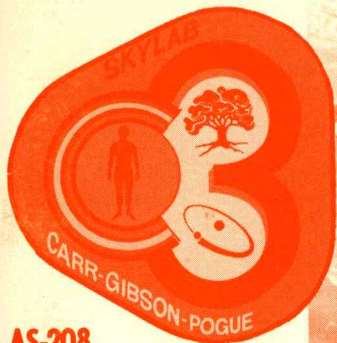


SKYLAB

ORBITAL WORKSHOP



AS-208
SATURN 1B BOOSTER
CM-118 G&N 222

SKYLAB IV



Delco Electronics

General Motors Corporation
Goleta, California 93017

MISSION GOALS

- Obtain Biomedical Data to Determine the Effects of Long Duration Space Flight on Man.
- Obtain Engineering and Technological Data Needed For Development of Advanced Space Vehicles and Equipment.
- Obtain Data in the Areas of Solar and Stellar Astronomy With Special Emphasis on Observations That are Invisible or Obscured From the Ground Due to the Earth's Atmosphere.
- Evaluate Techniques Provided for Earth Resources Studies in Areas of Geology, Geography, Hydrology, Agriculture Forestry, Oceanography, Meteorology, and Ecology.

U.S. SPACE FLIGHT LOG

MISSION	ASTRONAUTS	LAUNCH DATE	ELAPSED TIME HR:MIN:SEC	TOTAL U.S. MANNED HOURS IN SPACE
Mercury-Redstone 3	Shepard	May 5, '61	00:15:22	00:15:22
Mercury-Redstone 4	Grisson	July 21, '61	00:15:37	00:30:59
Mercury-Atlas 6	Glenn	Feb. 20, '62	04:55:23	05:26:22
Mercury-Atlas 7	Carpenter	May 24, '62	04:56:05	10:22:27
Mercury-Atlas 8	Schirra	Oct. 3, '62	09:13:11	19:35:38
Mercury-Atlas 9	Cooper	May 15, '63	34:19:49	53:55:27
Gemini-Titan III	Grisson-Young	Mar. 23, '65	04:53:00	63:41:27
Gemini-Titan IV	McDivitt-White	June 3, '65	97:56:11	259:33:49
Gemini-Titan V	Cooper-Conrad	Aug. 21, '65	190:55:14	641:24:17
Gemini-Titan VII	Borman-Lovell	Dec. 4, '65	330:35:31	1302:35:19
Gemini-Titan VI-A	Schirra-Stafford	Dec. 15, '65	25:51:24	1354:18:07
Gemini-Titan VIII	Armstrong-Scott	Mar. 16, '66	10:41:26	1375:40:59
Gemini-Titan IX-A	Stafford-Cernan	June 3, '66	72:21:00	1520:22:59
Gemini-Titan X	Young-Collins	July 18, '66	70:46:39	1661:56:17
Gemini-Titan XI	Conrad-Gordon	Sept. 12, '66	71:17:08	1804:30:33
Gemini-Titan XII	Lovell-Aldrin	Nov. 11, '66	94:34:31	1993:39:35
Apollo 7 Saturn 1B	Schirra-Eisele-Cunningham	Oct. 11, '68	260:06:18	2773:58:29
Apollo 8 Saturn V	Borman-Lovell-Anders	Dec. 21, '68	147:00:11	3214:59:02
Apollo 9 Saturn V	McDivitt-Scott-Schweickart	Mar. 3, '69	241:00:53	3938:01:41
Apollo 10 Saturn V	Stafford-Young-Cernan	May 18, '69	192:03:23	4514:11:50
Apollo 11 Saturn V	Armstrong-Aldrin-Collins	July 16, '69	195:18:35	5100:07:35
Apollo 12 Saturn V	Conrad-Gordon-Bean	Nov. 14, '69	244:36:24	5833:56:47
Apollo 13 Saturn V	Lovell-Swigert-Haise	April 11, '70	142:54:44	6262:40:59
Apollo 14 Saturn V	Shepard-Roosa-Mitchell	Jan. 31, '71	216:02:50	6910:49:29
Apollo 15 Saturn V	Scott-Worden-Irwin	July 26, '71	295:11:53	7796:25:8
Apollo 16 Saturn V	Young-Mattingly-Duke	Apr 16, '72	265:51:05	8593:58:23
Apollo 17 Saturn V	Cernan-Evans-Schmitt	Dec. 6, 1972	304:31:45	9507:33:38
Skylab II Saturn 1B	Conrad-Kerwin- Weitz	May 25, 1973	672:49:57	11525:24:29
Skylab III-SI-B	Bean-Garriott-Lousma	July 27, 1973	1427:08:54	17233:51:11
Skylab IV-SI-B	Carr-Gibson-Pogue	Nov. 10, 1973		

SKYLAB IV MISSION DESCRIPTION

1. CM118 - G&N222
2. Third Manned Skylab Mission

	Prime Crew	Backup Crew
Commander	Gerald P. Carr	Vance D. Brand
Scientist Pilot	Edward G. Gibson	William B. Lenoir
Pilot	William R. Pogue	Don L. Lind

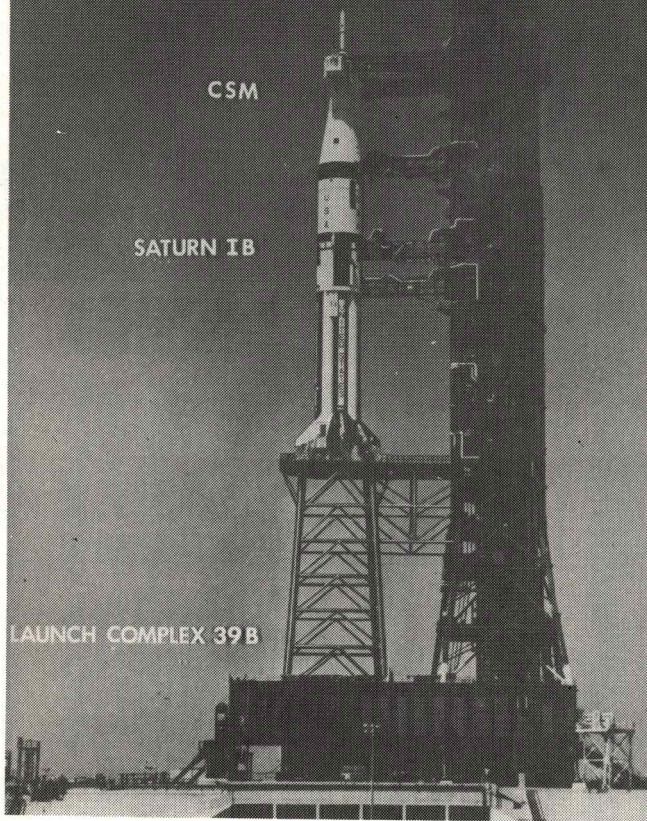
3. Mission Duration - 57-70 days
4. Orbit: Apogee 234.0 nmi - Perigee 230.1 nmi
5. Revolution Frequency - 93.2 minutes
6. Ground Track Repeat - Each 71 Orbits (5 Days)

