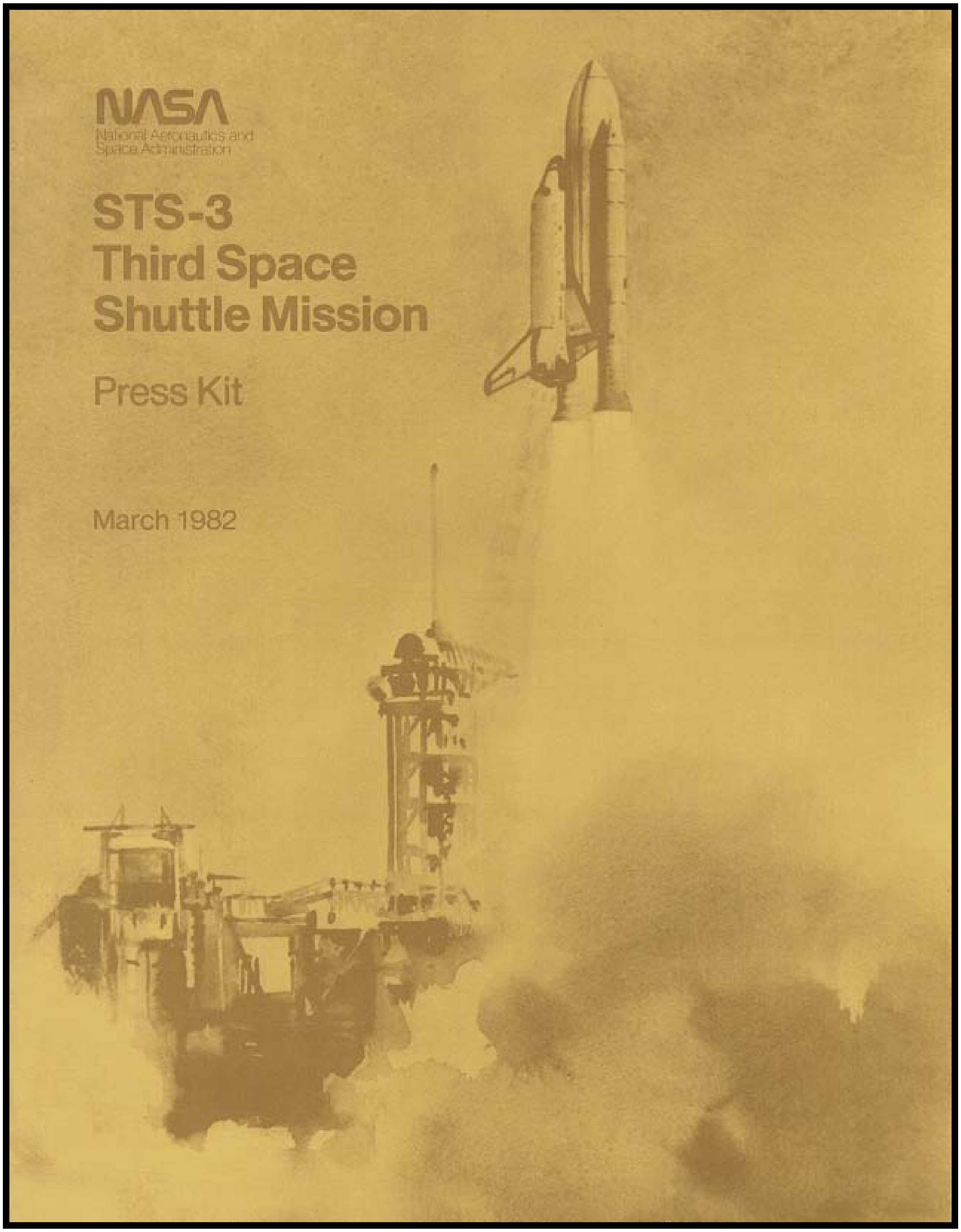

Original STS-3 press kit cover artwork

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION
STS-3

PRESS KIT
MARCH, 1982

THIRD SPACE SHUTTLE ORBITAL FLIGHT TEST (OFT-3)

STS-3 INSIGNIA

S82-26315 – The shuttle Columbia is depicted in the middle of the blue sphere against the background of the sun. Columbia's tail, nose, and top will each be pointed at the sun for long periods to test its thermal response to extremes of temperatures. The three prominent rays represent the third shuttle orbital flight test. The spacecraft's payload bay doors are open and the remote manipulator system arm with an experimental payload is extended as it will be on several occasions during the actual flight. The art work was accomplished by space artist Robert C. McCall of Paradise Valley, Arizona.

The NASA insignia design for space shuttle flights is reserved for use by the astronauts and for other official use as the NASA Administrator may authorize. Public availability has been approved only in the form of illustrations by the various news media. When and if there is any change in this policy, which we do not anticipate, it will be publicly announced.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration

RELEASE NO: 82-29 **March 1982**

CONTENTS

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RELEASE NO: 82-29 **March 4, 1982**

COLUMBIA CARRIES ASTRONOMY EXPERIMENTS ON THIRD TEST FLIGHT

Space Shuttle orbiter Columbia will make its third voyage into space March 22, 1982, carrying an array of astronomy and space science payloads in its cargo bay. The seven-day flight is scheduled for launch from NASA's Kennedy Space Center, Fla., at 10 a.m. EST.

Jack R. Lousma will be STS-3 commander. He was on the second crew which manned the Skylab space station for 59 days in 1973. C. Gordon Fullerton is pilot. Fullerton has not flown in space, but was teamed with Fred Haise in three of the five approach and landing glide flights of orbiter Enterprise in 1977.

Third of four planned orbital flight tests, STS-3 will continue the engineering shakedown of the Space Shuttle with emphasis on measuring the thermal responses of the orbiter spacecraft during long periods of nose-to-Sun, tail-to-Sun and open payload bay-to-Sun.

The Canadian-built remote manipulator arm will get its second workout, including grappling and hoisting two instrument packages from the payload bay to "sniff" the space environment around Columbia. The two instruments will be nested back into their holddowns and return to Earth after serving as forerunners of future deployable payloads.

Additionally, a "Get-Away Special" canister in the payload bay will be evaluated for suitability as a container for small, self-contained low-cost payloads.

Orbiter systems, such as the space radiators, electrical power generating system, attitude control and life support will undergo further performance measurements during the seven-day flight in the continuing qualification of the Space Transportation System for routine, operational space flight.

STS-3 will be launched into a 38-degree inclination orbit circularized with two orbital maneuvering system (OMS) maneuvers at 240.8 kilometers (130 nautical miles). Orbital maneuvering system burns later in the flight will have little effect upon the orbit for they are engineering tests of the engines in the cold engine restart mode, simulating worst-case flight conditions for operating the engines. Lousma and Fullerton will again use the wireless microphone headsets flown on STS-2 last November, freeing them from the restricting tethers of hardline cables.

The orbital maneuvering system deorbit burn will be made over the Indian Ocean near the end of the 115th orbit. Columbia will begin entering the atmosphere over the Western Pacific northeast of Guam. The groundtrack to landing will be almost identical to Columbia's first two flights as it crosses the California coast just north of Morro Bay, lets down over the San Joaquin Valley, passes south of Bakersfield, Tehachapi and Mojave to land on Rogers Dry Lake Runway 23 at Edwards Air Force Base at 10:24 a.m. PST, March 29.

If wind conditions at Edwards are right, Lousma and Fullerton may land Columbia on Runway 17 to gain the desired experience in landing the orbiter in a cross-wind. During final landing approach, the microwave scanning beam landing system will bring Columbia down to the flare to shallow glide from where the crew will land manually.

Kennedy Space Center teams will remove the crew and "safe" Columbia after landing.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS.)

SCHEDULED PRESS BRIEFINGS

Date	Time (EST)	Briefing	Location
T-4	9:00 a.m.	Countdown Status	KSC
T-3	9:00 a.m.	Countdown Status	KSC
	10:00 a.m.	Range operations Contingency Planning Weather Services	KSC
	1:30 p.m.	STS-3 Vehicle & KSC Facilities Terminal Countdown & Mission Rules	KSC
T-2	9:00 a.m.	Countdown Status	KSC
	10:30 a.m.	STS-3 Flight Plan	KSC
	1:00 p.m.	Payloads - Student Involvement Project	KSC
T-1	10:30 a.m.	Countdown Status	KSC
	1:00 p.m.	Prelaunch Press Conference	KSC
T	(approx. 1 hour after launch)	Postlaunch Press Conference	KSC
T thru T+7		Flight Director Change of Shift Briefings	JSC
T+6	2:00 p.m.	Landing Operations Briefing	DFRF
T+7	(approx. 2 hours after landing)	Postlanding Briefing	DFRF
T+8	2:00 p.m. Orbiter Status Briefing	DFRF	

NOTE: Times are subject to adjustment.

STS-3 OBJECTIVES: PROVING FLIGHT WORTHINESS

Each successive flight in the series of four orbital test flights with orbiter Columbia is aimed toward further verifying the Shuttle system's capability to do the job for which it was designed -- haul heavy payloads into and out of Earth orbit with a reusable vehicle. STS-3 will be the third in the planned four test flights in which flight worthiness of the Space Transportation System is demonstrated in a building-block scheme. Prime among the flight worthiness objectives is the operational compatibility of orbiter and its main tank and booster, and ground support facilities.

Among the varied tests of orbiter systems will be a "cold start" of an orbital maneuvering system engine after a prolonged cold-soak period in orbit. Orbiter's thermal response will be measured in tests of passive thermal control for 10 hours (payload bay toward Sun), 30 hours of tail toward Sun, 80 hours nose toward Sun, and 26 hours of payload bay toward Sun while Columbia holds an inertial attitude. The bulk of the data gathered by the Office of Space Science (OSS-1) payload will be while in the inertial, payload-bay-toward-Sun attitude.

In addition to the OSS-1 payload and the developmental flight instrumentation carried in the payload bay, STS-3 will carry the first Get-Away Special canister without a payload to verify its suitability as a container for low-cost scientific and research experiments. The OSS-1 payload and orbiter experiments aboard STS-3 are described in the payloads and experiments sections of this press kit.

Testing Columbia's Canadian-built robot arm, or payload deployment and retrieval system, will continue on STS-3 with those tests that were delayed because of the shortened STS-2 flight. In addition to testing the end effector grappling mechanism, the arm will lift the induced environment contamination monitor and the plasma diagnostic package from their payload bay racks for measuring space environment around the orbiter and as an exercise in payload handling before nesting the sensors back in their holddowns.

During launch and entry, orbiter aerodynamic performance will be further measured to add to the knowledge gained in the first two orbital test flights. Each successive flight profile is designed to push the orbiter closer to its operational limits.

During entry, a series of aerodynamic response tests will be run in all speed regimes from hypersonic down through subsonic to evaluate orbiter stability and control system effectiveness.

Aerodynamic stick outputs and programmed test inputs will cycle reaction control system and the aerosurface control system in combination and singly to induce attitude oscillations.

Similar tests were run at subsonic speeds during the 1977 approach and landing test flights with orbiter Enterprise.

Shuttle spacesuits, or extravehicular mobility units, are stowed in the airlock for a contingency spacewalk to close balky payload bay doors. Should such a spacewalk become necessary, Columbia's cabin pressure would be lowered from 14.5 pounds per square inch (21/79 percent oxygen/nitrogen mix) to 9 psi (28/72 percent oxygen nitrogen). Lowering cabin pressure to 9 psi eliminates the need to pre-breath oxygen on an umbilical or on a portable oxygen system to "wash" suspended nitrogen from blood before going out to haul the doors shut.

COLUMBIA'S THIRD TRIP INTO ORBIT
(Configuration)

In contrast to the Earth-looking experiments of the OSTA-1 payload carried aboard Columbia for the second flight, the OSS-1 payload for the third orbital test flight will carry spacelooking experiments. The OSS-1 experiment array is mounted on a Spacelab pallet similar to that used for the OSTA-1. As on all four orbital test flights, the development flight instrumentation, induced environment contamination monitor and the aerodynamic coefficient identification package share the payload bay with the scientific payload.

Two additional sets of cryogenic oxygen and hydrogen tanks supply reactants to Columbia's fuel cells for extending electrical power capacity. Strap-down potable water and waste water tanks on the mid-deck floor are available to feed the flash evaporators for a minimum six orbits after launch to cover the contingency of failure of the payload bay doors to open, exposing the space radiators for spacecraft cooling.

STS-3 liftoff weight will be 2, 031, 619 kilograms (4, 478, 954 pounds) compared to an STS-2 liftoff weight of 2,030,254 kg (4,475,943 lb.) -- an increase of 1,365 kg (3,011 lb.).

Weights of payloads and experiments in the payload bay for STS-3 are as follows:

- OSS-l, 2,264.4 kg (4,992 lb.);
- Spacelab pallet, 850.5 kg (1,875 lb.);
- OSS-1 attach hardware, cabling, 377.4 kg (832 lb.);
- Monodisperse Latex Reactor, 76.7 kg (169 lb.);
- Aerodynamic Coefficient Identification Package, 125.6 kg (277 lb.);
- Get-Away Special, 324.3 kg (715 lb.);
- Electrophoresis Equipment Verification Test, 37.6 kg (83 lb.);
- Induced Environment Contamination Monitor/Development, 5,015 kg (11,058 lb); and
- Miscellaneous attach hardware, cabling, 586.9 kg (1,294 lb.).
- Total cargo weight is 9,658.5 kg (21,293 lb.).

Creature comforts provided are not as sophisticated as they will be for operational flights.

Food stowed in mid-deck food lockers will be heated by a carry-on food warmer. Airliner-type galleys will be installed later on Columbia and subsequent orbiters.

Crewmen have the option of sleeping in the flight deck ejection seats or evaluating a sleeping bag stowed in the mid-deck. Ejection seats will be safed after STS-4, and removed from OV-102 during rework after STS-5, but until then crews will wear modified Air Force high-altitude pressure suits during launch and entry.

LAUNCH PREPARATIONS COUNTDOWN AND LIFTOFF

Assembly of the Space Shuttle "stack" for the STS-3 mission began the day before Columbia, mated to the top of its 747 carrier aircraft, left Dryden Flight Research Facility for the return trip to Kennedy.

The two aft assemblies, the bottom portions of the 46-m 150 ft.) tall boosters, were stacked on top of the Mobile Launcher Platform in High Bay 3 of the Vehicle Assembly Building on Nov. 23. The same transportable launch base used in the two previous Shuttle launches will again be used for STS-3. The forward assemblies were mated on Nov. 10 to complete assembly of the twin booster rockets.

Columbia arrived at Kennedy aboard the 747 Shuttle carrier aircraft on Nov. 25. The next day, the vehicle was moved into the orbiter Processing Facility. Post mission examination and modifications to the orbiter for the third flight began following a three-day holiday break.

About a week was spent troubleshooting flight anomalies experienced in the second flight. During this time, the faulty No. 1 fuel cell and auxiliary power unit No. 1 were removed and replaced with new components.

Troubleshooting of a problem with the remote manipulator arm's failure to move in the "yaw" position when in the backup mode revealed a bad cable, which was subsequently replaced. Also, the arm's end effector was returned to Canada to qualify it for use on STS-3.

Columbia was powered down for eight days, during which time the modifications peculiar to the STS-3 mission were made to the vehicle.

The most significant modifications were the addition of a fourth set of liquid oxygen and liquid hydrogen tanks for the power reactant storage and distribution system, and installation of OSS-l mechanical, electrical and fluid provisions.

Work days in the orbiter Processing Facility were cut significantly from 104 days on STS-2 to 69 days on STS-3. The reduction was because of fewer modifications, a reduced orbiter subsystem testing period and deletion of the orbiter integrated test

The external tank for STS-3 arrived at Kennedy Space Center on Oct. 5 via ocean-going barge, and was taken into the Vehicle Assembly Building for systems checkout in High Bay 4.

The tank was mated to the twin boosters in High Bay 3 of the Vehicle Assembly Building on Jan. 4-5.

The OSS-1 scientific package underwent assembly, checkout and flight validation in the operations and Checkout Building and was transported to the orbiter Processing Facility on Jan. 10 and inserted in Columbia's payload bay. The Cargo Interface Verification test was performed Jan. 26 to make certain the orbiter and payload were properly integrated.

Columbia was moved from the orbiter Processing Facility on Feb. 2-3 and was mechanically mated with the external tank and solid rocket boosters on Feb. 4, completing assembly of the STS-3 vehicle.

The Shuttle Interface Test was conducted from Feb. 6-13 to verify the mechanical and electrical connections between the various elements and to verify the function of onboard systems. Prime crew members Jack Lousma and C. Gordon Fullerton participated in the final phase of the Shuttle Interface Test -- a series of three mock mission simulations including a normal ascent to orbit, a return to launch site abort and a descent run.

Processing in the Vehicle Assembly Building followed much the same schedule as on STS-2. One task added to the work was the removal and replacement of auxiliary power unit lube oil filters and servicing the three units with new lube oil.

The assembled Space Shuttle and its Mobile Launcher Platform were moved to Pad A of Launch Complex 39 on Feb. 16 to undergo final processing prior to launch.

Pad-to-vehicle connections were verified, followed by a Dry Countdown Demonstration Test, a launch-day rehearsal with the prime crew, on Feb. 22. The test simulates as closely as possible the last hours of an actual Shuttle countdown, except that no cryogenic propellants are loaded into the external tank.

A wet cryogenic loading test was conducted Feb. 26. This test served two purposes: it verified the automatic propellant loading system and ability of Shuttle systems to perform under cryogenic conditions, and checked the integrity of the external tank's outer insulation. The flight crew did not participate in this test.

Hypergolic fuels are scheduled to be put aboard the orbiter and hydrazine loaded into the orbiter and solid rocket booster hydraulic power units from March 4-7.

Countdown preparations are to begin March 8 which could lead to picking up the 73-hour Shuttle launch countdown on March 18.

The launch countdown for STS-3 will be conducted from Firing Room 1 of the Complex 39 Launch Control Center by a government/ industry team of about 200 persons.

The STS-3 launch countdown is scheduled to pick up at T-73 hours with a call to stations on the morning of March 18. There are 29 hours and 30 minutes of hold time available to the launch team during the countdown.

The STS-3 countdown is essentially identical to the countdown for the second launch. One major test was added during the early part of the countdown to verify proper operation of the orbiter's fuel cells.

Pre-count activities should include closeout of the orbiter's aft end, pressurization of the orbital maneuvering and reaction control systems with gaseous nitrogen and helium, a patch and comparison of the mass memory units, loading of liquid oxygen and hydrogen into the orbiter's power reactant storage and distribution storage tanks, configuring of the pad sound suppression water, inertial measurement unit warm-up, retracting the rotating service structure, installation of mid-deck experiments, communication activation and checkout, gaseous oxygen vent arm extension, inertial measurement unit operation and pre-flight calibration and final cryogenic loading preparations.

The terminal portion of the countdown starts at T-5 hours with loading of cryogenic propellants into the external tank.

MAJOR COUNTDOWN MILESTONES

Count Time	Event
T-73 hours	Call to stations
T-61 hours	Pressurize orbital maneuvering and reaction control system tanks
T-58 hours	Purge fuel cells with gaseous hydrogen and oxygen reactants
T-50 hours	Mass memory unit patch and compare
T-35 hours	8-hour built in hold
T-32 hours	Load power reactant storage and distribution system liquid oxygen/liquid hydrogen tanks
T-27 hours	8-hour built in hold
T-20 hours	Retract rotating service structure
T-19 hours	Interface test with Merritt Island Tracking Station/Mission Control
T-10 hours	Fill sound-suppression water tank and load launch cameras
T-8 hours	12-hour 10-minute built-in hold
T-7 hours	Clear to blast danger area and switch orbiter air to gaseous nitrogen
T-5 hours	Start of terminal count. Start cross country line chilldown in preparation for external tank loading
T-3 hours, 30 minutes	Wake flight crew for breakfast and suiting
T-2 hours 15 minutes	External tank filled, start replenish
T-2 hours, 10 minutes	Flight crew begins suiting
T-2 hours, 5 minutes	1-hour hold
T-1 hour, 50 minutes	Crew entry into vehicle
T-1 hour	Inertial measurement unit pre-flight alignment
T-22 minutes	Transfer primary computer load to backup flight system and compare
T-20 minutes	10-minute hold
T-20 minutes	Orbiter computers transition to launch configuration
T-9 minutes	10-minute hold
T-9 minutes	Launch director "go" for launch. Start ground launch sequencer
T-7 minutes	Retract orbiter access arm
T-5 minutes	Start orbiter auxiliary power units, and arm external tank and solid rocket booster ignition and range safety systems
T-3 minutes, 30 seconds	Transfer orbiter to internal power
T-2 minutes, 55 seconds	Start pressurizing liquid oxygen tank, retract gaseous oxygen vent hood
T-2 minutes, 35 seconds	Transfer to on-board fuel cell
T-1 minute, 57 seconds	Start pressurizing liquid hydrogen tank
T-28 seconds	Go from ground launch sequencer for four primary flight computers to take over vehicle control of terminal count, and start solid rocket booster hydraulic power units
T-6.8 seconds	Main engines start
T-3 seconds	Main engines at 90 percent thrust
T-0	Solid rocket booster ignition, holddown post release and liftoff.

LAUNCH WINDOW

STS-3 will be launched from Complex 39's Pad A at Kennedy Space Center no earlier than March 22, 1982. The launch window on that date extends from 10 a.m. until 1:16 p.m. EST for a launch opportunity of three hours and 16 minutes in duration.

The window assumes a nominal landing on Runway 23 on Rogers Dry Lake at Dryden Flight Research Facility, Calif.

The lateness of the opening of the window will result in a later landing time at Edwards, increasing the probability of a crosswind landing, and provides optimum lighting conditions for photographic documentation of the launch as well as sufficient lighting for a safe landing at any of the designated landing sites.

SPACE SHUTTLE MISSION EVENTS

Event	Mission Elapsed Time Day/h:m:s	Comments
SRB Ignition	0/00:00:00	
Liftoff	0/00:00:00.3	
Pitchover	0/00:00:07.3	
Max Q (Maximum Dynamic Pressure)	0/00:00:52	26,479 ft. altitude, 651.1 lb/ft2, 1.9 nm downrange
SRB separation	0/00:02:06	163,444 ft., 25.2 nm downrange
MECO	0/00:08:34	57 nm altitude, 761 nm downrange
ET separation	0/00:08:52	
OMS-1 Ignition	0/00:10:34	1651.3 fps, 130x46 nm orbit
OMS-2 Ignition	0/00:40:51	151.9 fps, 130x130 nm orbit
OMS left engine cold restart	03/10:40:59	Two burns, 4 mins apart, 1.8 and 8.7 fps
Start aft RCS L2U thruster soakback burn test	03/22:40:50	30 3-second firings in 15 minutes
Deorbit ignition	07/02:31:47	269.4 fps, two engines, 126x17 nm orbit
Entry Interface (400,000 ft)	07/20:53:46	
Terminal area energy management (TAEM)	07/03:08:00	
Edwards crossover (sonic boom)	07/03:19:40	
Landing	07/03:24:28	

GUIDE TO USING THE FLIGHT PLAN

1. Summary Level Timeline (12-hour time span)

   The following letters (a-j) reference those in Figure 2-1.

   a. Timescales: Two time references are presented in this section. The two time references used are Central Daylight Time (CDT) (or TIG minus) and Mission Elapsed Time (MET). MET is referenced to liftoff beginning at 00/00:00:00 (days, hours, minutes and seconds).

   b. Crewmen (CDR & PLT): This is the column where titles of scheduled activities are shown for the commander (CDR) and pilot (PLT) at the appropriate times.

   c. Day/Night and orbit:

      1) Day/Night - The orbital day/night intervals are shown by black bars when the orbiter is in darkness.

      2) Orbit - Indicates which orbit the spacecraft is in by numerical sequence. The beginning of an orbit occurs when the orbiter crosses the Earth's equator going from the southern to the northern hemisphere (ascending node). The succession of orbits is numbered in this column starting with orbit 1 for launch.

   d. Earth Trace W/SAA: This is a display of the groundtrack of the orbiter and when it passes over the South Atlantic Anomaly (SAA) (indicated by a ' ---- ').

   e. GSTDN Coverage: The GSTDN communication coverage periods are indicated in this area with a horizontal line indicating when communication is available; the GSTDN site is identified to the right of the line.

   f. RMS OPS: This is a display of periods when the RMS is unstowed (indicated by a '----').

   g. Deorbit OPT: Times are identified in this area when deorbit burn opportunities exist for Edwards AFB (EDW) and Kennedy Space Center (KSC).

   h. Attitudes and Maneuvers:

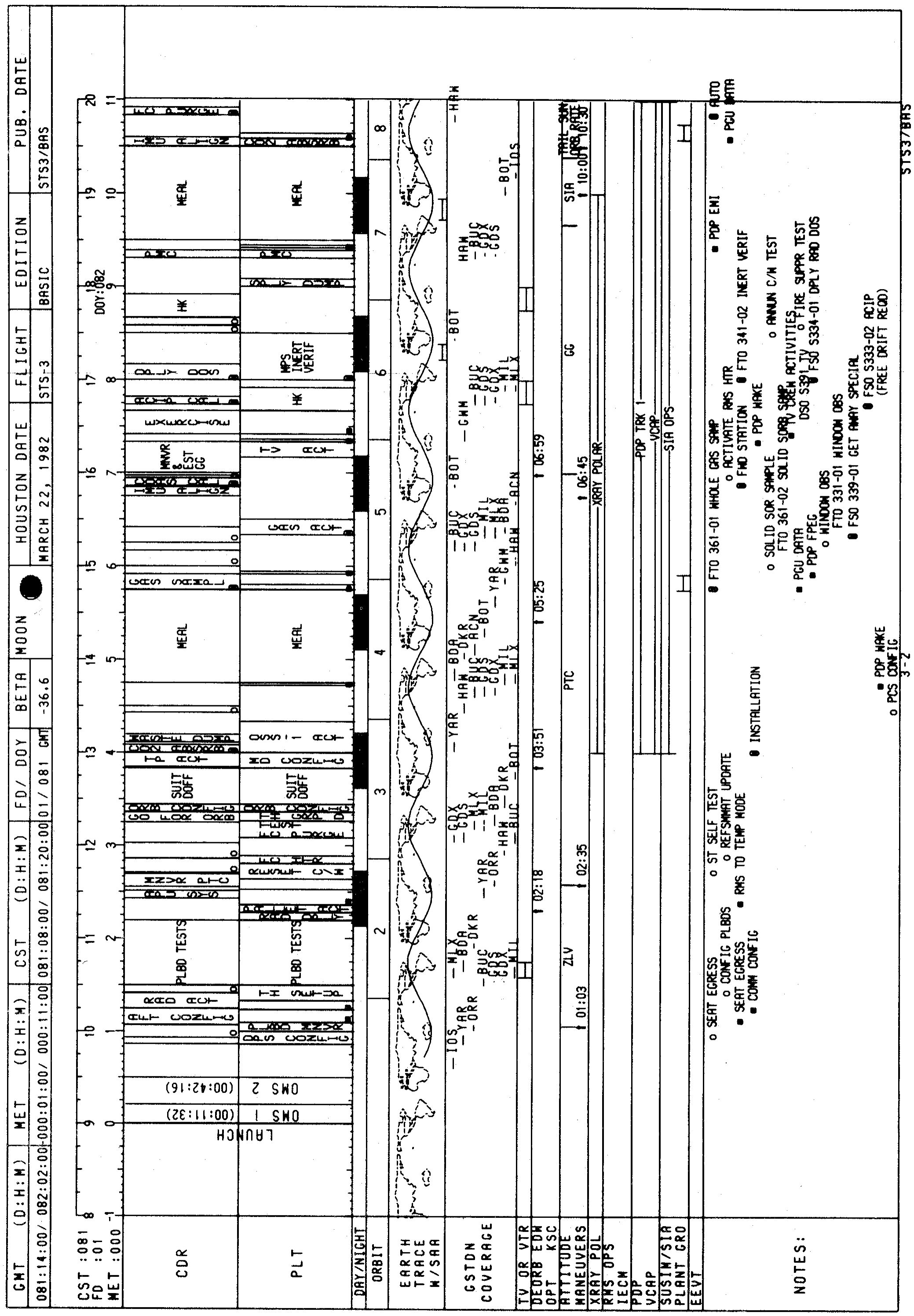
      1) Attitude - The current attitude of the vehicle is identified in this area, i.e., PTC, NOSE to SUN.

      2) Maneuvers - An `   ' is placed at the time an attitude maneuver occurs if the duration in attitude is to be greater than 15 minutes.

   i. VTR: Indicates periods when the video tape recorder is running (indicated by a '----'). TV - TV is indicated in this area with a '----'.

   j. Payload operating periods.

