STS 41-C National Space Transportation Systems Program Mission Report

May 1984

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
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STS 41-C

NATIONAL SPACE TRANSPORTATION SYSTEMS PROGRAM

MISSION REPORT

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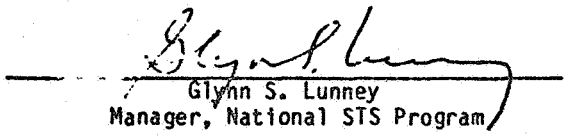

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INTRODUCTION AND MISSION OBJECTIVES

The STS 41-C National Space Transportation Systems Program Mission Report contains a summary of the major activities and accomplishments of the eleventh Shuttle flight and fifth flight of the OV-099 vehicle, Challenger. This report also summarizes the significant problems that occurred during STS 41-C, and provides a problem tracking list that is a complete list of all problems that occurred during the flight. None of the problems will affect the STS 41-D flight.

The major objectives of flight STS 41-C were to successfully deploy the LDEF (long duration exposure facility) and retrieve, repair and redeploy the SMM (Solar Maximum Mission) spacecraft, and perform functions of IMAX and Cinema 360 cameras.

The sequence of events for this flight is shown in table I. The problem tracking lists for the MSFC (Marshall Space Flight Center) elements and Orbiter are shown in tables II and III, respectively, also at the end of the report.

MISSION SUMMARY

The STS 41-C flight was launched from Launch Complex 39 at KSC (Kennedy Space Center) on April 6, 1984, at 097:13:57:59.999 G.m.t. (08:57:59.999 e.s.t.), and landed at the Edwards AFB (Air Force Base) at 05:38:07 P.s.t. on April 13, 1984. This flight was scheduled as a 6-day mission, but SMM retrieval problems during flight day 3 operations resulted in extending the mission 1 day for a total of 7 days. Also, this flight was scheduled to land at the Kennedy Space Center Shuttle Landing Facility; however, the possibility of adverse weather (rain) resulted in a decision to land at Edwards AFB, California.

The crew for this flight was Capt. Robert L. Crippen, Commander; Major Frances R. Scobee, Pilot; and Terry J. Hart, James D. Van Hoften, PhD., and George D. Nelson, PhD., Mission Specialists. Of the 25 DTO's (development test objectives) and DSO's (detailed supplementary objectives), all were completed for a 100-percent completion rate.

The ascent phase was nominal in all respects, as was the SRB (solid rocket booster) and the ET (external tank) separation and the OMS (orbital maneuvering system) maneuver that placed the vehicle in the planned 252- by 137-nmi. elliptical orbit. The SRB's were recovered along with their parachutes, although one main parachute did not open fully. The ET impacted within the planned footprint.

The first day of the STS 41-C flight progressed satisfactorily. The most significant of the anomalies that occurred was the failure of the MDM (multiplexer/demultiplexer) during prelaunch operations. This unit was replaced prior to launch and operated satisfactorily throughout the mission. Also, the GGVM (gas generator valve module) temperature on all three APU's (auxiliary power units) showed a short duration drop in temperature during ascent. The first maneuver of the rendezvous sequence (NC-1 phasing maneuver) was successfully performed about 5 hours into the flight. The optional plane change maneuver was not required. The DTO concerning ET tracking from Hawaii was also completed. The RMS (remote manipulator system) and the LDEF systems were also checked out during the first day.

Early on the second day, two rendezvous maneuvers (NH1 and NSR coelliptic) scheduled for that day were completed. The second maneuver placed the Orbiter in a 259- by 256-nmi. orbit. The LDEF activation in preparation for deployment was initiated about 24 hours into the flight. During the following 4 hours, two RMS/LDEF DTO's were accomplished and the LDEF was released at 098:17:19:27 G.m.t.

TABLE I. - STS 41-C SEQUENCE OF EVENTS

EVENT	Actual G.m.t.
APU activation (1)	097:13:53:07
(2)	097:13:53:07
(3)	097:13:53:08
SRB HPU activation command (RH-B2)	097:13:57:32.8
MPS start command sequence (engine 3)	097:13:57:53.4
SRB ignition command from GPC (lift-off)	097:13:57:59.999
MPS throttledown to 67 percent thrust (engine 3)	097:13:58:25.8
Maximum dynamic pressure	097:13:58:50.5
MPS throttleup to 104-percent thrust (engine 3)	097:13:58:57.6
SRB separation command	097:14:00:06
MPS throttledown for 3g acceleration (engine 3)	097:14:05:30.4
Main engine cutoff (MECO)	097:14:06:31.2
External tank separation	097:14:06:49.3
APU deactivation (APU 3)	097:14:10:11
OMS-2 ignition*	097:14:40:54.1
OMS-2 cutoff	097:14:42:29.3
Long duration exposure facility (LDEF) deploy	098:17:19:27
Start first extravehicular activity	099:14:18
End first extravehicular activity	099:17:15
SMM observatory grapple	101:13:52:20
Start second extravehicular activity	102:08:58
End second extravehicular activity	102:15:14
SMM observatory release	103:09:26:29
OPS-8 (flight control system) checkout	103:13:53:29
APU-1 activation	104:12:24:33
Deorbit maneuver ignition	104:12:29:30.3
Deorbit maneuver cutoff	104:12:33:32.8
APU-2 and -3 activation	104:12:54:58
Entry interface (400,000 ft)	104:13:07:51.6
End blackout	104:13:24:12
Terminal area energy management	104:13:31:54.5
Main landing gear contact	104:13:38:07
Nose landing gear contact	104:13:38:23
Wheels stop	104:13:38:55
APU deactivation complete	104:13:51:16

