

# **STS 51-G National Space Transportation Systems Program Mission Report**

July 1985



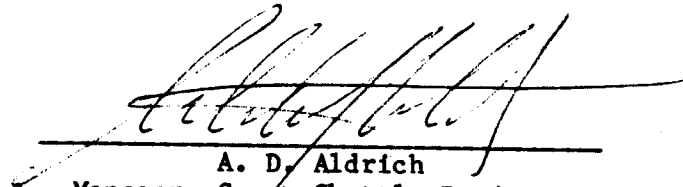
National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas


STS 51-G  
NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM  
MISSION REPORT



Michael A. Collins, Jr.  
Manager, Shuttle Data  
and Evaluation Office



A. D. Aldrich  
Manager, Space Shuttle Projects



Richard H. Kohrs  
Acting Manager, National STS Program

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LYNDON B. JOHNSON SPACE CENTER  
HOUSTON, TEXAS 77058

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## INTRODUCTION AND MISSION OBJECT VES

The STS 51-G National STS (Space Transportation Systems) Program Mission Report contains a summary of the major activities and accomplishments of the eighteenth Space Shuttle flight and the fifth flight of the OV-103 vehicle, Discovery. The primary objectives of the STS 51-G flight were to successfully deploy the TELSTAR-3D/PAM-D (Payload Assist Module-D), MORELOS-A/PAM-D, and ARABSAT-A/PAM-D satellites; to conduct the deployment and retrieval operations of the SPARTAN 1; and to perform the operations of the ADSF (Automated Directional Solidification Furnace), FPE (French Posture Experiment), and FEE (French Echocardiograph Experiment). The sequence of events for this flight is shown in table I. The problem tracking list for the Orbiter is presented in table II to provide a complete list of all flight-associated problems that occurred.

### MISSION SUMMARY

The STS 51-G final countdown proceeded very smoothly with no unplanned holds. Lift-off occurred at 168:11:33:00 G.m.t. (07:33 a.m., e.d.t., June 17, 1985) from launch complex 39A at KSC (Kennedy Space Center) with a satisfactory landing at 175:13:11:57 G.m.t. (June 24, 1985) at Edwards Air Force Base, California.

The crew for STS 51-G was Daniel C. Brandenstein, Capt., U. S. Navy, Commander; John O. Creighton, Cdr., U. S. Navy, Pilot; Steven R. Nagel, Lt. Col., U. S. Air Force, John M. Fabian, Col., U. S. Air Force, and Shannon W. Lucid, Ph.D., Mission Specialists; and Patrick Baudry and Sultan Salman Al-Saud, Payload Specialists. Patrick Baudry was a representative of CNES and Sultan Salman Al-Saud was a representative of ARABSAT.

The ascent phase was nominal in all respects. The SRB's (Solid Rocket Boosters) performed normally with motor performance close to predicted values and well within allowable envelopes. SRB separation occurred at the nominal time and both SRB's were floating normally at recovery.

All ET (External Tank), SSME (Space Shuttle Main Engine), and MPS (Main Propulsion System) parameters were normal. No ET launch commit criteria violations were noted, and no significant ice buildup was observed. Main engine operation at start, mainstage, and shutdown was very satisfactory. MPS performance was also very satisfactory.

MECO (Main Engine Cutoff) occurred very near the predicted time and the resulting orbital parameters were as predicted. Since this was a direct insertion trajectory, the OMS (Orbital Maneuvering System) 1 maneuver was not performed. The orbital parameters following the satisfactory 178-second OMS-2 maneuver were as predicted (190 by 191 nmi.).

Flight day 1 on-orbit activities consisted mainly of unstowing equipment required for orbital operations and deploying the MORELOS satellite. The satellite was deployed at 168:19:37:51 G.m.t., within 1 second of the planned time. Following deployment, the Orbiter performed a 13.46-second separation maneuver

using the left OMS engine. The RMS (Remote Manipulator System) was deployed and the wrist camera was used to observe the PKM (Perigee Kick Motor) firing of the satellite.

