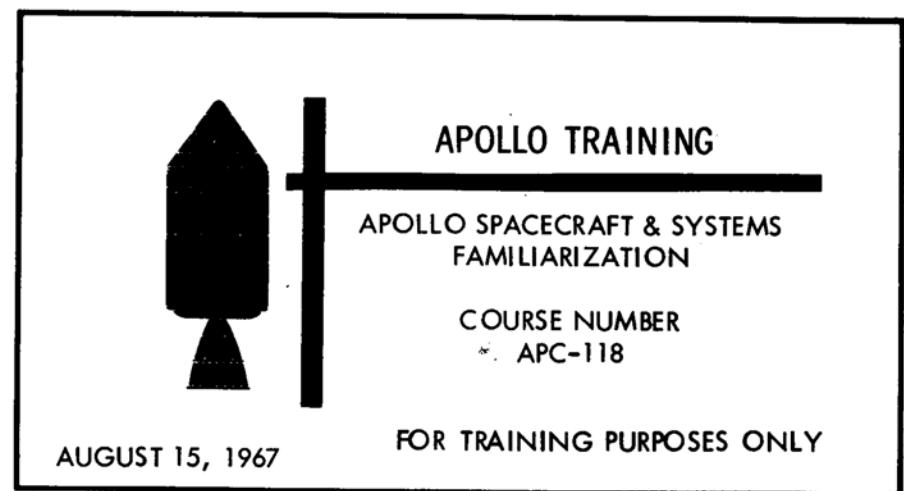
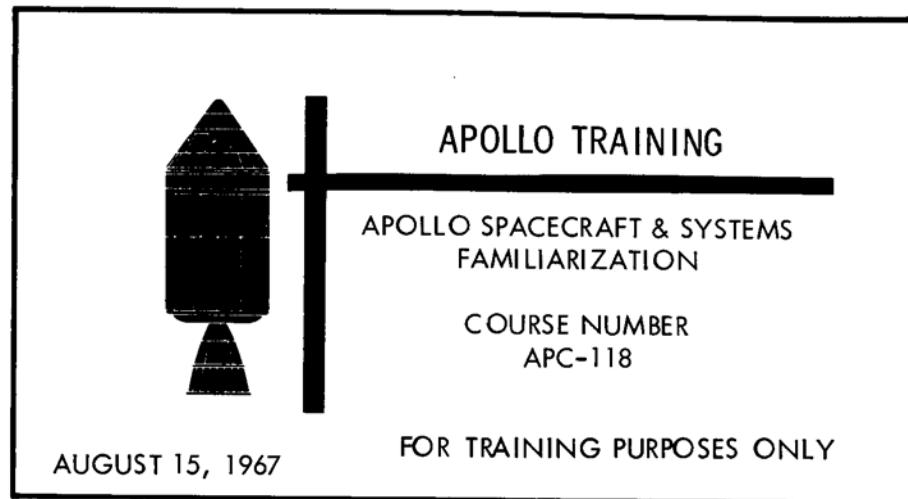


— ROBINSON —



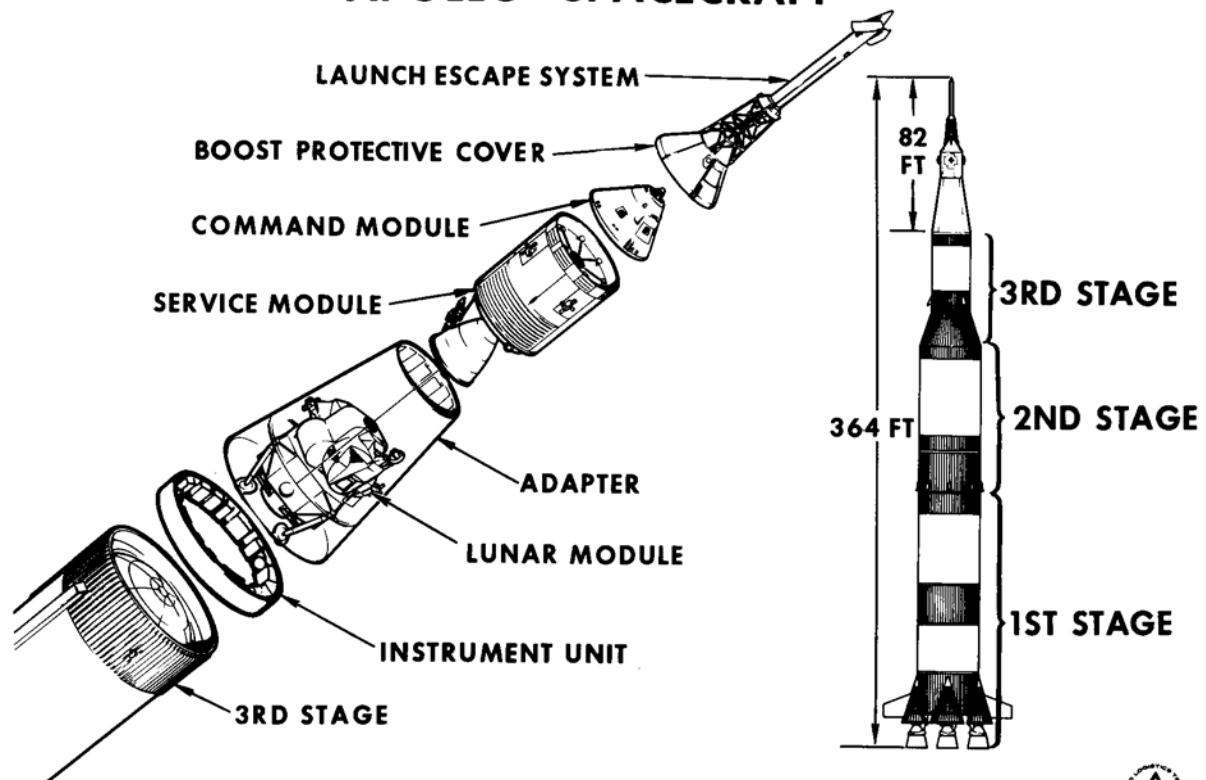


QUESTIONS RELATIVE TO THE CONTENTS OF THIS
DOCUMENT SHOULD BE DIRECTED TO:

S.I. JIMENEZ
B.C. GROVER
NAA, SPACE DIVISION
DOWNEY, CALIFORNIA
EXTENSION 4325,6 OR 7

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CREW EQUIPMENT	9
APOLLO ABBREVIATIONS	LAST PAGE

APOLLO SPACECRAFT



FAM-1027 

NAA APOLLO SUBCONTRACTORS (CONT)

SYSTEM/COMPONENTS	CONTRACTOR
PROPELLION	
CM REACTION CONTROL ENGINES.....	ROCKETDYNE DIV OF NAA - CANOGA PARK, CALIF.
SM REACTION CONTROL ENGINES.....	MARQUARDT CORP - VAN NUYS, CALIF.
POSITIVE EXPULSION TANKS (RCS).....	BELL AEROSYSTEMS - BUFFALO, N.Y.
HELIUM TANKS.....	AIRITE PRODUCTS - LOS ANGELES, CALIF.
FUEL & OXIDIZER TANKS (SPS).....	ALLISON DIV OF GMC - INDIANAPOLIS, IND.
PROPELLANT GAGING & MIXTURE RATIO CONTROL.....	SIMMONDS PRECISION PROD - TARRYTOWN, N.Y.
SERVICE PROPULSION ENGINE	AEROJET GENERAL - SACRAMENTO, CALIF.
COMMUNICATIONS & DATA.....	COLLINS RADIO CO. - CEDAR RAPIDS, IOWA
BEACON ANTENNA (R&D).....	MELPAR - FALLS CHURCH, VA.
C-BAND ANTENNA.....	RADCOM - COLLEGE PARK, MD.
CENTRAL TIMING SYSTEM.....	GENERAL TIME - ROLLING MEADOWS, ILL.
HF ANTENNAS (RECOVERY & ORBITAL).....	DEHAVILLAND - ONTARIO, CANADA
DIGITAL UP-DATA LINK.....	MOTOROLA, INC. - SCOTTSDALE, ARIZ.
VHF ANTENNA.....	LOS ANGELES DIV OF NAA - INGLEWOOD, CALIF.
TV CAMERA	RCA - PRINCETON, N.J.
2 KMC HI GAIN ANTENNA.....	DALMO - VICTOR - BELMONT, CALIF.
MISSION SIMULATOR TRAINER	GIP - LINK DIV - BINGHAMTON, N.Y.
SYSTEMS INTEGRATED TEST EQUIPMENT.....	AUTONETICS DIV OF NAA - ANAHEIM, CALIF.

FAM-1004G 

NAA APOLLO SUBCONTRACTORS

1

SYSTEM/COMPONENTS	CONTRACTOR
STRUCTURES	
ABLAITIVE MATERIAL FOR HEAT SHIELD.....AVCO CORP-WILMINGTON, MASS.	
BOOST COVER, LES TOWER, DOCKING PROBE, CANARDS	
RADIAL BEAMS, FWD HEAT SHIELD & CREW COUCHES	LOS AN GELES DIV OF NAA - INGLEWOOD, CALIF.
STAINLESS STEEL HONEY COMB PANELS	AERONCA MFG CO - MIDDLETOWN, OHIO
ELECTRICAL POWER	
BATTERIES ("A", "B" & "C").....	EAGLE Picher - JOPLIN, MO.
BATTERY CHARGER.....	ITT - INDUSTRIAL PRODUCTS DIV - SAN FERNANDO, CALIF.
FUEL CELL MODULES.....	PRATT & WHITNEY - EAST HARTFORD, CONN.
STATIC INVERTERS	WESTINGHOUSE ELECTRIC CORP - LIMA, OHIO
CRYOGENIC GAS STORAGE.....	BEECH AIRCRAFT - BOULDER, COLO.
ENVIRONMENTAL CONTROL	
AIRESEARCH MFG CO - LOS ANGELES, CALIF.	
SEQUENTIAL EVENTS CONTROL	
MASTER EVENT SEQUENCE CONTROLLER.....	AUTONETICS DIV OF NAA - ANAHIEM, CALIF.
LAUNCH ESCAPE & PITCH CONTROL MOTORS.....	LOCKHEED PROPULSION CO - REDLANDS, CALIF.
TOWER JETTISON MOTOR	THIOKOL CHEMICAL CORP - ELKTON, MD.
EARTH LANDING PARACHUTE SUBSYSTEM	NORTHROP - VENTURA - NEWBERRY PARK, CALIF.
STABILIZATION & CONTROL	
HONEYWELL CORP - MINNEAPOLIS, MINN.	

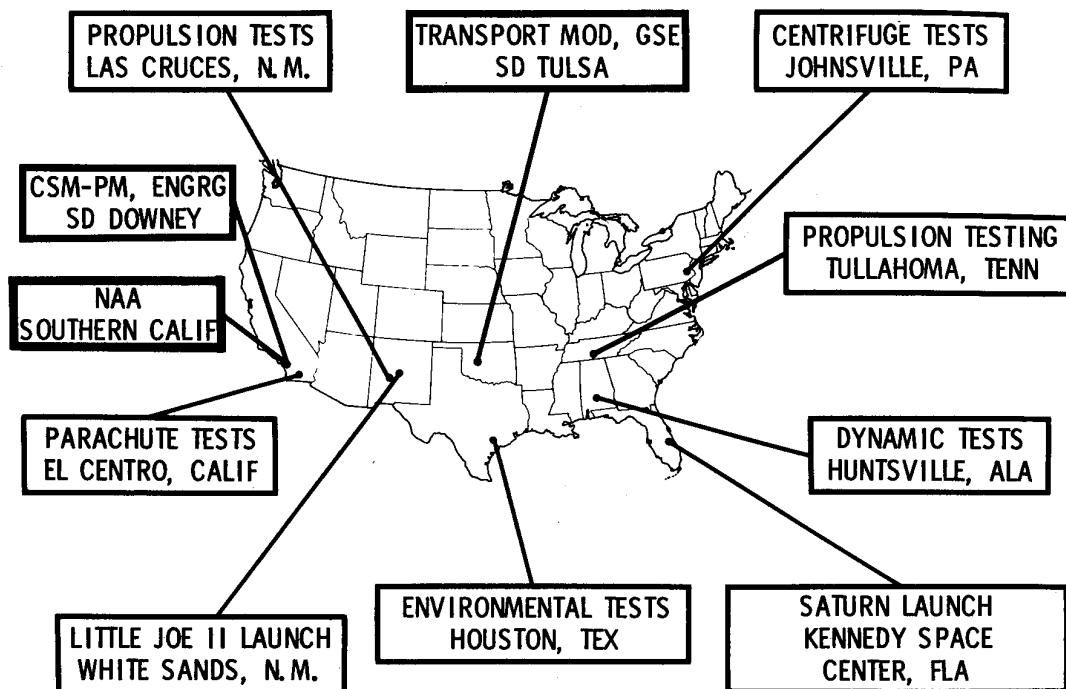
FAM-1003D

NAA APOLLO SUBCONTRACTORS (CONT)

SYSTEM/COMPONENTS	CONTRACTOR
PROPELLION	
CM REACTION CONTROL ENGINES.....	ROCKETDYNE DIV OF NAA - CANOGA PARK, CALIF.
SM REACTION CONTROL ENGINES.....	MARQUARDT CORP - VAN NUYS, CALIF.
POSITIVE EXPULSION TANKS (RCS).....	BELL AEROSYSTEMS - BUFFALO, N.Y.
HELUM TANKS	AIRITE PRODUCTS - LOS ANGELES, CALIF.
FUEL & OXIDIZER TANKS (SPS).....	ALLISON DIV OF GMC - INDIANAPOLIS, IND.
PROPELLANT GAGING & MIXTURE RATIO CONTROL.....	SIMMONDS PRECISION PROD - TARRYTOWN, N.Y.
SERVICE PROPULSION ENGINE	AEROJET GENERAL - SACRAMENTO, CALIF.
COMMUNICATIONS & DATA.....	
BEACON ANTENNA (R&D).....	MELPAR - FALLS CHURCH, VA.
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CENTRAL TIMING SYSTEM.....	GENERAL TIME - ROLLING MEADOWS, ILL.
HF ANTENNAS (RECOVERY & ORBITAL).....	DEHAVILLAND - ONTARIO, CANADA
DIGITAL UP-DATA LINK.....	MOTOROLA, INC. - SCOTTSDALE, ARIZ.
VHF ANTENNA.....	LOS ANGELES DIV OF NAA - INGLEWOOD, CALIF.
TV CAMERA	RCA - PRINCETON, N.J.
2 KMC HI GAIN ANTENNA.....	DALMO - VICTOR - BELMONT, CALIF.
MISSION SIMULATOR TRAINER	
MISSION SIMULATOR TRAINER	GIP - LINK DIV - BINGHAMTON, N.Y.
SYSTEMS INTEGRATED TEST EQUIPMENT.....	AUTONETICS DIV OF NAA - ANAHEIM, CALIF.

FAM-1004G 

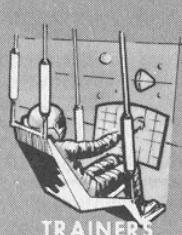
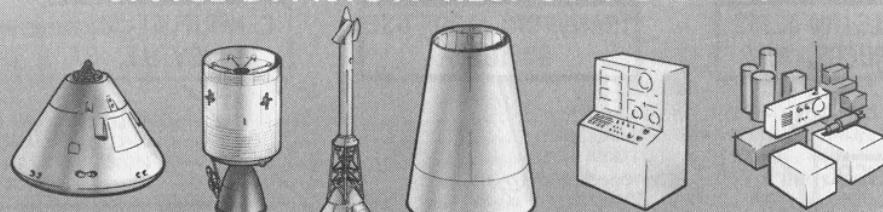
FACILITIES-NATIONWIDE



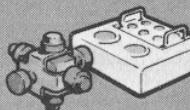
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APOLLO SPACECRAFT SPACE DIVISION RESPONSIBILITIES

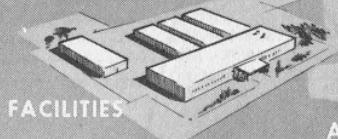
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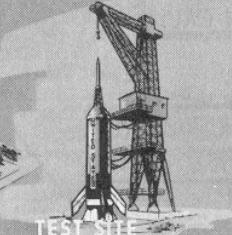
TRAINERS



MAJOR SUBS

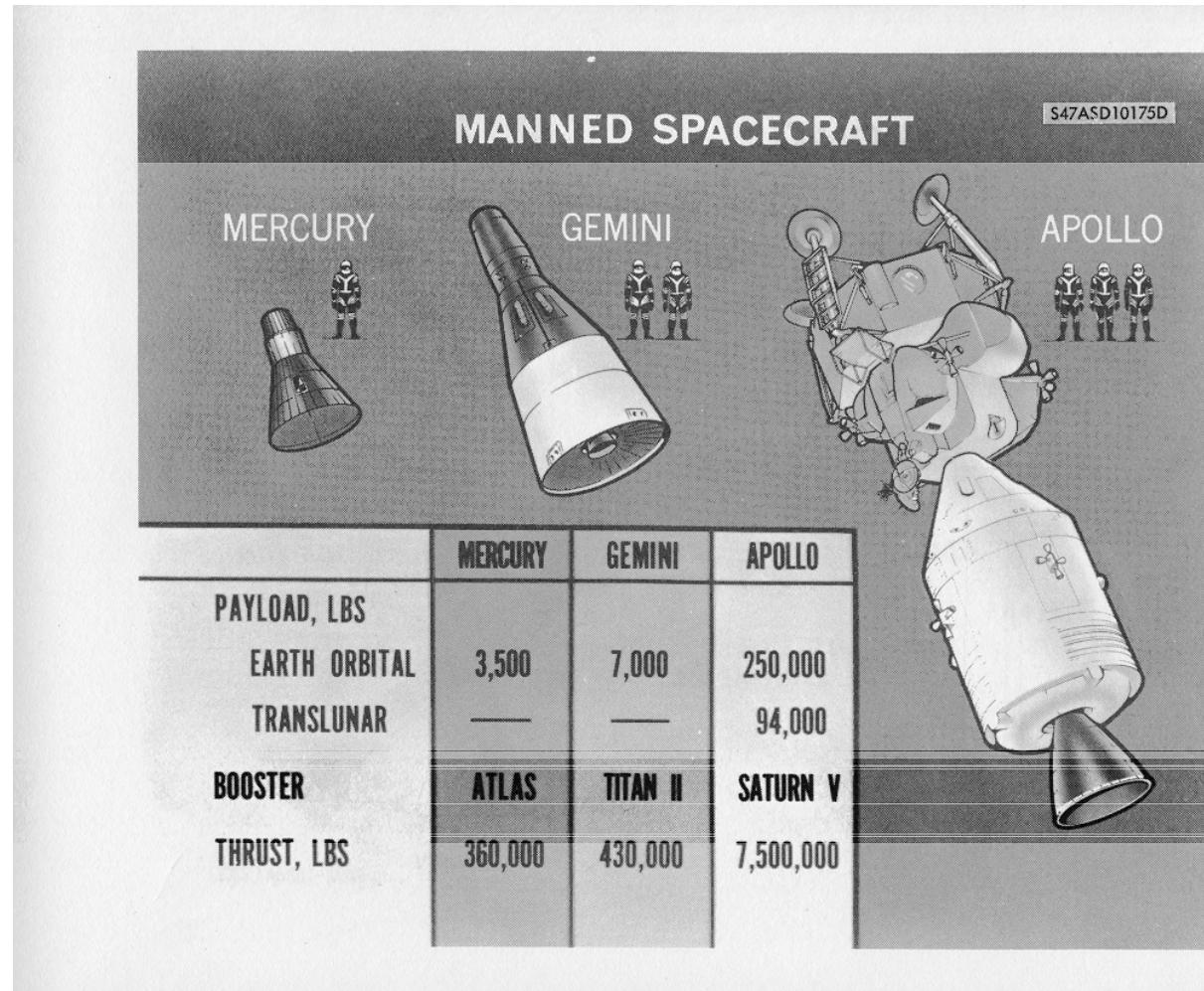


FACILITIES



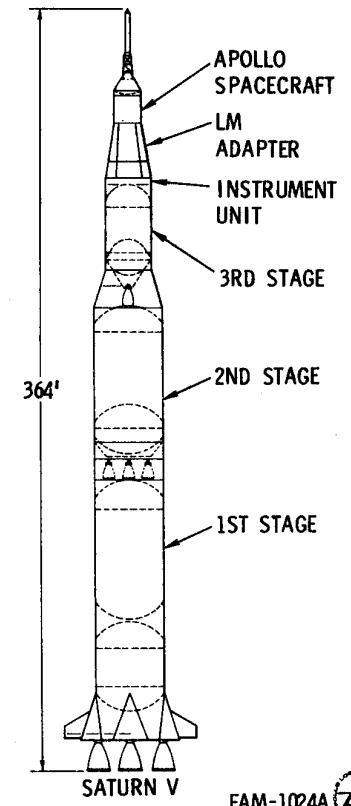
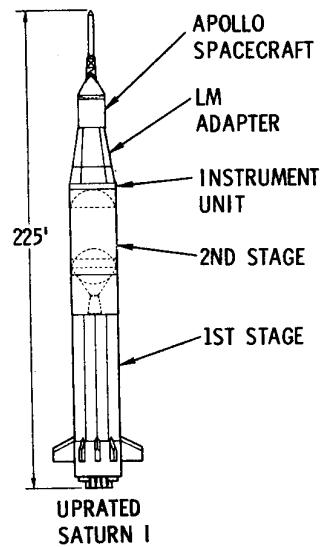
TEST SITE
ACTIVATION

(NAA ALSO INTERFACES WITH ASSOCIATE CONTRACTORS FOR GUIDANCE & NAVIGATION, ACCEPTANCE CHECKOUT EQUIPMENT, LUNAR MODULE, ETC.)



	MERCURY	GEMINI	APOLLO
PAYOUT, LBS			
EARTH ORBITAL	3,500	7,000	250,000
TRANSLUNAR	—	—	94,000
BOOSTER	ATLAS	TITAN II	SATURN V
THRUST, LBS	360,000	430,000	7,500,000

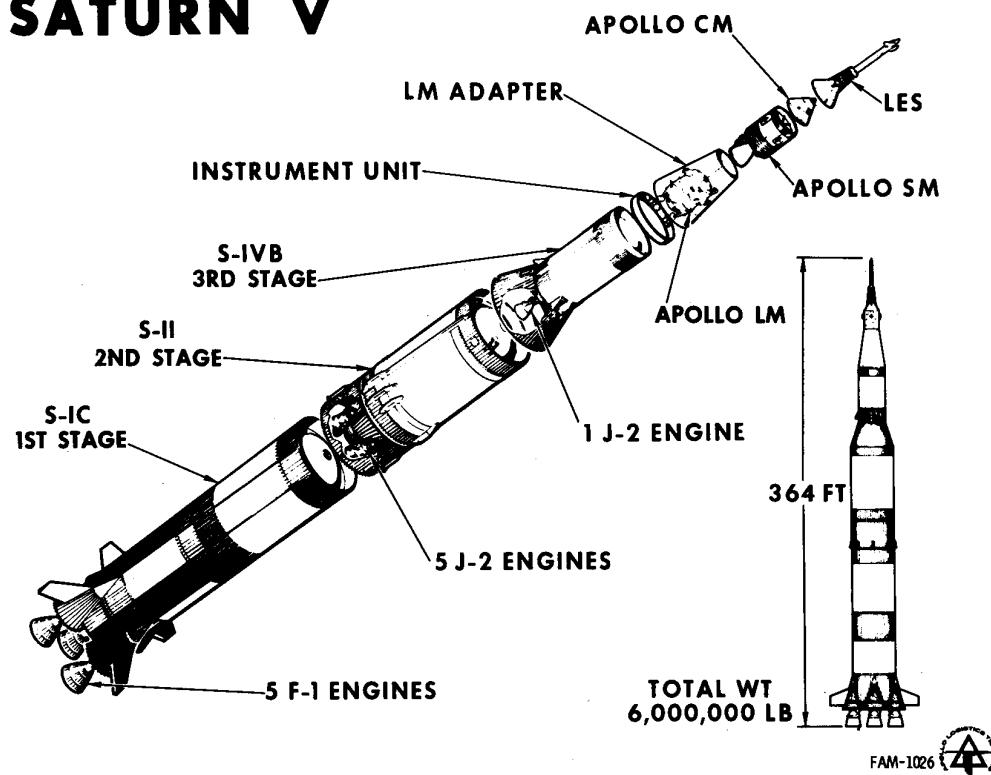
APOLLO LAUNCH VEHICLES



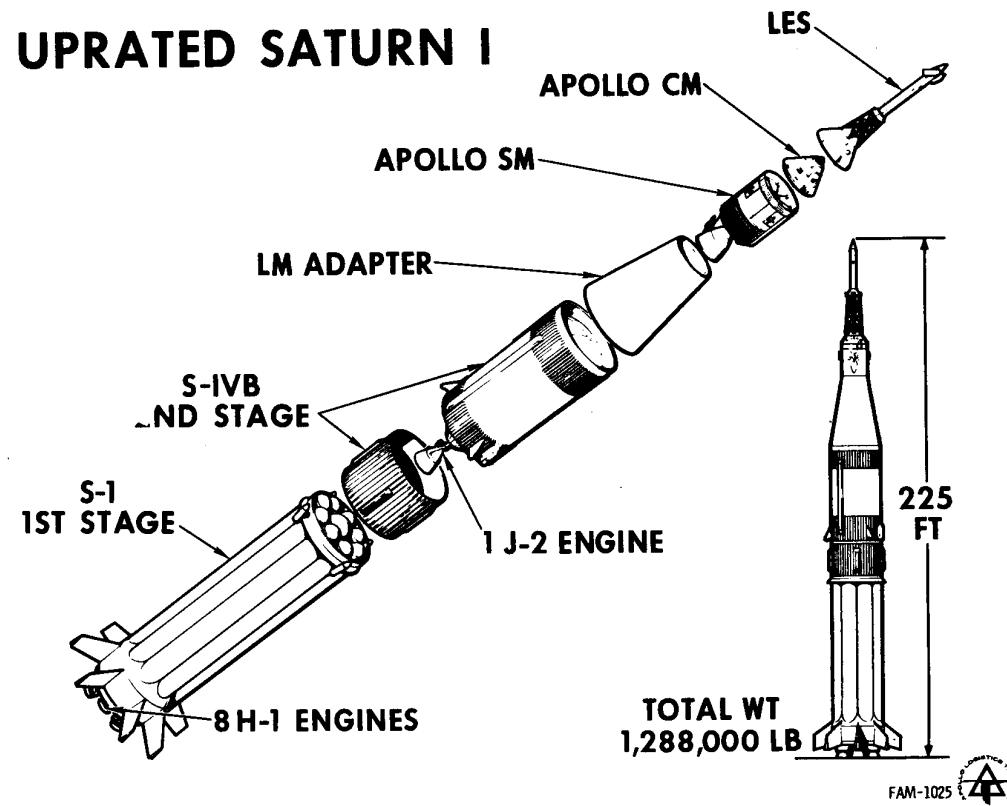
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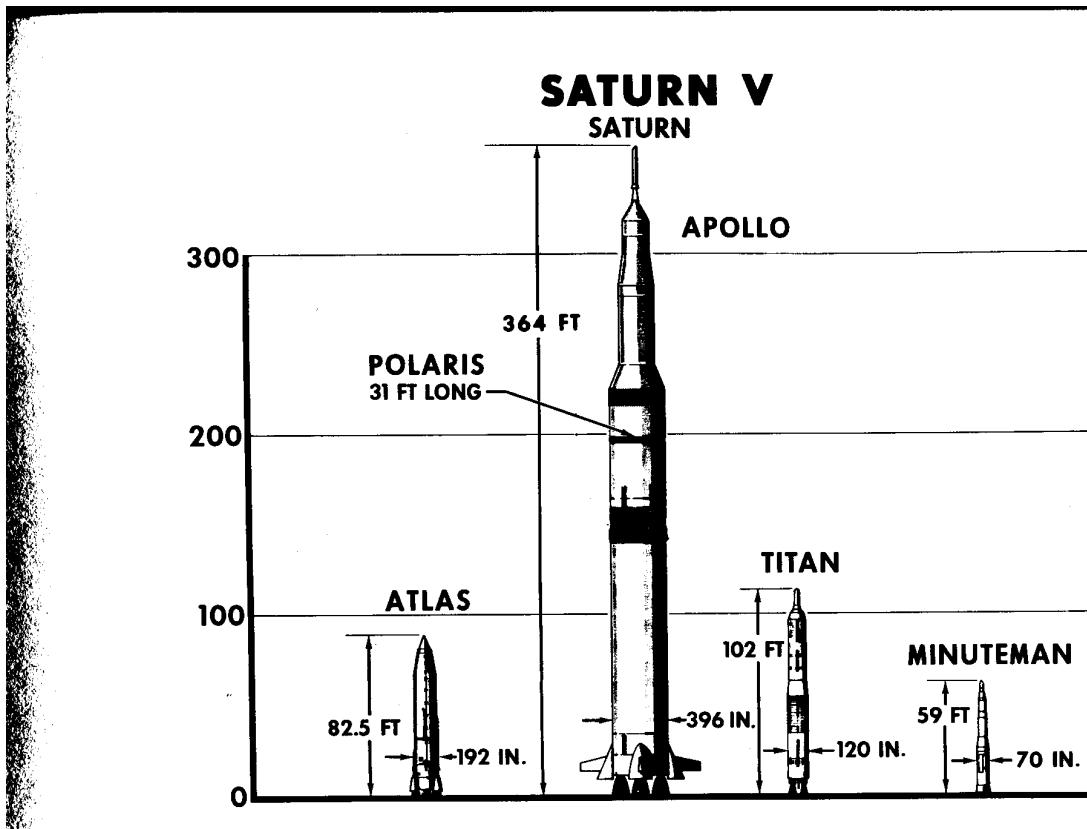
SATURN V

1



UPRATED SATURN I

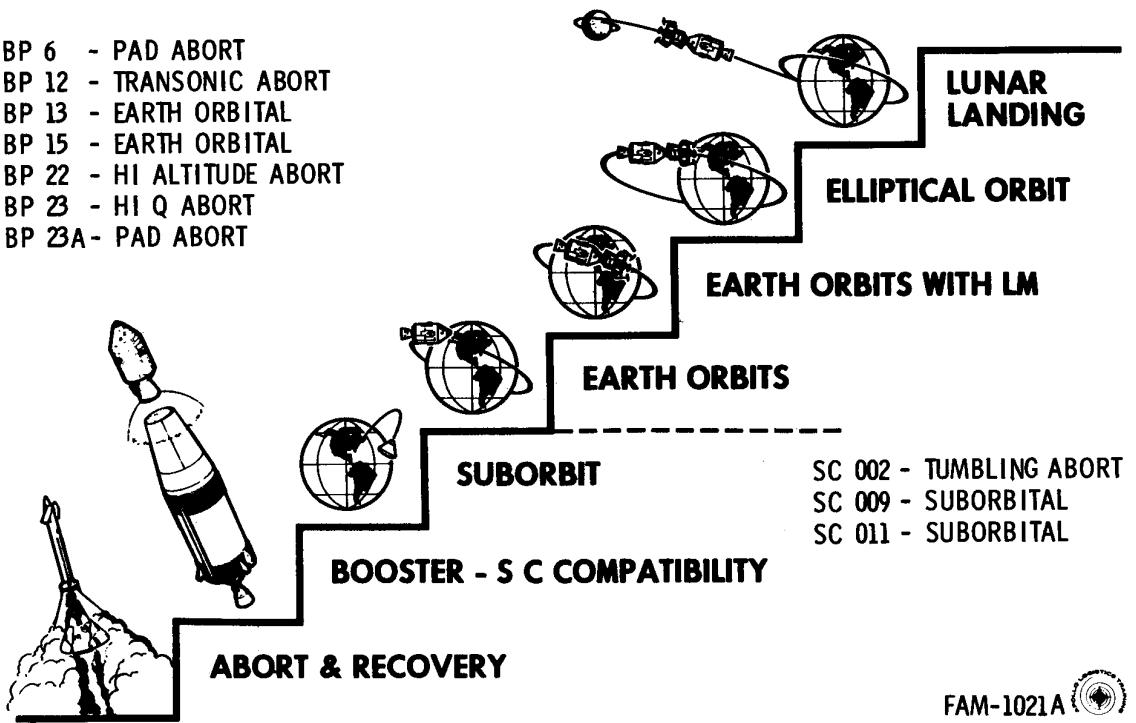




FAM-1014B

SPACECRAFT DEVELOPMENT FLIGHT CATEGORIES MAJOR STEPS TO ULTIMATE MISSION

BP 6 - PAD ABORT
BP 12 - TRANSONIC ABORT
BP 13 - EARTH ORBITAL
BP 15 - EARTH ORBITAL
BP 22 - HI ALTITUDE ABORT
BP 23 - HI Q ABORT
BP 23A - PAD ABORT

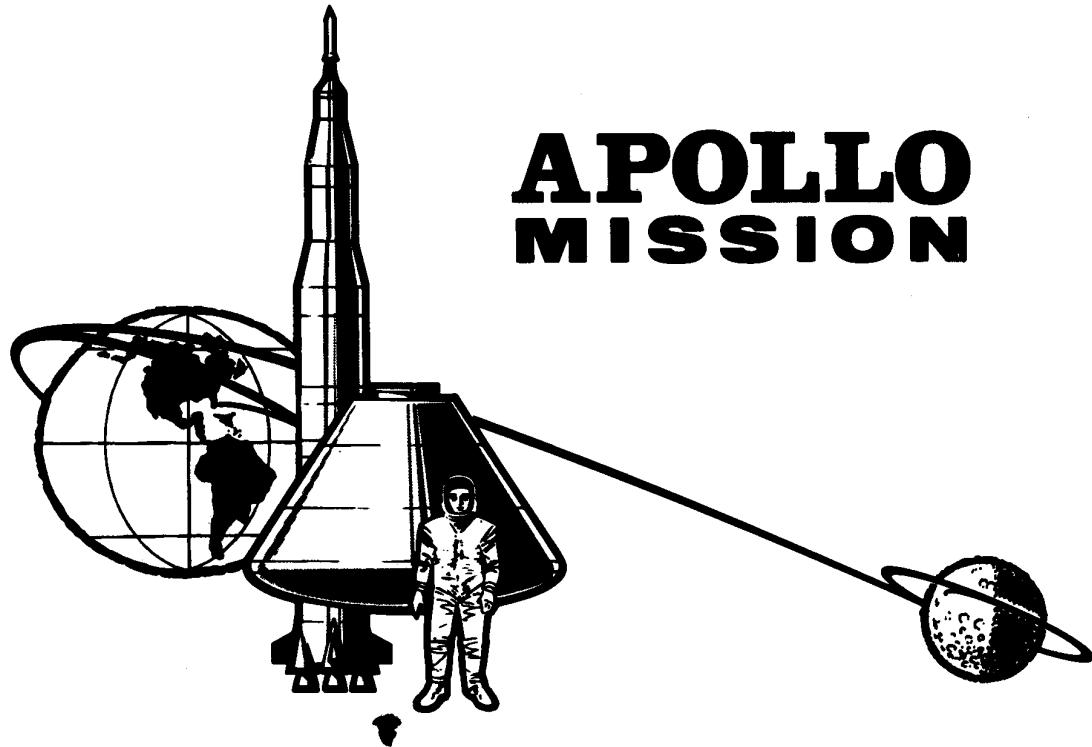


FAM-1021A

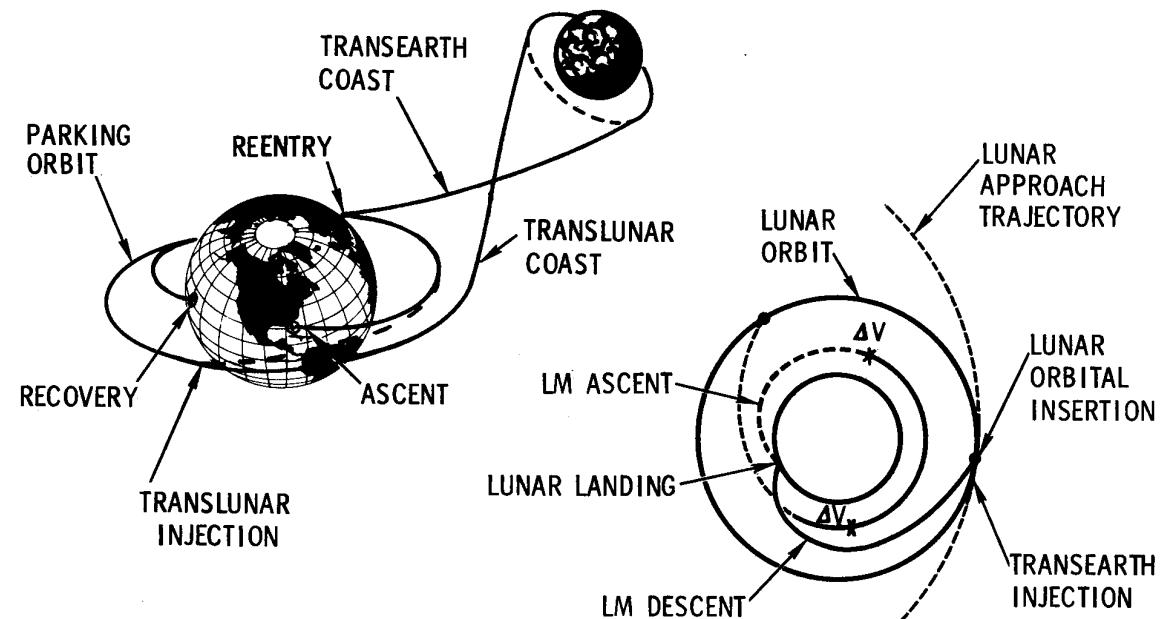
S85AP83038

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APOLLO MISSION



LUNAR MISSION

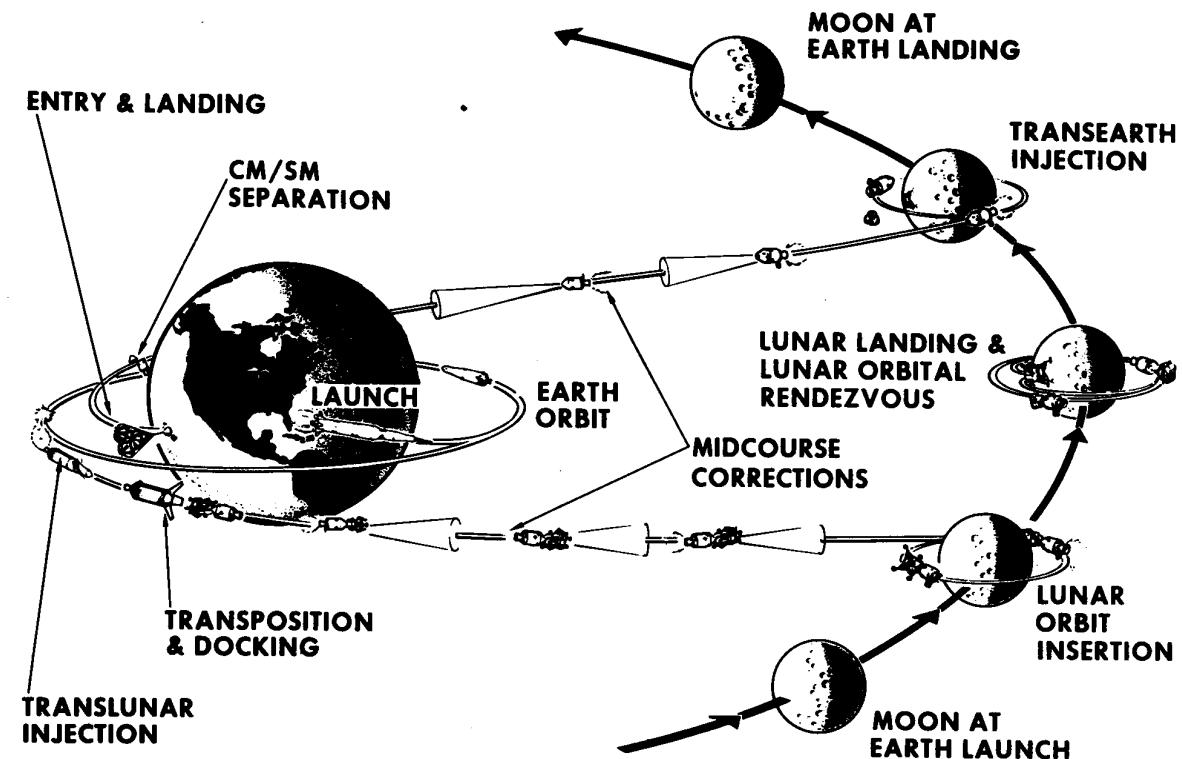


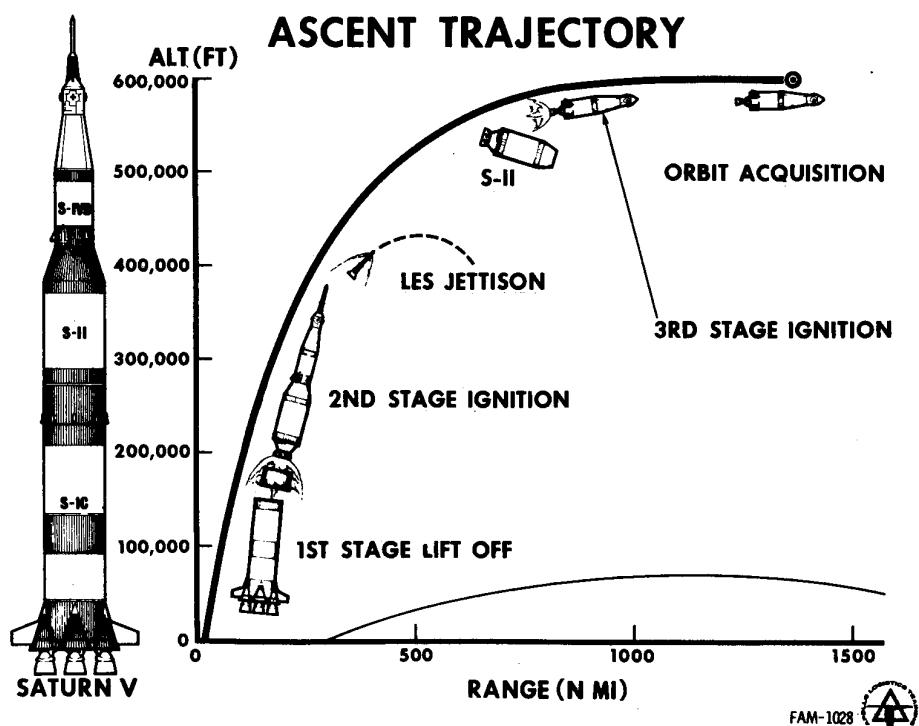
F-313C

APOLLO MISSION PLAN

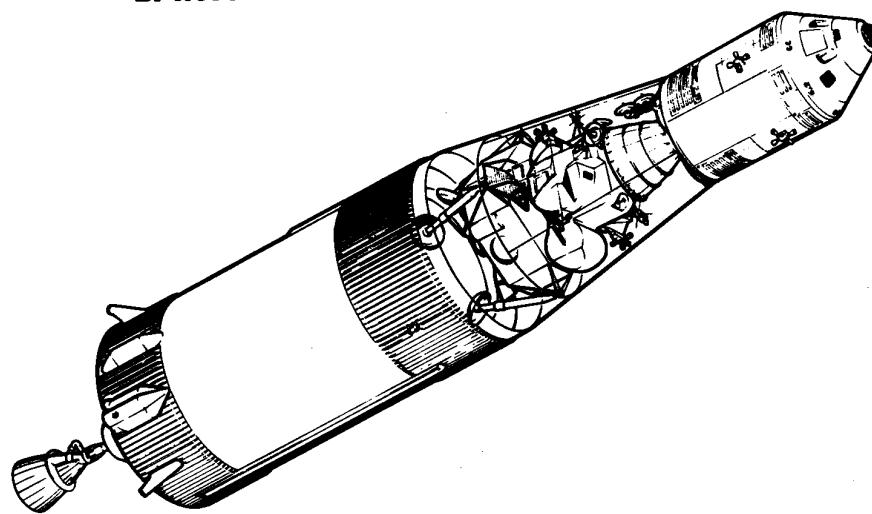
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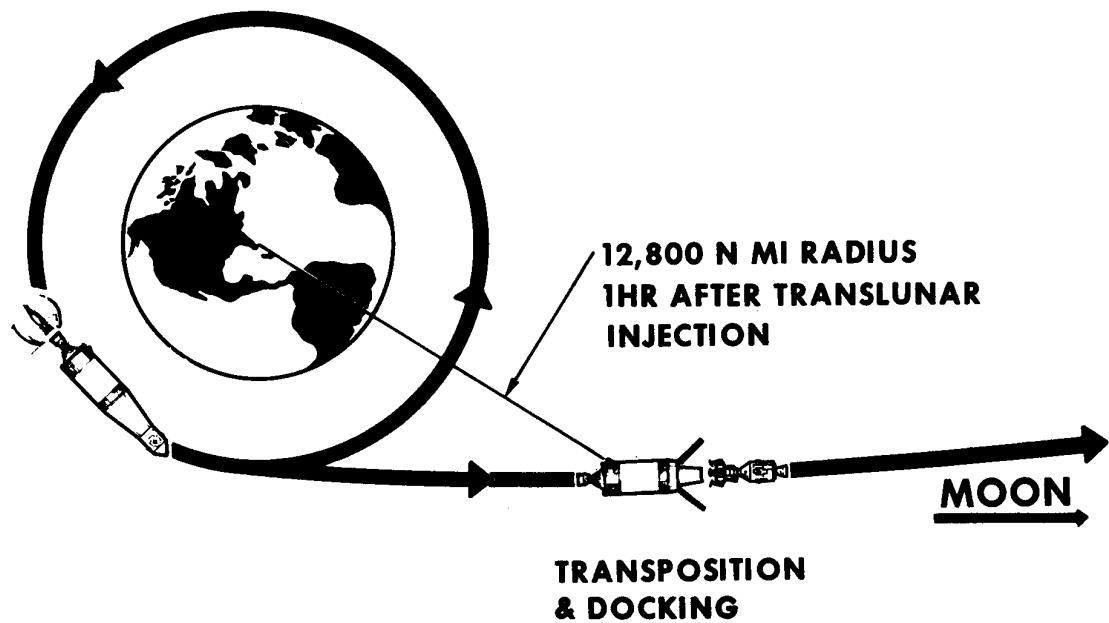
**APOLLO SPACECRAFT/3RD STAGE
EARTH ORBITAL CONFIGURATION**



FAM-1029 

S125AP84499

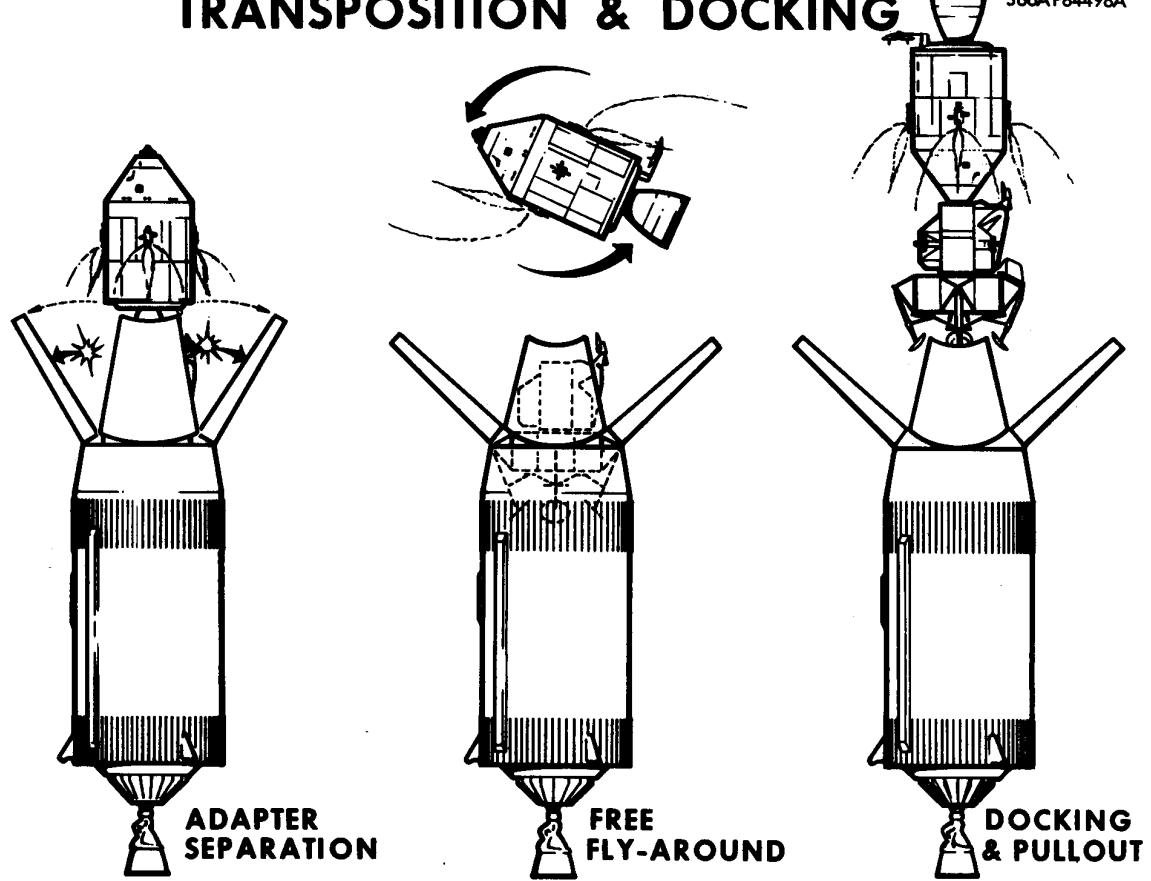
TRANSLUNAR INJECTION & COAST



TRANSPOSITION & DOCKING

S66AP84498A

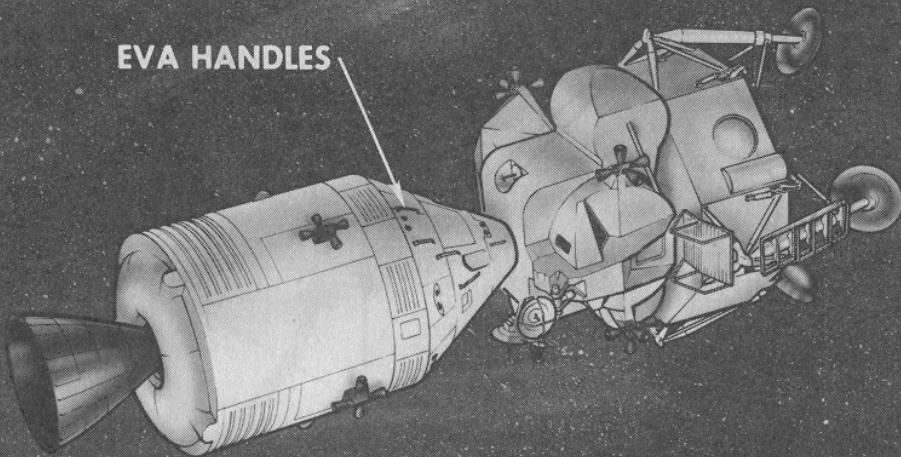
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APOLLO SPACECRAFT
TRANSLUNAR CONFIGURATION