Note:
*The OMS-1 maneuver was not planned or made on this flight because of the direct ascent trajectory.

On the second day, the cabin pressure was lowered to 10.2 psia in preparation for the EVA (extravehicular activity) that was to be conducted following SMM rendezvous on day 3. However, because of a procedural error in the prebreathing protocol with the suit, the cabin was repressurized and depressurized again to the 10.2-psia level to insure that the required prebreathing was accomplished prior to the EVA. All subsystems in the cabin area functioned satisfactorily during the extended period of lower pressure.

Following rendezvous with the SMM, two of the Mission Specialists (Nelson and Van Hoften) went EVA to begin SMM stabilization, berthing, and repair operations. The translation to the SMM using the MMU (manned maneuvering unit) was excellent; however, all attempts at docking with the SMM were unsuccessful because the jaws of the TPAD (trunnion pin attachment device) would not release and softdock with the SMM trunnion pin. The crew member then held on to a solar wing in an attempt to slow vehicle rotation so that the SMM could be grappled, but this procedure was also unsuccessful. At this time the EVA was terminated.

Following EVA termination, attempts were made to grapple the SMM with the RMS. These were also unsuccessful. Attempts to retrieve the satellite were terminated and an Orbiter separation maneuver was performed to allow the SMM spacecraft to stabilize.

The fourth day was a replanning day for the re-rendezvous and recovery of the SMM. Planning during this fourth day also included a one-day extension to the mission, if the second attempt to capture the SMM was successful. Because of the extensive station keeping and maneuvering performed in attempting to retrieve the SMM, the forward RCS (reaction control system) had only 22 percent propellant remaining after the first rendezvous activity. As a result, the re-rendezvous was delayed until the fifth day because the propellant usage would be significantly less since the SMM would be in a more advantageous orbital position with respect to the Orbiter.

Early on the fifth day, the rendezvous maneuvers were begun. A minimum amount of propellant was used to reach the station keeping position from where grappling could begin with the RMS. The first grapple attempt was successful in capturing the SMM, after which the spacecraft was placed in the FSS (flight service system) in the cargo bay. The SMM was locked in place for the repairs that were to be conducted on the sixth day.

The EVA on the sixth day was successful with the crew completing all repair activities in less than 4 hours. Because of the shorter-than-planned time required for SMM repair, Mission Specialist Van Hoften was given permission to conduct a performance evaluation of the second MMU. A successful evaluation was completed and the EVA was completed in 6 hours 16 minutes. Using the RMS, the SMM satellite was lifted from the FSS fixture and held above the cargo bay so that a more complete checkout could be completed. Tests of the satellite showed that the repairs had been successful in restoring the SMM to full operation.

Original planning for this mission included a reboost of the SMM orbit to about 285 nmi. circular. However, since Orbiter propellant was becoming a critical consumable, and since the extended satellite mission life was not a high priority item, the reboost was cancelled. As a result, the SMM is operating in about a 270-nmi. circular orbit.

Upon release of the SMM in its planned attitude, the Shuttle remained nearby until the overall condition of the SMM could be determined by Goddard Space Flight Center engineers. After the more extensive test showed the SMM to be operating properly, the SMM was released, the Orbiter separated from the SMM and final stowage for entry was begun.

All preparations for entry were completed and the crew was making final preparations for the deorbit maneuver when the ground controllers made a decision to delay entry one orbit because of unsatisfactory weather that was headed toward the Shuttle Landing Facility area at KSC. Further weather evaluations lead to the decision to land at Edwards AFB where the weather was ideal.

The descent was flown as planned with only one PTI (programmed test input) not being performed. This was expected based on the trajectory flown for entry and landing at Edwards AFB. All other aspects of entry were as planned and after a 249-degree heading alignment circle maneuver, the Orbiter touched down at 104:13:38:07 G.m.t. on lakebed runway 17.