Flight day 2 was mainly characterized by the activities surrounding the deployment of the ARABSAT-A satellite. Initially, data indicated that the solar arrays were deployed on the satellite while it still was covered by the sunshield. After opening the sunshield, a survey was made with the RMS end effector TV camera of the satellite and all systems appeared to be ready for deployment. The satellite was deployed on time at 169:13:56:56 G.m.t. on June 18, 1985. The PKM burn was again observed by video camera and all activities associated with the satellite appeared normal. Other activities of the second day included performing the two French experiments and Earth observations.

Much of flight day 3 was devoted to preparation for the deployment of the TELSTAR-3D satellite. The satellite was deployed within 1 second of the planned time at 170:11:20:36 G.m.t. The usual separation maneuver after satellite deployment was performed, and the RMS was positioned so that the TELSTAR PKM burn could be observed on TV.

The HPTE (High Precision Tracking experiment) was unsuccessfully attempted during the third day. Two errors in the Crew Activity Plan data caused the Orbiter to be oriented to the incorrect attitude for successful acquisition. Additionally, the two French experiments and the ADSF experiment were all operated successfully. Also, the advanced autopilot performance DTO (detailed test objective) (0909) was performed successfully.

On flight day 4, the SPARTAN 101 spacecraft was deployed and released at 171:16:02:39 G.m.t., followed by two RCS separation maneuvers. The French Echocardiograph experiment was also successfully performed.

On flight day 5, all activities with the ADSF experiment were completed and the experiment was deactivated. Also, the French echocardiograph experiment was continued and the high precision tracking experiment were successfully conducted. Television pictures of the laser beam from the HPTE as viewed by onboard TV cameras were transmitted to Mission Control. In addition to the Earth observations, the first of the required SPARTAN rendezvous maneuvers was performed.

The major activity of flight day 6 was the rendezvous with the SPARTAN spacecraft from a separation distance of about 100 miles. All rendezvous operations were nominal as was the grappling at 173:13:31:54 G.m.t. and the berthing of the SPARTAN spacecraft in the payload bay. The SPARTAN spacecraft was off 90 degrees in roll from the orientation that was planned for at capture, but this caused no problems in the capture operations. Other activities of this sixth day were the conduct of the French experiments and the performance of the FCS (flight control system) checkout using APU (Auxiliary Power Unit) 3.

The activities of the seventh day included another successful performance of DTO 0909 and the crew press conference. Cabin stowage activities were conducted in preparation for landing on the eighth day.

Early on the eighth flight day, all cabin stowage was completed and the payload bay doors were closed in preparation for entry. The 151-second deorbit maneuver was initiated at 175:12:07:30 G.m.t. The entry was normal in all respects with all PTI (Programmed Test Input) maneuvers were performed as planned. After completing the 240-degree heading alignment circle turn, the final approach into Edwards Air Force Base runway 23 was completed with main gear contact at 175:13:11:52.4 G.m.t. After a rollout of 7743 feet, the Orbiter was stopped at 175:13:12:33.7 G.m.t., and the STS 51-G mission was brought to successful conclusion.

All seven planned DTO's and four DSO's (Detailed Supplementary Objectives) were completed based on data available at this writing. In addition, all the GAS (Getaway Special) experiments were completed.

