | | 437 | | | 100 |
| Jettison Motor Skirt | 90 | 90 | | 90 | | | 100 |
| Pitch Control | 49 | 49 | | 49 | | | 100 |
| Separation Provisions | 15 | 15 | | 15 | 53 | 47 | |
| C/M Boost Protective Cover | 539 | 580 | | 580 | 100 | | |
| LES - NO BALLAST | 7585 | 7588 | | 7588 | 8 | 9 | 83 |
| BALLAST | 615 | 612 | | 612 | 100 | | |
| TOTAL LAUNCH ESCAPE SYSTEM | 8200 | 8200 | - | 8200 | 15 | 8 | 77 |

BLOCK I

ADAPTER WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK I STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| Structure (Includes Stabilizing Members) | 3470 | 3097 | +40 | 3137 | 18 | 62 | 20 |
| Electrical | 70 | 61 | | 61 | 82 | 18 | |
| Separation System | 360 | 302 | +5 | 307 | 83 | 17 | |
| TOTAL ADAPTER | 3900 | 3460 | +45 | 3505 | 25 | 57 | 18 |

SPACECRAFT WEIGHT STATUS

BLOCK II

JUNE 1965

| ITEM | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | POTENTIAL CHANGES | POTENTIAL TOTAL | CONTROL WEIGHT |
|---|---|---|---|---|---|---|
| COMMAND MODULE | 10270 | +145 | 10415 | +234 | 10649 | 11000 |
| SERVICE MODULE | 10030 | +335 | 10365 | -7 | 10358 | 10200 |
| ADAPTER | 3430 | +165 | 3595 | +3 | 3598 | 3800 |
| LEM | 29500 | +2500 | 32000 | | 32000 | 29500 |
| TOTAL LESS PROPELLANT | 53230 | +3145 | 56375 | +230 | 56605 | 54500 |
| SPS PROPELLANT AVAILABLE | 37420 | +205 | 37625 | -230 | 37395 | 39500 |
| TOTAL INJECTED | 90650 | +3350 | 94000 | | 94000 | 94000 |
| LAUNCH ESCAPE SYSTEM | 8200 | - 60 | 8140 | | 8140 | 8200 |
| TOTAL SPACECRAFT AT LAUNCH | 98850 | +3290 | 102140 | | 102140 | 102200 |

NOTE: With the incorporation of the Heavy LEM, the SPS propellant listed above is the total propellant weight available within the constraints of the Saturn V Boost Capability. A redefinition of the delta V budget by NASA-MSC incorporating the Heavy LEM along with GFE carried in Section I of the Service Module is pending.

BLOCK II

COMMAND MODULE WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK II STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | % EST | %CAL | %ACT |
| WEIGHT EMPTY | (9582) | (8868) | | (9013) | (64) | (35) | (1) |
| Structure | 5687 | 5373 | +37 | 5410 | 60 | 40 | |
| Stabilization & Control | 140 | 135 | -2 | 133 | 100 | | |
| Guidance & Navigation | 400 | 354 | | 354 | 100 | | |
| Crew Systems | 94 | 88 | -2 | 86 | 71 | 29 | |
| Environmental Control | 417 | 400 | | 400 | 62 | 38 | |
| Earth Landing System | 673 | 575 | +23 | 598 | 14 | 74 | 12 |
| Instrumentation | 43 | 44 | | 44 | 100 | | |
| Electrical Power | 1120 | 959 | +93 | 1052 | 93 | 7 | |
| Reaction Control | 328 | 303 | +3 | 306 | 13 | 87 | |
| Communication | 358 | 337 | -3 | 334 | 100 | | |
| Controls & Displays | 322 | 300 | -4 | 296 | 100 | | |
| USEFUL LOAD | (1418) | (1402) | | (1402) | (4) | (96) | |
| Scientific Equipment | 80 | 80 | | 80 | | 100 | |
| Crew Systems | 953 | 951 | | 951 | 6 | 94 | |
| Reaction Control | 270 | 270 | | 270 | | 100 | |
| Environmental Control | 115 | 101 | | 101 | | 100 | |
| GROSS WEIGHT | 11000 | 10270 | +145 | 10415 | 56 | 43 | 1 |