SUMMARY
TIMELINE



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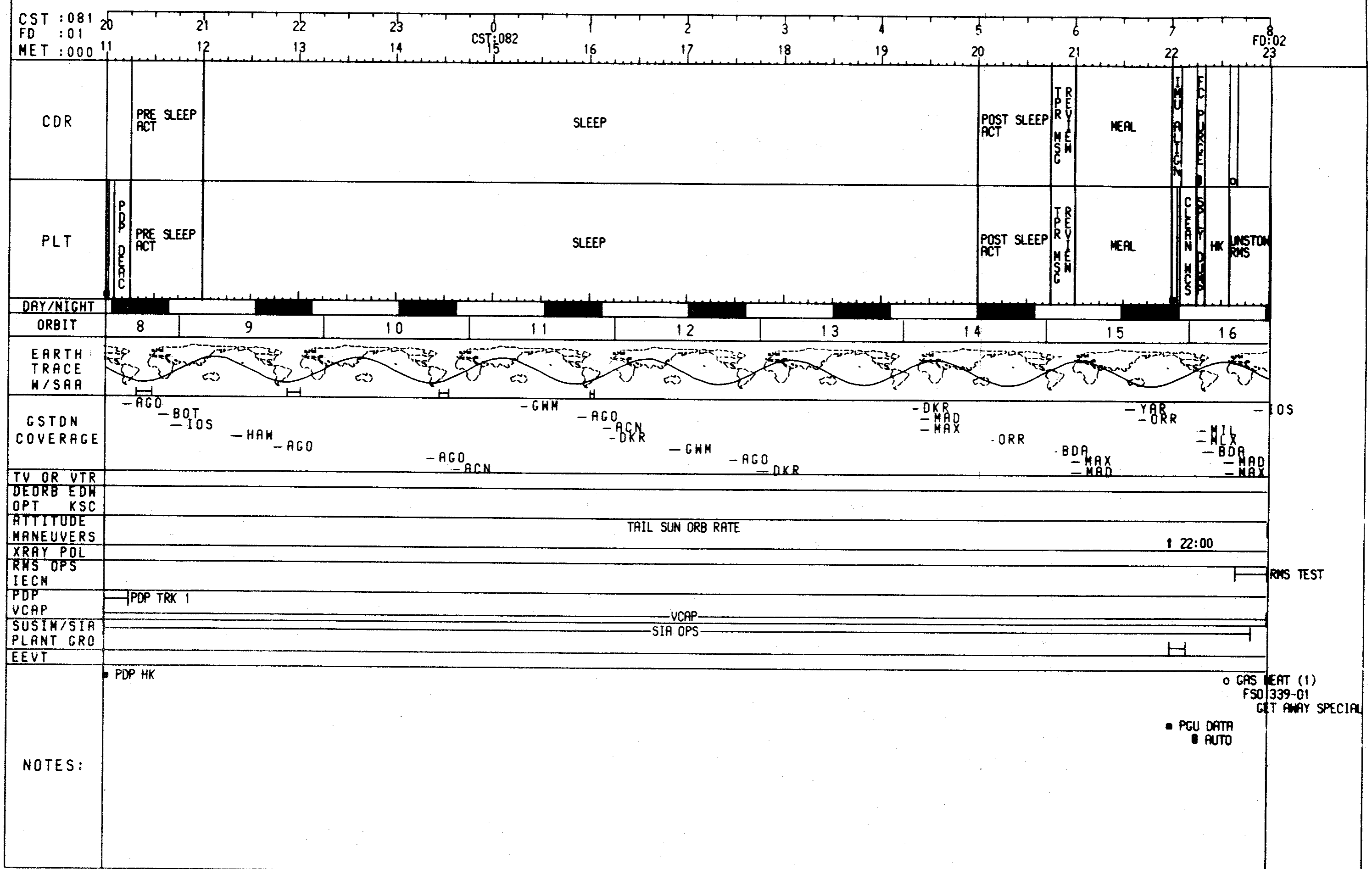

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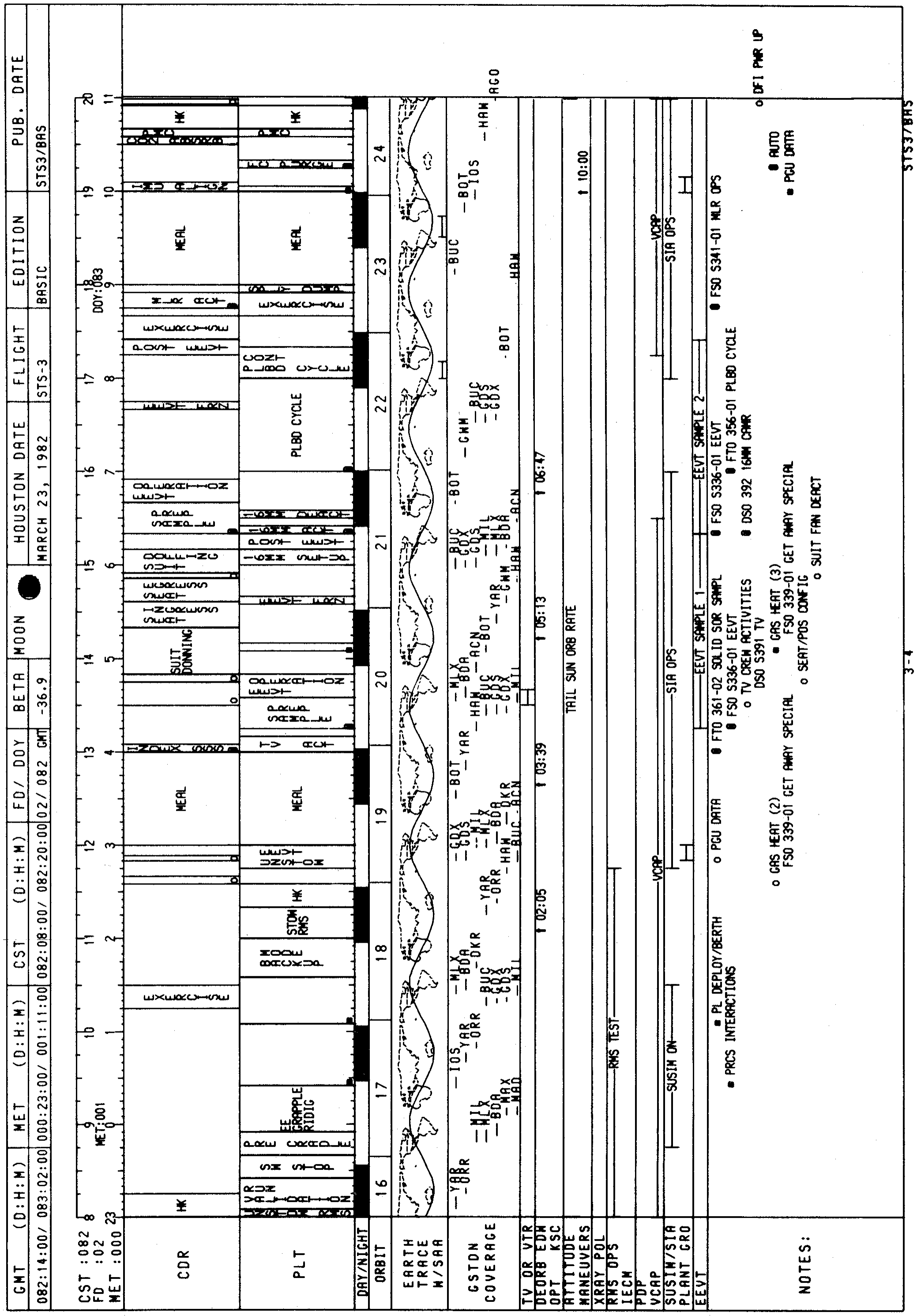

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PL DEPLOY/BERTH
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FSO S336-01 EEVT
TV CREW ACTIVITIES
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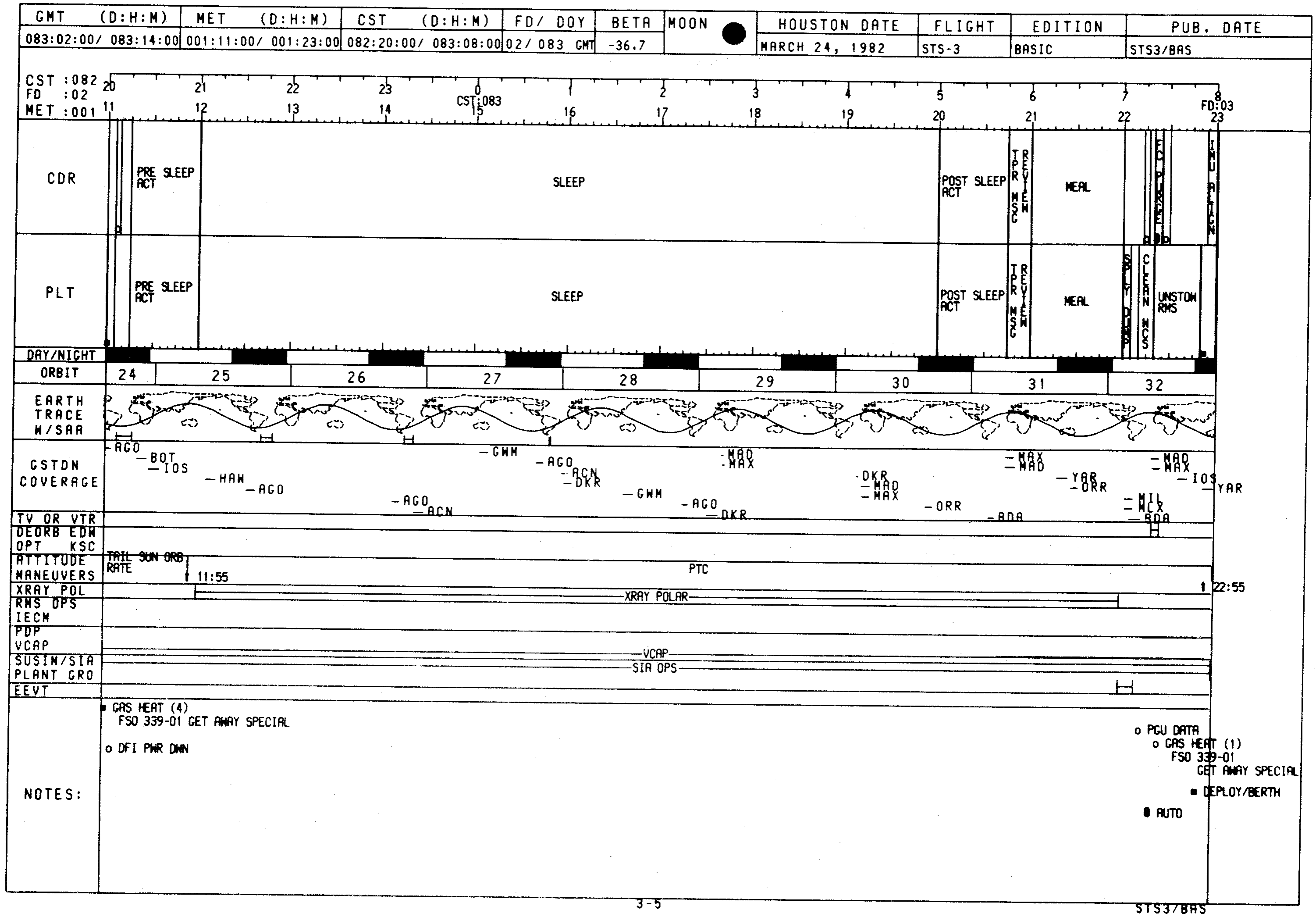
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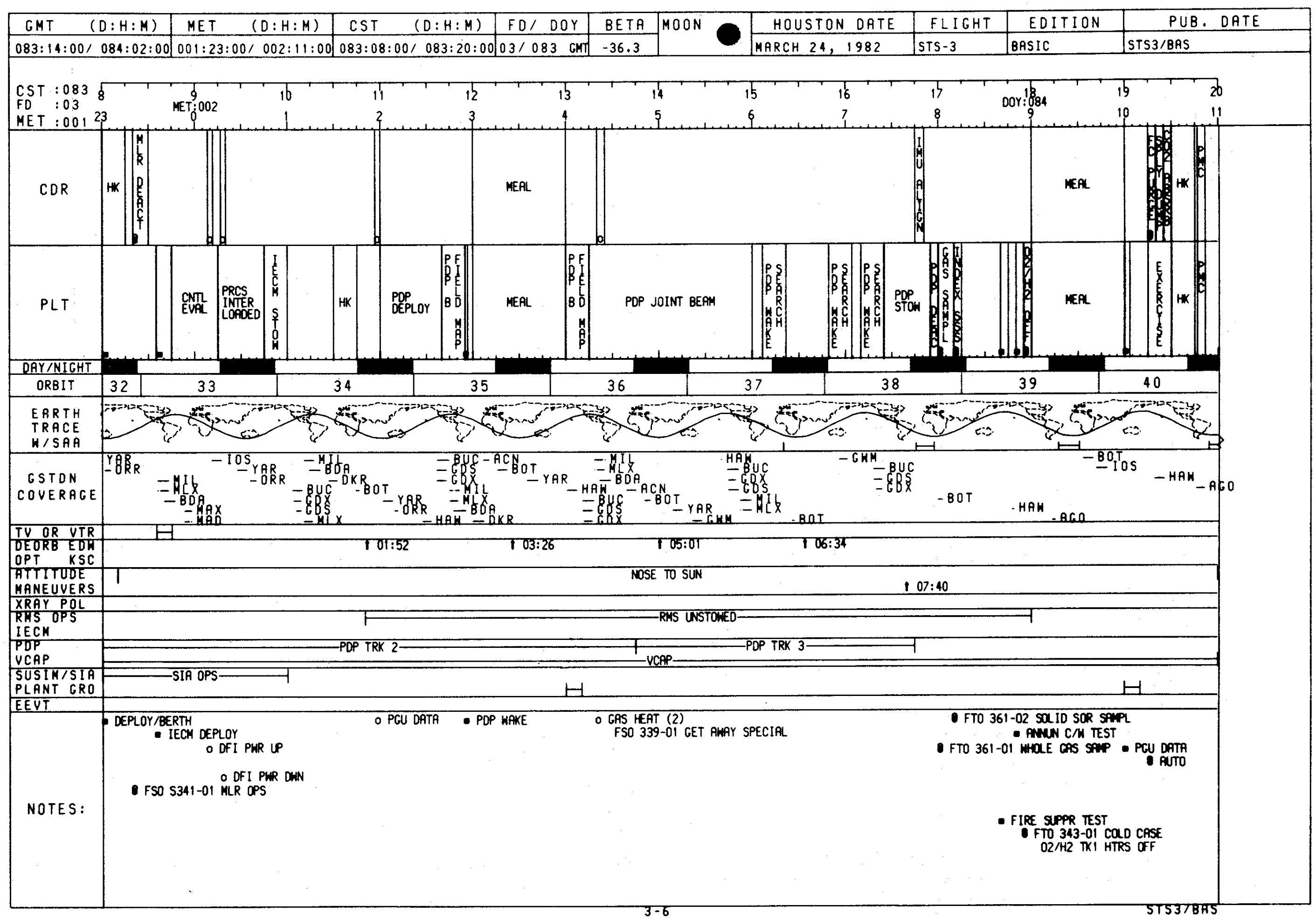
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PRCS INTER LOADED
IECM STOW
PDP DEPLOY
PDP FIELD MAP
PDP JOINT BEAM
PDP WAKE SEARCH
PDP STOW
GAS SAMPL
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EEVT
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IECM DEPLOY
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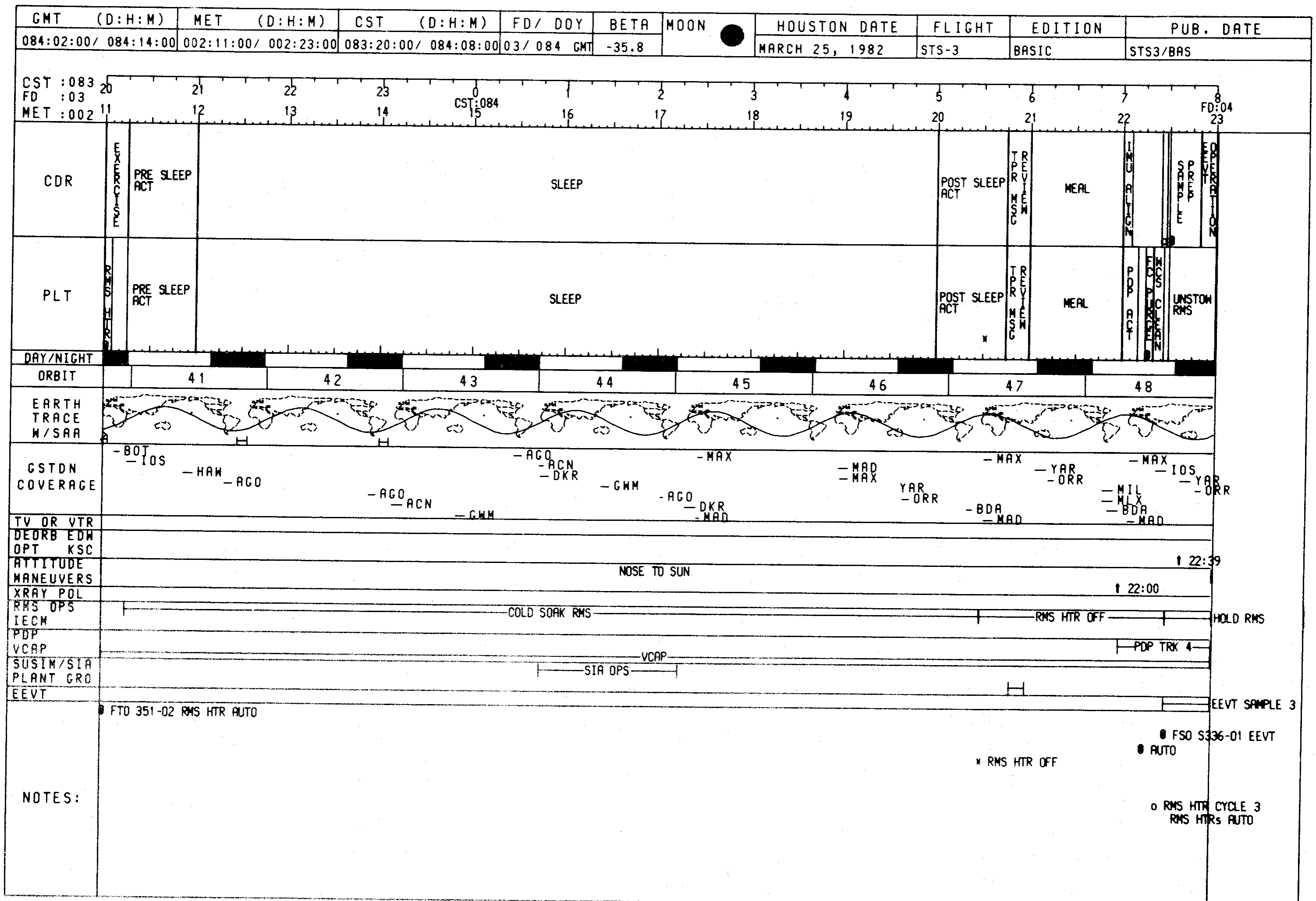
GAS HEAT (2)
FSO 339-01 GET AWAY SPECIAL
FTO 361-02 SOLID SOR SAMPL
ANNUN C/W TEST
FTO 361-01 WHOLE GAS SAMP
PGU DATA
AUTO
FIRE SUPPR TEST
FTO 343-01 COLD CASE
O2/H2 TK1 HTRS OFF
3-6
STS3/BAS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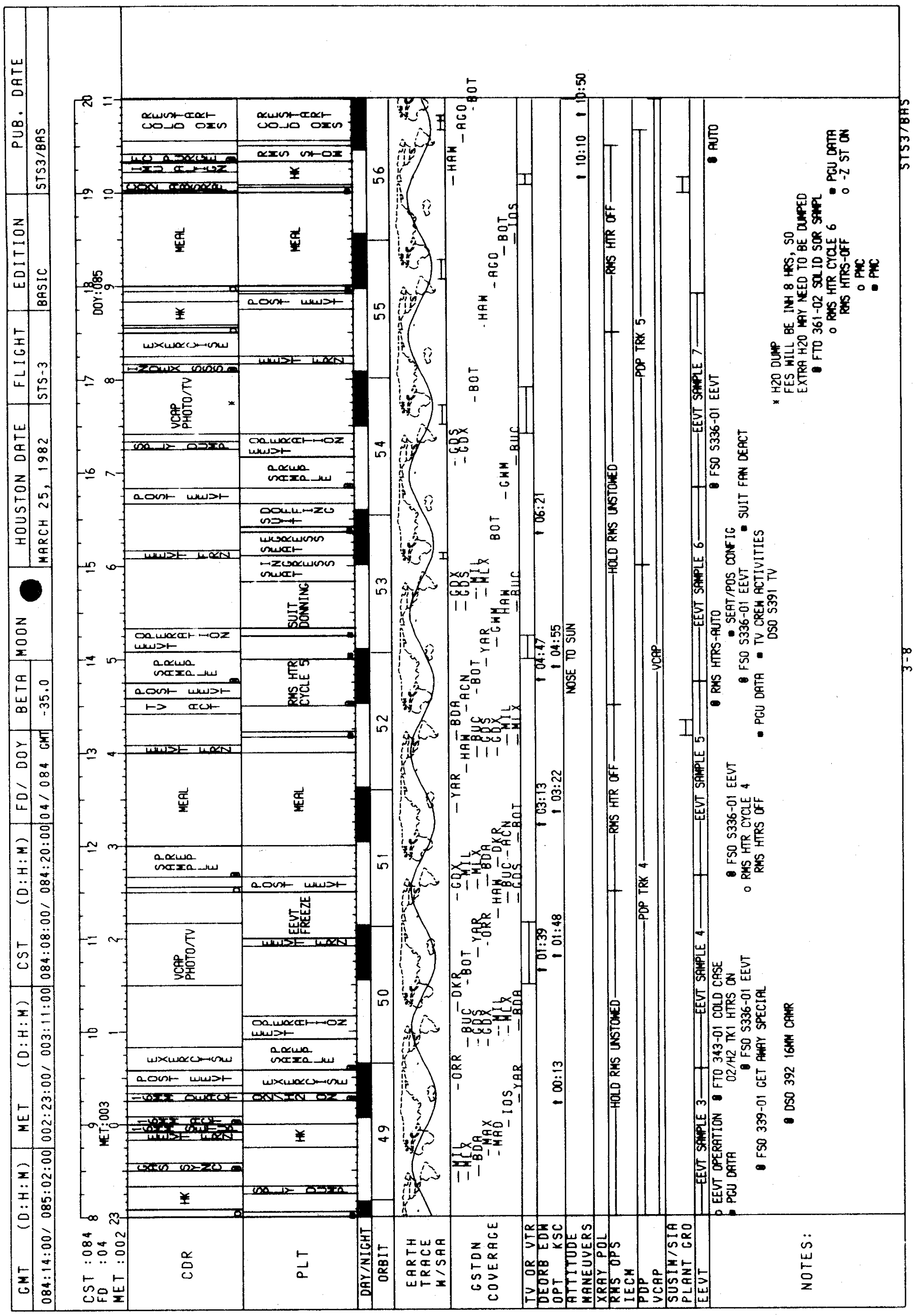
CST (D:H:M) 083:20:00/ 084:08:00
FD/ DOY 03/ 084 GMT
BETA -35.8
MOON
HOUSTON DATE MARCH 25, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CST :083
FD :03
MET :002
CST:084
FD:04
CDR
EXERCISE
PRE SLEEP ACT
SLEEP
POST SLEEP ACT
TPR REVIEW MSG
MEAL
IMU ALIGN
SAMPLE PREP
EEVT OPERATION
PLT
RMS HTR
PRE SLEEP ACT
SLEEP
POST SLEEP ACT
TPR REVIEW MSG
MEAL
PDP ACT
UNSTOW RMS
DAY/NIGHT
ORBIT
41
42
43
44
45
46
47
48
EARTH TRACE W/SAA
GSTDN COVERAGE
BOT
IOS
HAW
AGO
ACN
GWM
DKR
MAD
MAX
YAR
ORR
BDA
MIL
MLX
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE MANEUVERS
NOSE TO SUN
22:39
22:00
XRAY POL
RMS OPS
IECM
COLD SOAK RMS
RMS HTR OFF
HOLD RMS
PDP
PDP TRK 4
VCAP
SUSIM/SIA
SIA OPS
PLANT GRO
EEVT
EEVT SAMPLE 3
NOTES:
FTO 351-02 RMS HTR AUTO
FSO S336-01 EEVT
AUTO
RMS HTR OFF
RMS HTR CYCLE 3
RMS HTRs AUTO

