

STS 51-B National Space Transportation Systems Program Mission Report

June 1985



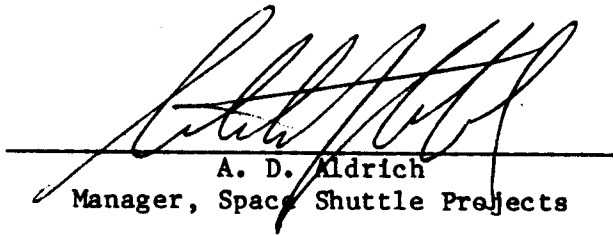
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Space Administration

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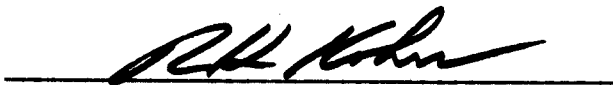
STS 51-B
NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM
MISSION REPORT



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INTRODUCTION AND MISSION OBJECTIVES

The STS 51-B National STS (Space Transportation Systems) Program Mission Report contains a summary of the major activities and accomplishments of the seventeenth Space Shuttle flight and the seventh flight of the OV-099 vehicle, Challenger. The problem tracking list is presented to provide a complete list of all Orbiter problems that occurred.

The primary objectives of the STS 51-B flight were to carry out the assigned Spacelab 3 scientific activities and to deploy the Northern Utah State Satellite (NUSAT) and the Global Low Orbit Message Relay (GLOMR) Satellite. The sequence of events for this flight are shown in table I. The problem tracking list for the Orbiter is presented in tables II.

MISSION SUMMARY

The STS 51-B mission, the seventh for the OV-099 vehicle, Challenger, was launched on April 29, 1985. The final countdown proceeded smoothly until T-4 minutes when a failure of a front end processor in the LPS (launch processing system) caused a 2-minute 18-second hold. This failure resulted in the liquid oxygen facility replenish valve and liquid oxygen vent valve not automatically closing as scheduled. The valves were manually positioned during the hold, initiating liquid oxygen drainback. The countdown, once reinitiated, resulted in a lift-off at 119:16:02:18 G.m.t. (11:02:18 a.m., e.d.t.) from Launch Complex 39A at KSC (Kennedy Space Center) on April 29, 1985. The mission was successfully concluded with a landing at Edwards Air Force Base, California, at 126:16:12:03 G.m.t., on May 6, 1985.

The crew for this seventeenth flight of the Space Shuttle and second flight of Spacelab were Robert F. Overmyer, Col., U. S. Marine Corp., Commander; Frederick D. Gregory, Col., U. S. Air Force, Pilot; Don L. Lind, Ph.D., Norman E. Thagard, M.D., and William E. Thornton, M.D., Mission Specialists; Lodewijk van den Berg, Ph.D., and Taylor Wang, Ph.D., Payload Specialists.

The ascent phase was nominal in all respects. The SRB (solid rocket booster) head pressures were at, or slightly above, predicted values. All other SRB performance parameters were within expected limits. SRB separation was commanded 0.1-second early and all recovery systems worked properly.

All main engine and main propulsion system performance parameters were nominal. MECO (main engine cut-off) occurred within 1 second of the predicted time. Following two satisfactory OMS (orbital maneuvering system) maneuvers, the Orbiter was placed in the planned 190-nmi. circular orbit, having an inclination of 57 degrees.

The first day's activities consisted of opening the payload bay doors, deploying the NUSAT satellite, and attempting to deploy the GLOMR satellite. An anomaly occurred to the canister door for the GLOMR satellite, preventing this satellite from being deployed. Other activities of the first day included activating the Spacelab and initializing performance of many of the Spacelab experiments. These experiments were divided into four broad disciplines and are as follows:

1. Materials Processing
 - a. Fluid Experiment System
 - b. Vapor Crystal Growth
 - c. Mercury Iodide Crystal Growth
2. Environmental Observation
 - a. Atmospheric Trace Molecules Spectroscopy
 - b. Very Wide Field Camera
3. Fluid Mechanics
 - a. Geophysical Fluid Flow Cell
4. Life Sciences
 - a. Ames Research Center
 - b. Urine Monitoring Investigation
 - c. Autogenic Feedback Training

The crew was divided into two teams, each working a 12-hour shift. Thus, the Spacelab was operated 24 hours a day throughout the 7-day mission.

The VWFC (Very Wide Field Camera) experiment was discontinued on the second day. Except for this operation, the experiment activities for day 2 were a repeat of the first day. Additionally, an Auroral Imaging Experiment in the Environmental Observation discipline and the Drop Dynamic Module experiment in the Fluid Mechanics discipline were performed.