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(VELLUM) REV. 1-63

BLOCK II

SERVICE MODULE WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK II STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| WEIGHT EMPTY | (8104) | (7933) | (+91) | (8024) | (49) | (45) | (6) |
| Structure | 4594 | 4490 | +6 | 4496 | 65 | 35 | |
| Environmental Control | 104 | 134 | | 134 | 35 | 65 | |
| Instrumentation | 46 | 46 | | 46 | 100 | | |
| Electrical Power | 1572 | 1535 | +71 | 1606 | 37 | 33 | 30 |
| Main Propulsion | 1226 | 1240 | +10 | 1250 | 10 | 90 | |
| Reaction Control | 358 | 371 | +4 | 375 | 20 | 80 | |
| Communications & Rendezvous Radar | 204 | 117 | | 117 | 100 | | |
| USEFUL LOAD | (2096) | (2097) | (+244) | (2341) | | (100) | |
| Reaction Control | 838 | 838 | | 838 | | 100 | |
| Electrical Power | 503 | 503 | | 503 | | 100 | |
| Environmental Control | 150 | 150 | | 150 | | 100 | |
| Main Propulsion | 605 | 606 | +244 | 850 | | 100 | |
| TOTAL SERVICE MODULE BURNOUT | 10200 | 10030 | +335 | 10365 | 38 | 57 | 5 |

BLOCK II

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK II STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| Structure | 1537 | 1536 | | 1536 | | 43 | 57 |
| Ballast Installation Prov. | 29 | 29 | | 29 | | 100 | |
| Electrical | 55 | 58 | | 58 | 73 | 22 | 5 |
| Propulsion System | | | | | | | |
| Main Thrust | 4826 | 4794 | | 4794 | | | 100 |
| Jettison | 445 | 437 | | 437 | | | 100 |
| Jettison Motor Skirt | 90 | 90 | | 90 | | | 100 |
| Pitch Control | 49 | 49 | | 49 | | | 100 |
| Separation Provisions | 15 | 15 | | 15 | 53 | 47 | |
| C/M Boost Protective Cover | 539 | 580 | | 580 | 100 | | |
| LES - NO BALLAST | 7855 | 7588 | | 7588 | 8 | 9 | 83 |
| BALLAST | 615 | 612 | -60 | 552 | 100 | | |
| TOTAL LAUNCH ESCAPE SYSTEM | 8200 | 8200 | -60 | 8140 | 15 | 8 | 77 |

BLOCK II

ADAPTER WEIGHT STATUS

| ITEM | CONTROL WEIGHT | PREVIOUS STATUS 5-1-65 | CHANGES TO CURRENT | CURRENT STATUS 6-1-65 | BASIS FOR CURRENT BLOCK II STATUS | | |
|---|---|---|---|---|---|---|---|
| | | | | | %EST | %CAL | %ACT |
| Structure | 3370 | 3033 | +160 | 3193 | 19 | 62 | 19 |
| Electrical | 70 | 90 | | 90 | 86 | 14 | |
| Separation System | 360 | 307 | +5 | 312 | 83 | 17 | |
| TOTAL ADAPTER | 3800 | 3430 | +165 | 3595 | 26 | 57 | 17 |