S47AP84497B

EVA HANDLES



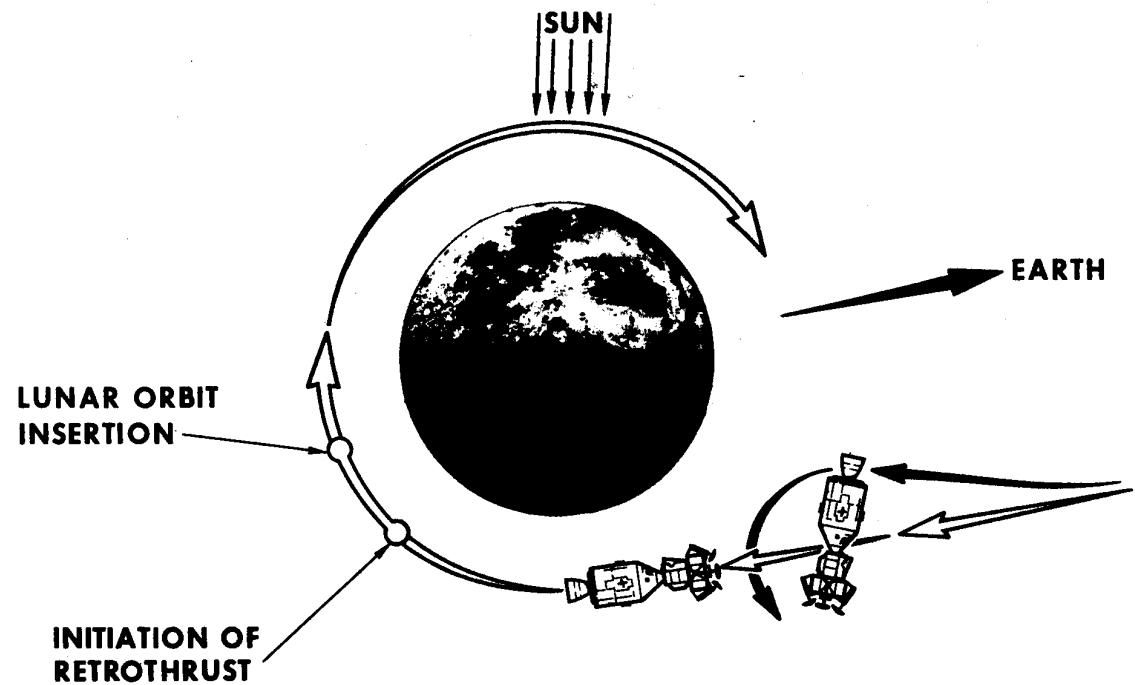


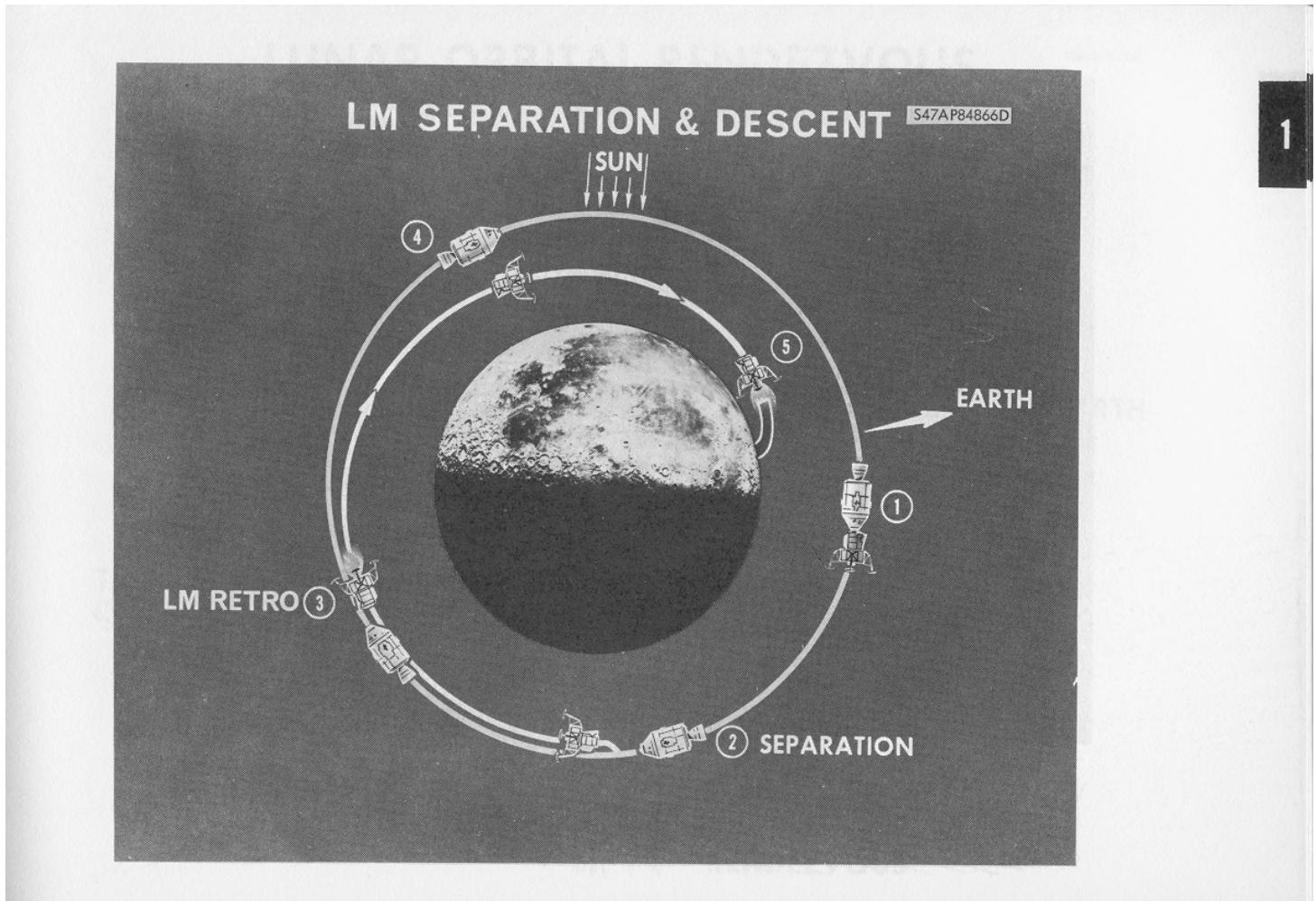
PROPOSED LUNAR LANDING

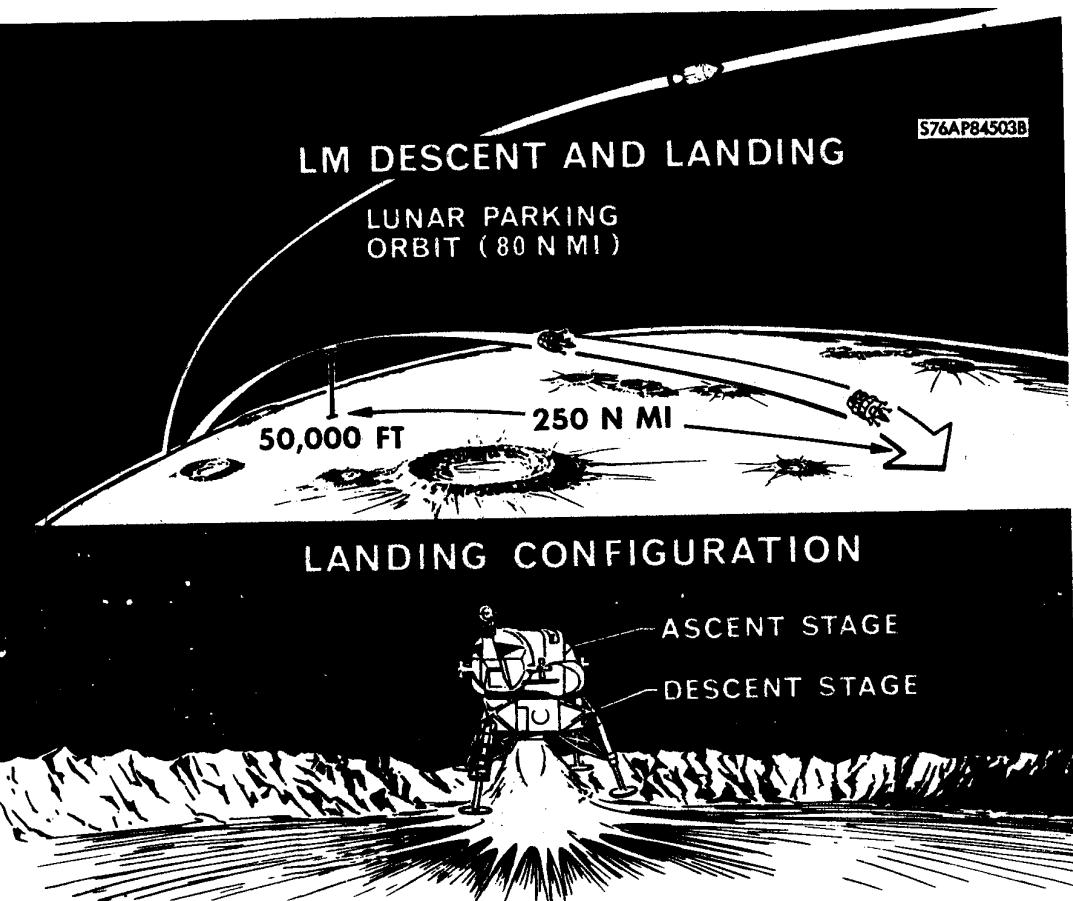
FAM-1022

LUNAR ORBIT INSERTION

S56AP85005C



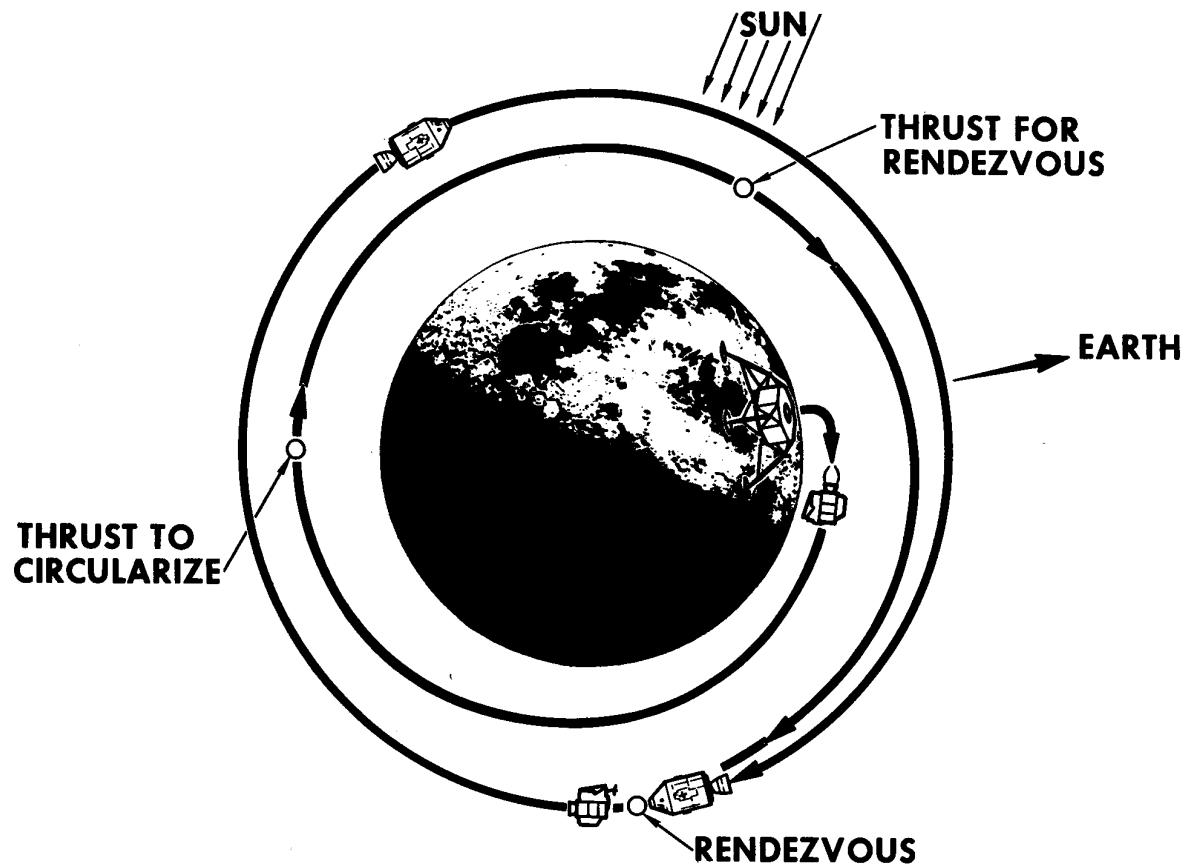


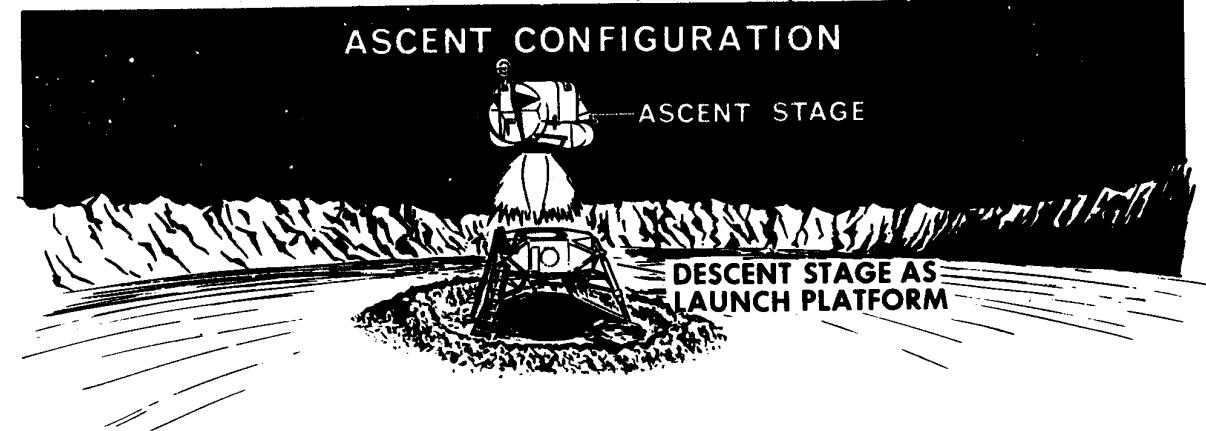
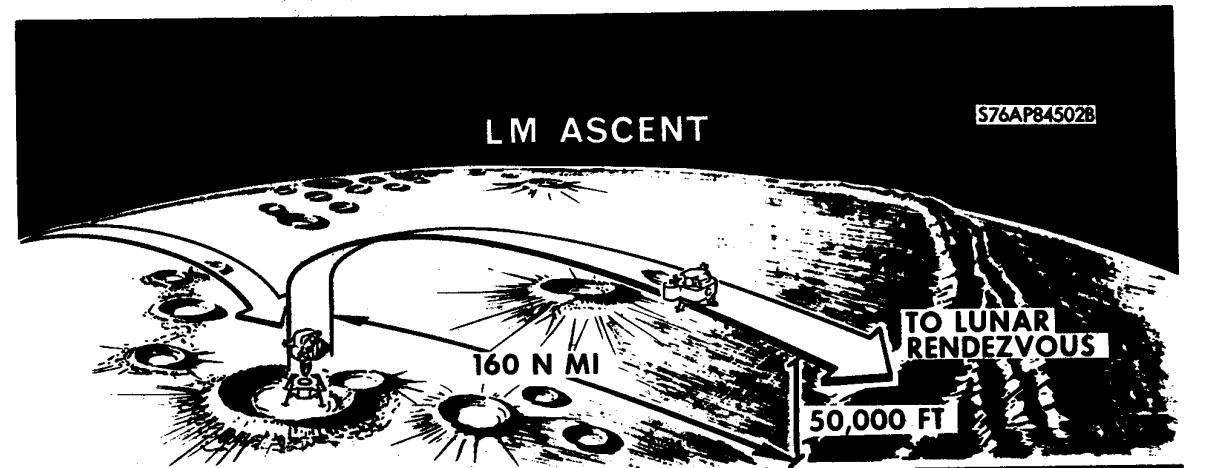


LUNAR ORBITAL RENDEZVOUS

556ASD10292C

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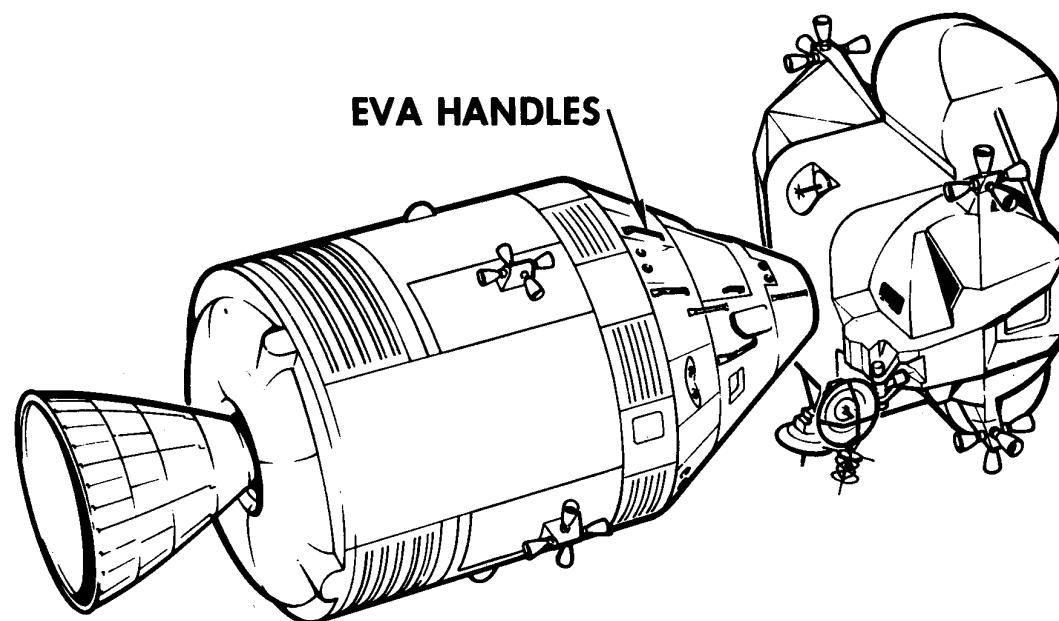




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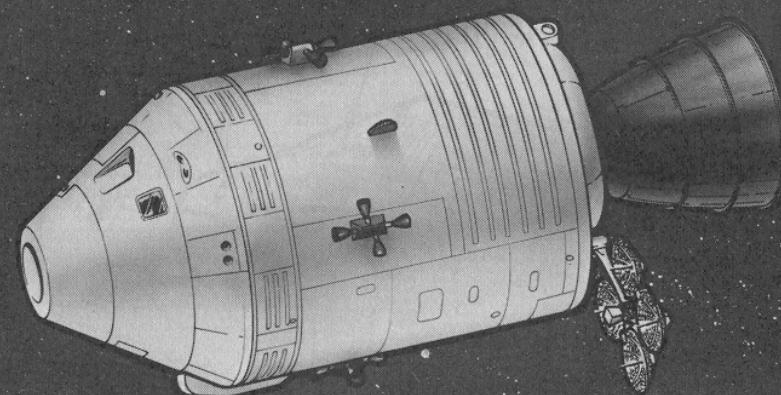
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APOLLO SPACECRAFT LOR CONFIGURATION

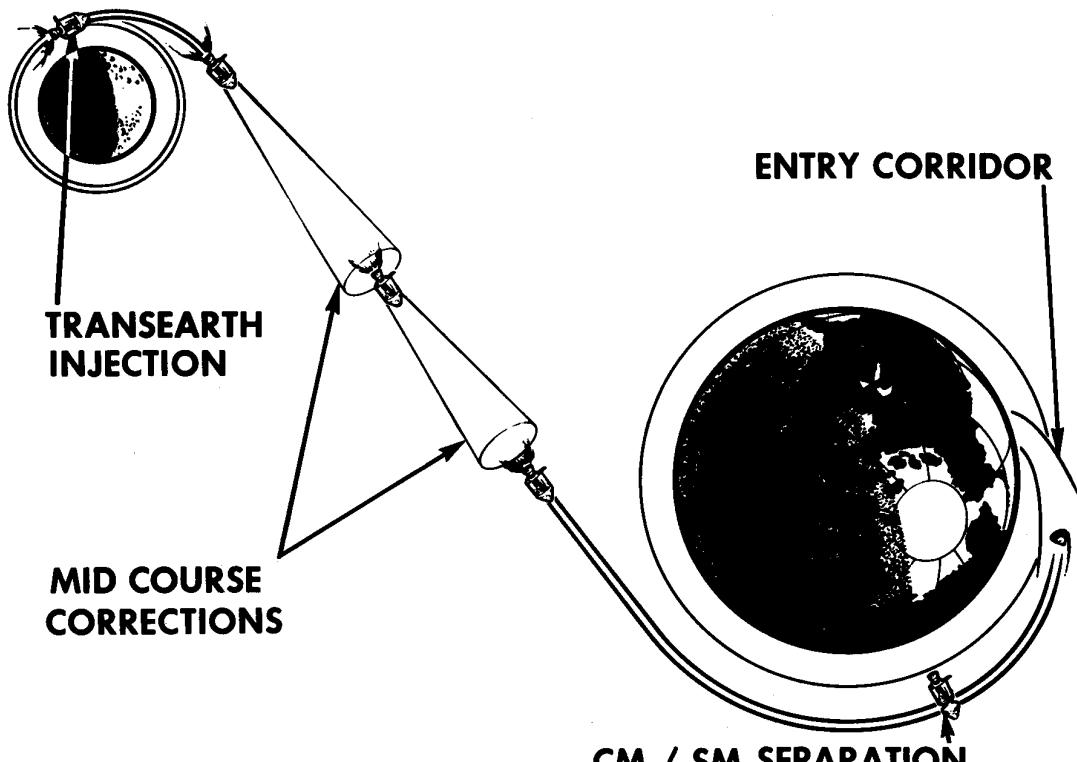


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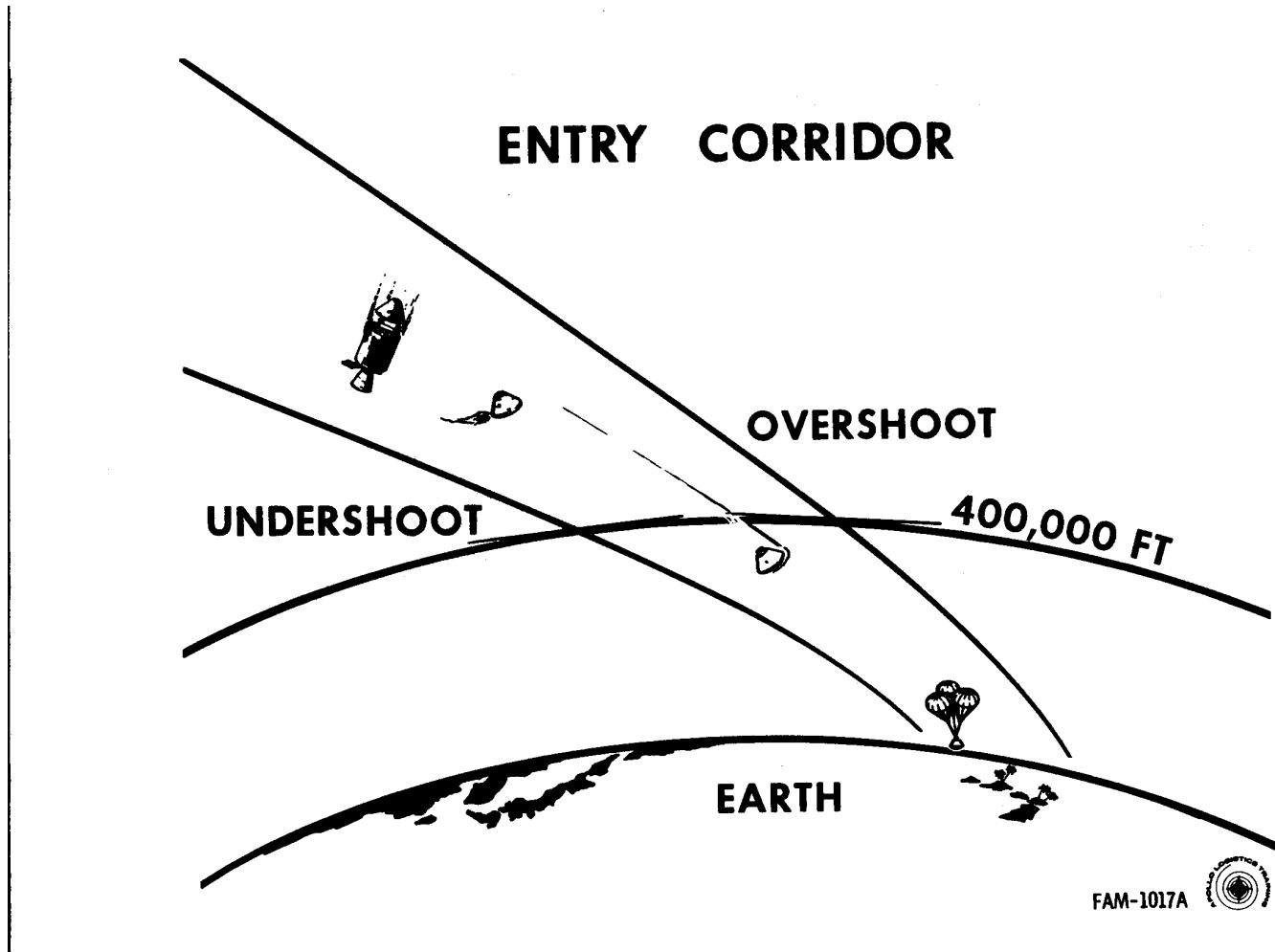
APOLLO TRANSEARTH CONFIGURATION



TRANSEARTH & ENTRY



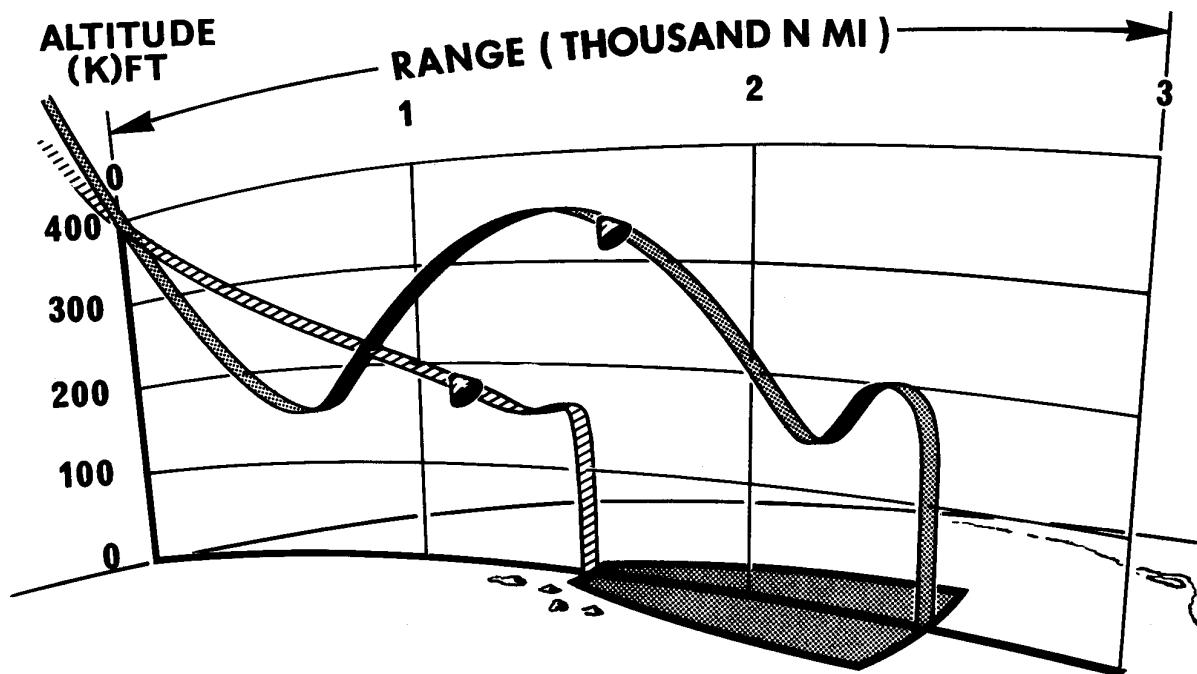
FAM-1018A



65ASD10884A

1

TYPICAL RE-ENTRY RANGES



RECOVERY

HEAT SHIELD
JETTISONED
BY 24,000 FEET

AFTER
TIME DELAY
DROGUE CHUTES
DEPLOYED-REEFED

DROGUE CHUTES RELEASED
AND MAIN CHUTES DEPLOYED
REEFED BY 10,000 FT

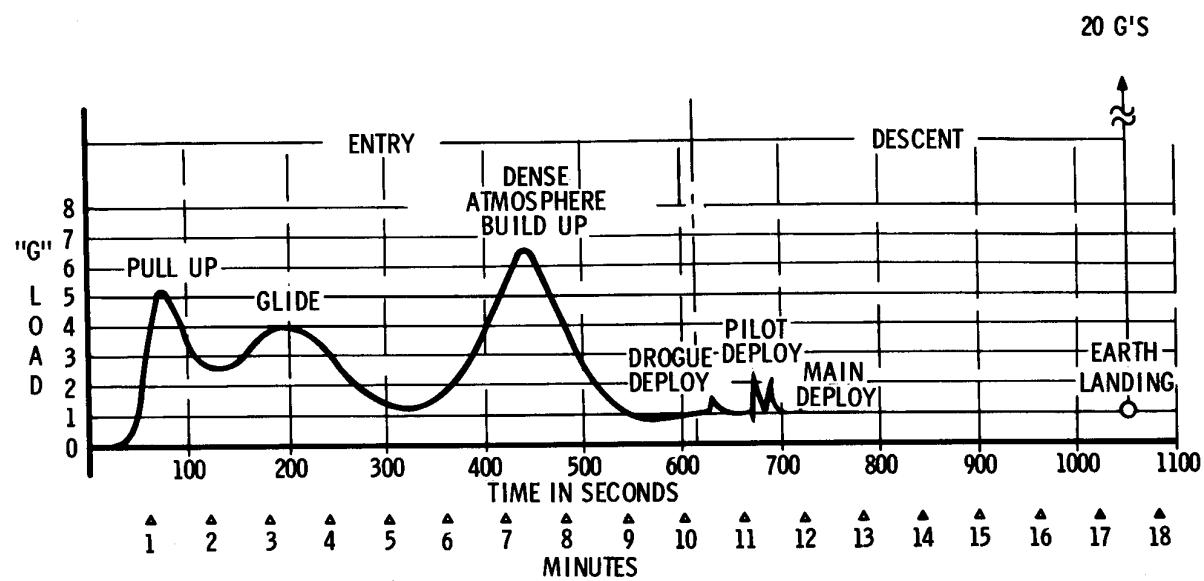
MAIN CHUTES FULLY
OPENED AFTER BEING
REEFED



FAM-1009B 

"G" FORCES, LUNAR MISSION, BLOCK II

ASTRONAUT SENSED



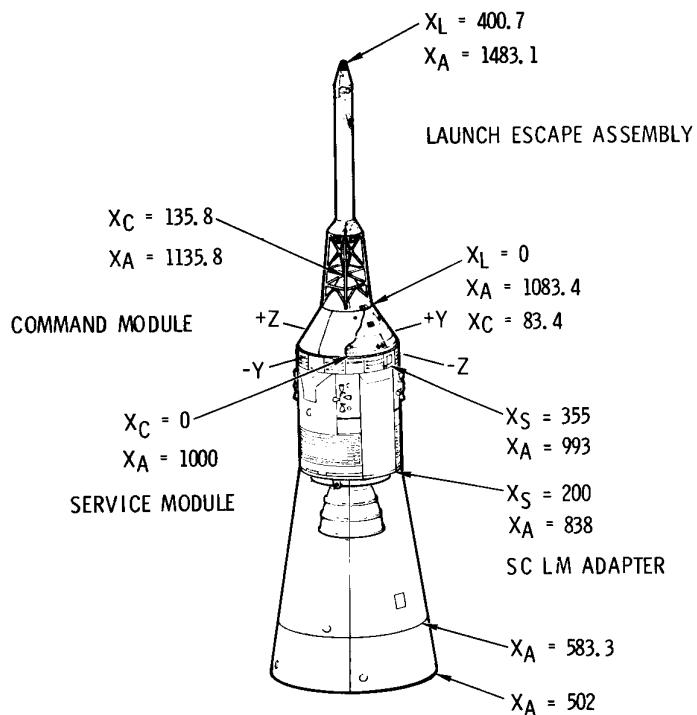
REF DESIGN REFERENCE MISSION, LED-540-12 dtd OCT 64

FAM-1016

STRUCTURES

FAM-1515 

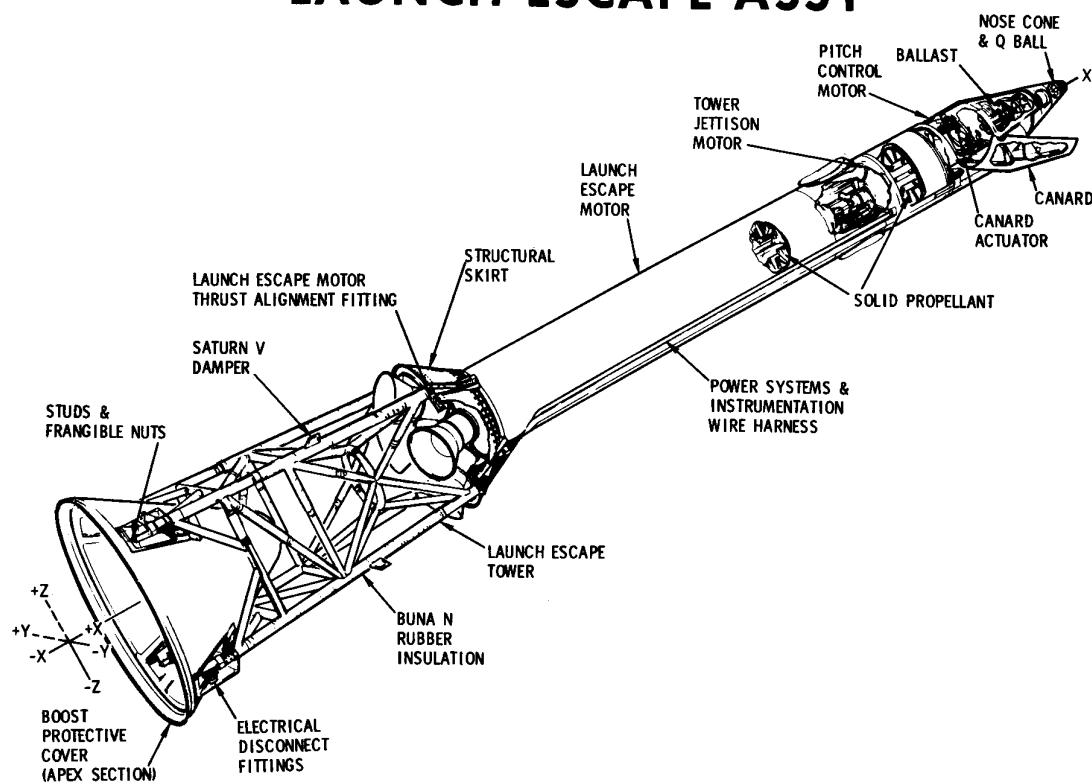
APOLLO INTEGRATED STATION & CSM AXIS BLOCK II



ST-107A 

LAUNCH ESCAPE ASSY

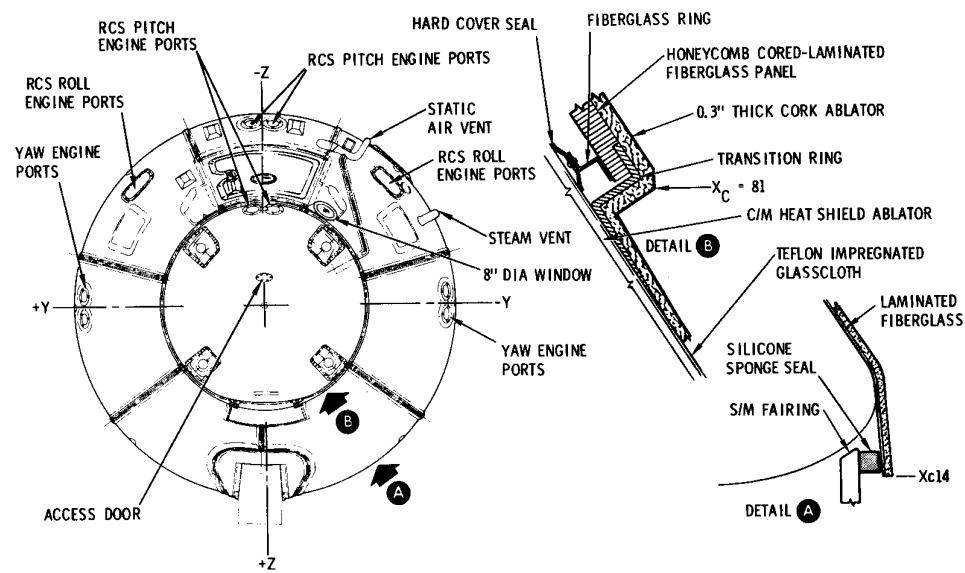
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SEQ-65C

BOOST PROTECTIVE COVER

BLOCK II CSM

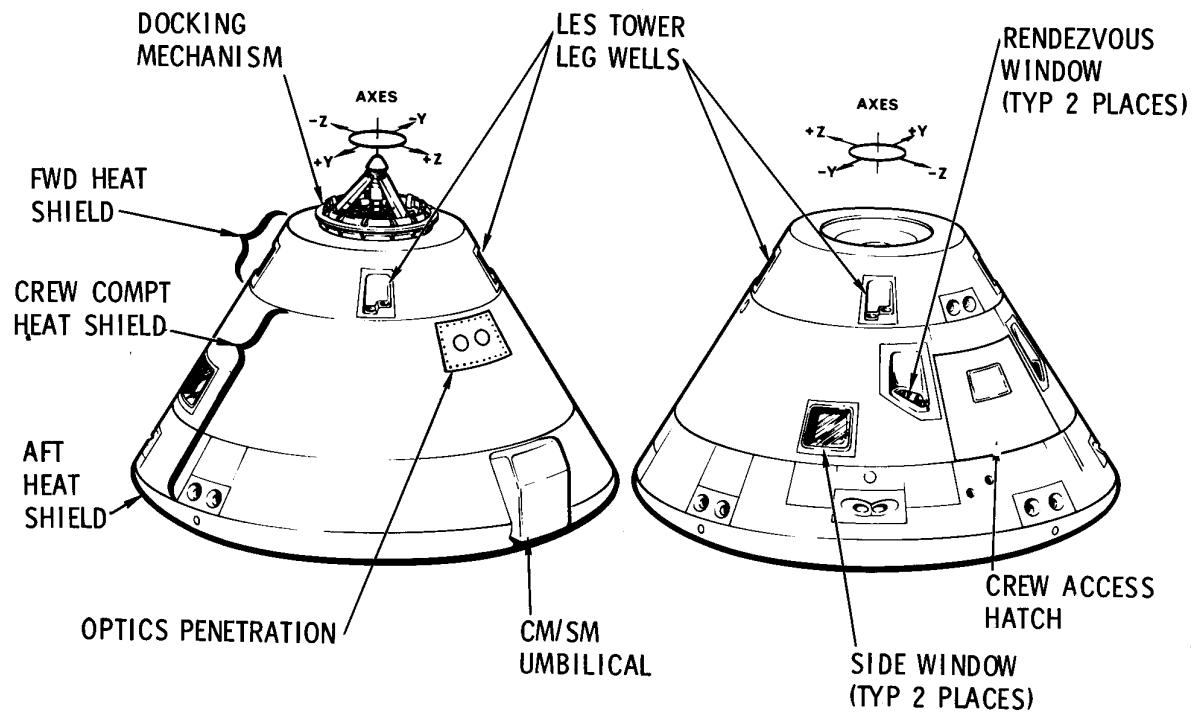


ST-568B

COMMAND MODULE EXTERIOR

BLOCK II

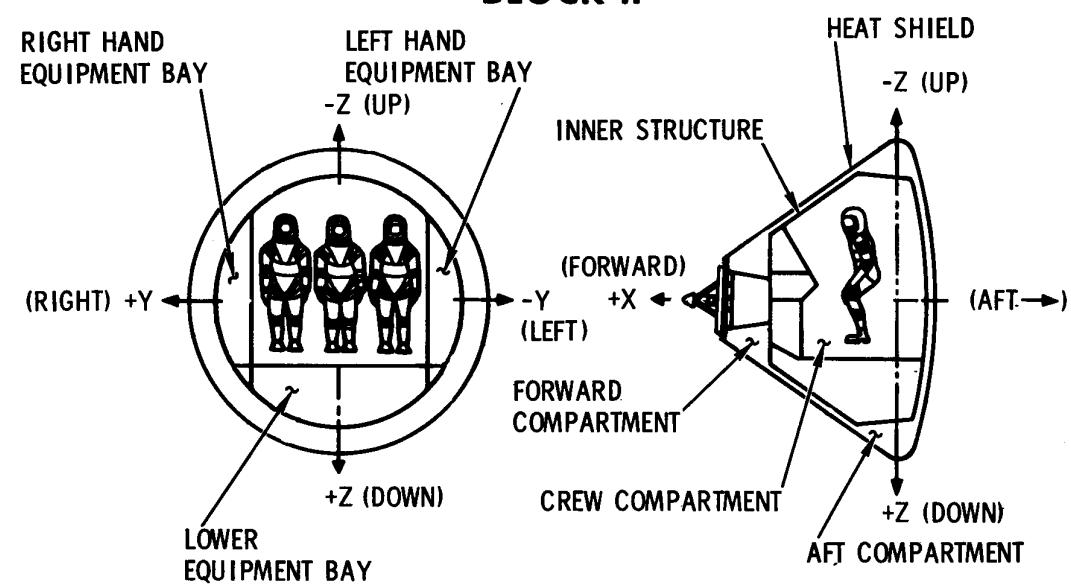
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ST-260B

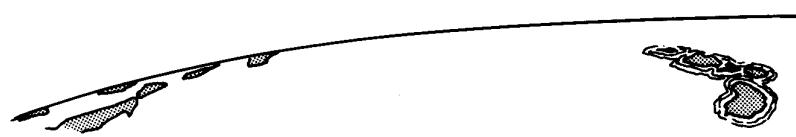
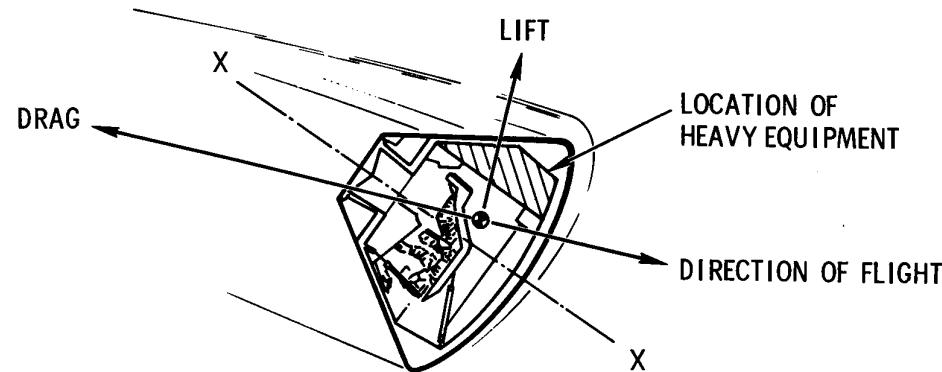


COMMAND MODULE COMPARTMENT ORIENTATION BLOCK II



COMMAND MODULE AERODYNAMICS

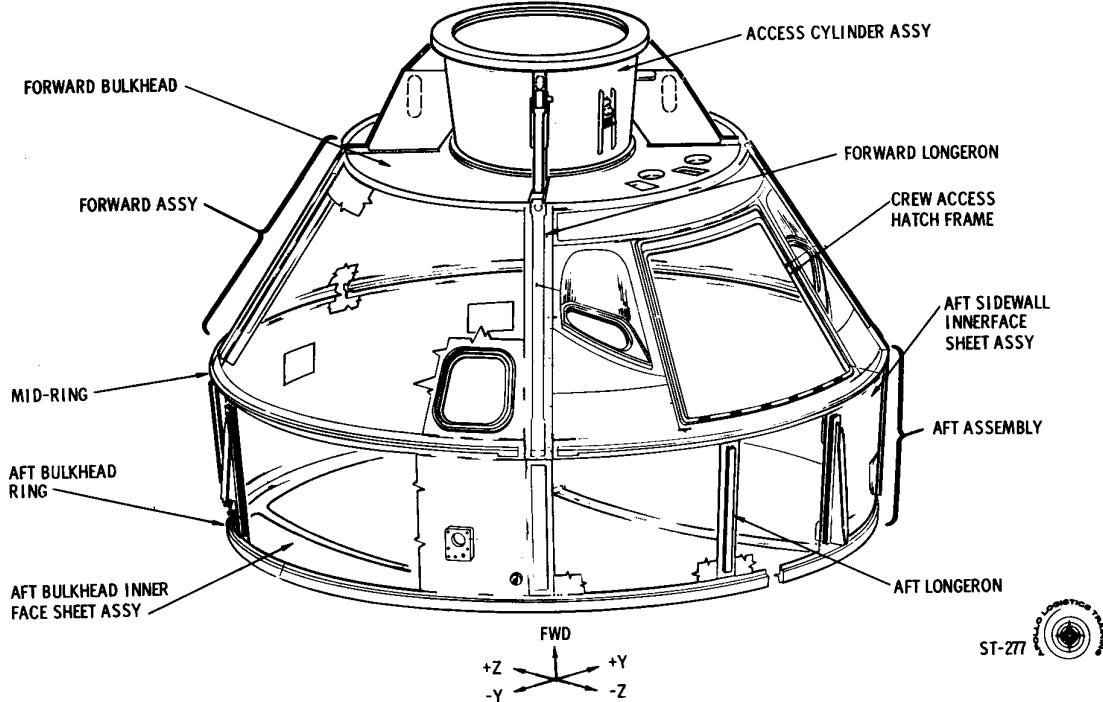
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FAM-1511

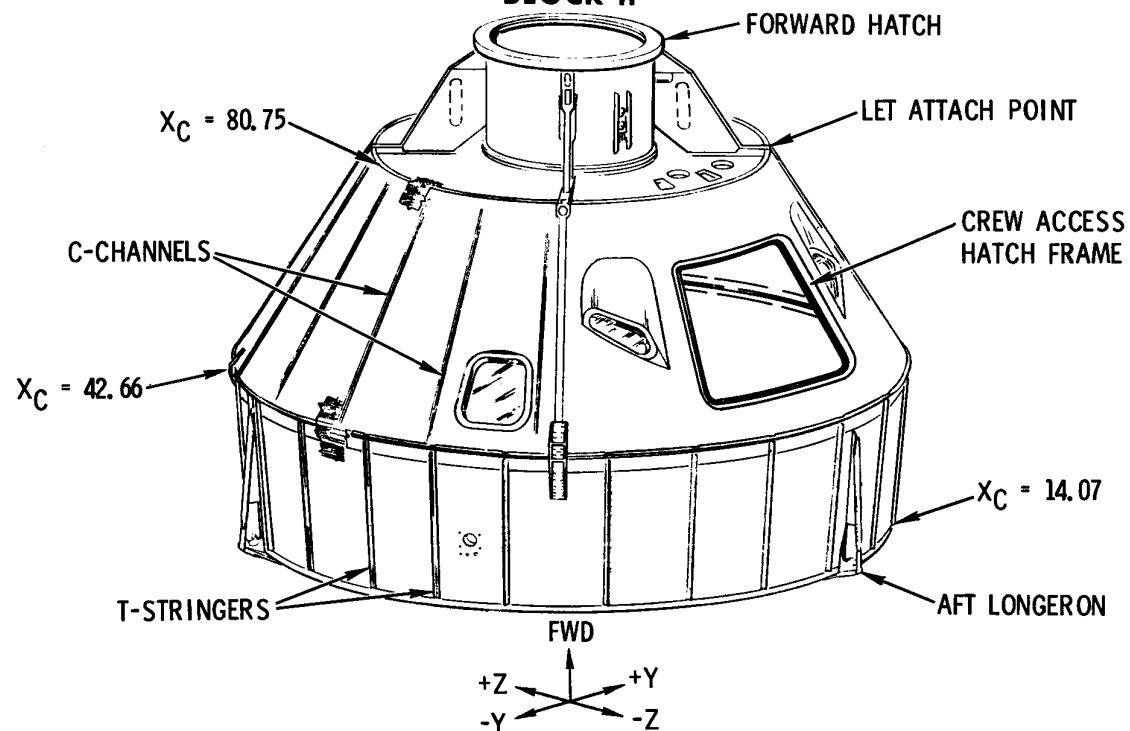
INNER STRUCTURE

INNER SHELL (BLOCK II)