The day 3 experiment activities again were a repeat of those conducted on day 2 with one addition - Ionization of Solar and Galactic Cosmic Ray Heavy Nuclei - in the Environmental Observation discipline.

Day 4 experiment activities were a repeat of day 3 in their entirety. Day 5 was a repeat of day 4 except the Autogenic Feedback Training Experiment was ended.

Day 6 was a repeat of day 5 except the Geophysical Fluid Flow Cell Experiment was ended. The gravity gradient attitude selected for this mission allowed the RCS (reaction control system) propellants in the OMS pods to cool and created a potential for unstable combustion (zots). As a result, it was necessary on flight day 6 to change the gravity gradient attitude to warm the propellants. This change minimally impacted four Spacelab experiments and caused some minor rescheduling of experiment activities.

All experiment activities were ended early on the seventh day and the deactivation of the Spacelab was completed 5 hours prior to entry. All stowage activities were also completed on schedule as well as the closure of the payload bay doors. The 264-second deorbit maneuver was initiated at 126:15:04:48 G.m.t.

TABLE I.- STS 51-B SEQUENCE OF EVENTS

<u>Event</u>	<u>Actual time, G.m.t.</u>
APU activation (1)	119:15:55:08
(2)	119:15:55:09
(3)	119:15:55:10
SRB HPU activation command (LH-A2)	119:16:01:47.4
MPS start command sequence (engine 3)	119:16:02:11.4
SRB ignition command from GPC (lift-off)	119:16:02:18
MPS throttle-down to 94 percent (engine 3)	119:16:02:36.8
MPS throttle-down to 65 percent (engine 3)	119:16:02:45.5
Maximum dynamic pressure	119:16:03:09
MPS throttle-up to 104 percent (engine 3)	119:16:03:18.6
SRB separation command from GPC	119:16:04:24
MPS throttle-down for 3g acceleration (engine 3)	119:16:09:50.6
3g acceleration	119:16:09:51
Main engine cutoff (MECO)	119:16:10:53
External tank separation	119:16:11:11
OMS 1 ignition	119:16:12:53
OMS 1 cutoff	119:16:15:07
OMS 2 ignition	119:16:48:33
OMS 2 cutoff	119:16:50:58
NUSAT deploy	119:20:17:00
Flight control system checkout - APU 2 start	126:01:04:17
APU 2 shutdown	126:01:08:40
APU 1 activation	126:14:59:51
Deorbit maneuver ignition	126:15:04:48
Deorbit maneuver cutoff	126:15:09:12
APU activation (2)	126:15:26:59
(3)	126:15:26:59
Entry interface	126:15:40:04
End blackout	126:15:54:44
Terminal area energy management (TAEM)	126:16:04:42
Main landing gear contact	126:16:11:04
Nose landing gear contact	126:16:11:16
Wheels stop	126:16:12:03
APU deactivation complete (3)	126:16:24:52

The entry was normal in all respects except no PTI (programmed test input) maneuvers were performed because of the conditions existing with the payload bay door latches. After completing the 193-degree HAC (heading alignment circle) turn angle, the Orbiter was guided to a landing on runway 17 at Edwards AFB, CA. Rollout required 8,317 feet during the 59-second duration. An inspection of the Orbiter after landing showed the vehicle to be in good condition with only insignificant damage to the thermal protection system tiles.

Fifteen of the 17 DTO/DSO's (detailed test objectives/detailed supplemental objectives) were completed during the STS 51-B mission. Because of the payload bay door latch anomaly, the entry aerodynamic test was not performed so that the aerodynamic loads on the payload bay doors were reduced. Also, the scientific airlock latch handle anomaly prevented measurements of the scientific airlock latch force.

VEHICLE ASSESSMENT

SOLID ROCKET BOOSTERS

All SRB systems performed as expected. Performance of both SRM's (solid rocket motors) was close to predicted values, and well within the allowed envelopes. The average head pressure, web time, burn time, and action time parameters were all well within predicted limits. Preliminary data indicate that the SRB separations occurred at the predicted time. The SRB recovery system performed nominally, and both SRB's were reported to be floating in the normal mode with signals being received from both beacons.

EXTERNAL TANK

All ET (external tank) systems and instrumentation performed as expected. There were no ET preflight or ascent phase anomalies.

SPACE SHUTTLE MAIN ENGINE

All SSME (Space Shuttle main engine) parameters appeared to be normal during the prelaunch countdown and compared well with prelaunch parameters that were observed on previous Challenger flights. SSME performance at start, mainstage, and shutdown looked very good.