## COMMAND MODULE

## CURRENT WEIGHT EMPTY CHANGES

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| STRUCTURE | (+37.0) | (+37.0) | |
| Increase the inner structure forward section due to adding bonded doublers to the forward cylinder based on current impact loads. This change incorporates potential item STR-5. | +17.0 | +17.0 | NAA |
| Increase the uprighting system based on calculation of layout drawings which incorporate rigid canisters with related latching based on current design requirements. This change incorporates potential item STR-3. | +20.0 | +20.0 | NAA |
| STABILIZATION AND CONTROL | (-) | (-2.0) | |
| Decrease the Block II equipment based on current Minneapolis Honeywell status reflecting partial calculations and revised estimates. | - | -2.0 | NAA |
| CREW SYSTEMS | (-2.0) | (-2.0) | |
| Increase the drawer assembly for the work shelf stowage due to adding tool stowage provisions to the drawer. | +1.2 | +1.2 | NAA |
| Increase the pressure suit assembly electrical umbilical based on actual weights of prototype item. This change incorporates potential item Crew-2. | +2.0 | +2.0 | NAA |
| Decrease the quantity of pressure suit umbilicals from four to three based on current system requirements. | -5.2 | -5.2 | NAA |
| EARTH LANDING SYSTEM | (+5.0) | (+23.0) | |
| Transfer the recovery personnel hard line from Communications due to recoding consistent with system design responsibility. | +5.0 | +5.0 | NAA |
| Increase the Block II parachute system based on procurement specification weight consistent with current design requirements. | - | +18.0 | NAA |

## COMMAND MODULE

## CURRENT WEIGHT EMPTY CHANGES

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| ELECTRICAL POWER SYSTEM | (+98.0) | (+93.0) | |
| Increase the wire installation provisions such as string, clamps and varnish based on revised estimates of Airframe 009 requirements. This change incorporates potential item EPS-7. | +35.0 | +35.0 | NAA |
| Increase the wiring based on revised lengths per Airframe 009. This change incorporates potential item EPS-8. | +65.0 | +60.0 | NAA |
| Increase the wiring based on replacing hydraulic actuated propellant valves with a pneumatic system | +1.0 | +1.0 | NAA |
| Decrease the RCS controller due to utilizing relays in lieu of motor switches for circuit improvement. | -3.0 | -3.0 | NAA |
| REACTION CONTROL SYSTEM | (+3.0) | (+3.0) | |
| Add a vent line to each fuel and oxidizer tank to increase the service life by reducing cycling of bladder during fill and drain operations. This change incorporates potential item RCS-1. | +3.0 | +3.0 | NAA |
| COMMUNICATIONS | (-3.0) | (-3.0) | |
| Transfer the recovery personnel hard line to Earth Landing System due to recoding consistent with system design responsibility. | -5.0 | -5.0 | NAA |
| Add supports for coax cables based on calculation of current drawings. | +3.9 | +2.0 | NAA |
| Increase the TV viewfinder stowage container based on current vendor estimate. | +1.5 | - | NAA |
| Decrease the Communication Equipment per Collins status reflecting actual weights based on Airframe 008 and 009 equipment. | -3.4 | - | NAA |

## COMMAND MODULE

## CURRENT WEIGHT EMPTY CHANGES

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| CONTROLS AND DISPLAYS | (+7.0) | (-4.0) | |
| Increase the crew compartment flood lighting based on current drawing reflecting a change to fluorescent in lieu of incandescent lights and an increased quantity. This change incorporates potential item C&D-4. | +4.5 | +4.5 | NAA |
| Increase the main display panel based on calculation of miscellaneous drawing changes. | +1.9 | - | NAA |
| Increase the SCS hand controls per Minneapolis Honeywell status reflecting revised cable lengths. | +2.5 | - | NAA |
| Decrease the electrical provisions due to deleting the SCS hand control cable junction box per current requirements. | -1.9 | -1.9 | NAA |
| Decrease the caution and warning detector due to utilizing the Block I unit in lieu of the proposed larger unit with added functions. | - | -6.6 | NAA |
| TOTAL COMMAND MODULE CURRENT WEIGHT CHANGES | +145.0 | +145.0 | |