SKYLAB MANNED VISIT LAUNCH CONFIGURATION

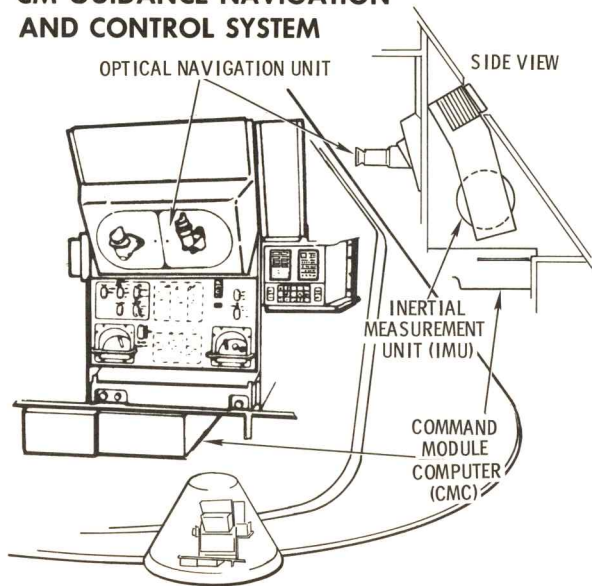
CSM

SATURN IB

LAUNCH COMPLEX 39B



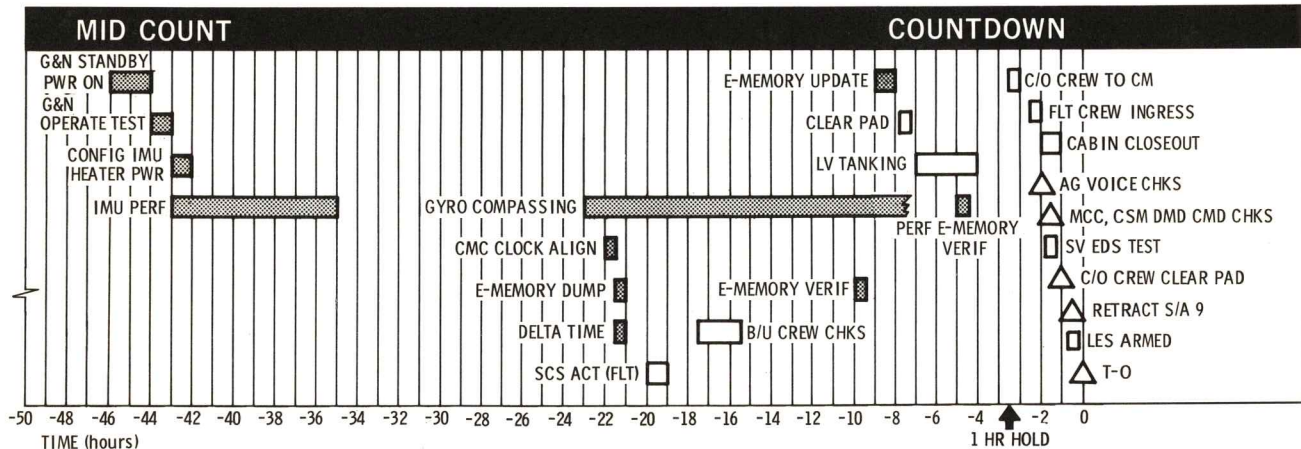
CM GUIDANCE NAVIGATION AND CONTROL SYSTEM



THE GUIDANCE AND NAVIGATION SYSTEM IS MANUFACTURED BY DELCO ELECTRONICS DIV., GMC COMPOSED OF THREE BASIC SUBSYSTEMS: INERTIAL, OPTICAL AND COMPUTER.

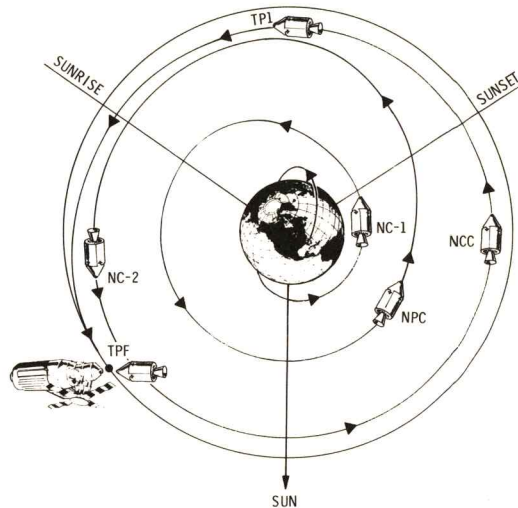
1. The inertial guidance subsystem is composed of inertial measurement unit (IMU) and associated equipment. This subsystem performs three major functions: (A) Measures changes in spacecraft attitude; (B) Measures spacecraft velocity due to thrust; and (C) Assists in generating steering signals.
2. The optical navigation subsystem is composed of a space sextant and a scanning telescope. Sightings on celestial bodies and landmarks on the earth are used by the computer subsystem to determine the spacecraft's position and velocity and to align the inertial reference within the IMU.
3. The command module computer (CMC) provides five major functions: (A) Calculates steering signals and engine dis-cretes necessary to keep the spacecraft on the required trajectory; (B) Positions the stable member in the IMU to a coordinate system defined by precise optical measurements; (C) Positions the optical unit to celestial objects; (D) Conducts limited malfunction isolation of the G&N system by monitoring the level and rate of system signals; and (E) Supplies pertinent spacecraft condition information to the display and control panel.