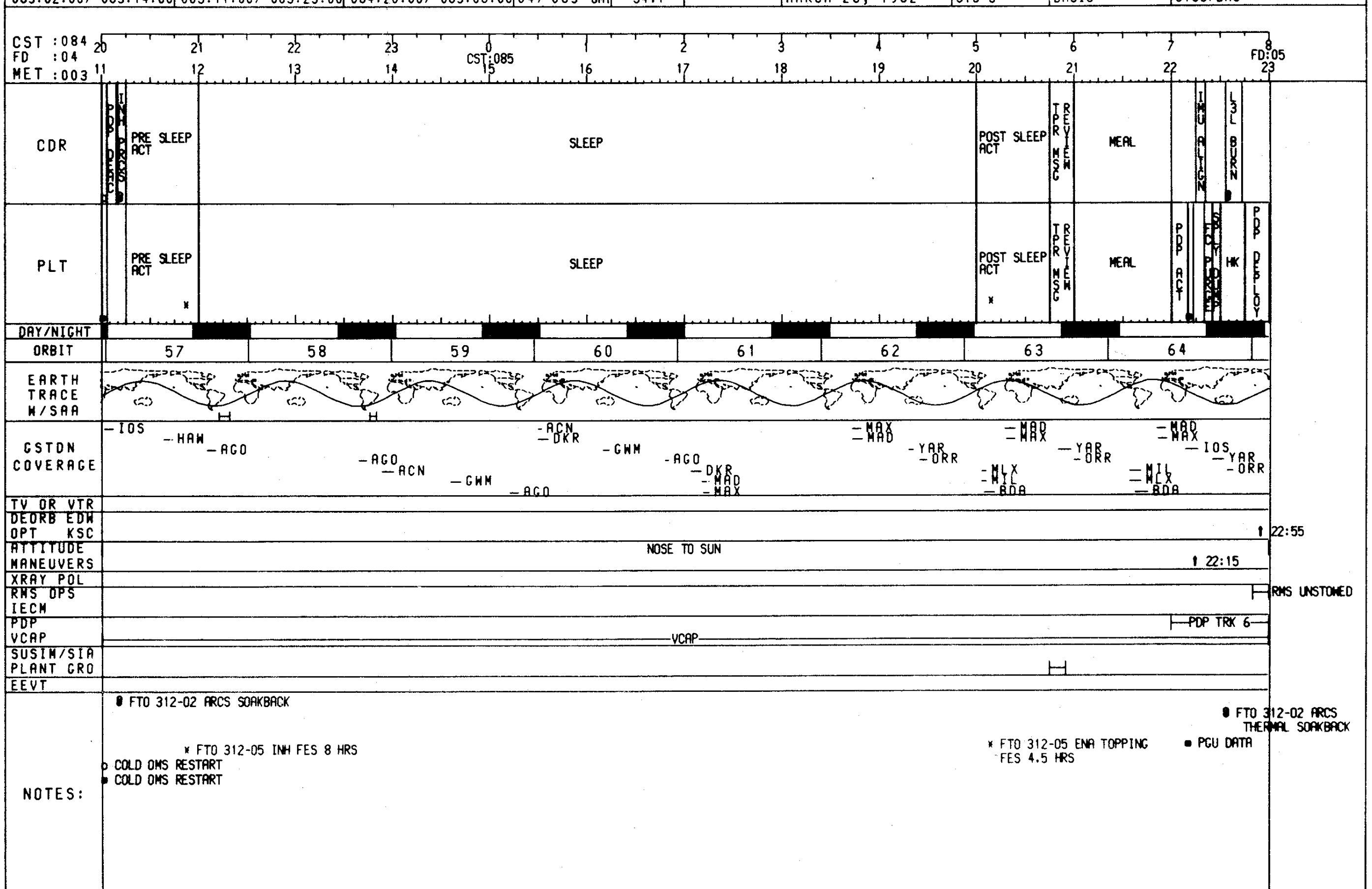
3-7

STS3/BAS



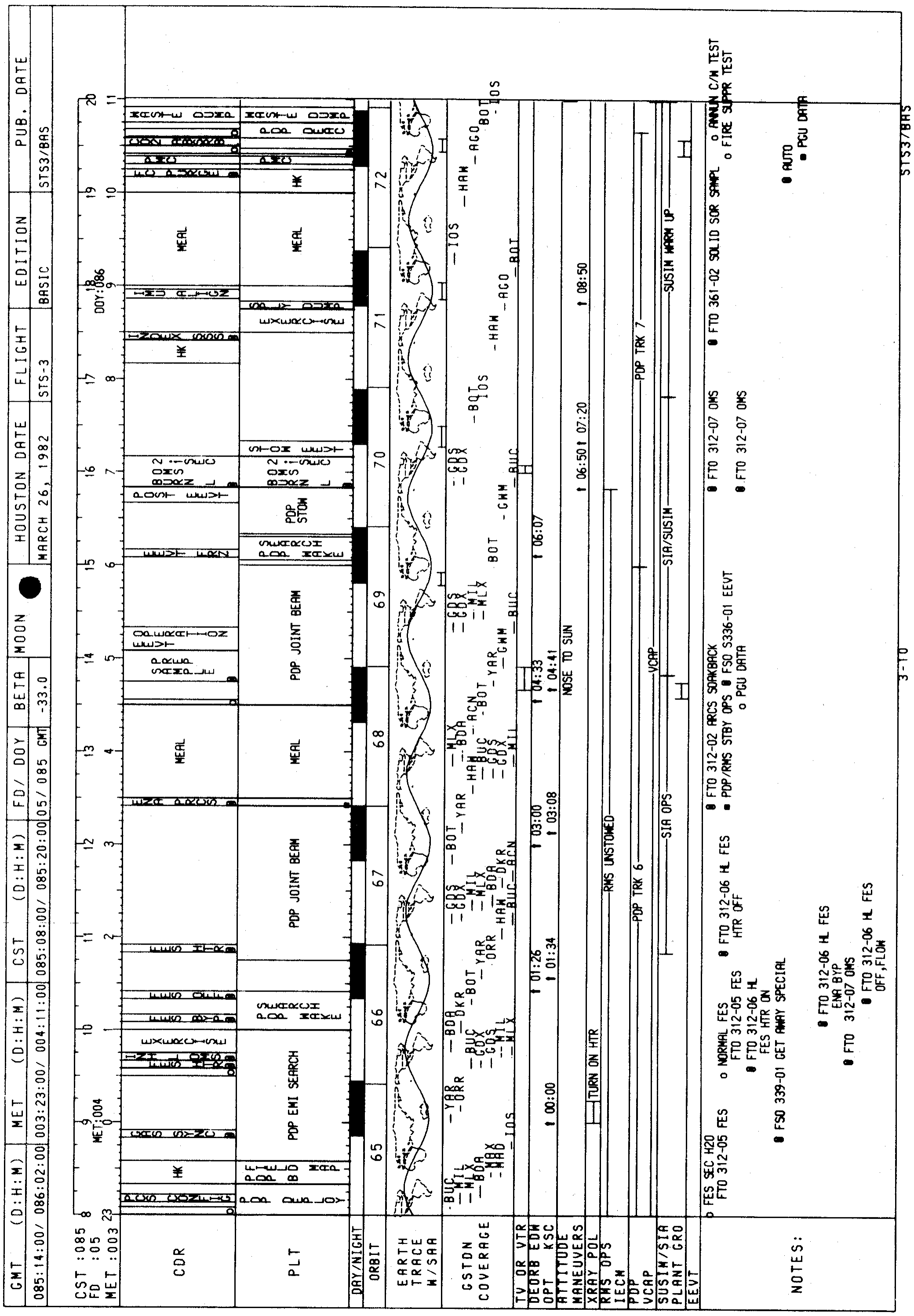
GMT (D:H:M)
MET (D:H:M)
CST (D:H:M)
FD/ DOY
BETA
MOON
HOUSTON DATE
FLIGHT
EDITION
PUB. DATE
084:14:00/ 085:02:00
002:23:00/ 003:11:00
084:08:00/ 084:20:00
04/ 084 GMT
-35.0
MARCH 25, 1982
STS-3
BASIC
STS3/BAS
CDR
PLT
DAY/NIGHT
ORBIT
EARTH TRACE W/SAA
GSTDN COVERAGE
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE
MANEUVERS
XRAY POL
RMS OPS
IECM
PDP
VCAP
SUSIM/SIA
PLANT GRO
EEVT
NOTES:
MEAL
VCAP PHOTO/TV
SUIT DONNING
RMS HTR CYCLE 5
EEVT FREEZE
HK
NOSE TO SUN
HOLD RMS UNSTOWED
RMS HTR OFF
POP TRK 4
POP TRK 5
EEVT SAMPLE 3
EEVT SAMPLE 4
EEVT SAMPLE 5
EEVT SAMPLE 6
EEVT SAMPLE 7
3-8

GMT (D:H:M)	MET (D:H:M)	CST (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
085:02:00/ 085:14:00	003:11:00/ 003:23:00	084:20:00/ 085:08:00	04/ 085 GMT	-34.1	●	MARCH 26, 1982	STS-3	BASIC	STS3/BAS



3-9

STS3/BAS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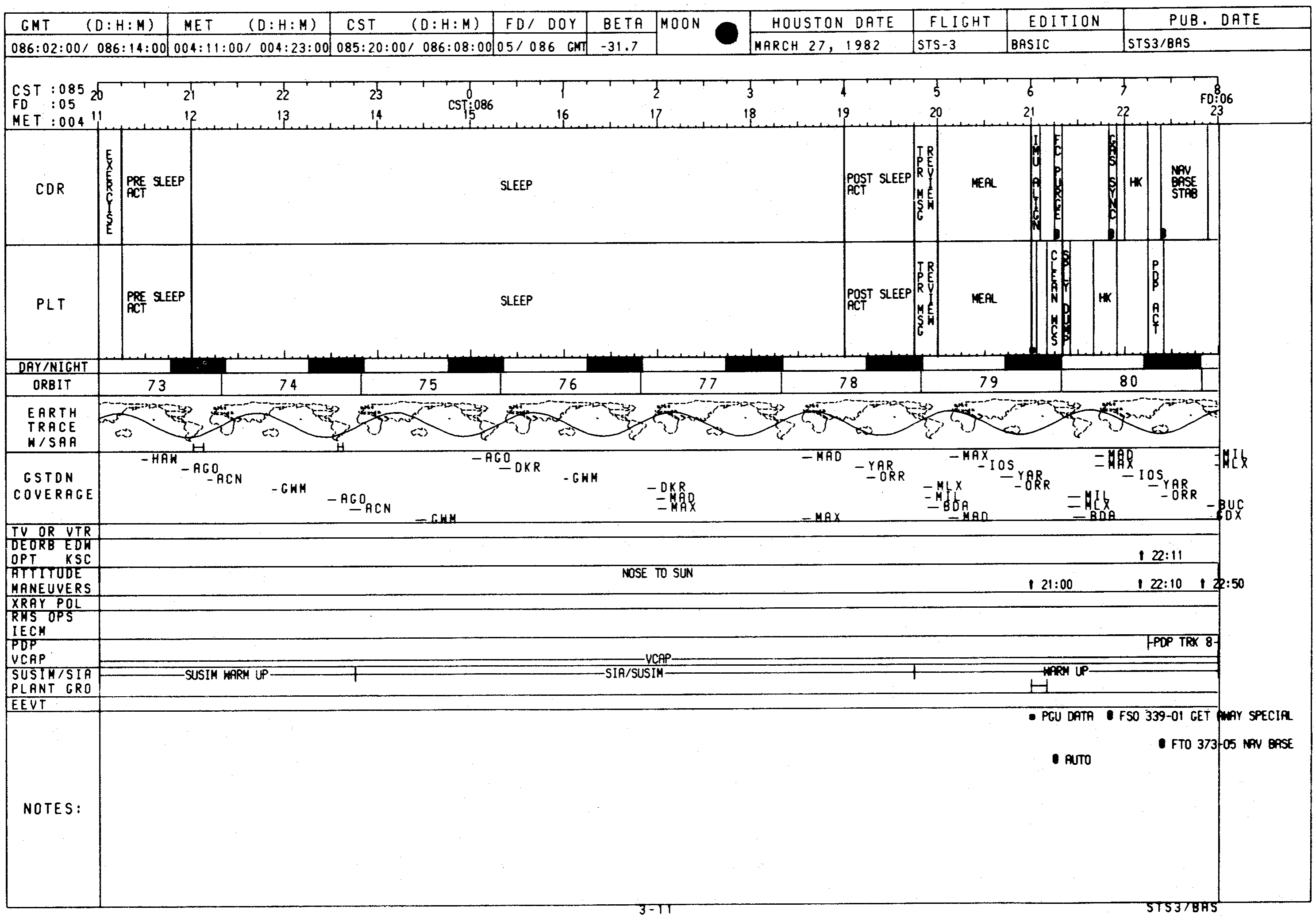
FD/ DOY 05/ 085 GMT
BETA -33.0
MOON
HOUSTON DATE MARCH 26, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CDR
PLT
DAY/NIGHT
ORBIT
EARTH TRACE W/SAA
GSTDN COVERAGE
NOTES:
MEAL
PDP JOINT BEAM
PDP EMI SEARCH
NOSE TO SUN
SIA OPS
SIA/SUSIM
SUSIM WARM UP
RMS UNSTOWED
TURN ON HTR
PDP TRK 6
PDP TRK 7
3-10
STS3/BAS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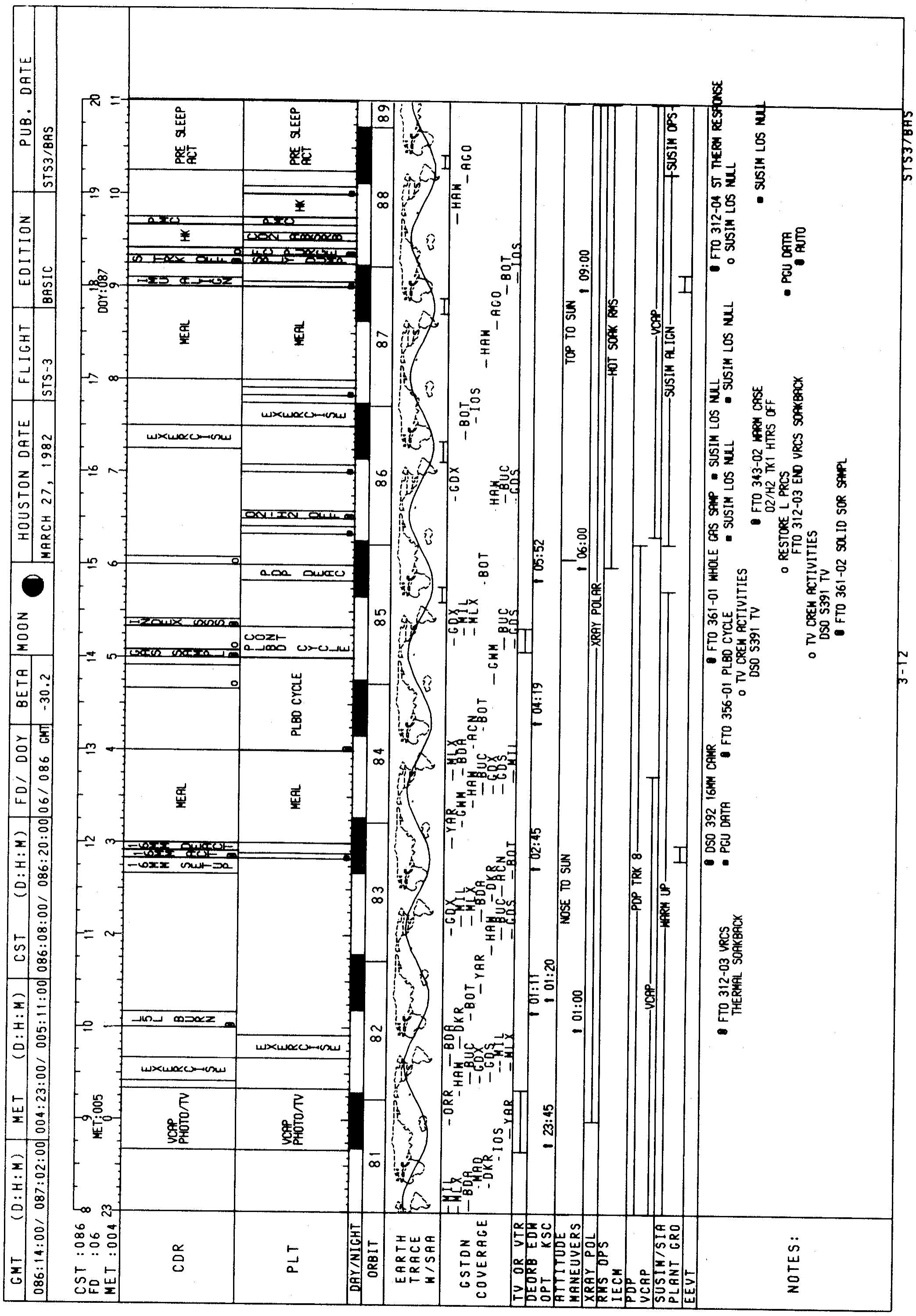
FD/ DOY 05/ 086 GMT
BETA -31.7
MOON
HOUSTON DATE MARCH 27, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CST :085
FD :05
MET :004
CST:086
FD:06
CDR
PLT
EXERCISE
PRE SLEEP ACT
SLEEP
POST SLEEP ACT
TPR MSG
REVIEW
MEAL
IMU ALIGN
FC PURGE
GPS SYNC
HK
NAV BASE STAB
CLEAN MCS
PDP ACT
DAY/NIGHT
ORBIT
73
74
75
76
77
78
79
80
EARTH TRACE W/SAA
GSTDN COVERAGE
HAW
AGO
ACN
GWM
DKR
MAD
MAX
YAR
ORR
IOS
MLX
MIL
BDA
BUC
FDX
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE MANEUVERS
NOSE TO SUN
21:00
22:10
22:11
22:50
XRAY POL
RMS OPS
IECM
PDP
PDP TRK 8
VCAP
SUSIM/SIA
SUSIM WARM UP
SIA/SUSIM
WARM UP
PLANT GRO
EEVT
NOTES:
PGU DATA
FSO 339-01 GET AWAY SPECIAL
FTO 373-05 NAV BASE
AUTO
3-11
STS3/BAS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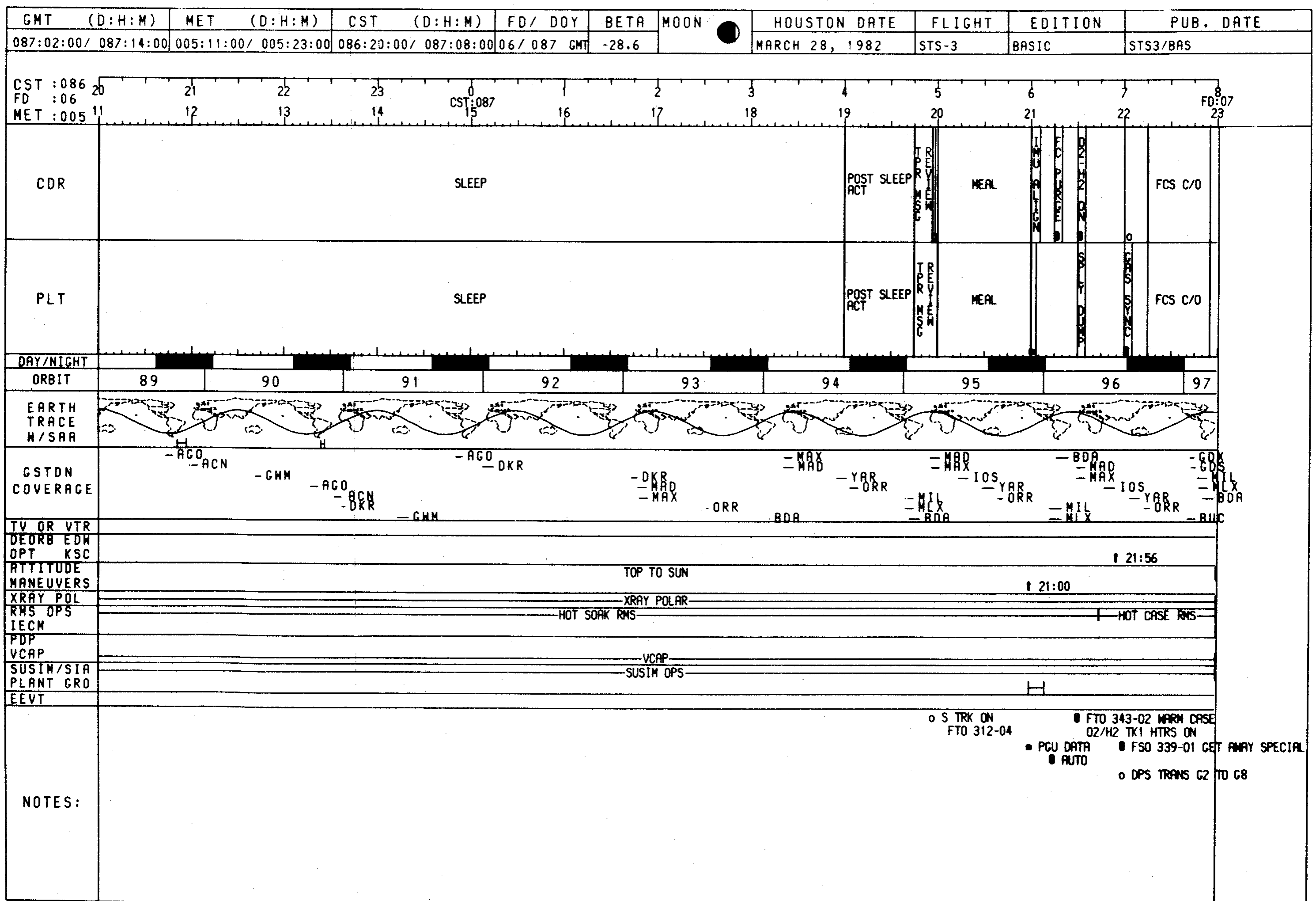
CST (D:H:M) 086:08:00/ 086:20:00
FD/ DOY 06/ 086 GMT
BETA -30.2
MOON
HOUSTON DATE MARCH 27, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CST :086
FD :06
MET :004
DOY:087
MET:005
CDR
PLT
DAY/NIGHT
ORBIT
EARTH TRACE W/SAA
GSTDN COVERAGE
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE MANEUVERS
XRAY POL
RMS OPS
IECM
PDP
VCAP
SUSIM/SIA
PLANT GRO
EEVT
NOTES:
VCAP PHOTO/TV
EXERCISE
MEAL
PLBD CYCLE
PRE SLEEP ACT
HK
81
82
83
84
85
86
87
88
89
NOSE TO SUN
TOP TO SUN
XRAY POLAR
HOT SOAK RMS
PDP TRK 8
VCAP
WARM UP
SUSIM ALIGN
SUSIM OPS
FTO 312-03 VRCS THERMAL SOAKBACK
DSO 392 16MM CAMR
PGU DATA
FTO 356-01 PLBD CYCLE
TV CREW ACTIVITIES
DSO S391 TV
FTO 361-01 WHOLE GAS SAMP
SUSIM LOS NULL
FTO 343-02 WARM CRSE
O2/H2 TK1 HTRS OFF
RESTORE L PRCS
FTO 312-03 END VRCS SOAKBACK
TV CREW ACTIVITIES
DSO S391 TV
FTO 361-02 SOLID SOR SAMPL
FTO 312-04 ST THERM RESPONSE
PGU DATA
AUTO
3-12
STS3/BAS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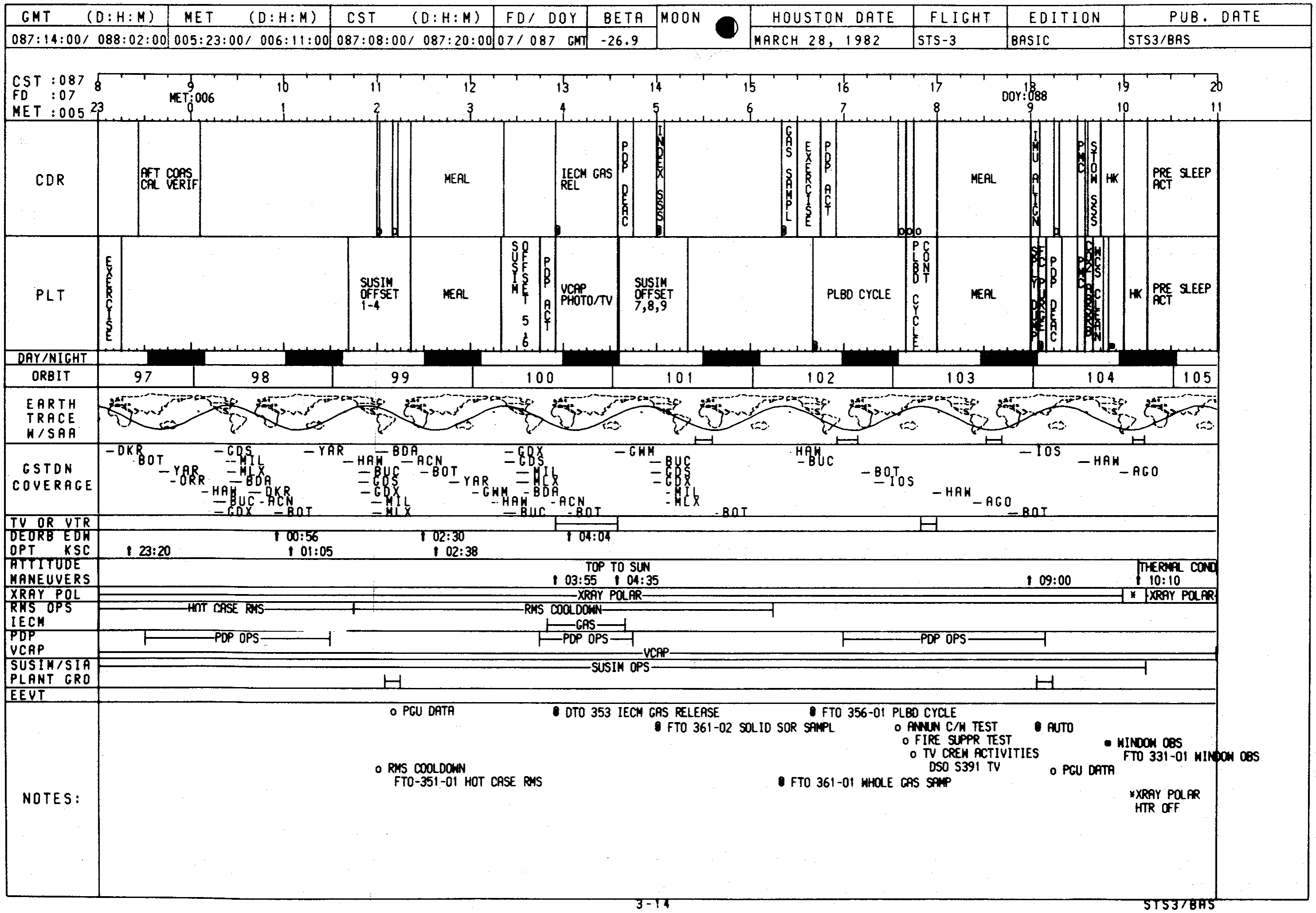
CST (D:H:M) 086:20:00/ 087:08:00
FD/ DOY 06/ 087 GMT
BETA -28.6
MOON
HOUSTON DATE MARCH 28, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CST :086
FD :06
MET :005
CST:087
FD:07
CDR
PLT
SLEEP
POST SLEEP ACT
TPR MSG
REVIEW
MEAL
IMU ALIGN
FC PURGE
O2/H2 ON
SPLY DUMP
GAS SYNC
FCS C/O
DAY/NIGHT
ORBIT
89
90
91
92
93
94
95
96
97
EARTH TRACE W/SAA
GSTDN COVERAGE
AGO
ACN
GWM
DKR
MAD
MAX
ORR
BDA
YAR
IOS
MIL
MLX
GDX
GDS
BUC
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE MANEUVERS
TOP TO SUN
21:00
21:56
XRAY POL
XRAY POLAR
RMS OPS
HOT SOAK RMS
HOT CASE RMS
IECM
PDP
VCAP
SUSIM/SIA
SUSIM OPS
PLANT GRO
EEVT
NOTES:
o S TRK ON FTO 312-04
PCU DATA
AUTO
FTO 343-02 WARM CASE O2/H2 TK1 HTRS ON
FSO 339-01 GET AWAY SPECIAL
o DPS TRANS G2 TO G8

STS3/BAS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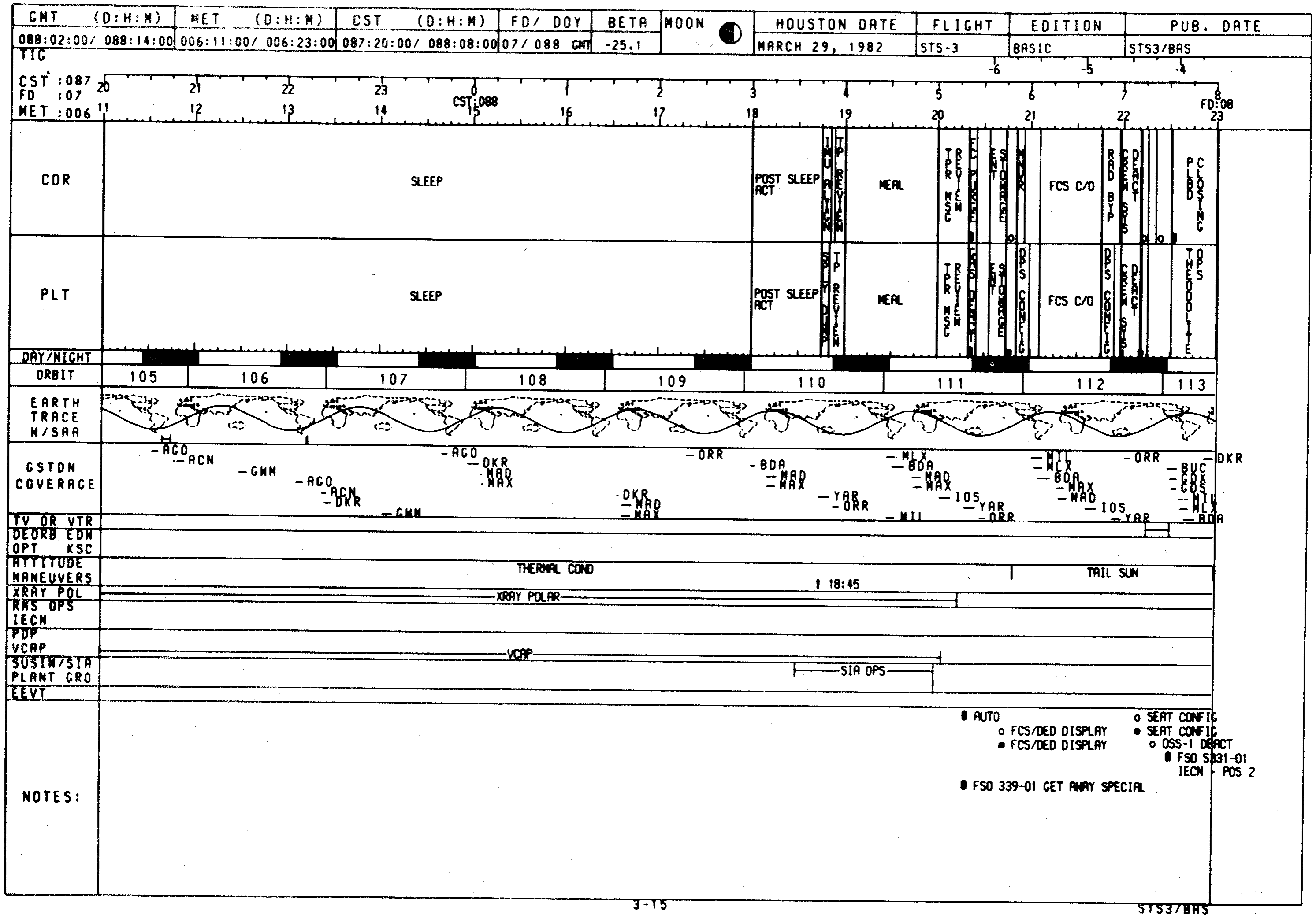
FD/ DOY 07/ 087 GMT
BETA -26.9
MOON
HOUSTON DATE MARCH 28, 1982
FLIGHT STS-3
EDITION BASIC
PUB. DATE STS3/BAS
CST :087
FD :07
MET :005
MET:006
DOY:088
CDR
AFT COAS CAL VERIF
MEAL
IECM GAS REL
PDP DEAC
INDEX SSS
GAS SAMPL
EXERCISE
PDP ACT
HK
PRE SLEEP ACT
PLT
SUSIM OFFSET 1-4
VCAP PHOTO/TV
SUSIM OFFSET 7,8,9
PLBD CYCLE
DAY/NIGHT
ORBIT
97
98
99
100
101
102
103
104
105
EARTH TRACE W/SAA
GSTDN COVERAGE
TV OR VTR
DEORB EDW
OPT KSC
23:20
00:56
01:05
02:30
02:38
04:04
ATTITUDE MANEUVERS
TOP TO SUN
03:55
04:35
09:00
THERMAL COND
10:10
XRAY POL
XRAY POLAR
RMS OPS
HOT CASE RMS
RMS COOLDOWN
IECM
GAS
PDP
PDP OPS
VCAP
SUSIM/SIA
SUSIM OPS
PLANT GRO
EEVT
NOTES:
o PGU DATA
o RMS COOLDOWN
FTO-351-01 HOT CASE RMS
DTO 353 IECM GAS RELEASE
FTO 361-02 SOLID SOR SAMPL
FTO 356-01 PLBD CYCLE
o ANNUN C/W TEST
o FIRE SUPPR TEST
o TV CREW ACTIVITIES
DSO S391 TV
FTO 361-01 WHOLE GAS SAMP
AUTO
o PGU DATA
WINDOW OBS
FTO 331-01 WINDOW OBS
*XRAY POLAR
HTR OFF
3-14
STS3/BAS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CST (D:H:M)
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FD/ DOY
07/ 088 GMT
BETA
-25.1
MOON
HOUSTON DATE
MARCH 29, 1982
FLIGHT
STS-3
EDITION
BASIC
PUB. DATE
STS3/BAS
TIG
CST :087
FD :07
MET :006
CST:088
FD:08
CDR
PLT
SLEEP
POST SLEEP ACT
MEAL
FCS C/O
DAY/NIGHT
ORBIT
105
106
107
108
109
110
111
112
113
EARTH TRACE W/SAA
GSTDN COVERAGE
TV OR VTR
DEORB EDW
OPT KSC
ATTITUDE MANEUVERS
THERMAL COND
18:45
TRAIL SUN
XRAY POL
XRAY POLAR
RMS OPS
IECM
PDP
VCAP
SUSIM/SIA
SIA OPS
PLANT GRO
EEVT
NOTES:
AUTO
o FCS/DED DISPLAY
FCS/DED DISPLAY
FSO 339-01 GET AWAY SPECIAL
o SEAT CONFIG
SEAT CONFIG
o OSS-1 DEACT
FSO S031-01
IECM - POS 2
3-15
STS3/BAS