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## SERVICE MODULE

## CURRENT WEIGHT EMPTY CHANGES

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| STRUCTURE | (+6.0) | (+6.0) | |
| Transfer miscellaneous hardware attachments for the SPS tanks from Main Propulsion due to recoding consistent with system design responsibility. | +6.0 | +6.0 | NAA |
| ELECTRICAL POWER SYSTEM | (+70.0) | (+71.0) | |
| Increase the wiring based on replacing hydraulic actuated propellant valves with a pneumatic system. | +3.0 | +3.0 | NAA |
| Increase wiring provisions based on potting connectors based on humidity requirements. This change incorporates potential item EPS-2. | +15.0 | +15.0 | NAA |
| Increase wire installation provisions such as string, clamps and varnish based on revised estimates of Airframe 009 requirements. This change incorporates potential item EPS-7. | +22.0 | +23.0 | NAA |
| Increase the wiring based on revised lengths per Airframe 009. This change incorporates potential item EPS-8. | +30.0 | +30.0 | NAA |
| MAIN PROPULSION | (+10.0) | (+10.0) | |
| Transfer miscellaneous hardware attachments for the SPS tanks to Structure due to recoding consistent with system design responsibility. | -6.0 | -6.0 | NAA |
| Increase the SPS engine due to utilizing a pneumatic action in lieu of hydraulic for the propellant valves to meet Apollo requirements for reliability and start or shutdown impulse accuracy. This change incorporates potential item MPS-2 and eliminates a pending increase in fuel for restart losses when the fuel is utilized a valve hydraulic fluid. | +16.0 | +16.0 | NAA |

## SERVICE MODULE

### CURRENT WEIGHT EMPTY CHANGES

| | BLOCK | BLOCK | CHANGE RESPONSIBILITY |
|---|---|---|---|
| REACTION CONTROL SYSTEM | (+4.0) | (+4.0) | |
| Increase the engines due to the addition of valve thermal isolator to meet the passive thermal control requirements. | +5.0 | +5.0 | NASA |
| Decrease the fuel and oxidizer tanks based on miscellaneous actual weights per Bell status. | -1.0 | -1.0 | NAA |
| TOTAL SERVICE MODULE CURRENT WEIGHT EMPTY CHANGES | +90.0 | +91.0 | |

## SERVICE MODULE

## CURRENT USEFUL LOAD CHANGE

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| MAIN PROPULSION | (-15.0) | (+244.0) | |
| Revise the main propulsion residuals consistent with mission requirements, including oxidizer loading tolerance previously reported in useable propellant. | -15.0 | +244.0 | NAA |
| TOTAL SERVICE MODULE CURRENT USEFUL LOAD | -15.0 | +244.0 | |
| TOTAL SERVICE MODULE CURRENT WEIGHT EMPTY CHANGES | +90.0 | +91.0 | |
| TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES | +75.0 | +335.0 | |

## LAUNCH ESCAPE SYSTEM

## CURRENT WEIGHT STATUS

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| BALLAST | | (+60.0) | |
| Decrease the ballast due to reporting only the ballast required to meet an 1125.0 burnout center of gravity for Block II. | - | -60.0 | NAA |
| TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES | - | -60.0 | |

## ADAPTER

### CURRENT WEIGHT CHANGES

| | BLOCK I | BLOCK II | CHANGE RESPONSIBILITY |
|---|---|---|---|
| STRUCTURE | (+40.0) | (+160.0) | |
| Add auxiliary (GSE) work platform provisions at Station 525.0 per CCA 297. This change incorporates potential item ADP-2. | - | + 5.0 | NASA |
| Revise the size and quantity of the LEM servicing access holes through the SLA per CCA 301. This change incorporates potential item ADP-3. | - | +32.0 | NASA |
| Add structural provisions for the increase in size of the +Z LEM access door per CCA 315. This change incorporates potential item ADP-4. | - | +20.0 | NASA |
| Add a retracting mechanism to the SLA-LEM umbilical to provide clearance for the withdrawal of the LEM when the panels are deployed consistent with CCA 304. This change incorporates potential item ADP-5. | - | +5.0 | NASA |
| Add backup structure for the 45° panel deployment requirement per CCA 275 for Block I and CCA 304 for Block II. This change incorporates potential item ADP-12. | +24.0 | +24.0 | NASA |
| Add cork insulation to the forward section of SLA due to boost heating requirements. | +16.0 | +16.0 | NAA |
| Increase the aft section honeycomb panel face sheets based on increased LEM weight consistent with CCA 290. This change incorporated potential item ADP-10. | - | +58.0 | NASA |
| SEPARATION PROVISIONS | (+5.0) | (+5.0) | |
| Increase the separation provisions due to a beef-up in the attenuation system for the 45° panel deployment requirement per CCA 275 for Block I and CCA 304 for Block II. This change incorporates potential item ADP-12. | +5.0 | +5.0 | NASA |
| TOTAL CURRENT ADAPTER WEIGHT CHANGES | +45.0 | +165.0 | |

