

Note: Rev 15 BASELINE corrects typo's, adds S-Band comm drop out data, adds new debris observations, & references QBAR, Mach no., & predicted Wing Leading Edge Stagnation temps
 Rev 15 was baselined by the OVE Working Group Team as of 3/10/03.

Sum No.	GMT GMT Day 32	Milestone	Entry Event	Remarks	MSID
1	13:10:39	TIG-5	APU 2 Start		
2	13:15:30	TIG	OMS TIG		
3	13:18:08		OMS End of Burn		
4	13:31:25	EI-13	APU 1 Start		
5	13:31:29		APU 3 Start		
6	13:44:09	EI	Entry Interface (400,000 ft)	Mach 24.57	
6.3	13:49:32		Start of initial roll		
QBAR = ~15 psf (-0.10 psi); Mach 24.4 ----- 32:13:50:00 ----- EI + 351 sec; WLE Stagnation Temp: ~2520 F (STS-107 Nom EOM Design Pred)					
6.5	13:50:00 / 43		Five events of unexpected return link comm drop-out (Comm events 1-5)	On upper left aft antenna (TDRS 171/W). Appears off-nominal based on previous flt data. Comm loss not continuous thru period indicated.	
7	13:50:53	Start of Peak Heating		Determined by analysis	
QBAR = ~19 psf (-0.13 psi); Mach 24.1 ----- 32:13:51:00 ----- EI + 411 sec; WLE Stagnation Temp: ~2650 F					
7.3	13:51:19 / 13:52:49		Remote sensors indicate off-nominal external event	L2L, L3L, and R2R jet firings occurred near event.	n/a
7.35	13:51:46		Inertial Beta goes and stays Negative until LOS		V90H2249C
QBAR = ~22 psf (-0.15 psi); Mach 23.7 ----- 32:13:52:00 ----- EI + 471 sec; WLE Stagnation Temp: ~2700 F					
7.4	13:52:05		First clear indication of off-nominal aero increments	Delta yawing moment coefficient only (as compared to nominal aero). Derived by analysis.	n/a
7.45	13:52:09 / 55		Four events of unexpected return link comm drop-out (Comm events 6-9)	On upper left aft antenna (TDRS 171/W). Appears off-nominal based on previous flt data. Comm loss not continuous thru period indicated.	
7.5	13:52:17	Approx Vehicle Ground Location: 39.0 N / -129.2 W	Altitude 236,800 ft / Mach 23.6 - Over the Pacific Ocean, approx 300 miles West of California Coastline	Approx vehicle position when first off-nominal data was seen; Data source: STS-107 GPS Trajectory Data	
8	13:52:17 / 52:41		LMG Brake Line Temps (D, A, C) (3) - start of off nominal trend	Unusual Temperature Increase	V58T1703A V58T1702A V58T1700A
8.5	13:52:32/55		Supply H2O Dump Nozzle Temps (A, B) (2) and Vacuum Vent Temp (1) - transient (15 to 23 seconds, respectively) increase in typical rise rates.	GMT shown indicates initial rise duration. Supply H2O Dump Nozzle temps took additional 48 secs to return to nominal temp rise, vacuum vent temps took additional 40 secs to return to nominal rise.	V62T0440A V62T0439A V62T0551A
9	deleted				
10	13:52:59		Left INBD Elevon Lower Skin Temp (1) - OSL	Began trending down 3 secs earlier	V09T1006A
QBAR = ~25.5 psf (-0.18 psi); Mach 23.2 ----- 32:13:53:00 ----- EI + 531 sec; WLE Stagnation Temp: ~2800 F					