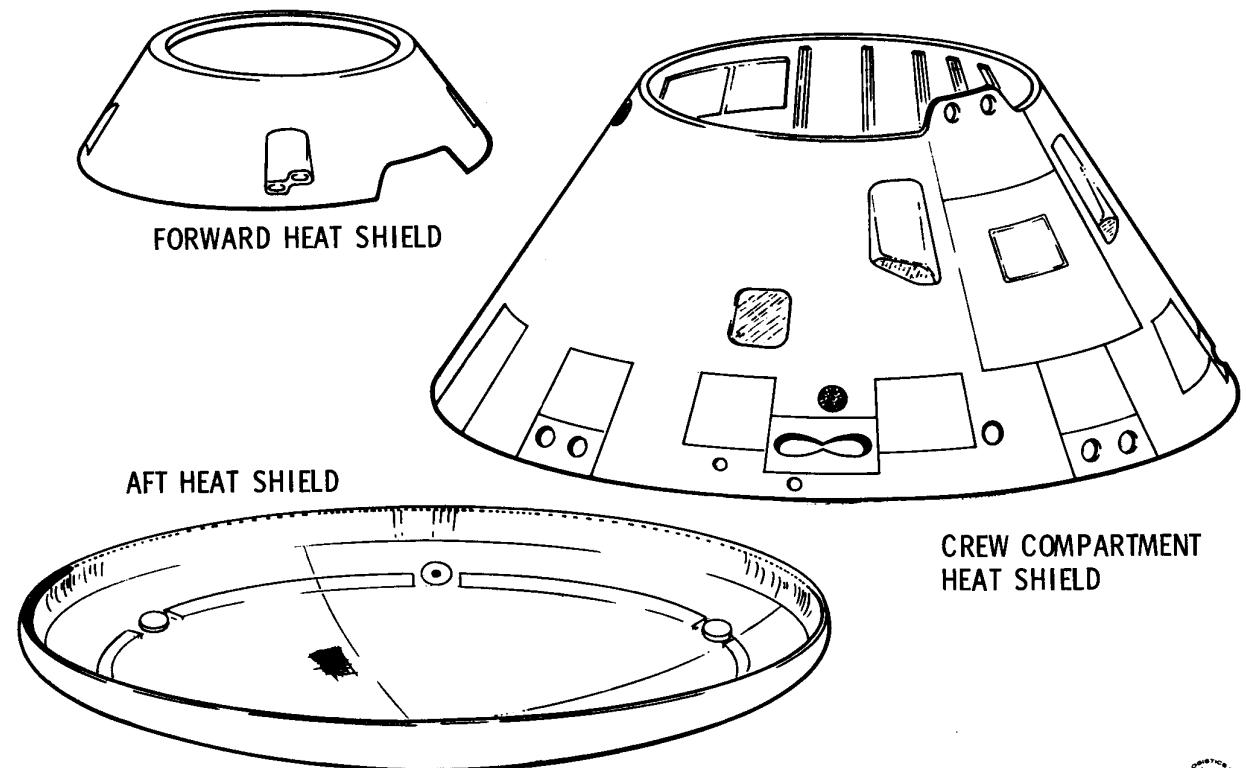
CM INNER STRUCTURE

BLOCK II



ST-278A

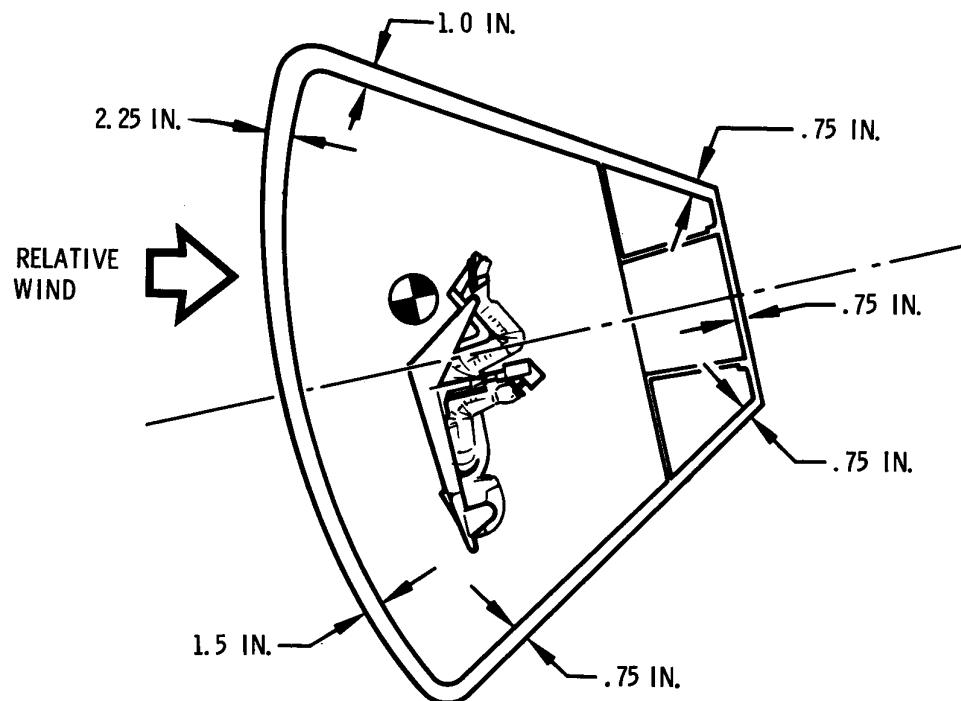
COMMAND MODULE HEAT SHIELDS BLOCK II



FAM-1504A 

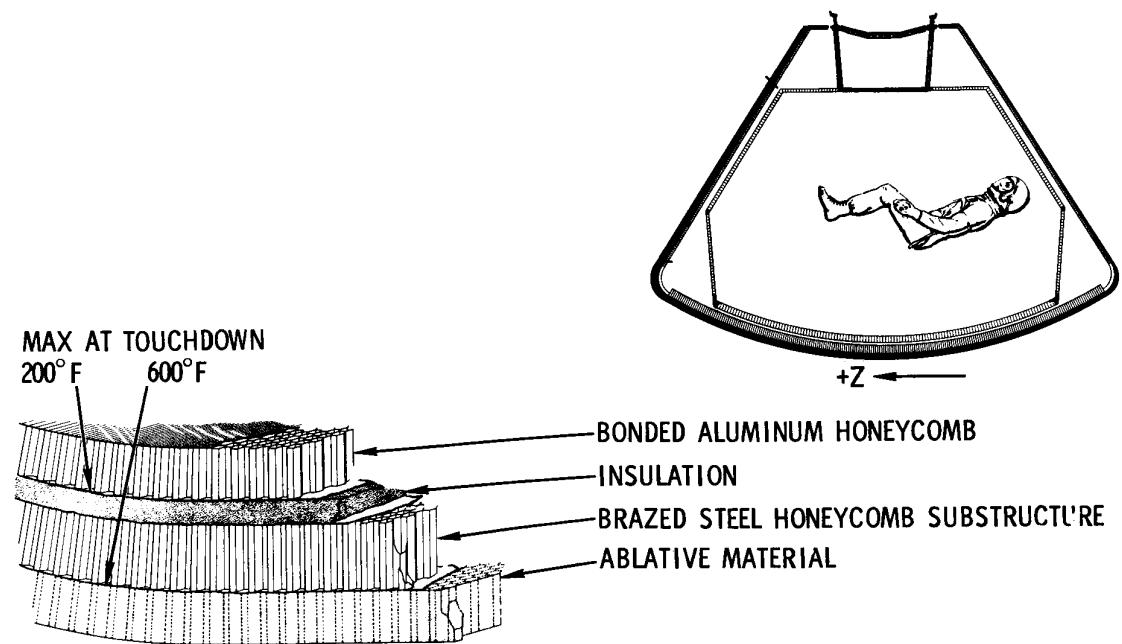
COMMAND MODULE ABLATIVE MATERIAL THICKNESS BLOCK II

2



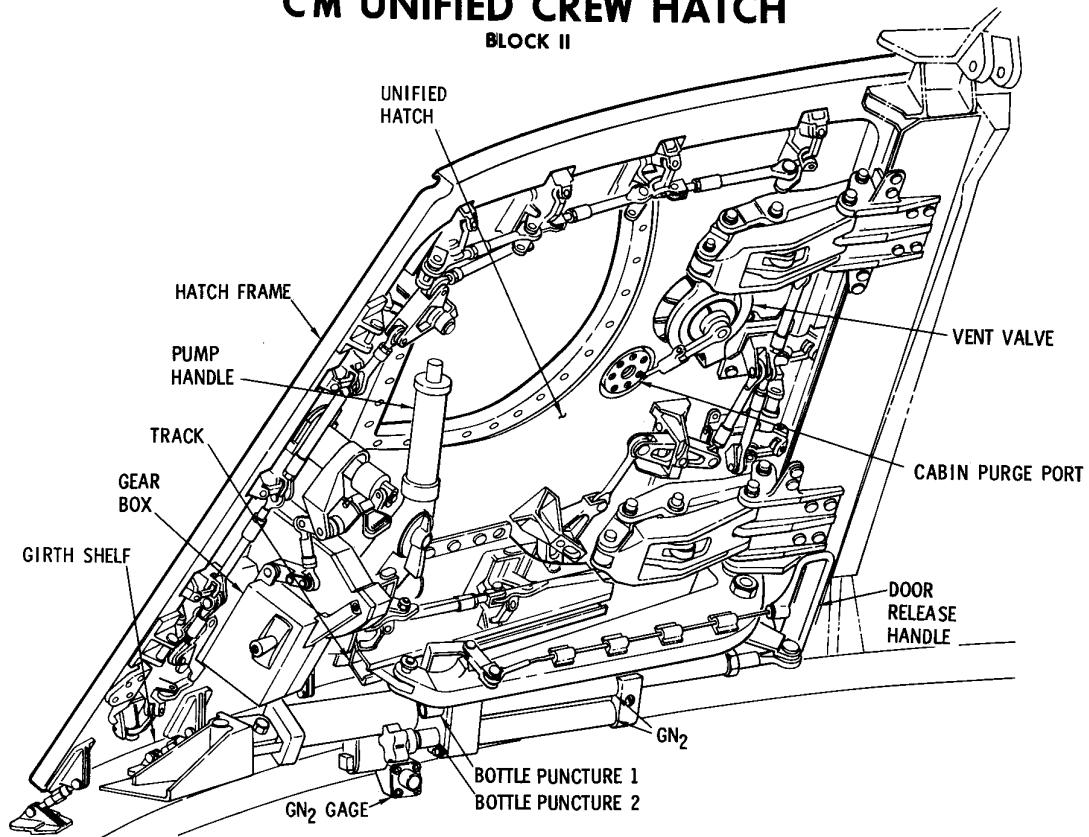
ST-530

COMMAND MODULE SKIN CONFIGURATION



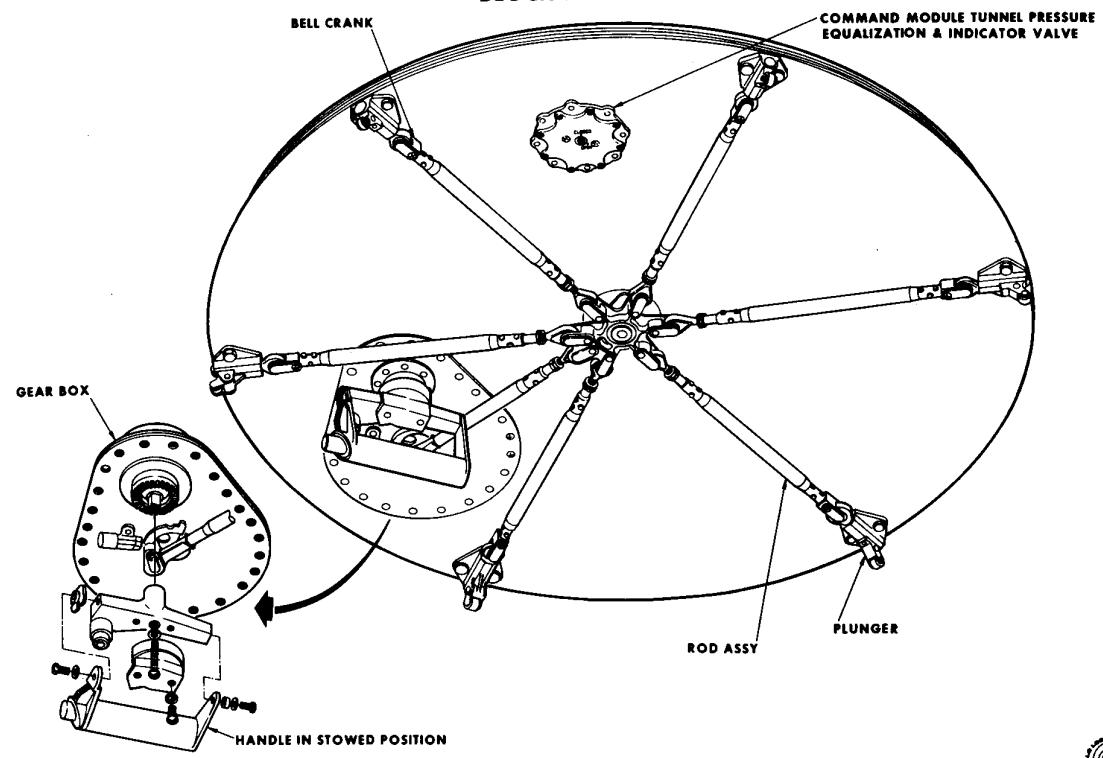
ST-206J 

CM UNIFIED CREW HATCH BLOCK II



FORWARD PRESSURE HATCH

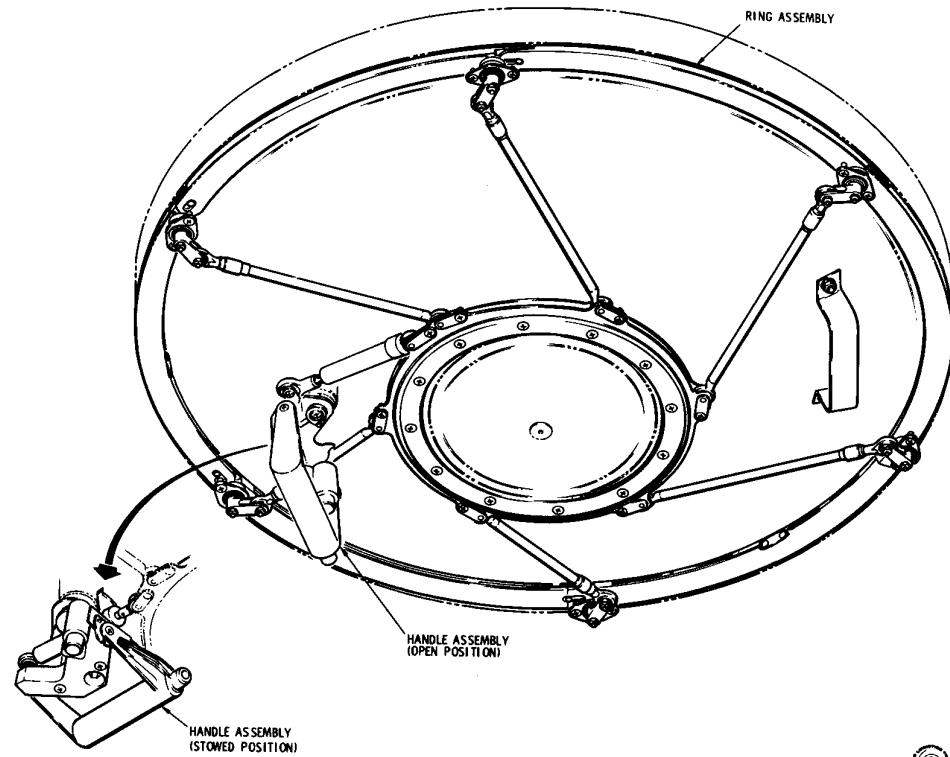
BLOCK II



ST-500A

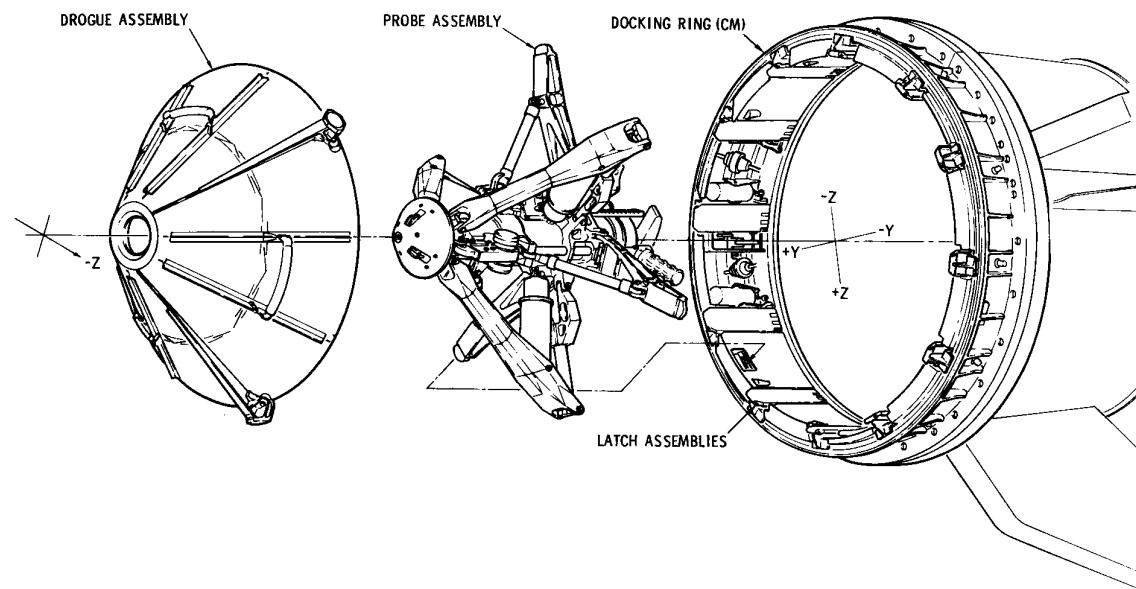
ABLATIVE HATCH

2

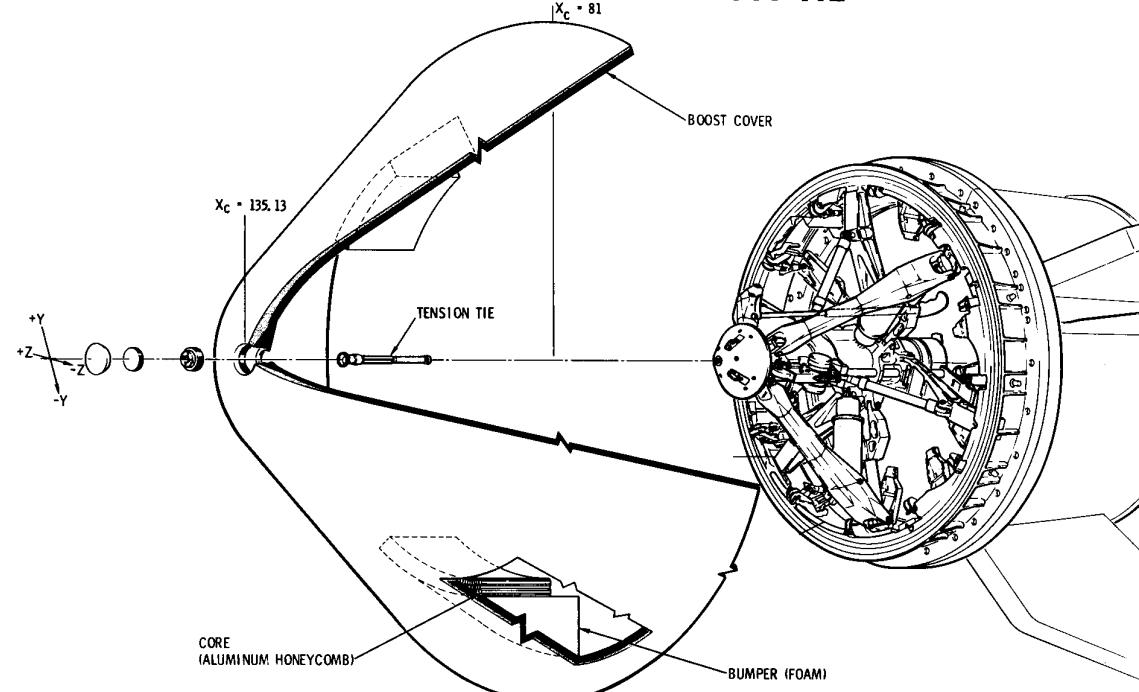


ST-501

PROBE INSTALLATION-DOCKING SYSTEM

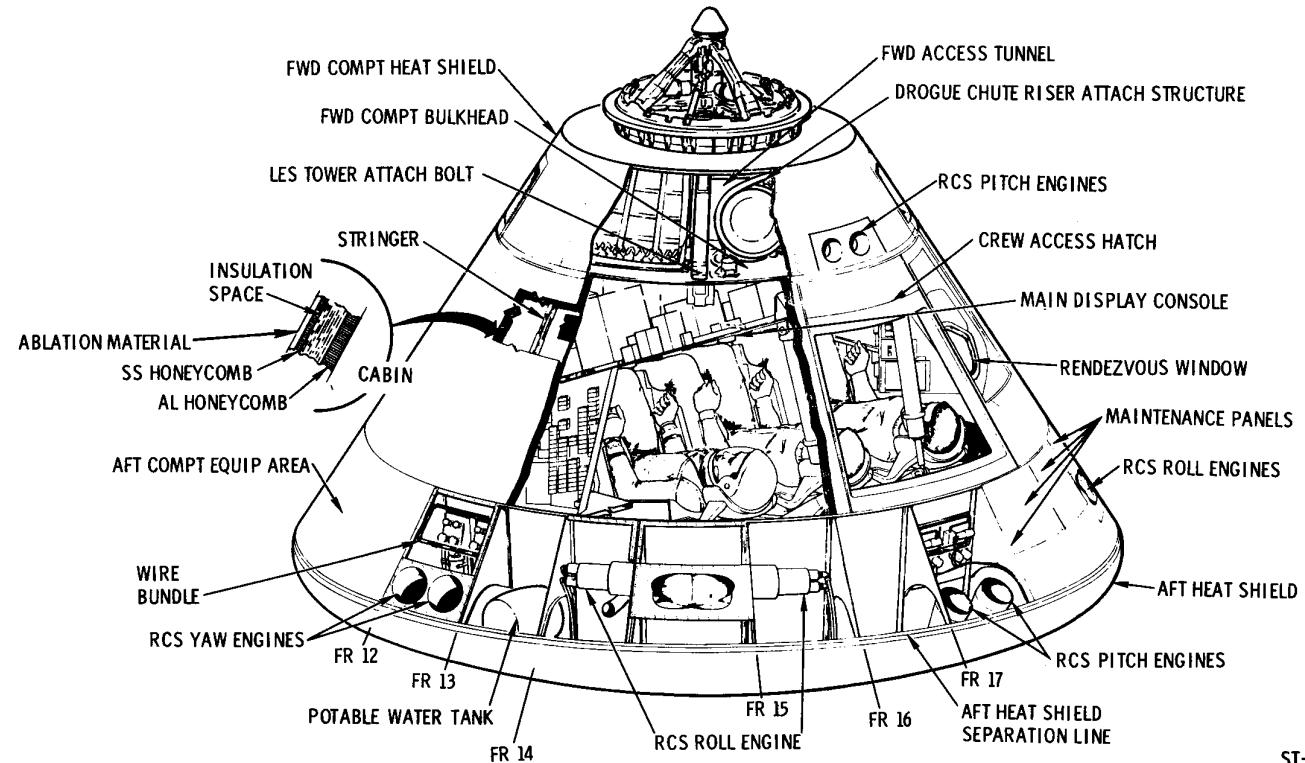


PROBE PASSIVE TENSION TIE



DKG-013A

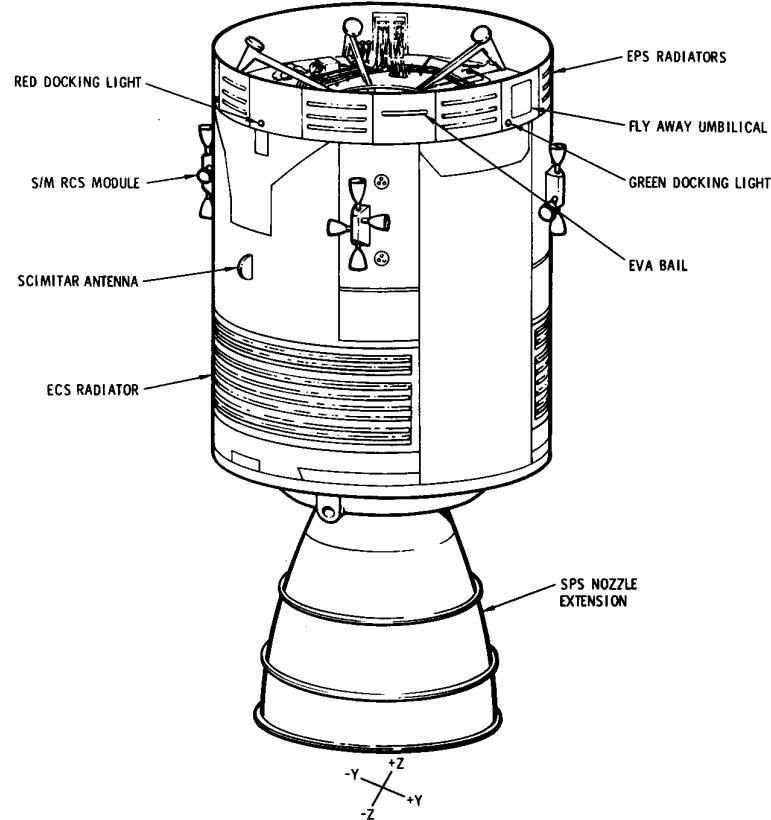
GENERAL ARRANGEMENT COMMAND MODULE (BLOCK II)



ST-230A

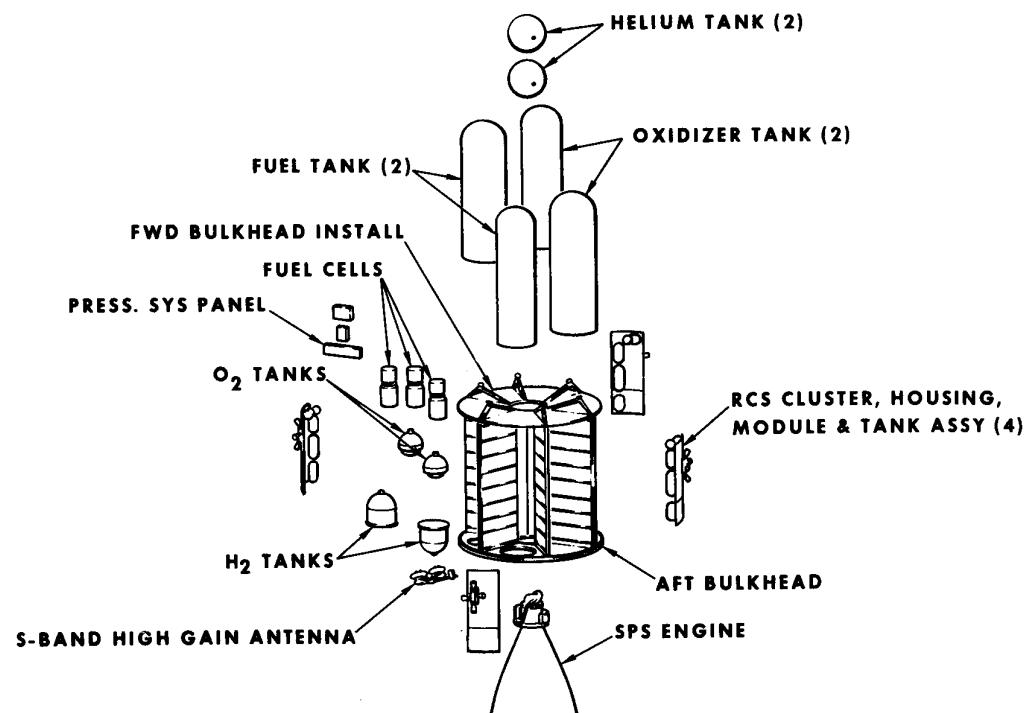


SERVICE MODULE BLOCK II



APOLLO SM SYSTEMS EQUIPMENT

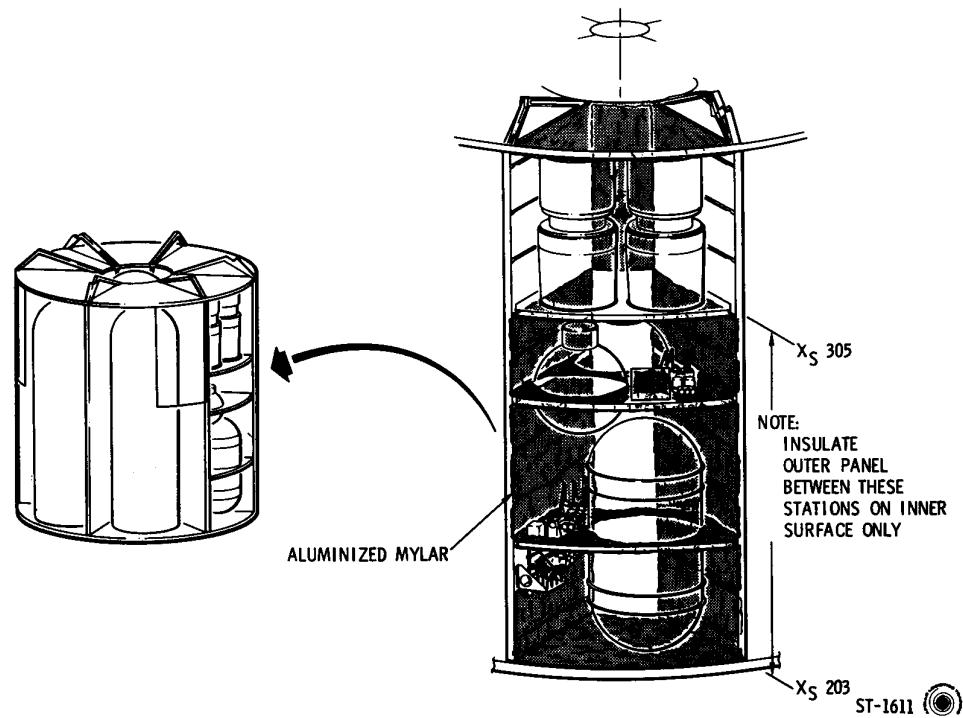
BLOCK II



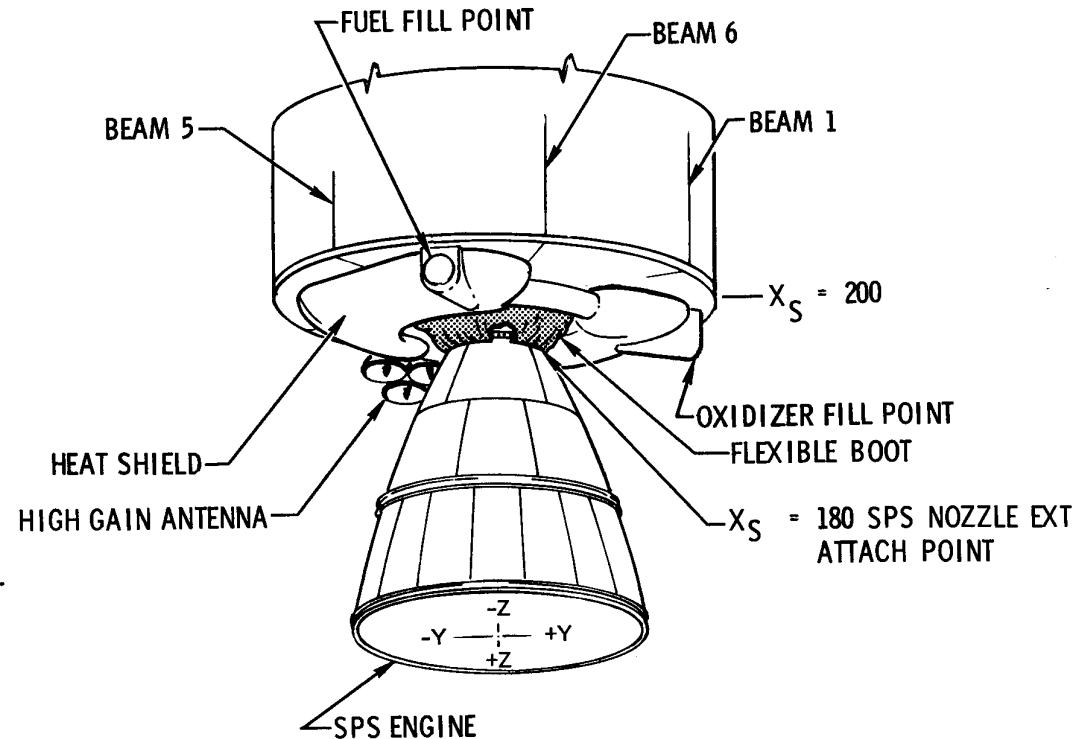
ST-1300

SM INSULATION TYPICAL FOR SECTOR IV

2



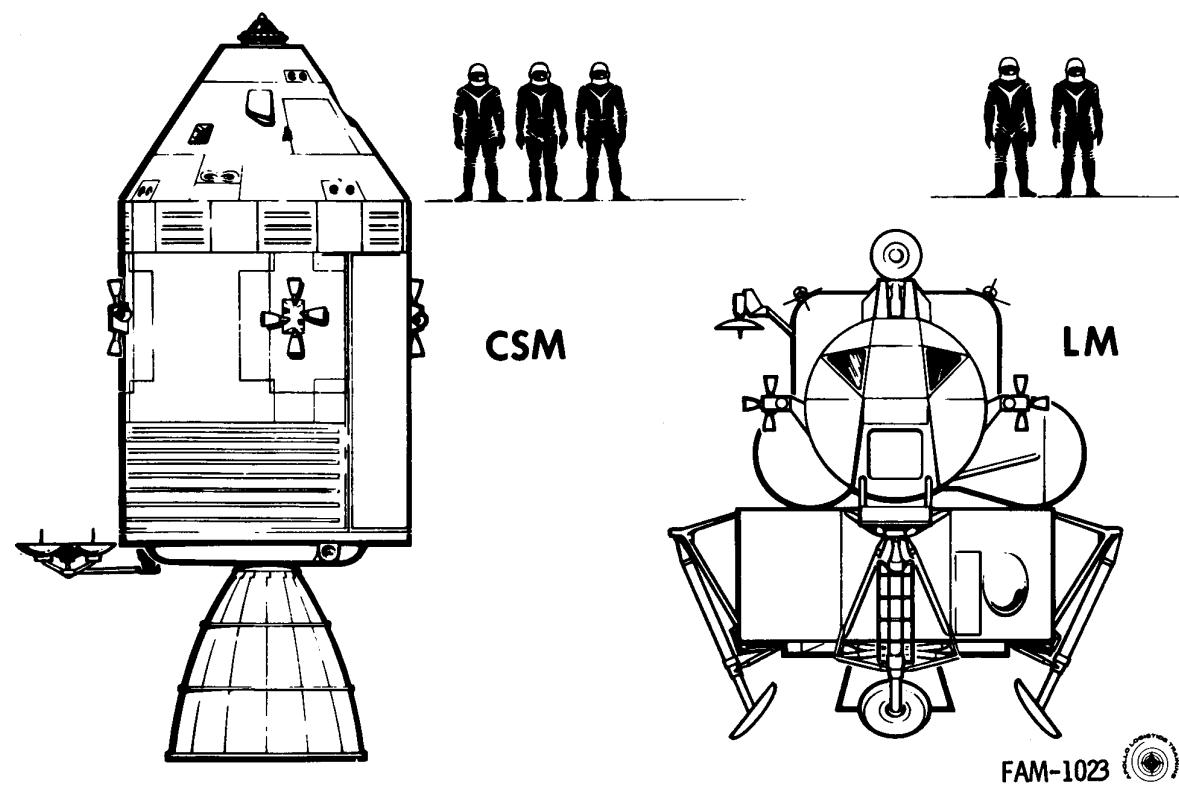
S/M SPS NOZZLE AND HEAT SHIELD



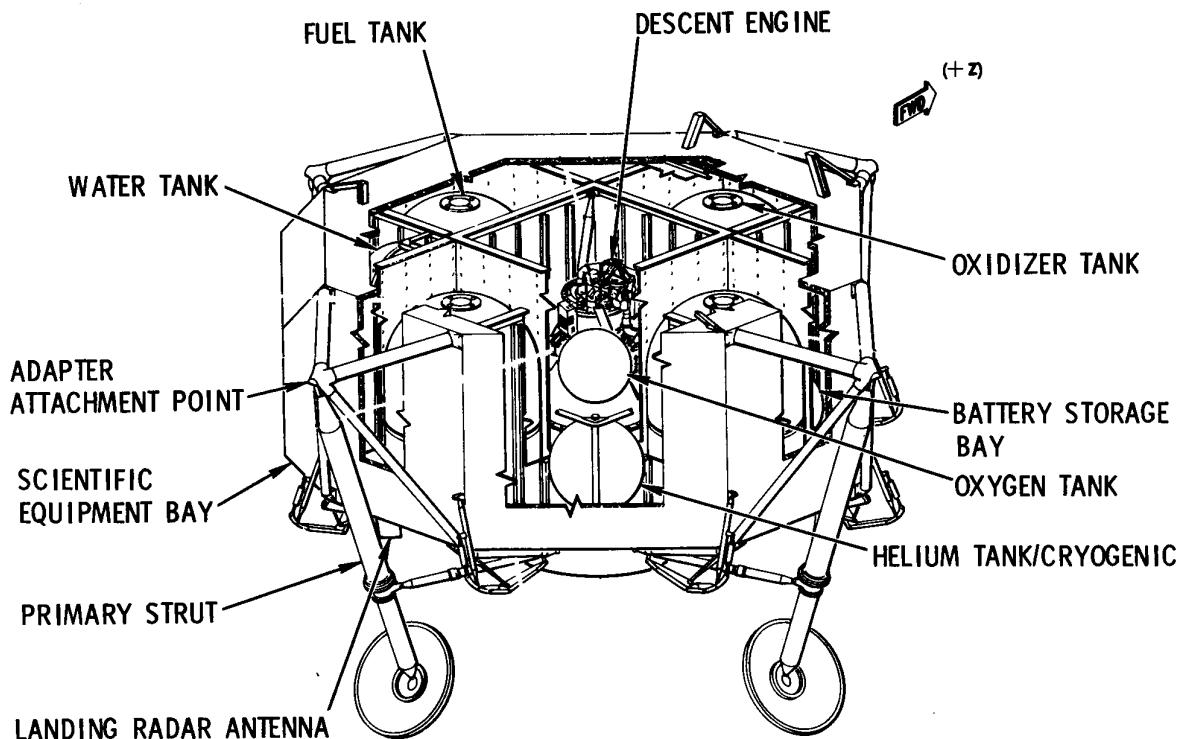
ST-304C

CSM & LM COMPARISON

2



LM DESCENT STAGE

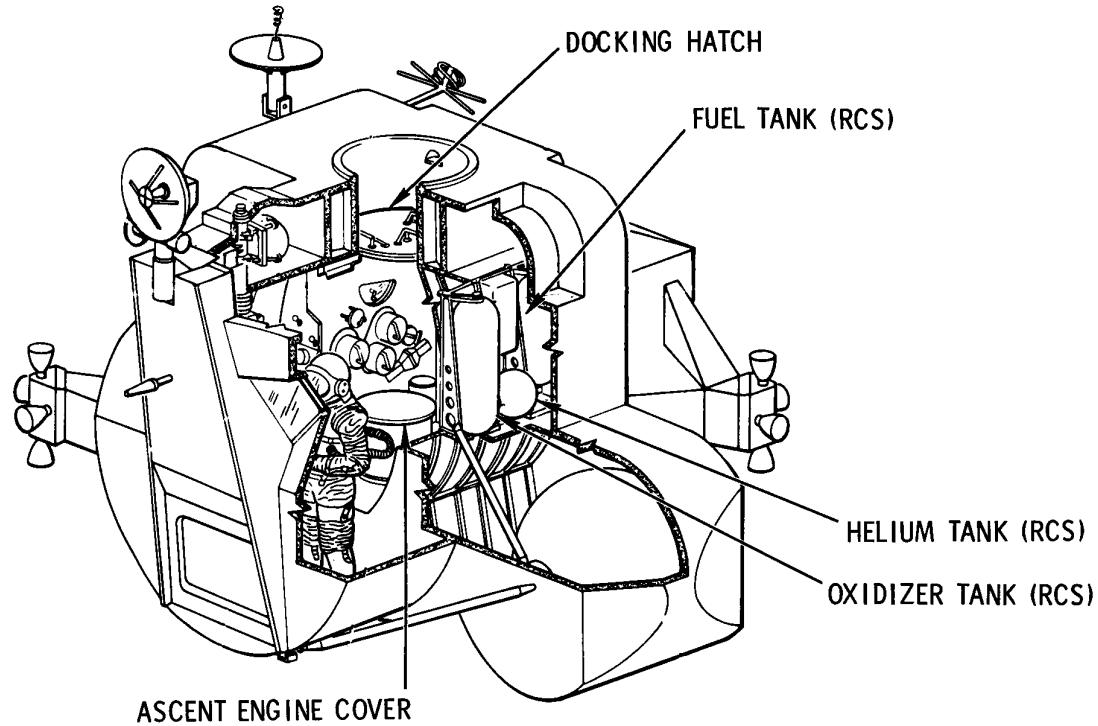


FAM-1512 A

LM ASCENT STAGE

VIEW A

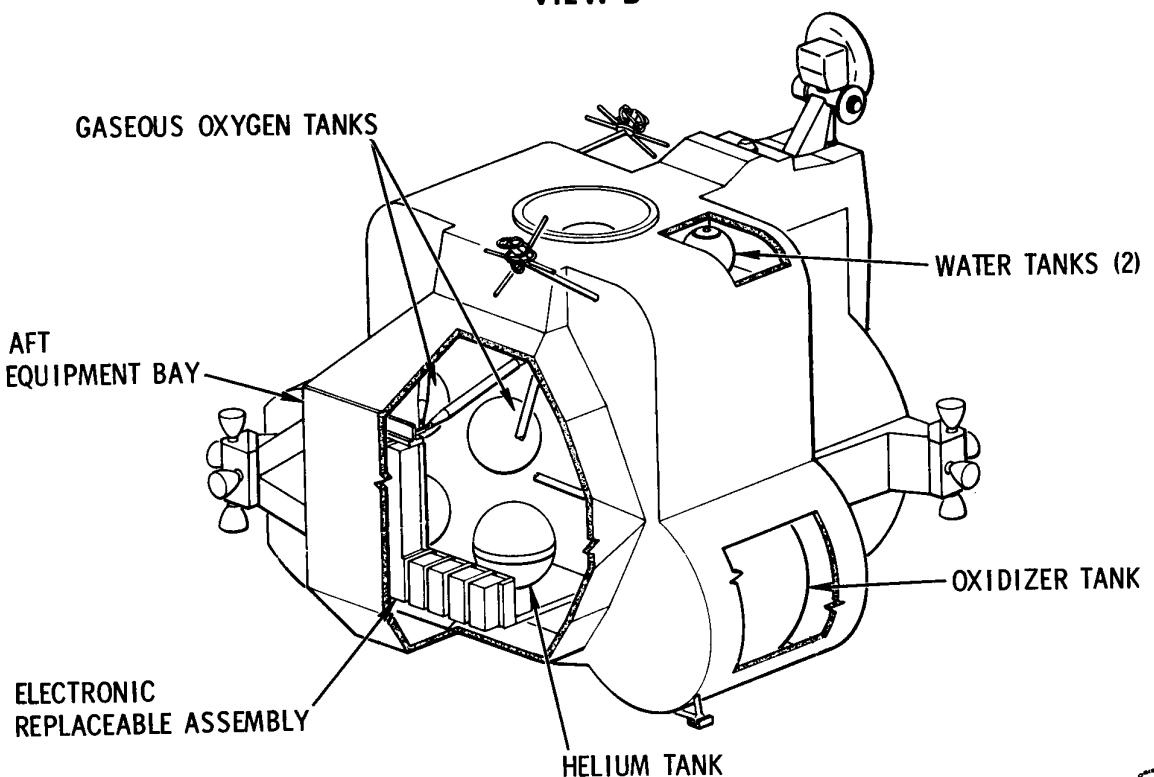
2



FAM-1513 A

LM ASCENT STAGE

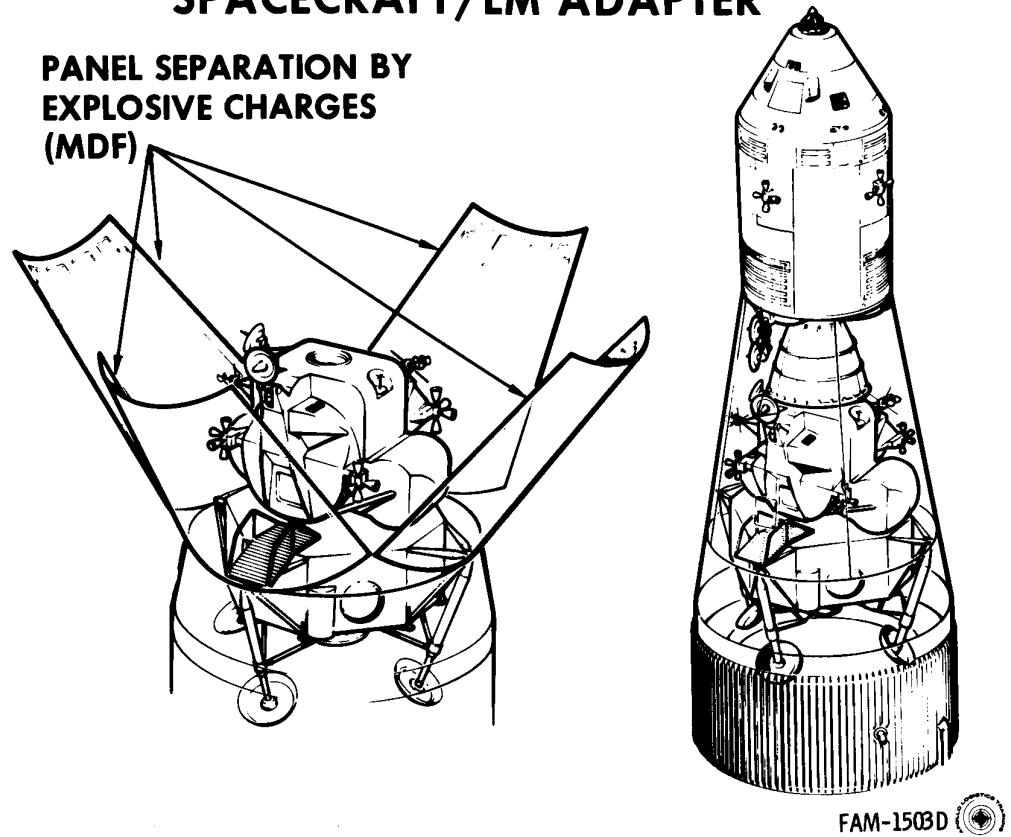
VIEW B



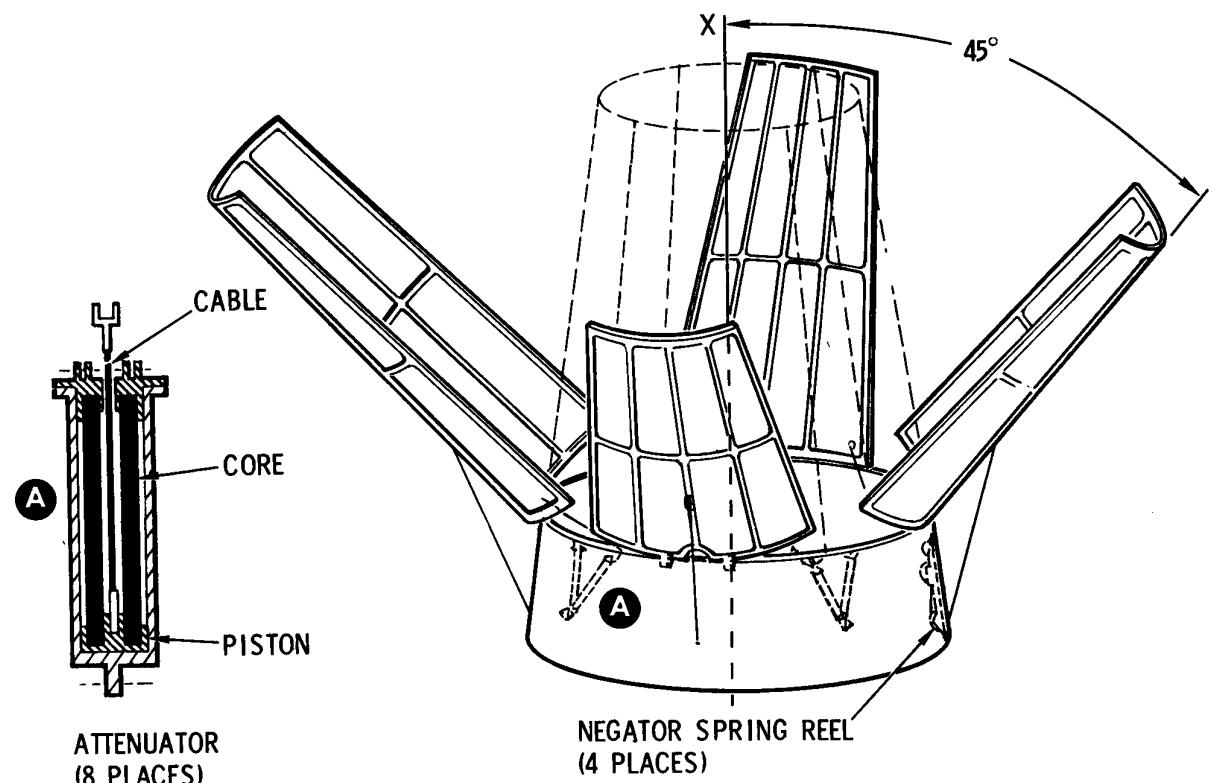
FAM-1514 A

SPACECRAFT/LM ADAPTER

PANEL SEPARATION BY
EXPLOSIVE CHARGES
(MDF)



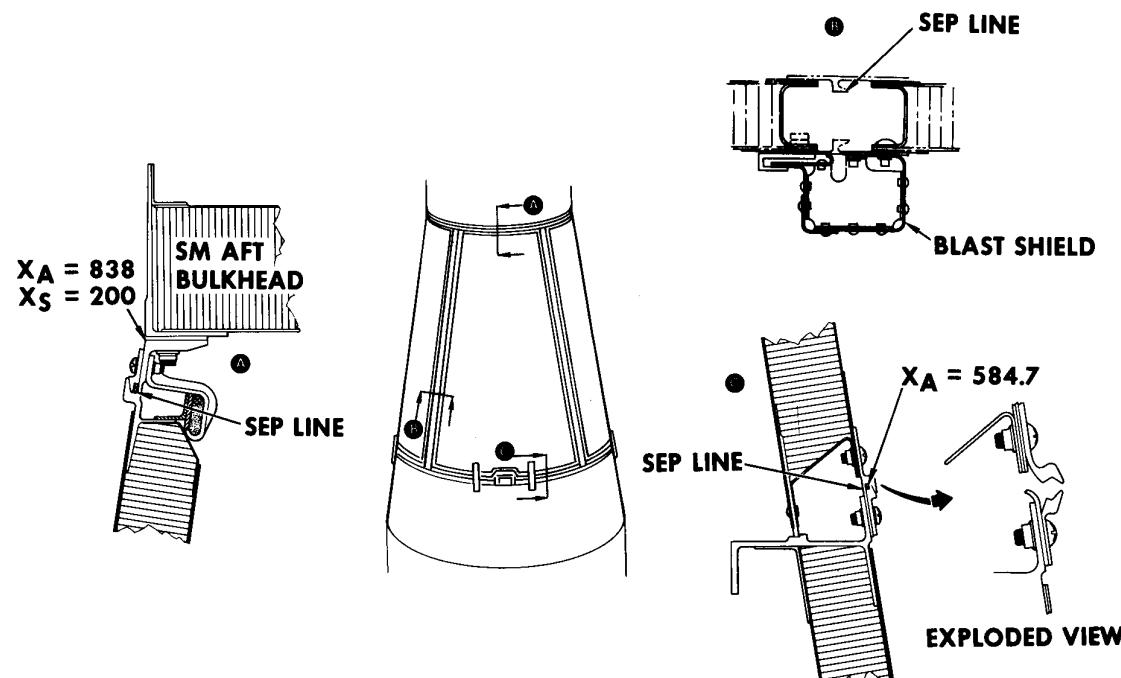
SLA PANEL DEPLOYMENT



ST-3025 E

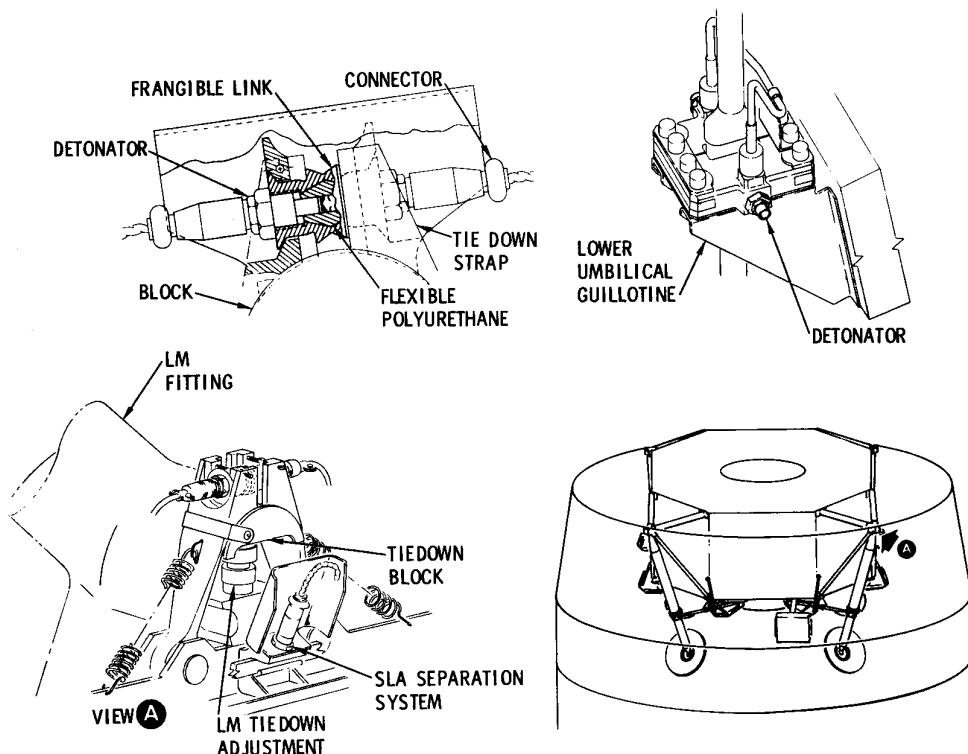
ADAPTER PANEL SEPARATION LINE

2



ST-30358

LM SEPARATION SYSTEM BLOCK II



ST-3050A ()