## COMMAND MODULE

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY X | CENTER OF GRAVITY Y | CENTER OF GRAVITY Z | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| STRUCTURE | (+20) | (+20) | | | | |
| Redesign the air vent based on heat sink requirements (Item STR-6, Dtd. 6-1-65) | +4 | - | 1025.8 | -23.8 | -63.4 | 8-1-65 |
| | - | +4 | 1025.8 | -23.8 | -30.0 | 8-1-65 |
| Increase the crew couch based on calculation of released drawing reflecting 90 per cent of the released drawings. (Item STR-7, Dtd. 6-1-65) | +16 | +16 | 1040.5 | 0.0 | -2.2 | 8-1-65 |
| ENVIRONMENTAL CONTROL | (+14) | (+14) | | | | |
| Delete the potential change (ECS-1) to fill the water tanks at launch as this requirement has been eliminated by the addition of the Service Module supplemental water system. | | | | | | |
| Add a suit compressor inverter to the pressure suit circuit due to Block II requirements to maintain an oxygen flow of 12 CFM/Man in lieu of 10 CFM/Man in a 3.5 psia (suited) condition per current specification requirements. (Item ECS-4, Dtd. 4-1-65) | - | +5 | 1027.8 | -48.3 | 5.5 | 8-1-65 |
| Modify the pressure suit heat exchanger evaporator per CCA 308 (Item ECS-5, Dtd. 5-1-65) | +9 | +9 | 1027.8 | -48.3 | 5.5 | 7-1-65 |
| Incorporate a cabin water separator to prevent water accumulation. (Item ECS-6, Dtd. 5-1-65) | +5 | - | 1027.8 | -48.3 | 5.5 | 8-1-65 |

## COMMAND MODULE

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY X | CENTER OF GRAVITY Y | CENTER OF GRAVITY Z | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| INSTRUMENTATION | (+5) | (+5) | | | | |
| Add a runaway RCS engine detection unit to detect possible failures within the SCS and RCS. (Item Instr.-2, Dtd. 1-1-65) | +5 | +5 | 1050.0 | 0.0 | -25.0 | 8-1-65 |
| ELECTRICAL POWER SYSTEM | (+100) | (+172) | | | | |
| Increase the wiring based on revised lengths due to rerouting required by EMI problems. | +100 | - | 1035.0 | 5.1 | -7.1 | 8-1-65 |
| | - | +172 | 1036.3 | 3.3 | 15.2 | 8-1-65 |
| REACTION CONTROL SYSTEM | (+15) | (+15) | | | | |
| Incorporate an RCS rapid fuel dumping system. (Item RCS-2, Dtd. 5-1-65) | +15 | +15 | 1022.6 | -5.6 | 57.0 | 8-1-65 |
| COMMUNICATIONS | (+21) | (+6) | | | | |
| Increase the TV camera and equipment based on current estimates for the current GFE design. (Item COM-2, Dtd. 5-1-65) | - | +6 | 1064.7 | 14.3 | -6.3 | 8-1-65 |
| Add real time radio command relays to provide additional capability for MSFN to command certain spacecraft functions. (Item COM-3, Dtd. 5-1-65) | +14 | - | 1036.0 | 18.1 | 30.2 | 8-1-65 |
| Incorporate an additional VHF transmitter required for flight qualification data. (Item COM-4, Dtd. 5-1-65) | +7 | - | 1030.0 | 44.0 | -2.0 | 8-1-65 |