SKYLAB IV LAUNCH COUNTDOWN

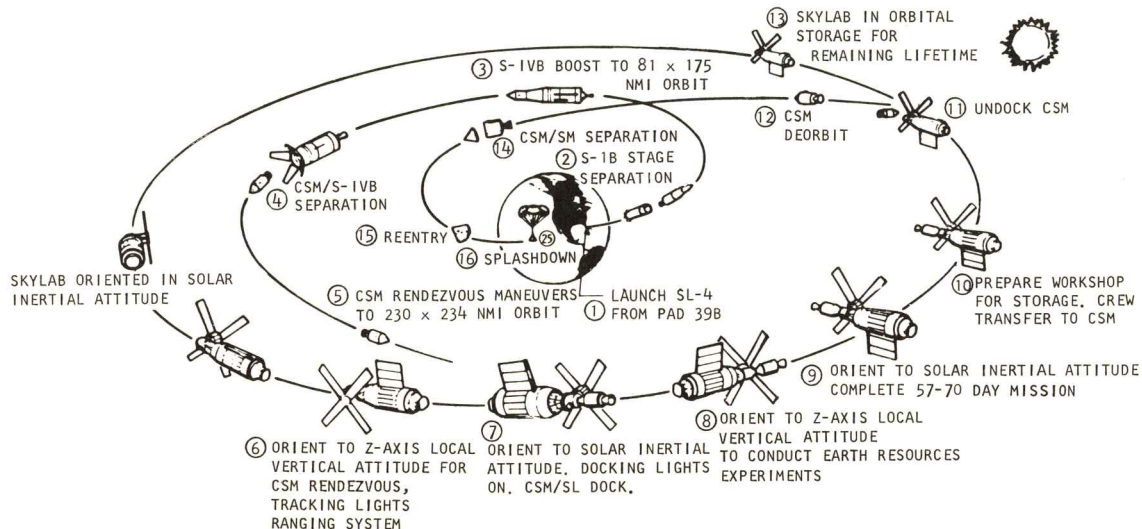


BURN SCHEDULE

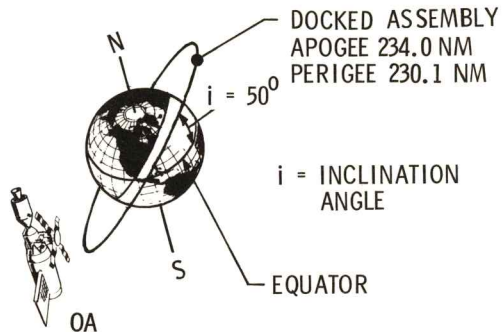
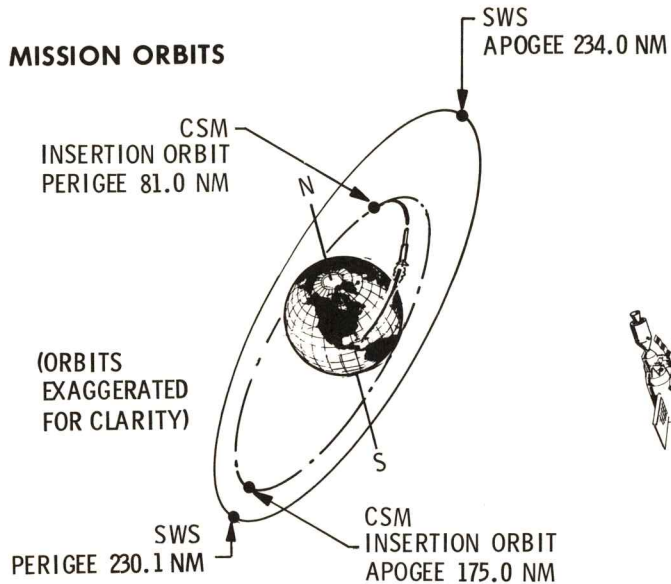
	TIME, G.E.T., HR:MIN:SEC	V, fps	RESULTANT PERIGEE/APOGEE, n. mi.
INSERTION	0:09:47		81/175
SEPARATION	0:25:00	3.0	81/176
PHASING 1	2:23:10	215.6	176/204
PLANE CHANGE	PLANE CHANGE, IF NECESSARY, OCCURS AT NODE BETWEEN NC1 AND NC2.		
PHASING 2	4:40:33	61.6	203/212
CORRECTIVE COMBINATION	5:26:41	30.2	212/221
COELLIPTIC	6:03:41	18.7	220/223
TERMINAL PHASE INITIATION	6:45:23	20.7	224/232
TERMINAL PHASE FINALIZATION	7:18:59	28.1	230/234



SL-IV MISSION



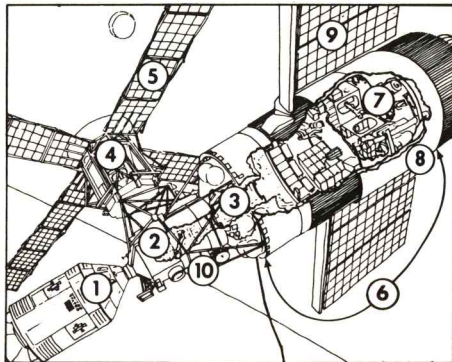
MISSION ORBITS



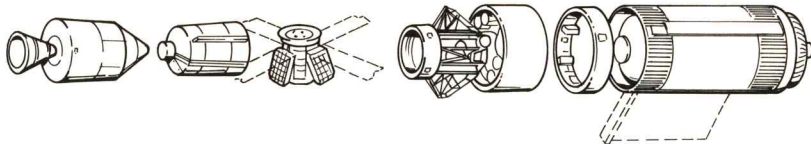
SKYLAB CLUSTER

The Skylab orbital cluster consists of an SWS and a docked Apollo CSM. The SWS will be composed of an S-IVB stage modified into an orbital workshop (OWS), an airlock module (AM), a multiple docking adapter (MDA), an instrument unit, an Apollo telescope mount (ATM), and an ATM deployment assembly.