During the propellant dump, a power-loss failure on ME (main engine) 2 (Channel B) was reported. Also, a MOV (main oxidizer valve) actuator (Channel B) failure occurred on ME-3 during the propellant dump.

MAIN PROPULSION SYSTEM

Overall performance of the MPS (main propulsion system) was excellent. Liquid oxygen and liquid hydrogen loading was accomplished as planned.

During liquid hydrogen swing-arm retraction, the swing-arm missed the catch and hit hard enough to break the liquid hydrogen vent line. This caused a liquid hydrogen fire on the facility that is being investigated at this time.

During propellant loading, a hydrogen leak occurred at the GUCP (ground umbilical carrier plate). Hydrogen concentrations as high as 12000 ppm were observed for a short time while the valve was open. The valve was cycled and no further evidence of leakage was seen.

Liquid oxygen drainback was not initiated as planned at T-5 minutes. Due to failure of a front-end processor at the LPS (launch processing system), the liquid oxygen facility replenish valve did not close as scheduled, nor did the ET liquid oxygen vent valve. This caused a short hold to be initiated at T-4 minutes. During the hold the valves were manually positioned, initiating liquid oxygen drainback. Resumption of the count was then delayed approximately 1 additional minute to achieve a total liquid oxygen drainback of 5 minutes. This problem is being further investigated.

Ascent performance appeared to be normal. Orbiter main engine 2 gaseous hydrogen pressurant-supply pressure failed at approximately T+6 minutes. This problem did not affect performance.

ORBITER

At lift-off, the right ET door open indication B was lost. Later, when the ET doors were closed, motor B did not operate. Motor A closed the door in single motor time.

On orbit, the crew reported a protrusion from the thermal protection system at about the center of the right OMS pod. The protrusion was viewed by television and determined not to be a flight-safety issue. On flight day 3, MMCA (mid motor control assembly)-2 operations status 5 (V76X2225E) indicated zero. Power was cycled on MMCA-2, but the status bit did not reset. During payload bay door closure, no latch A or B latched indication was received on the port-aft door latches. All release and ready-to-latch indications were received. The crew reported that from visual indications the port-aft latches were in the latched position. The planned PTI maneuvers were deleted from the entry profile to minimize the aerodynamic loading on the payload bay door latches. None of the problems had any impact on the overall accomplishments of the mission.

SPACELAB

Power was applied to Spacelab 3 at approximately 4:56 a.m., c.d.t. on April 28, 1985. Main bus voltage was a nominal 29.2 volts dc at that time. Spacelab was partially activated during prelaunch to accommodate the RAHF (Research Animal Holding Facilities) and fire detection during the launch and ascent phase of flight. The animal loading was completed and the access equipment removed at 1:31 p.m., c.d.t.

Performance of the systems monitored by Spacelab 3 indicated nominal operations during ascent. The Spacelab water-flow sensor indicated fluctuations in the water flow. These fluctuations were expected, and are attributed to the temperature sensitivity of the sensor, coupled with warm freon flow from the Orbiter. These same fluctuations were observed on Spacelab 1. The water differential-pressure measurement remained constant during the fluctuations, indicating constant flow.

During the mission, virtually all scientific objectives were met, and several experiments were able to gain additional data beyond their mission expectations. It is estimated that more than 250 billion bits of data were obtained from all instruments combined, and more than 3 million video images were recorded. Although it will take several months to analyze the data from the 7-day mission, preliminary indications are that Spacelab 3 will produce a number of major discoveries.

The mission demonstrated the capabilities of Spacelab for multi-disciplinary research in microgravity. Once again, air-to-ground teamwork between the crew, the principal investigators, and the ground support teams culminated in a successful flight. Excellent data flow and downlink video contributed substantially to the enhancement of scientific research.

This mission was particularly successful in providing a high-quality microgravity environment. The gravity-gradient attitude of the Shuttle proved to be quite stable and conducive to the performance of delicate experiments in materials science and fluid mechanics. Important work was also accomplished in the disciplines of life sciences and atmospheric observations.

Of the 15 investigations in four scientific disciplines, all but the Very Wide Field Camera experiment met their primary objectives. The handle on the SAL (Scientific Air lock) was bent and airlock operations could not be completed. This anomaly resulted in the loss of VWFC activities for the mission.

A final postmission report is in preparation by the Marshall Space Flight Center and should be available in the near future.

FLUID EXPERIMENT SYSTEM

During the first flight of this new FES (fluid experiment system) facility, two TGS (triglycine sulfate) crystals were successfully grown in space from a liquid. The solution growth process was recorded by Schlieren video imaging and by a laser holographic system that will render 3-dimensional images. For the first time, scientists were able to see in detail the crystal growth process and to determine the differences between crystal growth on the ground and growth in microgravity where convection effects are negligible. Visual observations by the crew provided invaluable real-time descriptions of the crystal and aided investigators on the ground as they made decisions to control the progress of the investigation.