GMT (D:H:M)	MET (D:H:M)	CST (D:H:M)	FD/ DOY	BETA	MOON	HOUSTON DATE	FLIGHT	EDITION	PUB. DATE
088:14:00/ 089:02:00	006:23:00/ 007:11:00	088:08:00/ 088:20:00	08/ 088 GMT	-23.1		MARCH 29, 1982	STS-3	BASIC	STS3/BAS

TIC: -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8

CST :088 — 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 (DOY:089)
FD :08
MET :006 — 23, 0 (MET:007), 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

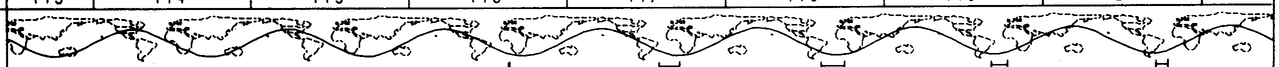
CDR: PLBD CLOSING; EXT FR...; SUIT DONNING; SNACK *; MNVR IMU; IMU ALIGN; MNVR; SW VERIF; SEAT INGRESS; BURN PREP; LANDING

PLT: TOP SHEODOLITE; OPS; SUIT DONNING; SNACK; FC PURGE; DPS CONFIG; SW VERIF; SEAT INGRESS; BURN PREP; TIG; LANDING

DAY/NIGHT

ORBIT: 113, 114, 115, 116, 117, 118, 119, 120, 121

EARTH TRACE W/SAA



GSTDN COVERAGE: -BOT, -YAR, -ORR, -HAW, --MIL, --MLX, -BDA, -DKR, -BUC, -ACN, -GDS, -BOT, -GDX, -YAR, -HAW, -ACN, -BUC, -BOT, -GDS, -GDX, -YAR, -GWM, -MIL, -MLX, -BDA, -GDS, -MIL, -MLX, HAW, -BUC, -GDX, -BOT, -GWM, -BUC, -GDS, -GDX, -BOT, -HAW, -BUC, -AGO, -BOT, -IOS, -HAW, -AGO, -BOT, -IOS, -HAW, -AGO

TV OR VTR

DEORB EDW: 00:41, 02:21, 03:48

OPT KSC: 23:15, 00:49, 02:23

ATTITUDE MANEUVERS: TRAIL SUN, 23:35, TOP SUN, DEORB 02:16, E1-5 02:46

XRAY POL

RMS OPS

IECM

PDP

VCAP

SUSIM/SIA

PLANT GRO

EEVT

NOTES:

FSO S331-01
IECM - POS 2
FTO 363-01 RAD FLOW (4 MIN)

* FTO 363-01 RAD FLOW (4 MIN)

3-16 STS3/BAS

LANDING AND POSTLANDING OPERATIONS

Kennedy Space Center is responsible for ground operations of the orbiter vehicle once it has rolled to a stop on the dry lake bed at Edwards, including preparations for returning the reusable vehicle to Kennedy Space Center for STS-4.

As soon as Columbia has- rolled to a stop, the recovery convoy will head toward the vehicle to begin preliminary securing and safing operations. The 100-member ground crew will perform such activities as connecting ground cooling and purge air units, conducting a post-landing inspection and connecting the ground tow vehicle.

The hatch on the side of the orbiter is scheduled to be opened within 30 minutes after landing. The crew will leave the orbiter at the direction of flight directors at Johnson Space Center.

The two largest vehicles in the ground support convoy are the tractor trailers carrying the large ground cooling and purge equipment. Another crew is responsible for detecting hazardous vapors, and a giant fan is used to blow potentially dangerous vapors away from the ground crew. Ground crewmen include NASA and contractor vehicle technicians; heavy machine operators; environmental health, fire, safety and security personnel; and an astronaut support crew.

Once it has been determined the orbiter is not releasing any dangerous vapors, the mobile white room is moved into place around the orbiter's crew access hatch. The hatch is opened and the flight crew is allowed to leave the crew cabin. The flight crew is replaced by other astronauts who complete the task of safing the vehicle in preparation for towing it to the Mate/ Demate Device.

The ground operations are conducted basically as follows:

After the vehicle comes to a stop on the dry lake bed at Dryden Flight Research Facility, the flight crew will turn off the auxiliary power units and turn on cooling systems and safe the orbiter's maneuvering and reaction control systems.

Vehicles with maneuverable access platforms will then be positioned at the rear of the orbiter near its umbilical connection panels. Large transporters carrying purge air and cooling units will then be moved into place behind the vehicle and their lines connected to the orbiter umbilical panels.

Once the connections are made, Freon from one transporter will begin flowing through the orbiter's cooling systems. Conditioned air from the other transporter will be blown into the orbiter for temperature and humidity control of its payload bay.

Following a safety assessment, the flight crew will be permitted to leave the crew compartment and will be replaced by a ground operations crew. The orbiter will then be towed to the Mate/Demate Device.

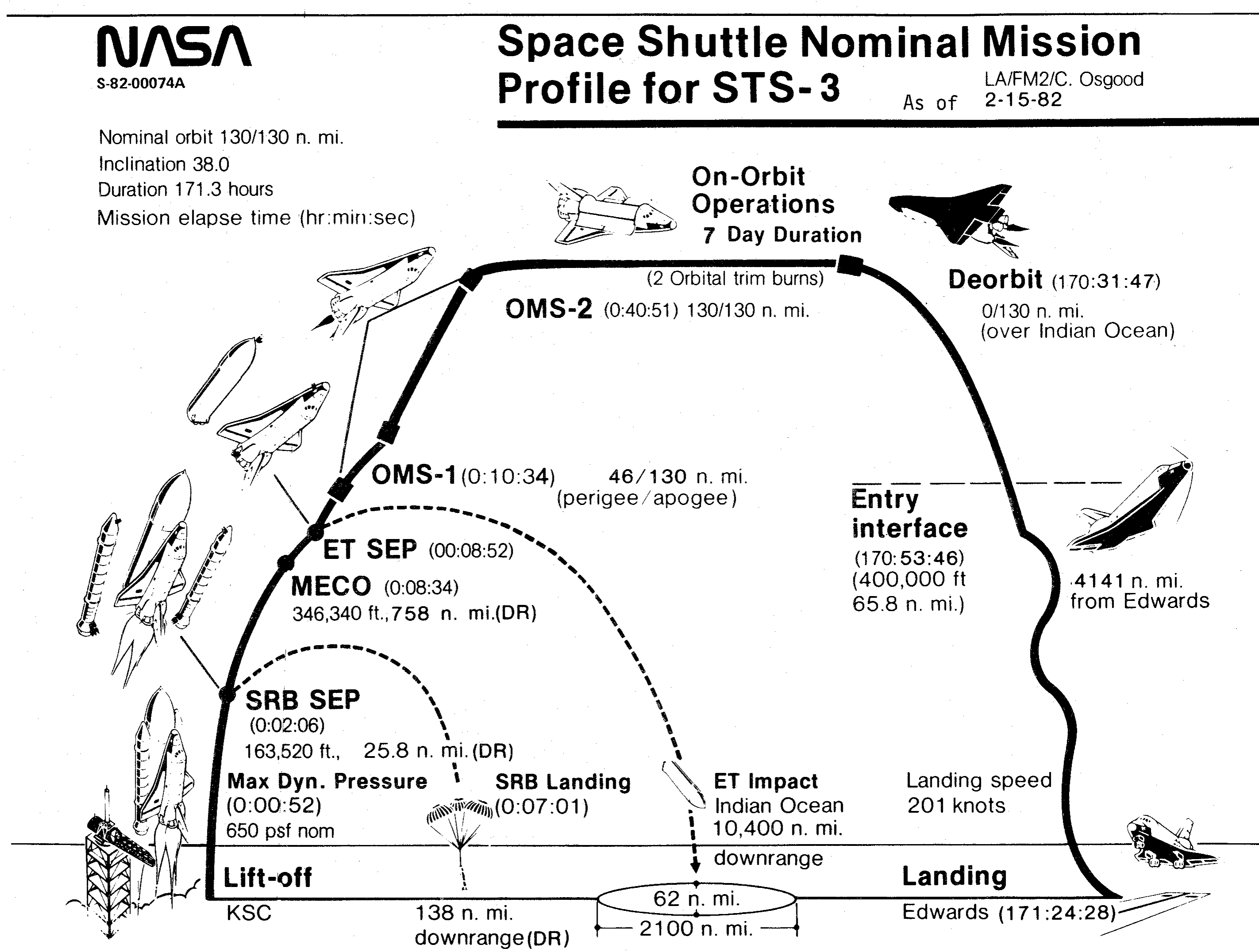
Three of the mid-deck experiments -- the Plant Growth Unit, Heflex experiment and the Electrophoresis Equipment Verification Test -- will be removed within an hour after Columbia lands. The Monodisperse Latex Reactor is scheduled to be removed within 21 hours after landing.

Once in the Mate/Demate Device, Columbia's power reactant storage and distribution tanks will be drained of left-over liquid hydrogen and oxygen reactants, the Shuttle main engines will be purged and explosive charges will be disconnected.

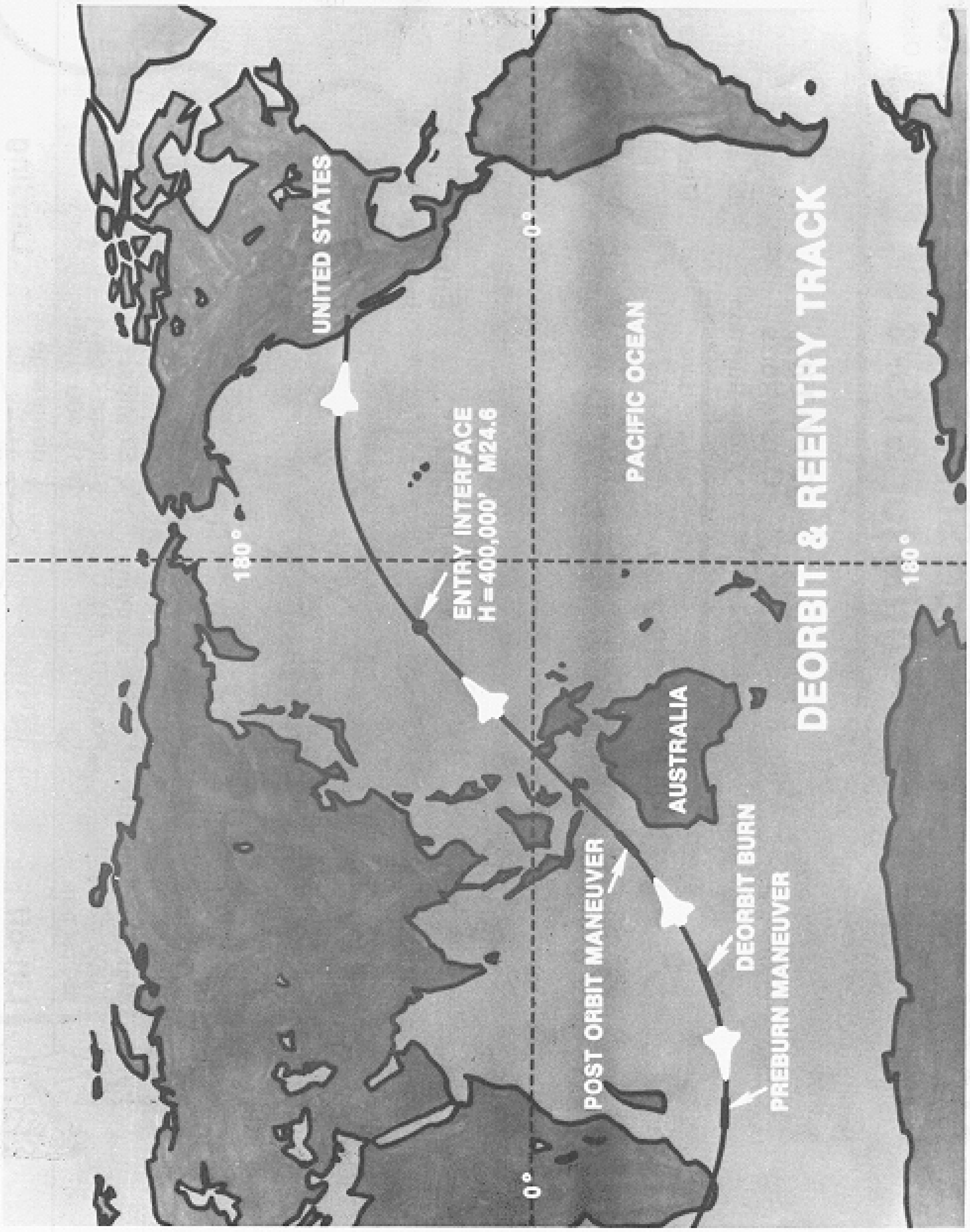
Retrieval of OSS-1 fight data and equipment will be done within two days after the landing. Also, auxiliary power units will be drained of residual hydrazine, and hypergolic propellants will be drained out of the reaction control system propellant tanks. Once the hazardous deservicing work is done, the tail cone will be installed and the orbiter mated to the top of the 747. Takeoff of the orbiter/747 combination is scheduled about 10 days after Columbia lands at Edwards.

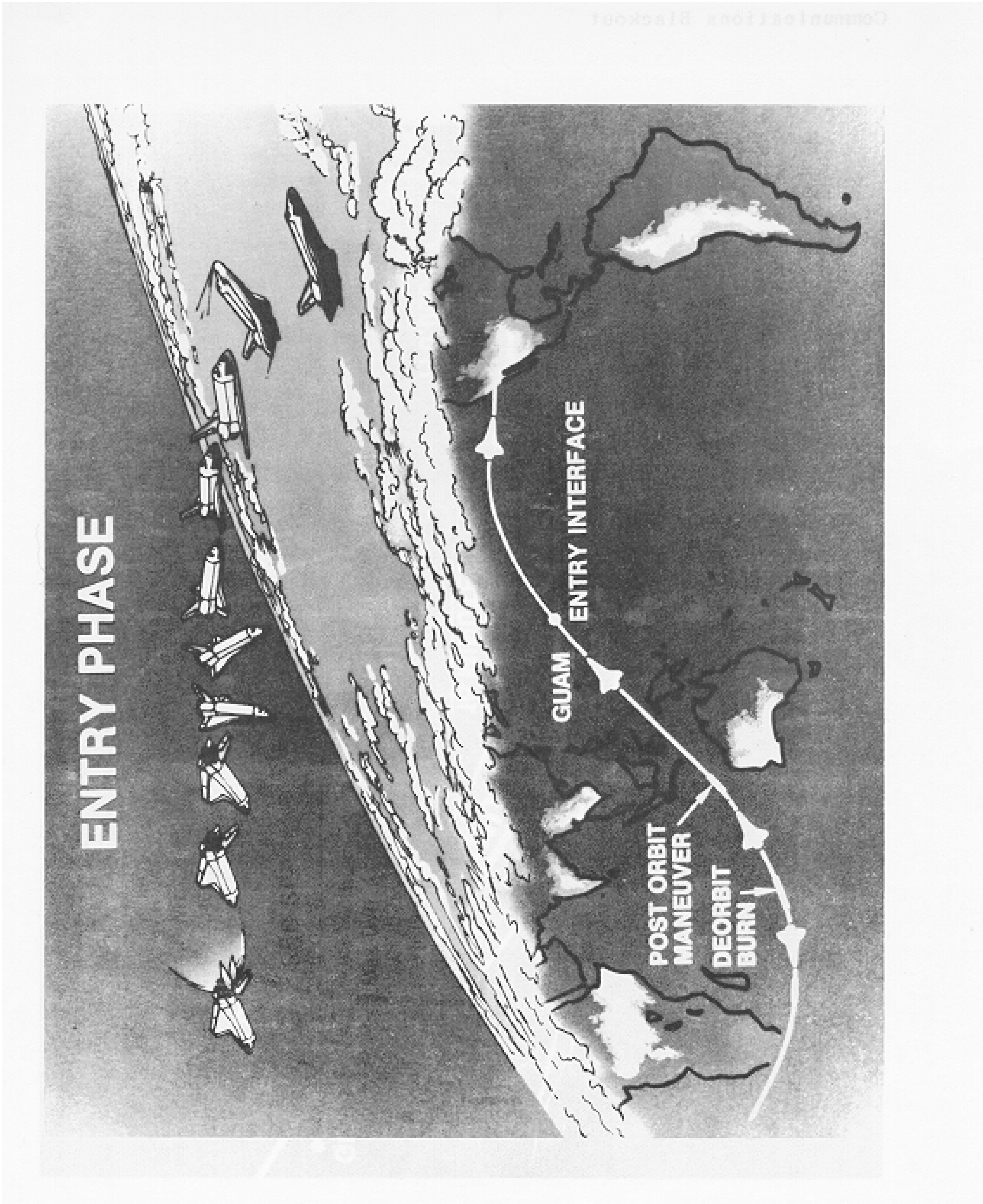
As on past cross-country trips, the Columbia/747 will make an overnight stop to refuel the carrier aircraft and rest the flight crew. Return to KSC, based on a nominal March 29 landing at Dryden, is scheduled for April 9.