1. APOLLO COMMAND & SERVICE MODULE
2. MULTIPLE DOCKING ADAPTER
3. AIRLOCK MODULE
4. APOLLO TELESCOPE MOUNT (ATM) SOLAR EXPERIMENTS
5. ATM SOLAR ARRAYS
6. SKYLAB WORKSHOP
7. CREW QUARTERS
8. MICROMETEOROID SHIELD
9. WORKSHOP SOLAR ARRAYS
10. EARTH RESOURCES EXPERIMENTS



CLUSTER ELEMENTS



GENERAL CLUSTER DATA

Skylab Launch Weight	197,600 Lb
Skylab Stack Height	344 Ft
Cluster Length	118.5 Ft
Conditioned Work Volume	11,700 Ft ³

Length (Ft)
Diameter (Ft)
Weight (Lb)
Working Vol
(Cu Ft)

<u>CSM</u> Command Service Module	<u>MDA</u> Multiple Docking Adapter	<u>ATM</u> Apollo Telescope Mount	<u>AM/FAS</u> Airlock Module/ Fixed Shroud	<u>IU</u> Instrument Unit	<u>OWS</u> Orbital Workshop
• Crew Ascent & Descent Vehicle	• Docking Interface • ATM/EREP Controls & Displays	• Solar Observation Unit	• Power Control & Distribution • Environmental Control • Utility Center for Cluster • EVA Port	• Launch Vehicle Control Center	• Primary Living & Working Quarters
34.3	17.3	13.3	17.6	3.0	48.1
13.0	10.0	-	10.0	21.6	21.6
29,500	13,600	24,800	49,200	4,500	76,000
366	1,140	-	613	-	9,550

SEQUENCE OF MISSION EVENTS

DATE	TIME	EVENT
Nov 10	10:40:29 CST	SL-4 liftoff - S-IB Launch Vehicle
	00:09:47 GET	Orbital Insertion - 81 x 175 Orbit
	00:25:00 GET	S-IVB Separation - 81 x 176 Orbit
	00:30:00 GET	P52 - Option 3 - Realign to Launch REFSMMAT
	00:45:00 GET	P52 - Option 2 - Reorient Platform to Local Vertical Orientation Defined at TIG-TPI
	00:50:00 GET	COAS LOS Determination - Calibrate COAS LOS in Optics Coordinates
	02:00:00 GET	P52 - Option 3 - Realign to Rendezvous REFSMMAT (first platform drift check)

S201 - COMET KOHOUTEK OBSERVATION

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Nov 10	02:23:10 GET	NC1 - Phasing Maneuver - $\Delta V = 215.6$ fps, SPS Burn Time = 10.5 seconds 176 x 204 Orbit
	03:06:10 GET	NPC - Plane Change Maneuver - $\Delta V =$ Nominally 0
	04:40:33 GET	NC2 - Phasing Maneuver - $\Delta V = 61.6$ fps, SPS Burn Time = 2.8 seconds 203 x 212 Orbit
	05:00:00 GET	P52 - Option 3 - Realign to Rendezvous REFSMMAT (second platform drift check)
	05:22:50 GET	NCC - Height Maneuver - $\Delta V = 30.2$ fps, SPS Burn Time = 1.3 seconds 212 x 221 Orbit
	05:59:50 GET	NSR - Coelliptic Maneuver - $\Delta V = 18.7$ fps, SPS Burn Time = 0.8 seconds 220 x 223 Orbit

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Nov 10	06:45:23 GET	TPI - Terminal Phase - $\Delta V = 20.7$ fps, SPS Initiation Maneuver Burn Time = 0.8 seconds 224 x 232 Orbit
	06:54:00 GET	TPM1 - Midcourse - $\Delta V =$ Nominally 0 Correction
	07:04:00 GET	TPM2 - Midcourse - $\Delta V =$ Nominally 0 Correction
	07:18:59 GET	TPF - Terminal Phase - $\Delta V = 28.1$ fps, RCS Final Braking Maneuvers Burn Time = 72.4 seconds total 230 x 234 Orbit
	07:27:00 GET	Station keeping and OWS Inspection

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Nov 10	07:59:31 GET	Docking
	09:40:00 GET	P52 - Option 3 - Realign to Rendezvous REFSMMAT (third platform drift check)
	10:15:00 GET	P50 - Option 1 - ATM Orientation Determination using ATM Sun Sensor Sighting
	10:20:00 GET	IVT to MDA - PLT Enters the Multiple Docking Adapter
	11:00:00 GET	Entry into AM - PLT Enters the Airlock Module
	11:10:00 GET	P52 - Option 3 - Realign to Rendezvous REFSMMAT (fourth platform drift check)
	12:45:00 GET	P50 - Option 2 - ATM Orientation Determination using ATM Sun Sensor and Star Tracker Sightings
Nov 11	14:20:00 GET	P52 - Option 3 - Realign to Rendezvous REFSMMAT using ATM Sun Sensor and Star Tracker Sightings

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Nov 11	14:45:00 GET	G&N Power Down - IMU Heater Power-On - CMC in Standby
Nov 15	07:49:34 CST	Orbit Trim 1 Maneuver - $\Delta V = 4.7$ fps, RCS Burn Time = 71.6 seconds 232 x 235 Orbit
Nov 17	10:00:00 CST	EVA #1 - S193 Antenna Repair and Film Replacement rk
Nov 25		Power Transfer - CSM Power is Transferred from SM Fuel Cells to AM/ATM Electrical Power System
Dec 14		Entry - 24 Day SIM - Deorbit/Entry dry run - Simulation - Power off
Dec 26		EVA #2 - Film Replacement
Dec 28		Entry - 10 Day SIM - Deorbit/Entry dry run - Simulation - Power off