The resultant crystals will undergo thorough postflight analysis to ascertain their quality and their properties as sensitive infrared detectors. Potential applications of improved TGS crystals include detectors for astronomical telescopes, Earth observation cameras, military systems, and various other kinds of infrared monitors. In addition to their infrared sensitivity, detectors made of TGS crystals can operate at room temperature, a salient technological advantage over other detectors which require cryogenic cooling for high performance.

VAPOR CRYSTAL GROWTH SYSTEM

A mercury iodide crystal measuring 14mm x 8mm x 7mm, about the size of a sugar cube, was successfully grown from a seed crystal 20 times smaller in this new VCGS (vapor crystal growth system) facility by a vapor transport process. The crystal was grown at a carefully controlled rate that varied from 1mm to 3mm per day over a 104-hour growth period. Downlink video and crew reports of visual observations were major benefits to investigators on the ground, who were able to follow the course of the investigation in detail.

The sample mercury iodide crystal produced in the VCGS will be analyzed and evaluated to determine its quality and properties as an X-ray and gamma ray detector for applications in scientific research, medicine, and industry.

Crystals grown in a microgravity environment, without the interference of gravity-driven convection, are expected to be more uniform and, thus, to have improved performance as detector materials.

MERCURY IODIDE CRYSTAL GROWTH

The MICG (Mercury Iodide Crystal Growth) experiment was a reflight of a Spacelab 1 experiment, with modifications as a result of data gained on the first mission. Six cartridges of mercury iodide material without seed crystals, each having different growth conditions, were processed for 70 hours at a time. Postflight analysis of the resultant crystals will yield important new data about the nucleation process in a microgravity environment.

DROP DYNAMICS MODULE

After initial start-up difficulties, the DDM (Drop Dynamics Module) facility underwent inflight maintenance and operated successfully for exploratory research in the behavior of free-floating fluid drops. For the first time, a principal investigator operated and repaired his own experiment in space as a Spacelab crew member. Close interaction between the crew and ground teams, as well as overtime work by the principal investigator/payload specialist, resulted in the recovery of this investigation facility and the accomplishment of virtually all the intended research, despite the delayed start.

Spacelab 3 verified the performance of this unique facility and provided unprecedented data on the fundamental behavior of fluids in microgravity. For the first time, both solid and liquid samples were acoustically positioned and manipulated in weightlessness; drops of various sizes and viscosities were formed, rotated, and oscillated; and compound drops (drop within a drop) were studied.

GEOPHYSICAL FLUID FLOW CELL

The purpose of the GFFC (Geophysical Fluid Flow Cell) investigation was to study fluid motions in microgravity as a means of understanding convection on the Sun, in planetary atmospheres, in Earth's oceans, and in basic fluid physics. Meteorologists and astrophysicists are interested in the large-scale circulations of fluids under the influence of rotation, gravity, and heating.

The unique GFFC facility, which models various fluid motion and temperature scenarios, operated excellently; all planned scenarios were performed during an 84-hour period, and a bonus of 13 unscheduled scenarios in 18 hours of extra operations was gained. These pioneering experiments, the first laboratory experiments of convection in spherical rotating shells with a radical gravity field, were preprogrammed and monitored by the Spacelab 3 crew. Approximately 46,000 images were recorded on film for postflight analysis.

AMES RESEARCH CENTER LIFE SCIENCES PAYLOAD

The ARCLSP (Ames Research Center Life Sciences Payload) consisted of 2 RAHF's (1 housing 24 rodents, the other housing 2 primates), a biotelemetry system, and a dynamic environment measurement system. The purpose of the Spacelab 3 ARCLSP investigations was to perform an engineering verification of the new equipment in preparation for further life science research on future missions.

The Spacelab 3 mission successfully demonstrated that the new facilities provide a suitable animal habitat. There were some initial difficulties with containment of food and waste particles, but the workarround procedures minimized the problem. Refinements to the design are necessary before reflight. Performance of the food, water, and activity monitors was satisfactory and provided good engineering data about the activity, as well as the status, of the animals. Acceleration data from the RAHF environment during launch and entry were tape recorded and will be available for postflight analysis.

AUTOGENIC FEEDBACK TRAINING

The purpose of the AFT (Autogenic Feedback Training) investigation was to obtain physiological measurements of the nature of space adaptation syndrome for assessments of the severity and frequency of symptoms. Four members of the crew participated, two as treatment subjects and two as controls. Crew members wore the equipment and performed scheduled diagnostic and maintenance procedures. In general, the hardware performed nominally and did not interfere with other crew activities. Reports of symptoms and actual use of the techniques will be obtained during the postflight crew debriefings.