RENDEZVOUS

FIRST RENDEZVOUS

The first star tracker navigation pass began at a range of approximately 105 nmi. and ended at about 88 nmi. The target was bright enough to be seen visually early in the pass and could be seen in the COAS (crewman optical alignment sight) at about 100 nmi. The two ground-computed maneuvers (NC, NH) were executed with small residuals. The second star tracker pass ranged from 53 to 48 nmi. The star tracker initially locked onto a star. The crew recognized this situation, broke lock and then the star tracker tracked the target successfully. During this tracking period, noisy behavior was noted within the star tracker. Postflight data analysis showed that the source of the noise was not the star tracker as originally suspected. The tracking anomalies were correlated to the IMU (inertial measurement unit) RM (redundancy management) software. The radar acquired the target prior to TI (terminal initiation) at a range of 17 nmi.

Because of the abnormal star tracker behavior noted during the second star tracker pass, radar angles were incorporated instead of star tracker angles for the post-TI navigation interval. All MC (midcourse corrections) were small as expected. The rendezvous was successfully flown manually following the MC4 maneuver to within 200 ft of the target and station keeping was initiated.

SECOND RENDEZVOUS

The first ground-computed maneuver (NC) for the second rendezvous was executed at a range of 54 nmi.

The first star tracker pass occurred after the NC maneuver at a range between 56 and 53 nmi. The second star tracker pass began on the next revolution. The position updates were consistently less than 200 ft. throughout the period. Star tracker behavior was normal.

The NCC maneuver solutions were computed before, during, and after the second star tracker pass. All solutions agreed within mission limits and the final NCC maneuver solution was executed.

The radar locked on at about 18 nmi. All midcourse corrections were small as expected. Manual procedures began after the MC4 maneuver and target station keeping was successfully achieved.

EXTRAVEHICULAR ACTIVITY

Two periods of EVA were planned and completed during STS 41-C. The first EVA was planned to capture and stablize the SMM using the MMU. All preparations for this first EVA went as planned and the EVA was initiated by the two crew members at about 099:14:18 G.m.t.

The donning of the starboard-side MMU and the translation to the SMM spacecraft all progressed as planned. The docking sequence was initiated, but the TPAD would not fire to capture the SMM trunnion pin. The crewman made numerous unsuccessful attempts and as an alternate procedure, the crewman held onto one of the solar wings in an attempt to stabilize the SMM. This action increased the instability of the SMM. As a result, the decision was made to teminate the EVA. The first EVA lasted 2 hours and 57 minutes, and the starboard-side MMU was flown for 42 minutes during this EVA.

After the successful retrieval and berthing of the SMM, plans for the second EVA were solidified. The crew preparations proceeded smoothly and the crew exited the airlock at 102:08:58, over an hour ahead of schedule. The crew proceeded directly to the SMM, repair activity was completed, and the crew was given permission to conduct an MMU performance evaluation in the cargo bay, using the port-side MMU.

Before departing the SMM, the crew took measurements of the SMM trunnion pin and adjacent equipment, using a tape measure. All equipment and tools used during the repair activity operated satisfactorily.

The port-side MMU operated satisfactorily during all tests; however, some difficulty was experienced in docking the MMU with its stowage station. The port-side MMU was flown for 28 minutes during the second EVA. The overall performance of the MMU's during both EVA's was flawless. After the MMU evaluation was completed, the crew removed a cover from an instrument on the SMM and entered the airlock. The second EVA lasted 6 hours 16 minutes.

PAYLOADS

LONG DURATION EXPOSURE FACILITY

The LDEF (long duration exposure facility) contains 57 individual science and technology experiments, is approximately 14 ft in diameter and 30 ft long, and weighs approximately 8000 lb. The LDEF was successfully deployed on STS 41-C, and will be retrieved from its gravity-gradient stabilized attitude on a future Shuttle mission.

The LDEF unberthing and deployment operations on day 2 went as planned. The LDEF was deployed on time and the crew reported no observable rates at deployment. A preliminary film review shows that the LDEF rates at deployment were at least 4 times less than the maximum allowable rate of 0.025 deg/sec. After deployment, the Orbiter separation maneuver was initiated and the crew confirmed the separation rate with the radar. The crew also reported that the view of the trunnion pins and berthing guides using the CCTV (closed circuit television) system was not satisfactory, and they expressed some concern about the use of the CCTV system during the forthcoming LDEF retrieval mission.

CINEMA 360 AND IMAX CAMERAS

The Cinema 360 camera system was flown in the payload bay and the IMAX camera in the crew compartment.

The IMAX 70mm camera was operated by the crew in the Orbiter cabin. The system had 4 interchangeable lenses and nine 1000-ft film magazines. The crew had no difficulty operating the camera or in changing film magazines or lenses. All film was exposed and

the user reported that 75 to 80 percent of the film was studio usable. The crew experienced some temporary difficulty with the voice recorder that was used in conjunction with the camera, but they were able to repair the recorder.