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
ENTRY - 5 DAY CHECKS		
Jan 1	13:10:00 CST	G&N Power Up
	13:40:00 CST	P51 - IMU Orientation - IMU Orientation Determination using ATM Sun Sensor and Star Tracker Sightings
	13:50:00 CST	P52 - Option 1 - Reorient Platform to Entry Orientation
	14:15:00 CST	P50 - Option 2 - ATM Orientation Determination using ATM Sun Sensor and Star Tracker Sightings
	14:45:00 CST	P40 - Gimbal Command Check - SPS Maneuver Simulation Checks Engine Gimbal - Control by G&N
	14:55:00 CST	DAP - Thruster Command Check - Thruster Command Capability by G&N is Demonstrated
	15:10:00 CST	P52 - Option 3 - Realign to Entry REFSMMAT (platform drift check)

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Jan 1	16:10:00 CDT	G&N Power Down - IMU Heaters - On - CMC in Standby
ENTRY		
Jan 5	02:45:00 CST	G&N Power Up
	03:30:00 CST	Power Transfer - CSM Power is Transferred to SM Descent Batteries from AM/ATM Electrical Power System
	03:40:00 CST	P51 - IMU Orientation - IMU Orientation Determination using ATM Sun Sensor and Star Tracker Sightings
	03:50:00 CST	P52 - Option 1 - Reorient Platform to Entry Orientation
	10:10:00 CST	P52 - Option 3 - Realign to Entry REFSMMAT (first IMU drift check)

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Jan 6	03:02:00 CST	P52 - Option 3 - Realign to Entry REFSMMAT (second IMU drift check)
	09:17:00 CST	P52 - Option 3 - Realign to Entry REFSMMAT (third IMU drift check)
	11:30:00 CST	Undocking - Undocking and Flyaround Inspection with 15 Minute TV Transmission Scheduled
	12:16:00 CST	Separation Maneuver - $\Delta V = 5.0$ fps, RCS Burn Time = 24.8 seconds 227 x 236 Orbit
	12:57:14 CST	Shaping Maneuver - $\Delta V = 252.1$ fps, SPS (first of two impulse deorbit maneuvers) Burn Time = 11.0 seconds 91 x 233 Orbit
	14:03:00 CST	P52 - Option 3 - Realign to Entry REFSMMAT (fourth IMU drift check)

SEQUENCE OF MISSION EVENTS (Continued)

DATE	TIME	EVENT
Jan 6	16:02:35 CST	Deorbit Maneuver $\Delta V = 176.4$ fps, SPS (second of two impulse Burn Time = 7.6 seconds deorbit maneuver) -3 x 233 Orbit
	16:27:31 CST	Entry Interface - 400,000 ft Altitude
	16:44:11 CST	Splashdown - Latitude = 25.75°N Longitude = 159.25°W

EXPERIMENT DESIGNATION INDEX

MEDICAL EXPERIMENTS

- M071 - Mineral Balance
- M073 - Bio-Assay of Body Fluids
- M074 - Specimen Mass Measurement
(Calibration)
- M092/M171 - In-Flight Lower Body Negative Pressure/Metabolic Activity
- M092/M093 - In-Flight Lower Body Negative Pressure/Vectorcardiogram
- M110 - Hematology and Immunology
- M131 - Human Vestibular Function
- M133 - Sleep Monitoring
- M151 - Time and Motion Study
- M172 - Body Mass Measurement (Calibration)

APOLLO TELESCOPE MOUNT EXPERIMENTS

- ATM - Apollo Telescope Mount

EARTH RESOURCES EXPERIMENTS

- EREP - Earth Resource Experimental Package

COROLLARY EXPERIMENTS

- D008 - Radiation in Spacecraft
- D024 - Thermal Control Coatings
- M479 - Zero Gravity Flammability
- M487 - Habitability/Crew Quarters
- M509 - Astronaut Maneuvering Equipment
- M516 - Crew Activities/Maintenance Study
- M551 - Metals Melting
- M552 - Exothermic Brazing
- M553 - Sphere Forming
- M554 - Composite Casting Experiment
- M555 - Gallium Arsenide Crystal Growth
- S009 - Nuclear Emulsion
- S015 - Zero-G Single Human Cells
- S019 - UV Stellar Astronomy
- S020 - UV/X-Ray Solar Photography
- S063 - UV Airglow Horizon Photography

EXPERIMENT DESIGNATION INDEX (Continued)

COROLLARY EXPERIMENTS (Cont'd.)

- S071/S072 - Circadian Rhythm, Pocket Mice/ Vinegar Gnat
- S073/T027 - Gegenschein/Zodiacal Light/Contamination Measurements
- S149 - Particle Collection
- S183 - UV Panorama
- S201 - Comet KOHOUTEK Observation
- T002 - Manual Navigation Sightings
- T003 - In-Flight Aerosol Analysis
- T013 - Crew Vehicle Disturbances
- T020 - Foot-Controlled Maneuvering Unit
- T025 - Coronagraph Contamination Measurements
- T027 - Contamination Measurement

PHOTOGRAPHY

M151, M487, M516, OPS Photography

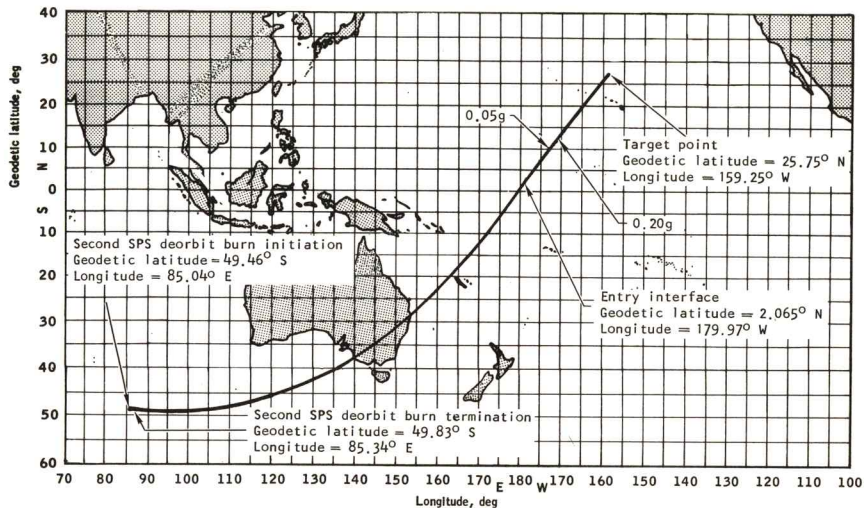
OPERATIONAL

Operational Radiation Measurements
20.10 Environmental Microbiology
Portable CO₂/Dew Point Monitor
EVA