Space Shuttle Nominal Mission Profile for STS-3

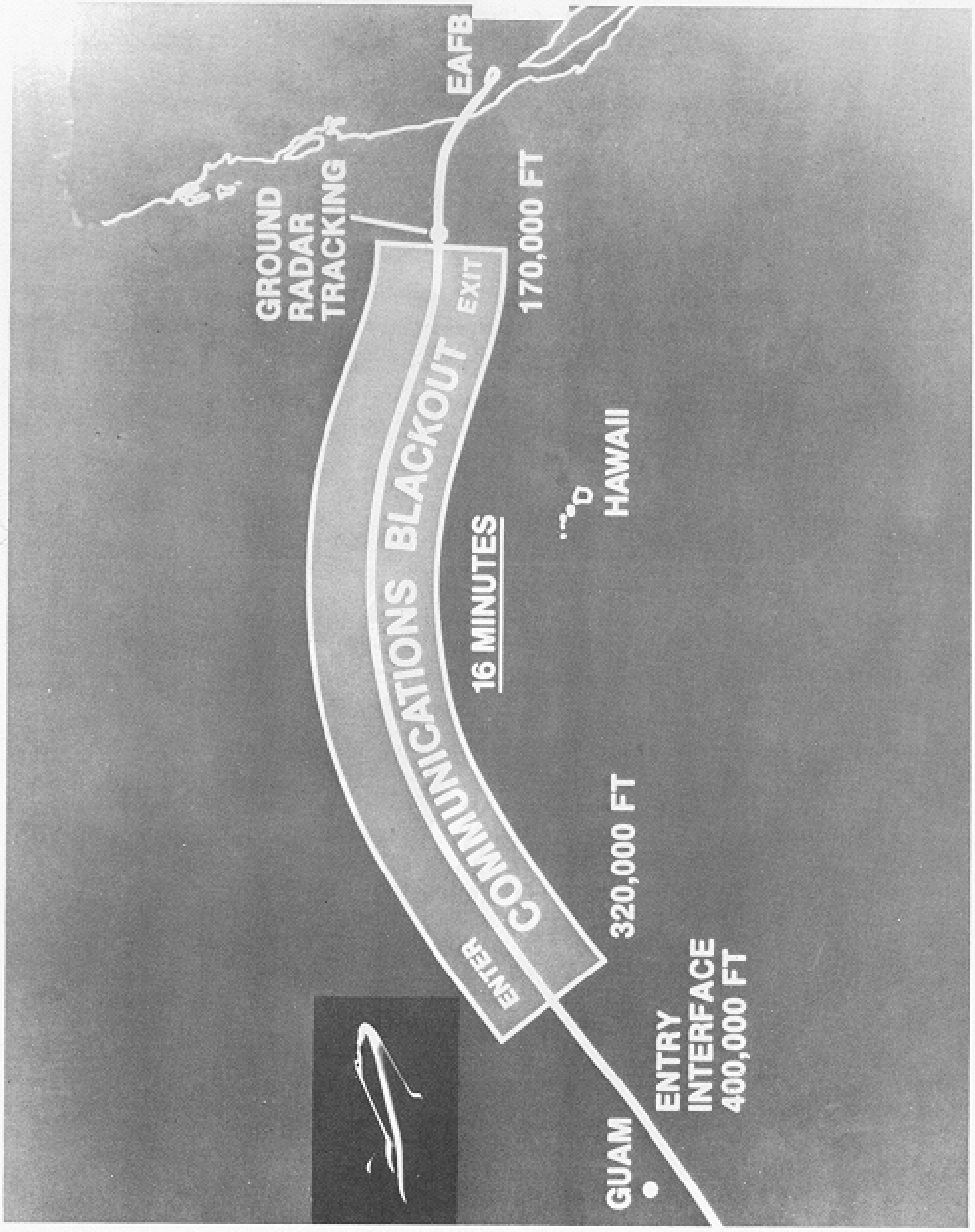


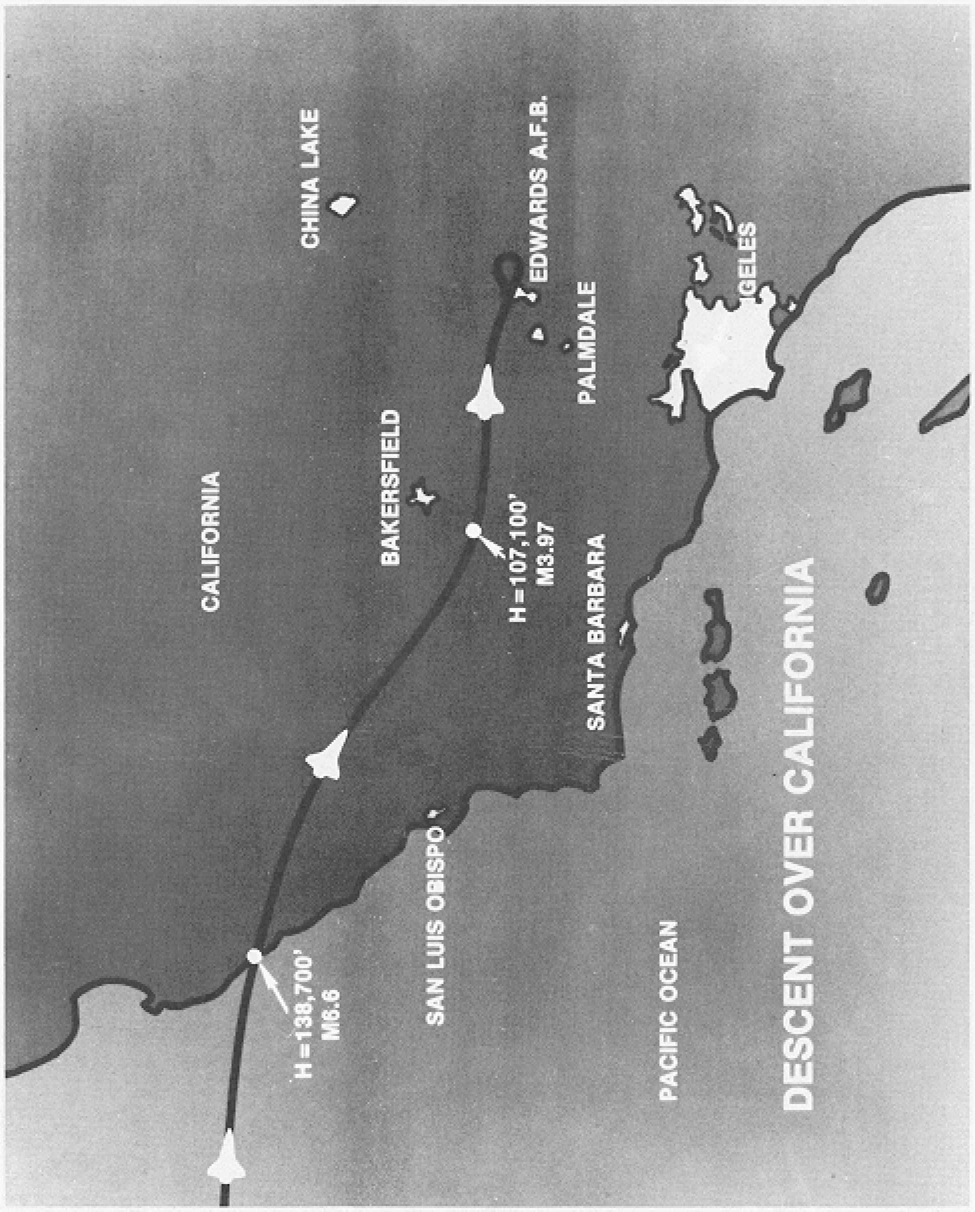
Deorbit & Reentry Track

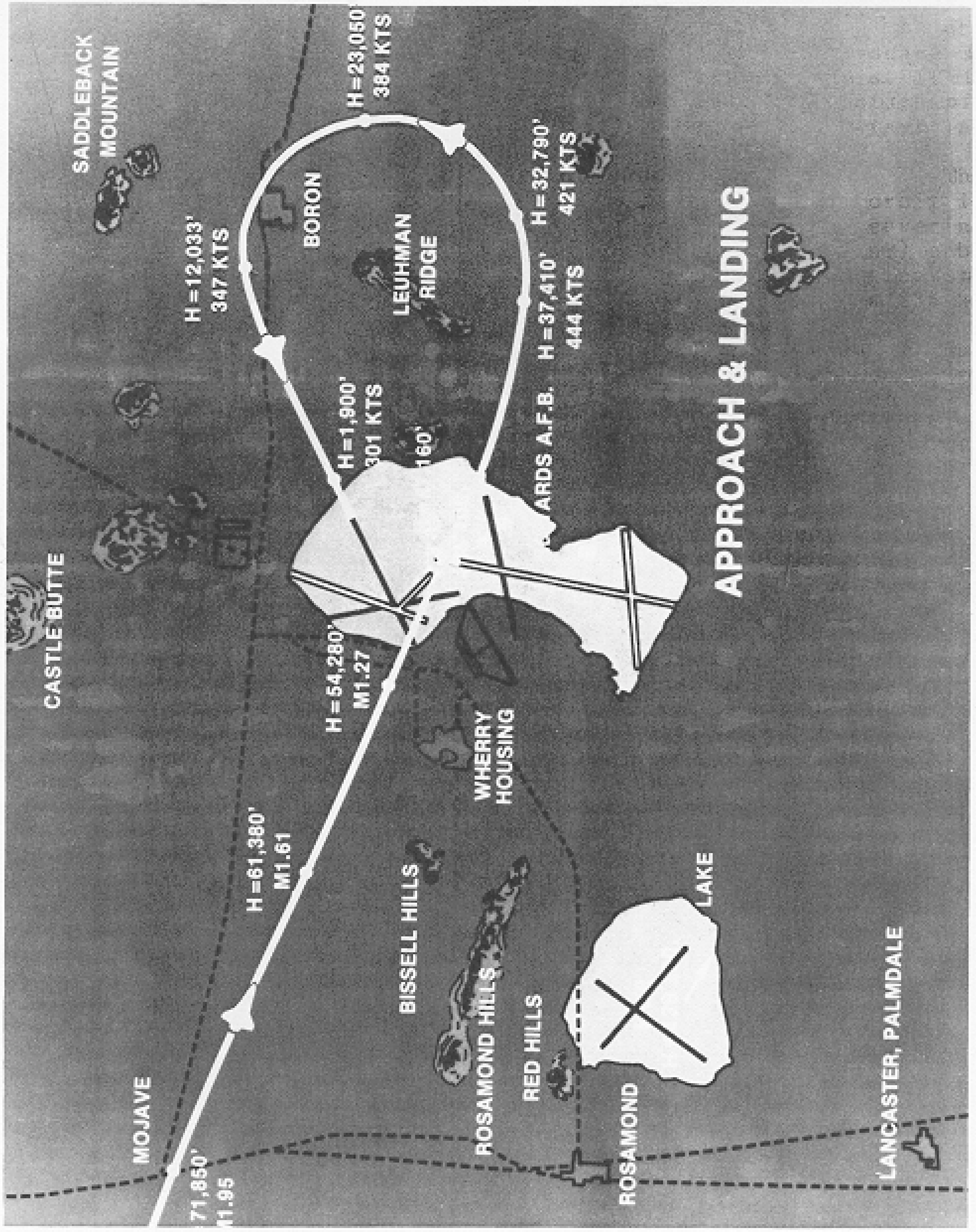



ENTRY PHASE
ENTRY INTERFACE
GUAM
POST ORBIT MANEUVER
DEORBIT BURN

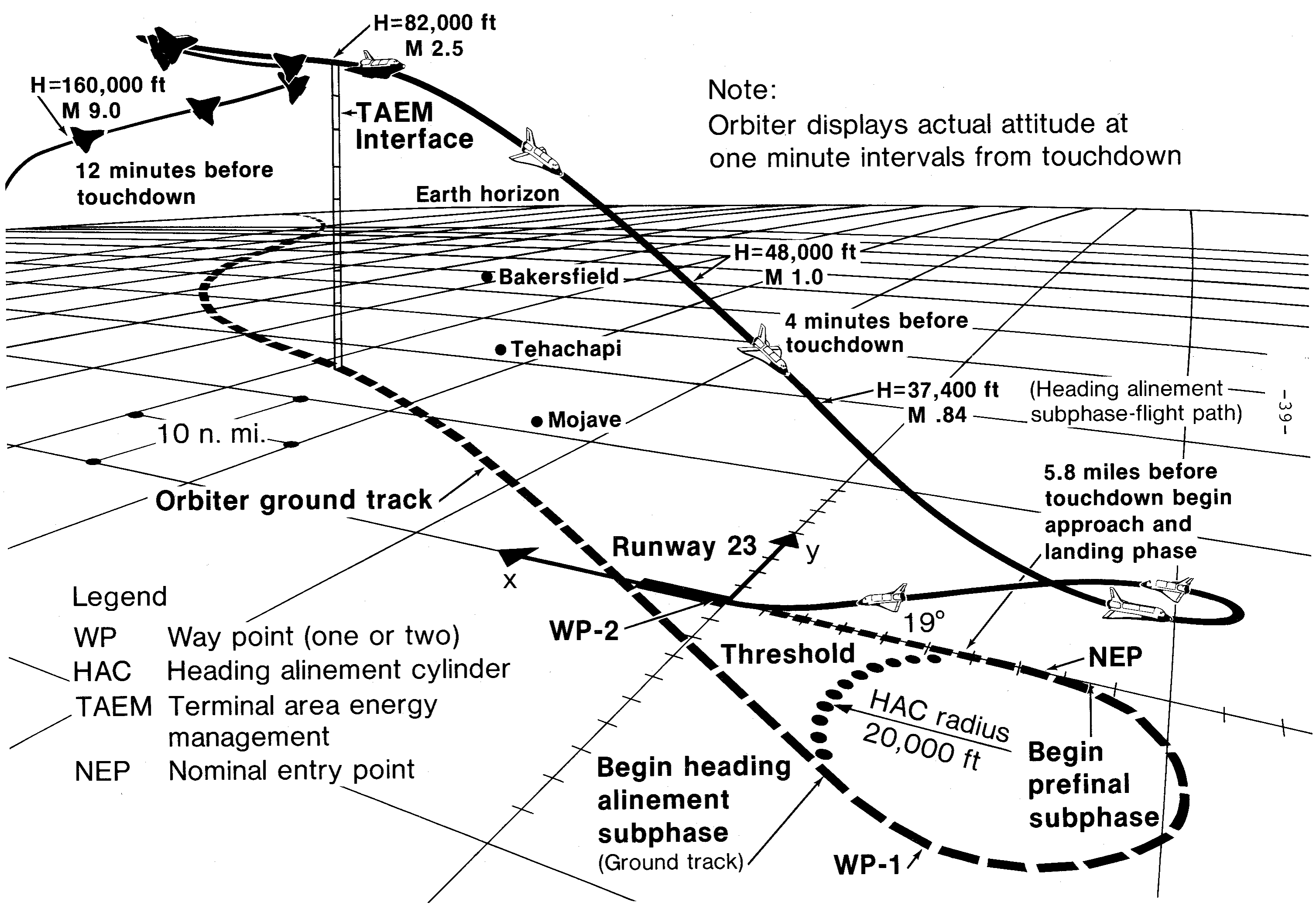
Communications Blackout




CALIFORNIA
CHINA LAKE
BAKERSFIELD
EDWARDS A.F.B.
PALMDALE
GELES
H=107,100'
M3.97
SANTA BARBARA
SAN LUIS OBISPO
H=138,700'
M6.6
PACIFIC OCEAN
DESCENT OVER CALIFORNIA


APPROACH & LANDING
SADDLEBACK MOUNTAIN
H=23,050'
384 KTS
H=12,033'
347 KTS
BORON
LEUHMAN RIDGE
H=32,790'
421 KTS
H=37,410'
444 KTS
H=1,900'
301 KTS
160'
ARDS A.F.B.
CASTLE BUTTE
H=54,280'
M1.27
WHERRY HOUSING
H=61,380'
M1.61
BISSELL HILLS
LAKE
ROSAMOND HILLS
RED HILLS
MOJAVE
71,850'
ROSAMOND
LANCASTER, PALMDALE

Nominal STS-3 Entry Flight Profile



Legend

WP	Way point (one or two)
HAC	Heading alinement cylinder
TAEM	Terminal area energy management
NEP	Nominal entry point

IF THINGS GO WRONG
(Contingencies)

While there has never been a launch abort in any U.S. manned space flight-program, flight crews and flight controllers must still train and plan for emergency early landing. The safe return of the flight crew, the orbiter and its payloads to an intact landing is emphasized in abort planning philosophy.

The preferred type of Shuttle launch abort is the abort-to-orbit in which combined thrust from main engines and orbital maneuvering system engines is enough to reach a minimal 194-km (105-nm) orbit. An abort-to-orbit would be called for if one main engine should shut down before enough velocity is reached to yield a 235-km (127-nm) orbit.

Earlier shutdown of one main engine would force an abort-once-around situation in which Columbia would land near the end of one orbit at Dryden Flight Research Facility. Also, any critical systems failure aboard Columbia after orbital insertion calls for an abort-once-around landing.

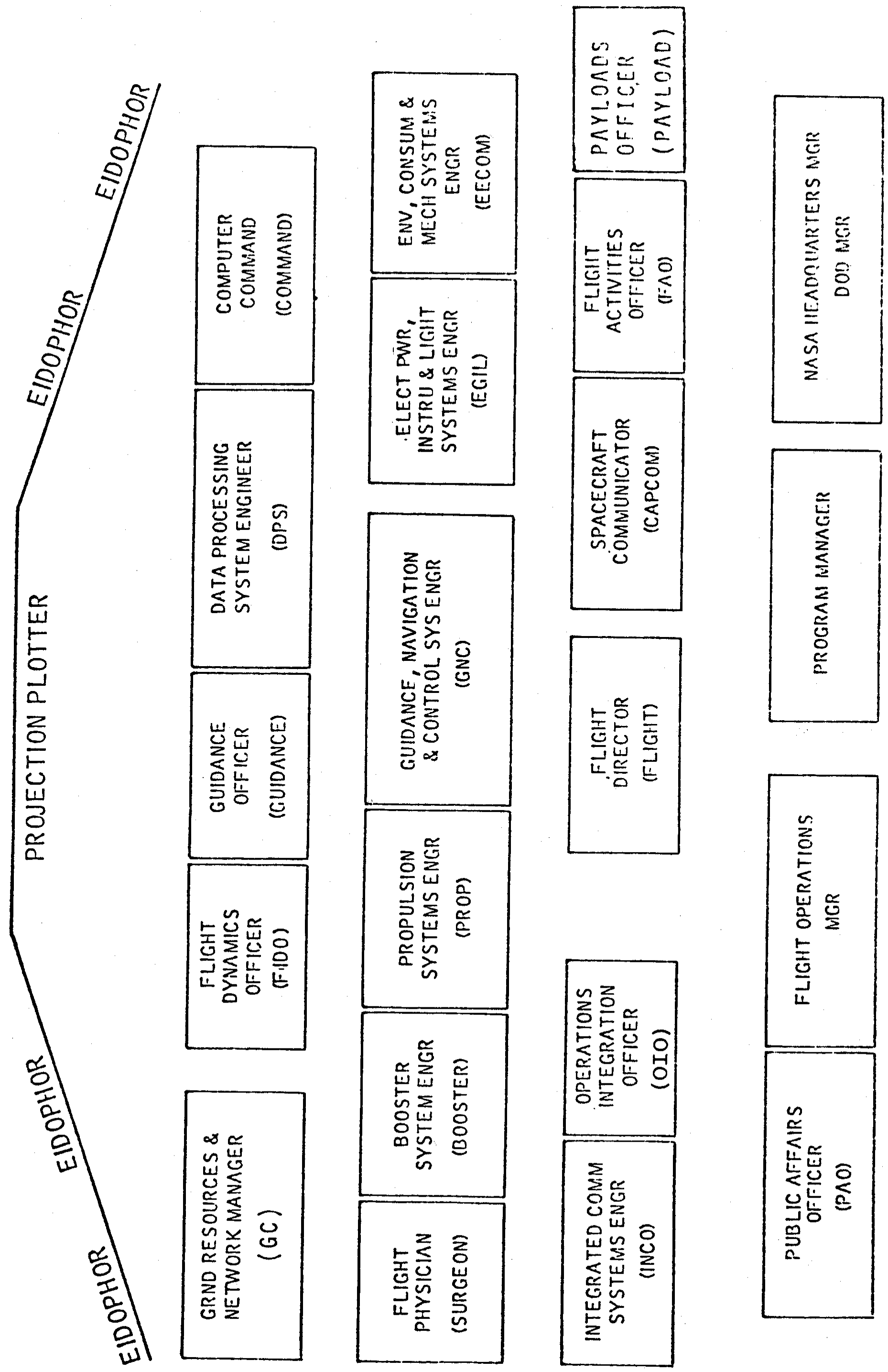
Loss of a second main engine during launch forces a trans-Atlantic abort landing, or "Press to Rota," in which the flight crew would steer the vehicle toward a main engine cutoff velocity and position that would allow gliding Columbia to the runway at the U.S. Naval Air Station, Rota, Spain.

Shutdown of one or more main engines early in the launch phase calls for a return-to-launch-site abort. Once an abort decision is made, Columbia and the external tank would be flown in a pitch-around maneuver to heads-up and pointed back along the ground track to Cape Canaveral. Whatever main engine thrust still available would then be used to kill off eastward velocity, and reverse direction until the Kennedy Space Center runway could be reached by gliding along a normal entry trajectory. Major orbiter systems failure during ascent could also force a return-to-launch-site abort.

Loss of control or impending catastrophic failure during ascent, from tower clear to 30,480 m (100,000 ft.) calls for crew ejection. Loss of two main engines prior to seven minutes of flight also calls for crew ejection after descending below 30,480 m (100,000 ft.).

The STS-3 alternate landing site is Northrup Strip on the U.S. Army White Sands Missile Range, N.M., if spring rains muddy up Rogers Dry Lake at the Dryden Facility at Edwards. Contingency landing sites, in addition to Edwards and Northrup, are Hickam Air Force Base/Honolulu International Airport, Hawaii; Kadena Air Base, Okinawa; and Rota Naval Station, Spain. The Kennedy Space Center's 4,570-m (15,000-ft.) Shuttle Landing Facility is the designated secondary landing site.

MCC MISSIONS OPERATIONS CONTROL ROOM (MOCR) POSITIONS
ROOM 231



HUNTSVILLE OPERATIONS SUPPORT CENTER

The Huntsville operations Support Center is a facility at the Marshall Space Flight Center in Huntsville, Ala., which provides launch support to Kennedy Space Center and payload operation support to Johnson Space Center.

During pre-mission, countdown, launch and powered flight toward orbit, Marshall engineers, development project managers and their contractors are on consoles in the support center to monitor real-time data being transmitted from the Shuttle. Their purpose is to evaluate and help solve any problems that might crop tip with Marshall-developed Shuttle elements, including the Space Shuttle main engines, external tank and solid rocket boosters. They also are concerned with problems in the overall main propulsion system and range safety system.

The data, which provide information on the "health" of these systems, are gathered by sensors aboard the Shuttle and are instantaneously transmitted from the launch site to-the support center. There the information is processed by computers and displayed on screens and other instruments at 12 stations in the engineering console room. More than 3,000 temperature, pressure, electrical voltage and other measurements are made every second. During the 10 hours of peak activity before and during launch, more than 11 million measurements are assessed by teams of experts.

Support center personnel will view the Shuttle on the launch pad via two closed circuit television lines. They also have access to more than 50 direct communications lines that link them with the launch site at Kennedy Space Center, Mission Control Center at Johnson and with responsible contractor plants.

In addition to launch support, payload services will be provided by teams of scientists operating out of specially equipped payload support rooms.

During this flight, the principal investigator and all three co-investigators on the Monodisperse Latex Reactor will operate in the support center to evaluate the function of the experiment and monitor the astronaut-experiment operations during televised hardware use. The Electrophoresis Equipment Verification Test scientific team will monitor the electrical performance of the flight hardware and provide advice and assistance to the principal investigators during experiment activities.

Other payload assistance is provided for the Induced Environment Contamination Monitor as scientists in the Huntsville center evaluate the electrical function of the instrument package during its normal operation and during the loaded arm test of the Remote Manipulator System. Two co-investigators on the Plasma Diagnostic Package aboard OSS-1 will operate in the support center to monitor real-time data from their experiment hardware to allow early evaluation of Shuttle-caused disturbances of the ionosphere.

OSS-1 PAYLOAD

The OSS-1 payload that will fly on STS-3 represents the most extensive and comprehensive scientific activity yet undertaken by the Shuttle. The STS-3 mission, building on the capability of the orbiter as a platform for remote sensing and scientific experimentation demonstrated on STS-2, will evaluate the operation of the Shuttle under extreme thermal conditions. The scientific experiments on board also will evaluate any effects that the orbiter will have on its immediate space environment. The investigations are designed to assist NASA in planning future scientific investigations using the Space Shuttle.

The STS-3 OSS-1 payload is dedicated to scientific investigations in space plasma physics, solar physics, astronomy, life sciences and space technology. The payload is designated OSS-1 because the program originally was managed by the office of Space Science (OSS) at NASA Headquarters. That office now carries the designation of office of Space Science and Applications.

The OSS-1 payload has been described as the "Pathfinder Mission." It is described in that manner because it will provide both technological and scientific information for future flights of the Shuttle and thus serve as a "pathfinder" for more extensive investigations of space.

Six of the nine experiments on OSS-1 have been designed by scientists at five American universities and one university in Great Britain and will be operated under their supervision during the mission. One experiment was developed by the Naval Research Laboratory in Washington, D.C., and two have been developed at the Goddard Space Flight Center, Greenbelt, Md., which -- from the beginning -- has been responsible for the development of the payload for NASA and for its integration with the pallet and the Shuttle orbiter. The U-shaped metal pallet, 2.86 meters (9.4 ft.) by 4.3 m (14.2 ft.), was built by the European Space Agency to fit into the Shuttle's 4.57 m (15 ft.) high payload bay.

The space plasma physics experiments are the Plasma Diagnostics Package (PDP), a project of the University of Iowa, and the Vehicle Charging and Potential experiment (VCAP), from Utah State University.

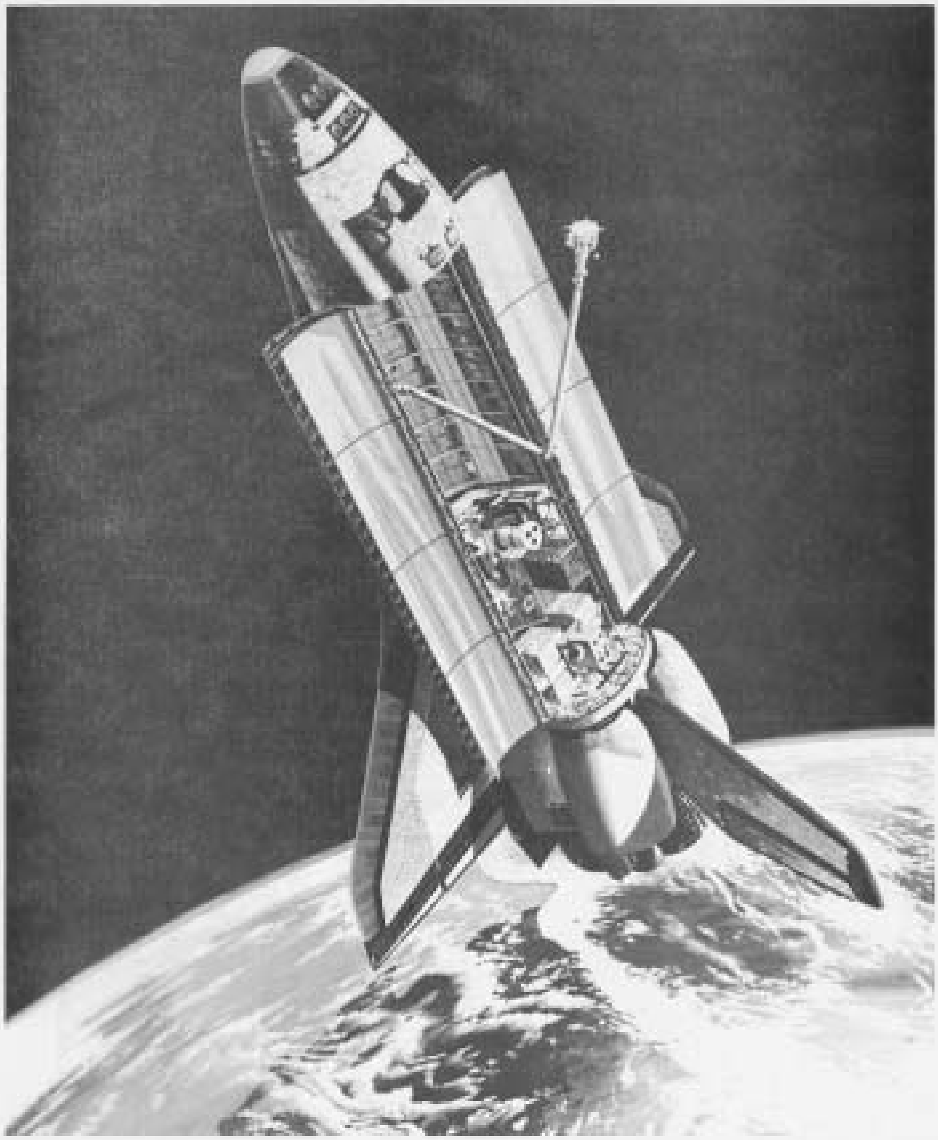
Although Goddard has developed payloads for a large number of unmanned satellites, the OSS-l payload is the first major one it has developed for the Shuttle.

The solar physics experiments are the Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) -- a Naval Research Laboratory project -- and the Solar Flare X-Ray Polarimeter experiment (SFXP) being conducted by scientists from Columbia University.

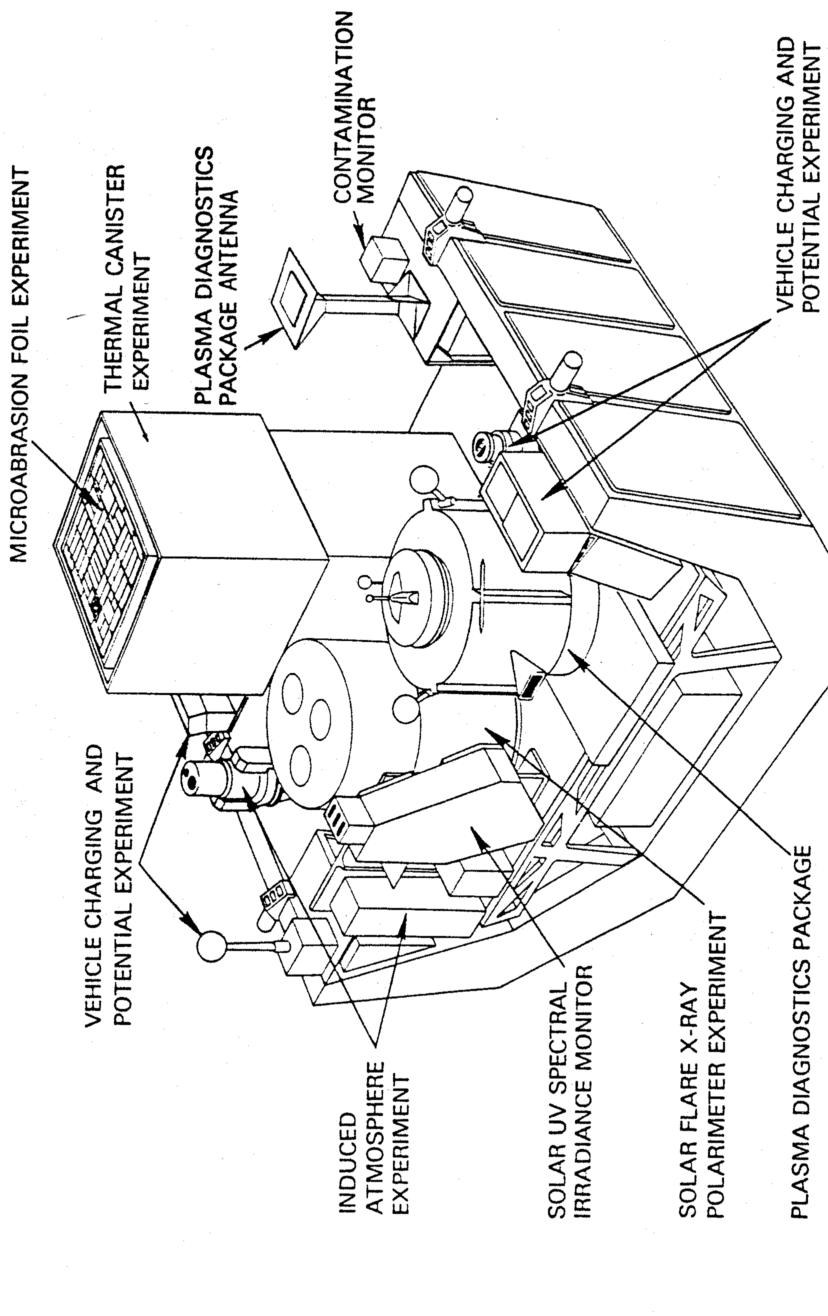
The astronomy investigations are the Shuttle Spacelab Induced Atmosphere (SSIA) -- a University of Florida project -- and the Microabrasion Foil Experiment (MFE) by the University of Kent, Canterbury, England. The life sciences project is a Plant Growth Unit (PGU) from the University of Houston, and the space technology projects are the Thermal Canister Experiment (TCE), and the Contamination Monitor Package (CMP), both from Goddard. The Contamination Monitor Package investigation is funded by the U.S. Air Force.

Mission Manager for OSS-1 is Kenneth Kissin, and Mission Scientist is Dr. Werner M. Neupert, both of Goddard. Program Manager is Robert A. Kennedy, and Program Scientist is Dr. Erie G. Chipman, both of NASA Headquarters.

Photo Orbiter & Payload



OSS-1 PALLET MOUNTED INSTRUMENTS



Contamination Monitor Package

The Contamination Monitor Package is designed to measure the buildup of molecular and gas contaminants in the orbiter environment. The measurements, when correlated with other instruments onboard STS-3, are expected to provide valuable insights as to how molecular contamination affects instrument performance.

Normal operations of the Shuttle and its equipment generate a gaseous environment.

In addition to the outgassing of the orbiter and its payload, the operation of attitude control systems, the venting of relief valves, and the dumping of water for thermal control of the vehicle all represent molecular sources that might affect sensitive instrumentation, particularly in the extremely cold temperatures of space.

These activities form the molecular contamination -- an accretion or film that is generated by thruster and other gases as well as water droplets when they condense. In the process, they form a thin deposit that accumulates on the surfaces of the orbiter instruments in the payload bay.

The Contamination Monitor Package measurements will provide information impossible to obtain in a laboratory and outline a profile of the molecular contaminants that are generated by the orbiter and its payload in flight. The experiment, funded by the U.S. Air Force Space Division, will measure buildup of materials on surfaces in the Shuttle during all phases of launch and ascent, in orbit, and during descent. Much of the information gathered by the experiment, developed by NASA's Goddard Space Flight Center, will be relayed to scientists in the Payload operations Control Center at the Johnson Space Center in near real-time, the first data being taken 36 minutes after launch and the second at launch plus 4 hours.

The Contamination Monitor Package will match some of its scientific information with data collected on the same STS-3 mission by the Induced Environment Contamination Monitor, developed by Marshall Space Flight Center, and other payload activities. These correlations will be made after the mission.

The contamination package, located on the aft/port corner of the pallet, is 30.48 cm (12 in.) long, 17.78 cm (7 in.) wide and 17.78 cm (7 in.) tall. It weighs 7.7 kilograms (17 pounds), and it contains four temperature controlled quartz crystal microbalances sensors that view both inside and outside the payload bay. In addition, two passive witness mirrors, supplied by the Naval Research Laboratory, are mounted on the experiment. The mirrors are coated with magnesium fluoride over aluminum, a material commonly used for optics in instruments designed to make ultraviolet measurements.

The ultraviolet reflectivity of these mirrors will be tested prior to and after flight to monitor those contaminants which specifically affect ultraviolet reflectivity.

Information obtained from this contamination experiment is expected to be extremely useful to scientists developing experiments for future Shuttle flights, particularly ones which might have highly sensitive optical components.

Principal investigator on the Contamination Monitor Package is Jack Triolo, Goddard Space Flight Center, Greenbelt, Md. Co-investigators include Capt. Paul Porzio, USAF Space Division, Los Angeles, Calif.; Carl Maag, Jet Propulsion Laboratory, Pasadena, Calif. and Roy McIntosh and Ray Kruger, both of Goddard.

Microabrasion Foil Experiment

The objectives of the Microabrasion Foil Experiment are to measure the numbers, chemistry, and density of micrometeorites encountered by spacecraft in near-Earth orbit. Data from those tiny particles are expected to yield new basic information about the history of our solar system. Developed by scientists at the University of Kent in Canterbury, England, the experiment is the first developed outside of the United States to fly on the Shuttle.

Because comets and asteroids are formed in different regions of the solar system, scientists anticipate that particulate materials from each source should differ. Comets apparently were formed at large distances from the Sun by the aggregation of ice and small dust grains. Asteroids, on the other hand, are believed to have been formed by the aggregation of stony and metallic dust grains, which condensed 4.6 billion years ago from the Mars/ Jupiter region of the solar nebula.

The experiment is a l-square meter (10.76-square feet) sheet of 50 aluminum foil pieces of varying density bonded to a plastic (Kapton) substrate or foundation and is mounted on top of the Thermal Canister Experiment at the aft of the payload pallet. As the micrometeorites hit the foil's thin surface, they puncture the foil and form craters. Very light particles cannot penetrate the foil, but will form an impact crater on the foil surface. Somewhat heavier particles will penetrate the foil to a depth that depends upon the particle's velocity. Heavier particles will not be fragmented and will survive almost intact. Icy particles will fragment and form a number of small craters. An analysis of the fragmentation profiles on the plastic sheet under the aluminum foil will yield information on the particles' density. Those micrometeorites which at least partially survive the impact will undergo chemical analysis.

As this is a passive experiment, the data return is dependent entirely upon post-flight analysis. It weighs 1 kg (2.2 lb.)

The experiment scientist is Dr. J. A. M. McDonnell, Space Sciences Laboratory, University of Kent; and participating scientists are Dr. William C. Carey and Dr. David Dixon, both from the University of Kent.