The payload bay camera was an Arriflex 35mm camera which used a 1000-ft magazine and was mounted in a modified GAS (getaway special) canister. The modified GAS canister had a precision-machined lid that housed a quartz dome for the fisheye lens to look through, and electronics that allowed the crew to remotely change f-stop, frame rate, plus operate the camera. This camera was used to capture footage of EVA's, payload deployment, and RMS operations. The camera was controlled with the APC (autonomous payload controller) and all film was exposed as planned. The user was extremely pleased with the results.

BEE EXPERIMENT

A student-sponsored bee experiment was successfully flown. The crew observed some initial bee disorientation during the first orbital day; however, the bees then settled and were able to walk, fly, and float with no apparent difficulty. A similar period of disorientation was also observed after entry.

The bees built approximately 30 in^2 of honeycomb while on orbit and the queen bee laid approximately 35 eggs. The initial inspection showed that the honeycomb was normal; i.e., the same as would be produced under one-g conditions. Only 120 bees (3 1/2 percent of the population) died during the flight and that is less than expected.

The bees apparently worked well under zero-g conditions and films show that they are able to fly faster in the weightless condition. Further analysis by the experimenter is continuing.

VEHICLE ASSESSMENT

SOLID ROCKET BOOSTERS

The SRB aft skirt shoe shim material on the south posts remained intact; however, the north post shims were missing and eroded by the flame impingement. This condition has been observed on previous flights.

The performance of the SRM's (solid rocket motors) was near predicted levels and well within the specification limits. Quick-look evaluation shows that head pressures and propellant burn rates were slightly greater than predicted for both motors. The separation time for the SRB's was approximately 1.4 seconds earlier than predicted. Operation of both SRB TVC (thrust vector control) systems was satisfactory and no anomalies were experienced. Thrust imbalance between the SRB's was within specification throughout the ascent phase.

The left-hand SRB range safety system channel A signal strength dropped to 1 volt at lift-off plus 1 minute 15 seconds for 5 seconds and then returned to saturation for the remainder of the flight. An investigation is underway to determine if this condition is due to some part in the measuring system or to the range safety system hardware.

Chase plane video and photographic coverage showed that one main parachute on the right-hand SRB failed to inflate and indicated normal parachutes on the left-hand SRB. All parachutes were recovered and the postflight inspection revealed the following: right-hand main parachute serial number 4030 failed in gore 47 from horizontal ribbon 24 through the vent band; left-hand drogue parachute serial number 3006 severely damaged in

gore 49 and other surrounding material, apparently from SRM hot propellant debris; and left-hand main parachute serial number 4027 failed all horizontal ribbons in gore 18 (skirt band, vent band intact). An investigation team has been established to determine the cause of these anomalies. Flashing lights and RF beacons performed normally. Table II contains a current anomaly list for the SRB's.

EXTERNAL TANK

The ET performance was excellent. During liquid hydrogen reduced flow prior to topping, the primary 100-percent number 1 level sensor measurement circuit erroneously indicated wet. The measurement indicated wet for 36 minutes and then returned to a dry state. The measurement operation was normal throughout the remainder of the loading.

All prelaunch requirements were met with no LCC (launch commit criteria) violations. ET separation and entry were as predicted, tumble was confirmed, and impact was within the footprint. The entry of the ET could be seen from Hawaii.

The prelaunch thermal environment was as expected. The TPS (thermal protection system) experienced only minor ice/frost buildup in areas that had approved waivers prior to flight.

SPACE SHUTTLE MAIN ENGINE/MAIN PROPULSION SYSTEM

All prelaunch countdown and mainstage main engine flight data looked very good. The high-pressure oxidizer and fuel turbo-pump turbine discharge temperatures compared favorably with predicted values. SSME (Space Shuttle Main Engine) start, cutoff and propellant dump appeared to be normal. No problems were encountered throughout the flight. Performance during mainstage appeared satisfactory.

Overall ascent performance was satisfactory. During max $\bar{q}$, the SSME's throttled down to about 67 percent compared to the predicted 71 percent. The lower-than-predicted throttle level indicates higher-than-predicted SRB impulse delivered during the first 20 seconds of flight.

Engine operation and performance during mainstage appeared satisfactory. During steady-state performance, ET/ORB, (Orbiter) pressures and temperatures and ORB/SSME pressures and temperatures satisfied interface requirements. Quick-look mixture ratio and thrust values from the flight indicate repeatable engine performance.

The liquid hydrogen 2-percent liquid-level sensor tripped at about MECO (main engine cutoff), and the liquid oxygen engine cutoff sensors tripped as expected. A velocity cutoff was achieved. MECO occurred at approximately 511 seconds compared to a predicted time of 510 seconds.