ABLE I. - STS 51-G SEQUENCE OF EVENTS

<u>Event</u>	<u>Actual time, G.m.t.</u>
APU activation (1)	168:11:28:11
(2)	168:11:28:13
(3)	168:11:28:14
SRB HPU activation command (LH-A2)	168:11:32:29.4
MPS start command sequence (engine 3)	168:11:32:53.4
SRB ignition command from GPC (lift-off)	168:11:33:00
MPS throttle-down to 83 percent (engine 3)	168:11:33:19.1
MPS throttle-down to 65 percent (engine 3)	168:11:33:30.3
Maximum dynamic pressure	168:11:33:50.5
MPS throttle-up to 104 percent (engine 3)	168:11:34:08.2
SRB separation command from GPC	168:11:35:05
MPS throttle-down for 3g acceleration (engine 3)	168:11:40:35.2
3g acceleration	168:11:40:36
Main engine cutoff (MECO)	168:11:41:36
External tank separation	168:11:41:54
OMS 1 ignition (not required)	
OMS 2 ignition	168:12:13:29
OMS 2 cutoff	168:12:16:27
MORELOS deploy	168:19:37:51
ARABSAT deploy	169:13:56:56
TELSTAR deploy	170:11:20:36
SPARTAN deploy	171:16:02:39
SPARTAN grapple	173:13:31:54
Flight control system checkout - APU 3 start	173:17:17:44
APU 3 shutdown	173:17:26:27
APU 1 activation	175:12:02:32
Deorbit maneuver ignition	175:12:07:30
Deorbit maneuver cutoff	175:12:10:01
APU activation (2)	175:12:28:32
(3)	175:12:28:32
Entry interface	175:12:41:22
End blackout	175:12:58:04
Terminal area energy management (TAEM)	175:13:05:43
Main landing gear contact	175:13:11:52.4
Nose landing gear contact	175:13:12:05
Wheels stop	175:13:12:33.7
APU deactivation complete (3)	175:13:30:28

## VEHICLE ASSESSMENT

### SOLID ROCKET BOOSTERS

All SRB systems performed as expected. The SRB prelaunch countdown was nominal. Performance of both SRM's (Solid Rocket Motors) was close to predicted values, and well within the allowed envelopes. Propellant burn rates were near predicted values. 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 normally when visually located by the recovery ship personnel. Recovery ship personnel reported that all parachutes had deployed properly.

### EXTERNAL TANK

All ET systems and instrumentation performed as expected. No LCC (Launch Commit Criteria) violations were experienced and no significant ice buildup was observed. Hydrogen ullage pressure transducers nos. 2 and 3 experienced intermittent open-circuit indications on the low end of the scale. The sensors performed as expected during prepressurization and flight. Photographs of ET separation showed larger than expected divots in the intertank insulation.

### SPACE SHUTTLE MAIN ENGINE

All SSME parameters appeared to be normal during the prelaunch countdown and compared well with prelaunch parameters that were observed on previous flights. Preliminary data indicate that SSME performance at start, mainstage, shutdown and propellant dump was very good. All temperatures appeared to be very close to predictions, and there were no problems detected.

### MAIN PROPULSION SYSTEM

Overall performance of the MPS was excellent. Liquid oxygen and Liquid hydrogen loading was accomplished as planned and the loads were very close to the planned loads. Ascent performance appeared to be normal.

### ORBITER

#### Multiplexer/Demultiplexer FA3 Power Supply Failure

A fault message "BCE string 3D" occurred at 172:19:16:48 G.m.t., and it was also noted that several commands associated with MDM (multiplexer/demultiplexer) FA3 were not being processed (firing command to aft manifold 2 RCS thrusters). The MDM was moded to the secondary port; however, this moding resulted in interference with command processing on the primary port of MDM FF3, which is tied to the secondary port of MDM FA3. MDM FA3 was moded back to the primary port for the remainder of the flight. The problem did recur during FCS (flight control system) checkout; however, all thrusters operated properly during the RCS hot-fire test.

The manifold 2 thrusters were reprioritized to the last priority for the remainder mission. No problems were encountered with this configuration during the entry and landing phases.

#### Thermal Protection System Damage

The postflight TPS (Thermal Protection System) inspection showed approximately 315 debris hits of which 144 were equal to or greater than 1 inch in area. The majority of hits (231) were on the Orbiter underbody and were concentrated in the right-hand wing glove area. This is a significantly higher number of debris hits than has occurred during any of the last 10 Orbiter flights, and represents the highest number of an upward trend that has occurred during the last three Orbiter flights. The glazed condition of the debris craters indicates the damage occurred during ascent.

Review of ET separation photographs shows a number of large divots in the inter-tank installation areas where one type of foam insulation is bonded to another. Review of the ET insulation application progress has identified a faulty batch of bonding resin used on the external tanks flown on the last 3 flights. The resin caused a chemical reaction at the dissimilar insulation bondline that resulted in trapped gas bubbles. The bubbles expanded during ascent, forcing ejection of pieces of the insulation from the ET. The faulty bonding has been isolated to LWTs (lightweight tanks) 10 through 13. Three of these tanks have flown on the last 3 flights and LWT 12 is scheduled to fly on STS 51-F.