Plant Growth Unit

The Plant Growth Unit experiment is designed to demonstrate the effect of near weightlessness on the quantity and rate of lignin formation in different plant species during early stages of development. Lignin is the second most abundant carbon compound (after cellulose) in plants and provides both strength and form to the organism. The objective of the experiment is to test the hypothesis that, under near or no gravity, lignin might be reduced, causing the plants to lose strength and droop rather than stand erect. Some think lignin is regulated by gravity.

Few plants have been grown in space, although Russian experiments over the last several years have demonstrated that near zero gravity disorients root and shoot growth, enhances plant sensitivity to substrate moisture conditions, and generally results in a high mortality rate. During the Skylab mission, U.S. scientists grew rice plants in space. Little is known, however, about the physiological changes that occur under near-weightless conditions. Understanding gravity's effects on plant growth will provide insight into plant physiology which is so necessary for an effective biological life support system for man's habitation of space for extended periods of time.

Lignin offers great potential industrially as a product. When synthesized, it can be economically attractive as a polymer for bonding wood. Plastics and other goods.

Ninety-six plants will be flown in the experiment on STS-3 -- 16 in each of six chambers which will be carried in the orbiter's mid-deck. The rectangular terrarium-like chambers will be sealed and placed in a locker on the Shuttle within seven hours of launch. The locker, the size of a filing cabinet, is completely automatic, requiring no flight crew interaction, except that crewmen will relay temperature data to scientists in the Payload operations Control Center at Johnson Center twice daily so that conditions surrounding the plants in space can be reconstituted with a similar group of plants being used as a control group on Earth. The control experiments will be compared with the flight experiments following the mission, and that comparison should provide an assessment of the validity of the hypothesis that lignin will be reduced in plants grown in zero gravity.

The three plants selected after an extensive screening process are the slash pine, a coastal pine which grows in states along the Gulf and East Coasts; the mung bean, a Chinese bean sprout; and oat, one of the most highly studied plants there is.

The plants were selected for their adaptability to growth in closed chambers and under relatively low light conditions.

The seeds and seedlings will be planted in a cellulose-like sandwich of moist sponge and filter paper.

The slash pine seedlings will have been pre-germinated with a little root showing at launch time, while the others will be planted as seeds.

During the seven-day STS-3 mission the plants will receive 14 hours daily of artificial sunlight. The plant growth unit in the orbiter provides the light, as well as temperature control. The unit has batteries, a tape recorder and controlling electronics.

When Columbia lands, the unit will be removed from the orbiter within one hour from the orbiter for photography and analysis.

The lignin experiment is the first of several plant experiments planned for Space Shuttle. The results of this experiment will help determine the choice of plants to fly under similar conditions aboard the European-built Spacelab on its second Shuttle flight, scheduled for late 1984.

Principal investigator for the unit is Dr. Joe R. Cowles and co-investigator is Dr. William Scheld, both of the University of Houston. The unit was built by Lockheed Missiles and Space Co. and the Life Sciences Flight Experiments Project offices at NASA's Ames Research Center, Mountain View, Calif., managed by William Berry. The Ames Plant Growth Unit managers are Dr. John Tremor and Ronald Mancini. Among the contractors involved in the project were Olympic Plastics, Culver City, Calif., Lexan tops for growth chambers; A. Johnson Co., Monrovia, Calif., cast aluminum boxes for the growth chambers; and the ILC Corp., Sunnyvale, Calif., light module for the unit.

Plasma Diagnostics Package

The Plasma Diagnostics Package is a comprehensive assembly of electromagnetic and particle sensors that will be used to study the interaction of the orbiter with its surrounding environment; to test the capabilities of the Shuttle's Remote Manipulator System; and to carry out experiments in conjunction with the Fast Pulse Electron Generator of the Vehicle Charging and Potential Experiment, another experiment on the OSS-1 payload pallet.

To achieve these scientific objectives, the package will be deployed for more than 20 hours of the seven-day STS-3 mission, and will be maneuvered at the end of the 15.2-meter (5O-foot)long arm three times during the mission -- flight days three, four and five. The package, developed by scientists at the University of Iowa, Iowa City, will be operated while attached to the payload pallet for another 36 hours.

In support of those objectives, the package will take measurements of electric and magnetic fields within 13.7 m (45 ft.) of the orbiter; ion and electron densities, energies and spatial distribution; electromagnetic waves over a broad frequency range; and determine the characteristics of the electron beam emitted by the Fast Pulse Electron Generator provided by Utah State University and measure the resulting beam-plasma interactions in terms of fields, waves and particle distribution.

The orbiter, a much larger spacecraft than those used in the past, is expected to disturb the electromagnetic fields and plasma (gas electrically-charged particles occupying most of outer space beyond the Earth's atmosphere) through which it is passing. The orbiter is expected to produce a wake as it passes through the Earth's magnetosphere (at an altitude of approximately 240.7 kilometers or 130 nautical miles), making waves much as a boat makes waves as it moves through water. The wake that is generated in the plasma, however, is a more complex phenomenon, and scientists have not had the opportunity to study it in detail with the smaller spacecraft that have flown up to this time. Since many scientific and engineering investigations are under way which will use the Shuttle Spacelab as a kind of plasma laboratory, there is a need to understand the extent of this wake which complicates measurements being made in or near the orbiter. Also, a better understanding of the wake and wake boundary will enable plasma physicists to comprehend better the nature of the plasma surrounding the Earth. In addition to measuring these wake effects the package will maneuvered by the arm to measure plasma effects in and around the electron beam generated by the generator.

The experiment's technical objectives are: to measure and locate the sources of fields, electromagnetic interference and plasma contamination in the orbiter environment out to 15 m (50 ft.); and to flight test the systems and procedures associated with the Spacelab 2 Plasma Diagnostics Package, due to fly on the Spacelab 2 Shuttle mission in 1984, particularly related to the arm operation, and to evaluate the Radio Frequency Telemetry Link. On STS-3, the package will be returned to Earth with the orbiter. On Spacelab 2, it will be released in space by the arm so it can probe remote effects of the orbiter as the two slowly separate. It will remain in orbit when the Shuttle lands.

Diagnosing the effects of the perturbations caused by the Shuttle can provide a better understanding of the complex chain of processes that lead to the natural plasma phenomena present not only in the Earth's environment and other planetary magnetospheres, but also around stars and other astrophysical objects.

Principal investigator on the experiment is Stanley Shawhan, University of Iowa. Co-investigators are Louis A. Frank, Donald A. Gurnett and Nicola D'Angelo, all of the University of Iowa; Henry C. Brinton, Goddard Space Flight Center; David Reasoner and Nobie Stone, both of Marshall Space Flight Center.

The package, which weighs about 160 kg (350 lb.), is a cylinder, located near the center of the OSS-1 payload pallet. It is 107 cm (42 in.) in diameter and 66 cm (26 in.) tall. The instrument was built by the University of Iowa, with some contract work being carried out by SPAR Aerospace in Toronto (grapple fixture) and by Ball Aerospace in Boulder, Colo. Other contractors include: Schonstedt Instrument Co., Reston, Va., magnetometer; Cincinnati Electronics Corp., Cincinnati, 400.65 MHz receivers; Aydin Vector, Newton, Pa., 400.65 MHz transmitter; Sentran Co., Santa Barbara, Calif., cold cathode vacuum gauge; Electrofilm, Inc., North Hollywood, Calif., heaters for package deck; Minco Products, Inc., Minneapolis, heaters for grapple fixture; Aertech Industries, Sunnyvale, Calif., log detector video amplifier; Norlin Communications, Inc., College Park, Md., ion mass spectrometer; Graphic Circuits Corp., Marion, Iowa, and Rohner Machine Works, Inc., West Liberty, Iowa, printed circuit boards; Iowa State University, Ames, 400 MHz antenna design.

Part of the funding for the project was provided by the U.S. Air Force.

Shuttle-Spacelab Induced Atmosphere

The Shuttle-Spacelab Induced Atmosphere experiment, developed by the University of Florida, will provide data on the extent to which dust particles and various volatile materials evaporating from the orbiter produce a local "cloud" or "plume" in the "sky" through which astronomical observations can be made.

The spacecraft induced contamination manifests itself in several ways that affect remote-sensing instrumentation: by material deposition that can decrease transmission or degrade optical surfaces; by sunlight scattered from particulate material, which is seen as a spacecraft corona that can degrade observations; and by particulates that individually and collectively affect imaging and infrared systems.

The technique used to assess the contamination environment is based on the analysis of sunlight scattered by particulate matter around the orbiter.

Basically, a photometer or sophisticated light level meter measures the amount of light and its polarization coming, at any one time, from one direction in the sky in each of 10 different bands of color,

A similar instrument flew aboard Skylab in 1973. In fact, Jack Lousma, Commander of STS-3, worked that instrument on the Skylab 3 mission he flew almost nine years ago. On that mission, there was no discernible contaminant cloud in a direction 90 degrees to the Sun. These earlier Skylab observations constitute the baseline against which new observations will be compared to establish levels of the local cloud produced by the orbiter.

The experiment also will measure diffuse sky radiation as seen from above the Earth's atmosphere. In the absence of contamination, that radiation consists of zodiacal light, light from bright stars, integrated light from faint stars, and diffuse galactic light.

The experiment is located on the starboard side of the payload pallet. Weighing 82 kg (180 lb.), the instrument is mounted on a gimbal which can scan in a vertical plane running fore and aft along the orbiter axis. Combined with the changing attitudes of the Shuttle during the seven-day STS-3 mission, the scanning motion will enable the review of the entire sky between 20 and 120 degrees from the Sun.

Principal investigator on the experiment is Dr. J. L. Weinberg, University of Florida, Gainesville, Fla. Co-investigators are Dr. D. W. Schuerman and Dr. F. Giovane, both of the University of Florida. Contractors who assisted with the project include the Institute for Wear Research, Rensselaer Polytechnic Institute, Troy, N. Y.; and Sterling Machine Co., Springfield, Mass.

Solar Flare X-Ray Polarimeter

The Solar Flare X-Ray Polarimeter is being carried aboard the OSS-1 payload pallet on the STS-3 mission to measure X-rays emitted during solar flare activities on the Sun.

A more definitive determination of what takes place during these solar eruptions could provide a major advance in understanding the physical processes that generate solar flares. Already, scientists have determined through observations of gamma rays, radio emissions and other manifestations of energetic particles, that particles are accelerated, sometimes in two or more stages, in such an event. Nevertheless, two fundamental questions remain: what is the nature of the mechanism by which these particles are energized, and how do these particles the observed emissions.

From observations, scientists believe that a flux of magnetic energy from the solar interior provides the energy for the solar flare events, and that interactions of the accelerated particles with the Sun's atmosphere dissipate this energy and result in observable flare phenomena, including X-Ray emission. Similar bursts of energy observed by the Einstein observatory satellite from other stellar objects have established that flares are relatively common in astronomy, suggesting that understanding them could provide further insight into magnetic phenomena in stars in general. The polarization state of hard X-rays emitted during flares carries unique information about the motion of the electrons producing the radiation. A definitive observation of X-Ray polarization could therefore provide important data needed in theoretical models of the flare phenomena.

The polarimeter instrument on STS-3 uses blocks of metallic lithium surrounded by xenon-filled gas proportional counters, similar to Geiger counters but a bit more sophisticated. If polarized (have their electric vectors lined up), the X-rays will be scattered by the lithium in a manner which permits the scientists to deduce to what extent and what direction the electrons were moving in the first place.

The reason for the experiment is that the direction and extent to which X-rays are polarized carries clues about the way in which X-rays are produced by the Sun. These details are not well known at this time.

To avoid instrumental effects that can mimic polarization (an occurrence which has plagued some previous experiments), the instrument uses three independent sets of scattering blocks and detectors, with each unit rotated 120 degrees with respect to the other two about a line passing through the Sun. A minimum of two units is necessary to determine the magnitude and orientation of polarizations, with the use of the third providing redundancy and increased effectiveness.

In operation, the instrument is aimed at the Sun by orienting the entire bay of the orbiter, using a Sun-sensor on the other solar viewing experiment (the Solar Ultraviolet Spectral Irradiance Monitor). The flight plan calls for the orbiter to remain in the bay-to-Sun attitude for approximately 28 hours. Because flares occur on the Sun only sporadically in association with other manifestations of magnetic activity such as sunspots, the observation of flare emission is not assured. The instrument has sufficient sensitivity that even a small event can yield a usable signal. In addition, flight rules dictate that if a relatively large flare occurs while the crew is involved in any activity other than sleep, consideration will be given to changing the attitude of the spacecraft to the bay-to-Sun attitude to permit the flare measurements. Time for such a maneuver would take an estimated 15 to 20 minutes. The spacecraft could be maneuvered bay-to-Sun while the Plasma Diagnostics Package is deployed on the remote manipulator system in most cases.

In addition to providing vital data needed to understand the flare phenomenon, results from this experiment may lead ultimately to improved predictive models for solar activity and flares. Such an advance would benefit manned space operations and terrestrial communications that are affected by electromagnetic radiation and by high energy particle fluxes from the Sun during these events.

The polarimeter is located near center on the OSS-1 payload pallet, sitting side by side with the Plasma Diagnostics Package. It weighs 209 kg (463 lb.). Principal investigator on the experiment is Dr. Robert Novick, Astrophysics Laboratory, Columbia University, New York, N.Y. Co-investigator is Dr. Gary A. Chanan, also of the Astrophysics Laboratory at Columbia University.

Among the major contractors involved in the project are D. T. Brown, Bohemia, N.Y.; Eagle Machine and Tool Co., Bronx, N.Y.; EMI Gencom, Inc., Plainview, N.Y.; EMI Nuclear Enterprises, Inc., San Carlos, Calif.; LND Inc., Oceanside, N.Y.; A. D. Little, Cambridge, Mass.; and Tektronix, Inc., Woodbury, N.Y.

Solar Ultraviolet Spectral Irradiance Monitor

The Solar Ultraviolet Spectral Irradiance Monitor is designed to establish a new and more accurate base of solar ultraviolet irradiance measurement over a wide wavelength region.

Making use of the unique capabilities of the Shuttle, the instrument will accumulate approximately 20 hours of solar measurements during the time when the orbiter's payload bay-to-Sun attitude (flight day 6) will be maintained for 17 orbits. Those 20 hours compare to five minutes during a typical sounding rocket flight. In addition, the instrument -- when brought back by the Shuttle -- will undergo extensive post-flight calibration to determine accurately any sensitivity change which may have occurred since the pre-flight calibrations.

The instrument carries two independent spectrometers and an inflight calibration light source which allow tracking any sensitivity change due to vibration at liftoff or contamination during flight. In addition, the instrument is equipped with seven detectors which allow cross-checks of possible detector changes.

During the bay-to-Sun period, the bay of the orbiter will be pointed at the Sun by the crew using Sun sensors mounted on the monitor instrument.

Interest in accurate measurements of the Sun's ultraviolet radiation and its range of variability has been heightened recently by increasing concern over long-range changes in the Earth's atmosphere and climate. This short wavelength radiation, absorbed in the outer reaches of the Earth's atmosphere, plays an important role in determining the physical properties of the upper atmosphere and, by implication, in influencing the condition of the lower levels that affect our lives and livelihoods.

The measurements taken by the monitor on OSS-1 are the first in a program to measure the variability of the solar ultraviolet radiation over an 11-year-long solar cycle. Decisive improvement of measurement accuracy is needed if the Sun's ultraviolet variability is to be determined.

This experiment, which weighs 69 kg (151 lb.), is located in the forward portion of the payload pallet, just in front of the Solar Flare X-Ray Polarimeter Experiment.

Principal investigator for the monitor is Dr. Guenter E. Brueckner, Naval Research Laboratory, Washington, D.C. Coinvestigators include Dr. John-David F. Bartoe; Dr. Dianne K. Prinz and Michael E. Van Hoosier, all of the Naval Research Laboratory.

Among the contractors and others assisting the project were: SCI Systems Inc., Huntsville, Ala.; the center for Radiation Research of the National Bureau of Standards, Washington, D.C.; the SURF Facility, Far W Physics Measurements, National Bureau of Standards; National Physical Laboratory, Teddington, Middlesex, U.K.; Cathodeon Limited, Cambridge, U.K., Keithley Instruments, Inc., Cleveland; Sangamo Weston Inc., Princeton, N.J.; Jobin Yvon Optical Systems, Metuchen, N.J.; Burleigh Instruments Inc., Fishers, N.Y.; and Management & Technical Services Co., Beltsville, Md.

Thermal Canister Experiment

The goal of the Thermal Canister Experiment is to pave the way for simpler thermal designs for protecting instruments and scientific experiments against extremes of heat and cold in space. With the development of the Space Shuttle, the opportunity exists for carrying out many scientific and technical investigations in the orbiter bay.

Objects in the virtual vacuum of space have few buffers against temperature extremes that might range from 200 degrees Centigrade in sunlight to minus 100 degrees on the night side of the orbit. In the past, satellites have been wrapped in insulation and provided with heaters, radiators, sensors and electronics for automatic temperature control. At present, the designer of each instrument is more or less on his or her own to protect his package.

The objective of the Thermal Canister Experiment is to determine the ability of a device using controllable heat pipes to maintain simulated instruments at several temperature levels in zero gravity, and under widely varying internal and external thermal loads. If all goes as planned, the experiment will be able to maintain a temperature stability of + 3 degrees C under the cold temperatures when the payload bay is in a attitude away from the Sun and under the warm temperatures experienced when the payload bay is pointed directly at the Sun over an extended period of time.

The experiment box is a rectangular enclosure 3 m (9 ft.) high, 1 m (3 ft.) long and 1 m (3 ft.) wide with aluminum sides which are equalized in temperature by a system of longitudinal fixed conductance heat pipes. The heat pipes collect the thermal energy dissipated internally by electrical heaters simulating instruments in operation and absorbed from direct and reflected sunlight.

The heat is then conducted to variable conductance heat pipes mounted to external radiators at the upper end of the canister and radiated into space.

The heat pipes are long narrow closed chambers with internal capillary wicking which provides pumping action. The wick is saturated with a volatile liquid (ammonia) in equilibrium with its vapor. Heat transport is established by applying heat at one end (the evaporator) and providing cooling at the other end (the condenser), with the heat being transferred as latent heat of vaporization. The flow path is completed by capillary forces in the wick.

The variable conductance heat pipes are somewhat more complex than the fixed conductance type in that they contain a noncondensable gas (nitrogen) stored in a reservoir at the condenser end of each pipe. As the temperature of the evaporator end of the pipe falls a heating element raises the temperature of the reservoir, causing the gas to expand into the condenser, blocking the condenser region and effectively stopping heat pipe action. The length of condenser rendered inactive depends upon the temperature level along the pipe. Conversely, with increasing evaporator-end temperature, the gas will recede into the reservoir making more active area of the radiators available for heat rejection to space.

The signal for activating the reservoir heaters is supplied through a feedback loop consisting of a temperature control sensor and either a hardwire proportional controller or a computer-driven controller. The sensors are attached to the canister side walls or on simulated instruments located in two different zones separated by an insulating barrier. The simulators are either radiatively or conductively coupled to the canister walls.

During the mission, it is planned to operate the canister over a variety of set points, 5 to 25 degrees C; change the internal dissipation (in the simulators); and demonstrate control in maintaining the two zones at differing temperatures.

The system can be operated by a proportional controller maintaining a specific temperature at one sensor; or by a microprocessor that uses all available data to maintain the overall temperature of the canister at some achievable level, in balance with the environment, irrespective of the preselected set point.

The experiment, which weighs 365 kg (805 lb.) is one of the most prominent experiments on the OSS-1 payload pallet. It is located to the aft of the pallet.

Principal investigator on the experiment is Stanford Ollendorf, Goddard Space Flight Center, Greenbelt, Md.

Among the contractors involved in the project are Grumman Aerospace Corp., Bethpage, N. Y.; ITE, Beltsville, Md.; Zilog, Palo Alto, Calif.; Base 10, New Jersey; and Universal Alloy, La Habra, Calif.

Vehicle Charging and Potential Experiment

The Vehicle Charging and Potential experiment is designed to measure the overall electrical characteristics of the Space Shuttle orbiter, including its interactions with the natural plasma environment of the ionosphere and the disturbances which result from the active emission of electrons. The experiment measurements will provide important information about the behavior of the orbiter with respect to the ionospheric plasma, the extent to which electric charge accumulates on the orbiter insulating (dielectric) surfaces and the manner in which return currents can be established through the limited area of surface conducting materials to neutralize active electron emissions. These measurements will provide important practical information which will guide the use of larger electron accelerators on Spacelab 1; the development of plans for dynamic electrical experiments such as the electrodynamic tether system; and as a test of suitability of using the payload bay for making in situ ionospheric measurements of geophysical interest.

In addition, during joint experiments with the University of Iowa's Plasma Diagnostic Package and during joint observing programs with ground stations, an opportunity exists to investigate, for the first time, the behavior of a coupled electron beam/ plasma system free from the pervasive wall effects present in all terrestrial laboratory experiments.

The relatively high gas pressure around an orbiter as a result of cabin outgassing and water dumps will affect the surrounding ionospheric plasma in ways not yet clear. Variable plasma density would allow an orbiter's electrical potential to vary widely, whereas enhanced plasma density would be stabilizing.

This experiment will control the induction of electrification, using -- for the first time ever in space -- a low power Fast Pulse Electron Generator. It emits a l,000-volt beam of electrons (about one-fifth of the electrons generated by a home television set). The pulses can be varied in duration and emitted at varying repetition rates or in a steady stream. Scientists hope that evidence of the beams will be visible to the STS-3 crew and that onboard TV cameras will be able to pick up the beams so that they might be seen by TV viewers on Earth. The beams have been photographed in laboratory tests, but never in space.

The instrument also has two charge and current probes, mounted on diagonally opposite corners of the payload pallet.

These probes simulate both the electrically insulating and conducting portions of the orbiter's surface. Additional observations will be made with a Langmuir probe-spherical retarding potential analyzer located on the sill of the pallet.

The experiment, which weighs 125 kg (275 lb.), is located in the forward portion of the payload pallet on the port side.

Principal investigator on the experiment is Dr. Peter M. Banks, Utah State University, Logan, Utah. Dr. Banks is associated with the Radio Science Laboratory, Department of Electrical Engineering, Stanford, Calif. Co-investigators are Dr. John W. Raitt and Dr. P. Roger Williamson, both of the Utah State University; Dr. U. Samir, University of Michigan; Dr. T. Obayashi, University of Tokyo; Dr. H. Liemohn, Battelle Memorial Institute; Dr. L. Linson, Science Applications, Inc.; and Dr. C.R. Chappell, and Dr. J. L. Burch, both of NASA's Marshall Space Flight Center, Huntsville. Ala.

Among the contractors involved with the project are the Thiokol Corp., Ogden, Utah, and PYE Electronics, of Cambridge, England.

Others who assisted with the project, among many at both Utah State and at Stanford, include J. R. Allred, William Denig and David Susskind, all of Utah State; and Michael Pon of Stanford.

Getaway Special

A Getaway Special Flight Verification Payload is aboard the STS-3 mission. The test payload, a cylindrical canister 61 cm (24 in.) in diameter and 91 cm (36 in.) deep, will measure the environment in the canister during the flight. That data will be recorded and analyzed for use by Getaway Special experimenters on future Shuttle missions.

Officially titled "Small Self-Contained Payloads," the Getaway Special program is offered by NASA to provide anyone who wishes the opportunity to fly a small experiment aboard the Space Shuttle. The experiment must be of a scientific research and development nature.

The Getaway Special experiments, will be flown on Shuttle missions on a space-available basis. The first private sector payload will be flown on STS-4, the next Shuttle mission, scheduled for launch in July.

The Getaway Specials are available to industry, educational organizations, and domestic and foreign governments for legitimate scientific purposes.

Since the offer for Space Shuttle space first was made in 1976, more than 320 reservations have been made by more than 191 individuals and groups from 33 states, the District of Columbia and 14 foreign nations. Although many reservations have been obtained by persons and groups having an obvious interest in space research, a large number of spaces have been reserved by persons and organizations entirely outside the space community.

Reservations are held, for example, by Realtors, bankers, newspaper publishers and school children, among other, who have an interest in conducting experiments in biology, chemistry, Earth science, physics and other disciplines. Examples include an inner city high school class in Camden, N.J., which intends to fly an ant colony in space to determine the effect of weightlessness on the ants, and a Japanese newspaper, the Asahi Shimbun, is planning a snow-making experiment under zero-G conditions to investigate crystallization.

The canister being flown on STS-3 contains instrumentation to measure temperatures, acceleration, acoustic noise and pressure. Temperatures will be monitored inside and outside the container, specifically on the mounting brackets and on the adapter beam which attaches the payload to the Shuttle structure.

Accelerometers will measure the vibration in three directions during liftoff. An acoustic microphone will turn the payload on when it senses ignition of the Space Shuttle's three liquid-fueled main engines. Data will be recorded continuously through the launch and ascent into orbit.

Once in orbit, data will be taken at preselected intervals. During reentry and landing, data will be recorded continuously again.

Pressure will be monitored in the container and in the sealed battery box in the canister.

In addition, a heat pipe experiment in the payload will help determine the feasibility of transferring thermal energy from a component inside the payload to the experiment mounting plate. This will be done to determine how well thermal energy can be radiated in space.

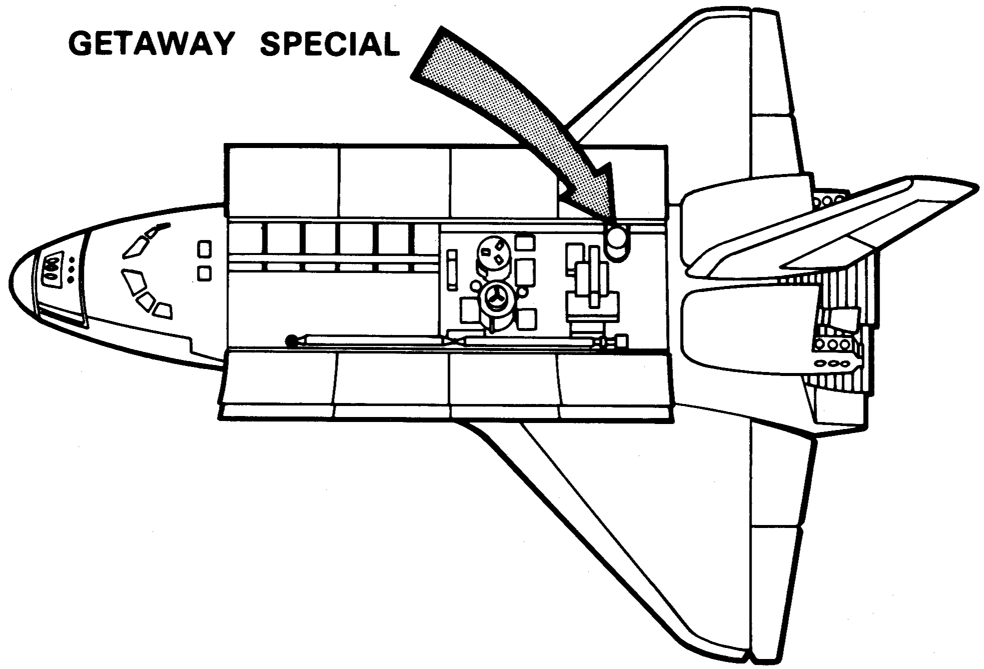
The payload also contains several film samples, located in chambers of various wall thicknesses. The film samples will provide information on the penetration, if any, of the experiment by cosmic radiation.

The canister on STS-3 weighs approximately 181 kg (400 lb.). It is the equivalent of a 0.14 cubic-meter (5 cubic-foot) container capable of carrying 91 kg (200 lb.) into space.

The Getaway Special canister on STS-3 is mounted in Bay 13 of the Shuttle. That section is located behind the OSS-1 pallet.

The Getaway Special program is managed by the Goddard Space Flight Center, Greenbelt, Md. Program Manager is James S. Barrowman. Clarke Prouty, also of Goddard, is Technical Liaison Officer. Program Manager at NASA Headquarters is Donna S. Miller.

LOCATION OF GETAWAY SPECIAL FLIGHT VERIFICATION PAYLOAD ON STS-3



Monodisperse Latex Reactor

The Monodisperse Latex Reactor is a materials processing experiment aboard STS-3. The project was developed at NASA's Marshall Space Flight Center, and Lehigh University, Bethlehem, Pa.

The experiment is designed to study the feasibility of making monodisperse (identical size) polystyrene latex microspheres which may have major medical and industrial research applications

Some of the proposed applications of the latex beads include measuring the size of pores in the wall of the intestine in cancer research; measuring the size of pores in the human eye in glaucoma research; and as a carrier of drugs and radioactive isotopes for treatment of cancerous tumors.

The National Bureau of Standards has also indicated its interest in routine use of the beads as calibration standards in medical and scientific equipment.

On Earth, these beads can be produced only up to about three microns and still be monodisperse. The experiment will help determine if much larger (up to 20 microns) monodisperse beads can be produced practically and economically in space.