GUIDANCE & CONTROL

3

FAM-3505



BASIC CONSIDERATIONS

DIA — 2160 MI

239,000 MI

93 MILLION MI

DIA — 7927 MI —

DIAMETER
864,000 MI

NORTH AMERICAN AVIATION, INC.
SPACE AND INFORMATION SYSTEMS DIVISION

3-63 AP 31651

VELOCITY REQUIREMENTS

ESCAPE VELOCITY

36,700 FT/SEC



8,400 FT/SEC

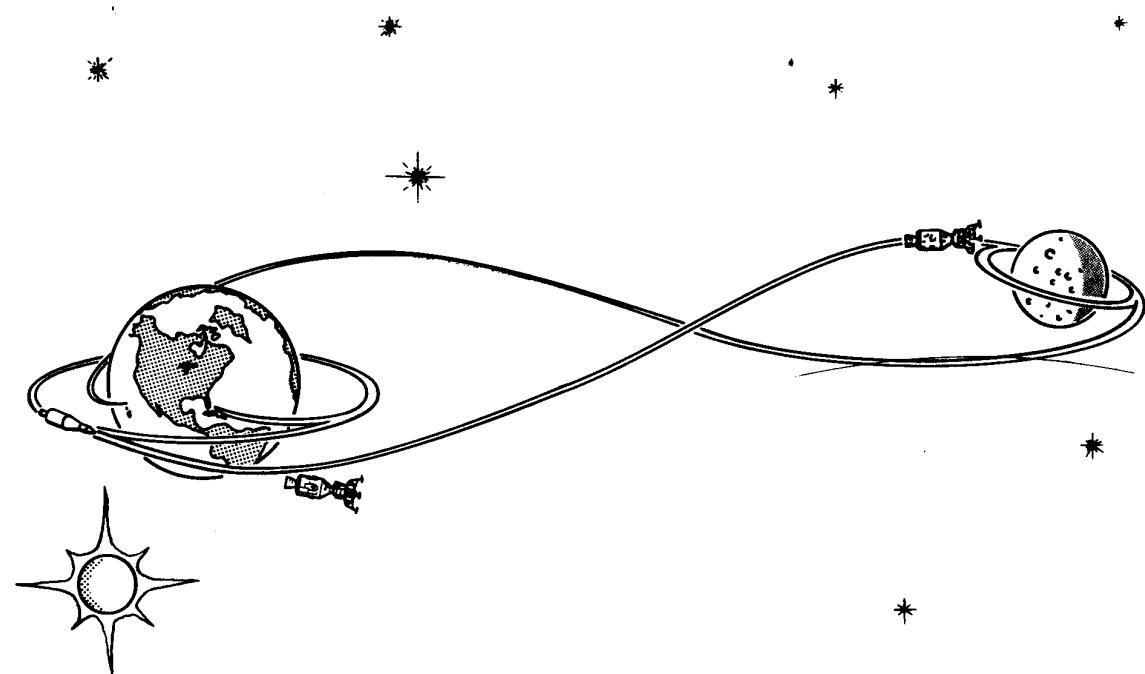
25,000 FT/SEC - ORBIT - 5280 FT/SEC

6 - RELATIVE GRAVITY - 1

NORTH AMERICAN AVIATION, INC.
SPACE AND INFORMATION SYSTEMS DIVISION

3-63 AP 31653

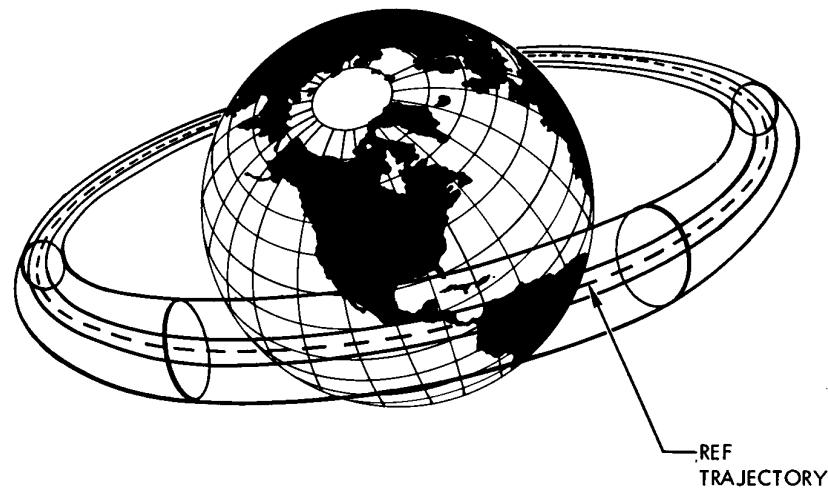
GUIDANCE & NAVIGATION REFERENCE TRAJECTORIES



FAM-3501C 4

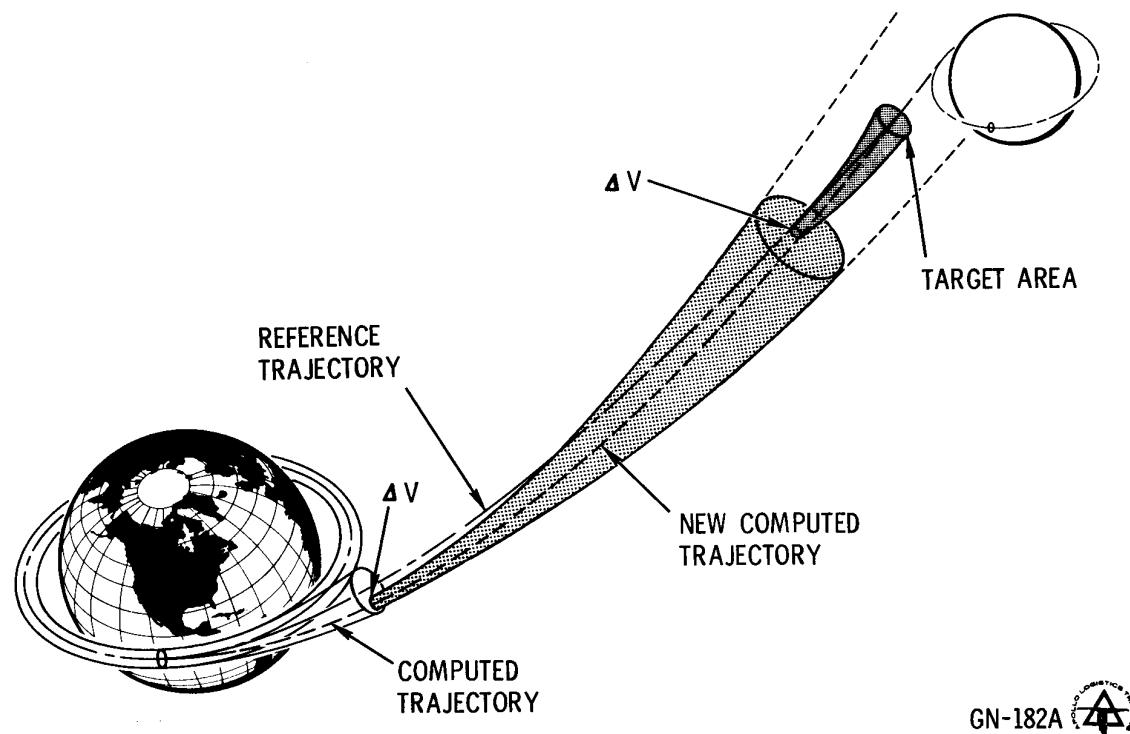
EARTH ORBIT POSITION & TRAJECTORY DETERMINATION

3



GN-180

MIDCOURSE POSITION & TRAJECTORY DETERMINATION

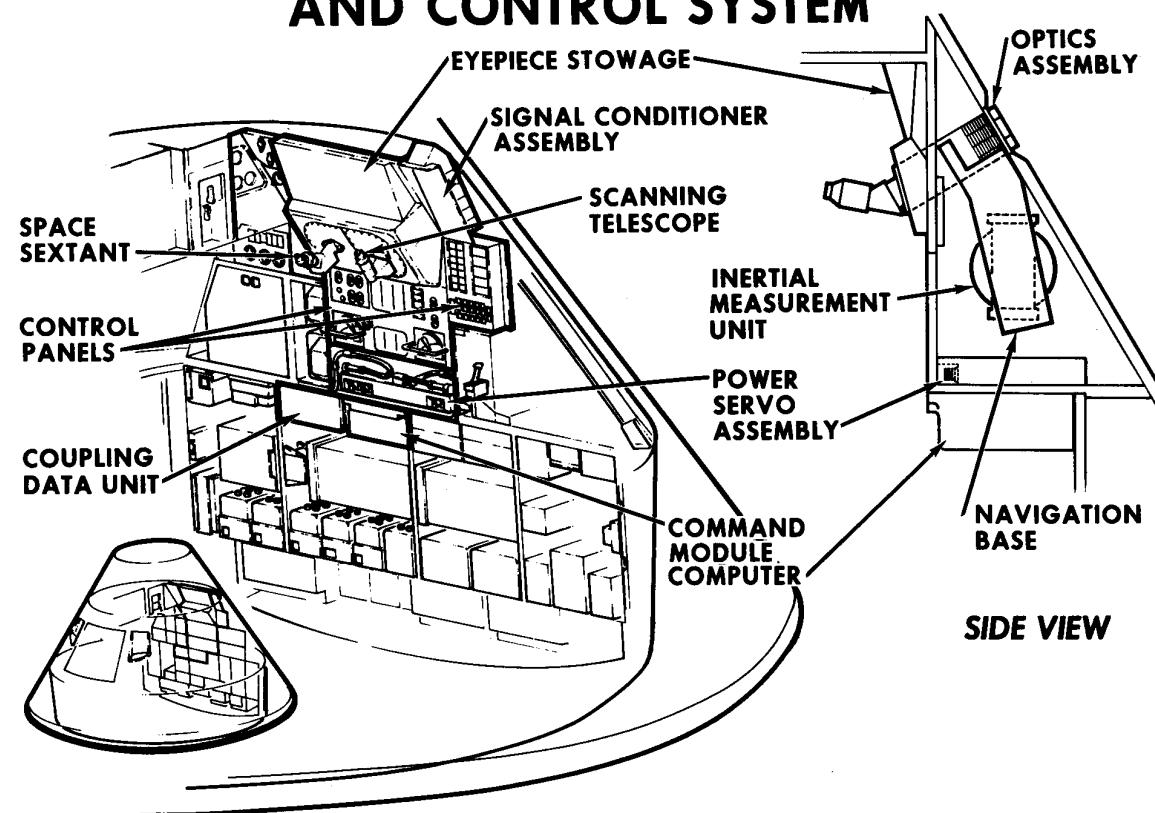


GUIDANCE & CONTROL FUNCTIONS

GNCS	SCS	RCS	SPS
• POSITION	• RATE CONTROL	• ROTATION ROLL PITCH YAW	• MID-COURSE CORRECTIONS
• TRAJECTORY	• ATTITUDE CONTROL	• TRANSLATION X, Y, Z ACCELERATIONS	• PLANE CHANGES
• VELOCITY	• DISPLAY		• LUNAR ORBIT INSERTION
• ATTITUDE	• MANUAL CONTROLS		• TRANS-EARTH INJECTION

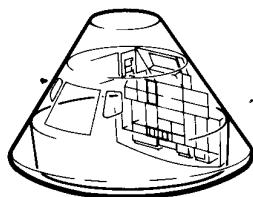
GUIDANCE, NAVIGATION, AND CONTROL SYSTEM

S86SD10793B

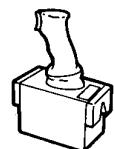


SIDE VIEW

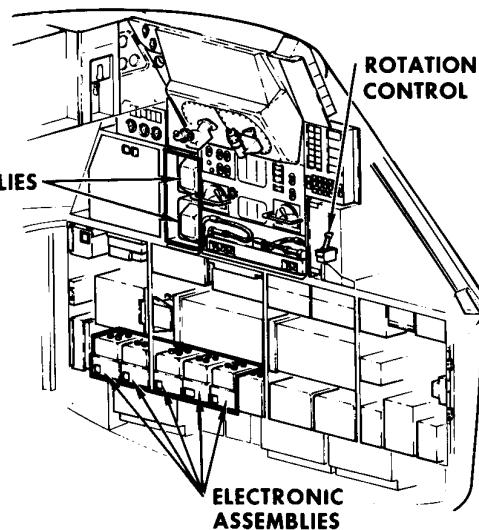
STABILIZATION AND CONTROL SYSTEM



TRANSLATION
CONTROL

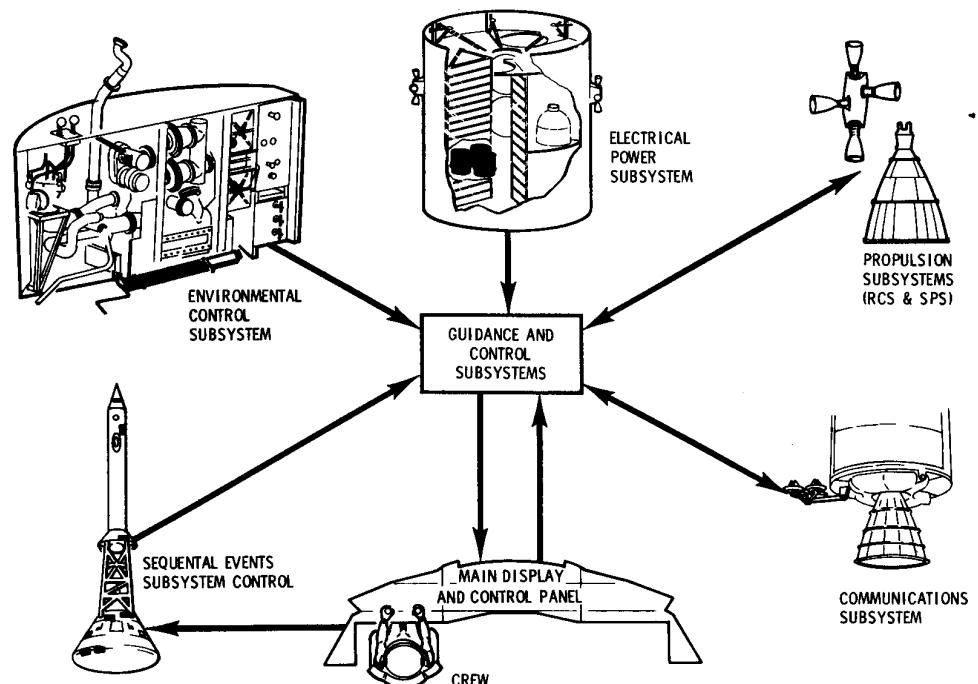


ROTATION
CONTROL



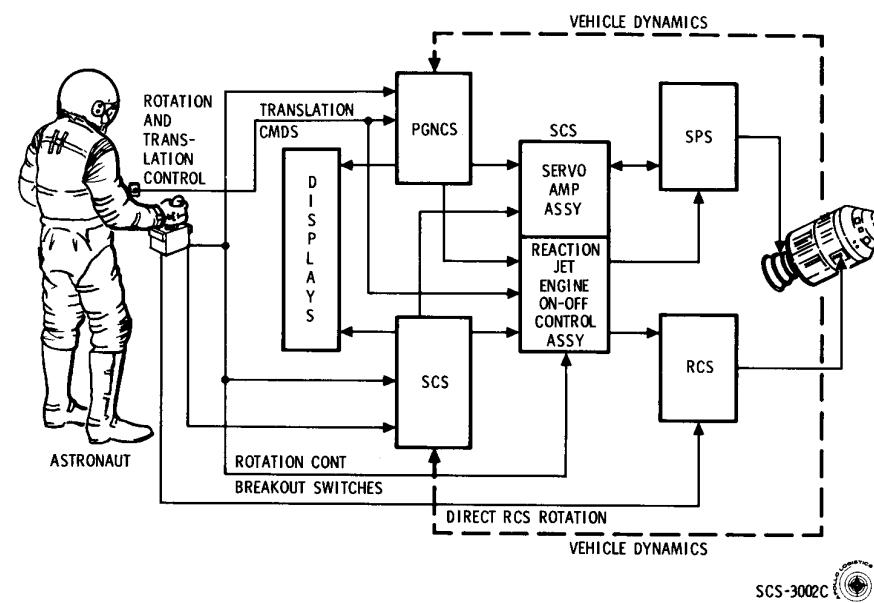
MANUAL CONTROLS

G&C AND APOLLO SUBSYSTEMS INTERFACE

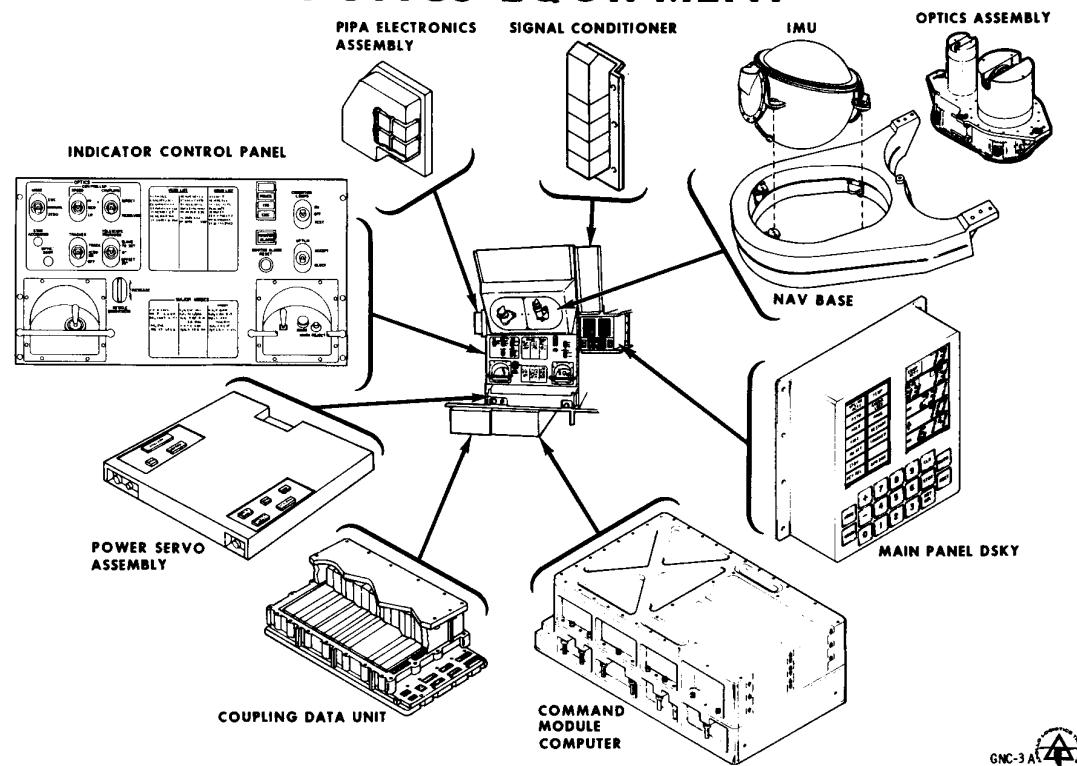


SCS-3009

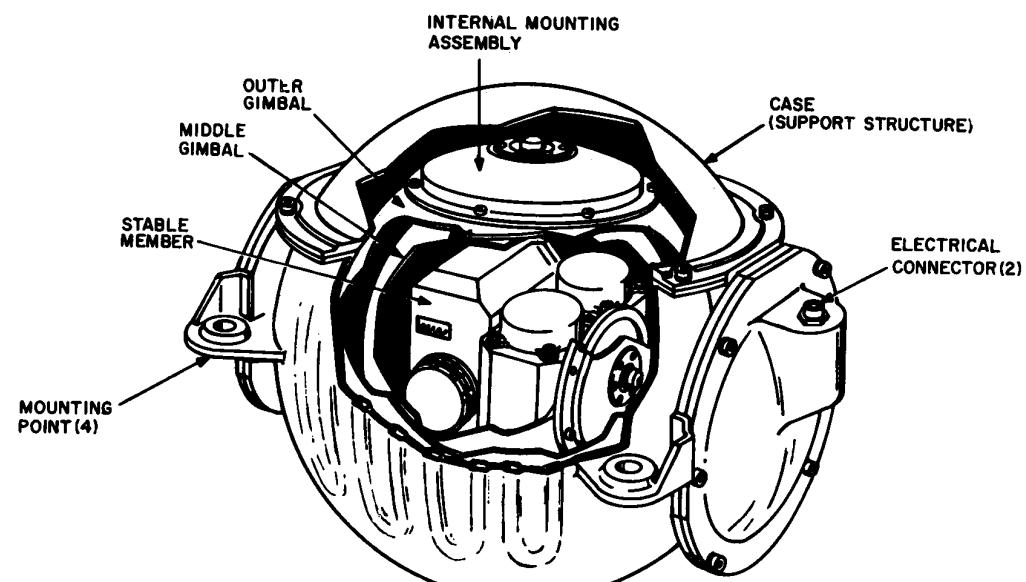
CSM GUIDANCE & CONTROL



PGNCS EQUIPMENT

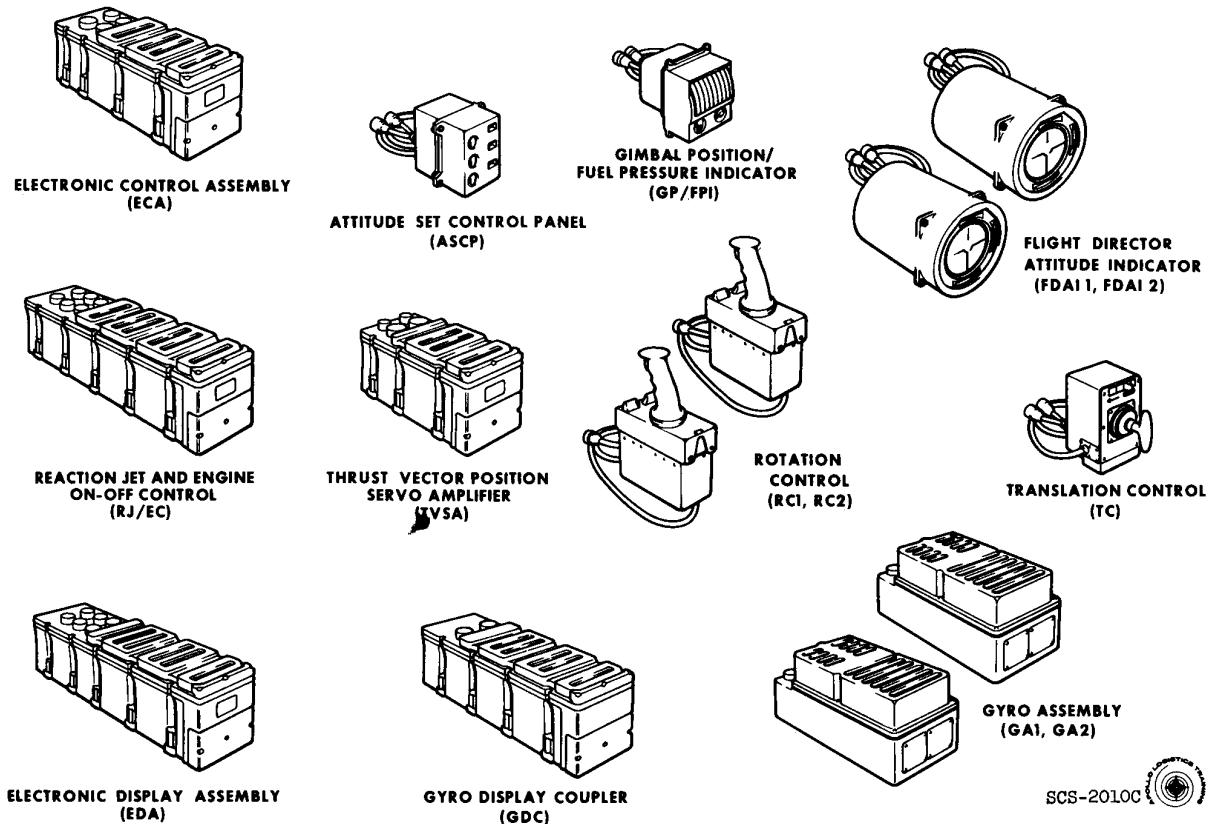


INERTIAL MEASUREMENT UNIT



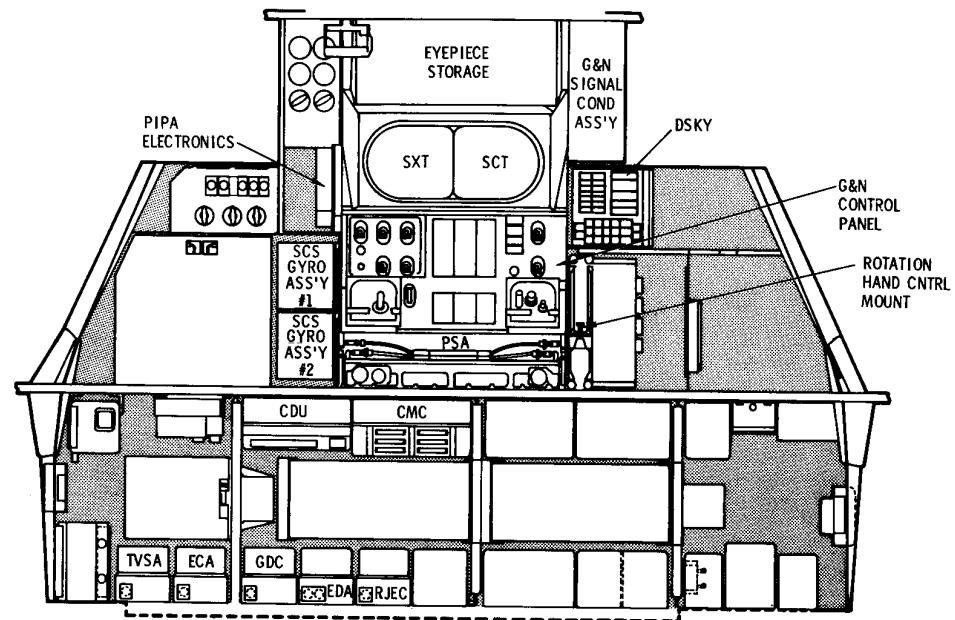
GNC-9

SCS FLIGHT HARDWARE BLOCK II



SCS-2010C

G&C EQUIPMENT LOCATION



SCS-3004B

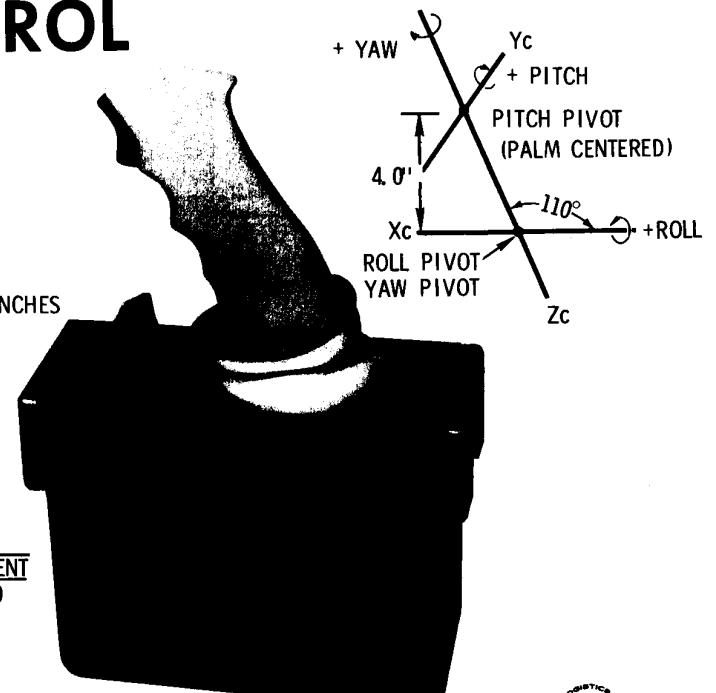
ROTATION CONTROL

PUSH TO TALK SWITCH PARAMETERS

TRAVEL PRIOR TO SWITCH ACTUATION	8.0° MIN
TRAVEL TO HARDCODE	25.0° MAX
MAXIMUM TORQUE	1.0 POUND INCHES

ROTATION CONTROL PARAMETERS

	<u>DISPLACEMENT</u>
HARD STOP	11.5±0.50
DIRECT SWITCH ACTUATION	≈11.0°
SOFT STOP	10±1°
BREAKOUT SWITCH ACTUATION	1.5±0.5°
CONTROLLER LOCK TO ARM	50.0°



SCS-2002B



TRANSLATION CONTROL

CW & CCW CONTROL MOTION LIMITS

HARD STOP, DETENT & SWITCH CLOSURE

$17^\circ \pm 2^\circ$

FORCE INTO DETENT

15 ± 5.0 LB INCHES

OUT OF DETENT

6 LB INCHES MIN

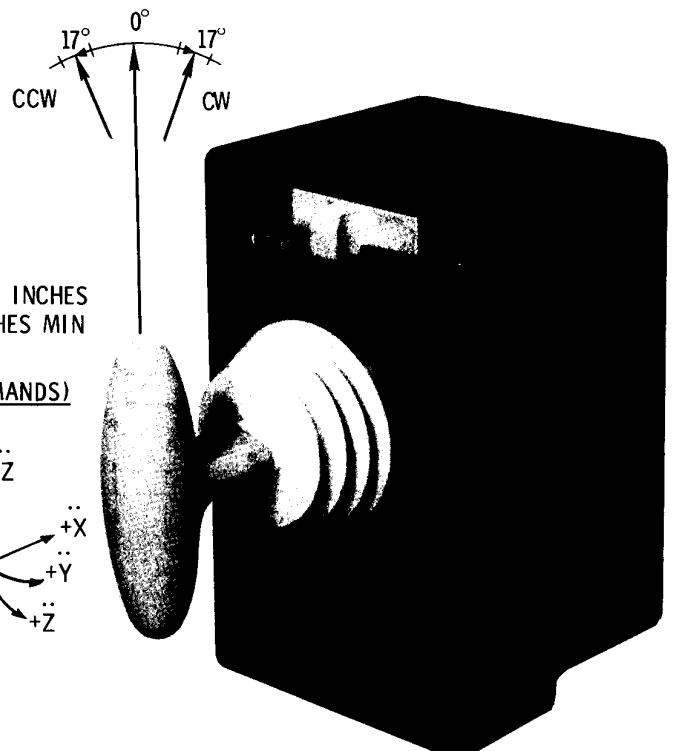
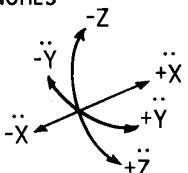
TRANSLATION CONTROL MOTION LIMITS (+ OR - COMMANDS)

MECHANICAL STOP - 0.5 ± 0.075 ARC INCHES

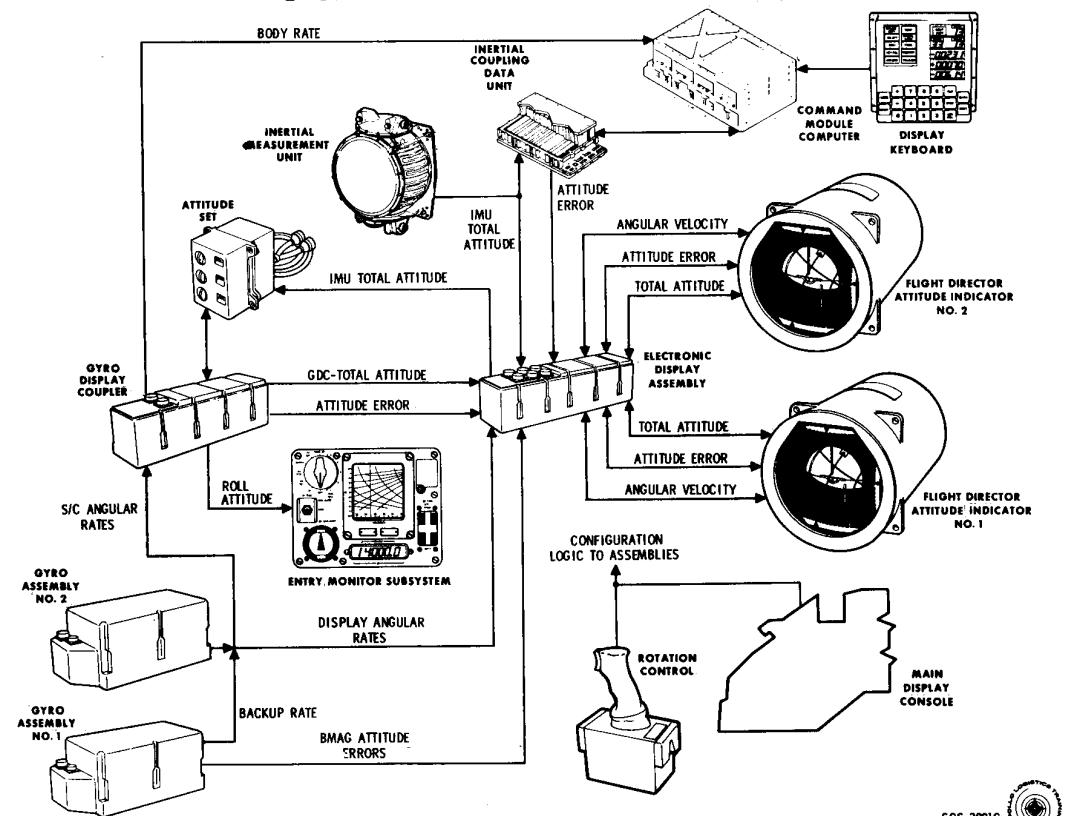
SWITCH CLOSURE - 0.375 ± 0.025 ARC INCHES

FORCE

- 1.5 ± 0.33 POUNDS

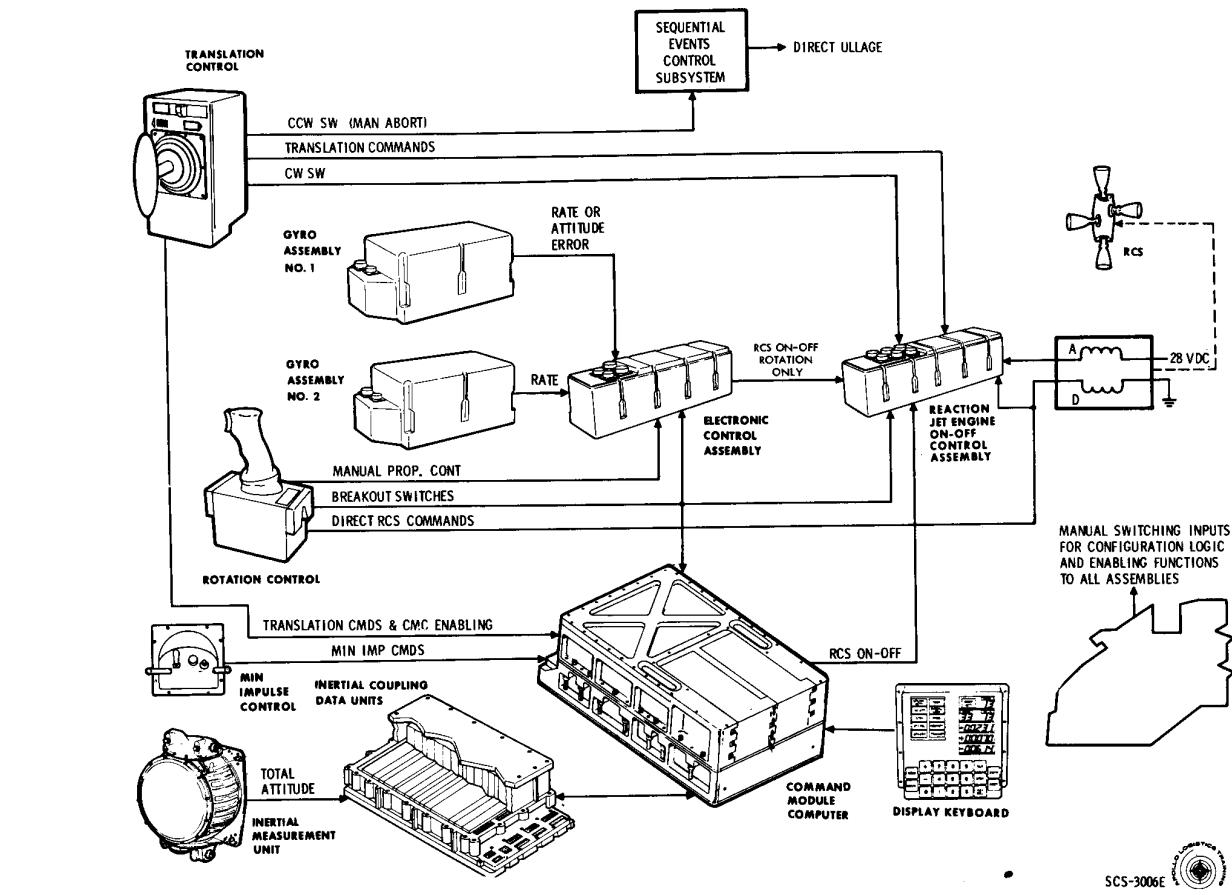


G & C ATTITUDE REFERENCE

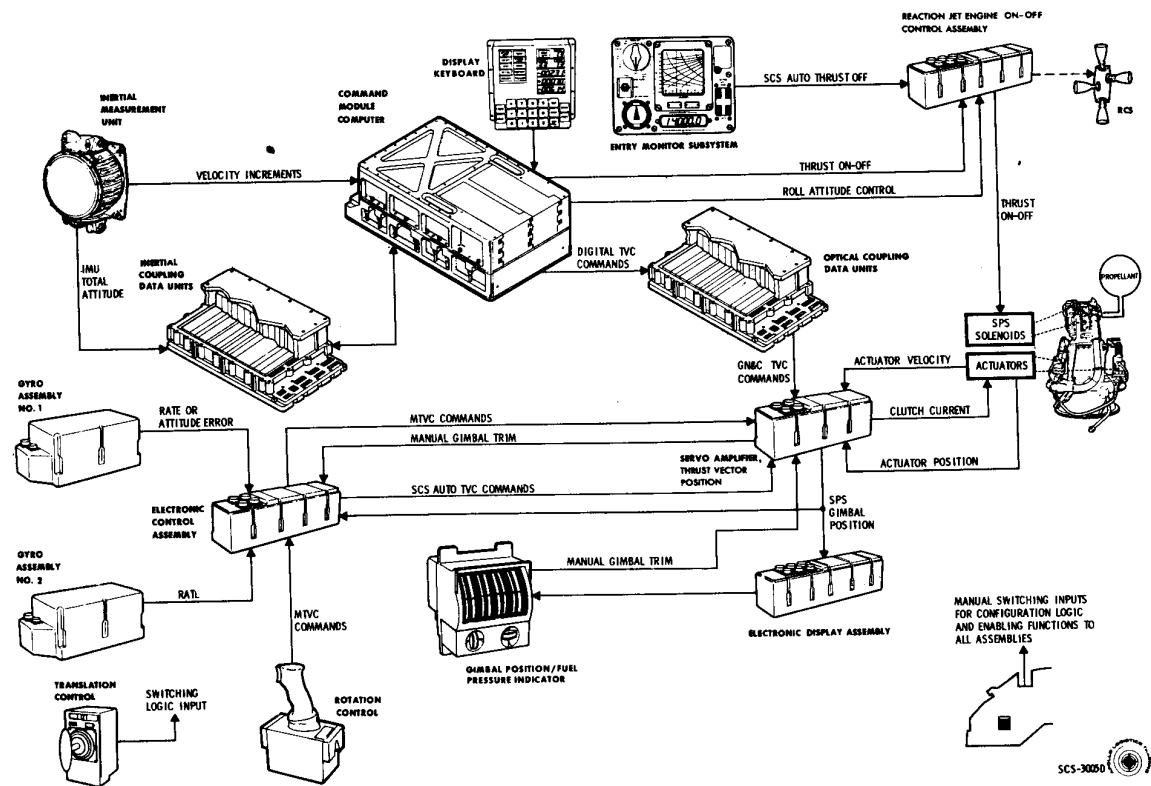


SCS-3001C

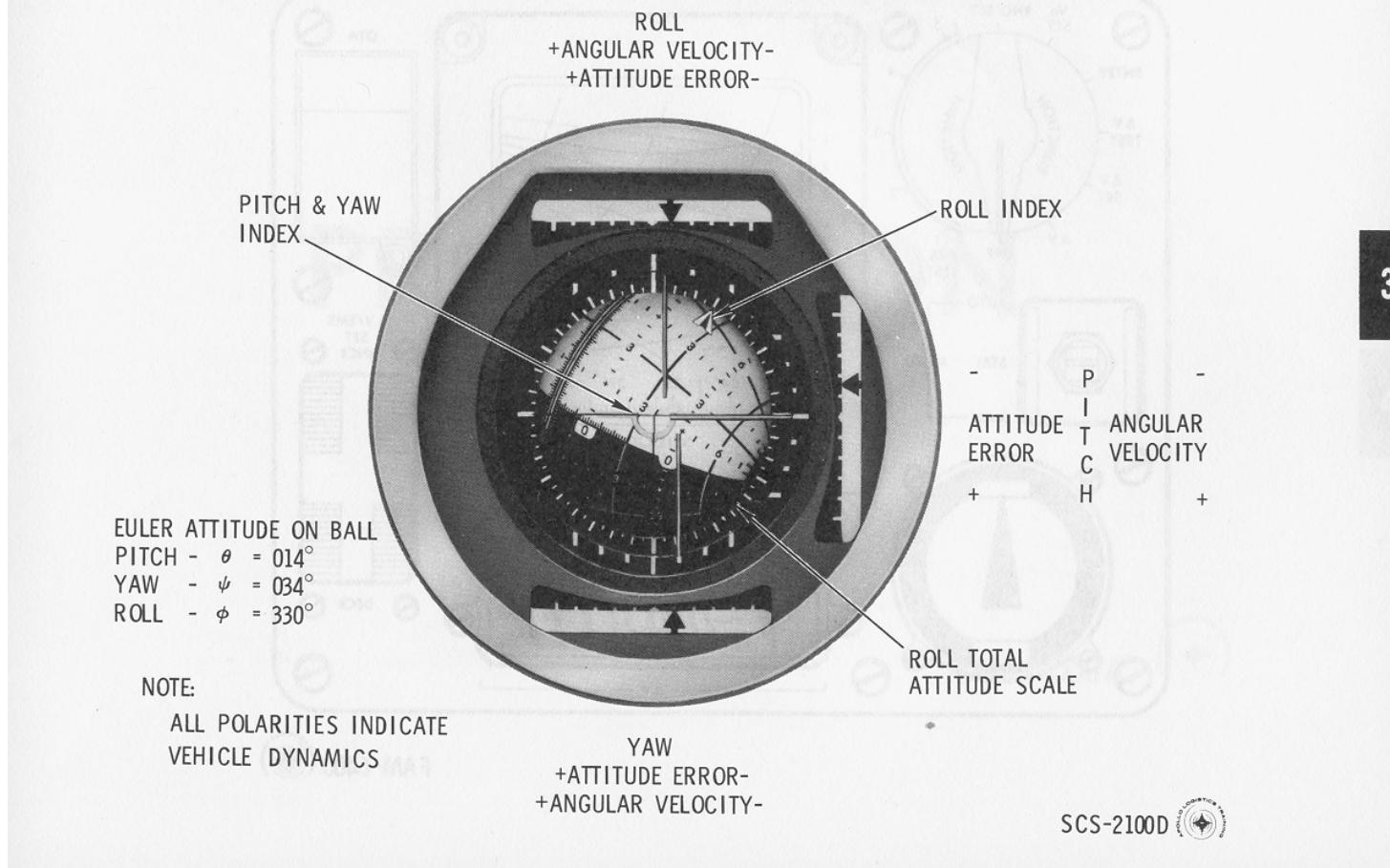
G&C ATTITUDE CONTROL

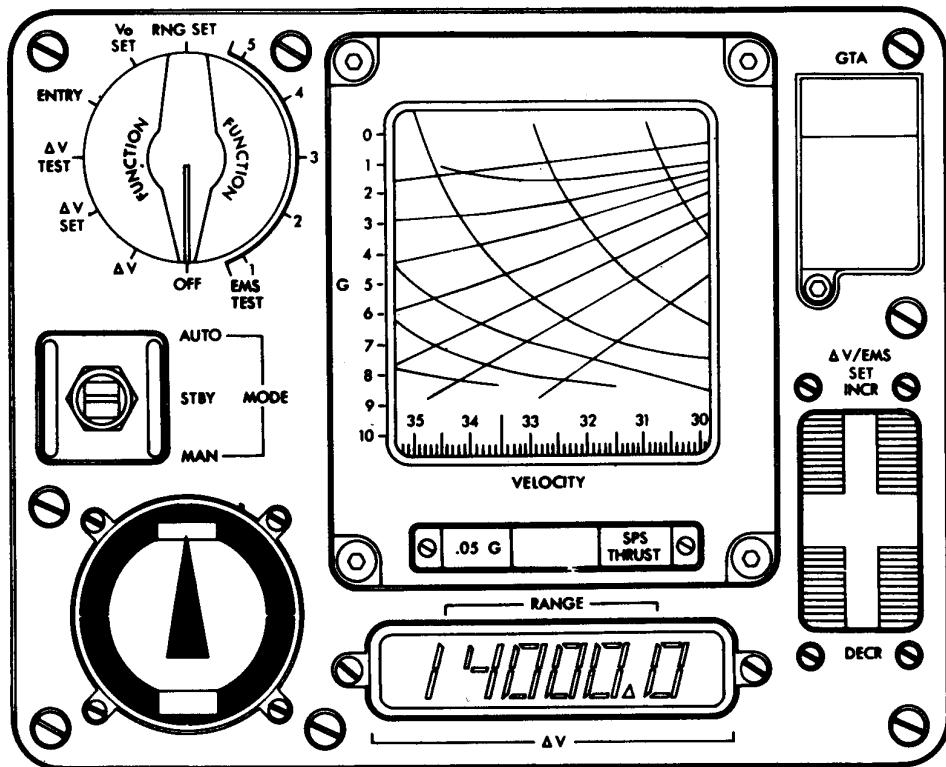


G & C THRUST VECTOR CONTROL



FLIGHT DIRECTOR ATTITUDE INDICATOR





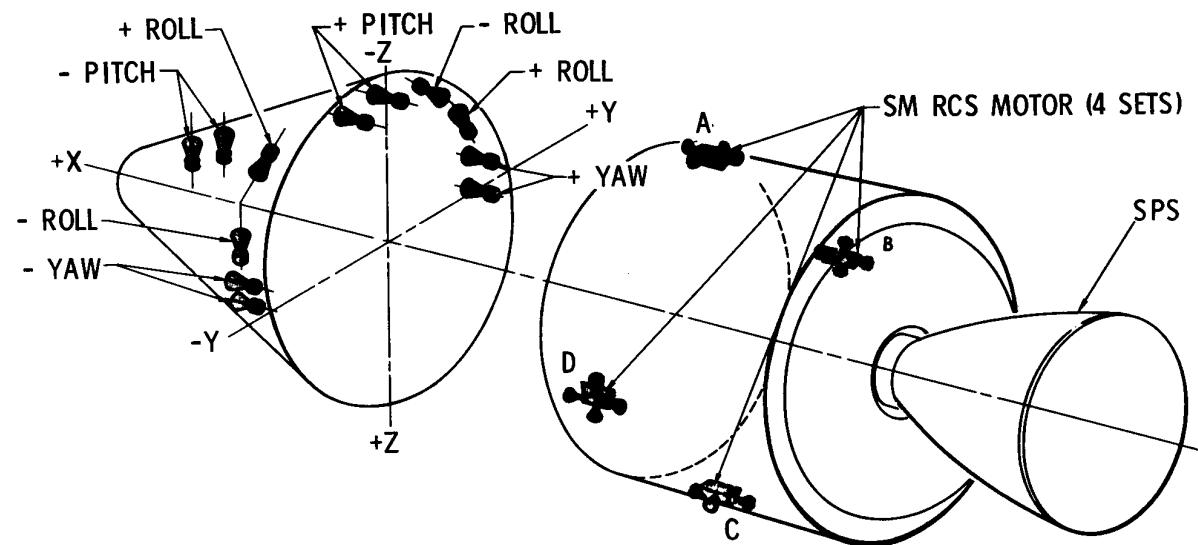
FAM-6400

PROPELLION

FAM-4000A



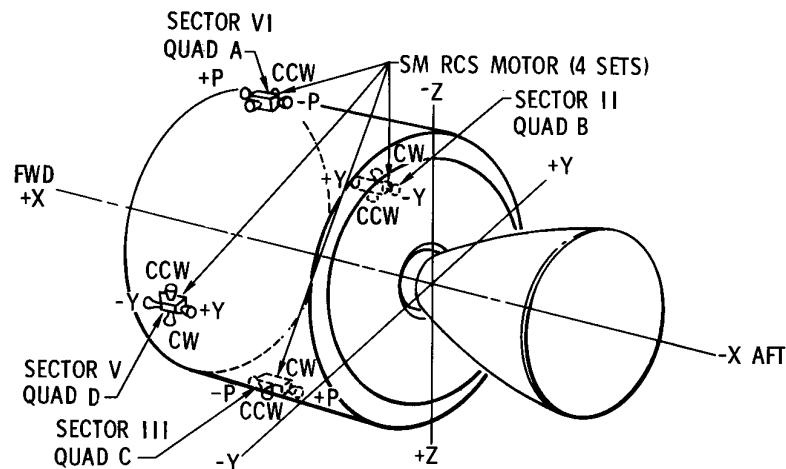
ENGINE LOCATION



S/M REACTION CONTROL SYSTEM

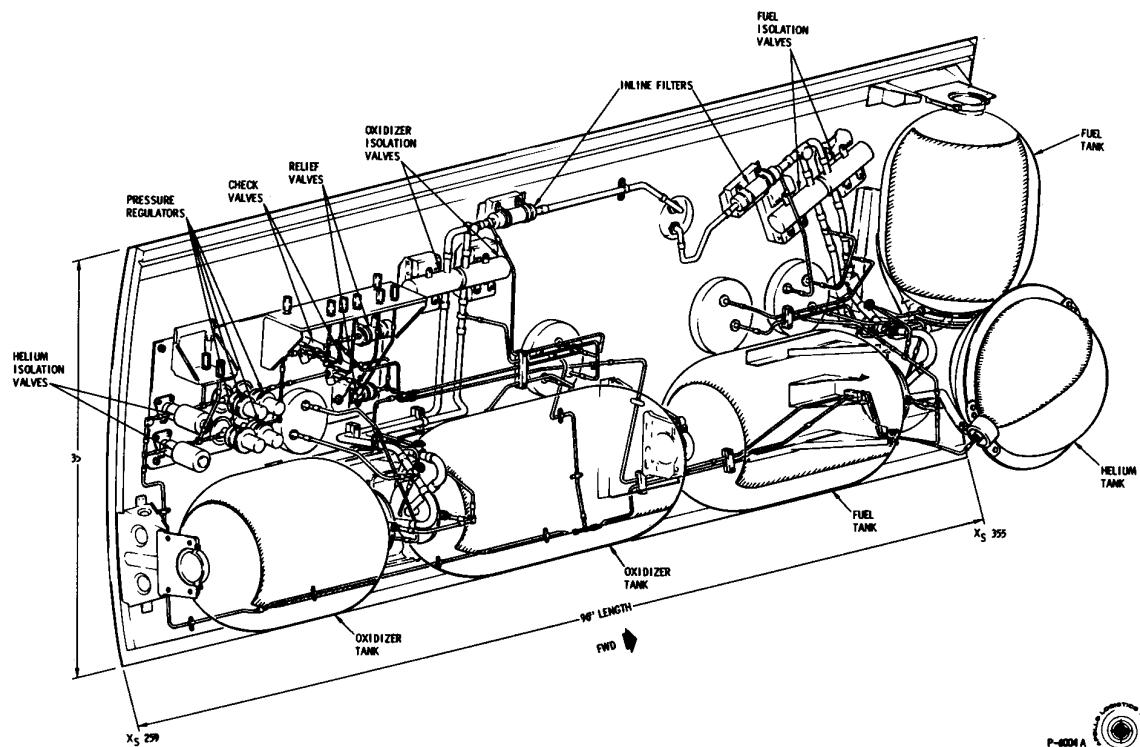
PURPOSE: PROVIDE POWER FOR ATTITUDE AND/OR TRANSLATION
CONTROL AFTER BOOSTER SEPARATION UNTIL C/M AND S/M SEPARATION
TYPE OF SYSTEM: NON THROTTLEABLE, PRESSURE FEED SYSTEM, HYPERGOLIC PROPELANTS AND RADIANT COOLED THRUST CHAMBERS.