Additional core-sample pull tests have been conducted in the affected areas of the ET scheduled to be flown on STS 51-F. Core sample density and subsequent repair has established a reasonable level of confidence that any insulation shed during ascent would be limited to small areas and would result in limited debris hits on the Orbiter.

#### PAYLOADS AND EXPERIMENTS

##### MORELOS-A/PAM-D

The MORELOS-A/PAM-D satellite was successfully deployed at the first planned opportunity at 168:19:37:51 G.m.t. on mission day 1, within 1 second of the planned time.

The Orbiter altitude was within 1 nmi. of the planned 190 nmi. circular orbit. Attitude errors were less than 0.2 degree in all axes and rates were less than 0.01 deg/sec. The PAM-D PKM burn occurred as planned 45 minutes after deployment and was monitored with the RMS wrist TV camera. The PKM burn was slightly underspeed (460- nmi. low apogee altitude), but was within 3 sigma tolerance. The apogee burn occurred on the third apogee at 23:49 G.m.t. on June 18, 1985.

At the time of this writing, the MORELOS-A satellite was in geosynchronous drift orbit, moving toward its permanent position at 113.5-degree West longitude. The



solar arrays and double aperture antenna were deployed and systems tests were in progress. All satellite systems were operating nominally.

#### ARABSAT/PAM-D

On day 1 of the mission, upon review of the ARABSAT health check data (acquired shortly after payload bay doors opening), an indication of a partially deployed spacecraft solar panel was noted. Initial evaluations theorized that the indication was caused by a microswitch failure, and that the solar panels were in their correct stowed position within the closed sunshield. However, to verify the proper configuration, the RMS wrist TV camera was used to gain confidence that the solar panel clamps were latched. The sunshield was opened on orbit 18, and the inspection revealed that the arrays were in the correct configuration.

The deployment occurred as planned at 169:13:56:56 G.m.t. on June 18, 1985, (day 2). The PAM PKM burn occurred 45 minutes later. The burn was slightly underspeed (406-nmi. low apogee altitude), but was within 3 sigma tolerance. Three apogee burns were performed to place the ARABSAT into a geosynchronous drift orbit. As of this writing, the solar panels have been deployed as planned, the spacecraft is in nominal configuration, and testing is underway.

#### TELSTAR-3D/PAM-D

The TELSTAR-3D/PAM-D satellite was successfully deployed at the first planned opportunity at 170:11:20:36 G.m.t. on mission day 3, within one second of the planned time.

The Orbiter altitude was within 1 nmi. of the planned 191-by-211 nmi. orbit. Attitude errors were less than 0.1 degree in all axes and rates were less than 0.01 deg/sec. The PAM-D PKM burn occurred as planned 45 minutes after deployment and was monitored with the RMS wrist TV camera. The PAM burn was slightly underspeed (230 nmi.-low apogee altitude), but within 3 sigma tolerance. The apogee burn occurred on the third apogee at 15:05 G.m.t. on June 20.

As of this writing, the TELSTAR-3D satellite is in geosynchronous drift orbit, moving toward its permanent position at 123 degrees West longitude. The solar arrays and main antenna are deployed and systems tests are in progress. All satellite systems are operating nominally.

#### SPARTAN 101

The SPARTAN 101 spacecraft was released by the RMS at 171:16:02:39 G.m.t. on June 20 (mission day 4). SPARTAN attitude rates were observed to be extremely low. An Orbiter separation maneuver was performed 23 minutes after the release. The SPARTAN moved ahead of the Orbiter to a maximum separation distance of approximately 100 nmi.

The Orbiter began closing on the SPARTAN with a correction maneuver at 101 hours elapsed time (mission day 5). On mission day 6, terminal phase rendezvous maneuvers began at approximately 173:08:14 G.m.t. When station keeping, it was

observed that the roll altitude of the SPARTAN was approximately 90 degrees different from that planned, placing the grapple fixture facing toward the payload bay rather than out the port side as planned. Capture was performed without incident, and the spacecraft was berthed and latched satisfactorily.