Information obtained on Spacelab 3 and other missions will be used to evaluate the autogenic feedback techniques for controlling symptoms. These data may prove useful in enhancing the comfort and efficiency of crew members. In addition, they provide insight into the physiological effects of crew workload, behavioral responses to environmental stress, and circadian effects on physiology. This baseline information is important in planning for long duration human habitation in a permanent Space Station as well as for short-term, high-productivity flights on the Space Shuttle.

URINE MONITORING SYSTEM

The primary objective of the UMS (Urine Monitoring System) investigation, an engineering checkout of a new facility to collect and measure urine samples, was met despite some early difficulty in actually using the system for urine collection. All planned calibrations and dead volume measurements were performed, but urine samples were collected only for 1 crewman rather than 2 as planned.

The UMS will be an essential part of future life sciences payloads to support studies of fluid electrolyte regulation, endocrine responses, and protein and calcium metabolism in the microgravity environment. These physiological functions are of interest for understanding space adaptation syndrome and basic body chemistry. Information gained on the Spacelab 3 mission will be valuable for assessing hardware design and crew procedures.

STUDIES OF THE IONIZATION OF COSMIC RAY NUCLEI

The IONS (Ionization of Cosmic Ray Nuclei) detector, mounted outside the Spacelab 3 module for direct exposure to space, successfully operated to collect data on high energy particles streaming toward Earth from the Sun and more distant sources elsewhere in the galaxy. This investigation is a refinement of a less sophisticated one originally flown on Skylab in 1973. Tracks in the detector will be analyzed postflight to identify the cosmic rays and determine their ionization state, intensity, energy spectrum, arrival time, and direction. Initially, the instrument did not respond to commands to rotate the detector stack; however, after an inflight maintenance procedure, the instrument operated nominally. Despite the delay in starting, the investigation accomplished about 2/3 of its operational timeline.

VERY WIDE FIELD CAMERA

The VWFC operated nominally, but activities were discontinued when the bent latch handle on the scientific airlock precluded further airlock operations. Ground teams assessed the airlock malfunction, and determined that inflight maintenance was inappropriate.

During the initial extension into space, the camera acquired its first target and a very brief 1-minute exposure was made. However, the 5 subsequent operations, with exposure times ranging from 6 to 16 minutes, had to be suspended. Consequently, this investigation did not meet its objectives, and it was not able to continue the ultraviolet survey of the sky begun on the Spacelab 1 mission.

AURORAL IMAGING EXPERIMENT

Of the 21 scheduled opportunities for auroral observations, 18 were accomplished, with auroras clearly visible on each observation. This mission marked the first time since Skylab that auroral observations have been made on a manned U. S. spaceflight and the first time ever that a manned American space vehicle has passed directly through an aurora (3 such passages occurred). The resultant data are the most complete set of auroral images yet from a manned mission.

The orbital inclination and vehicle attitude of the Spacelab 3 mission were especially favorable for viewing auroras, and Nature obliged with a show of great variety. The aurora passes covered the evening, midnight, and morning sectors of the South Pole auroral oval and occurred during different levels of geomagnetic activity. More than a half million video images were recorded, as well as an undetermined number of 35mm exposures. The video tapes will be processed postflight to construct three-dimensional images of auroral structure and motion.

The investigation demonstrated the use of standard orbiter equipment for scientific research; no experiment-unique hardware was required to collect the wealth of information.

ATMOSPHERIC TRACE MOLECULES SPECTROSCOPY

Although the ATMOS (Atmospheric Trace Molecules Spectroscopy) instrument was deactivated earlier than planned when a pressure leak disabled its laser, the investigation was one of the most successful of the Spacelab 3 mission. In 19 3-minute operations ATMOS made 150 independent atmospheric spectra, each of which contains at least 100,000 individual spectral measurements. The total harvest of data is estimated to be more than 300 million measurements of the atmosphere at altitudes from 10 to 150 km. Furthermore, during 5 solar calibrations, detailed infrared spectra of the Sun were obtained.

The ATMOS spectra will be used to characterize the physical and chemical properties of the Earth's atmosphere. The data will provide a detailed inventory of the minor and trace molecular contents of the stratosphere and mesosphere.