Table II contains a current listing of anomalies that occurred within the SSME/MPS (main propulsion system) subsystems.

ORBITER

The overall performance of the Orbiter was satisfactory. A brief discussion of the significant anomalies is contained in the following paragraphs. A complete list of the Orbiter flight anomalies is contained in table III.

MDM FF1 Card 5 Failure

During STS 41-C prelaunch checkout, card 5 of MDM FF1 failed. The MDM was removed, replaced, and all associated functions were reverified or waived. The replacement MDM exhibited normal performance throughout the mission.

Ku-Band Rendezvous Radar Failed Self-Test and Lost Lock

During on-orbit operations, the Ku-band rendezvous radar experienced sporadic AGC (automatic gain control) spiking and false detects. When these conditions were present (eight times), the radar failed the self-test; and, on one occasion, the Ku-band failed to reacquire the SMM after losing lock because of antenna obscuration and subsequent powering down of the TWTA (traveling wave tube assembly). The overall performance of the Ku-band for this mission, however, was acceptable.

Unsuccessful Soft Docking Attempts With SMM Satellite

The EV (extravehicular) -1 crewman made three unsuccessful attempts to soft dock with the SMM satellite trunnion pin. Attitude, angles, and rates during closure were well within the TPAD design envelope. On the first two attempts, the TPAD bounced back from the SMM trunnion pin in an elastic rebound. On the third attempt, the EV-1 crewman used the MMU translation system to hold the TPAD on the SMM trunnion pin, thus preventing the bounce-back response. However, the triggering did not activate and release the jaws for soft docking with the trunnion pin. While in the payload bay, both before and after the MMU SMM operations, the trigger ring was depressed with a tether hook and the TPAD fired both times.

A 1/4-inch diameter by 3/4-inch high grommet that held the thermal blanket on the SMM structure was located near the trunnion pin. During the second EVA, the crew took measurements and located the insulation grommet 1 inch from the trunnion pin with the head of the grommet 2 and 9/16 inches in from the outside end of the trunnion pin. The TPAD requires approximately 3 inches of trunnion pin penetration to release the trigger ring.

Waste Collection System Fan Separator Anomalies

The waste collection system (WCS) fan separator number 1 exhibited low air flow. The crew switched to fan separator number 2 which operated normally for a short time and then failed. Fan separator number 1 was reselected.

Subsequent cycling of the WCS controller dc circuit breaker temporarily restored use of fan separator number 2. The mission was completed using fan separator number 1.

Brake Failures

After landing, the brakes were applied at 110 knots ground speed. The deceleration varied from 12 to 6 ft/sec^2 during the 2142 feet of braking distance. Brake energy varied from 14×10^6 ft-lb [RHOB (right-hand outboard) and LHIB (left-hand inboard)] to 16×10^6 and 17×10^6 ft-lb [LHOB (left-hand outboard) and RHIB (right-hand inboard), respectively].

Postflight inspection, removal and teardown of the brakes revealed that all four brakes were damaged. The Beryllium was cracked on rotors 3 and 4 of both the RHOB and LHIB brakes and on rotor 4 of the LHOB brake. Carbon edges were chipped, retainer washers were missing, drive clip tails were bent and carbon-surface debris damage was found on the outer two rotors or stators of all four brakes. Damage was very similar to that which occurred on STS-7 except that the damage occurred on both the left and right sides.

Sublimator Pressure-High Messages To EV-1 Crewman

One EMU (extravehicular mobility unit) -1 sublimator "pressure-high" message occurred during the first EVA after the EV-1 crewman had been EVA for about 45 minutes. During the second EVA, the EV-1 crewman experienced numerous pressure-high messages and was able

to leave the cooling water on for only about 1 minute before the temperature became too cold. After turning the cooling water off, the EV-1 crewman was able to work for about an hour before the temperature became too hot. The EV-1 crewman was unable to maintain proper temperature control during the second EVA without turning the cooling water on and off about every hour.