The results of the SPARTAN 101 experiments are being analyzed with the initial assessment to be available within 30 days after landing.

#### HIGH PRECISION TRACKING EXPERIMENT

The HPTE is the first of a series of technology-development experiments from the Strategic Defense Initiative Organization (SDIO). The HPTE is an 8-inch diameter retroreflector which was stowed in a middeck locker and installed in the Orbiter side hatch window on-orbit. During the orbit 64 pass over the island of Maui, Hawaii, the Orbiter was maneuvered to position the side hatch window in the line-of-sight of the LBD (Laser Beam Director). A 4-watt green laser beam from the ground LBD was reflected back from the HPTE retroreflector. This reflection successfully demonstrated the ability of the ground LBD to accurately track an object in low-Earth orbit.

#### AUTOMATED DIRECTIONAL SOLIDIFICATION FURNACE

The ADSF was an experiment to perform directional solidification of magnetic materials, immiscibles, and infrared detectors, and to perform off-eutectic growth and solidification.

The ADSF was operated a total of 24 hours during the three scheduled periods of the mission and no problems were observed.

A complete evaluation of the 4 material samples will be performed after the ADSF is delivered to the NASA-MSFC and the canister module is disassembled.

#### FRENCH ECHOCARDIOGRAPH EXPERIMENT

During the 51-G mission, the FEE was conducted twice each day by the CNES payload specialist and once each day by the participating mission specialist, except for day 1.

The echocardiograph functioned adequately throughout the mission, with the exception of the operating temperature of the hardware that appeared to reach higher levels than predicted in a shorter period of time. This will be investigated after return of the hardware.

#### FRENCH POSTURE EXPERIMENT

Seven FPE sessions, one session per day, were performed by the CNES payload specialist during the 51-G mission. The first session was performed 6 hours after launch and the last session 28 hours before landing. Three sessions were performed by the ARABSAT payload specialist. Each session lasted between 2 and 3 hours depending on the activity on the middeck.

No technical problems were encountered throughout the mission. The quality of the signals recorded on the tape was excellent. There was a comment that the velcro foot restraint failed to hold during rapid elevation of the arms.

#### DETAILED TEST OBJECTIVES

##### ORBITAL EXPERIMENT DIGITAL AUTOPILOT PERFORMANCE (DTO 0909)

A total of twelve data gathering periods on flight day 3 and 6 were devoted to test runs for the OEX (Orbital Experiment) DAP (Digital Autopilot) Performance DTO (0909). Eleven different tests were completed. Excellent data were obtained and the overall results of the tests were very successful.

##### WASTE AND SUPPLY WATER DUMPS (DTO 0325)

Seven water dumps (three waste, four supply) were performed in support of the waste and supply water dumps DTO (0325). Five of the dumps were performed from a warm nozzle attitude and two with a cold nozzle attitude. All dumps were successful with only insignificant ice formations on two of the dumps. A total of 711 lb of water was expelled during these dumps.