TABLE II.- ORBITER PROBLEM TRACKING LIST

JSC OV-099 STS 51-B PROBLEM TRACKING LIST

JUNE 21, 1985

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
1	WATER SPRAY BOILER 3 CONTROLLER A INOPERATIVE.	119:16:12	AT 119:16:11:33, BFS FAULT 1 INDICATED SM2 APU TEMP 3. CREW SWITCHED TO CONTROLLER B. TEMPERATURE STARTED TO COOL AND APU 3 WAS SHUT OFF. LUBE OIL TEMP REACHED 335 DEG F, LIMIT IS 355 DEG F. R&R CONTROLLER A AT KSC.	D. HAINES CAR 24F013 CLOSED 05/29/85
2	RIGHT ET DOOR MOTOR B INOPERATIVE.	119:16:21	AT LIFTOFF, RIGHT ET DOOR B OPEN INDICATION (V56X4015X) WAS LOST. AT ET DOOR CLOSURE, B CLOSED INDICATOR WAS NOT RECEIVED. BOTH A AND B INDICATED LATCHED. DOOR CLOSED IN SINGLE MOTOR DRIVE TIME. CONNECTOR 50P884/J2 FOUND DEMATED AND WITH A WEAK SPRING. REPLACED CABLE HALF AND RETESTED. PROCEDURES CHANGED.	R. BALCIUNAS CAR 24F009 CLOSED 06/14/85
3	INSTRUMENTATION:			CLOSED 06/05/85
A	SSME 2 CH2 OUTLET PRESSURE (V41P1260A) FAILED.	119:16:07:17	READ OFF-SCALE HIGH A FEW MINUTES BEFORE MECO. R&R AT KSC.	P. COTA CAR 24F002
B	HYDRAULIC SYSTEM 2 MAIN PUMP PRESSURE B (V58P0215C) BIASED LOW.	119:16:02	READ ABOUT 80-PSI LOW. MEASUREMENT SCALED FROM 0 TO 4000 PSI. BIAS WITHIN SPEC. FLY AS IS.	D. HAINES
4	ABORT ADVISORY LIGHT MALFUNCTIONED AND LENS WAS CRACKED.	119:10:19	THE ABORT LIGHT DID NOT GO DIM WHEN ABORT A COMMAND WAS REMOVED. CREW REPORTED LEXAN LIGHT COVER WAS CRACKED. LIGHTS OPERATED AT KSC. CHANGE CHECKOUT PROCEDURE. R&R LIGHT ASSEMBLY.	R. BURGHDOFF CLOSED 06/05/85
5	SYSTEMS MANAGEMENT ONBOARD DISPLAY DATA EXHIBITED ERRATIC VALUES.	119:17:32	FIRST NOTED WHEN SPEC 67 AND 69 DISPLAYED ERRATIC FUEL CELL DATA. TELEMETRY DATA WAS NORMAL. UPLINKED G-MEM PATCH CORRECTED THE PROBLEM. TWO SPACELAB POWER PARAMETER FDA LIMITS OVERLAYED TWICE THE AREA ALLOCATED IN DATA TABLE. SOFTWARE UNIQUE FOR STS 51-B. SOFTWARE DR.	W. C. YOUNG CLOSED 06/19/85

TABLE II.- OKBITEK PROBLEM TRACKING LIST (Cont'd)