SYSTEM DESCRIPTION: FOUR INDIVIDUAL SUB-SYSTEMS
EACH SUBSYSTEM CONSISTS OF A SEPARATE PROPELLANT
FEED SYSTEM AND FOUR THRUST CHAMBERS
PROPELLANTS - INHIBITED NITROGEN TETOXIDE AND MONOMETHYL HYDRAZINE
SYSTEM CONTROLLED BY CMC OR SCS WITH A MANUAL BACK-UP
CAPABILITY

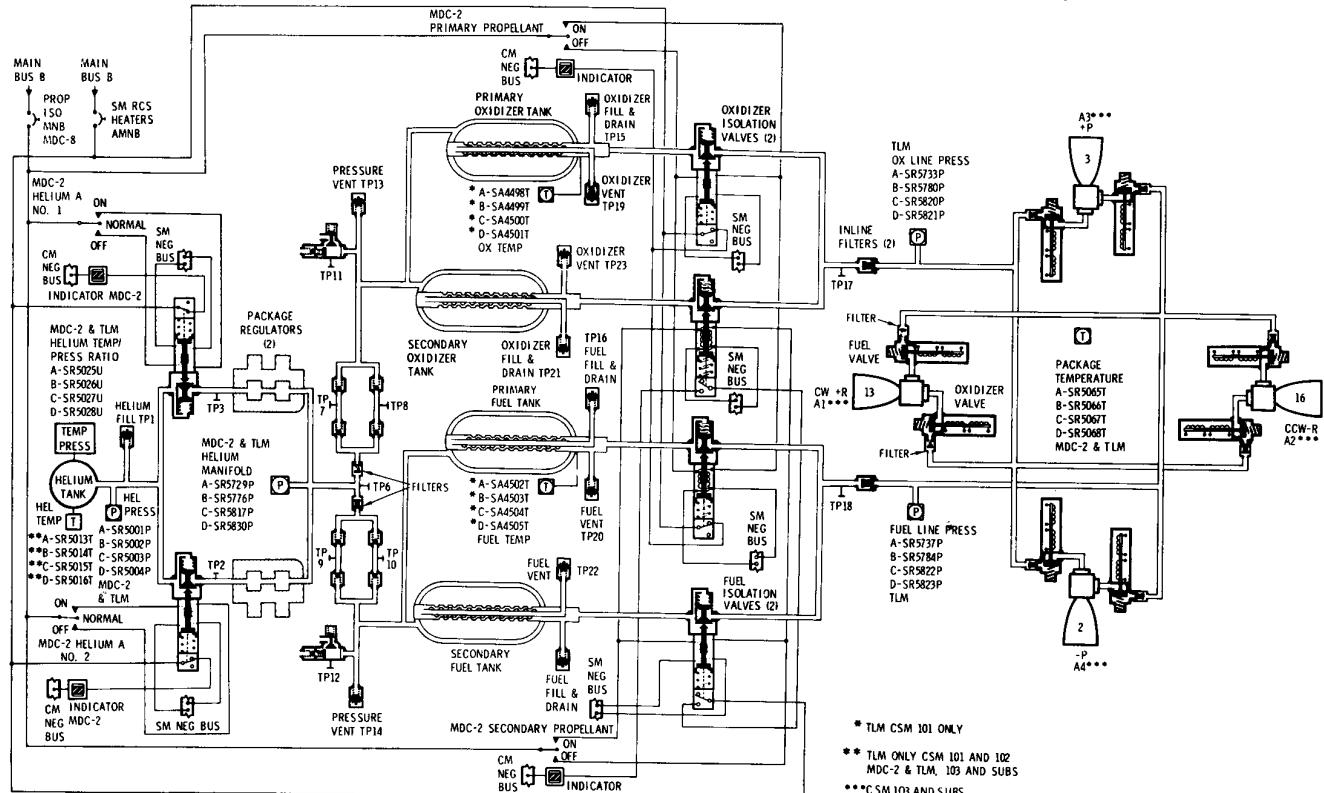


P-6000A

SM RCS PANEL ASSEMBLY QUAD B & D

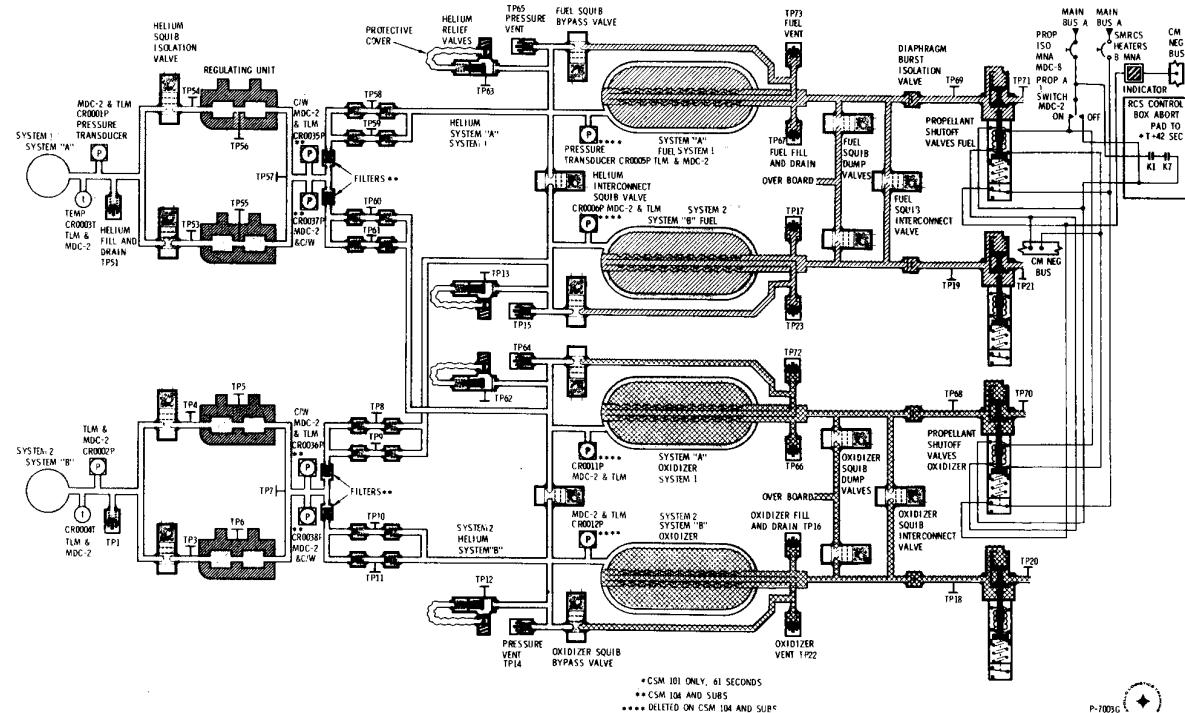


SM REACTION CONTROL SUBSYSTEM (QUAD A)

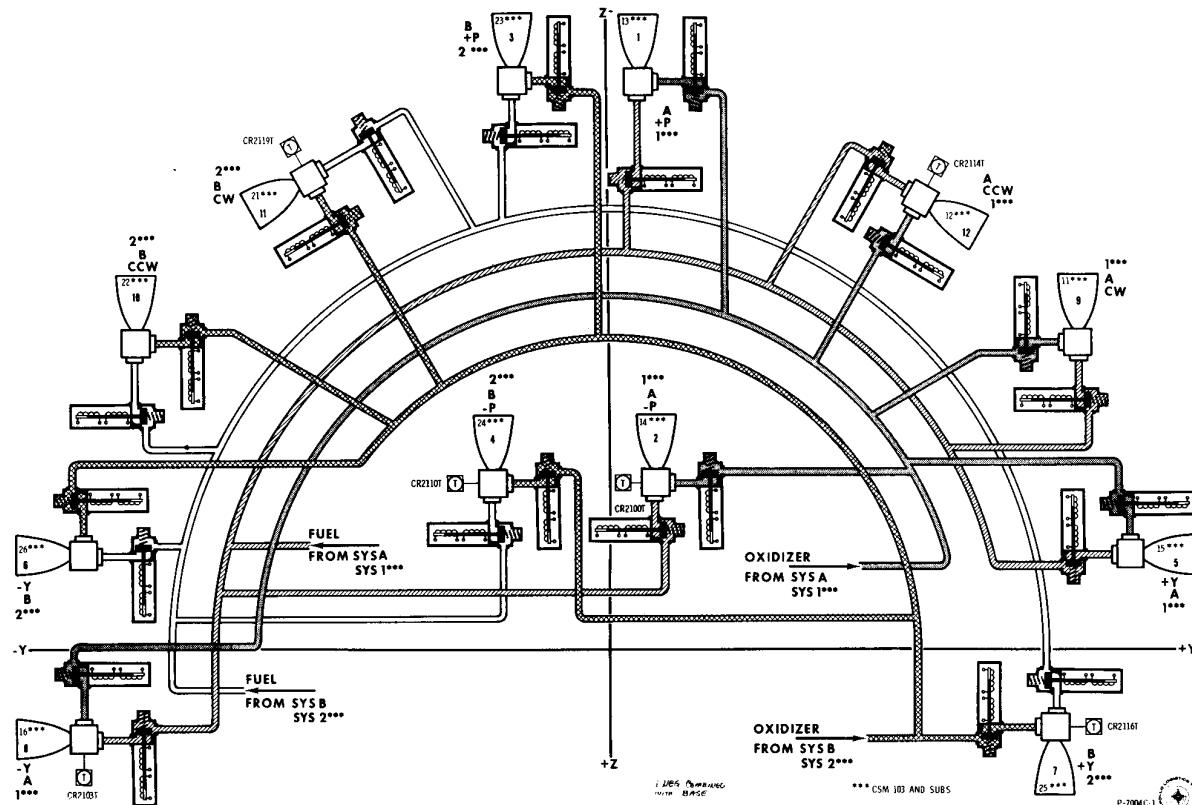


CM REACTION CONTROL SUBSYSTEM

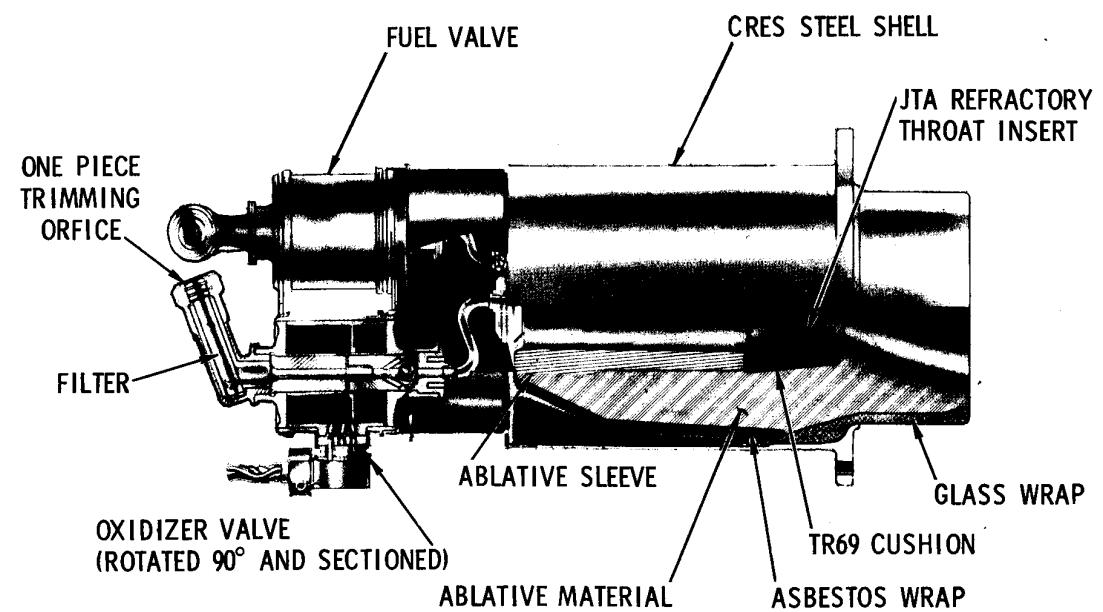
PROPELLANT FEED SUBSYSTEM A&B



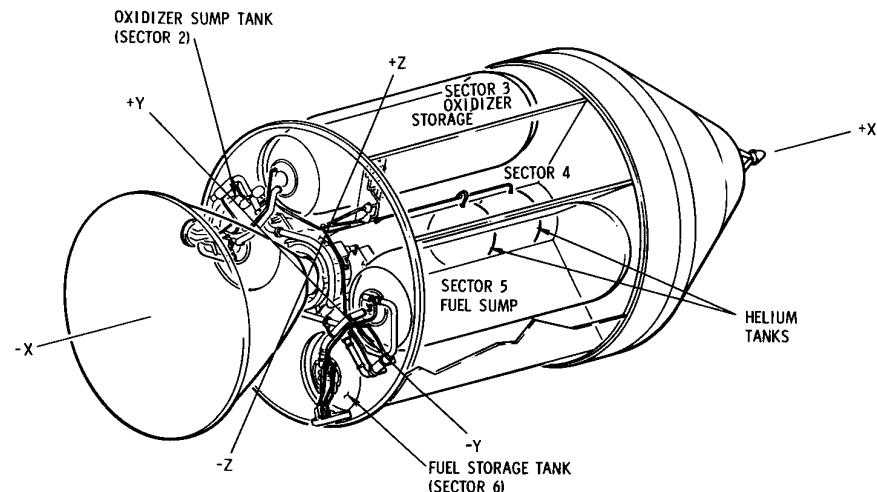
CM REACTION CONTROL ENGINES



CM RCS ENGINE



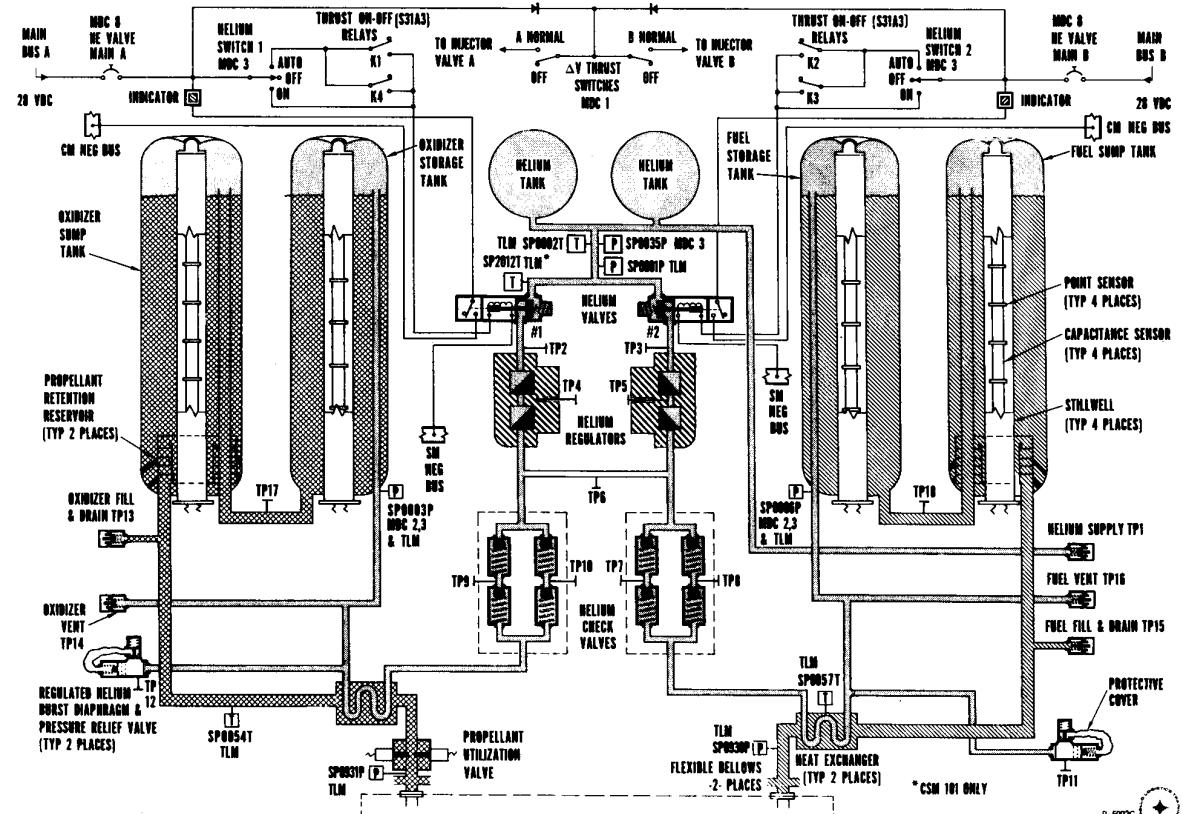
SERVICE PROPULSION SYSTEM



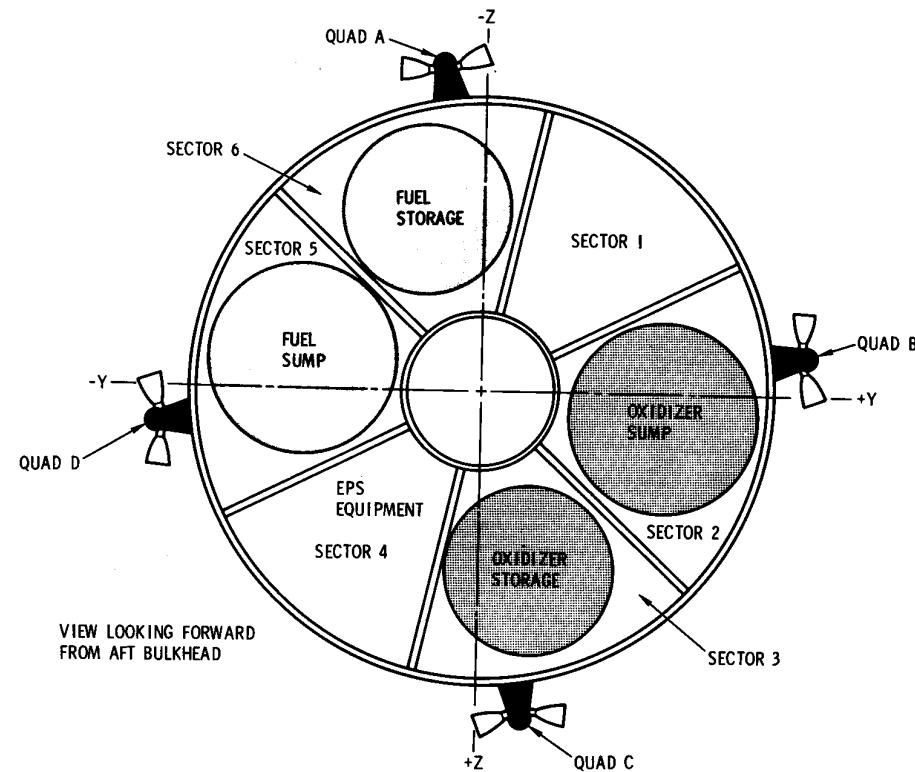
TYPE OF SYSTEM:	NON-THROTTLEABLE, PRESSURE FEED SYSTEM, HYPERGOLIC PROPELLANTS AND ABLATIVE CHAMBER WITH RADIANT COOLED NOZZLE EXTENSION.	PURPOSE:	PROVIDE THRUST FOR MAJOR VELOCITY CHANGES AFTER BOOSTER SEPARATION UNTIL C/M S/M SEPARATION. IN ADDITION SUPPORTS S/M ABORT AFTER THE LAUNCH ESCAPE TOWER HAS BEEN JETTISONED.
SYSTEM DESCRIPTION:	ONE SYSTEM CONSISTING OF A PROPELLANT FEED SYSTEM AND ONE ENGINE		
PROPELLANTS - INHIBITED NITROGEN TETROXIDE AND BLENDED HYDRAZINE (50% UDMH & 50% HYDRAZINE)			
SYSTEM CONTROLLED BY CMC OR SCS WITH A MANUAL BACK-UP CAPABILITY			

P-5078A

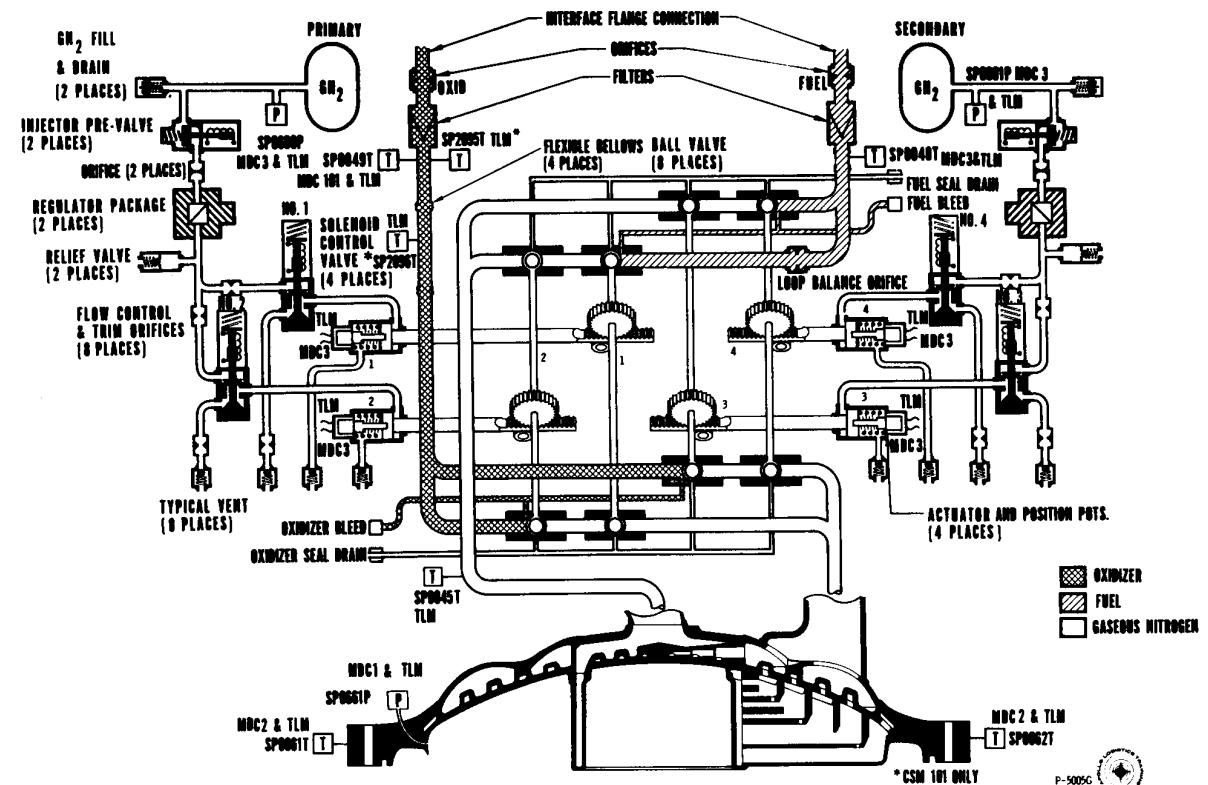
SERVICE PROPULSION SYSTEM PROPELLANT FEED



SERVICE MODULE SECTORS

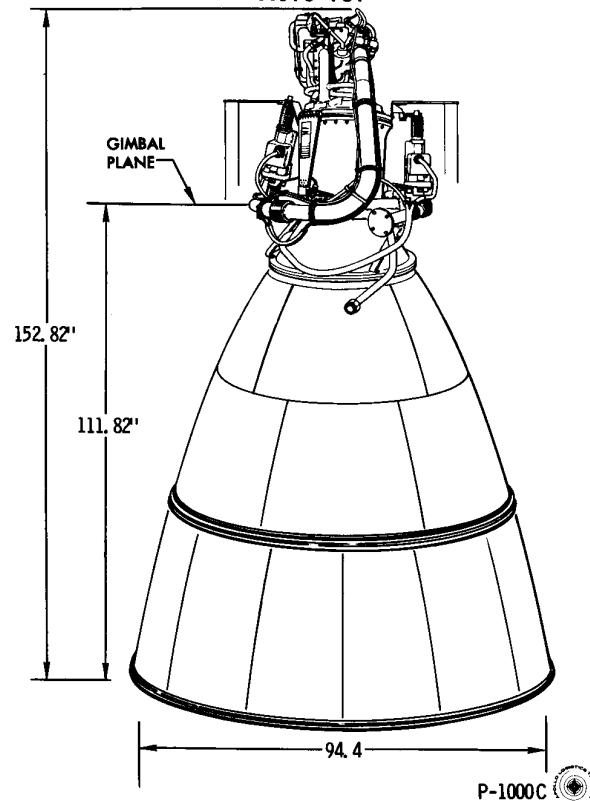


SPS ENGINE PROPELLANT FEED

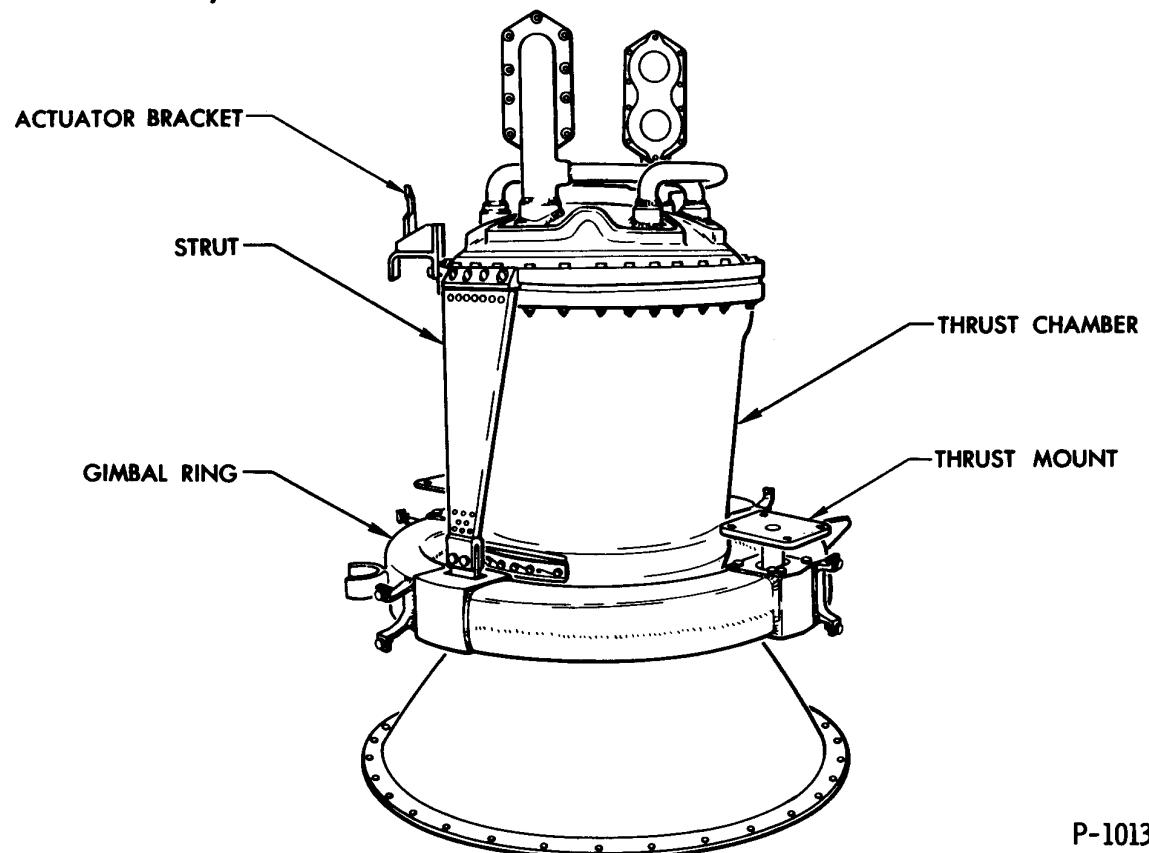


SPS ROCKET ENGINE

AJ10-137



SPS RING, STRUT & THRUST CHAMBER ASSEMBLY



P-1013

TELECOMMUNICATIONS

5

FAM-4505 

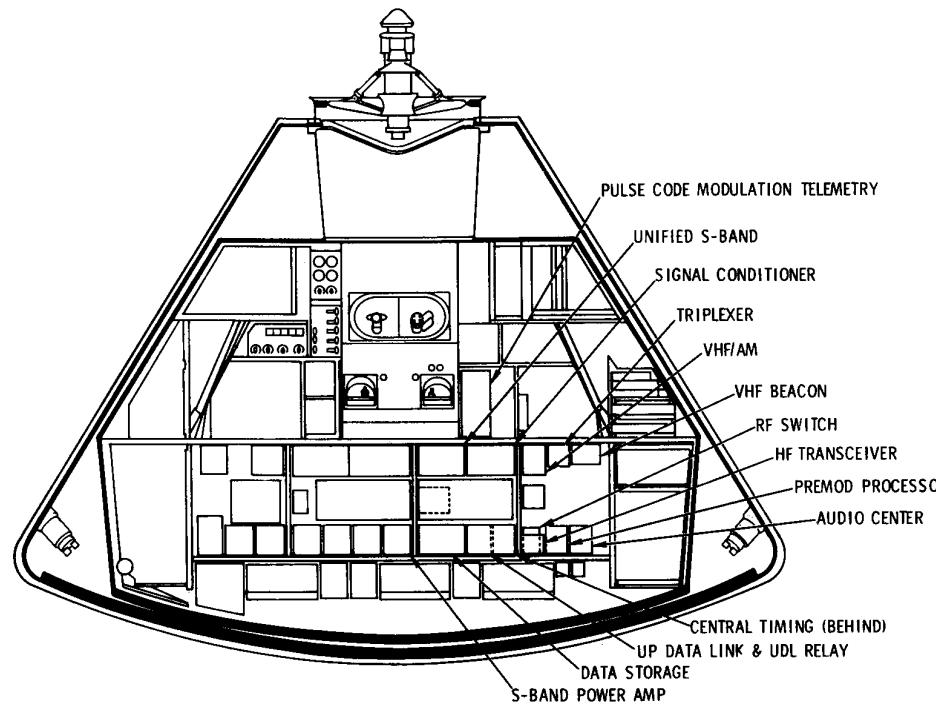
COMMUNICATIONS SYSTEM

MISSION REQUIREMENTS

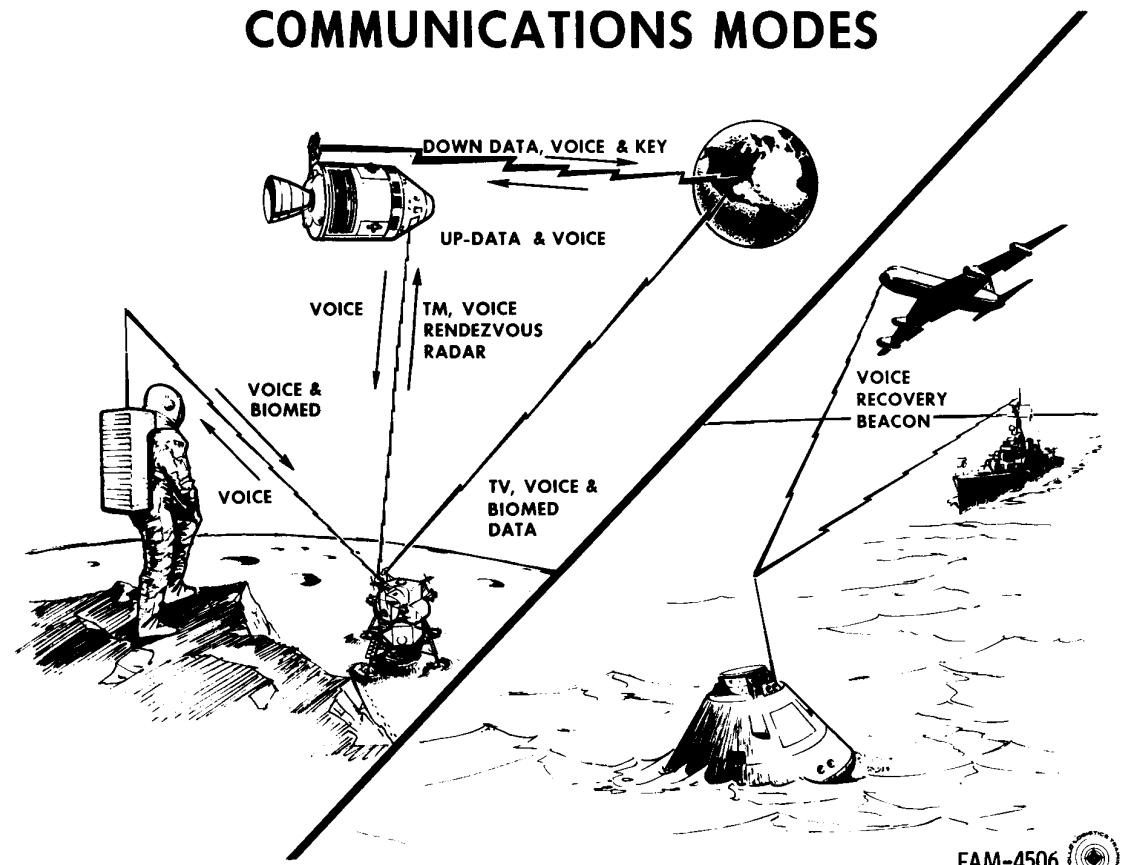
- DATA COLLECTION
 - CREW STATUS
 - SYSTEM STATUS
- VOICE
- TV
- TRACKING
- RECOVERY BEACON
- UP DATA
- TAPE RECORDER

TELECOMMUNICATIONS EQUIPMENT

LOWER EQUIPMENT BAY BLOCK II

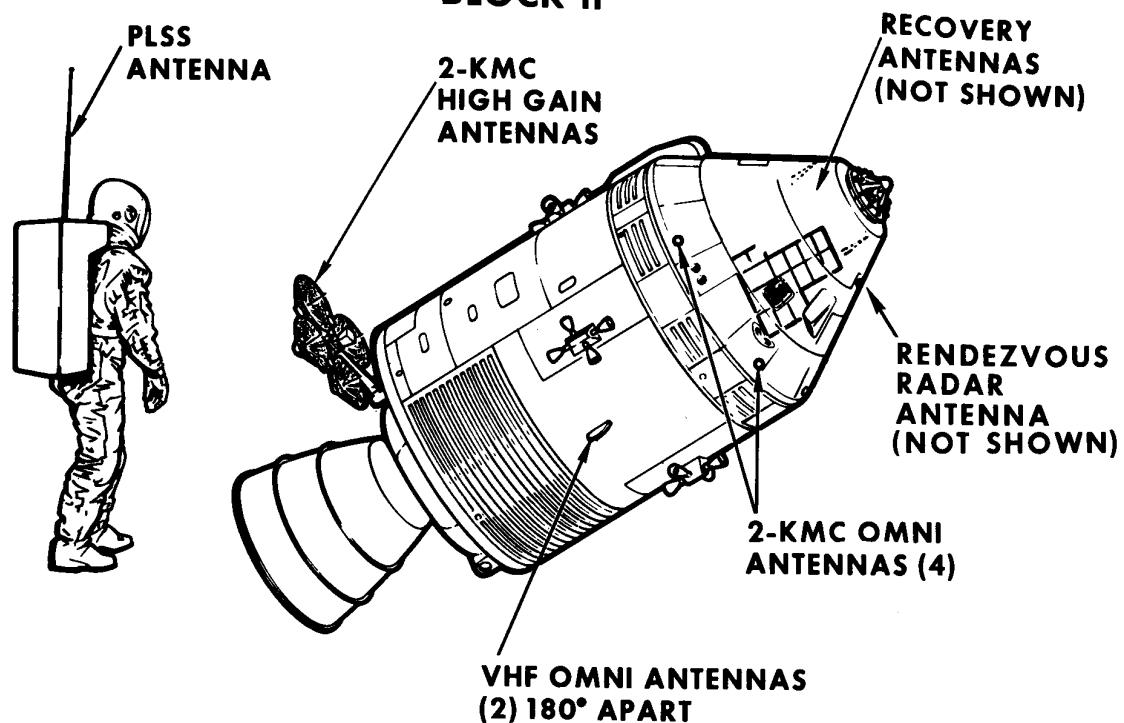


COMMUNICATIONS MODES

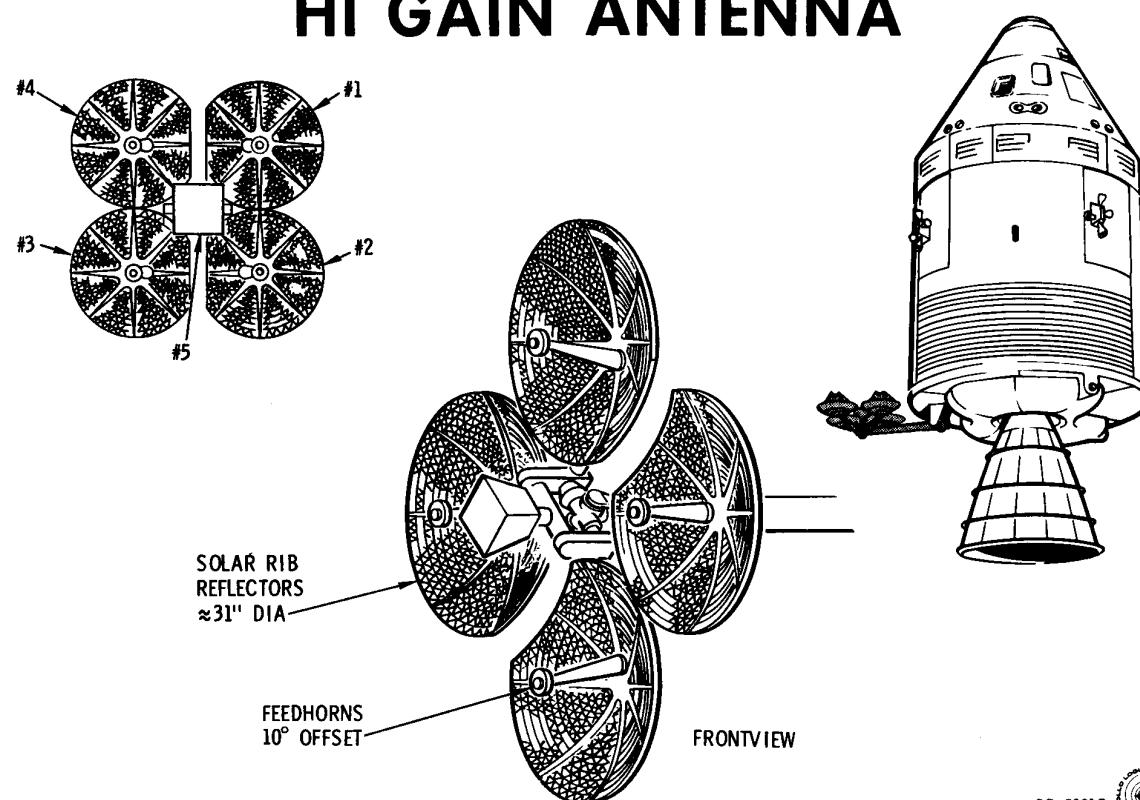


FAM-4506

COMMUNICATIONS SYSTEM BLOCK II

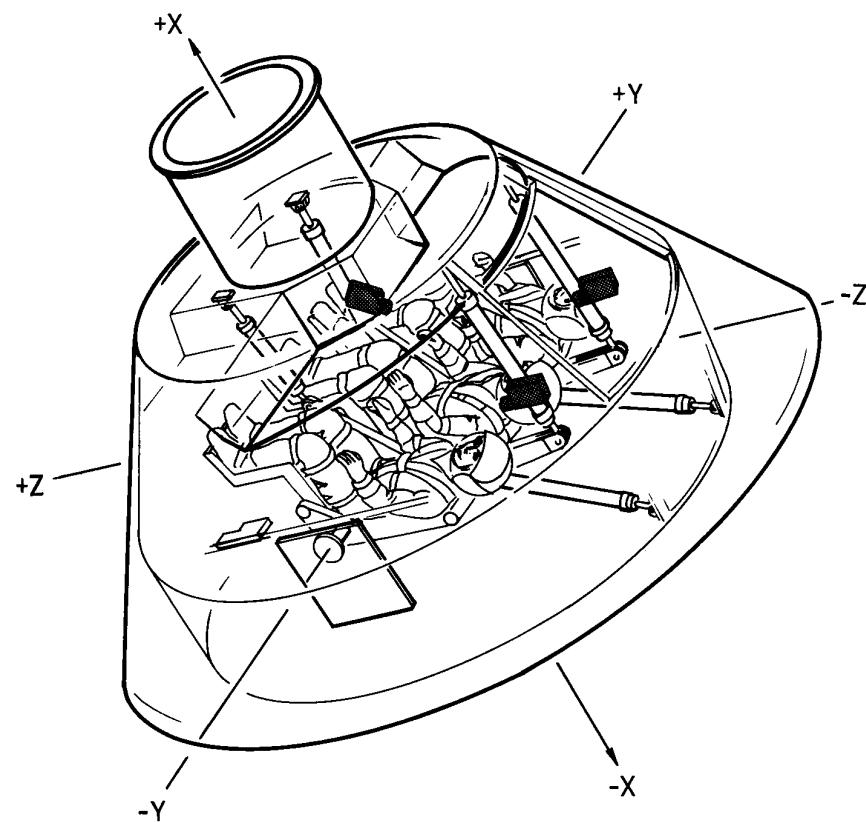


BLOCK II S-BAND HI GAIN ANTENNA

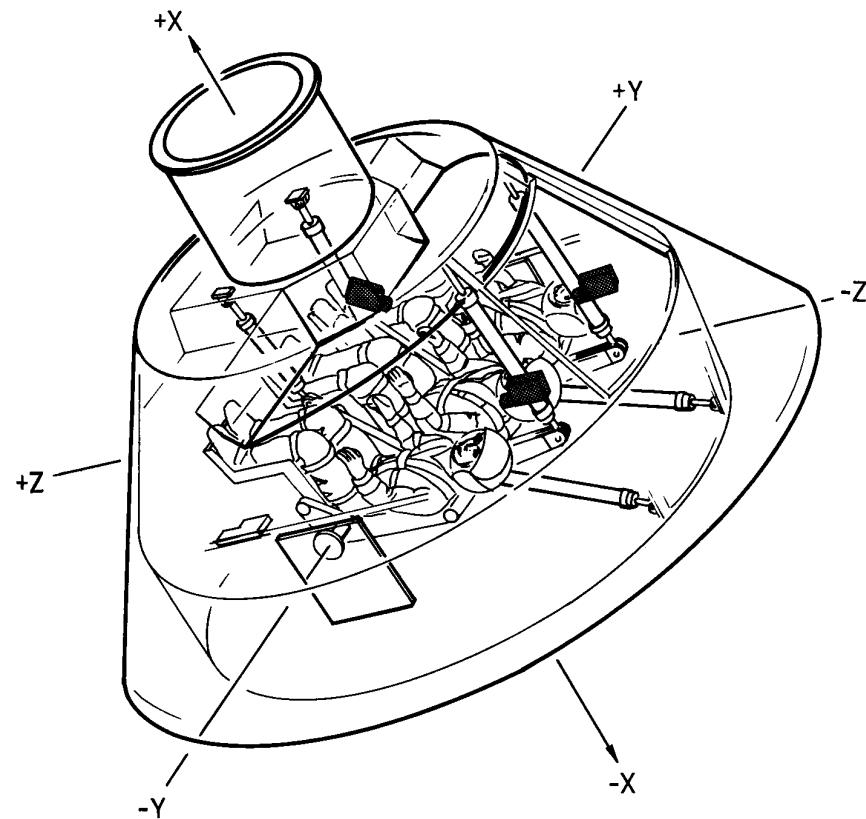


CD-2001C

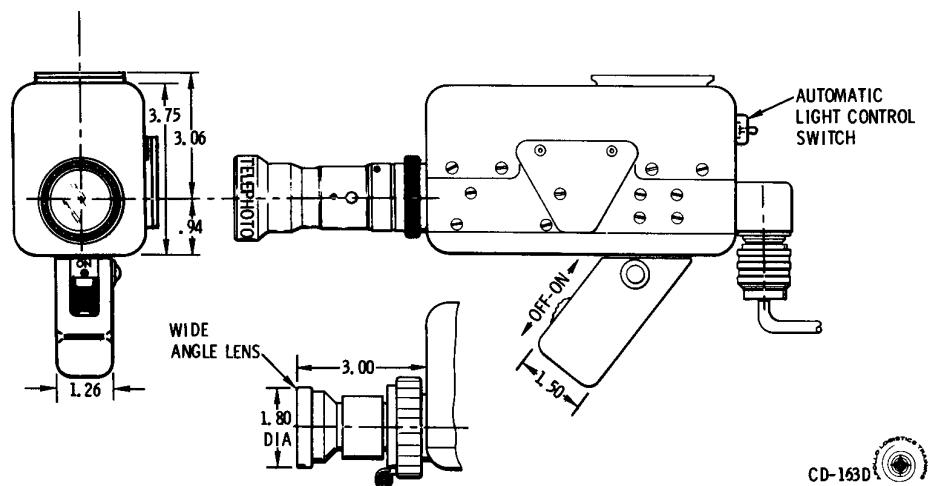
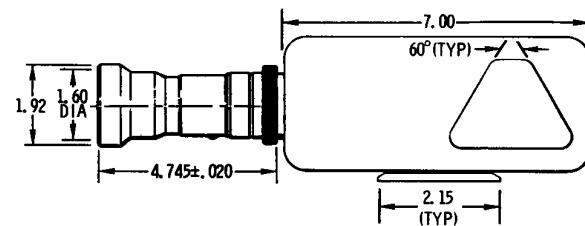
TV CAMERA LOCATIONS



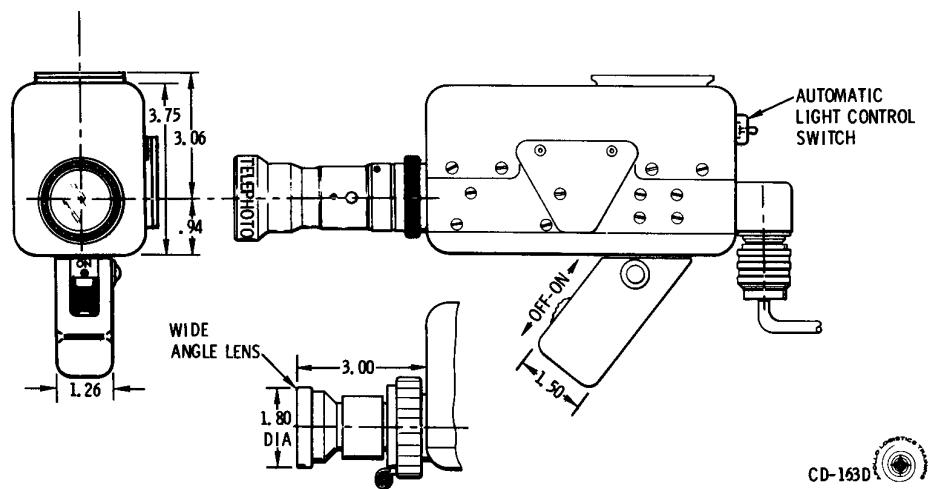
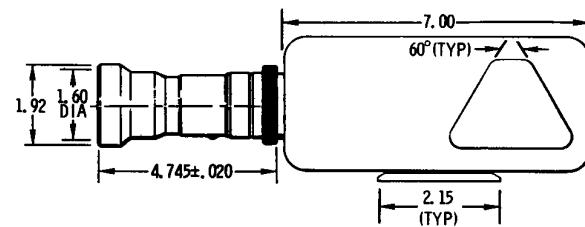
TV CAMERA LOCATIONS