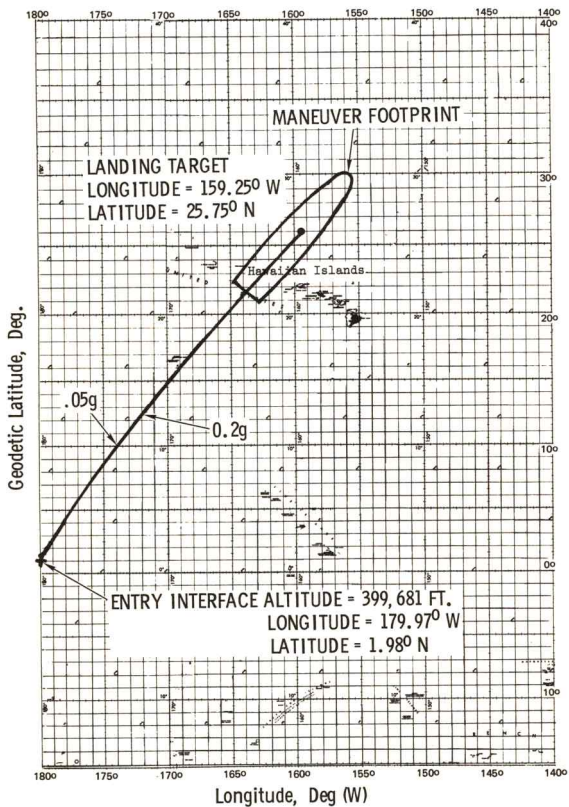
STUDENT ACTIVITIES

- ED 23 - UV Spectra of Quasars
- ED 24 - X-Ray Stellar Classes
- ED 25 - X-Rays From Jupiter
- ED 26 - UV From Pulsars
- ED 31 - Bacteria and Spores in Zero g
- ED 32 - In-Vitro Immunology
- ED 41 - Motor Sensory Motion
- ED 52 - Web Formation
- ED 61/62 - Plant Growth/Phototropism
- ED 63 - Cytoplasmic Streaming
- ED 72 - Capillary Study
- ED 74 - Mass Measurement
- ED 76 - Neutron Analysis
- ED 78 - Liquid Motion in Zero g

ENTRY GROUND TRACE FOR SPS DEORBIT MANEUVER



SKYLAB IV LANDING FOOTPRINT



COMPUTER PROGRAMS

PHASE	PROGRAM NUMBER	PROGRAM TITLE
PRE-LAUNCH AND SERVICE	00	CMC IDLING
	01	PRELAUNCH OR SERVICE INITIALIZATION
	02	PRELAUNCH OR SERVICE - GYRO COMPASSING
	03	PRELAUNCH OR SERVICE - OPTICAL VERIFICATION OF GYRO COMPASSING
BOOST COAST	06	GNCS POWER DOWN
	07	SYSTEMS TEST
	11	EARTH ORBIT INSERTION MONITOR (EOI)
	20	UNIVERSAL TRACKING
	21	GROUND TRACK DETERMINATION
	25	CONTINGENCY VHF RANGE-RATE
	27	CMC UPDATE
PRE-THRUST TARGETING	29	TIME-TO-LONGITUDE
	30	EXTERNAL DELTA V
	31	FIRST PHASING MANEUVER (NC 1)
	32	SECOND PHASING MANEUVER (NC 2)
	33	CORRECTIVE COMBINATION MANEUVER (NCC)
	34	CO-ELLIPTIC MANEUVER (NSR)
	35	TRANSFER PHASE INITIATION (TPI)
	36	TRANSFER PHASE MIDCOURSE (TPM)
	37	RENDEZVOUS FINAL PHASE
	38	PLANE CHANGE (PC)

PHASE	PROGRAM NUMBER	PROGRAM TITLE
THRUSTING	40	SPS
	41	RCS
	47	THRUST MONITOR
ALIGNMENT	48	RENDEZVOUS THRUST MONITOR
	50	ATM ORIENTATION DETERMINATION
	51	IMU ORIENTATION DETERMINATION
	52	IMU REALIGN
	53	BACK-UP IMU ORIENTATION DETERMINATION
	54	BACK-UP IMU REALIGN
	55	ATM STAR TRACKER GIMBAL ANGLES
ENTRY	61	ENTRY PREPARATION
	62	ENTRY CM/SM SEPARATION AND PRE-ENTRY MANEUVER
	63	ENTRY INITIALIZATION
	64	ENTRY-POST 0.05 G
POST- THRUSTING	65	ENTRY-UP CONTROL
	66	ENTRY BALLISTICS
	67	ENTRY-FINAL PHASE
	77	CSM VELOCITY VECTOR UPDATE

STAR LIST

NOUN CODES

P5X: N70/71 RI: SENSOR/STAR CODE OOCDE

C = 0 CSM OPTICS

C = 1 SUN SENSOR (DE = 46)

C = 2 STAR TRKR (DE = 04, 14, OR 25)

00 PLANET
01 ALPHERATZ
02 DIPHA
03 NAVI
04 ACHERNAR
05 POLARIS
06 ACAMAR
07 MENKAR
10 MIRFAK
11 ALDEBARAN
12 RIGEL
13 CAPELLA
14 CANOPUS
15 SIRIUS
16 PROCYON
17 REGOR
20 DNOCES
21 ALPHARD
22 REGULUS
23 DENEbola
24 GIENAH
25 ACRUX
26 SPICA

27 ALKAID
30 MENKENT
31 ARCTURUS
32 ALPHECCA
33 ANTARES
34 ATRIA
35 RASALHAGUE
36 VEGA
37 NUNKI
40 ALTAIR

41 DABIH
42 PEACOCK
43 DENEb
44 ENIF
45 FOMALHAUT
46 SUN
47 EARTH

NO6 OPTIONS:

P50

1 = ACQ SS

2 = ACQ SS/ST

3 = INDEP. SOURCE

P52/4

1 = PREFERRED

2 = NOMINAL

3 = REFSMMAT

P55

1 = IMU ALIGNED

2 = IMU NOT ALIGNED

P20

0 = RNDZ (POINT)

1 = CEL BODY (POINT)

2 = ROTATE

4 = RNDZ (3-AXIS)

5 = CEL BODY (3-AXIS)

VERB/NOUN LISTS

VERB LIST

- | | | | |
|----|-----------------------------|----|---|
| 50 | PLEASE PERFORM | 25 | PLEASE PERFORM |
| 51 | PLEASE MARK | 28 | TIG NC2 |
| 53 | PLEASE MARK ALT LOS | 33 | TIG |
| 54 | REND COAS MARK | 34 | T EVENT (PROGRAM) |
| 56 | TERMINATE P20 | 37 | TIG TPI |
| 58 | STICKFLAG (R)/V50N18FLAG(S) | 40 | TF GETI/TFC - V.G - Δ .V |
| 64 | OPTICS ANGLE TRANSFORM | 45 | MARKS - TF GETI - M.GA |
| 76 | ENABLE VHF DATA PROC | 49 | Δ P.OS - Δ VE.L - CODE |
| 77 | DISABLE VHF DATA PROC | 53 | RAN.GE - R.R - P.HI |
| 85 | REND PARAM DISP NO. 2 | 54 | RAN.GE - R.R - THE.TA |
| 86 | REJECT REND COAS MARK | 56 | VEHICLE .RATE |
| 87 | ENABLE VHF RANGE MARKS | 58 | Δ VTP.1 - Δ VTP.F - Δ T2 |
| 88 | DISABLE VHF RANGE MARKS | 59 | Δ VLOS.X- Δ VLOS.Y- Δ VLOS.Z |
| 93 | ENABLE W - MATRIX INIT. | 70 | SENSOR/CODE (BEFORE MK) |
| 96 | TERM SV INTEG (CALL P00) | 71 | SENSOR/CODE (AFTER MK) |

NOUN LIST

- | | | | |
|----|-------------------------|----|--|
| 04 | ATT E.RR | 72 | TIME OF OPT |
| 05 | ANG SEP E.RR - ANG S.EP | 75 | Δ HNS.R - Δ T1 - Δ T2 |
| 06 | OPTION CODE | 76 | RAN.GE - R.R - TIME FR OPT |
| 09 | ALARM CODES | 77 | RAN.GE - R.R - THE.TA/P.HI |
| 11 | TIG NCC | 78 | Y.AW - PIT.CH - OMICR.ON |
| 13 | TIG NSR | 81 | Δ V LOCAL VER.T |
| 14 | STAR TRKR OG, IG | 82 | Δ VNSR LOCAL VER.T |
| 16 | T EVENT (EXT VERB) | 84 | Δ VNEX.T - Δ HNEX.T - Δ VTHIR.D |
| 18 | AUTO MN.VR | 85 | VG CONTROL AXE.S |
| 19 | STAR TRKR OG | 88 | X, Y, Z P.LANET |
| 20 | PRES ICDU A.NG | 91 | PRESENT SHA.FT - T.RUN |
| 22 | NEW ICDU A.NG | 92 | COMMAND SHA.FT - T.RUN |
| 23 | DOCKING ANGL.ES | 93 | TORQUING .ANG |
| | | 94 | ALT LOS SHA.FT - T.RUN |
| | | 95 | TIG NC1 |

ALARM CODES

ALARM CODES (V05N09)

00107	STAR TRACKER OUT OF LIMITS	00501	NOT ENOUGH JETS FOR ROLL (DOCKED)	20607	NO CONIC SOLUTION
00110	MK REJECT ENTERED & IGNORED	00600	FAILURE IN PHASE MATCH ITERATION	21204	NEG OR ZERO WAITLIST CALL
00113	NO INBITS (CH 16)	00601	FAILURE IN HEIGHT MANEUVER ITERATION	21206	TWO DISPLAYS ATTEMPTED AT ONCE
00114	MORE MKS THAN DESIRED	00602	FAILURE IN OUTER LOOP ITERATION	21210	TWO PROGRAMS USING AT ONCE
00115	V4IN9I WITH OPTICS NOT IN CMC	00603	FAILURE IN QRDPI ITERATION	21302	SQRT CALLED WITH NEG ARGUMENT
00116	OPTICS SW MOVED BEFORE 15 SEC	00611	NO TIG FOR ELEV ANGLE GIVEN	21501	DSKY ALARM DURING INTERNAL USE
00117	V4IN9I BUT OPTICS NOT READY	00777	ISS WARNING-PIPA FAIL	21502	ILLEGAL FLASHING DISPLAY
00120	ZERO OPTICS FIRST	01102	CMC SELF TEST ERROR	21521	KEYED P01 AFTER LIFTOFF
00121	CDUS BAD DURING MK-REPEAT	01105	DOWNLINK TOO FAST	31104	DELAY ROUTINE IS BUSY
00205	PIPA SATURATED	01106	UPLINK TOO FAST	31201	EXEC OVERFLOW-NO VAC AREAS
00206	CANNOT ZERO ICDU-WITH ALARMS	01107	PHASE TABLE FAIL-ERASABLE BAD	31202	EXEC OVERFLOW-NO CORE SETS
00207	NEED 90 SEC FOR ISS TURN ON	01301	ARCSIN/ARCCOS INPUT > ONE	31203	WAITLIST OVERFLOW-MANY TASKS
00210	IMU NOT OPERATING	01407	VG INCREASING	31211	CANNOT INTERRUPT EXTENDED VERB
00211	COARSE ALIGN ERROR > 2 DEG	01426	IMU UNSATISFACTORY	32000	DOCKED DAP CYCLES OVERLAP
00212	PIPA FAIL BUT PIPA NOT IN USE	01427	IMU POLARITY REVERSED		
00213	IMU NOT ON-TURN ON IMU	01520	V37 NOT PERMITTED NOW		
00214	PROGRAM USING IMU BUT IMU OFF	01600	OVERFLOW DURING DRIFT TEST		
00217	COARSE ALIGN/TORQUING PROBLEM	01601	BAD IMU TORQUE		
00220	IMU NOT ALIGNED/NO REFSMMAT	01703	INSUF TIME TO INTEG-TIG SLIP		
00401	DESIRED MGA TOO LARGE	03777	ISS WARNING-ICDU FAIL		
00402	DO SECOND MINKEY PULSE TORQUE	04777	ISS WARNING-ICDU & PIPA FAIL		
00404 *	TGT OUT OF VIEW (TRUN > 90 DEG)	07777	ISS WARNING-IMU FAIL		
00405	STAR PAIR NOT AVAILABLE	10777	ISS WARNING-IMU & PIPA FAIL		
00406	P20 NOT OPERATING	13777	ISS WARNING-IMU & ICDU FAIL		
00421	W MATRIX OVERFLOW	14777	ISS WARNING-IMU, ICDU & PIPA FAIL		
00500	NOT ENOUGH JETS FOR P/Y (DOCKED)	20430	ORBITAL INTEGRATION STOPPED		