TABLE II.- MSFC STS 41-C ANOMALY LIST

MSFC STS-41C ANOMALY LIST — DATE: APRIL 18,1984

NO.	TITLE	TIME, G.M.T	COMMENTS	RESP. MGR.
1.	LH2 PRIMARY 100% LIQUID LEVEL SENSOR FALSE INDICATION	097:07:28	THE LH2 PRIMARY 100% LIQUID LEVEL SENSOR CIRCUIT INDICATED WET BEFORE THE TANK WAS 98% FULL, CAUSING A STOP-FLOW CONDITION AND REMAINED WET FOR APPROXIMATELY 35 MINUTES. THE LEVEL SENSOR CIRCUIT THEN OPERATED PROPERLY THEREAFTER.	ET G. PLATT EE31
2.	RH SRB MAIN PARACHUTE FAILURE TO INFLATE	097:14:05	ONE MAIN PARACHUTE ON THE RH SRB FAILED TO INFLATE. POSTFLIGHT INSPECTION REVEALED FAILED RIBBONS AT GORE 47 FROM HORIZONTAL RIBBON 24 THROUGH THE VENT BAND. AN INVESTIGATION BOARD, CHAIRED BY STAN REINARTZ/JA01, HAS BEEN ESTABLISHED.	SRB
3.	LH SRB DROGUE PARACHUTE DAMAGE	POSTFLIGHT INSPECTION	THE LH SRB DROGUE PARACHUTE WAS SEVERELY DAMAGED IN GORE 49. RIBBONS 50 THROUGH 73 WERE FAILED. AN INVESTIGATION BOARD, CHAIRED BY STAN REINARTZ/JA01, HAS BEEN ESTABLISHED.	SRB
4.	LH SRB MAIN PARACHUTE DAMAGE	POSTFLIGHT INSPECTION	ONE MAIN PARACHUTE FAILED RIBBONS 2 THROUGH 263 AT GORE 18. THE VENT AND SKIRT BANDS WERE INTACT. AN INVESTIGATION BOARD, CHAIRED BY STAN REINARTZ/JA01, HAS BEEN ESTABLISHED.	SRB

TABLE III.- JSC OV-099 STS 41-C PROBLEM TRACKING LIST

JSC OV-099 STS 41-C PROBLEM TRACKING LIST — MAY 07, 1984

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
1	MDM FF1 CARD 5 FAILURE.	PRELAUNCH	FAILED PRELAUNCH CHECKOUT. ISOLATED TO CHANNEL O ON CARD 5. REMOVED MDM. REPLACED AND RETESTED BEFORE LAUNCH. REPEATED AT VENDOR AT HIGH TEMPERATURE. ISOLATED TO A HYBRID CIRCUIT.	R. MACIAS CAR AC7900 CLOSURE IN PROCESS
2	SRB SEP AUTO A FAILED.	PRELAUNCH 96:21:49	RM WILL OPERATE ON AUTO B AND C. IF 2 OF 3 CONTACTS FAIL, SOFTWARE GOES TO AUTO/MANUAL. AUTO/MANUAL SWITCH POSITION USES 3 DIFFERENT CONTACTS. BROKEN WIRE TO MDM FF1.	R. EGUSQUIZA R. BURGHDUFF CLOSURE IN PROCESS
3	INSTRUMENTATION FAILURES:			
A	ET H2 100% FILL SENSOR (T41X1718E) INTERMITTENT.	PRELAUNCH 97:08	1 OF 2 100% SENSORS WAS INTERMITTENT AT START OF REPLENISH MODE. BOTH SENSORS NORMAL FOR LAUNCH. VERIFIED ORBITER SIGNAL CONDITIONER OK.	H. HERNANDEZ DR 13F006
B	APU 3 EGT 1 (V46T0342A) FAILED.	PRELAUNCH 97:13:53	MEASUREMENT DROPPED 500 DEG F LOW AT STARTUP AND WAS NOISY. REMOVED AND REPLACED.	R. LANCE CAR 13F005
C	SSME 2 GH 2 PRESSURIZATION OUTLET PRESSURE (V41P1260A) FAILED.	97:14:01:13	MEASUREMENT USABLE UNTIL ABOUT T+190 SECONDS. ALSO FAILED ON STS-6, 7, 8, AND 41-B. R&R.	S. BAIRD CAR 13F003
4	APU 1, 2 AND 3 GGVM TEMPERATURES (V46T0171A, 0271A & 0371A) DROPPED.	97:13:59:30	DROPPED 17 DEG F ON APU-2 FOR 13 SEC AT T+1.8 MIN. DROPPED 5 DEG F ON APU-1 FOR EQUIVALENT TIME PERIOD AT T+2 MIN 15 SEC. APU- DECREASED FROM 81 DEG F AT LAUNCH TO 75 DEG F AT T+1 MIN. WATER IN MANIFOLD IMPINGES ON TRANSDUCER.	R. LANCE CLOSURE IN PROCESS
5	AFT MCA 2 STATUS DISCRETE (V76X2261E) SHOWED OPEN AND R OMS CROSSFEED VALVE B WOULD NOT CLOSE.	98:07:42 99:07:45	DISCRETE INDICATES ANY OF 15 RELAYS IN CHAIN OUT OF CONFIGURATION. K51 RELAY MUST BE IN NON ENERGIZED POSITION TO CLOSE THE CROSSFEED VALVE. TROUBLESHOOT AT KSC.	R. EGUSQUIZA

TABLE III.- JSC OV-099 STS 41-C PROBLEM TRACKING LIST (Continued)