10.5	13:53:01		First clear indication of off-nominal rolling moment increment	Start of steady (-) growth in roll moment. Derived by analysis.	n/a
11	13:53:10 / 36		Hydraulic System Left Outbd / Inbd Elevon Return Line Temps (4) - OSL	OSL was preceded by Nominal Temp rise.	V58T0394A V58T0193A V58T0157A V58T0257A
11.1	13:54:24		Start of Alpha Modulation		V90H0803C
11.2	13:53:26	Approx Veh Grd Location: 38.7 N / -123.5 W	Altitude 231600 ft / Mach 23.0 - Crossing the California Coastline	Data source: STS-107 GPS Trajectory Data	
11.3	13:53:32 / 54:22		Two events of unexpected return link comm drop-out (Comm events 10-11)	On upper left aft antenna (TDRS 171/W). Appears off-nominal based on previous flt data. Comm loss not continuous thru period indicated.	
11.5	13:53:44 / 54:11		1st reported debris (5) observed leaving the Orbiter just aft of Orbiter envelope (Debris # 1 thru 5)	EOC video # EOC2-4-0026, 0056, & 0064. No evidence of jet firings near events.	n/a
QBAR = ~29 psf (-0.20 psi); Mach 22.7 ----- 32:13:54:00 ----- EI + 591 sec; WLE Stagnation Temp: ~2850 F					
12	deleted				
13	13:54:10 / 55:12		Left Main Gear Brake Line Temp B (1) / Strut Actuator Temp (1) / Sys 3 LMG Brake Sw Vlv Ret Line Temp (FWD) (1) - start of off nominal trend	Unusual Temperature Increase	V58T1701A V58T0842A V58T0405A
14	13:54:20		Start of slow aileron trim change; Reversal in trend of derived rolling moment coefficient.	GMT is approximate (+/- 10 sec) for aileron. Observed roll moment changed from a negative to positive slope. Derived by analysis.	V90H1500C
15	13:54:22		Mid Fuselage LT BondLine Temp at x1215 (1) & LH Aft Fus Sidewall Temp at x1410 (1) - start of off nominal trend	Unusual increase in temperature rise rate	V34T1106A V09T1724A
15.3	13:54:33.3 / 37		Flash #1 - Orbiter envelope suddenly brightened (duration 0.3 sec), leaving noticeably luminescent signature in plasma trail; plus Debris # 6 - report of very bright debris observed leaving the Orbiter just aft of the Orbiter envelope.	EOC video # EOC2-4-0026, 0034, & 0009B. R3R and R2R jet firings occurred near events. Debris events 6 & 14 are visually the biggest, brightest events & therefore may indicate the most significant changes to the Orbiter of the western debris events.	n/a
QBAR = ~34.5 psf (-0.24 psi); Mach 22.1 ----- 32:13:55:00 ----- EI + 651 sec; WLE Stagnation Temp: ~2900 F					
15.35	13:55:04 / 55:30		Debris # 7 thru 10 observed leaving the Orbiter just aft of Orbiter envelope. Debris #8 event was followed by momentary brightening of plasma trail. Debris #9 event was followed by multiple secondary plasma trails.	EOC video # EOC2-4-0005, 0017, 0021, 0028, and 0030. No evidence of jet firings near events.	n/a