## COMMAND MODULE

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY | | | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| | | | X | Y | Z | |
| CONTROLS & DISPLAYS | (-) | (+2) | | | | |
| The study to provide radiation detection on the Block I vehicle has been rejected, the potential item C&D-3 is being deleted. | - | | | | | |
| Incorporate display functions of the launch vehicle oxidizer pressure. (Item C&D-5, Dtd. 5-1-65) | - | +2 | 1066.0 | 0.0 | -20.0 | 8-1-65 |
| BALLAST | (+60) | - | | | | |
| Add ballast to maintain Ycg of ±0.33 ±0.1 inch consistent with requirements established by the entry modes unit. This change is necessary to compensate for aerodynamic roll moments induced by external protuberances. | +60 | - | 1016.1 | 64.1 | 0.0 | 7-1-65 |
| TOTAL COMMAND MODULE POTENTIAL WEIGHT CHANGES | +235 | +234 | | | | |

## SERVICE MODULE

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY | | | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| | | | X | Y | Z | |
| STRUCTURE | (+19) | (-17) | | | | |
| Add support structure for supplemental water supply system required for extended earth orbital missions. (Item STR-3, Dtd. 4-1-65) | +12 | - | 916.0 | -22.5 | 41.9 | 7-1-65 |
| Replace the thixotropic paste of core edges with foaming paste in the fuel bay areas of the aft bulkhead based on current allowables. (Item STR-5, Dtd. 5-1-65) | - | -17 | 839.5 | 0.0 | 0.0 | 7-1-65 |
| Add edge isolating material to the ECS radiators. (Item STR-6, Dtd. 5-1-65) | +7 | - | 893.4 | 0.0 | 0.0 | 8-1-65 |
| ENVIRONMENTAL CONTROL SYSTEM | (+152) | (-) | | | | |
| Add a water supply storage system (includes 112 pounds of water) to be used as a supplement to the existing Command Module ECS waste water supply during extended earth-orbital flights. The mission duration cannot be fulfilled with present ECS heat rejection capabilities. (Item ECS-2, Dtd. 4-1-65) | +150 | - | 925.0 | -22.5 | 41.9 | 7-1-65 |
| Add plumbing and valves to minimize edge freezing consistent with CCA 309. (Item ECS-3, Dtd. 6-1-65) | +2 | - | 893.4 | 0.0 | 0.0 | 7-1-65 |

## SERVICE MODULE

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY X | CENTER OF GRAVITY Y | CENTER OF GRAVITY Z | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| INSTRUMENTATION | (-) | (-) | | | | |
| The study to provide radiation detection on the Block I vehicle has been rejected, therefore, the potential item Instr-2 is being deleted. | - | - | | | | |
| ELECTRICAL POWER | (+8) | (+10) | | | | |
| Increase fuel cell based on the addition of start-up potassium hydroxide wetting agent. (Item EPS-4, Dtd. 2-1-65) | +8 | - | 860.4 | -33.1 | 42.0 | 7-1-65 |
| | - | +8 | 964.8 | -33.1 | 42.7 | 7-1-65 |
| Add wiring provisions for launch vehicle oxidizer pressure display function. (Item EPS-9, Dtd. 5-1-65) | - | +2 | 957.5 | -8.5 | 18.7 | 8-1-65 |
| TOTAL SERVICE MODULE POTENTIAL WEIGHT CHANGES | +179 | -7 | | | | |

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## ADAPTER

## POTENTIAL WEIGHT CHANGES

| ITEM | BLOCK I WEIGHT | BLOCK II WEIGHT | CENTER OF GRAVITY | | | EFFECTIVE DATE |
|---|---|---|---|---|---|---|
| | | | X | Y | Z | |
| ELECTRICAL POWER | (-) | (+3) | | | | |
| Increase electrical provisions to provide for mounting the LEM pyrotechnic sequencer system on the SLA. This item includes boxes, structure and wire. (Item ADP-6, Dtd. 3-1-65) | - | +26 | 538.0 | 0.0 | 0.0 | 9-1-65 |
| Reroute wiring from -Z axis to +Z axis to reduce length of wire. (Item ADP-9, Dtd. 4-1-65) | - | -25 | 835.0 | 49.3 | 0.0 | 8-1-65 |
| Add wiring provisions for launch vehicle oxidizer display function. (Item ADP-11, Dtd. 5-1-65) | | +2 | 670.0 | 0.0 | -112.0 | 8-1-65 |
| TOTAL ADAPTER POTENTIAL WEIGHT CHANGES | - | +3 | | | | |