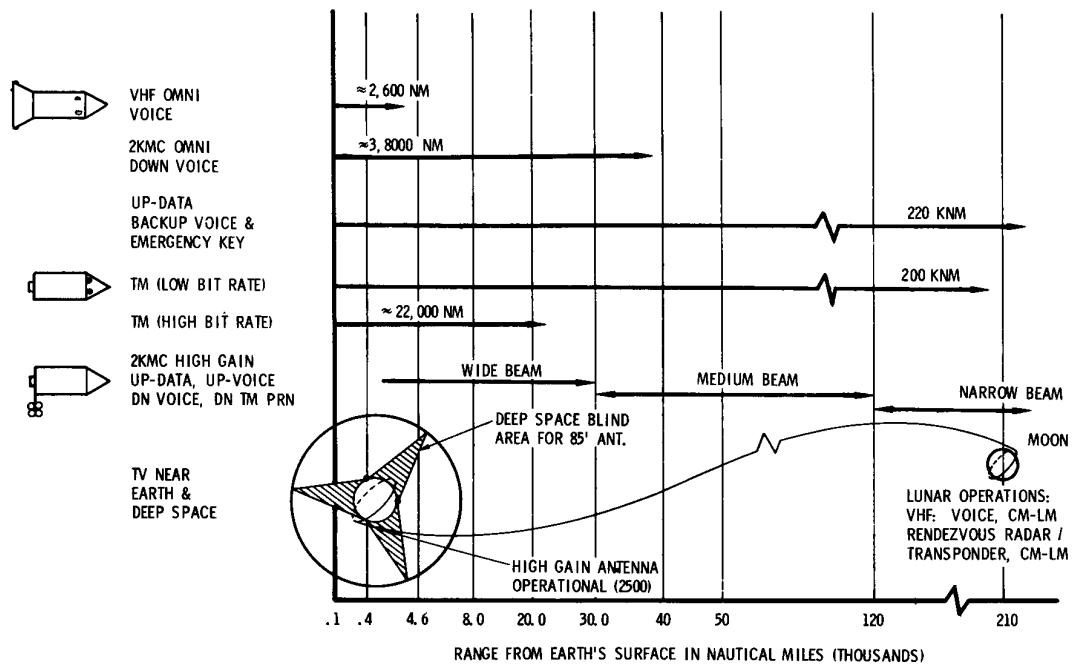
APOLLO TV CAMERA



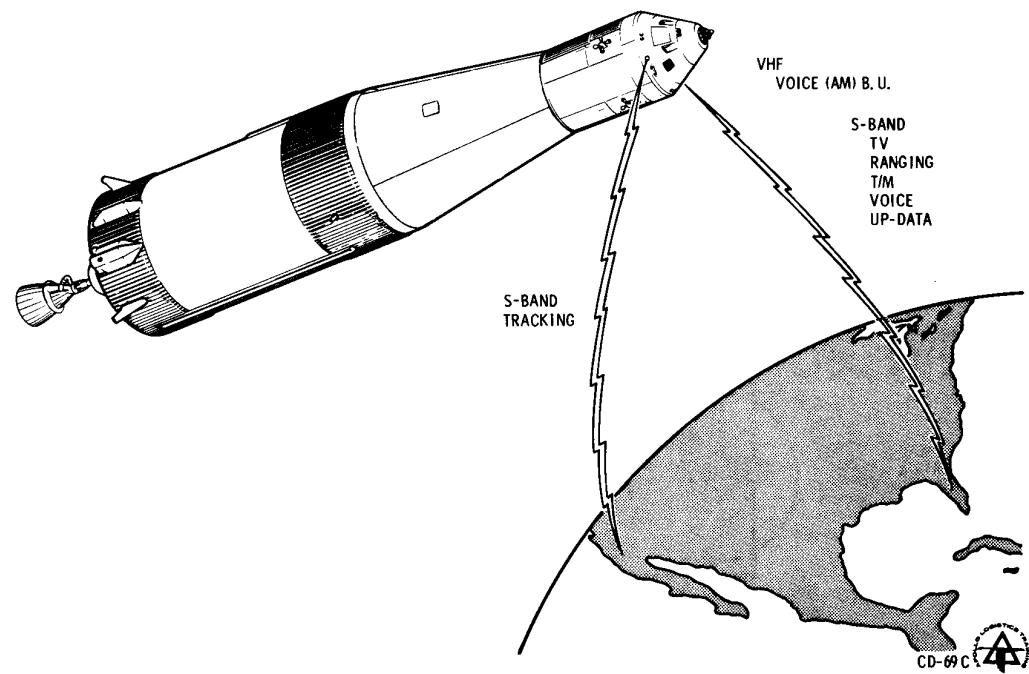
APOLLO TV CAMERA



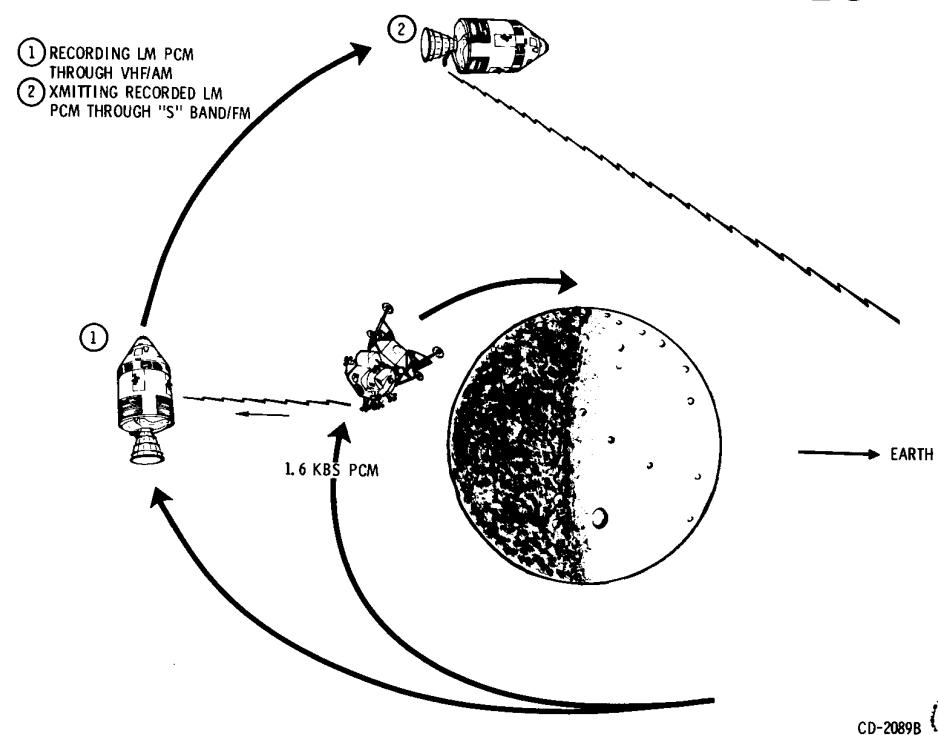
CSM COMMUNICATIONS RANGES BLOCK II



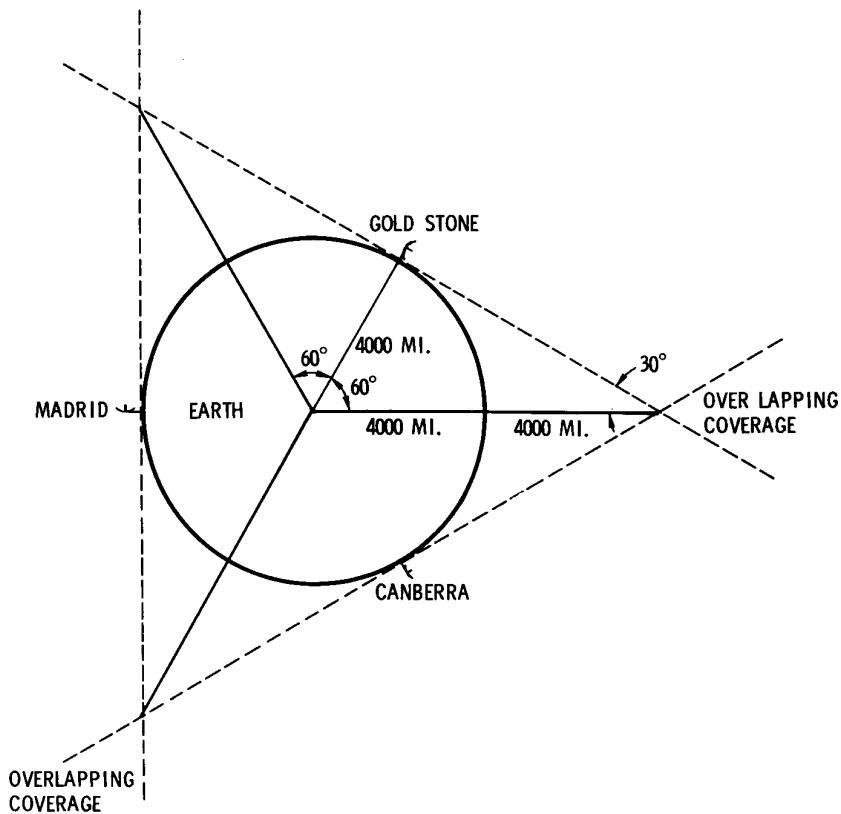
NEAR EARTH COMMUNICATION MODES



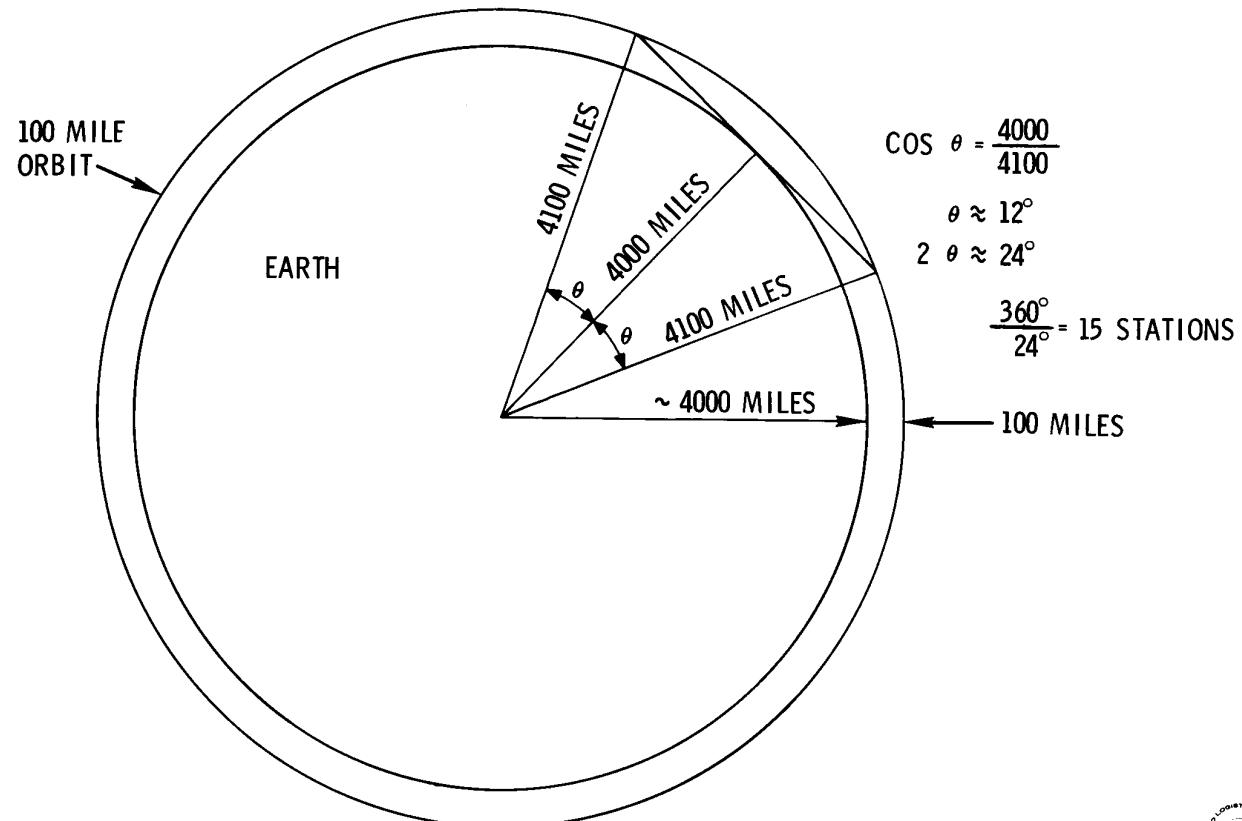
LEM-CSM VHF/AM DATA REC



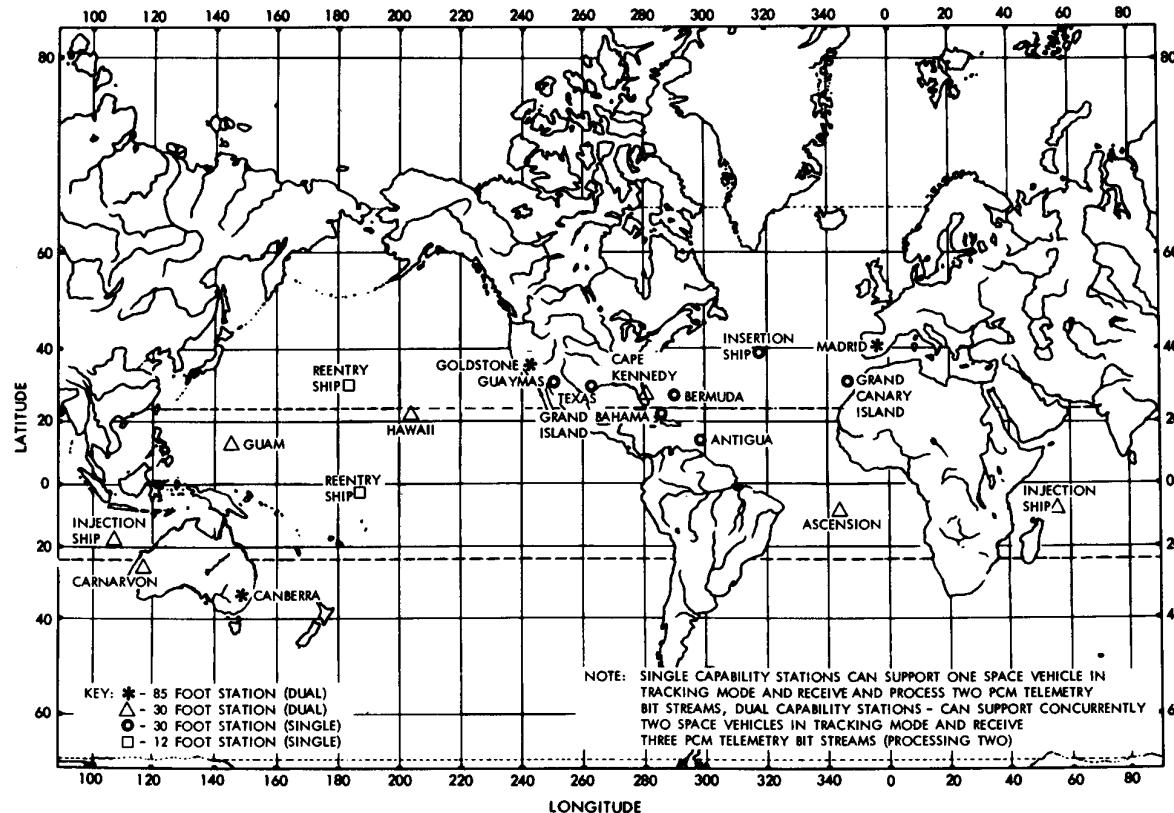
S-BAND GROUND STATION GEOMETRY



S-BAND GROUND STATION REQ



BLOCK I & II MSFN S-BAND STATION LOCATIONS



CD-62



MSFN S-BAND IMPLEMENTATION SCHEDULE

STATION	DUAL C SINGLE CAPABILITY	ANTENNA SIZE (FT)	1966												1967													
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
CARNARVON	● D	30						▲						■														
BERMUDA	● S	30						▲						■														
HAWAII	● D	30						▲						■														
KENNEDY	● D	30						▲						■														
TEXAS	● S	30							▲					■														
GUAYMAS	● S	30							▲					■														
GUAM	● D	30						▲						■														
ASCENSION	● D	30							▲					■														
ANTIGUA	S	30								▲					■													
CANARY	S	30								▲					■													
GRAND BAHAMA	S	30								▲					■													
GOLDSTONE	D	85								▲					■													
CANBERRA	D	85								▲					■													
MADRID	D	85								▲					■													
INSERTION SHIP	S	30								■																		
INJECTION SHIP	D	30								■																		
INJECTION SHIP	D	30								■																		
REENTRY SHIP	S	12									■																	
REENTRY SHIP	S	12										■																
8 INSTRUMENT- ATION AIRCRAFT																												■

COMPLETE INSTALLATION AND CHECKOUT _____ ▲
FULLY OPERATIONAL-MANNED MISSIONS _____ ●

COMPLETE SYSTEM SIMULATION _____ ■

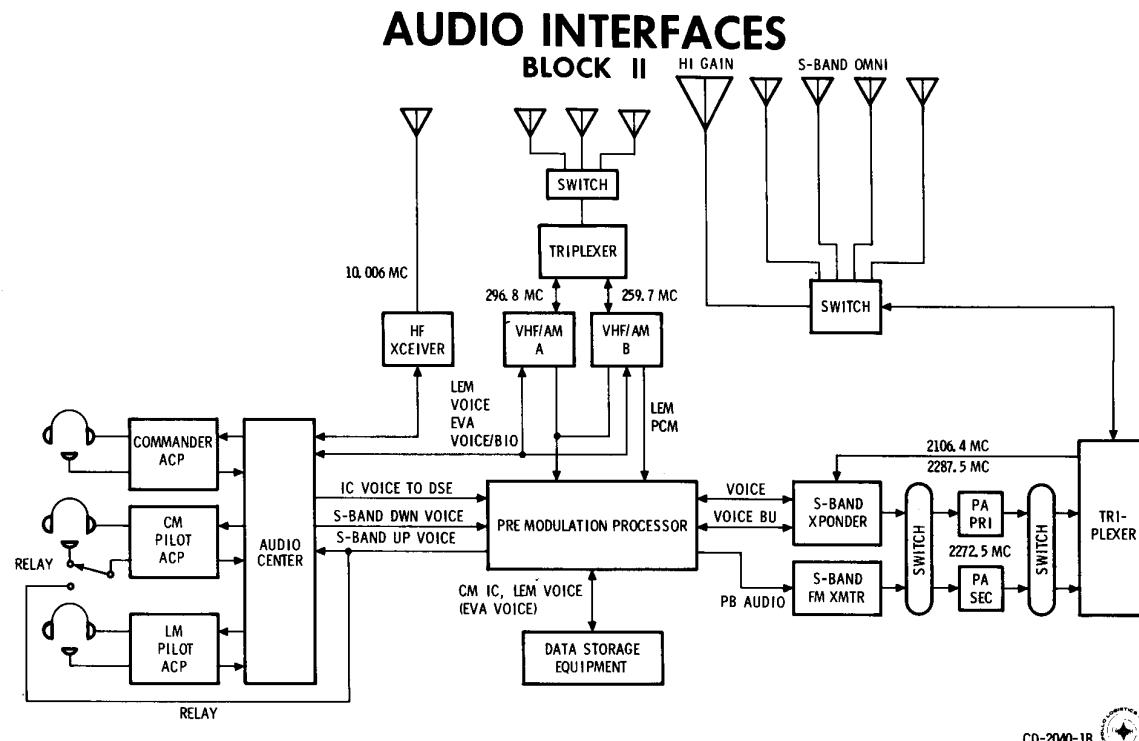
CD-2011B 

COMM EQUIPMENT/MISSION PHASE

	PRE-LAUNCH	LAUNCH EARTH ORBIT	TRANS-LUNAR FLIGHT 4000 MI	LUNAR ORBIT	LEM DESCENT LUNAR EXPLORE LEM ASCENT	TRANS-EARTH INJECT TRANS EARTH FLIGHT	DESCENT LANDING RECOVERY
VOICE	HARDLINE S-BAND	S-BAND VHF/AM*	S-BAND	S-BAND	S-BAND VHF/AM+	S-BAND	S-BAND VHF/AM
TV	HARDLINE	S-BAND	S-BAND	S-BAND	S-BAND	S-BAND	
BIO MED	HARDLINE S-BAND*	S-BAND	S-BAND VHF/AM+	S-BAND	S-BAND VHF/AM+	S-BAND	
UP-DATA	HARDLINE S-BAND*	S-BAND	S-BAND	S-BAND	S-BAND	S-BAND	
DWN-DATA	HARDLINE S-BAND*	S-BAND	S-BAND	S-BAND	S-BAND	S-BAND	
RANGING		S-BAND	S-BAND	S-BAND	S-BAND	S-BAND	
BEACON							VHF-BCN

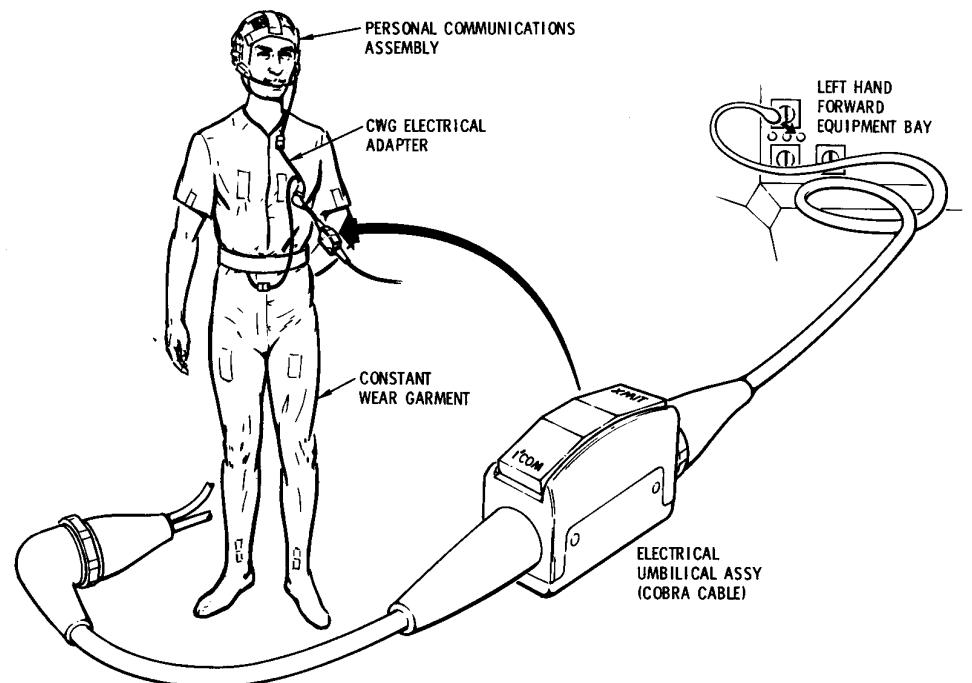
* BACKUP MODE

+ LM-E V. A. COMMUNICATIONS



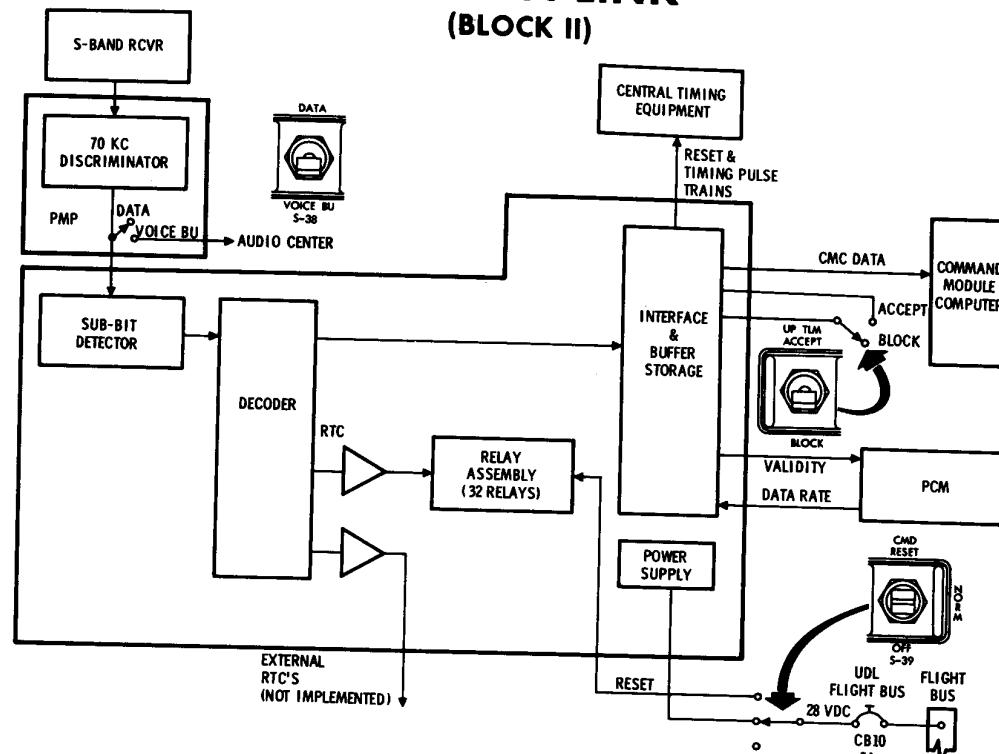
ELECTRICAL UMBILICAL (COMM CABLE)

BLOCK II

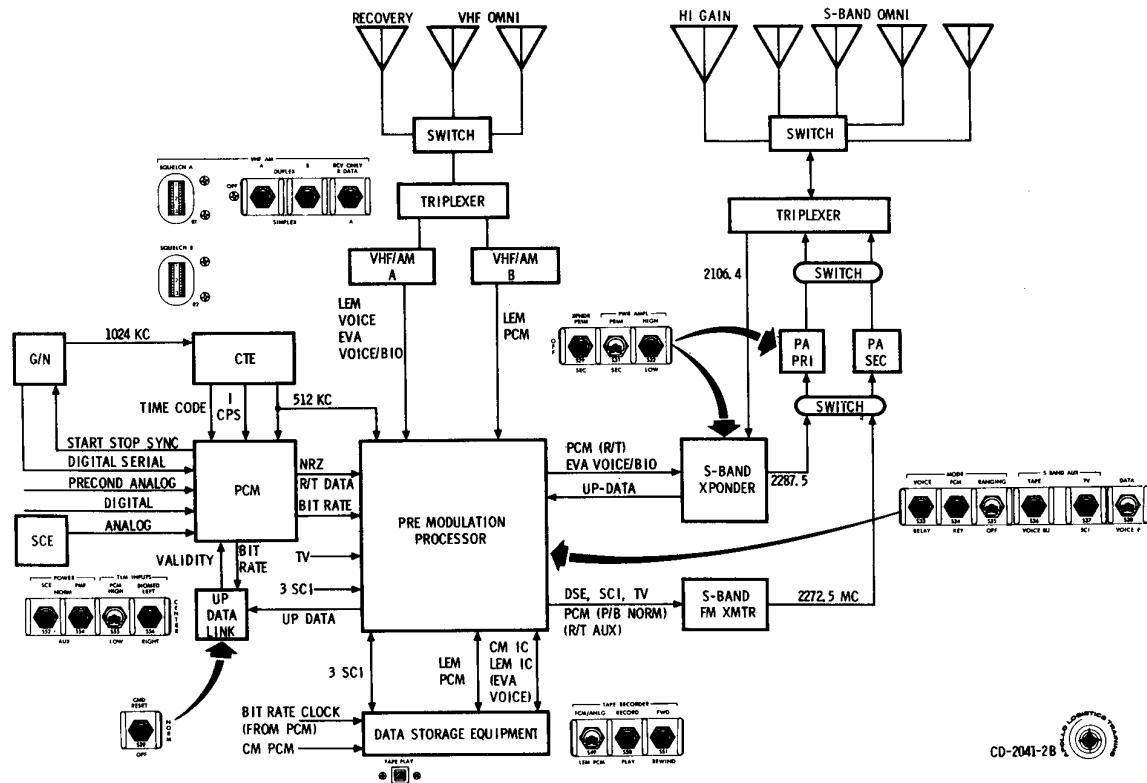


CD-2065 A

UP-DATA LINK (BLOCK II)

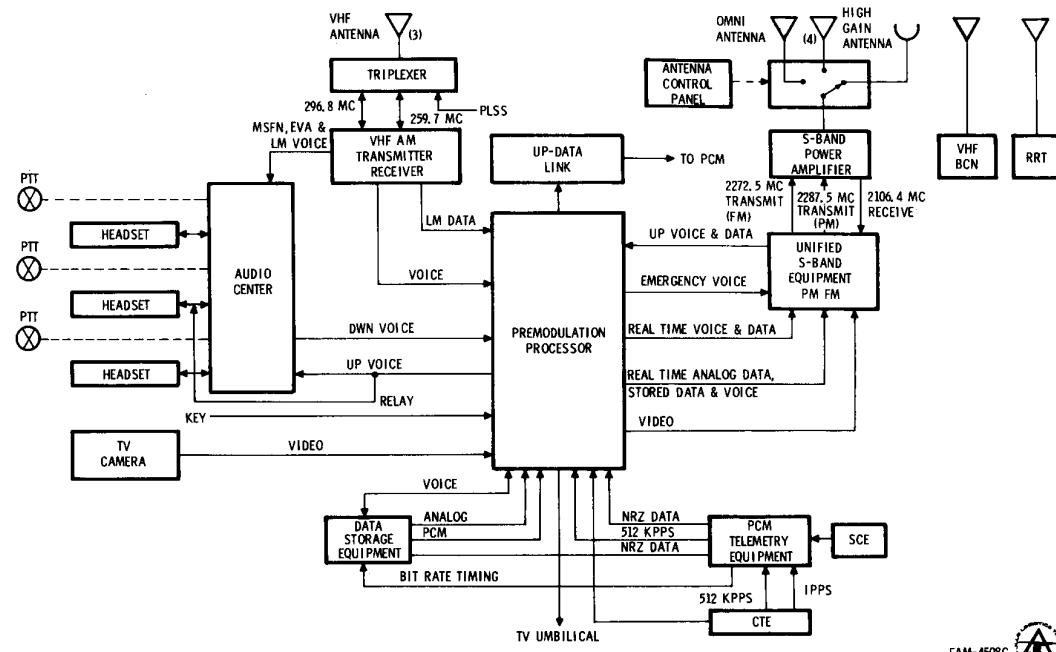


DATA INTERFACES BLOCK II



CD-2041-2B

TELECOMMUNICATIONS SYSTEM BLOCK II



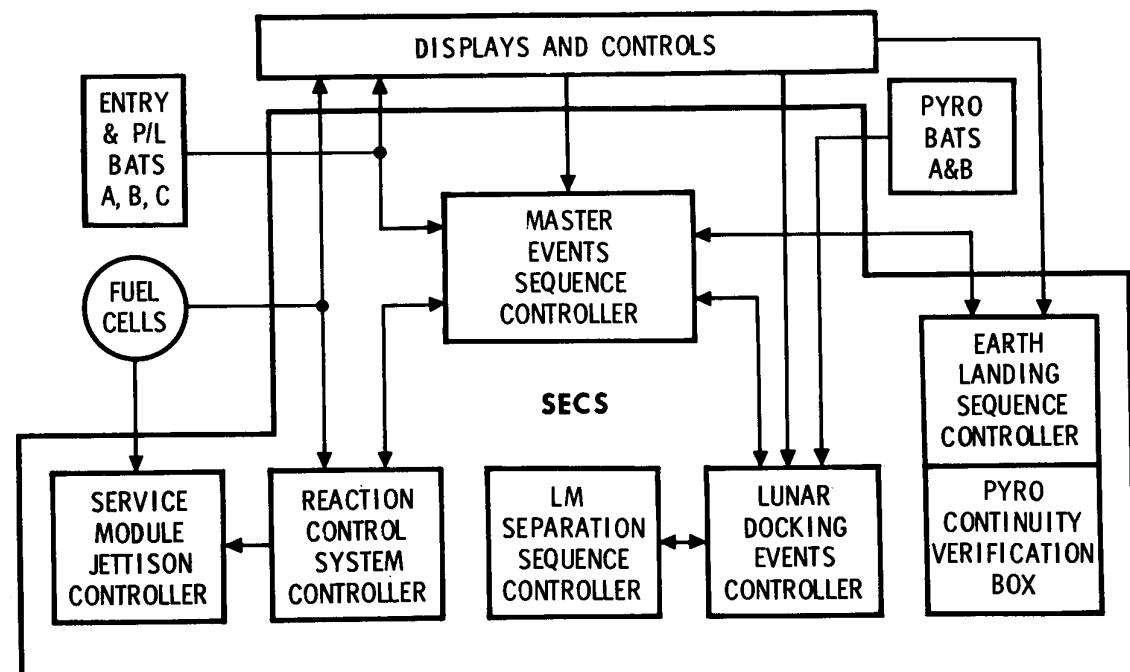
SEQUENCING

FAM-3005B



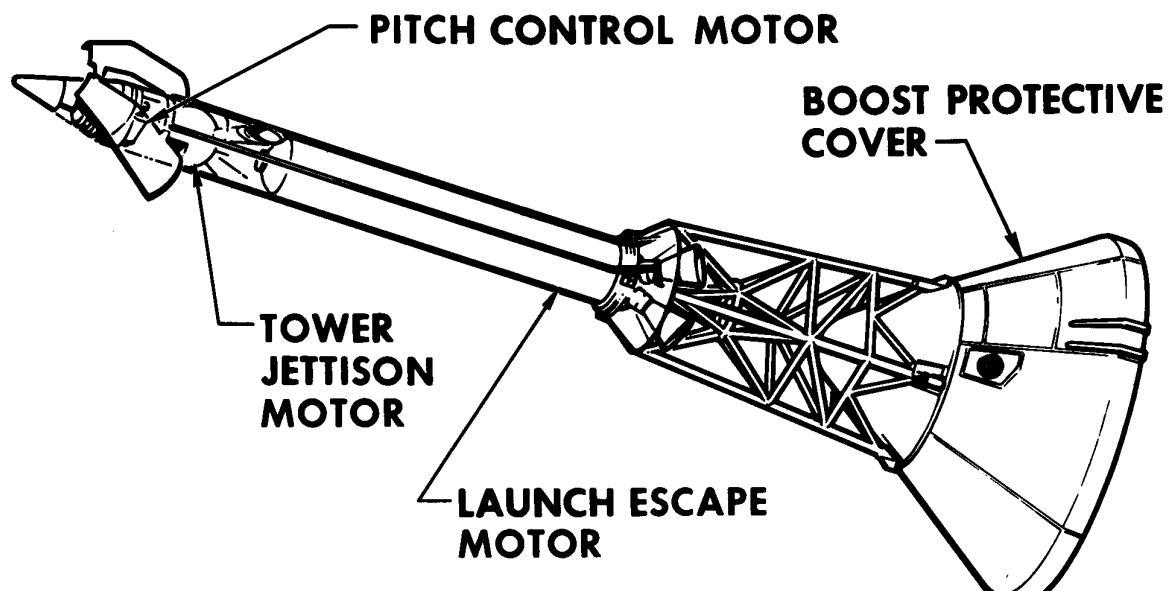
SECS

MAJOR COMPONENTS (BLOCK II)



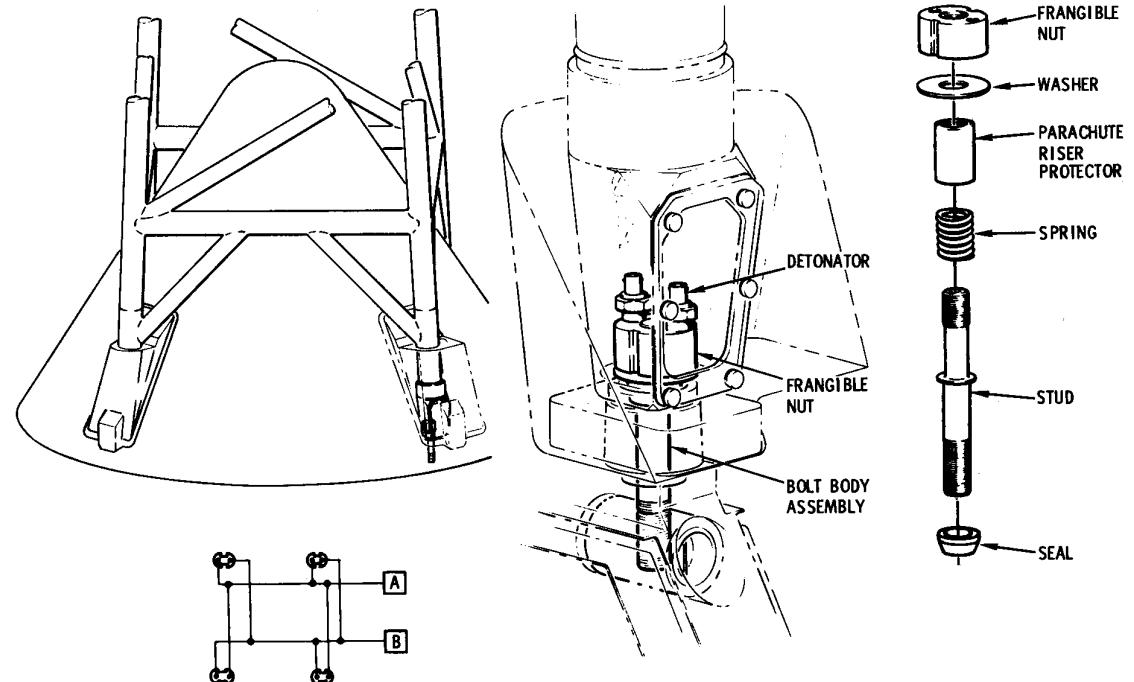
SEQ-501B

LAUNCH ESCAPE SYSTEM & BOOST PROTECTIVE COVER



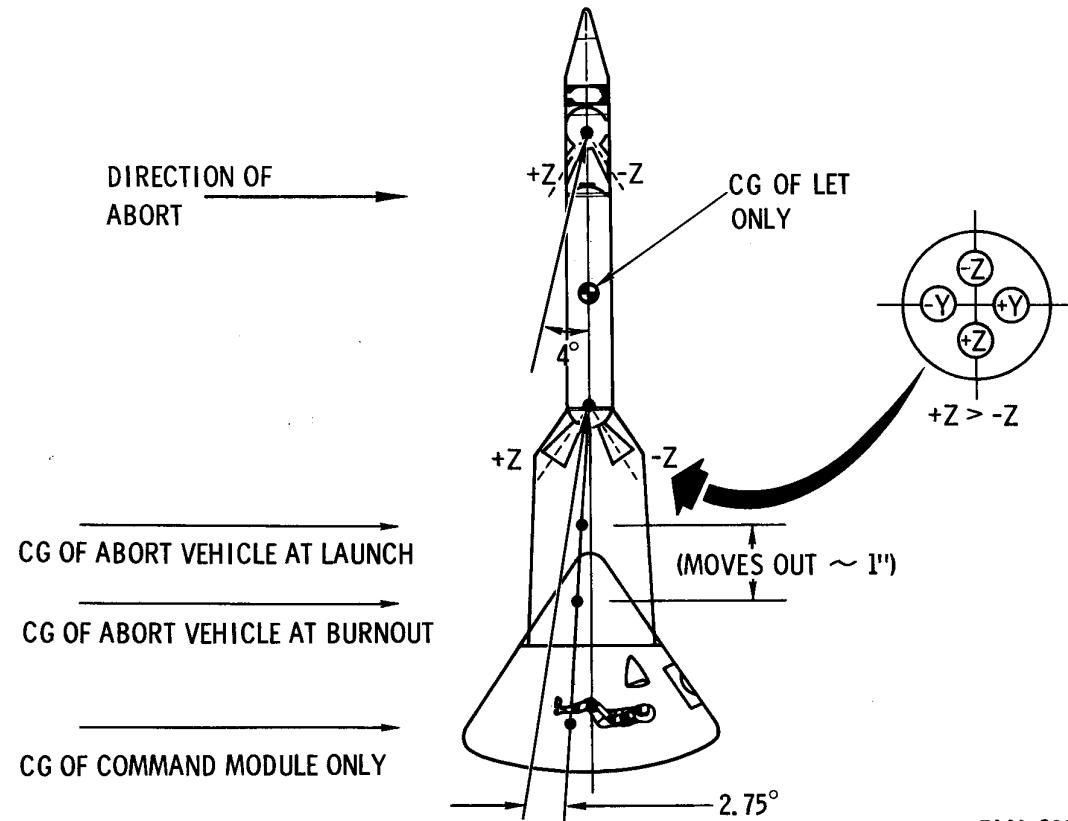
FAM-3017

TOWER SEPARATION SYSTEM

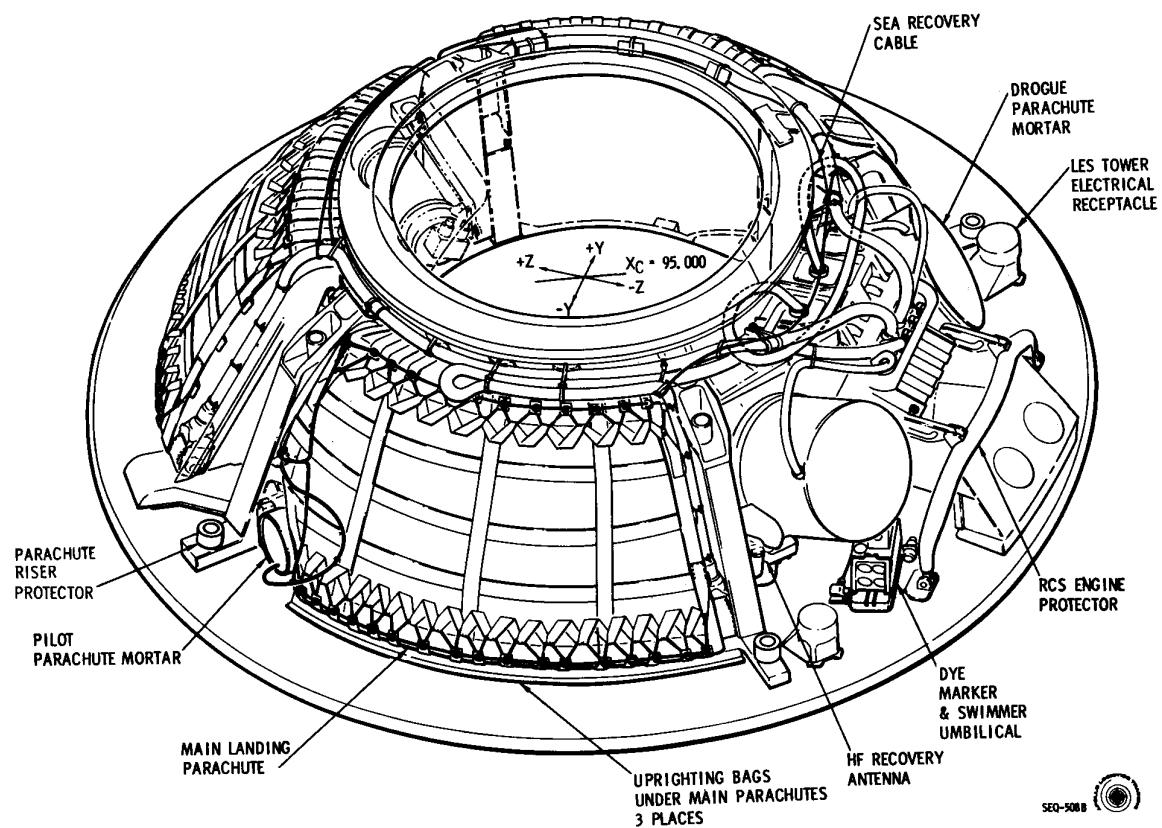


SEQ-519

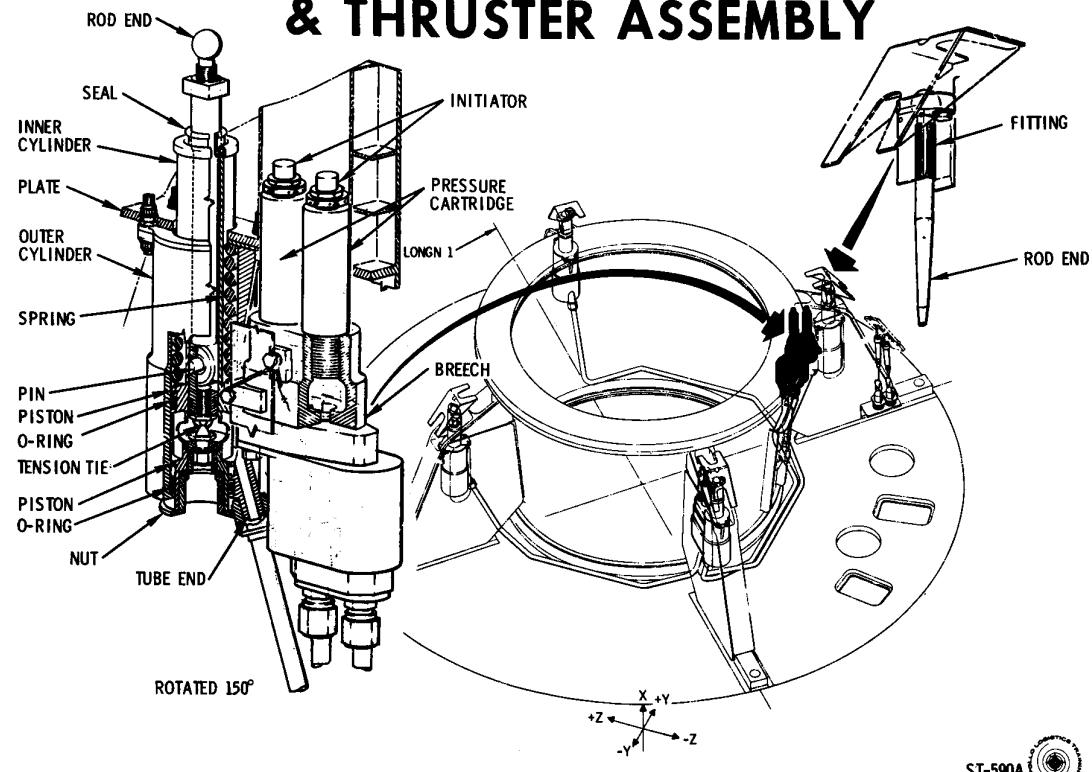
ABORT VEHICLE MECHANICS



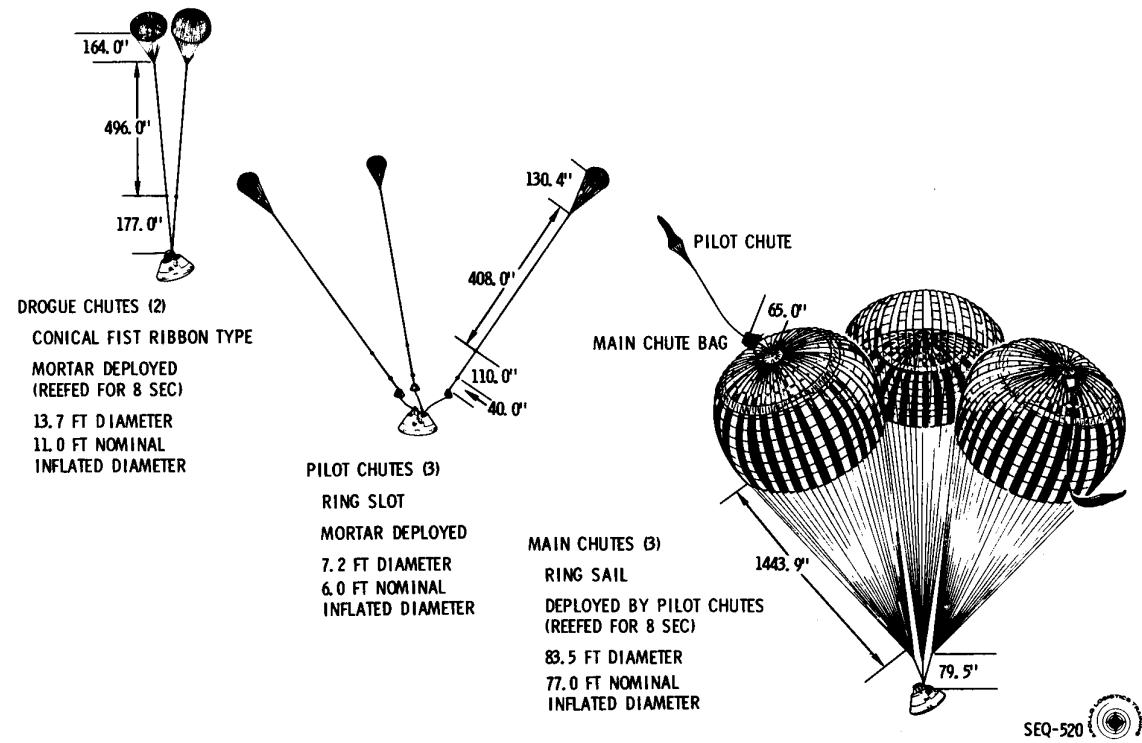
ELS EQUIPMENT (BLOCK II)



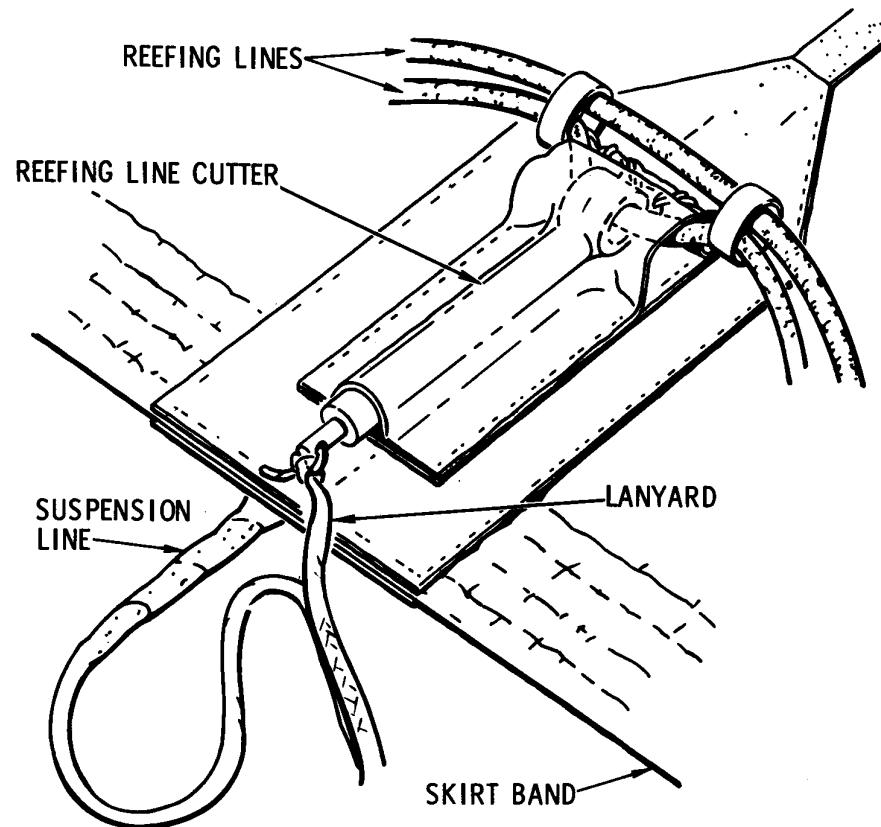
FORWARD HEATSHIELD ATTACHMENT & THRUSTER ASSEMBLY