JSC OV-099 STS 51-B PROBLEM TRACKING LIST

JUNE 21, 1985

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
6	RIGHT OMS POD THERMAL PROTECTION SYSTEM PROTRUSION.	119:17:27	PROTRUSION FROM ABOUT CENTER OF RIGHT OMS POD. A 6 BY 16 INCH AREA ON CARRIER PANEL Y WEBB DOOR WAS LAID BACK AFTER PULLING THROUGH A FASTENER. REPAIR IN PLACE. REPAIRED NEW PANEL ON OV-103 LEFT POD.	J. SMITH CAR 24F001 CLOSED 06/19/85
7	GALLEY DID NOT DISPENSE WATER.	119:19:02	GALLEY WORKED AFTER CREW BANGED ON DOOR AND SIDE. DID NOT DISPENSE HOT OR COLD WATER AT KSC. PROBABLE INTERMITTENT IN CONTROL PANEL MICRO-PROCESSOR. R&R AT KSC. FIAR.	R. TRAVANINO HEN 0050F CLOSED 06/14/85
8	APU 3 SEAL CAVITY DRAIN LINE HEATER 3A FAILED.	120:13:26	HEATER FAILED TO CYCLE BACK ON AT ABOUT 60 DEG F (V46T0386A). SWITCHED TO HEATER 3B, CYCLED NORMALLY. R&R THERMOSTAT S132A AT KSC.	W. SCOTT CAR 24F012 CLOSED 05/29/85
9	SMOKE DETECTOR IN AVIONICS BAY 2A FAILED SELF TEST.	119:19:42 120:13:10	THE 2B ALARM WORKED, BUT THE 2A ALARM FAILED. TEST REPEATED HOLDING BUTTON IN FOR 60 SECONDS, 2A ALARM FAILED AGAIN. R&R AT KSC.	H. ROTTER CAR 24F004 CLOSED 05/29/85
10	RIGHT RCS THRUSTER R4D INJECTOR HEATER FAILED.	120:10:02	INJECTOR HEATER DID NOT CYCLE UNTIL AFTER HOT FIRE. HEATER CYCLE WAS OFF NOMINAL. DID NOT DRAIN AND PULSE PURGE RIGHT MANIFOLD 4 OX AND FUEL AT DRYDEN. NO LEAK DURING FERRY OR AT KSC. HEATER FAILED ON AT KSC. R&R THRUSTER.	G. GRUSH CAR 24F007 CLOSED 05/29/85
11	S-BAND UPPER RIGHT ANTENNA REFLECTED POWER HIGH AND UPPER LEFT ANTENNA REFLECTED POWER ERRATIC.	119:16:04(R) 123:13:29(L)	17 TO 18 WATTS INDICATED ON UPPER RIGHT. S-BAND FORWARD LINK PERFORMANCE THROUGH TDRS ON BOTH FWD AND AFT BEAMS MARGINAL. REMOVED BOTH UPPER ANTENNAS AT KSC, RECYCLED BOTH IN ONE WEEK AT VENDOR FOR OV-099. REINSTALLED AND RETESTED.	D. EGGERS CAR 24F005 CAR 24F006 CLOSED 06/18/85

TABLE II.- ORBITER PROBLEM TRACKING LIST (Cont'd)

JSC OV-099 STS 51-B PROBLEM TRACKING LIST		JUNE 21, 1985	
NO.	TITLE	TIME, G.M.T.	COMMENTS
12	RIGHT OMS OXIDIZER LOW-POINT DRAIN- LINE HEATER SET POINT DRIFTED.	120:00:02	TEMPERATURE (V43T6237A) CYCLING LOW, 51 TO 65 DEG F. LOWERED FDA LIMIT FROM 50 TO 45 DEG F. AT 121:07:01 FELL TO 45 DEG F, CREW SWITCHED TO B HEATERS AND TEMP CYCLED NORMALLY. T/S AT KSC FOUND THERMOSTAT FAILED. R&R SIIII.
13	KU-BAND RADAR MODE FAILED SELF TEST.	119:18:20	COM MODE OPERATING PROPERLY. T/S AT KSC. NO REPLACEMENT AVAILABLE. SUSPECT EAI. JSC EVALUATE AGC SPIKE DATA. PASSED SELF TEST AT KSC. FLY AS IS.
14	APU 1 FUEL BY-PASS LINE HEATER B FAILED ON.	123:06:11	REACHED 206 DEG F. SWITCHED TO HEATER A AND TEMPERATURE (V46T0128) RETURNED TO NORMAL. PROBABLE CONTAMINATION INTERNAL TO SWITCH. R&R THERMAL SWITCH AT KSC.
15	MID MCA 2 OPS STATUS 5 (V76X2225E) INDICATED ZERO.	121:20:07	POWER ON MMCA-2, PL2 AND FF4 WAS CYCLED FOR K7, K26, AND K30--THE LEFT AFT BULKHEAD MOTOR 2 LATCH AND THE VENT DOORS 4 AND 7 MOTOR 1 OPEN AND CLOSE RELAYS. THE STATUS BIT WAS NOT RESET. FOUND K7 RELAY STUCK ON AT KSC. R&R MMCA-2.
16	SSME 2 LO2 PRE-VALVE NO OPEN INDICATION DURING LOX DUMP.	119:16:12	OPEN INDICATION (V41X1234X) WAS NOT PRESENT DURING MPS DUMP. THE CLOSED INDICATION (V41X1235E) ALSO WAS NOT PRESENT DURING THE DUMP. VALVE CYCLED PROPERLY AT DRYDEN. R&R ACTUATOR.
17	HIGH OXYGEN FLOW ON PRESSURE CONTROL SYSTEM 2.	125:00:12:01	CLASS 2 HIGH O2 FAULT SUMMARY MESSAGE FOR PCS 2. CDR REPORTED A LOUD BANG AS 14.7 PSI REC 2 WENT TO SECOND STAGE FLOW. CHANGED TO PCS 1. T/S AT KSC DID NOT REPEAT PROBLEM. FLY AS IS.