JSC OV-099 STS 41-C PROBLEM TRACKING LIST — MAY 07, 1984

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
6	KU-BAND RENDEZVOUS RADAR FAILED SELF TEST AND LOST LOCK.	98:16:40 99:10:18 103:10:20	FAILED TEST 2 TIMES BEFORE LDEF RELEASE AND 2 TIMES BEFORE SOLAR MAX RENDEZVOUS. LOST LOCK ON SOLAR MAX AFTER DEPLOYMENT AT ABOUT 2000 FEET.	R. FENNER CAR 13F010 CLOSURE IN PROCESS
7	R OMS FUEL TANK ISOLATION VALVE SYSTEM A POSITION INDICATOR MISCOMPARE.	99:11:05	INDICATED SIMULTANEOUS OPEN AND CLOSED ABOUT 1 HOUR 20 MIN AFTER R OMS TANK ISO VALVE WAS CLOSED. POSTFLIGHT TESTING REPEATED FAILURE.	C. HUMPHRIES CAR 13F002 CLOSURE IN PROCESS
8	SECONDARY TRUNNION PIN ATTACHMENT DEVICE FAILED TO CAPTURE SOLAR MAX SATELLITE.	99:15:33	JAWS FAILED TO FIRE PREVENTING SOFT DOCK LATCHING. INTERFERENCE CAUSED BY GROMMET HOLDING SOLAR MAX SATELLITE INSULATION.	H. RODRIGUEZ CLOSURE IN PROCESS
9	WCS FAN SEPARATOR 2 FAILED AND FAN SEPARATOR 1 IS DEGRADED.	99:07:40	CREW EXPERIENCED AIR FLOW DEGRADATION ON FAN SEP 1, SWITCHED TO FAN SEP 2, AND STATED FAN SEP 2 DID NOT WORK AT ALL. CYCLED MAIN B DC BREAKER RESTORING POWER FOR 7 HOURS. SUSPECT NOISE SUPPRESSION CIRCUIT INTERFERENCE. ACTUATOR ROD LOOSE AND LOAD SWITCH INTERMITTENT.	E. WINKLER CAR 13F008
10	RMS DEPLOY MICROSWITCHES FOR SHOULDER MANIPULATOR POSITIONING MECHANISM PEDESTAL WENT TO ZERO.	99:16:10	BOTH MICROSWITCHES TOGGLED TO 1'S ABOUT 0.5 SECONDS AFTER DEPLOY COMMAND. MICROSWITCH ADJUSTMENT SENSITIVE. RERIG AT KSC.	R. WEST CAR 13F004 CLOSURE IN PROCESS
11	L RCS FUEL 3, 4 AND 5 TANK ISOLATION VALVE B STATUS LOST.	101:13:04	CREW WENT TO GPC TAKING POWER OFF VALVE. VALVE B SHOULD HAVE BEEN OPEN. VALVE A WAS OPEN. VALVE B WAS CLOSED AT 101:17:48 G.M.T. ALL INDICATIONS GOOD. OFF LOAD OK. R&R ACTUATOR.	D. BLEVINS CAR 13F001 CLOSURE IN PROCESS
12	PAYLOAD BAY TV CAMERA B LASER RANGEFINDER COULD NOT BE TURNED ON AND IT WOULD NOT TURN OFF ON CAMERA C.	101:14:22	CREW REPORT. CYCLED POWER ON CAMERA C AND RANGEFINDER WENT OFF. SUSPECT BLOWN FUSE ON CAMERA B RANGEFINDER. REMOVE AND REPLACE.	B. EMBREY

TABLE III.- JSC OV-099 STS 41-C PROBLEM TRACKING LIST (Continued)