The experiment consists of four, 30-cm (12-in.) tall reactors, each containing a chemical latex-forming recipe, housed in a 60-cm (24-in.) tall metal cylinder. The recipe is a suspension of very tiny (micron-size) plastic beads in water or another liquid.

Prior to launch, each of the reactors are loaded with 100 cubic centimeters of the chemical latex-forming recipe. A small onboard computer will control the experiment after the Shuttle crew turns it on.

In orbit, the latex mixture is heated to a constant 70 degrees centigrade (258 degrees Fahrenheit) which initiates a chemical reaction to form the larger plastic beads.

A recorder will store all data produced during operation of the experiment. After 14 hours, the experiment turns itself off.

The reactor will be removed from the Shuttle at the landing site and returned to the experimenters for sample and data analysis. After a cleanup and refurbishment of the experiment hardware, it will be ready for another flight.

The experiment, carried in the Shuttle orbiter crew compartment locker area, is to be conducted on three more early Shuttle flights beyond STS-3.

The principal investigator on the experiment is Dr. John W. Vanderhoff of Lehigh University. The three co-investigators are Drs. Fortunato J. Micale and Mohamed S. El-Aasser, of Lehigh University, and Dale Kornfeld of Marshall Space Flight Center.

Marshall's Materials Processing in Space Projects office, is responsible for producing and testing the flight experiment.

Design support for the experiment was provided by General Electric Co., Valley Forge, Pa., and Rockwell International, Downey, Calif.

Electrophoresis Test

The Electrophoresis Equipment Verification Test is designed to evaluate the feasibility of separating cells according to their surface electrical charge. It is a forerunner to planned experiments with other equipment that will purify biological materials in the low gravity environment of space.

The STS-3 test hardware was previously flown on the Apollo Soyuz Test Project in 1975.

The process of electrophoresis utilizes an electric field to separate cells, and other biological materials in fluids without damaging the cells which can then be used in the study of cell biology, in immunology and in medical research.

Electrophoresis is limited on Earth because heat produced by the electric field causes buoyancy and re-mixing of the cells and fluid, thereby defeating the separation process. In space, even though the process still produces heat and density variation in the fluid, the separation is not disturbed because buoyancy is absent in the low gravity environment.

The experiment consists of an electrophoresis processing unit with glass columns in which the separation takes place; a camera and film to document the process, and a cryogenic freezer to freeze and store the samples after separation. The equipment will be stowed in the middeck area of the Shuttle orbiter crew cabin.

A crewman will activate the equipment and insert the biological samples into one of the unit's glass columns. The duration of each separation is one hour, after which the fluids are frozen to preserve the degree of separation during descent.

The samples to be used in the equipment verification include fixed red blood cells supplied by the Marshall Center and live kidney cells provided by the Johnson Center.

The electrophoresis unit will be removed from the orbiter within three hours after landing. The frozen columns are then to be delivered to the Marshall and Johnson Centers for analyses. The flight hardware will be returned to Marshall for refurbishment for future Shuttle flights.

Principal investigators on the experiment are Dr. Robert Snyder at Marshall and Dr. Dennis Morrison at the Johnson Space Center. Co-investigators are Dr. Paul Todd, Pennsylvania State University, Bethlehem, Pa. and Dr. Grant Barlow of Michael Reese Foundation, Chicago, Ill.

Heflex Bioengineering Test

The Heflex Bioengineering Test is a preliminary test that supports an experiment called Heflex (for Helianthus Annuus Flight Experiment), part of Spacelab 1 mission. The Heflex experiment depends on plants grown to a particular height range. The relationship between initial soil moisture content and final height of the plants will be determined in order to maximize the plant growth during the Spacelab mission. Principal investigator is Allan H. Brown, University of Pennsylvania.

The experiment consists of dwarf sunflower plants contained in small metal vials, each with a different soil moisture content. Following the flight, each of the plants will be measured and the results compared with the soil moisture. This will then be used as a standard for the Spacelab 1 experiments.

This experiment did not receive sufficient flight time on STS-2 due to the minimum mission. This is a reflight of the STS-2 experiment.

Orbital Flight Test Pallet

The six OSS-1 experiments being flown in the orbiter's payload bay are being carried on a special "U"-shaped structure called an orbital flight test pallet. The 3-by-4 m (10-by-13 ft.) aluminum frame and panel structure weighing 527 kg (1,162 lb.), is an element of Spacelab, a reusable, modular research facility being developed for the Space Transportation System by the European Space Agency (ESA) in cooperation with NASA.

The pallet was built by the British Aerospace Dynamics Group under subcontract to ERNO Raumfahrttechnik GmbH, the prime contractor for ESA. Spacelab will be carried inside the orbiter's cargo bay on missions set to begin in 1983.

The pallet was designed to hold a group of experiments requiring direct exposure to space during a Spacelab mission. It allows many experiment payloads to be prepackaged and checked out as a unit prior to installation in the orbiter.

The pallet being carried on STS-3 is an engineering model of the flight version pallet. This engineering unit has been certified for flight and has been adapted for use with special subsystems which provide interfaces between the payload and orbiter systems. These subsystems were developed by NASA using, for the most part, off-the-shelf hardware.

The pallet's active thermal control subsystem employs coldplates and a pallet-mounted Freon pump to reject heat generated by the experiments by sending it through the orbiter's payload heat exchanger. A power subsystem includes a control box mounted to the pallet to distribute orbiter electrical power to the payload and provide fused wire protection. The experiment control and data handling subsystem includes a pallet-mounted multiplexer/demultiplexer which provides for control of the payload from the orbiter and for the return of data from the experiments. The OSS-1 pallet, including subsystems and experiment hardware, weighs 3,125 kg (6,890 lb.).

The Spacelab Program office at Marshall is responsible for design, development and integration of the overall orbital flight test Pallet system.

McDonnell Douglas Technical Services Co. integrated the system using a pallet structure built by British Aerospace Dynamics Group, and other components developed by several U. S. contractors. The pallet structure is a part of the Spacelab hardware being provided to NASA by the European Space Agency.

Induced Environment Contamination Monitor

The Induced Environment Contamination Monitor is a desk-sized detector designed to check for contaminations in and around the Space Shuttle orbiter cargo bay which might adversely affect delicate experiments carried on future missions.

The package of 10 instruments, developed by the Marshall Space Flight Center, measures any induced atmosphere generated by offgassing and outgassing from materials on board the Shuttle and from other contamination-producing Shuttle activities. These include the firing of the orbiters attitude control jets and water dumps. The monitor will also provide data on the interaction between the induced and natural environments.

The monitor was first carried into space on the second Space Shuttle flight in November 1981. On that mission, the open cargo bay was faced toward the Earth. During the third Shuttle flight, the orbiter's cargo bay will be placed in a "worst case" situation exposing it to direct sunlight which will result in higher temperatures and an expected increase in outgassing in the bay.

On STS-3, as on STS-2, the monitor will be attached to a special demonstration flight instrumentation pallet toward the rear of the cargo bay.

Crew time permitting during the planned seven-day mission, the monitor may also be moved to other locations around the cargo bay by means of the orbiter's remote manipulator system to make additional checks for contamination

The monitor will operate during pre-launch, ascent, on-orbit, descent and post-landing. The on-orbit measurements include molecular return flux, background spectral intensity, molecular deposition and optical surface effects. During the other mission phases, dew point, humidity, aerosol content and trace gas will be measured as well as optical surface effects and molecular deposition.

After this and subsequent space flights, the monitor will be returned to Marshall for refurbishment. The flight data will be correlated with an orbiter event chronology furnished by Johnson Space Center and the results analyzed.

Data from the first flight of the monitor indicated that it could clearly identify each type of contamination-producing orbiter activity, although the brevity of the 54-hour mission provided insufficient time to evaluate the potential breadth of contamination.

The results from that flight showed: humidity levels remained low in the cargo bay during ascent and descent; particulate matter of sizes greater than 5 micrometers were relatively absent from the bay, but particles less than five micrometers exceeded expectations; and the cargo bay was successfully sealed from engine by-products during liftoff and descent.

The flight data also indicated: water molecules and other early-mission contaminants began boiling off rapidly and there was a 90 percent reduction after approximately 35 hours in orbit; other data indicated that when the orbiter's attitude control system is used, or a water dump is made, a temporary "cloud" of particles is generated.

NASA began strong manned mission contamination control efforts prior to the Skylab missions of 1973-74 and, recognizing the possible limiting effects induced contamination might have on sophisticated observational programs planned for the 1980s, committed to an effort to insure that the induced environment would not be a problem on the Shuttle orbiter.

This equipment is also scheduled to be carried on the fourth Shuttle mission and on Spacelab missions 1 and 2.

A brief description of the objectives of each of the contamination monitor's instruments follows:

Mass Spectrometer -- This measures molecular return flux, from which molecular column density may be calculated. The purpose of the instrument is to define the amount of offgassing and outgassing molecules transported to surfaces in the cargo bay. The data is later correlated with actual deposition measurements on optical and temperature-controlled surfaces to define the gas cloud (induced atmosphere) through which optical experiments must look.

Camera/Photometer -- This will make optical measurements of both the induced particulate environment and background brightness. Two such automated instruments have been placed aboard the monitor.

Cryogenic Quartz Crystal Microbalance -- The objective of this instrument is to provide a record of the absorption and "boiling off" of molecular contamination in the cargo bay. When the cargo bay is oriented toward the Sun for long periods of time, the instrument will have the special objective of measuring molecular water vapor.

Temperature-Controlled Quartz Crystal Microbalance -- This is designed to detect the absorption or desorption of molecular contamination in the cargo bay as a function of temperature. The contamination sources will be characterized as a function of direction and events.

Optical Effects Module -- The degradation of some typical optical materials will be measured during the prelaunch, orbital and post-landing phases by this instrument. Optical property changes due to deposition of particulates and molecular films will be discriminately measured utilizing an integrated scattered light measurement in conjunction with direct, self-calibrating transmission measurements. This instrument is also applicable in assessing the contamination hazards likely to be encountered by optical components of space-borne instrumentation.

Passive Sample Array -- This consists of optical samples which will be exposed to the natural and induced environment of the cargo bay, permitting a greater scope and range of analysis required to more fully assess the physical mechanisms of degradation due to deposited contaminants.

Cascade Impactor -- This provides a determination of the concentration and particle-size distribution, as a function of time, and of air-suspended contaminants in the spacecraft environment during ground-based, ascent, descent and post-landing phases. The instrument also measures the amount of airborne nonvolatile residue for molecules with sufficient high sticking properties at the temperature encountered.

Air Sampler -- The Air Sampler is designed to determine the gaseous contaminants in the cargo bay during orbital missions. The requirements of the instrument are generally categorized into three groups: ground-based sampling to detect the presence of organic and silicone polymers (such as hydraulic fluids and lubricants, paints and adhesives) which is of most concern; ascent, when the primary interest is in hydrochloric acid from the solid rocket booster plume as well as hydrocarbons and silicones; descent, when the gaseous sources of greatest concern are expected to be nitrogen compounds from the auxiliary power unit exhaust and other products from reentry effects on the adhesives for the thermal protective system (hydrocarbons and silicones can also be sampled during descent).

Dew Point Hygrometer -- This will measure the dew point of the air surrounding the monitor. The measurements will be made prior to launch and as long as the vehicle is within the Earth's atmosphere, including ascent, reentry and landing.

Humidity Monitor -- This will measure the relative humidity from O to 70 centigrade (32 to 158 Fahrenheit). Measurements will be taken while the vehicle is in the Earth's atmosphere to produce a humidity/temperature profile of the environment within the cargo bay. The temperature measurement, O to 100 (32 to 212 F), will be made by a thermistor located within the humidity sensor mounting.

Shuttle Student Involvement Project

An additional capability of the Space Transportation System will be realized on this flight with the flight of the first student-developed experiment aboard Columbia. The Shuttle Student Involvement Project is a joint venture between NASA and the National Science Teachers Association and is designed to stimulate the study of science and technology in the nation's secondary school systems.

Todd Nelson, 18, one of 10 finalists in this year's competition, will be flying his "Insects in Flight Motion Study" inside a specially constructed container to be mounted in the orbiter mid-deck cabin.

The experiment will require a Shuttle crew member to remove the insect container, attach it to one of the mid-deck walls and photograph and film the insects as they fly around in the microgravity conditions of Earth orbit.

The experiment will examine the adaptation of different flying insects to weightless conditions.

Insects chosen for this study are the Velvetbean Caterpillar Moth, and the Honeybee Drone. These insects were chosen because of their hardy life span, the difference between the bee and moth mass and wing surface area and their ready availability as subjects.

Nelson is a senior at Southland Public School, Adams, Minn.

One of the aspects of the Shuttle involvement project is the pairing of student winners, selected by a regional competition by the science teachers association, with industrial sponsors. In the case of Nelson, his sponsor is the Aerospace and Defense Group, Honeywell, Inc. Robert Moulton and Dr. Robert Peterson from Honeywell worked with Nelson during the past six months to prepare this experiment for Shuttle flight.

The Shuttle involvement project grew out of a an earlier student project on the Skylab missions in 1973. The Shuttle project is an annual competition, the winners being chosen from 10 regions across the country. The experiments proposed by the winning students will be scheduled for flight on future Shuttle missions on a space available basis.

STS-3 ORBITER EXPERIMENTS PROGRAM

A complete and accurate assessment of Shuttle performance during the launch, boost, orbit, atmospheric entry and landing phases of a mission requires precise data collection to document the Shuttle's response to these conditions.

The NASA office of Aeronautics and Space Technology (OAST), through its orbiter Experiments Program, is providing research experiments onboard the shuttle orbiter to record specific, research-quality data. The data will verify the accuracy of wind tunnel and other ground-based simulations made prior to flight; verify ground-to-flight extrapolation methods, and verify theoretical computational methods. The data also will be useful to the office of Space Transportation Systems to further certify Shuttle and expand its operational envelope.

The primary objective of the orbiter Experiments Program is to increase the technology reservoir for development of future (21st Century) space transportation systems.

The following experiments are currently included in the program and are slated to fly on early Shuttle flights.

Aerodynamic Coefficient Identification Package (ACIP)

The primary objectives of the Aerodynamic Coefficient Identification Package are:

- To collect aerodynamic data during the launch, entry and landing phases of the Shuttle;
- To establish an extensive aerodynamic data base for verification of and correlation with ground-based data, including assessments of the uncertainties of such data;
- To provide flight dynamics data in support of other technology areas, such as aerothermal and structural dynamics.

Instruments in this package include dual-range linear accelerometers and rate gyros. Also included are the power conditioner for the gyros, the power control system and the housekeeping components. The package is installed co-linearly with the geometric axes of the orbiter and post-installation measurements made to establish the position within 10 arc minutes. The instruments continuously sense the dynamic X, Y and Z attitudes and performance characteristics of the orbiter through these critical flight phases. The Aerodynamic Coefficient Identification Package also provides high rate sampling of the positions of orbiter control surfaces for recording with the package's attitude data.

Principal technologist is D.B. Howes of Johnson Space Center, Houston.

Infrared Imagery of Shuttle (IRIS)

This experiment will obtain high-resolution infrared imagery of the orbiter lower (windward) and side surfaces during reentry from which surface temperatures and hence aerodynamic heating may be inferred. The imagery will be obtained utilizing a 91.5-cm (36-in.) telescope mounted in the NASA C-141 Gerard P. Kuiper Airborne observatory positioned appropriately at an altitude of 13,700 m (45,000 ft.) along the entry ground track of the orbiter. A single image will be obtained during each flight.

The primary technology objective is to decrease the current level of uncertainty associated with various reentry aerothermodynamic phenomena affecting thermal protection system design. The phenomena include boundary layer transition, flow separation and reattachment, flow/surface interactions and surface catalyses to flow chemistry. These data will provide for improved computational procedures and lead to development of advanced thermal protection systems.

The infrared imagery system consists of the C-141 aircraft and its optical system, a 6-cm (2-in.) aperture acquisition telescope focal plane system with detector array, and a high-speed data handling and storage system. The aircraft will operate from Ames Research Center, Mountain View, Calif., and will be stationed along the orbiter entry ground track about one hour prior to reentry. As the orbiter passes through the field of view of the telescope, the orbiter windward or side surface will be observed by the detector system and the data recorded on tape. After the flight, these data will be supplemented by orbiter-derived data of velocity, altitude, angle-of-attack, yaw and roll conditions existing during the period of infrared imagery observation. Analysis involves computer arrangement of this data into a two-dimensional image format, radiometric analysis and detailed comparisons of the aerodynamic heating rates with analytical predictions and ground-based experimental data.

Principal technologist is W.C. Davy, Ames Research Center.

Tile Gap Heating Effects (TGH) Experiment

Analyses and ground tests have shown that the gaps between the tiles of the thermal protection system generate turbulent airflow, which will cause increased heating during the reentry phase of flight. Tests have also shown that the heating effect may be reduced by optimum design of the gaps and by altering the radii at the edges of the tiles. The tile gap experiment was devised to further the investigations of heating phenomena. The results will enable improvements in reusable element thermal protection systems to reduce the convective heating caused by gaps and other discontinuities.

The orbiter will be instrumented with a removable panel 45.7 cm (18 in.) square, which will carry 11 tiles of baseline material and size. The panel will be fitted to the underside of the orbiter fuselage. The gaps between tiles will be carefully calculated and controlled during fitting to ensure that the heating rates generated during entry will be no higher than those of the baseline tile array. The aim will be to produce a design that will result in heating rates lower than those of the baseline system.

In addition to gap spacing, the gap depth will also be controlled through the use of fillers fitted at the bottom of certain gaps; i.e., at the junction of the tiles and the orbiter fuselage skin. The radii at the outer edges of the tiles will be controlled during fabrication to conform to calculations that show the reduced effects in combination with the spacing. Thermocouples will be fitted to the tile surfaces and at various depths in the gaps to measure temperatures during reentry. The output of the thermocouples will be recorded on the orbiter's development flight instrumentation system. To assist in evaluation, Tile Gap Heating Effects data will be compared to development flight instrumentation data obtained from earlier missions.

Principal technologist is W. Pitts, Ames Research Center.

Catalytic Surface Effects (CSE) Experiment

A strong shockwave will encompass the Shuttle orbiter during the atmospheric reentry maneuver. The shock wave severely compresses and heats the air flowing through it, causing the molecules to dissociate and react chemically with each other.

Computations show that as the dissociated atomic oxygen approaches the cooler regions of flow adjacent to the orbiter, the atomic oxygen fails to recombine into molecular oxygen.

This experiment will investigate the chemical reaction caused by impingement of atomic oxygen on the Shuttle thermal protection system which was designed under the assumption that the atomic oxygen would recombine at the thermal protection system wall.

This chemical reaction releases additional heat which results in higher thermal protection system temperatures. In this case, the surface is referred to as being a catalytic surface, that is, it allows the chemical reaction to take place.

If the thermal protection system surface is non-catalytic, then atomic oxygen will not recombine into molecular oxygen and the heating rates will be lowered. Thus, the temperature of the orbiter during reentry will be lower. With lower temperatures, orbiter thermal protection system weight could be reduced, its flight envelope could be expanded, or greater reusability could result.

The technology objective is to verify analytical predictions which could not be adequately simulated in ground-based facilities. The results will provide data and improved computational techniques for future thermal protection system designs.

The Catalytic Surface Effects will use baseline tiles, selected from those having development flight instrumentation thermocouples, located on or near the orbiter lower fuselage centerline. The six tiles will be sprayed with an overcoating mixture of chrome-iron-spinel, a highly efficient catalytic material and a vinyl acetate binder which will protect the overcoat during ground operations. The mixture is compatible with the existing tile and coating and will not alter the thermal or mechanical properties of the uncoated portions of the thermal protection system. During orbiter ascent, the vinyl acetate will burn off the tile surface, leaving the chrome-iron-spinel exposed.

Thermocouple measurements recorded during reentry will be used to determine Catalytic Surface Effects performance. Comparison of this experiment's data with data taken on previous flights from uncoated tiles will aid in the performance evaluation.

At the end of each mission, the overcoat will be removed from the six tiles, leaving the thermal protection system in its original condition.

Principal technologist is D. Stewart, Ames Research Center.

Dynamic, Acoustic and Thermal Environment (DATE) Experiment

To fully and economically exploit the benefits of the orbiter's large cargo-carrying capability, it is necessary to predict payload environments with accuracy and dispatch.

Such predictions will facilitate payload development and reduce the need for ultraconservative design and test. The Dynamic, Acoustic and Thermal Environment experiment will collect information for use in making credible predictions of cargo-bay environments. These environments are neither constant nor consistent throughout the bay and are influenced by interactions between cargo elements.

The instrumentation includes accelerometers, microphones, thermocouples and strain gages on payloads and in the cargo bay. Sensor outputs will be recorded for post-flight interpretation.

The Goddard Space Flight Center, Greenbelt, Md., will be responsible for the data reduction. Principal technologist is W. Bangs of Goddard.

ORBITER'S ROBOT "ARM"
(Remote Manipulator System)

Columbia is fitted with a Canadian-built remote manipulator system which was tested during STS-2. Part of the payload deployment and retrieval system, the mechanical arm will be used in operational flights to deploy satellites and other payloads or to grapple payloads for stowing in the payload bay and subsequent return to Earth.

Designed as an analog to the human arm, the manipulator system has shoulder, elbow and wrist joints driven by DS electric motors controlled by the flight crew using a combination of direct observation and television cameras on the elbow and wrist joints. The arm may be operated in five different modes ranging from full manual to computer-controlled through hand controls and keyboard at the payload station on the flight deck.

The manipulator system is installed on the left payload bay longeron for STS-3. A second one can be installed on the right longeron for specific payload tasks, although both arms could not be operated simultaneously.

The arm, built of a light-weight carbon composite tubing 38 cm (15 in.) in diameter, is 15.3 m (50.25 ft.) long, and weighs 408 kg (900 lb.). A thermal blanket provides temperature control for protecting joint-drive mechanisms and electronics. Brushless electric motors and gear trains drive the joints for pitch UD/ down, yaw left/right and wrist roll motions. The "hand," called an end effector, has snare wires that engage a grapple fixture on the payload.

Television cameras at the wrist and elbow provide the operator visual cues for maneuvering the end effector toward a grapple fixture or other target. Operator hand controllers are similar to those for spacecraft maneuvers -- a rotational hand controller, for roll, pitch and yaw motions, and translational hand controller for up/ down, left/right and fore/aft motions. When deactivated, the arm is latched into three cradle pedestals along the left longeron. If the drive mechanisms jam and the arm cannot be moved to its stowed position, and if contingency spacewalks are unsuccessful in restowing, the arm can be separated with a pyrotechnic device.

The five arm operating modes are as follows:

- Automatic -- operators select autosequence loaded into general purpose computer software which then moves arm through sequence; or, operator enters desired position coordinates into computer with keyboard at operator's station.
- Manual Augmented -- operator drives arm end effector with hand controllers without controlling individual joint motions.
- Manual Single Joint Drive -- operator drives arm through control panel switches on a joint-by-joint basis.
- Direct Drive -- operator controls motion through hardwired command from control panel that bypasses the general purpose computer.
- Backup Drive Control -- Essentially same as direct drive, only commands Pass through backup electronics and wiring.

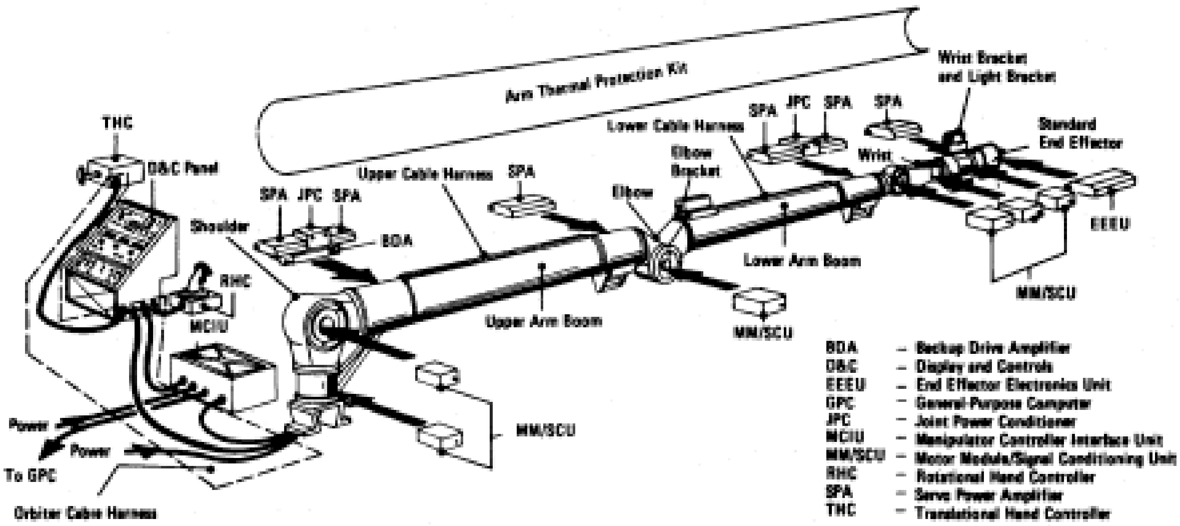
The arm was developed and built under a cooperative agreement between NASA and the National Research Council of Canada. Spar Aerospace Limited is system prime contractor. Canada has absorbed the costs of research and development of the first arm installed aboard Columbia.

The ability of the arm to handle payloads in orbital flight can be tested on the ground only to a limited degree. Before full-scale heavy-mass and large-volume payloads can be moved in and out of the payload bay, smaller, lighter objects must first be handled to gain confidence in the design and to gain experience in operating the arm. The test plan laid out for STS-3 picks up those tests that had to be postponed when STS-2 was cut short and adds more qualification tests including handling low-weight and volume payloads. The induced environment contamination monitor and the plasma diagnostic package serve as simulated payloads during STS-3 arm testing, which will be run during night as well as daylight conditions.

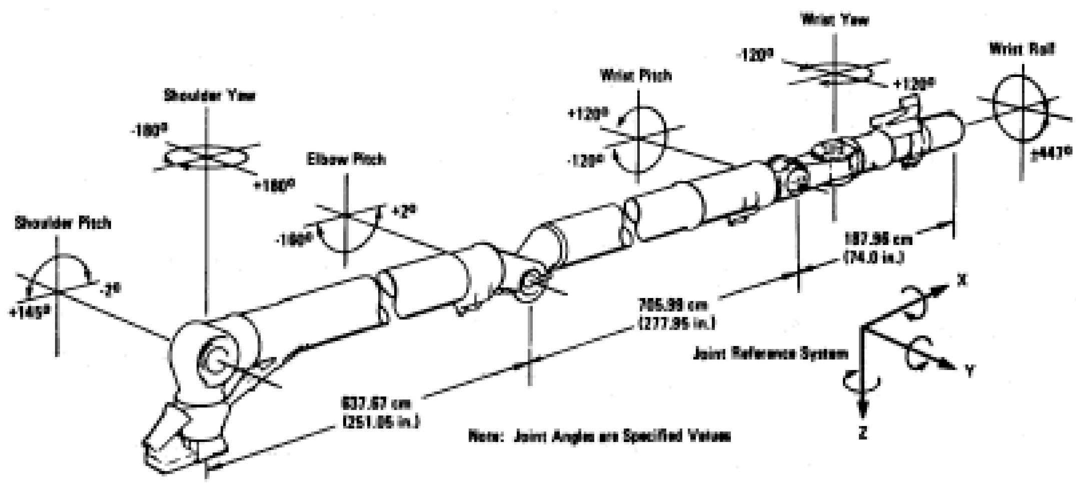
Systems testing of the remote arm are aimed toward verifying that the arm, its computer software, closed-circuit television and crew visual cues all mesh for smooth and reliable operation. STS-3 arm tests are grouped under six basic test objectives:

- Deploy and berth the contamination monitor and plasma diagnostic packages with the remote arm.
- Grapple, rigidize and release the contamination monitor grapple fixture with the arm's end effector, or hand.
- Verify that the software will bring an arm joint to stop before its travel limit is reached.
- Verify full and half-rate arm translation maneuvers, and ability of the control system to bring the loaded arm to rest.
- Demonstrate the arm's ability to hold position during power reactor control system thruster activity.
- Test the software's ability to move the arm elbow joint in manual control mode.

REMOTE MANIPULATOR SYSTEM



RMS Components



Mechanical Arm-Stowed Position and Movement Configuration

TRACKING AND DATA NETWORK

One of the key elements in the Shuttle mission is the capability to track the spacecraft, communicate with the astronauts and to obtain the telemetry data that informs ground controllers on the condition of the spacecraft and its astronauts. The heart of this complex network is located at NASA's Goddard Space Flight Center, in Greenbelt, Md., just outside Washington, D.C., where the Spaceflight Tracking and Data Network and the NASA Communications Network is located.

With the exception of very brief periods during the launch, flight, and recovery of STS-3, Goddard serves as the heartbeat of the mission, receiving all telemetry, radar and air-to-ground communications and relaying that information to the Johnson Space Center in Houston, and to other NASA and Department of Defense facilities participating in the mission. Most video (TV) transmission facilities used during the mission are provided by and monitored for quality by Goddard personnel. At Goddard, the network operations managers and systems specialists keep the entire NASA/DOD network tuned for the mission support.