TABLE II.- ORBITER PROBLEM TRACKING LIST (Cont'd)

JSC OV-099 STS 51-B PROBLEM TRACKING LIST		JUNE 21, 1985		
NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
18	PAYLOAD BAY DOOR CLOSE SEQUENCE FAILED ON PORT AFT LATCHES.	126:12:28:16	NO LATCH A OR B INDICATION ON LEFT AFT LATCHES. RECEIVED ALL RELEASE AND READY-TO-LATCH INDICATIONS. CREW REPORTED PORT AFT LATCH VISUALLY IN LATCHED POSITION. PROPER LATCH OPERATION DEMONSTRATED AT KSC AFTER VERIFYING LEFT AFT LATCHES WERE NOT FULLY CLOSED.	R. BALCIUNAS CAR 24F010 CLOSED 06/14/85
19	BACKUP FLIGHT SYSTEM ERROR UPDATING RUNWAY.	126:14:12:25	A BFS ERROR MESSAGE WAS OBSERVED AS THE BFS MAXI TABLE WAS UPDATED. ISSUED BFS PROGRAM NOTE TO CLEAR TSC BUFFER BEFORE UPLINK CORRECTION.	W. C. YOUNG CLOSED 06/20/85
20	LEFT MAIN LANDING GEAR BRAKES DAMAGED.	LANDING	BROKE STATORS ON BOTH INBOARD AND OUTBOARD LEFT BRAKES. R&R AT DRYDEN. INITIATED NEW BRAKE REDESIGN STUDY.	C. CAMPBELL CAR 08F011 CLOSED 06/20/85
21	MPS HELIUM SYSTEM DECAY RATE HIGH DURING ENTRY REPRESS.	ENTRY	POSTFLIGHT DATA REVIEW. PROBABLE TRANSIENT LEAK IN LH2 FEED SYSTEM. BOTH SYSTEMS TIGHT AT KSC.	P. COTA CLOSED 06/14/85
22	MAIN LANDING GEAR DUMP VALVE LEAKED 3 DAYS AFTER LANDING.	POST FLIGHT	INSPECTION OF LEFT WHEEL WELL FOUND LANDING GEAR DOOR SPRAYED. VALVE ENERGIZED AND OVERHEATED. LEAK IN VALVE BODY. VALVE PULLED AND LINE PLUGGED AT DRYDEN. R&R THREE VALVES. GOLD MYLAR TAPE ON SOLENOIDS. MAY CHANGE TAPING PROCEDURES.	D. HAINES CAR AC 9961 CLOSED 06/14/85
23	PAYLOAD BAY BLACK AND WHITE TV CAMERA "A" DID NOT RESPOND TO ALC PBI COMMANDS.	ON ORBIT	FOLLOWING 10 SUCCESSFULL AURORA PASSES THE IRIS DID NOT OPEN AFTER 3 ALC PBI COMMANDS. T/S AT KSC FOUND REMOTE CONTROL UNIT MISSED COMMANDS.	B. EMBREY CLOSED 06/14/85
24	WCCU LEG UNIT A PTT BUTTON STUCK.	ON ORBIT	CREW DEBRIEFING. UNIT INITIALLY HAD DEAD BATTERIES. UNIT OPERATED ON TRANSMIT. T/S UNABLE TO REPEAT PROBLEM. FLY AS IS.	L. LEOPOLD CLOSED 06/14/85

TABLE II.- ORBITER PROBLEM TRACKING LIST (Concluded)

JSC OV-099 STS 51-B PROBLEM TRACKING LIST		JUNE 21, 1985	
NO.	TITLE	TIME, G.M.T.	COMMENTS
25	ACIP X-AXIS ANGULAR ACCELEROMETER FAILED.	LIFT OFF	READ OFF-SCALE HIGH THROUGHOUT FLIGHT. REMOVED AND REPLACED FILTER CARD AT KSC. X-AXIS ACCELEROMETER FAILED RETEST IN VEHICLE. FLY AS IS FOR STS 51-F AND R&R POSTFLIGHT. FIAR.
26	LEFT OUTBOARD ELEVON TILE SLUMPED AND GAP FILLER WAS BREACHED.	ENTRY	SIMILAR TPS DAMAGE ON OV-103 AFTER PREVIOUS FLIGHT. NO STRUCTURAL DAMAGE. STANDARD TPS REPAIR AND ADDITIONAL PREFLIGHT INSPECTIONS.
			R. GIESECKE HEN 0049F CLOSED 06/14/85
			J. SMITH CLOSED 06/14/85

PREPARED BY: /s/RJW
ROBERT J. WARD

06/21/85
DATE

APPROVED BY: /s/JEM
JOSEPH E. MECHELAY

06/21/85
DATE