JSC OV-099 STS 41-C PROBLEM TRACKING LIST — MAY 07, 1984

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
13	PAYLOAD BAY TV CAMERA D BLURRED AND CAMERA C FOCUSED OUT ONLY TO ABOUT 10 FEET.	102:14:20 98:16	USED CAMERA A AS PRIMARY FOR D AND B FOR C. REMOVE AND REPLACE.	B. EMBREY
14	EVA COMMUNICATIONS LOST SIDE TONE FOR EV-2 ON MODE A.	102:07:59	EV-2 REPORTED DURING EVA-2 COMM CHECKS. CREW DEBRIEFING REPORTED ADJUSTMENT WRONG.	P. SHACK CLOSURE IN PROCESS
15	EVA VHF COMMUNICATIONS DEGRADED.	99:15:30	DURING EVA-1 AND 2 MARGINAL COMMUNICATIONS WERE EXPERIENCED IN DIFFERENT MODES. EV-1 ANTENNA CABLE SHIELD BROKEN LOOSE FROM END NUT.	P. SHACK
16	APU-2 PUMP WATER LINE (V46T0294A) SYSTEM B HEATER FAILED.	103:04:30	SWITCHED TO SYSTEM A HEATER. SYSTEM B HEATER WORKED BEFORE DEORBIT. HIGH CONTACT RESISTANCE IN THERMOSTAT.	R. LANCE CAR 13F011 CLOSURE IN PROCESS
17	FSS KEEL RETENTION LATCH DRIVE MOTOR LOST PHASE A.	103:14:39	AC PHASE A DROPPED OUT AS LATCH WAS DRIVING IN LATCH DIRECTION. COMPLETED LATCH AND RELEASE ON 2 PHASES. ISOLATED INSIDE FSS. R&R AT KSC.	G. KENNEY CLOSURE IN PROCESS
18	ECLSS GN2 SYSTEM 2 REGULATOR LOCKUP PRESSURE HIGH.	103:11:21	REGULATOR INDICATED LOCKUP AT ABOUT 256 PSIA. DECREASED TO ABOUT 230 PSIA (NORMAL) AFTER 14.7 PSIA REGULATOR WAS CYCLED. SYS 1 LEAK 0.9 SCIMS BUT IN SPEC.	J. WHALEN CLOSURE IN PROCESS
19	L OMS FUEL TOTAL QUANTITY GAGE READ LOW.	104:12:32:18	GAGE READING DROPPED ABOUT 10% TO 8% DURING DEORBIT BURN AND CONTINUED READING TO ZERO. CAUSED LOW LEVEL ALARM (5%) AT 104:12:32:42. NO REPEAT AT KSC. REPLACED FWD ELECTRONICS AND TOTALIZER.	C. HUMPHRIES CAR 13F009 CLOSURE IN PROCESS
20	RMS WRIST ROLL JOINT MOVED WHEN ARM WAS IN SINGLE MODE PITCH.	103:16:43	UNEXPLAINED WRIST ROLL MOVEMENT, ONCE WITH ELBOW PITCH AND ONCE WITH SHOULDER PITCH SELECTED. SOFTWARE DROVE WRIST ROLL BACK TO CORRECT POSITION. DATA SHOWED BRAKES WERE REMOVED.	J. PECK CLOSURE IN PROCESS

TABLE III.- JSC OV-099 STS 41-C PROBLEM TRACKING LIST (Concluded)

JSC OV-099 STS 41-C PROBLEM TRACKING LIST — MAY 07, 1984

NO.	TITLE	TIME, G.M.T.	COMMENTS	RESP. MGR.
21	ALL FOUR BRAKES DAMAGED.	LANDING	CRACKS IN BERYLLIUM, BENT DRIVE CLIPS, CARBON EDGE CHIPPING AND/OR TZM WASHERS MISSING ON ROTORS 3 & 4 OF ALL FOUR BRAKES.	C. CAMPBELL CAR 13F007
22	EMU-1 SUBLIMATOR "P HIGH" MESSAGES.	99:15:06 102:09:16	EV-1 CREWMAN REPORTED HIGH SUBLIMATOR PRESSURE DURING BOTH EVA'S. STANDARD MALFUNCTION PROCEDURES USED ON STS-41B CORRECTED PRESSURE EACH TIME BUT HAD TO SHUT COOLING WATER OFF ABOUT EVERY HOUR THEN LEAVE ON ONLY 1 MINUTE FOR EVA-2. EMU'S REMOVED AND RETURNED TO JSC.	J. McMANN CLOSURE IN PROCESS
23	PORT SLIDE WIRE BRAIDED COVERING FRAYED AND BOUND UP SLIDE.	DURING EVA	CREW DEBRIEFING. COVERING FRAYED IN 3 PLACES, ONE ALL THE WAY AROUND THE WIRE. T/S AT KSC.	J. O'KANE
24	PHOTO AND GALLEY BRACKETS DEBONDED.	ON ORBIT	CREW DEBRIEFING. PHOTO BRACKET ML94B ON STARBOARD OUTSIDE MIDDECK ABOVE SLEEP RESTRAINTS; CREW HIT CAMERA. GALLEY BRACKET FOR PERSONAL HYGIENE CURTAIN CAME OFF EARLY IN FLIGHT.	G. SANDARS R. GERLACK T. TURNER
25	GALLEY WATER DISPENSER DID NOT SHUT OFF FLOW.	97:18	CREW DEBRIEFING. STUCK ON SEVERAL TIMES DURING FIRST DAY ON ORBIT. CREW SHUT OFF GALLEY POWER EACH TIME. WORKED OK REST OF FLIGHT. T/S AT JSC. R&R GALLEY.	T. TURNER
26	ET SEPARATION 35 MM CAMERA FAILED TO OPERATE.	ET SEP	POSTFLIGHT INSPECTION. CAMERA DID NOT TURN ON WHEN ET SEP SIGNAL WAS SENT BY GPC. CAMERA OK AT JSC POSTFLIGHT AND CIRCUITS OK AT KSC.	R. GERLACH R. EGUSQUIZA