NOTE :

00404 * IS A PRIORITY ALARM
 2XXXX POODOO - NO RESTART LT - F37
 (AVE G ON OR EXT VERB -
 ACTS AS BAILOUT)
 3XXXX BAILOUT - NO RESTART LT -
 PROGRAM CONTINUES

ABBREVIATIONS

ACN - ASCENSION TRACKING STATION	EI - ENTRY INTERFACE	IVA - INTERVEHICULAR ACTIVITY	SCT - SCANNING TELESCOPE
ALSA - ASTRONAUT LIFE SUPPORT ASSEMBLY	EMOD - ERASABLE MEMORY DUMP	KSC - KENNEDY SPACE CENTER	SI - SOLAR INERTIAL ATTITUDE
AM - AIRLOCK MODULE	EPCS - EXPERIMENT POINTING CONTROL SYSTEM	LOS - LOSS OF SIGNAL/LINE OF SIGHT	SM - SERVICE MODULE
AME - ASTRONAUT MANEUVERING EQUIPMENT	EPO - EARTH PARKING ORBIT	MAD - MADRID TRACKING STATION	SPS - SERVICE PROPULSION SYSTEM
AOS - ACQUISITION OF SIGNAL	EPS - ELECTRICAL POWER SYSTEM	MDA - MULTIPLE DOCKING ADAPTER	SPT - SCIENTIST PILOT
APCS - ATTITUDE AND POINTING CONTROL SYSTEM	EREP - EARTH RESOURCES EXPERIMENT PACKAGE	MGA - MIDDLE GIMBAL ANGLE	STDN - SPACEFLIGHT TRACKING AND DATA NETWORK
ATM - APOLLO TELESCOPE MOUNT	EVA - EXTRA VEHICULAR ACTIVITY	MIL - MERRITT ISLAND TRACKING STATION	SWS - SATURN WORKSHOP
BDA - BERMUDA TRACKING STATION	GDS - GOLDSTONE TRACKING STATION	MSC - MANNED SPACECRAFT CENTER	SXT - SEXTANT
BT - BURN TIME	GET - GROUND ELAPSED TIME	MSFC - MARSHALL SPACE FLIGHT CENTER	SIVB - SATURN IVB
CDR - COMMANDER	GMT - GREENWICH MEAN TIME	NC1 - FIRST PHASING MANEUVER	TACS - THRUSTER ATTITUDE CONTROL SUBSYSTEM
CDU - COUPLING DISPLAY UNIT	G&N - GUIDANCE AND NAVIGATION	NC2 - SECOND PHASING MANEUVER	TEX - CORPUS CHRISTI TRACKING STATION
CM - COMMAND MODULE	GSFC - GODDARD SPACE FLIGHT CENTER	NCC - CORRECEIVE COMBINATION MANEUVER	TPF - TERMINAL PHASE FINAL
CMC - COMMAND MODULE COMPUTER	GWM - GUAM TRACKING STATION	NSR - COELLIPTIC OR SLOW RATE PHASING MANEUVER	TP1 - TERMINAL PHASE INITIALIZATION
CMG - CONTROL MOMENT GYRO	HA - APOGEE ALTITUDE	OA - ORBITAL ASSEMBLY	TPM - TERMINAL PHASE MIDCOURSE
CRO - CARNARVON TRACKING STATION	HAW - HAWAII TRACKING STATION	OGA - OUTER GIMBAL ANGLE	TVC - THRUST VECTOR CONTROL
CSM - COMMAND AND SERVICE MODULES	HP - PERIGEE ALTITUDE	OWS - ORBITAL WORKSHOP	VAN - VANQUARD TRACKING SHIP
CYI - GRAND CANARY ISLAND TRACKING STATION	HSK - HONEYSUCKLE TRACKING STATION	PC - PLANE CHANGE MANEUVER	Z-LV - Z-LOCAL VERTICAL ATTITUDE
DAP - DIGITAL AUTOPILOT	IGA - INNER GIMBAL ANGLE	PLT - PILOT	ΔV - VELOCITY CHANGE (DIFFERENTIAL)
DOY - DAY OF YEAR	IMU - INERTIAL MEASUREMENT UNIT	RCS - REACTION CONTROL SYSTEM	ΔV_c - VELOCITY CHANGE AT ENGINE CUT-OFF
ECS - ENVIRONMENTAL CONTROL SYSTEM	ISS - INERTIAL SUBSYSTEM	SAL - SCIENTIFIC AIRLOCK	ΔR - POSITION CHANGE (DIFFERENTIAL)

NOTES:

NOTES:

NEWS CENTERS

CAPE KENNEDY

NASA - SKYLAB IV Mission News Center	783 7781
NASA - Recorded Information	784 2380
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NASA - Johnson Spacecraft Center - News	483 5111
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(Titusville)		
Holiday Inn	269 2121	
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