15.4	13:55:30		Remote sensors indicate off-nominal external event	GMT is approximate. Preliminary match to debris shedding seen in video #10 (Ivins, UT). No evidence of jet firings near event.	n/a
15.43	13:55:33 / 56:03		Two events of return link comm drop-outs (Comm events 12 & 13)	On upper right aft antenna (TDRS 171/W). Uncertain if off-nominal based on previous flight data. Comm loss not continuous thru period indicated.	
15.45	13:55:36 / 56:13		Debris # 11 thru 15 observed leaving the Orbiter just aft of Orbiter envelope. Debris #12 event was preceded and followed by secondary plasma trails. Debris #13 event was followed by momentary brightening of plasma trail adjacent to debris. Debris #14 event consisted of very bright debris observed leaving the Orbiter.	EOC video # EOC2-4-0005, 0017, 0021, 0028, 0030, and 0050. No evidence of jet firings near events. (Nearest jet firings occur at 56:17.) Debris events 6 & 14 are visually the biggest, brightest events & therefore may indicate the most significant changes to the Orbiter of the western debris events.	n/a
15.5	13:55:41		Mid Fuselage Port (Left) Sill Longeron Temp at X1215 - start of off nominal trend	Unusual Temperature Increase	V34T1118A
QBAR = ~40 psf (~0.28 psi); Mach 21.4 ----- 32:13:56:00 ----- EI + 711 sec; WLE Stagnation Temp: ~2900 F					
16	13:56:03 / 56:24		Left Lower/Upper Wing Skin Temps - Trending down (2)	Indication of potential measurement failures	V09T1002A V09T1024A
16.5	13:56:16 / 56:53		Hyd Sys 1 LMG Uplock Actuator Unlock Line Temp; Sys 3 LMG Brake Sw Vlv Ret Line Temp (FWD); LMG Brake Line Temp C; LMG Brake Line Temp B; Sys 3 Left Main Gear Strut Actuator Temp - all show a temp rise rate change.	Significant increase in temp rise rate on all four lines	V58T0125A V58T1701A V58T0405A V58T0842A V58T1702A
16.55	13:56:30 / 55		First Roll Reversal initiation / completion	Mach 21.13 - 20.76	V90H1044C
16.6	13:56:55 / 57		Return link comm drop-out (Comm event 14)	On upper right aft antenna (TDRS 171/W). Uncertain if off-nominal based on previous flight data.	
QBAR = ~42 psf (~0.29 psi); Mach 20.7 ----- 32:13:57:00 ----- EI + 771 sec; WLE Stagnation Temp: ~2900 F					
16.7	13:57:19 / 24		MLG LH Outbd Tire Pressures 1 & 2 - start of small increase in pressures	Not seen in previous flights	V51P0570A V51P0572A
16.8	13:57:19 / 58:01.5		Debris # 16 (very faint debris) observed leaving just aft of Orbiter followed by two events of asymmetrical brightening of the Orbiter shape (Flares 1 and 2) occurred over NM	Debris #16: EOC video # EOC2-4-00148-2. Flares #1 & 2: EOC2-4-00148-4. Observations by personnel from the Starfire Optical Range (Kirtland Air Force Base, NM).	n/a
17	13:57:28 / 43		Left Lower/Upper Wing Skin Temps (2) - OSL		V09T1002A V09T1024A
18	deleted				
19	13:57:54		Sys 2 LH Brake Sw Vlv Return Temp (1)	Unusual Temperature Increase	V58T0841A
QBAR = ~52.5 psf (~0.36 psi); Mach 19.8 ----- 32:13:58:00 ----- EI + 831 sec; WLE Stagnation Temp: ~2880 F					
20	13:58:03		Start of sharp aileron trim Increase	GMT is approximate (+/- 10 sec)	V90H1500C
20.5	13:58:09		Increase in derived rolling and yawing moment increments	Substantial increase in observed growth rate of both roll and yaw moment increments. Derived by analysis.	n/a
21	deleted				
22	deleted				
22.5	13:58:16		LMG Brake Line Temp D - Temp rise rate change	Significant increase in temp rise rate.	V58T1703A
23	13:58:32 / 54		MLG LH Inbd / Outbd Tire Pressures (4) - Decay to OSL		V51P0570A V51P0573A V51P0571A V51P0572A
24	deleted				
25	13:58:39 / 48		MLG LH Inbd/Outbd Wheel Temps (2) - OSL		V51T0574A V51T0575A
25.5	13:58:40		BFS Fault Msg (4) - Tire Pressures - 1st Message		
26	13:58:56		BFS Fault Msg (4) - Tire Pressures - Last Message		
QBAR = ~63.5 psf (~0.44 psi); Mach 18.7 ----- 32:13:59:00 ----- EI + 891 sec; WLE Stagnation Temp: ~2850 F					
27	13:59:06		Left Main Gear Downlocked Indication - Transferred ON		V51X0125E
27.5	13:59:23		Loss of MCC real-time data to the workstations in the FCR and MER		
28	13:59:30.66 / 30.68		Start of two yaw jets firing (R2R and R3R)	Fired continuously until end of data at 13:59:37.4	V79X2634X V79X2638X
29	13:59:31		Observed elevons deflection at LOS	Left: -8.11 deg (up) Right: -1.15 deg (up)	
29.3	13:59:31.4 / 34.5		Several events and PASS and BFS FSM messages during this time period all indicate the failure signature of ASA 4	ASAs responded appropriately. However, signature is indicative of failure of ASA 4.	V57H0253A (5 Hz)
29.5	13:59:32		Observed aileron trim at LOS	-2.3 degrees	
30	deleted				
31	deleted				
32	deleted				
32.5	13:59:32	Approx Veh Grd Location: 32.9 N / -99.0 W	Altitude ~200700 ft / Mach ~18.1 - Near Dallas TX	Approximate Vehicle Ground Location at Loss of Signal based on GMT; Data source: STS-107 GPS Trajectory Data	n/a
33	13:59:32.136	LOS	Last valid downlink frame accepted by ODRC - OI / BFS / PASS. Start of reconstructed data.	Nominal loss of comm at this GMT (for ~15 sec max based on previous flt data)	
34	deleted				
35	13:59:35/36		Sideslip on vehicle changes sign.	The event occurred between the two times listed. Aerodynamic forces due to sideslip are now reinforcing aerodynamic asymmetry.	n/a
36	13:59:36		Growth in Bank attitude error	Up until this time the flight control had been able to maintain the Bank error around 5 deg.	