TABLE II.- STS 51-G ORBITAL PROBLEM TRACKING LIST

JSC OV-103 STS 51-G PROBLEM TRACKING LIST

JULY 16, 1985

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
1	INSTRUMENTATION			
A	SSME 2 GH2 OUTLET PRESSURE (V41P1260A) FAILED.	168:11:36:38	READ OFF SCALE HIGH 3 MIN. AND 38 SEC. AFTER LAUNCH. R&R AT KSC.	P. COTA CAR 25F001
B	LEFT MAIN LANDING GEAR HYDRAULIC BRAKE PRESSURE (V51P0522A) CHANNEL 4 READ LOW.	ROLL OUT	READ 1000 PSI WHEN OTHER CHANNELS READ 1500 PSI. T/S AT KSC.	J. WILTZ CAR 25F011
C	LEFT OMS FEED LINE TEMPERATURE (V43T4216A) INCREASED DURING POSTFLIGHT SAFING.	POST FLIGHT	READING WENT FROM AMBIENT TO 130 DEG F IN ABOUT AN HOUR. THEN RETURNED TO AMBIENT WITH NO CORRESPONDING PRESSURE CHANGE. T/S AT KSC.	J. HOOPER L. JOHNSON
2	APU 2 FUEL PUMP WATER COOLING VALVE SYSTEM A FAILED.	168:11:59:28	CREW SWITCHED ON SYSTEM B AND VALVE MODULE COOLED DOWN GRADUALLY. CGWN T 1 SYS 2 (V46T0271). FOUND VALVES A AND B CROSSWIRED REQUIRING BOTH SYSTEMS ON FOR COOLING.	W. SCOTT CLOSURE IN PROCESS
3	WCS FAN SEPARATOR 1 MOTOR CURRENT HIGH.	168:17:51	CREW SWITCHED TO SEP 2 AT 168:17:58 AND FAN OPERATED NORMALLY. R&R AT KSC.	E. WINKLER DR 25F003
4	RCS MICROSWITCHES:		PROBABLE CONTAMINATION IN MICROSWITCHES.	G. GRUSH CAR 13F001 CLOSURE IN PROCESS
A	RIGHT RCS FUEL CROSSFEED VALVE 3/4/5 OPEN INDICATION TRANSIENT FAILURE.	169:09:30	VALVE OPENED, BUT GROUND TELEMETRY DID NOT INDICATE OPEN. BOTH OPEN INDICATIONS RECEIVED AFTER SECOND INTERCONNECT. CREW SWITCHED TO GPC CONTROL. R&R ACTUATOR AT KSC.	
B	LEFT RCS OXIDIZER OR FUEL TANK ISOLATION VALVE 1/2 CLOSED INDICATION FAILED.	169:09:30	VALVE OPENED, BUT ONBOARD TALKBACK DID NOT SHOW CLOSED DURING SWITCHOVER TO INTERCONNECT. VALVE PLACED IN GPC. R&R ACTUATOR AT KSC.	

TABLE II.- STS 51-G ORBITER PROBLEM TRACKING LIST (CONTINUED)

JSC OV-103 STS 51-G PROBLEM TRACKING LIST		JULY 16, 1985	
NO.	TITLE	TIME, G.M.T.	COMMENTS
C	RIGHT RCS OXIDIZER TANK ISOLATION VALVE 3/4/5 B LEG OPEN INDICATION FAILED.	169:09:30 171:18:30	ONBOARD TALKBACK AND GROUND TELEMETRY DID NOT INDICATE OPEN. CLOSED INDICATION CYCLED PROPERLY. CREW SWITCHED TO GPC CONTROL. ON DAY 4 TERMINATED INTERCONNECT AND SAME MISCOMPARE WAS PRESENT. R&R ACTUATOR AT KSC.
5	S-BAND LOWER LEFT ANTENNA BEAM SWITCH INTERMITTENT SLOW OR STUCK.	168:14:45 172:04:04 174:01:46	AN SN FAULT MESSAGE "ANTENNA" OCCURRED WITH A BEAM SWITCH, LLF TO LLA, AND AN INCREASE IN REFLECTED POWER. SWITCHED TO EA2 AND RECOVERED. DATA REVIEW SHOWED INCOMPLETE BEAM SWITCH OPERATION. OPERATION NORMAL UNTIL DAY 5 WHEN BEAM DID NOT SWITCH FROM LLF TO LLA, SWITCHED TO EA2 AND RECOVERED. OPERATION NORMAL AGAIN. TESTS ON DAY 7 REPEATED THE PROBLEM. FLY AS IS AND REPAIR AFTER NEXT FLIGHT.
6	MDM FA3 FAILURE.	172:19:16:48	BCE STRING 3 D FAULT MESSAGE. I/O RESET - NO EFFECT. PORT MODE & POWER CYCLE - 9 MIN. CLEAR; THEN SEVERAL I/O ERRORS. MODED BACK TO PRIMARY AND OPERATION WAS NORMAL. ANALYSIS INDICATED INTERMITTENT OUTPUT FROM SECONDARY CORE POWER SUPPLY. R&R AT KSC.
7	FORWARD PORT AND STARBOARD AND FORWARD BULKHEAD PAYLOAD BAY FLOODLIGHTS FAILED.	173:17:40	CREW REPORT DURING SPARTAN OPERATIONS. MID MAIN B MPC2 BUS SHOWED 5 AMP CONTINUOUS ARCING. R&R AT KSC.
8	UTILITY POWER AC-3 PHASE B SPIKES USING UTILITY OUTLET ON PANEL A15.	172:09:20	TWO 7-AMP SPIKES ON BUS WHEN VACUUM CLEANER PLUG NOT TIGHTENED IN OUTLET. CREW REPORTED PROBLEMS CONNECTING ANYTHING TO PANEL A15 UTILITY OUTLET AND CONNECTING MOVIE LIGHT TO ANY OUTLET. T/S AT KSC.