EARTH LANDING SYSTEM PARACHUTES

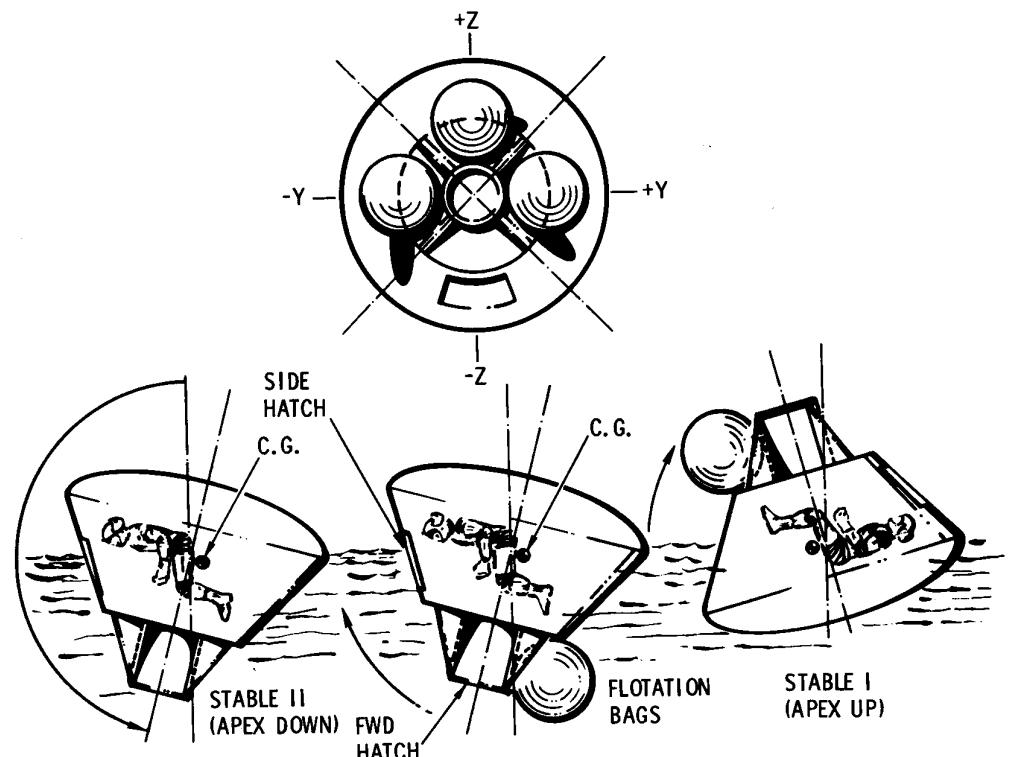


REEFING LINE CUTTER INSTALLATION



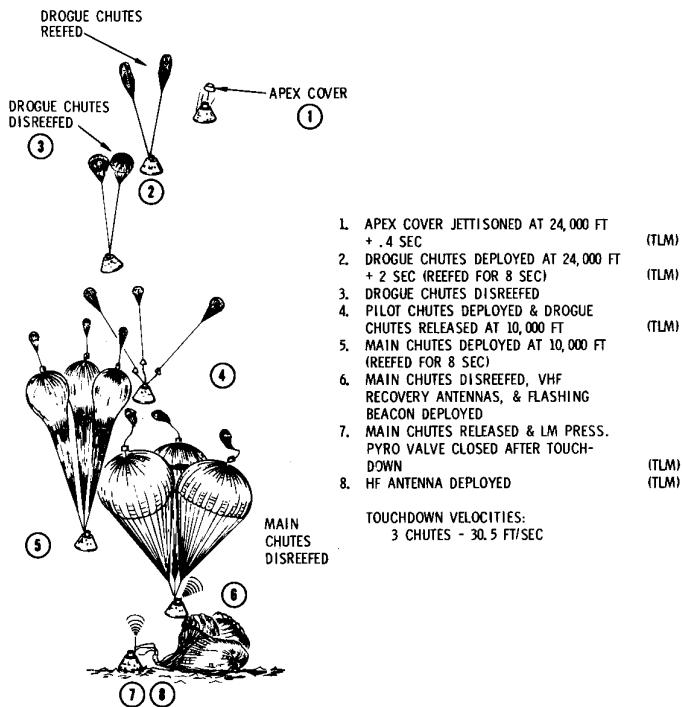
SEQ-75

UPRIGHTING SYSTEM 3 BAG SYSTEM



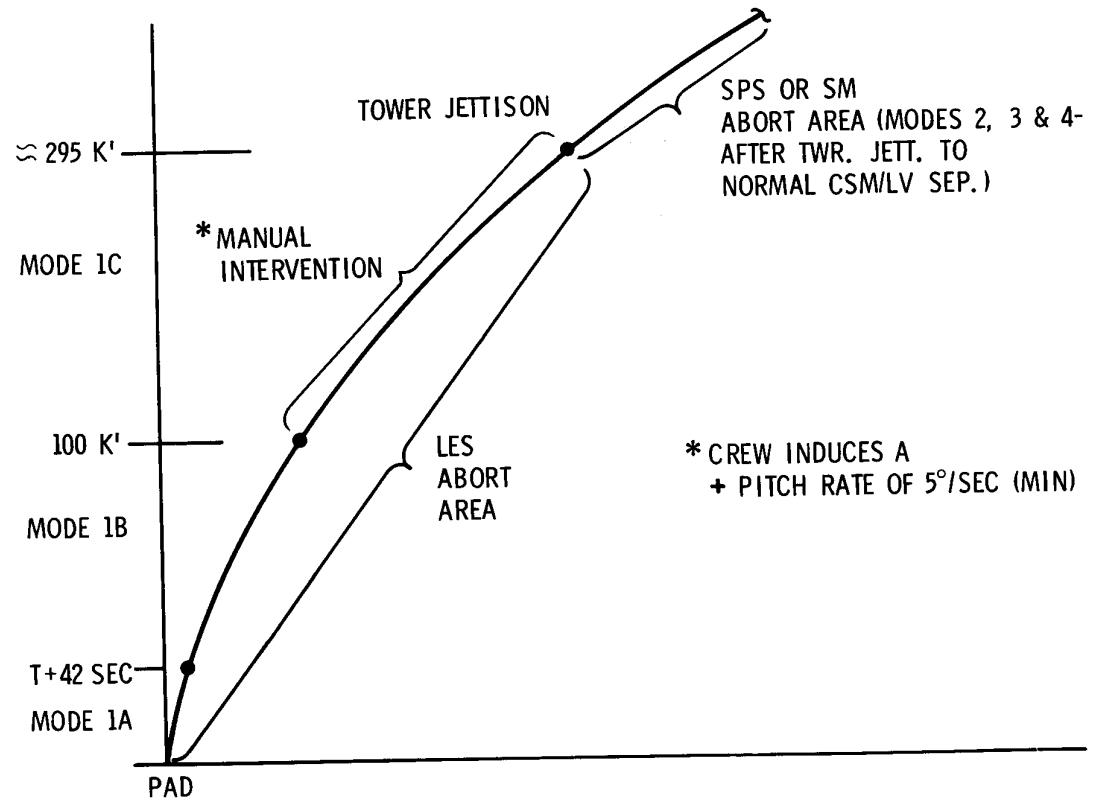
ST-650C

EARTH LANDING SYSTEM NORMAL SEQUENCE



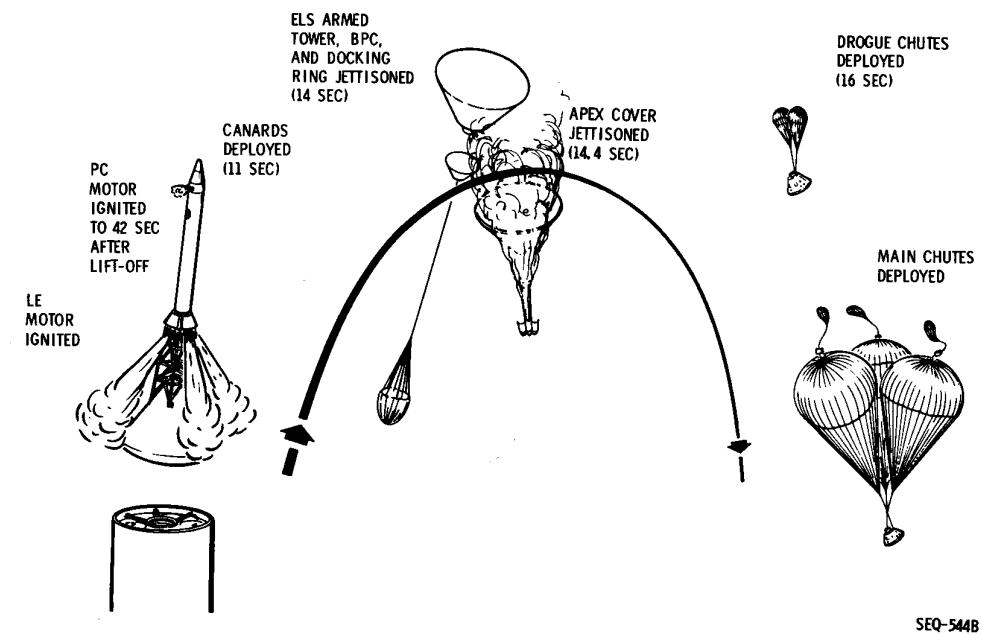
SEQ-547A

ABORT DESIGNATIONS BLOCK II - MODE 1

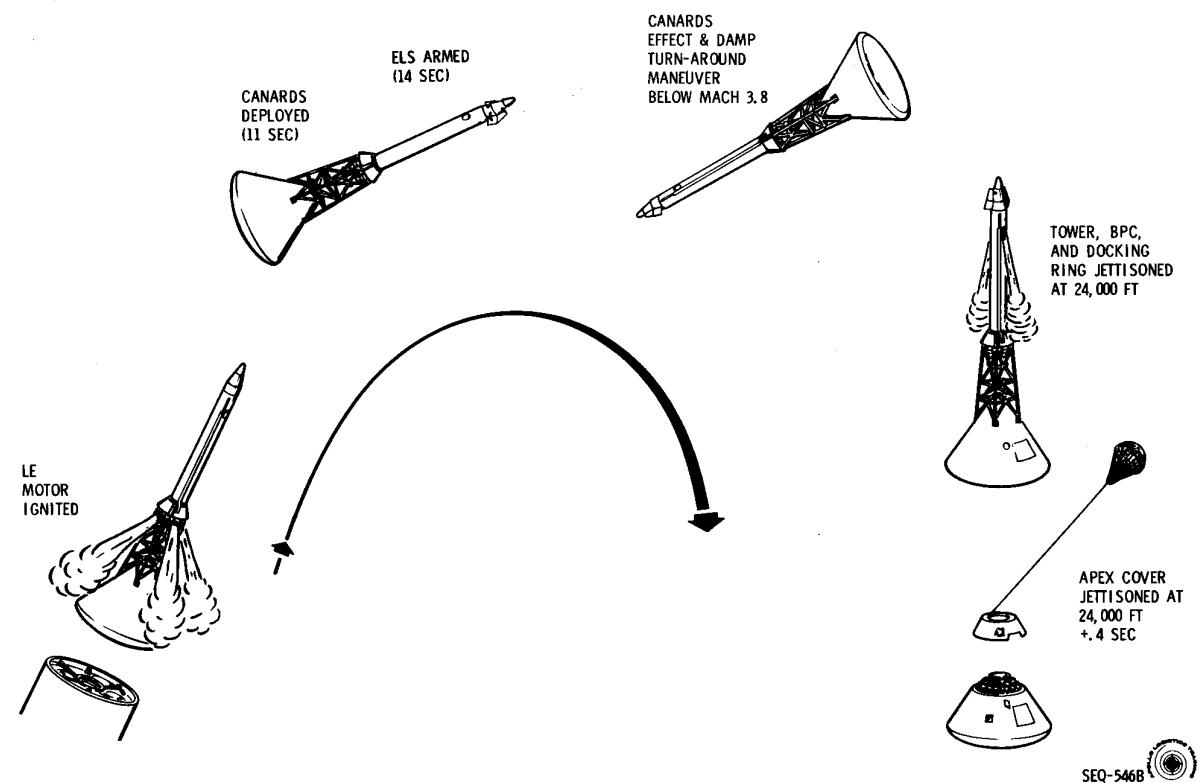


SEQ-95B

PAD TO ≈30,000 FT LES ABORT

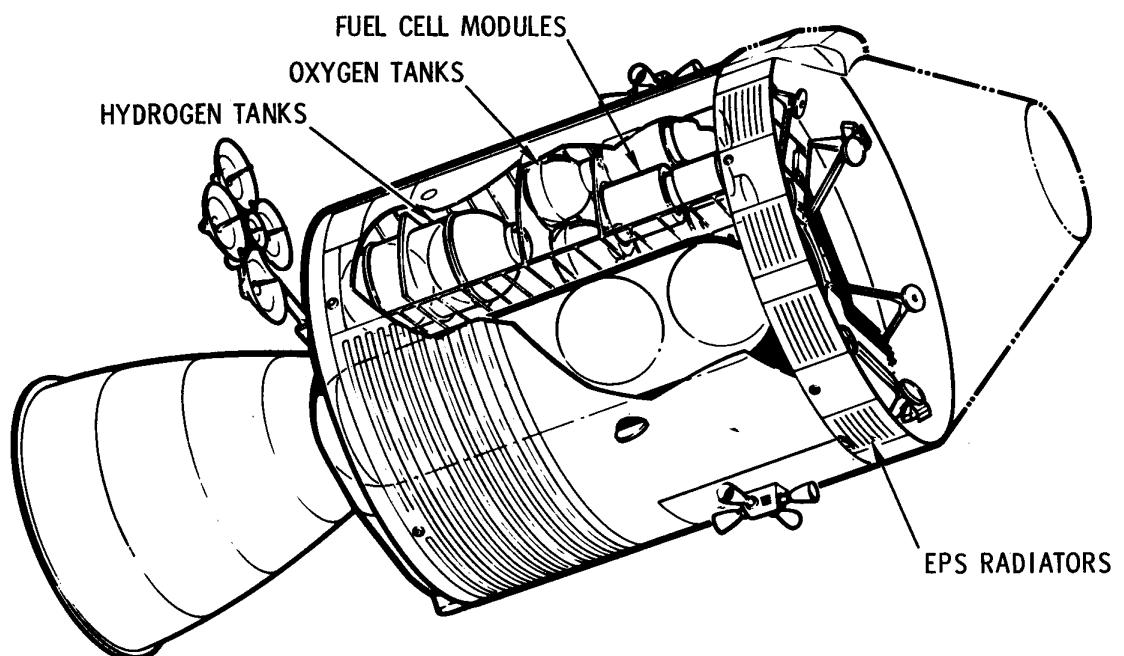


= 30,000 FT TO TWR JETT LES ABORT



ELECTRICAL POWER

ELECTRICAL POWER SYSTEM BLOCK II



FAM-2005B 4

ELECTRICAL POWER SYSTEM

FUNCTIONAL DIVISION

POWER SOURCES

- **D.C. SYSTEM**

- FUEL CELL MODULES (3)
 - BATTERIES (3)

- **A.C. SYSTEM**

- INVERTERS (3)

POWER DISTRIBUTION

- **D.C. BUSSES**

- **A.C. BUSSES**

SPECIAL CIRCUITS

- **BATTERY CHARGER**

- **PYROTECHNIC BATTERIES (2)**

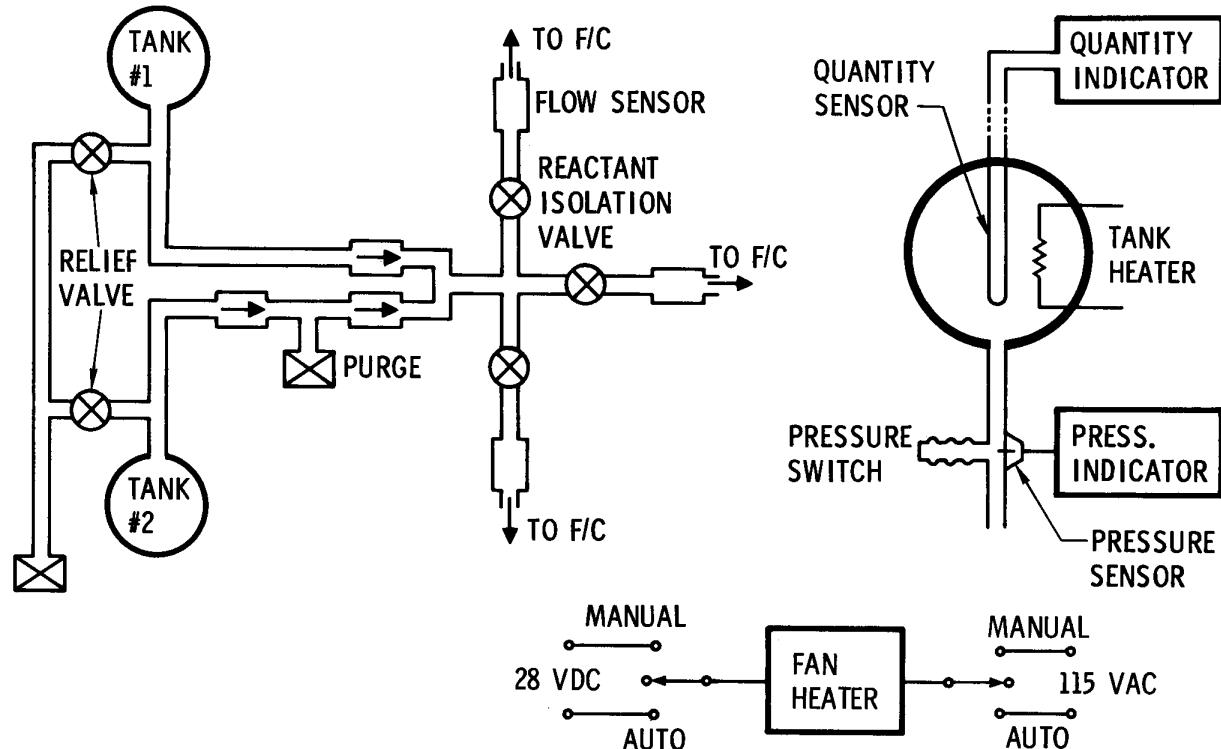
- **S/M JETTISON CONTROL**

CRYOGENIC STORAGE SYSTEM

GAS	CONTAINER	USEABLE	TOTAL USEABLE
O ₂	INCONEL (2)	320 LBS (EA)	640 LBS
H ₂	TITANIUM (2)	28 LBS (EA)	56 LBS

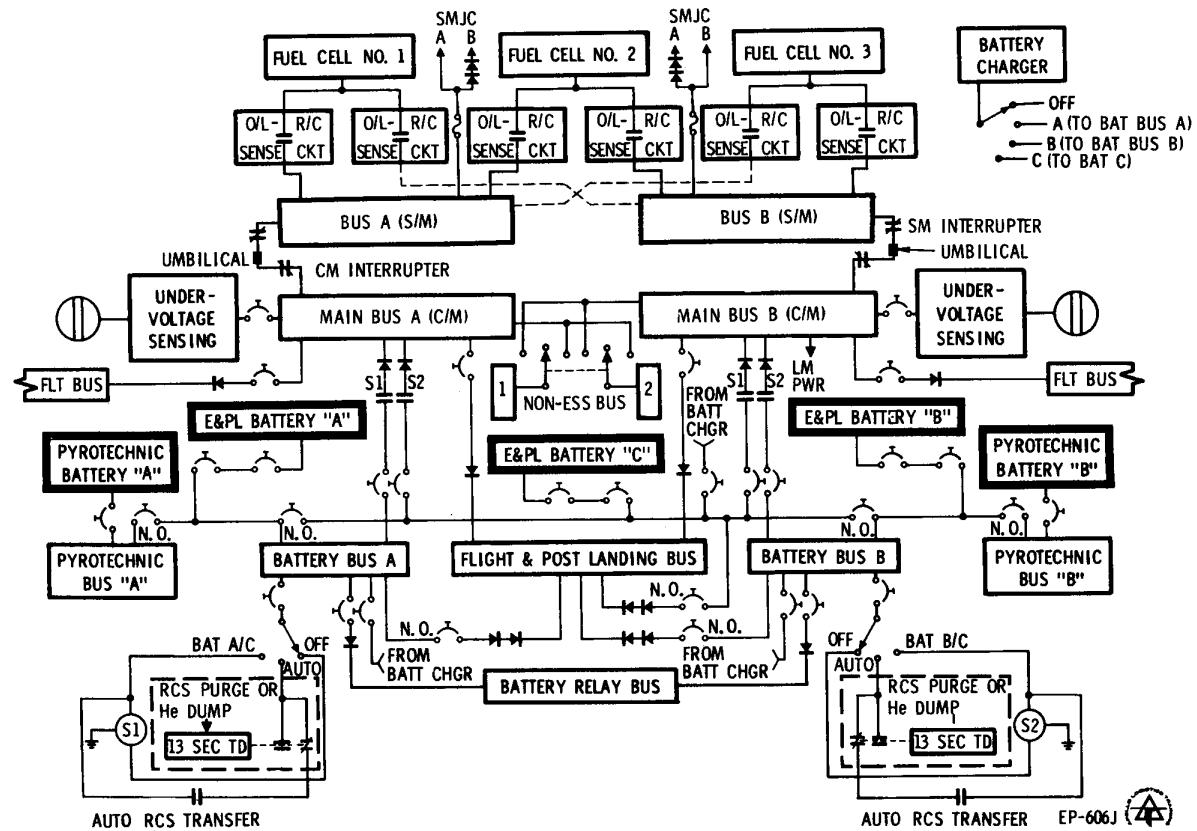
GAS	INPUT TEMP.	SETTLED TEMP.	STORED PRESSURE	SYSTEM ALLOCATION
O ₂	-297° F	-284° F	900 ± 35 PSIA	EPS - 410 #
				ECS - 230 #
H ₂	-423° F	-417° F	245 ± 15 PSIA	FUEL CELLS ONLY

CRYOGENIC STORAGE SYSTEM



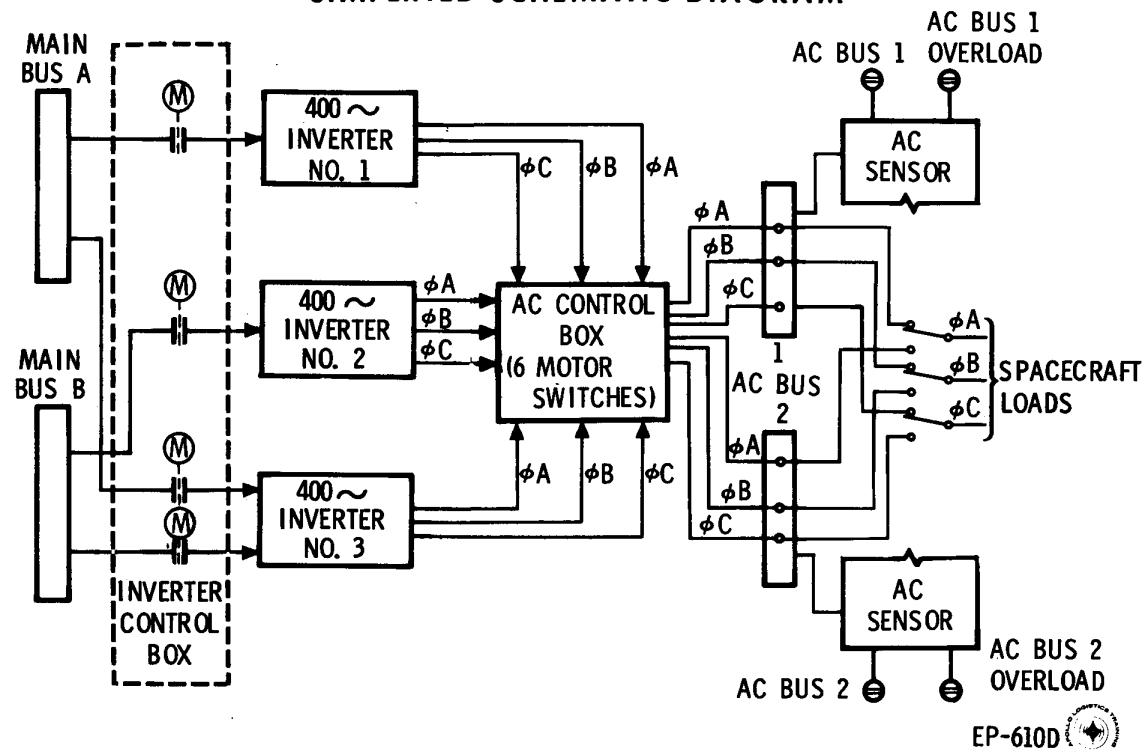
DC POWER DISTRIBUTION

SIMPLIFIED SCHEMATIC DIAGRAM

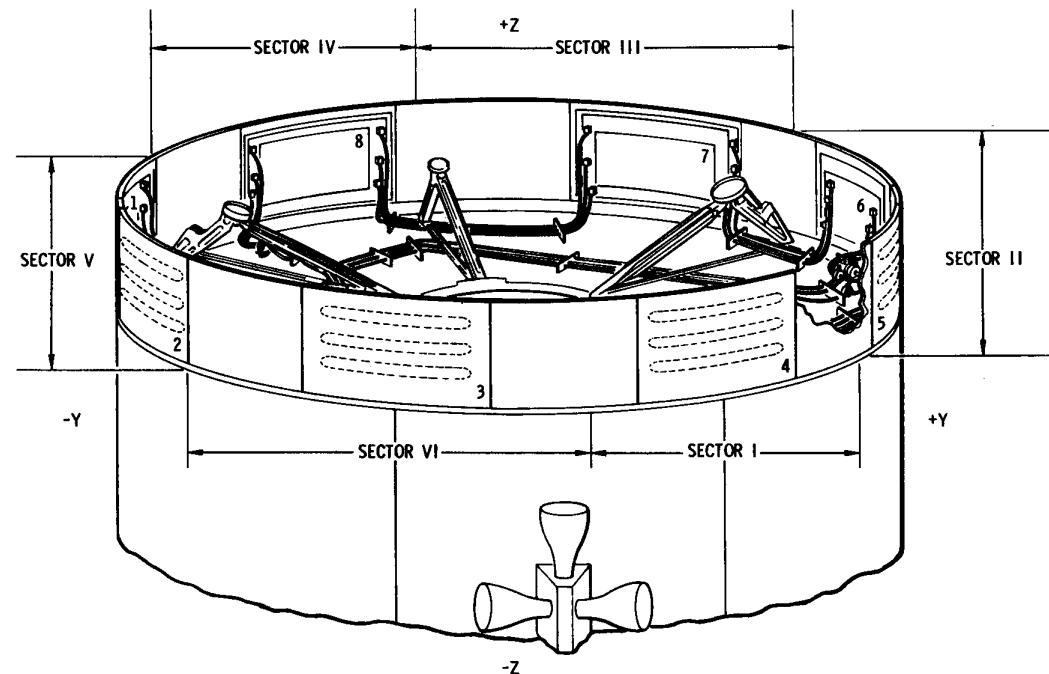


AC POWER DISTRIBUTION

SIMPLIFIED SCHEMATIC DIAGRAM

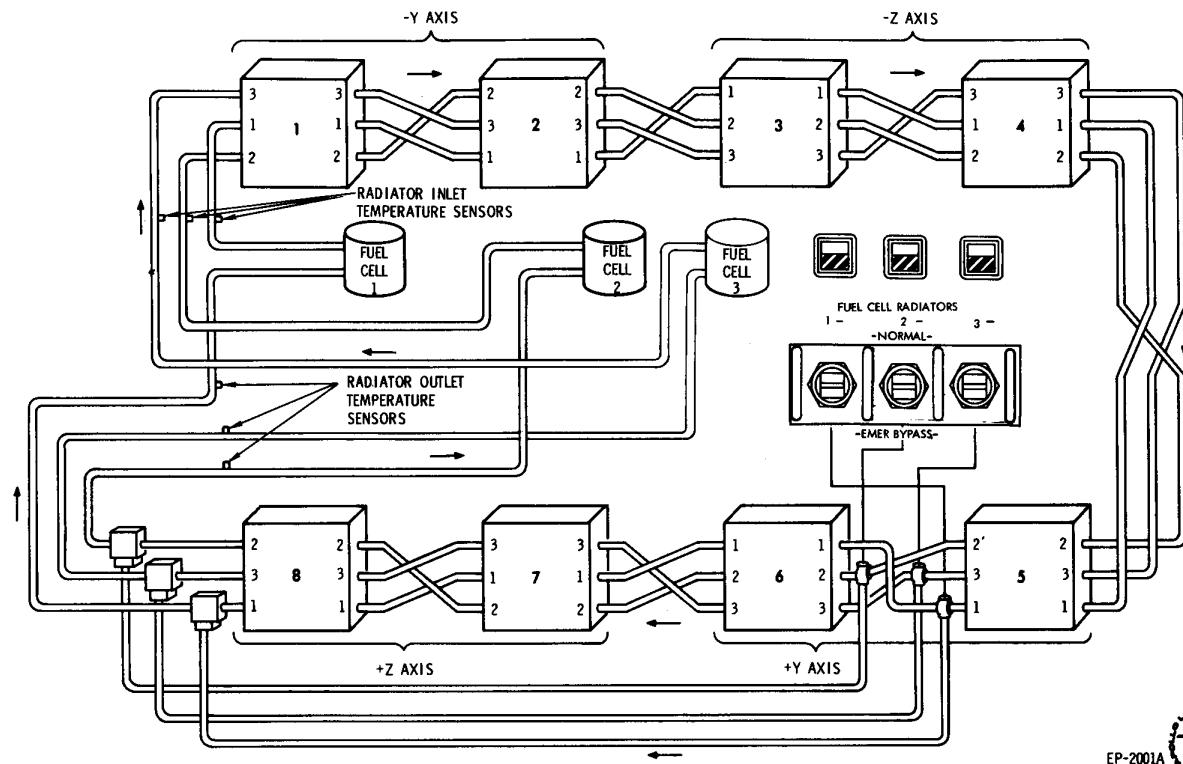


**EPS RADIATOR LOCATION
BLOCK II**



EP-2000 

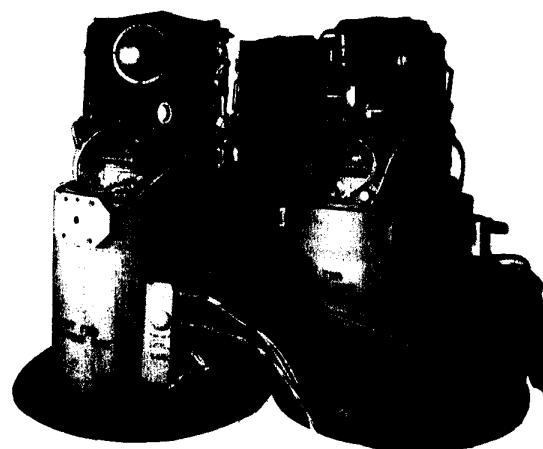
EPS RADIATOR CONTROL BLOCK II



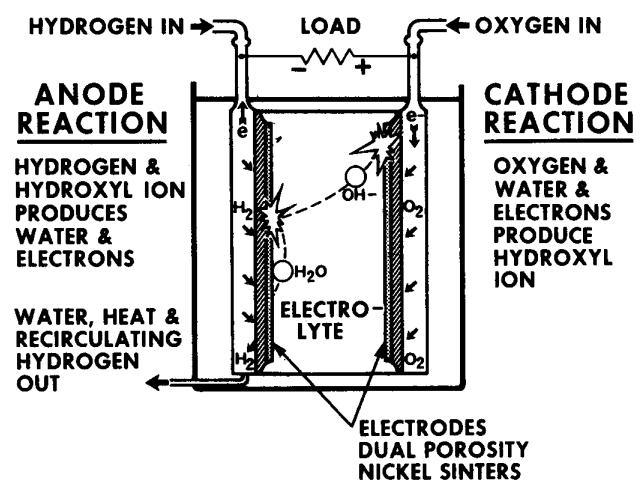
EP-2001A

124SD10324A

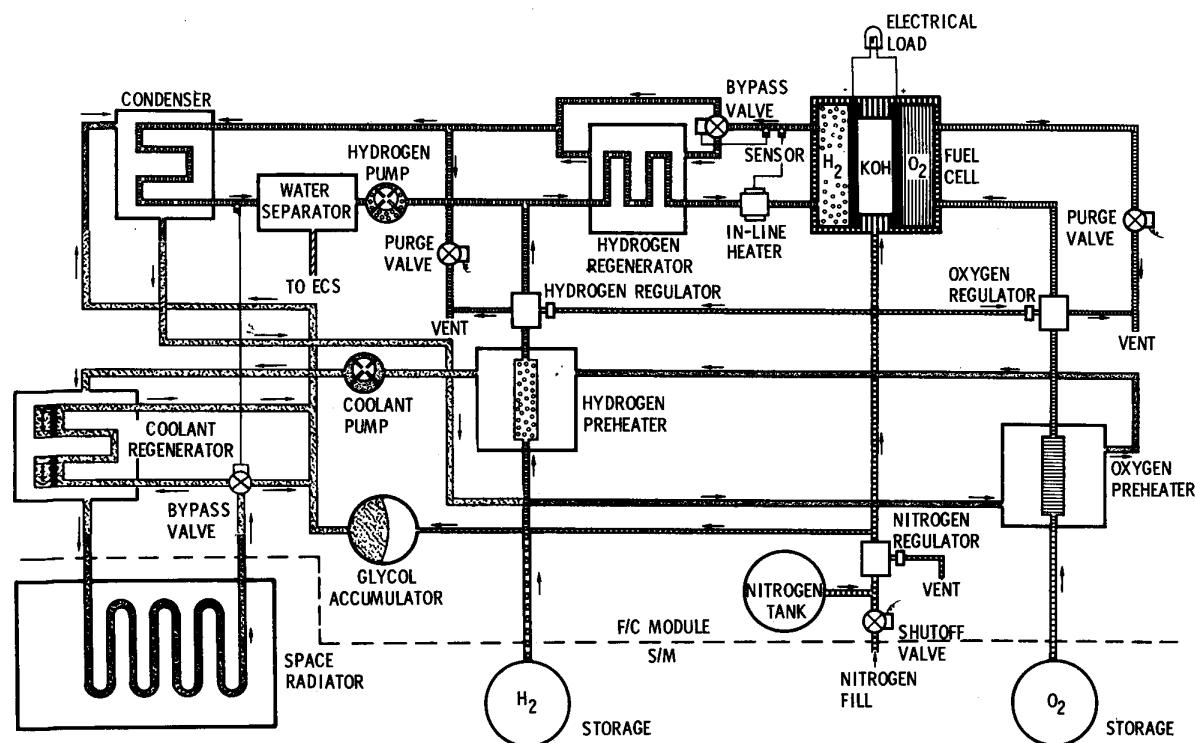
APOLLO FUEL CELL POWERPLANT



HEIGHT = 44 IN.
DIAM = 22 IN.
WEIGHT = 245 LB EACH

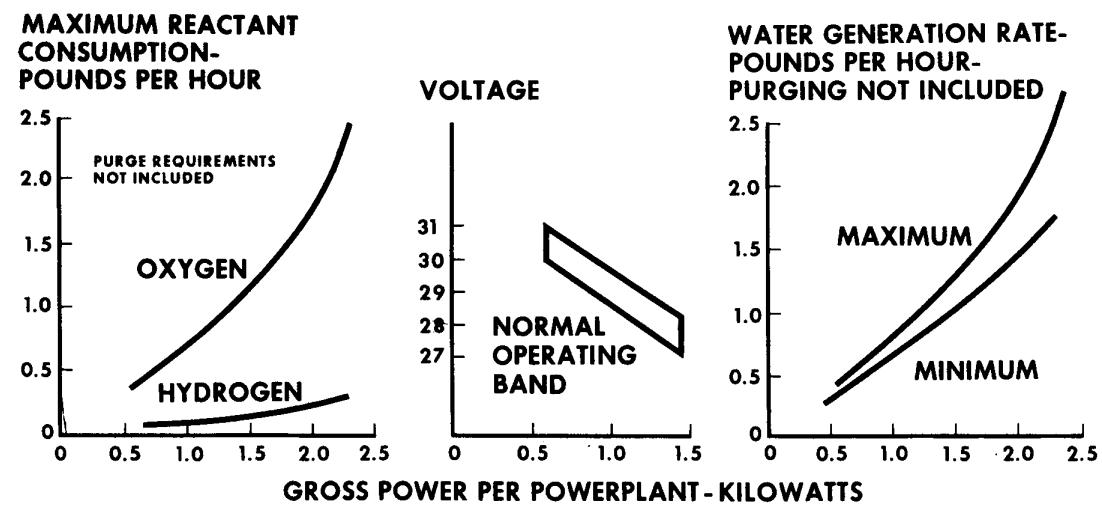


EPS FUEL CELL DIAGRAM

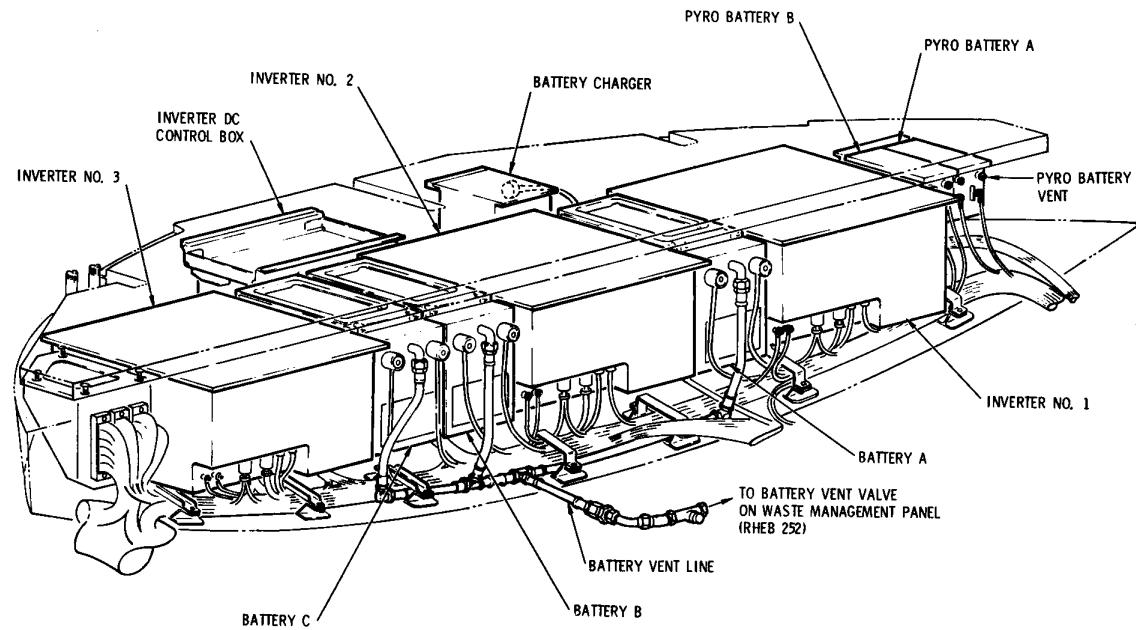


124SD10325

FUEL CELL REACTION



EPS COMPONENTS LOWER EQUIPMENT BAY (BLOCK II)



ENVIRONMENTAL CONTROL

FAM-2505A



ECS FUNCTIONAL REQUIREMENTS

CONTROL SPACECRAFT ATMOSPHERE

- PRESSURE-TEMPERATURE-HUMIDITY-CONTAMINATION

PROVIDE COOLING FOR SPACECRAFT EQUIPMENT

- GUIDANCE & NAVIGATION-STABILIZATION & CONTROL
- COMMUNICATIONS-AC POWER SUPPLY-OTHER

CONTROL COLLECTION, STORAGE & DISTRIBUTION OF WATER

- POTABLE WATER FOR CREW USE
- WASTE WATER FOR SUPPLEMENTAL COOLING

ENVIRONMENTAL CONTROL SUBSYSTEM FUNCTIONS

8

OXYGEN SUPPLY SUBSYSTEM

- NORMAL OXYGEN SUPPLY
- ENTRY OXYGEN SUPPLY
- CABIN PRESSURE CONTROL
- FLUID TANK PRESSURIZATION

PRESSURE SUIT SUBSYSTEM

- WATER & CONTAMINANT REMOVAL FROM SUIT & CABIN
- SUIT PRESSURE & TEMPERATURE CONTROL

WATER SUBSYSTEM

- STORES & DISTRIBUTES
 - POTABLE WATER (DRINKING & FOOD RECONSTITUTION)
 - WASTE WATER (SUPPLEMENTAL COOLING)

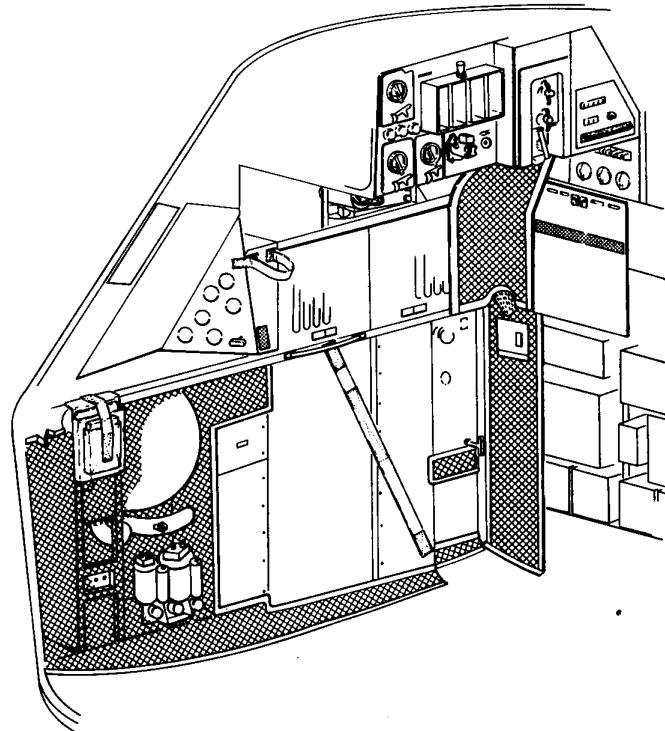
WATER GLYCOL SUBSYSTEM

- PRIMARY HEAT TRANSFER
- COOLING FOR SUIT & ELECTRONICS
- HEATING OR COOLING FOR CABIN
- REJECTS EXCESS HEAT TO SPACE



APOLLO CM INTERIOR LHEB & LHFE^B

BLOCK II

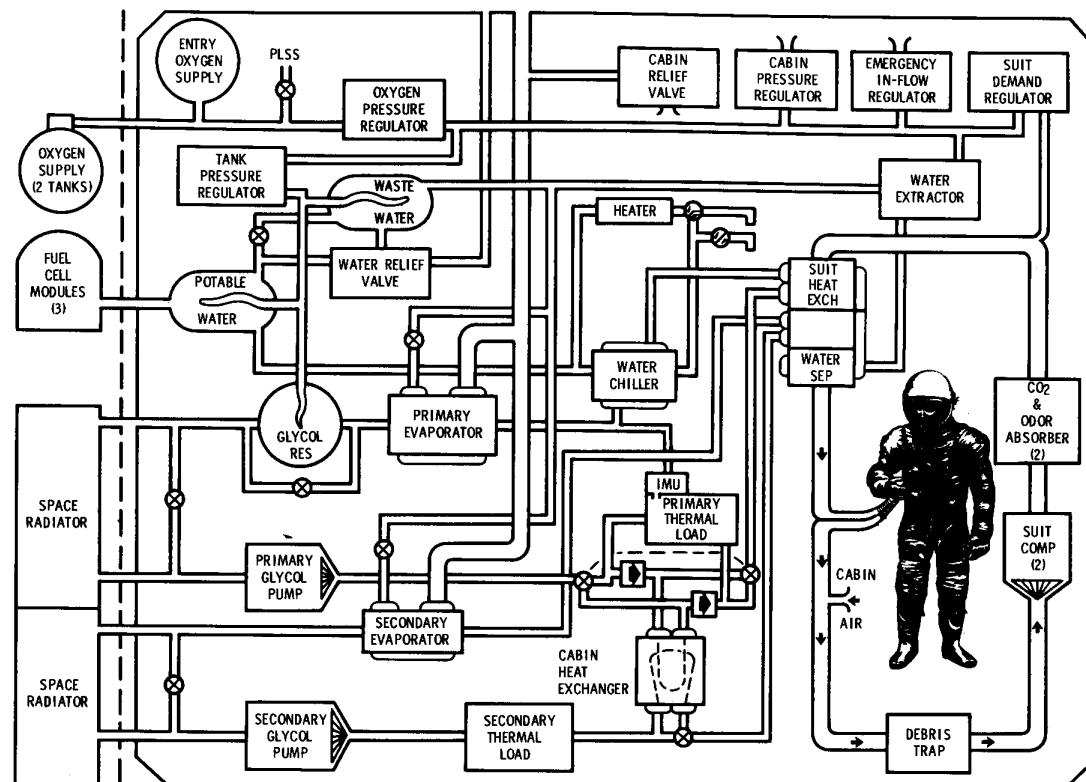


FEB 67

CS-0014

ENVIRONMENTAL CONTROL

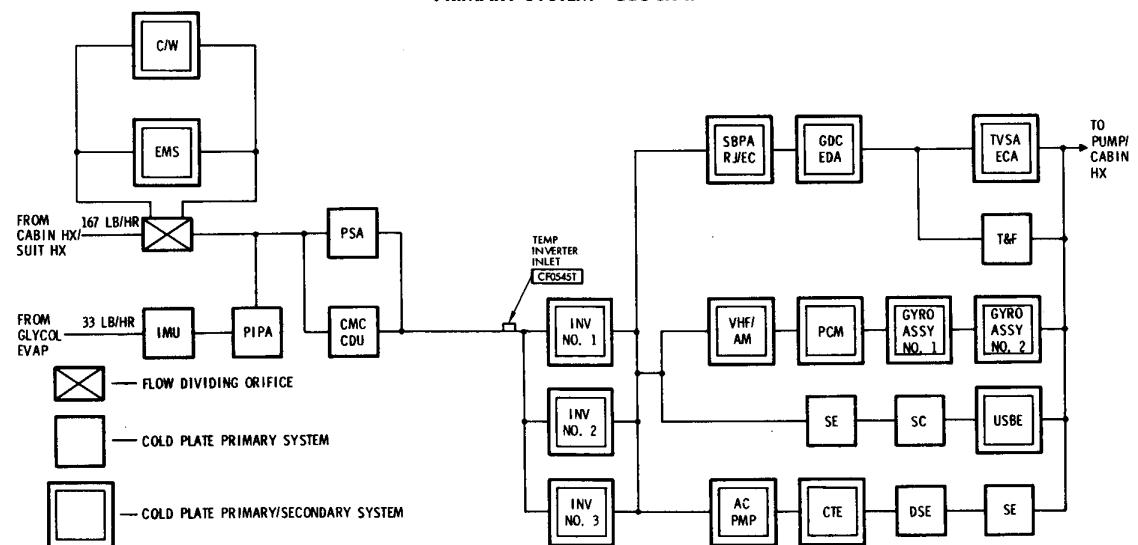
BLOCK II



FAM-2507D

COLD PLATE NETWORK

PRIMARY SYSTEM - BLOCK II

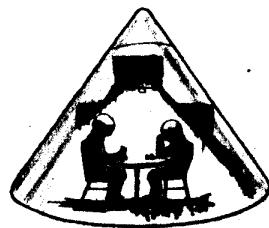


ECS-210B 

CREW EQUIPMENT

9

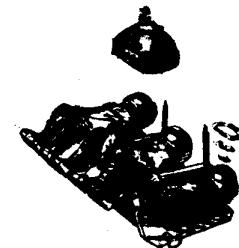
FAM-5015 



LIGHT AND SIGHT ^{A10}



SPACE SUIT ASSY



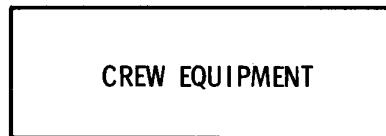
CREW COUCHES



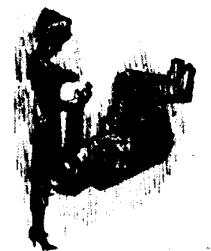
RESTRAINTS



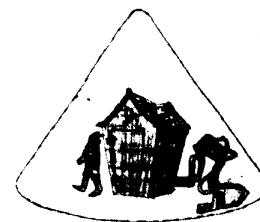
SURVIVAL



MISSION EXPERIMENTS

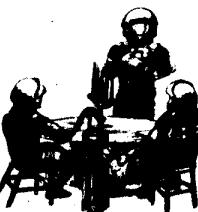


MEDICAL



WASTE CONTROL

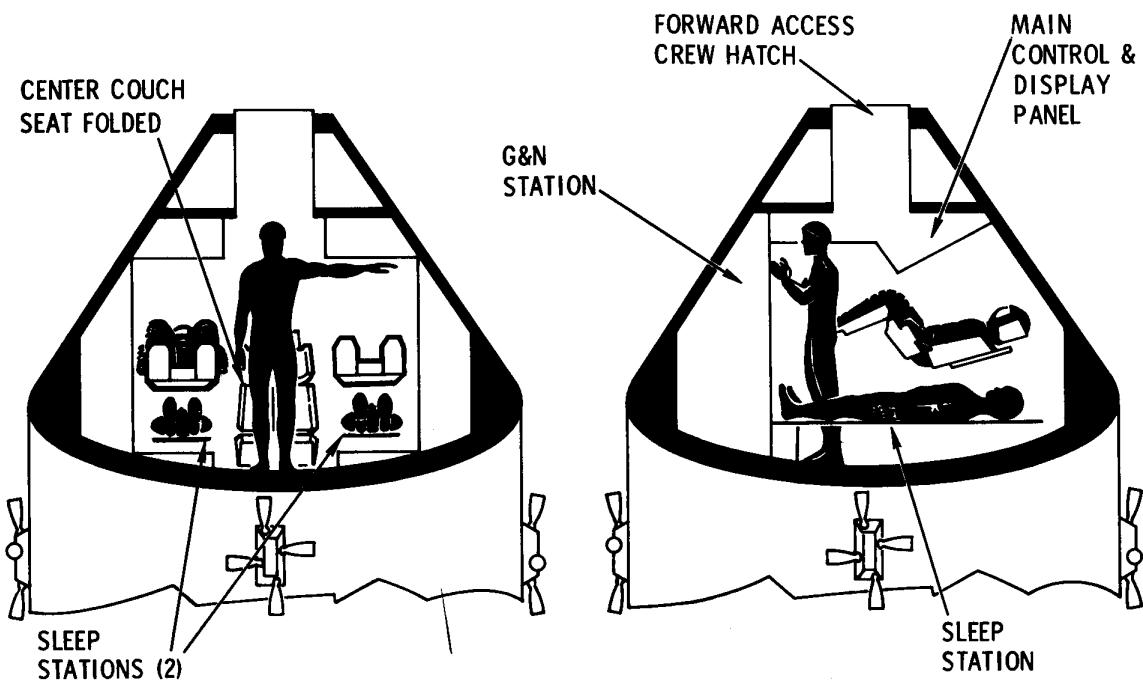
MAR 66



WATER AND FOOD ^{A11}

FAM-5402 A 

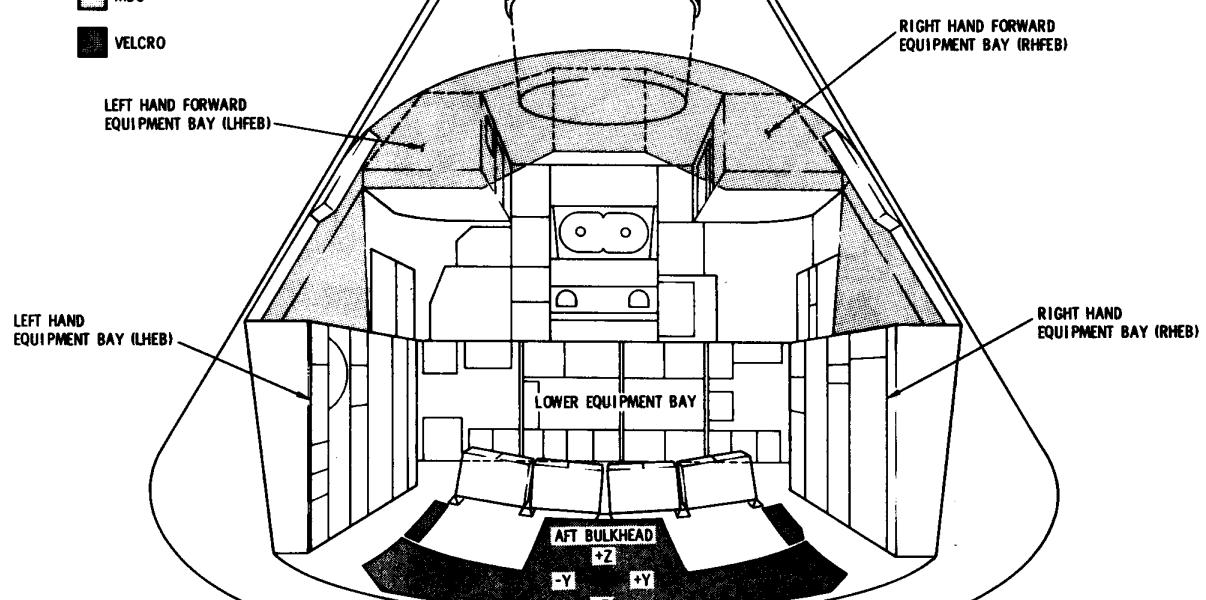
APOLLO CREW STATIONS



FAM-5008B

APOLLO CREW COMPARTMENT

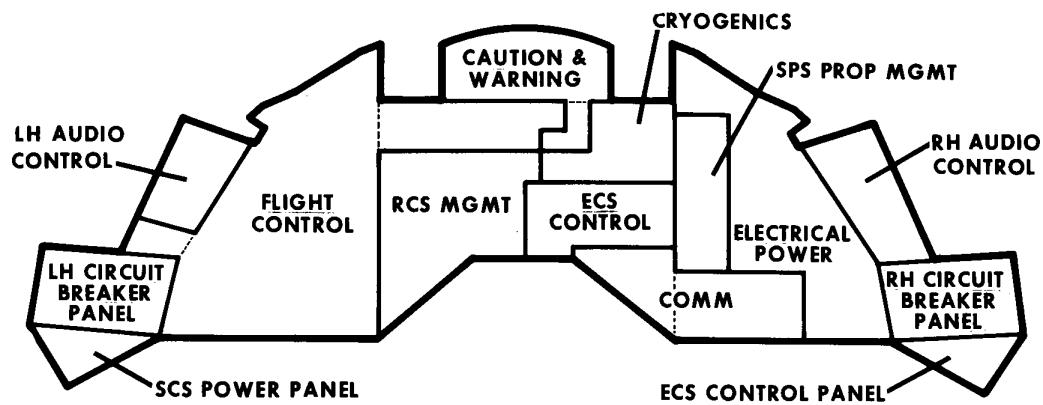
BLOCK II



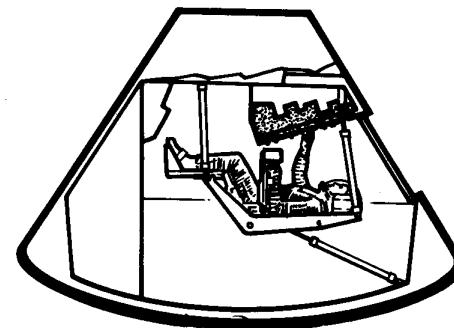
JAN 67

CS-0012

COMMAND MODULE MAIN PANEL



9

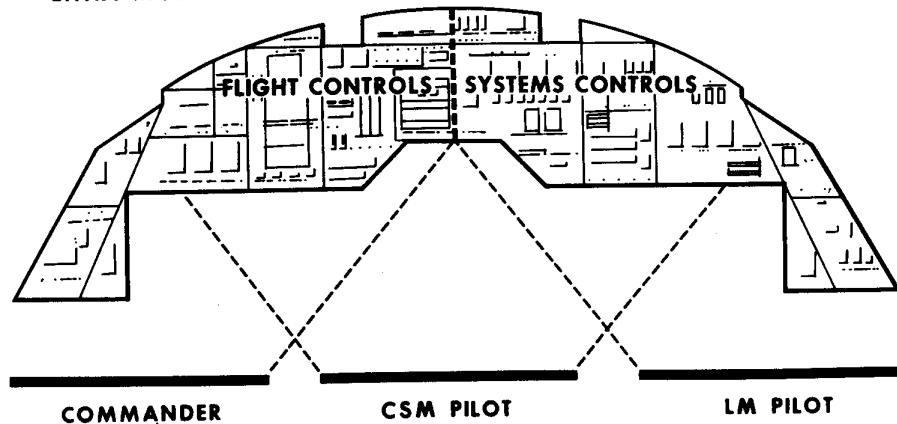


S66SD10818-1B

MAIN PANEL FUNCTIONS

- LV EMERGENCY DETECTION
- FLIGHT ATTITUDE
- MISSION SEQUENCE
- ΔV MONITOR
- ENTRY MONITOR

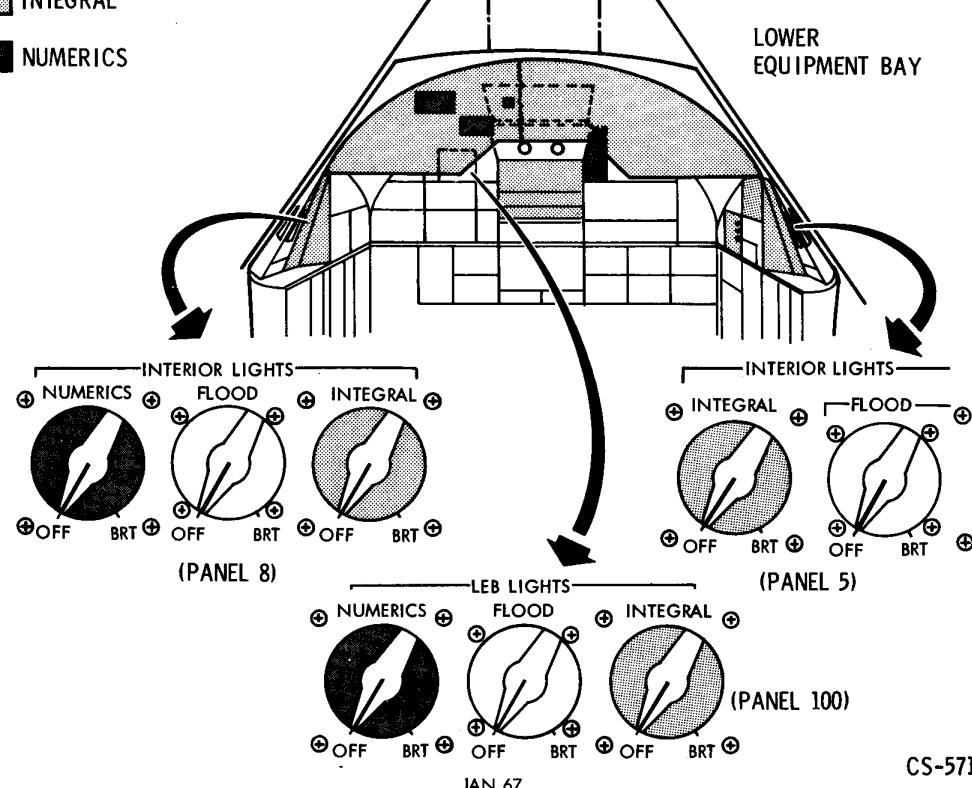
- PROPELLANT GAGING
- ENVIRONMENT CONTROL
- COMMUNICATIONS CONTROL
- POWER DISTRIBUTION
- CAUTION & WARNING