37	13:59:36.8		Aerojet DAP Requests Third Right Yaw RCS Jet (R4R)	This additional jet is required to counteract the increasing aerodynamic moments on the vehicle. Fired continuously until end of data at 13:59:37.4	
38	13:59:37.3		Aerojet DAP Requests Third Right Yaw RCS Jet (R1R)	This additional jet is required to counteract the increasing aerodynamic moments on the vehicle. Fired continuously until end of data at 13:59:37.4	
39	13:59:37.n		Last aileron data	The aileron position is now approx -5.2 deg with approx -2.5 deg of aileron trim. The rate of change of aileron trim had reached the maximum allowed by the flight control system.	
40	13:59:37.396	End of 5-second period of reconstructed data	End of first 5-seconds of the 32-second period of post-LOS data. Start of approximately 25 seconds of no data available	GMT derived by MER data personnel	n/a
41	13:59:46.347 / 14:00:01.900*		PASS Fault Message annunciation - ROLL REF PASS Fault Message annunciation - L RCS LEAK BFS Fault Message annunciations - L RCS LEAK (2)	*Time info corrupted on some of the events.	

QBAR = nn psf; Mach nn ----- 32:14:00:00 ----- EI + 951 sec; WLE Stagnation Temp: ~2800 F

42	14:00:02/06	Beginning of 2-second period of reconstructed data	Debris A observed leaving the Orbiter - Large debris seen falling away from the Orbiter envelope.	EOC videos # EOC2-4-0024, EOC2-4-0018 & EOC2-4-0118	n/a
43	14:00:02.654		PASS Fault Message annunciation - L RCS LJET		
44	14:00:02.660		Start of last 2-seconds of the 32 second period of post-LOS data.		
<p>During this final 2 second period of reconstructed data, the data indicates the following systems were <u>nominal</u>: APUs were running and WSB cooling was evident. MPS integrity was still evident. Fuel cells were generating power and the PRSD tanks/lines were intact. Comm and nav aids systems in the forward fuselage were performing nominally. RSB, Body Flap, main engine, and right wing temps appeared active. ECLSS performance was nominal.</p> <p>During this final 2 second period of reconstructed data, the data indicates the following systems were <u>off-nominal</u>: All three Hyd systems were lost. The left inbd/outbd elevon actuator temps were either OSL or no data exists. Majority of left OMS pod sensors were either OSH or OSL or no data exists. Elevated temps at bottom bondline centerline skin forward and aft of the wheel wells and at the port side structure over left wing were observed. EPDC shows general upward shift in Main Bus amps and downward shift in Main Bus volts. AC3 phase A inverter appeared disconnected from the AC Buss.</p> <p>GNC data suggests vehicle was in an uncommanded attitude and was exhibiting uncontrolled rates. Yaw rate was at the sensor maximum of 20 deg/sec. The flight control mode was in AUTO. (Note that all Nav-derived parameters (e.g., alpha) are suspect due to high rates corrupting the IMU state.)</p>					
45	14:00:03.470 / 14:00:03.637*	End of 2-second period of reconstructed data	BFS Fault Message annunciation - L OMS TK P BFS Fault Message annunciation - In-determinant BFS Fault Message annunciation - SM1 AC VOLTS PASS Fault Message annunciation - L RCS PVT	* Time info corrupted on some of the events.	
46	14:00:03.637		PASS Fault Message annunciation - DAP DOWNMODE RHC	The s/w process which logs the PASS message runs every 1.92 seconds, so this event could have occurred as early as 14:00:01.717 GMT. However, during the 2 sec period, available vehicle data indicates RHC was in detent and DAP was in AUTO.	n/a
47	14:00:04.826		Last identifiable OI Downlink frame		
48	14:00:17 / 22		Debris B and C observed leaving the Orbiter	EOC videos # EOC2-4-0024 & -0118 (for both B and C)	n/a
49	14:00:21 / 25		Vehicle Main Body break-up	EOC videos # EOC2-4-0024, -0018 & -0118	n/a
50	14:00:53	End of Peak Heating		Determined by analysis	

= Nominal/Expected Event or Performance