Spaceflight Tracking and Data Network

The STDN is a highly complex NASA worldwide system that provides reliable, real-time communications with the Space Shuttle orbiter and crew. About 2,500 personnel are required to operate the network.

The network for the orbital Flight Test Program consists of 15 ground stations equipped with 4.3, 9, 12 and 26 meter (14, 30 40 and 85 feet) S-band antenna systems and C-band radar systems, augmented by 15 Department of Defense geographical locations providing C-band support and one Department of Defense 18.3 m (60 ft.) S-band antenna system. In addition, there are six major computing interfaces located at the Network operations Control Center and at the operations Support Computing Facility, both at Goddard; Western Space and Missile Center, Calif.; Air Force Satellite Control Facility, Colo.; White Sands Missile Range, N.M.; and Eastern Space and Missile Center, Fla., providing real-time network computational support.

The network has support agreements with the governments of Australia, Spain, Senegal, Botswana, Chile, United Kingdom and Bermuda to provide NASA tracking stations support to the Space Transportation System program.

In the Spaceflight Tracking and Data Network operations Control Center at Goddard, the network director and a team of operations managers and network systems specialists, keep the entire network tuned for the mission support.

Should the Johnson Space Center Mission Control Center be seriously impaired for an extended time, facilities serving the Network operations Control Center becomes an emergency mission control center manned by Johnson personnel, with the responsibility of safely returning the Space Shuttle orbiter to a landing field.

The Merritt Island, Fla., S-band station provides the appropriate data to the Launch Control Center at the Kennedy Space Center and the Mission Control Center at Johnson during prelaunch testing and the terminal countdown. During the first minutes of launch and during the ascent phase, the Merritt Island and Ponce de Leon, Fla., S-band and Bermuda S-band stations, as well as the C-band stations located at Bermuda; Wallops Island, Va.; Grand Bahama; Grand Turk; Antigua; Cape Canaveral; and Patrick Air Force Base, Fla., will provide appropriate tracking data, both high speed and low speed, to the Kennedy and Johnson Control Center.

The Madrid, Spain; Indian ocean Station Seychelles; or Orroral and Yarragadee, Australia; and Guam stations provide critical support to the Orbital Maneuvering System 1 and 2 burns on the first revolution. During the orbital phase, all the S-band and some of the C-band stations that see the Space Shuttle orbiter at 3 degrees above the horizon will support and provide appropriate tracking, telemetry, air-ground and command support to the Johnson Mission Control Center through Goddard.

During the nominal reentry and landing phase planned for Edwards Air Force Base, Calif.; the Goldstone and Buckhorn, Calif.; S-band stations and C-band stations at the Pacific Missile Test Center, Vandenberg Air Force Base, Edwards Air Force Base and Dryden Flight Research Facility will provide highly critical tracking, telemetry, command and air-ground support to the orbiter and send appropriate data to the Johnson and Kennedy Control Centers.

NASA TRACKING STATIONS

Location	Equipment
1. Ascension Island (ACN)	S-Band, UHF A/G
2. Bermuda (BDA)	S-Band, C-Band, UHF
3. Buckhorn (BUC)	S-Band, C-Band
4. Goldstone (GDS)	S-Band, UHF A/G
5. Guam (GWM)	S-Band, UHF A/G
6. Hawaii (HAW)	S-Band, UHF A/G
7. Merritt Island (MIL)	S-Band, UHF A/G
8. Santiago (AGO)	S-Band
9. Madrid (MAD)	S-Band, UHF A/G
10. Orroral (ORR)	S-Band
11. Botswana (BOT)	UHF A/G
12. Dakar (DKR)	UHF A/G
13. Yarragadee (YAR)	UHF A/G

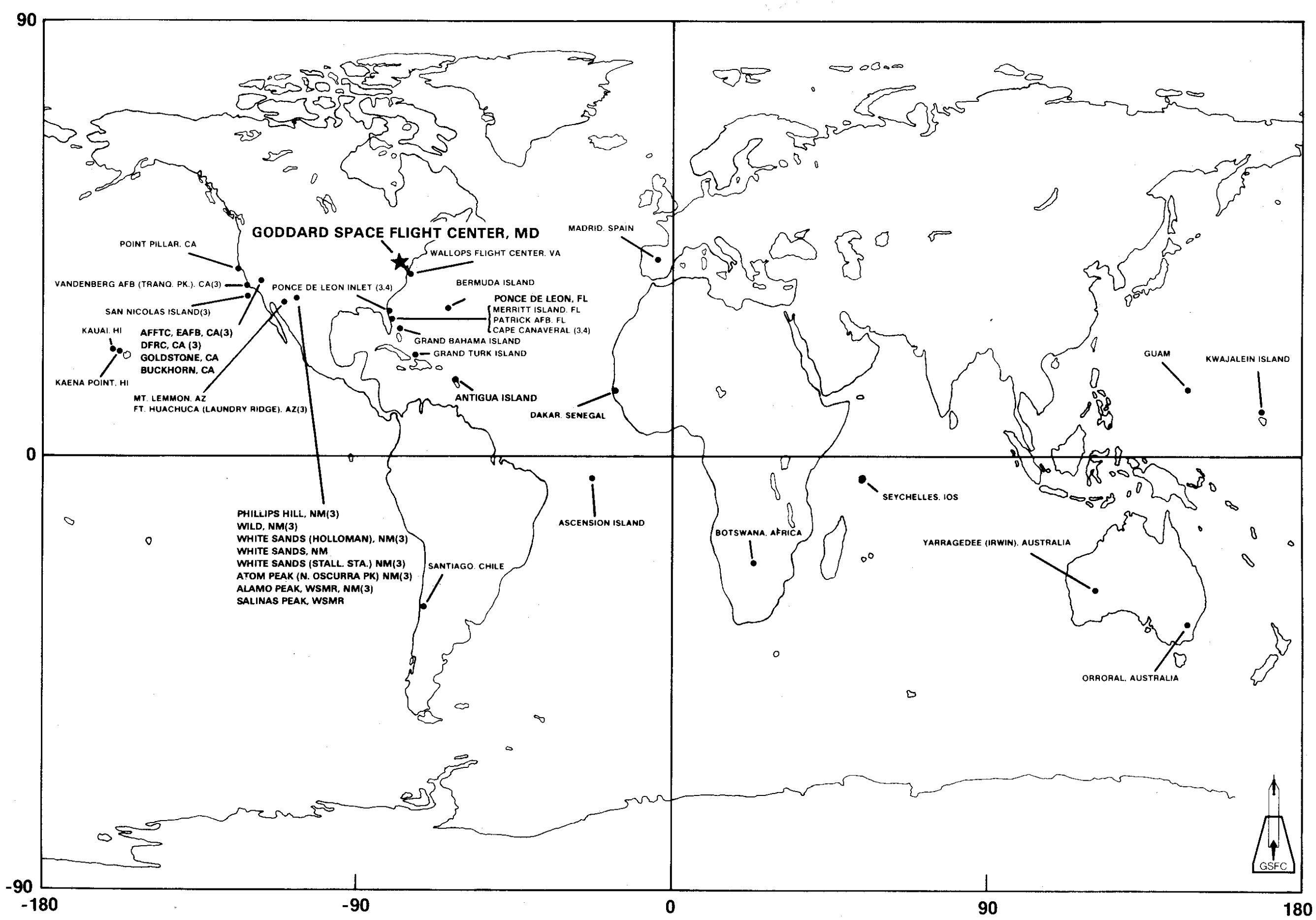
Personnel:

Tracking Stations, 1,110*
Goddard Space Flight Center, 1,400

* More than 500 of which are local residents.

STS-3 FREQUENCIES

Uplink	
2106.4063 MHz	COMMAND VOICE
1831 MHz	AND RANGING
2041.9479 MHz	
296.8 MHz	UHF A/G VOICE
259.4 MHz	
Downlink	
2205.0 MHz	
2217.5 MHz	TELEMETRY
2287.5 MHz	
2250.0 MHz	
296.8 MHz	UHF A/G
259.4 MHz	VOICE



SPACEFLIGHT TRACKING AND DATA NETWORK (STDN)

TV SCHEDULE FOR STS-3

Orbit	Approx MET (dd:hh:mm:ss)	SC	Subject	Downlink Site	CST
2	00/01:35-01:43		GROUND CONTROLLED PLB-TV	MILS	10:35 AM
20	01/04:24-04:31 04:32-04:39	TV01	EEVT	GDS MILS	1:24 PM
33	01/23:36-23:44		PLB-TV OF IECM PAYLOAD DEPLOY	MILS	8:36 AM
34	02/01:06-01:10		VTR PLB-TV OF IECM BERTHING	GDS	10:06 AM
36	02/04:01-04:07 04:11-04:17 04:19-04:27	TV02	VCAP/PDP BEAM SEARCH	HAWS GDS MILS	1:01 PM
50	03/00:50-00:56 00:57-01:03		PLB-TV 25 DEGREE ELBOW VIEWS	GDS MILS	9:50 AM
52	03/03:57-04:03 04:04-04:12		PLB-TV OF 120 DEGREE ELBOW VIEWS	GDS MILS	12:57 AM
54	03/07:05-07:10	TV03	EEVT	GDS	4:05 PM
65	03/23:10-23:18		PDP DEPLOY	MILS	8:10 AM
71	04/08:21-08:24	TV04	VTR OF FORWARD FLIGHT DECK ACTIVITIES	HAWS	5:21 PM
83	05/01:49-01:56 01:59-02:06	TV05	VTR OF CREW EXERCISE	HAWS GDS	10:49 AM
85	05/05:07-05:14 05:16-05:21	TV06	THEODOLITE OPS	GDS MILS	2:07 PM
98	06/00:23-00:29	TV07	WASTE MANAGEMENT OPS	MILS	9:23 AM
99	06/01:38-01:45	TV08	VTR OF PERSONAL HYGIENE	HAWS	10:38 AM

SHUTTLE - STANDARD OFT MENU

Day 1*, 5		**Day 2, 6**		**Day 3,7**		**Day 4,8**	
			Meal A				
Peaches	(T)	Applesauce	(T)	Dried Peaches	(IM)	Dried Apricots	(IM)
Beef Pattie	(R)	Dried Beef	(NF)	Sausage	(R)	Breakfast Roll	(1)(NF)
Scrambled Eggs	(R)	Granola	(R)	Scrambled Eggs	(R)	Granola w/Blueberries	(R)
Bran Flakes	(R)	Breakfast Roll	(I)(NF)	Cornflakes	(R)	Vanilla Inst. Breakfast	(B)
Cocoa	(B)	Chocolate. Instant. Breakfast	(B)	Cocoa	(B)	Grapefruit Drink	(B)
Orange Drink	(B)	Orange-Grapefruit Drink	(B)	Orange--Pineapple Drink	(B)		
			Meal B				
Frankfurters	(T)	Corned Beef	(T)(I)	Ham	(T)	Ground Beef w/Pickle Sauce	(T)
Turkey Tetrazzini	(R)	Asparagus	(R)	Cheese Spread	(T)	Noodles & Chicken	---
Bread (2X)	(I)(NF)	Bread (2X)	(I)(NF)	Bread (2X)	(I)(NF)	Stewed Tomatoes	(T)
Bananas	(FD)	Pears	(T)	Green Beans & Broccoli	(R)	Pears	(FD)
Almond Crunch Bar	(NF)	Peanuts	(NF)	Crushed Pineapple	(T)	Almonds	(NF)
Apple Drink (2X)	(B)	Lemonade (2X)	(B)	Shortbread Cookies	(NF)	Strawberry Drink	(B)
				Cashews	(NF)		
				Tea w/Lemon & Sugar (2X)	(B)		
			Meal C				
Shrimp Cocktail	(R)	Beef w/BBQ Sauce	(T)	Cream of Mushroom Soup	(R)	Tuna	(T)
Beef Steak	(T)(I)	Cauliflower w/ Cheese	(R)	Smoked Turkey	(T)(IM)	Macaroni & Cheese	(R)
Rice Pilaf	(R)	Green Beans w/ Mushrooms	(R)	Mixed Italian Vegetables	(R)	Peas w/Butter Sauce	(R)
Broccoli au Gratin	(R)	Lemon Pudding	(T)	Vanilla Pudding	(T)	Peach Ambrosia	(R)
Fruit Cocktail	(T)	Pecan Cookies	(NF)	Strawberries	(R)	Chocolate Pudding	(T)
Butterscotch Pudding	(T)	Cocoa	(B)	Tropical Punch	(B)	Lemonade	(B)
Grape Drink	(B)						

*Day 1 (launch day) consists of Meal B and C only.

Abbreviations

T = Thermostabilized   I = Irradiated   R= Rehydratable   IM = Intermediate Moisture   FD = Freeze-Dried   NF = Natural Form   B = Beverage (Rehydratable)

STS-3 CREWMEMBERS

S82-25504 -- Official portrait of STS-3 crewmembers Jack R. Lousma (commander), left, and C. Gordon Fullerton (pilot) posing in ejection escape suits (EES) inside the shuttle trainer.

BIOGRAPHICAL DATA

NAME: Jack Robert Lousma (Colonel, USMC) STS-3 Commander NASA Astronaut

BIRTHPLACE AND DATE: Born Feb. 29, 1936, in Grand Rapids, Mich.

PHYSICAL DESCRIPTION: Blond hair; blue eyes; height: 6 feet; weight: 195 pounds.

EDUCATION: Attended Tappan Junior High School and Ann Arbor High School in Ann Arbor, Mich.; received a bachelor of science degree in aeronautical engineering from the University of Michigan in 1959 and the degree of Aeronautical Engineer from the U.S. Naval Postgraduate School in 1965; presented an honorary doctorate of astronautical science from the University of Michigan in 1973.

MARITAL STATUS: Married to the former Gratia Kay Smeltzer of Ann Arbor, Mich. Her mother, Mrs. Steven Bolling, resides in Bear Lake, Mich.

CHILDREN: Timothy J., December 23, 1963; Matthew o., July 14, 1966; Mary T., September 22, 1968; Joseph L., September 14, 1980.

RECREATIONAL INTERESTS: He is a golfing enthusiast and enjoys hunting and fishing.

ORGANIZATION: Fellow of the American Astronautical Society; Member of the Society of the Sigma Xi, the University of Michigan "M" Club, and the officer's Christian Fellowship.

SPECIAL HONORS: Awarded the Johnson Space Center Certificate of Commendation (1970) and the NASA Distinguished Service Medal (1973); presented the Navy Distinguished Service Medal and the Navy Astronaut Wings (1974), the City of Chicago Gold Medal (1974), the Robert J. Collier Trophy for 1973 (1974), the Marine Corps Aviation Association's Exceptional Achievement Award (1974), the Federation Aeronautique Internationale's V.M. Komarov Diploma for 1973 (1974), the Dr. Robert H. Goddard Memorial Trophy for 1975 (1975), the AIAA octave Chanute Award for 1975 (1975). the AAS Flight Achievement Award for 1974 (1975).

EXPERIENCE: Lousma was assigned as a reconnaissance pilot with VMCJ-2, 2nd Marine Air Wing, at Cherry Point, N.C., before coming to Houston and the Lyndon B. Johnson Space Center.

He has been a Marine Corps officer since 1955 and received his wings in 1960 after completing training at the U.S. Naval Air Training Command.

He was then assigned to VMA-224, 2nd Marine Air Wing, as an attack pilot and later served with VMA-224, 1st Marine Air Wing, at Iwakuni, Japan.

He has logged 5,400 hours of flight time -- 3,600 hours in jet aircraft and 240 hours in helicopters.

NASA EXPERIENCE: Colonel Lousma is one of the 19 astronauts selected by NASA in April 1966. He served as a member of the astronaut support crews for the Apollo 9, 10, and 13 missions.

Lousma was pilot for Skylab 3 (SL-3), July 28 to September 25, 1973. With him on this 59 1/2-day flight were Alan L. Bean (spacecraft commander) and Owen K. Garriott (science pilot). SL-3 accomplished 150 percent of many mission goals while completing 858 revolutions of the Earth and traveling some 24,400,000 miles in Earth orbit. The crew installed six replacement rate gyros used for attitude control of the spacecraft and a twin-pole sunshade used for thermal control, and repaired nine major experiment or operational equipment items. They devoted 305 man-hours to extensive solar observations from above the Earth's atmosphere, which included viewing two major solar flares and numerous smaller flares and coronal transients. Also acquired and returned to Earth were 16,000 photographs and 18 miles of magnetic tape documenting Earth resources observations. The crew completed 333 medical experiment performances and obtained valuable data on the effects of extended weightlessness on man. Skylab 3 ended with a Pacific splashdown and recovery by the USS NEW ORLEANS.

The crew of Skylab 3 logged 1,427 hours and 9 minutes each, setting a new world record for single mission, and Lousma also logged 11 hours and 2 minutes in two separate extravehicular activities outside the orbital workshop.

Lousma served as backup docking module pilot of the U.S. flight crew for the Apollo-Soyuz Test Project (ASTP) mission which was completed successfully in July 1975.

CURRENT ASSIGNMENT: Lousma is commander for the third orbital flight of Columbia.

BIOGRAPHICAL DATA

NAME: Charles G. Fullerton (Colonel, USAF) STS-3 Pilot NASA Astronaut

BIRTHPLACE AND DATE: Born Oct. 11, 1936, in Rochester, N.Y. His parents, Mr. and Mrs. Charles R. Fullerton, are residents of Salem, ore.

PHYSICAL DESCRIPTION: Blond hair; blue eyes; height: 6 feet; weight: 165 pounds.

EDUCATION: Graduated from Ulysses S. Grant High School in Portland, ore.; received from the California Institute of Technology bachelor of science and master of science degrees in Mechanical Engineering in 1957 and 1958, respectively.

MARITAL STATUS: Married to the former Marie J. Buettner of Delphos, Ohio. Her parents, Mr. and Mrs. Everett G. Buettner. reside in Delphos. Ohio.

CHILDREN: Molly Marie, June 29, 1973; Andrew Alexander, October 24. 1975.

RECREATIONAL INTERESTS: His hobbies include woodworking and photography, and he also enjoys tennis and racquetball.

ORGANIZATIONS: Member of the Society of Experimental Test Pilots (SETP) and the Tau Beta Pi; honorary member, National WWII Glider Pilots Association.

SPECIAL HONORS: Presented the Air Force Distinguished Flying Cross, the Air Force Commendation Medal, and the Air Force Meritorious Service Medal; the JSC Group Achievement Award (1971, 1974, 1977); the Soaring Society of America's Certificate of Achievement Award (1978); the JSC Special Achievement Award and NASA's Exceptional Service Medal (1978); the General Thomas D. White Space Trophy for 1977 (1978); the SETP's Iven C. Kincheloe Award (1978); the Air Force Association's David C. Schilling Award (1978); the American Astronautical Society's Flight Achievement Award for 1977 (1978); the American Institute of Aeronautics and Astronautics Haley Flight Award for 1980.

EXPERIENCE: Fullerton entered active duty with the Air Force in July 1958 after having worked as a mechanical design engineer for the Hughes Aircraft Company in Culver City, Calif.

He received primary and basic flight training at Bainbridge Air Base, Ga., and Webb Air Force Base, Texas. In September 1959, he went to Perrin Air Force Base, Texas, for F-86 fighter interceptor training and was then assigned from May to December 1960 at McConnell Air Force Base, Kansas, for B-47 combat crew training.

Following completion of this training, he served as a B-47 jet bomber pilot with Strategic Air Command’s 303rd Bomb Wing at Davis Monthan Air Force Base, Ariz.

After graduation in May 1965 from the USAF Aerospace Research Pilot School at Edwards Air Force Base, Calif. he reported to the Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio. He was a test pilot for the bomber operations division at Wright-Patterson when notified of his selection to the USAF Manned orbiting Laboratory Program as a flight crew member.

With over 9,000 hours flying time, he has gained proficiency in the following aircraft: T-33, T-34, T-37, T-38, T-39. F-86. F-104 F-106, 3-47, and KC-135.

NASA EXPERIENCE: Colonel Fullerton became a NASA astronaut in September 1969. He served as a member of the astronaut support crews for the Apollo 14 and 17 missions.

Fullerton a was member of one of the two two-man crews who piloted Space Shuttle approach and landing test flights during the period June through October 1977. This series of critical orbiter flight tests initially involved Boeing 747/orbiter captive-active flights, followed by air-launched, unpowered glide, approach, and landing tests (free flights). There were three captive mated tests with the orbiter "Enterprise" carried atop the Boeing 747 carrier aircraft, allowing inflight test and checkout of flight controls and orbiter subsystems, and five free flights which permitted extensive evaluations of the orbiter's subsonic flying qualities and performance characteristics during separation, up and away flight, flare, landing, and rollout -- providing valuable real-time data duplicating the last few minutes of an operational Shuttle mission.

CURRENT ASSIGNMENT: Colonel Fullerton is pilot for the third orbital flight of Columbia.

SPACE SHUTTLE PROGRAM MANAGEMENT

NASA Headquarters

James M. Beggs	Administrator
Dr. Hans Mark	Deputy Administrator
Maj. General J. A. Abrahamson	Associate Administrator for Space Transportation Systems
L. Michael Weeks	Deputy Associate Administrator for Space Transportation Systems
David R. Braunstein	Deputy Associate Administrator for Space Transportation Systems (Management)
Walter F. Dankoff	Director, Engine Programs
Edward P. Andrews	Director, Ground Systems and Flight Test
Frank Van Rensselear	Director, Upper Stage
Jerry J. Fitts	Director, Solid Rocket Booster and External Tank
Robert E. Smylie	Associate Administrator for Space Tracking and Data Systems

Johnson Space Center

Christopher C. Kraft Jr.	Director
Clifford E. Charlesworth	Deputy Director
Glynn S. Lunney	Manager, Space Shuttle Program
Donald K. "Deke" Slayton	Manager, Orbital Flight Test
Aaron Cohen	Manager, Space Shuttle Orbiter Project Office
George W. S. Abbey	Director of Flight Operations
Robert O. Piland	Director of Engineering and Development
Lynwood C. Dunseith	Director of Data Systems and Analysis

Kennedy Space Center

Richard G. Smith	Director
Dr. Robert H. Gray	Manager, Shuttle Projects Office
John J. Neilon	Manager, Cargo Projects
George F. Page	Director, Shuttle Operations
Thomas S. Walton	Manager, Cargo Operations

Marshall Space Flight Center

Dr. William R. Lucas	Director
Thomas J. Lee	Deputy Director
Robert E. Lindstrom	Manager, MSFC Shuttle Projects Office
James E. Kingsbury	Director, Science and Engineering Directorate
James B. Odom	Manager, External Tank Project
George B. Hardy	Manager, Solid Rocket Booster Project
James R. Thompson Jr.	Manager, Space Shuttle Main Engine Project
James M. Sisson	Manager, Engineering and Major Test Management office

Dryden Flight Research Center

John A. Manke	Facility Manager
Gary Layton	Shuttle Project Manager

Goddard Space Flight Center

A. Thomas Young	Director
Dr. John H. McElroy	Deputy Director
Richard S. Sade	Director of Networks Directorate Space Tracking and Data Network
Walter LaFleur	Deputy Director of Networks Directorate (STDN)
William B. Dickinson	Division Chief, NASA Communications Network
Donald D. Wilson	Chief, NASA Communications Network
Daniel Spintman	Chief, Network Operations Division
James M. Stevens	Shuttle Network Support Manager

ABBREVIATIONS/ACRONYMS

AA	Accelerometer Assembly, Angular Accelerometer
A/A	Air-to-Air
ACCEL	Accelerometer
ACCU	Audio Center Control Unit
ACIP	Aerodynamic Coefficients Identification Package
ACN	Ascension Island (STDN site)
ADI	Attitude Directional Indicator
AGO	Santiago, Chile (STDN site)
ANG	Angle
ANT	Antenna
AOA	Abort Once Around
AOS	Acquisition of Signal
APU	Auxiliary Power Unit
ATO	Abort to orbit
AUD	Audio
AUTO	Automatic
BDA	Bermuda Island (STDN site)
BOT	Botswana (STDN site)
BRT	Bright
BUC	Buckhorn, Calif. (STDN site)
CAL	Calibration
CAMR	Camera
CCTV	Close Circuit Television
CCU	Crewman Communications Umbilical
CDR	Commander
CNSL	Console
CNTLR	Controller
C/O	Checkout
COAS	Crewman optical Alignment Sight
CONT	Continuous
CRT	Cathode Ray Tube
CRT	Center
C/W	Caution and Warning
DAP	Digital Auto Pilot
DB	Deadband
DFI	Development Flight Instrumentation
DISC	Discrete
DKR	Dakar, Senegal (STDN site)
DTO	Detailed Test objective
ECLS	Environmental Control Life Support
ESW	Edwards AFB, Calif. (Deorbit optional site)
EES	Emergency Ejection Suits
EET	Entry Elapsed Time
EI	Entry/Interface
ET	External Tank
FCS	Flight Control System
FDF	Flight Data File
FM	Frequency Modulation
FRD	Flight Requirements Document
FSO	Functional Supplementary Objective
FTO	Functional Test Objective
GDS	Goldstone, Calif. (STDN site, 1st antenna)

ABBREVIATIONS/ACRONYMS (continued)

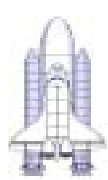
GDX	Goldstone, Calif. (STDN site, 2nd antenna)
GLRSHLD	Glareshield
GMT	Greenwich Mean Time
GNC	Guidance Navigation and Control
GPC	General Purpose Computer
GWM	Guam Island, U.S. (STDN site)
HAW	Hawaii (Kauai, STDN site)
HIC	Hickam AFB, Hawaii (Deorbit optional site)
HTR	Heater
IECM	Induced Environmental Contamination Monitor
IMU	Inertial Measurement Unit
INRTL	Inertial
IOS	Indian Ocean Station (STDN site)
ITS	Interim Teleprinter System
KAD	Kadena AB, Ryukyu Islands (Deorbit optional site)
KSC	Kennedy Space Center, Fla. (Deorbit optional site)
L	Left
LH2	Liquid Hydrogen
LON	Longitude
LOS	Loss of Signal
LOX	Liquid Oxygen
LTG	Lighting
LVLH	Local Vertical Local Horizontal
MAD	Madrid, Spain (STDN site, 1st antenna)
MAN	Manual
MAX	Madrid, Spain (STDN site, 2nd antenna)
MECO	Main Engine Cutoff
MET	Mission Elapsed Time
MIL	Merritt Island, Fla. (STDN site, 1st antenna)
MLX	Merritt Island, Fla. (STDN site, 2nd antenna)
MNVR	Maneuver
NOR	Northrup FLT Strip, N.M. (Deorbit optional site)
NOZ	Nozzle
O2	Oxygen
OF	Operational Flight Instrumentation
OI	Operational Instrumentation
OMS	Orbital Maneuvering System
OPR	Operator
OPS	Operations, Operational Sequence
ORB	Orbiter
ORR	Orroral Valley, Australia (STDN site)
OVHD	Overhead
PA	Power Amplifier
PCM	Pulse-Code Modulation
PL	Payload
PLBD	Payload Bay Doors
PLT	Pilot
PM	Phase Modulation
PMC	Private Medical Communication
PNL	Panel
POS	Position
PRO	Proceed

ABBREVIATIONS/ACRONYMS (continued)

PTC	Passive Thermal Control
PWR	Power
QTY	Quantity
QUI	Quito, Ecuador (STDN site)
R	Right
RCDR	Recorder
RCS	Reaction Control System
REF	Reference
REFSMMAT	Reference Stable Member Matrix
RELMAT	Relative Matrix
RGA	Rate Gyro Assembly
ROS	Regulated Oxygen System
ROT	Rota, Spain (Deorbit optional site); Rotation
RT	Rotation Discrete Rate
SA	South Atlantic Anomaly
SEL	Select
SEP	Separation
SGLS	Space Ground Link System
SPKR	Speaker
SPLY	Supply
SV	State Vector
SYS	Systems
TB	Talkback
TDRS	Tracking and Data Relay Satellite
TK	Tank
T/L	Timeline
TRKR	Tracker
TUL	Tula Peak, N.M. (STDN site)
TV	Television
UHF	Ultra High Frequency
VAC	Vacuum
VLV	Valve
VTR	Video Tape Recorder
WCS	Waste Collection System
WIN	Yarragadee, Australia (STDN site)
WMC	Waste Management Compartment
XFER	Transfer
X-POP	X Body Axis Perpendicular to orbit Plane
Y-POP	Y Body Axis Perpendicular to orbit Plane
-ZLV	-Z Local Vertical (-Z body axis towards Earth)

SHUTTLE FLIGHTS AS OF MARCH 1982

2 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM



STS-2 11/12/81 – 11/14/81
STS-1 04/12/81 - 04/14/81

OV-102
Columbia
(2 flights)