## POTENTIAL WEIGHT CHANGES

## 14 DAY MISSION DURATION IN LIEU OF 10.6 DAY

(CSM 012 ONLY)

| | WEIGHT | CENTER OF GRAVITY X | Y | Z |
|---|---|---|---|---|
| COMMAND MODULE | (+47) | | | |
| Food | +19 | 1055.0 | -18.8 | 26.2 |
| Lithium Hydroxide (28 Cartridges in lieu of 22 Cartridges) | +28 | 1012.0 | 25.0 | -17.0 |
| SERVICE MODULE | (+113) | | | |
| Metabolic Oxygen (97% Capacity) | +51 | 933.8 | 23.0 | -29.7 |
| Top Off Oxygen Tanks to 100% Full (See note) | +58 | 933.8 | 23.0 | -29.7 |
| Top Off Hydrogen Tanks to 100% Full (See note) | +4 | | | |
| TOTAL COMMAND MODULE AND SERVICE MODULE | 160 | | | |

NOTE: The SID 64-1237 spec. quotes a minimum usable oxygen capacity of 640 pounds. This is based on filling to 97% capacity. In addition to this there is 12.5 pounds of residual oxygen making the total capacity 652.5 lbs when filled to 97% capacity. The weight status for the 10.6 day mission is currently carrying 444.5 lbs of oxygen for the fuel cells and 157.0 lbs for metabolic oxygen. Filling the oxygen containers for the 14 day mission to the 97% capacity level will add 51 pounds of oxygen, bringing the total up to 652.5 pounds. Present plans for servicing the the CGSS at the launch pad is to cold soak and top-off plus start up of the fuel cells at an earlier time this allowing a 100% fill. The time previously allotted for the 30 hour standby with a 97% full tank is now used for a cold soak period. Topping-off the CGSS will add an additional 58 lbs of liquid oxygen and 4 pounds of liquid hydrogen.

BLOCK I

GOVERNMENT FURNISHED EQUIPMENT

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

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

*The current status weight does not include this allowance.
**MIT status report dated 15 February 1965.

## BLOCK II

## GOVERNMENT FURNISHED EQUIPMENT

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

| ITEM | CONTROL WEIGHTS | CURRENT STATUS |
|---|---|---|
| GFE List | | |
| LEM | (29500.0) | (32000.0)**** |
| Guidance and Navigation | (400.0) | (354.0)*** |
| Crew (50, 70, 90) | (528.0) | (528.0) |
| Crew Equipment | (371.0) | (371.0) |
| Pressure Garment Assembly (3) (Incl. Comm.) | 102.0 | 102.0 |
| Portable Life Support System (2) (Incl. Comm.) | 106.0 | 106.0 |
| Emergency Oxygen System (2) | 6.5 | 6.5 |
| Constant Wear Garments - Gas Cooled (7) | 6.5 | 6.5 |
| Liquid Cooled Garments (2) | 9.0 | 9.0 |
| External Thermal Garment | 13.4 | 13.4 |
| Radiation Dosimeters | 5.0 | 5.0 |
| Food Set (8.3 days) | 49.5 | 49.5 |
| Probe | 0.5 | 0.5 |
| Medical Kit-Emergency | 2.8 | 2.8 |
| Clinical Instrumentation | 1.5 | 1.5 |
| Biomedical Instrumentation | 4.3 | 4.3 |
| Spacesuit Assembly Spare Parts | 4.0 | 4.0 |
| Survival Equipment | 60.0 | 60.0 |
| TV Camera | (8.8) | (8.8) |
| Scientific Equipment | (80.0) | (80.0) |
| Rendezvous Radar | (106.0) | *(20.1)** |
| Q-Ball | (25.0) | (25.0) |
| TOTAL GFE | 31018.8 | 33386.9 |

*Reduced to 84.4 pounds per NASA letter PPS1/L137-64-822.
**Reduced to 20.1 pounds per CCA 303 deleting rendezvous radar equipment.
***MIT Status Report dated 15 February 1965.
****Increased per CCA 290.