TABLE II.- STS 51-G URBITEK PROBLEM TRACKING LIST (CONCLUDED)

JSC OV-103 STS 51-G PROBLEM TRACKING LIST		JULY 16, 1985		
NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
9	FLIGHT DECK SPEAKER MICROPHONE UNIT INTERMITTENT.	174:15:45	CREW REPORTED INTERMITTENT RECEPTION ON THE FLIGHT DECK SPEAKER. OPERATION OF ATU WITH HEADSET WAS NORMAL THROUGHOUT FLIGHT. T/S AT DRYDEN AND KSC DID NOT REPEAT PROBLEM. FLY AS IS.	G. NEALIS CLOSURE IN PROCESS
10	SURFACE POSITION INDICATOR (SPI) OFF FLAG FAILED.	174:08:19	SPI FLAG WAS NOT VISIBLE DURING FLAG TEST PORTION OF FCS CHECKOUT. SURFACE POSITION INDICATORS AND DATA OK. FLAG NOT VISIBLE WITH POWER OFF. PROBABLE ELECTROMECHANICAL FAILURE IN FLAG. R&R AT KSC.	T. E. LEWIS CAR 25F007 CLOSURE IN PROCESS
11	TPS DAMAGED BY NUMEROUS DEBRIS HITS AND TILE SLUMPED NEAR NOSE LANDING GEAR DOOR, ON LEFT OUTBOARD ELEVON AND AFT OF NOSE CONE.	IN FLIGHT	POSTFLIGHT INSPECTION AT DRYDEN COUNTED 120 DEBRIS HITS, OVER 60 SCRAP TILES AND SEVERAL SLUMPED TILE FORWARD RIGHT OF NLG DOOR, ON LEFT ORB ELEVON AND ON SECOND ROW AFT OF NOSE CONE.	J. SMITH
12	G METER READ 1 G THROUGHOUT FLIGHT.	LIFT OFF	CREW POSTFLIGHT REPORT. MECHANICAL G METER DID NOT RESPOND TO FLIGHT PROFILE. T/S AT KSC FOUND METER CAGED. CLOSEOUT PHOTOS SHOW METER WAS CAGED FOR ALL FLIGHTS OF OV-103.	R. BURCHDUFF CLOSURE IN PROCESS
13	L OMS ENGINE ARM/PRESS SWITCH LACKED POSITIVE DETENT.	PRE DEORBIT	CREW POSTFLIGHT REPORT. LEFT ENGINE GN2 ISO VALVE DID NOT OPEN UNTIL SWITCH WAS RESET JUST 2 MIN BEFORE DEORBIT BURN. T/S AT KSC.	J. HOOPER
14	GALLEY WATER DISPENSER ERRATIC.	ON ORBIT	CREW POSTFLIGHT REPORT. DISPENSER CUT OFF WAY BELOW OR ABOVE PRESET QUANTITY AND CONTROL ARM SHUT OFF WAS ERRATIC. T/S THEN R&R AT KSC.	R. TRABANINO

PREPARED BY: /s/RJW  
ROBERT J. WARD

07/16/85  
DATE

APPROVED BY: /s/JEM  
JOSEPH E. NECHELAY

07/16/85  
DATE