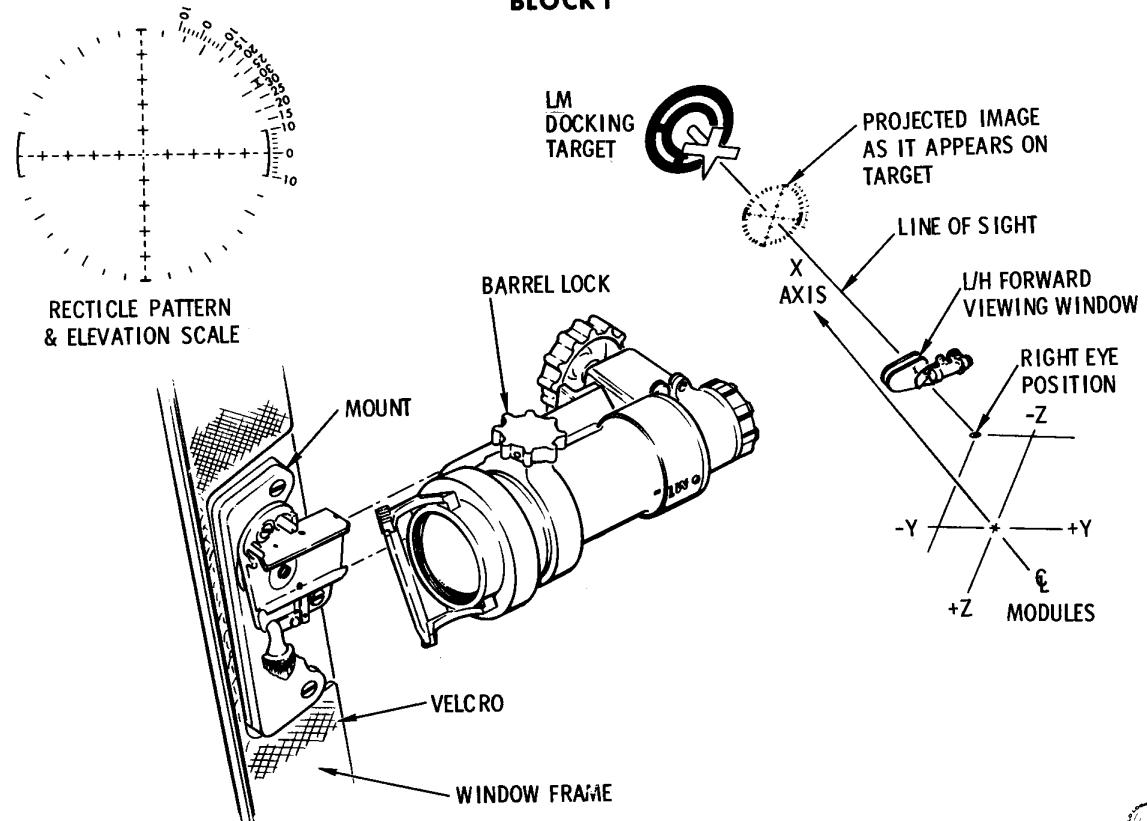
FAM-5404 A

CM INTEGRAL/NUMERICS ILLUMINATION SYSTEM BLOCK II

■ INTEGRAL
■ NUMERICS



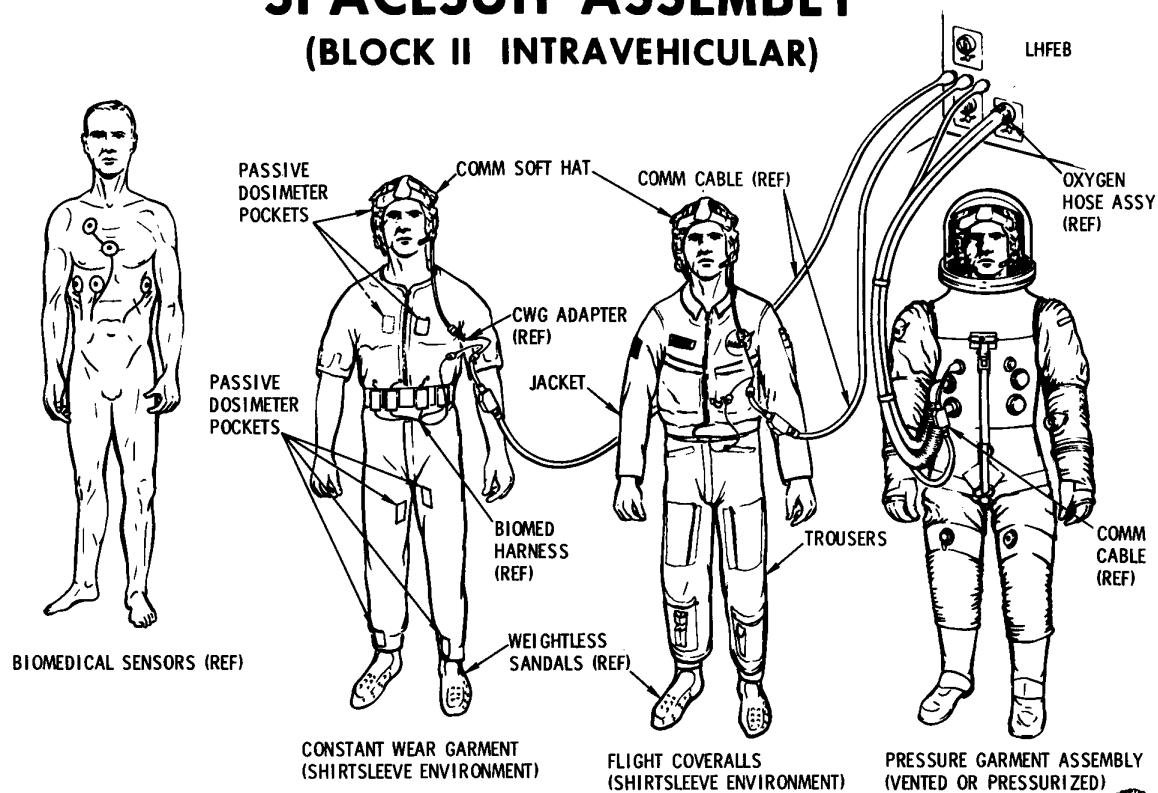
**APOLLO CREWMAN ALIGNMENT SIGHT SYSTEM CONFIGURATION
BLOCK I**



FEB 67

CS-531C

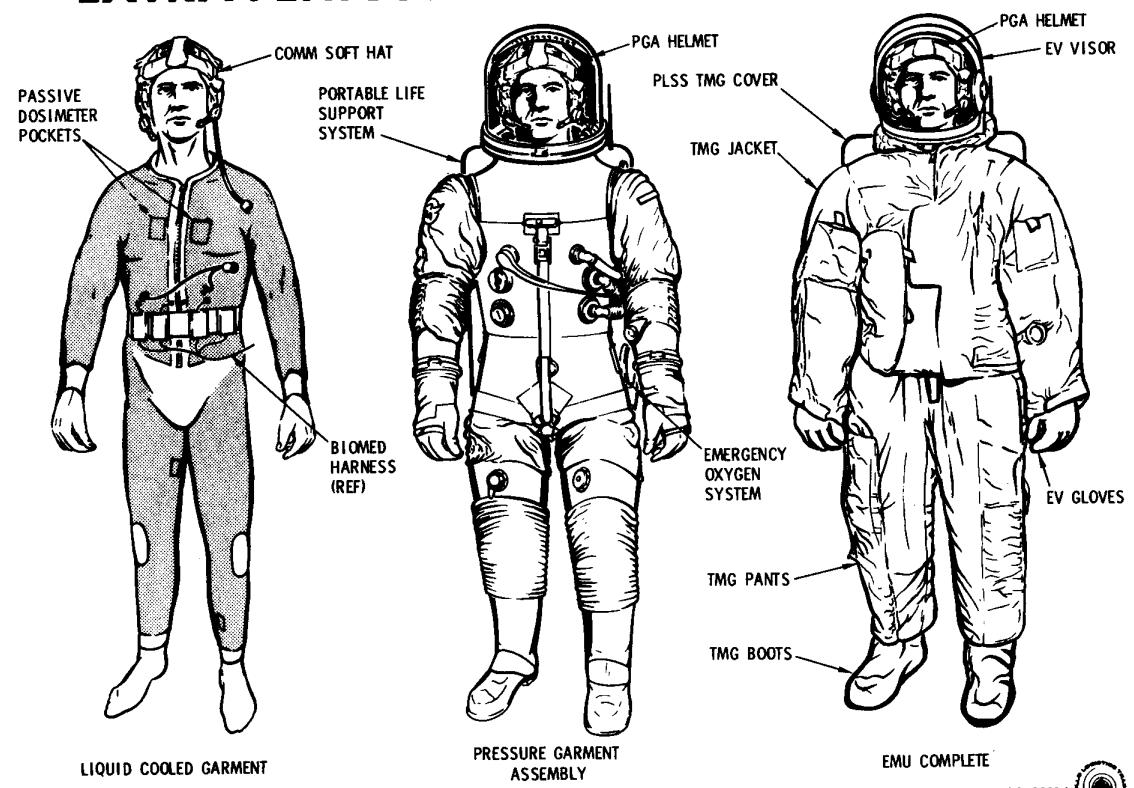
SPACESUIT ASSEMBLY (BLOCK II INTRAVEHICULAR)



MAY 67

CS-1001 B

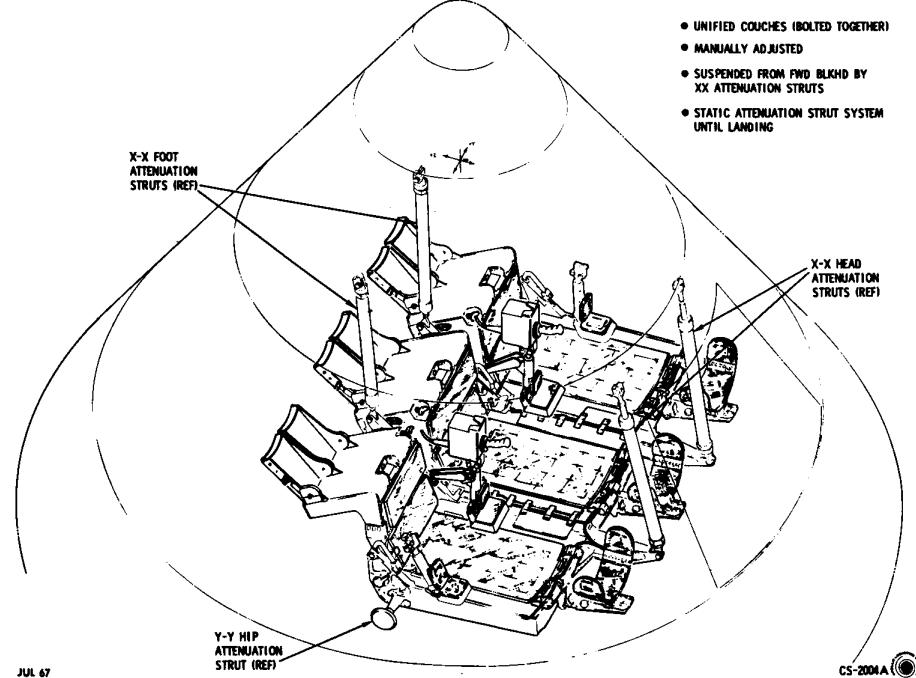
EXTRAVEHICULAR MOBILITY UNIT (EMU)



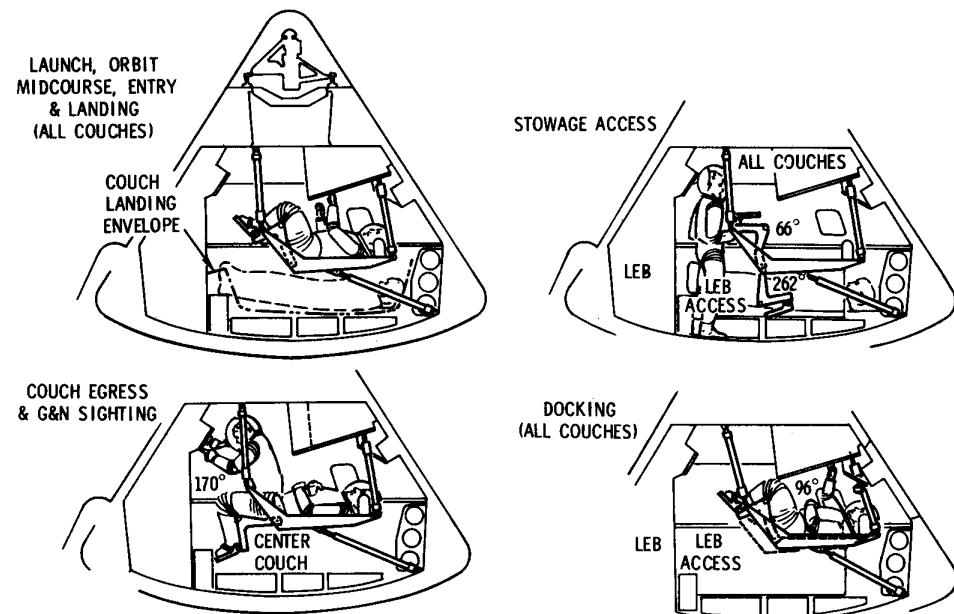
JAN 67

CS-1002A

CREW COUCH STRUCTURE BLOCK II



MISSION PHASES WITH COUCH POSITIONS & SEAT ANGLE SC 2TV-1 & 101

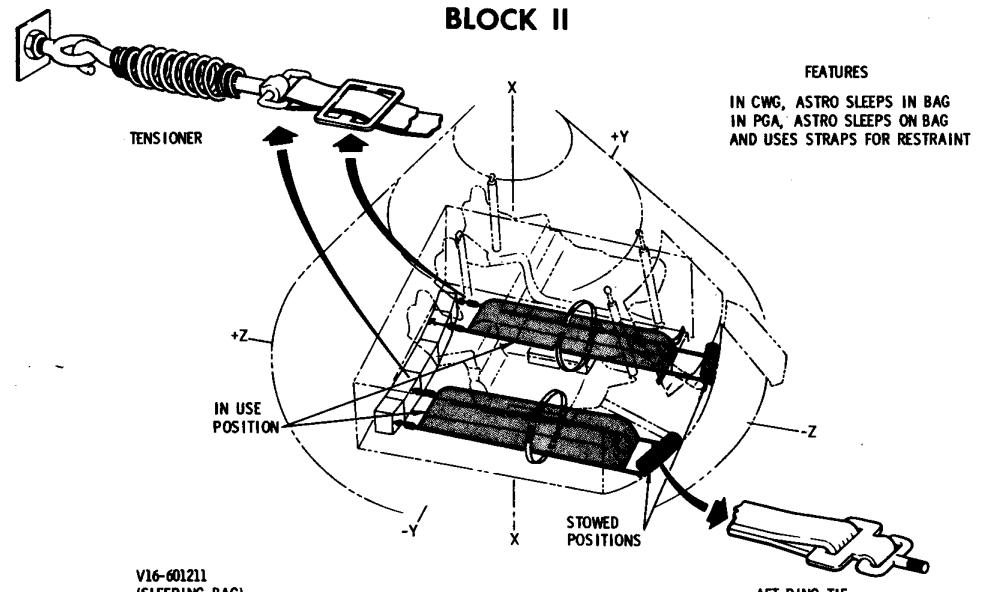


JUN 67

CS-2025C

SLEEPING POSITION RESTRAINT CONFIGURATION

BLOCK II

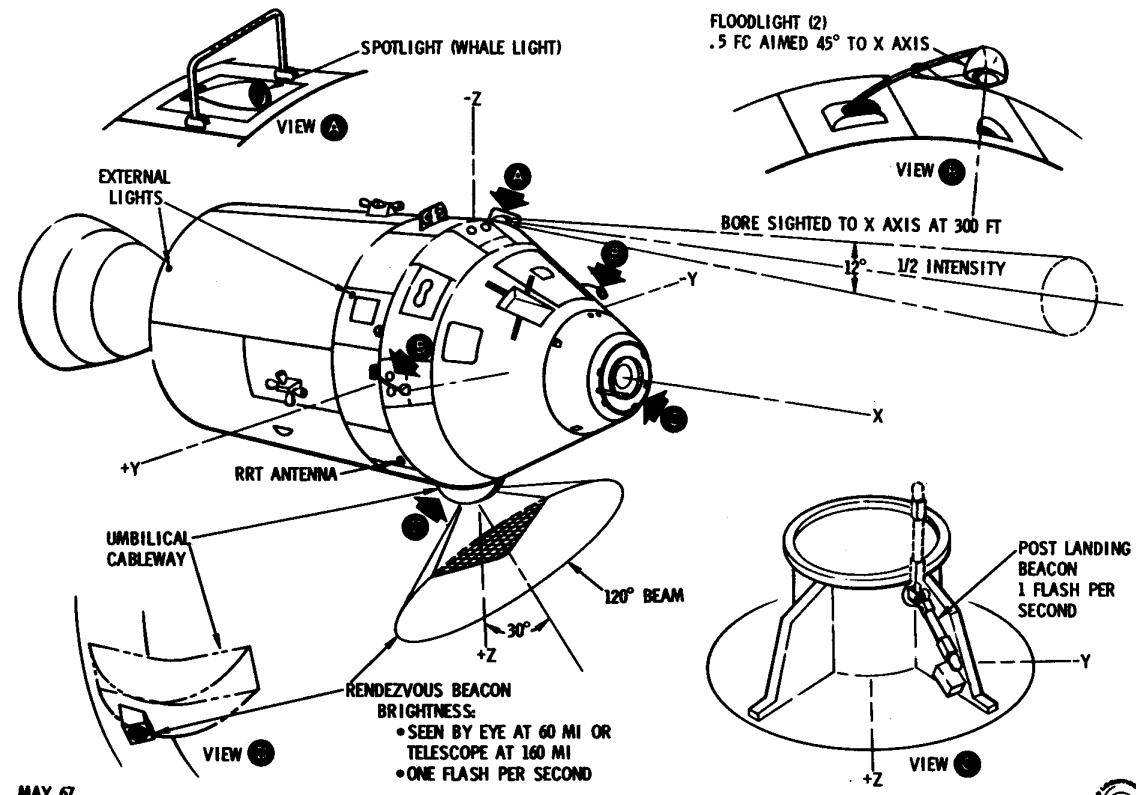


V16-601211
(SLEEPING BAG)

MAR 67

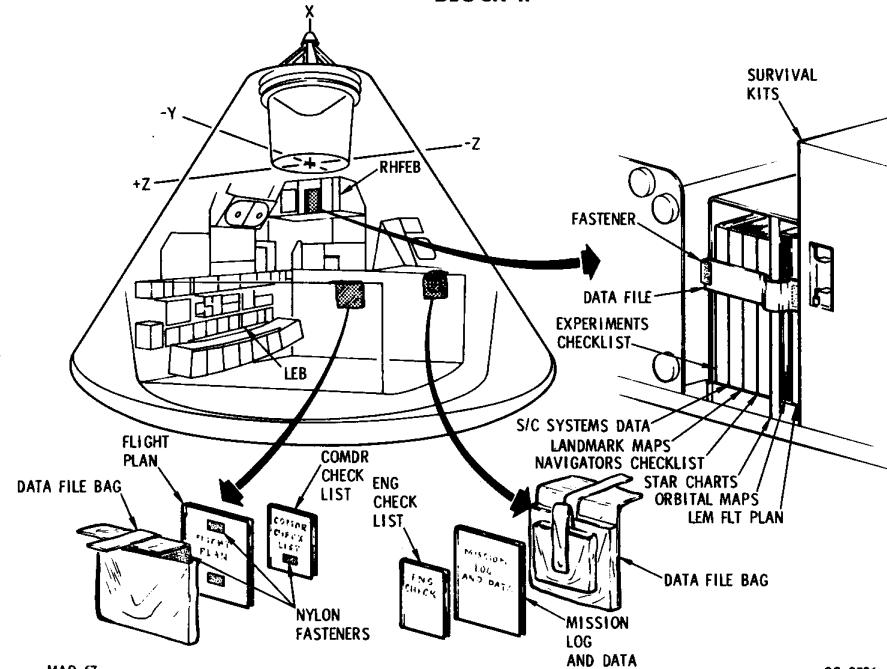
CS-2331

CSM DOCKING, EVA, & EXTERNAL LIGHTS

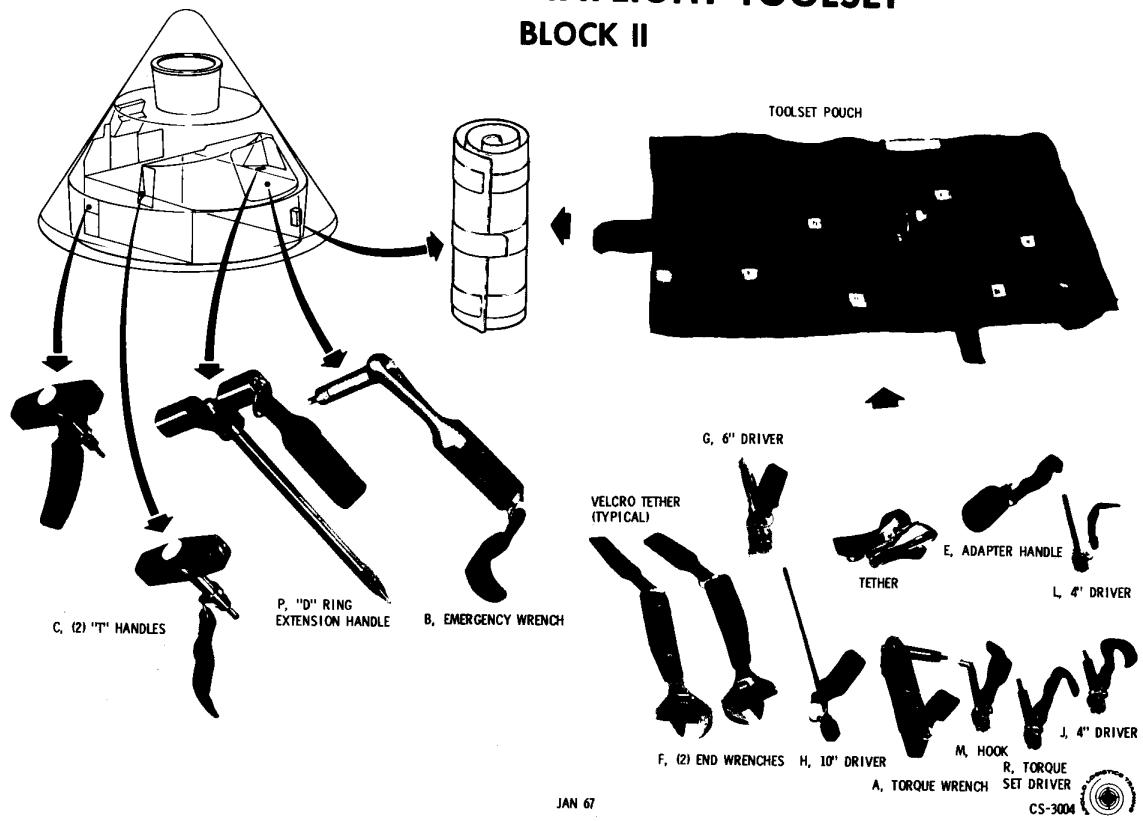


FLIGHT DATA FILE

BLOCK II

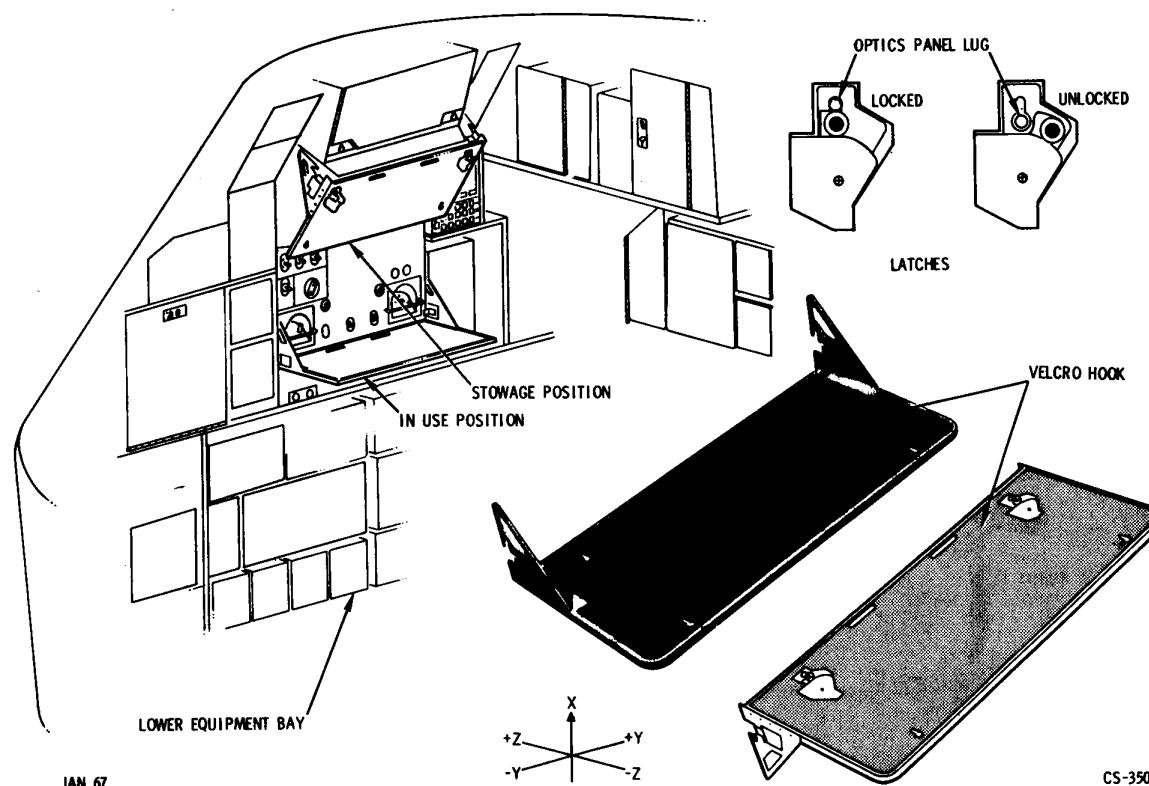


CM CREWMAN INFLIGHT TOOLSET BLOCK II

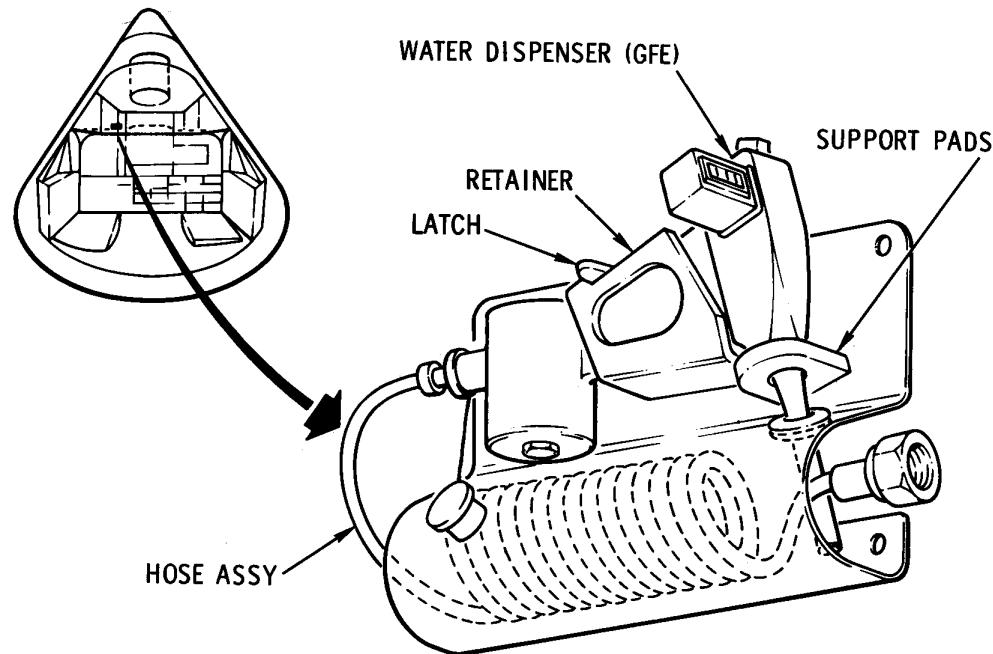


JAN 67

WORK SHELF/OPTICS PANEL COVER BLOCK II



WATER METERING DISPENSER ASSEMBLY

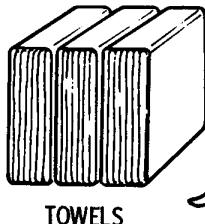
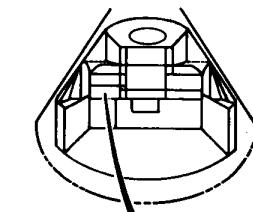


9

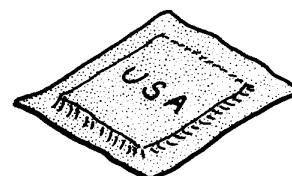
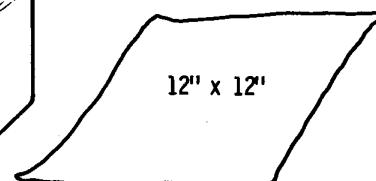
JAN 67

CS-4101D (C)

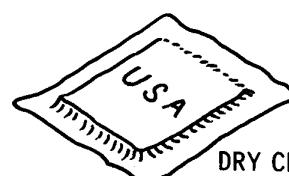
PERSONAL HYGIENE ITEMS



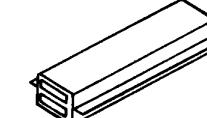
TOWELS



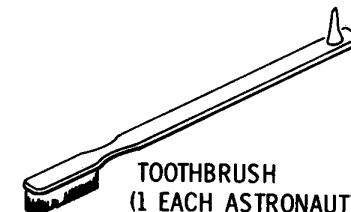
WET CLEANSING CLOTH



DRY CLEANSING
CLOTH



INGESTABLE GUM PACK
(2 STICKS PER PACK)

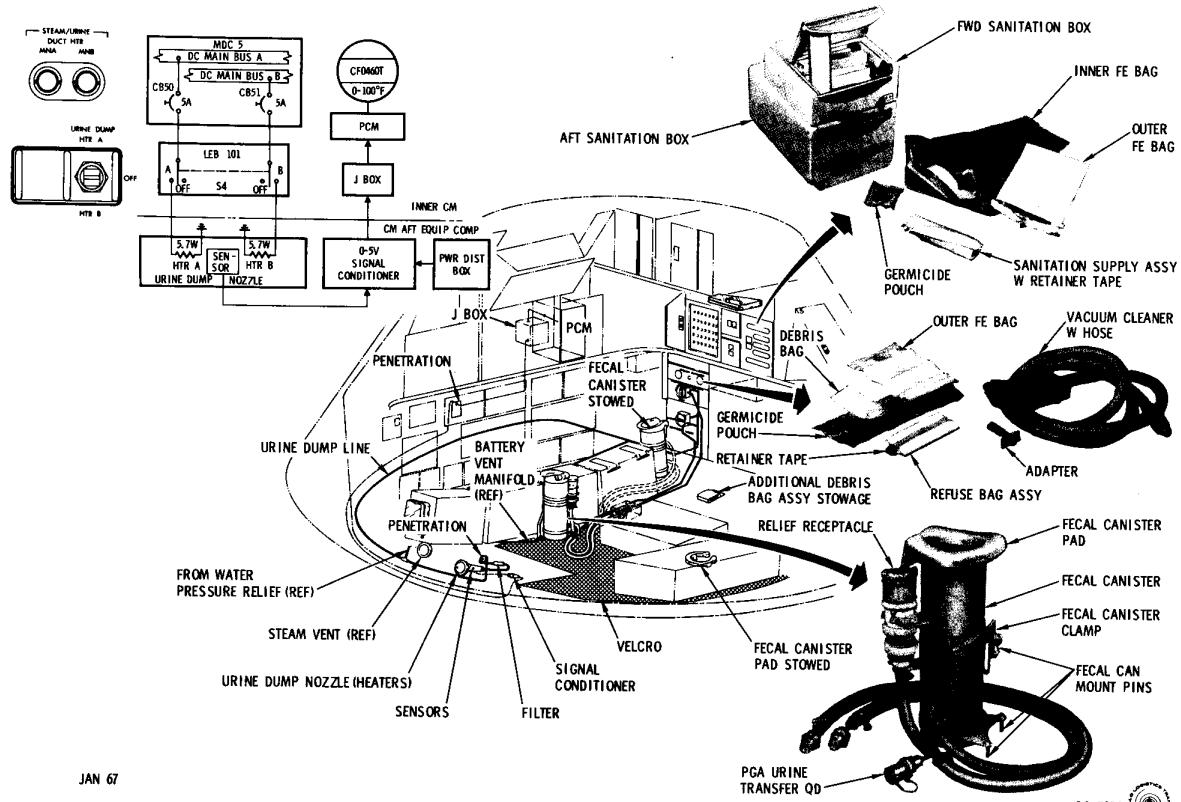


TOOTHBRUSH
(1 EACH ASTRONAUT)

CS-5501D

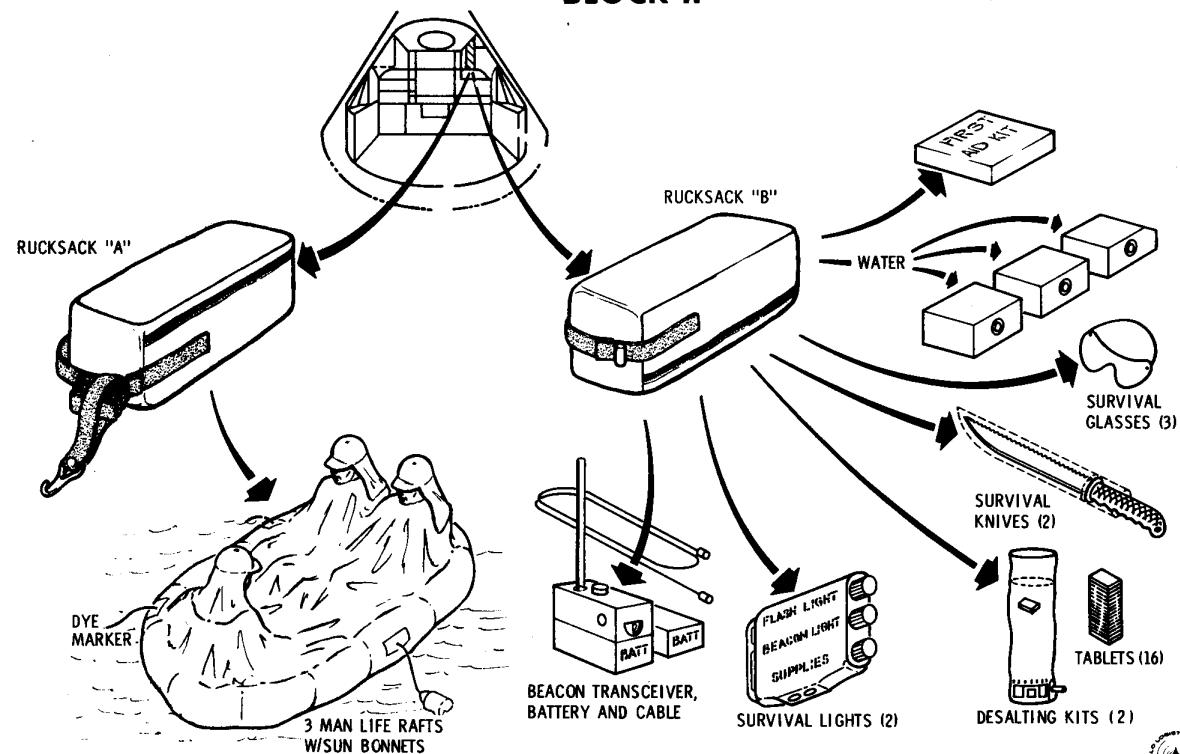
WASTE MANAGEMENT SYSTEM

BLOCK II

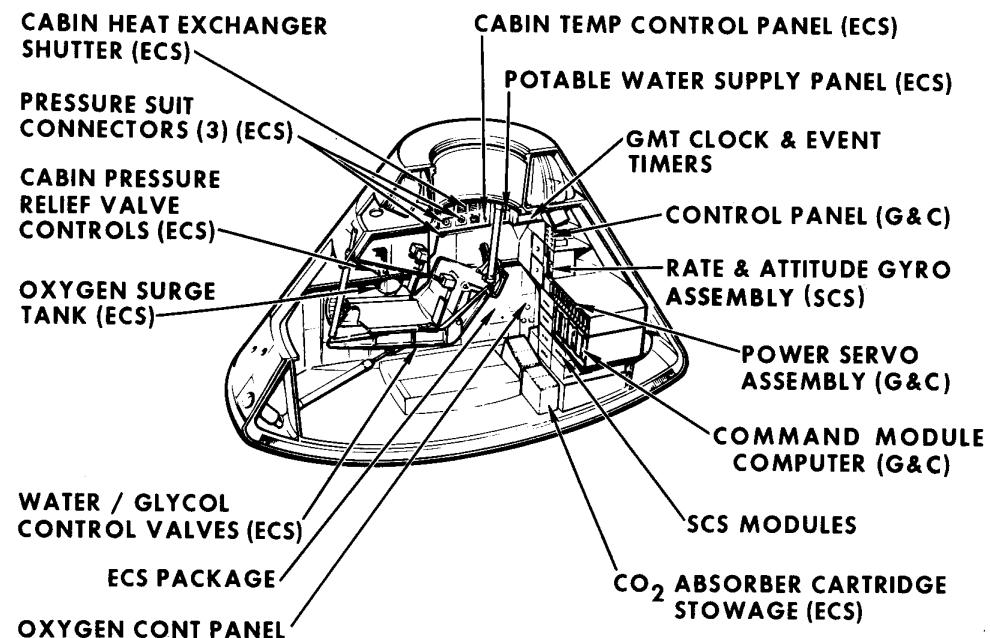


APOLLO SURVIVAL KIT AND COMPONENTS

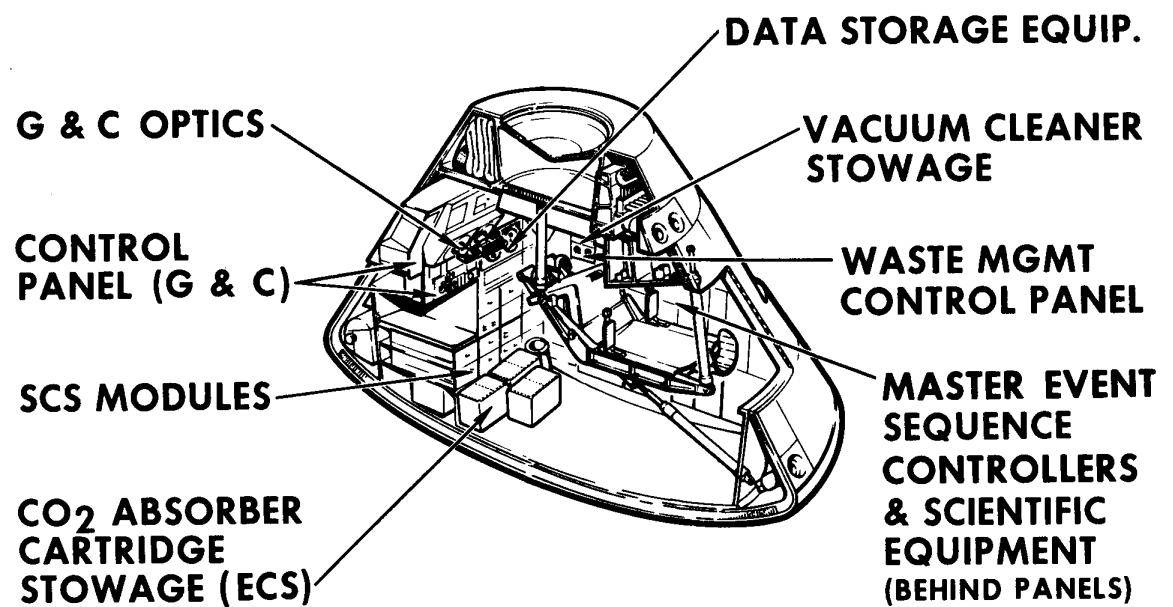
BLOCK II



COMMAND MODULE INTERIOR (LEFT SIDE)



COMMAND MODULE INTERIOR (RIGHT SIDE)



COMMUNICATIONS MODULES

FAM-1008C

APOLLO ABBREVIATIONS

A/C	AUDIO CENTER (COMM)	L/O	LIFT-OFF
ACE	ACCEPTANCE CHECKOUT EQUIP.	LOI	LUNAR ORBIT INSERTION (G&C)
ACS	ATTITUDE CONTROL SUBSYSTEM (SCS)	LOR	LUNAR ORBITAL RENDEZVOUS
A/D	ANALOG TO DIGITAL (COMM)	LOS	LINE OF SIGHT (GBN)
AGAA	ATTITUDE GYRO ACCELEROMETER ASSEMBLY (SCS)	LSC	LINEAR SHAPE CHARGE (SECS)
ARS	ATTITUDE REFERENCE SUBSYSTEM (SCS)	LV	LAUNCH VEHICLE
B MAG	BODY MOUNTED ATTITUDE GYRO (SCS)	MAX Q	MAXIMUM DYNAMIC PRESSURE
BPC	BOOST PROTECTIVE COVER (SECS)	MC	MEGACYCLES
B/P	BOILERPLATE	MDC	MAIN DISPLAY CONSOLE
CDU	COUPLING DATA UNIT (G&C)	MDF	MILD DETONATING FUSE (STRUCT)
CM	COMMAND MODULE	MESC	MASTER EVENTS SEQUENCE CONTROLLER (SECS)
CMC	COMMAND MODULE COMPUTER	MNA	MAIN BUS A (EPS)
COAS	CREWMAN OPTICAL ALIGNMENT SIGHT (CREW)	MNB	MAIN BUS B (EPS)
COMM	COMMUNICATIONS SUBSYSTEM	MSFN	MANNED SPACE FLIGHT NETWORK (COMM)
CSM	COMMAND SERVICE MODULE	MTVC	MANUAL THRUST VECTOR CONTROL (SCS)
GTE	CENTRAL TIMING EQUIP. (COMM)	PCM	PULSE CODE MODULATION (COMM)
C/W	CAUTION & WARNING	PGA	PRESSURE GARMENT ASSEMBLY (CREW)
CWG	CONSTANT HEAR GARMENT (CREW)	PGNCS	PRIMARY GUIDANCE, NAVIGATION & CONTROL SYS
D/A	DIGITAL TO ANALOG (COMM)	PIPA	PULSED INTEGRATING PENDULOUS ACCELEROMETER (G&C)
D/S	DOCKING SYSTEM	PLSS	PORTABLE LIFE SUPPORT SYSTEM (CREW)
DSE	DATA STORAGE EQUIP. (COMM)	PM	PHASE MODULATION (COMM)
DSIF	DEEP SPACE INSTRUMENTATION FACILITY (COMM)	PMP	PREMODULATION PROCESSOR (COMM)
DSKY	DISPLAY & KEYBOARD (G&C)	PRN	PSEUDO-RANDOM NOISE (COMM)
AV	DIFFERENTIAL VELOCITY (G&C)	PROP	PROPELLION
ECA	ELECTRONIC CONTROL ASSEMBLY (SCS)	PSA	POWER SERVO ASSEMBLY (G&C)
ECS	ENVIRONMENTAL CONTROL SUBSYSTEM	PTT	PUSH TO TALK (COMM)
ECU	ENVIRONMENTAL CONTROL UNIT (ECS)	RCS	REACTION CONTROL SUBSYSTEM
EDA	ELECTRONIC DISPLAY ASSEMBLY (G&C)	RGA	RATE GYRO ASSEMBLY (SCS)
EDS	EMERGENCY DETECTION SUBSYSTEM (SECS)	RJEC	REACTION JET AND ENGINE ON-OFF CONTROL (G&C)
ELS	EARTH LANDING SUBSYSTEM (SECS)	RRT	RENDEZVOUS RADAR TRANSPOUNDER (COMM)
EMS	ENTRY MONITOR SYSTEM	RTC	REAL TIME COMMAND (COMM)
EMU	EXTRA-VEHICULAR MOBILITY UNIT (CREW)	SBPA	S-BAND POWER AMPLIFIER (COMM)
EOI	EARTH ORBIT INSERTION (G&C)	SC	SPACECRAFT
EPS	ELECTRICAL POWER SUBSYSTEM	SCE	SIGNAL CONDITIONING EQUIPMENT (ILM)
EVA	EXTRA-VEHICULAR ACTIVITY (CREW)	SCS	STABILIZATION & CONTROL SUBSYSTEM
FC	FUEL CELL (EPS)	SCT	SCANNING TELESCOPE (GBN)
FDAI	FLIGHT DIRECTOR ATTITUDE INDICATOR (SCS)	SECS	SEQUENTIAL EVENTS CONTROL SUBSYSTEM
FHS	FORWARD HEAT SHIELD	SLA	SPACECRAFT LN ADAPTER
G&C	GUIDANCE & CONTROL	SM	SERVICE MODULE
GDC	GYRO DISPLAY COUPLER (SCS)	SPS	SERVICE PROPULSION SUBSYSTEM
GHZ	GIGAHERTZ (COMM)	SSA	SPACE SUIT ASSEMBLY (CREW)
GNB	GUIDANCE & NAVIGATION	SXT	SEXTANT (GBN)
GNCS	GUIDANCE NAVIGATION & CONTROL SYSTEM	TCA	THRUST CHAMBER ASSEMBLY (PROP)
GSE	GROUND SUPPORT EQUIP.	TEI	TRANSEARTH INJECTION (G&C)
HF	HIGH FREQUENCY (3-30MC)	TLI	TRANSLUNAR INJECTION (G&C)
IMU	INERTIAL MEASUREMENT UNIT (G&N)	TLM	TELEMETRY (COMM)
INV	INVERTER (EPS)	TMG	THERMAL METEOROID GARMENT (CREW)
IU	INSTRUMENT UNIT (LV)	TVC	THRUST VECTOR CONTROL (SPS)
KMC	KILOMEGA CYCLES	TVSA	THRUST VECTOR POSITION SERVO AMPLIFIER (G&C)
KOH	POTASSIUM HYDROXIDE (EPS)	UDL	UP DATA LINK (COMM)
LCG	LIQUID COOLED GARMENT (CREW)	UDMH	UNSYMMETRICAL DIMETHYL HYDRAZINE (PROP)
LDEC	LUNAR DOCKING EVENTS CONTROLLER (DS)	UHF	ULTRA HIGH FREQUENCY (300-3000 MC)
LEB	LOWER EQUIPMENT BAY	USBE	UNIFIED S-BAND EQUIP. (COMM)
LES	LAUNCH ESCAPE SUBSYSTEM (SECS)	VHF	VERY HIGH FREQUENCY (30-300 MC)
LET	LAUNCH ESCAPE TOWER (SECS)	WMS	WASTE MANAGEMENT SUBSYSTEM (CREW)
LM	LUNAR MODULE		



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