

24	8	13:52:17		LMG Brake Line Temp D - On wheel well inbd sidewall (aft of sw vlvs) - Start of off nominal trend	Initiation of temp rise - off nominal based on rise rate comparison with flight experience.	V58T1703A	24	13:52:17	V58T1703A		1183	-108	312	1	1.46	-75/+300
24.3	7.45	13:52:25 / 31		Two events of unexpected Return link comm drop-out Event 7 - 13:52:25/26; Event 8 - 13:52:29/31	On upper left aft antenna (TDRS 171/W). S-Band comm drop-out considered out-of-family based on previous flt data (same remarks as seq # 20.3 above).		24.3	13:52:25 / 31								
24.5		deleted					24.5	deleted								
24.7		deleted					24.7	deleted								
24.8	8.5	13:52:32		Supply H2O dump Nozzle temps A/B show temporary increase in temp rise rate (15 second duration of high rise rate).	High rise rate is bounded by data loss. Increase in rise rate not observed on previous flights. GMT shown indicates start of initial rise duration. Reference event seq no. 26.6 for termination of event.	V62T0440A V62T0439A	24.8	13:52:32	V62T0440A V62T0439A							
24.9	8.5	13:52:32		Vacuum vent temp shows temporary increase in temp rise rate (23 second duration of high rise rate).	High rise rate is bounded by data loss. Increase in rise rate not observed on previous flights. GMT shown indicates start of initial rise duration. Reference event seq no. 26.65 for termination of event.	V62T0551A	24.9	13:52:32	V62T0551A							
25	8	13:52:41		LMG Brake Line Temp A - On strut facing MLG door - start of off nominal trend	Initiation of temp rise - off nominal based on rise rate comparison with flight experience.	V58T1700A	25	13:52:41	V58T1700A		1116	-140.4	282.8	1	1.46	-75/+300
25.5		deleted					25.5	deleted								
26	8	13:52:41		Left Main Gear Brake Line Temp C - Start of off nominal trend	Unusual Temp Rise	V58T1702A	26	13:52:41	V58T1702A		1140	-108	309	1	1.46	-75/+300
26.5		deleted					26.5	deleted								
26.6	8.5	13:52:47		Supply H2O dump Nozzle temps A/B return to typical rise rates.	High rise rate is bounded by data loss. GMT shown indicates end of initial rise duration. Temp took additional 48 seconds to return to nominal temp rise (53:35 GMT).	V62T0440A V62T0439A	26.6	13:52:47	V62T0440A V62T0439A							
26.63	7.45	13:52:49 / 55		Unexpected Return link comm drop-out (Comm event 9)	On upper left aft antenna (TDRS 171/W). S-Band comm drop-out considered out-of-family based on previous flt data (same remarks as seq # 20.3 above).		26.63	13:52:49 / 55								
26.65	8.5	13:52:55		Vacuum vent temp returns to typical rise rate.	High rise rate is bounded by data loss. GMT shown indicates end of initial rise duration. Temp took additional 40 seconds to returns to nominal temp rise (53:35 GMT).	V62T0551A	26.65	13:52:55	V62T0551A							
26.7		13:52:56		Left INBD Elevon Lower Skin Temp - Start of off nominal trend	Temp trending down	V09T1006A	26.7	13:52:56								
27	10	13:52:59		Left INBD Elevon Lower Skin Temp - OSL		V09T1006A	27	13:52:59	V09T1006A		nn	nn	nn	1	2.54	-200/+450
27.2	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	27.2	13:53:01								
27.5		13:53:02		Hyd Syst 1LH INBD Elevon Actr Ret Ln Temp - start of off nominal trend	Temp trending down	V58T0157A	27.5	13:53:02	V58T0157A		1350	-219	118	1	1.46	-75/+300
				Hyd Syst 3 LOE Ret LN Temp - start of off nominal trend	Temp trending down	V58T0394A			V58T0394A		nn	nn	nn	1	nn	nn
28	11	13:53:10		Hyd Syst 3 LOE Ret LN Temp - OSL	OSL was preceded by Nominal Temp rise	V58T0394A	28	13:53:10	V58T0394A		1368	-368	nn	1	1.46	-75/+300
29	11	13:53:11		Hyd Syst 1LH INBD Elevon Actr Ret Ln Temp - OSL	OSL was preceded by Nominal Temp rise	V58T0157A	29	13:53:11	V58T0157A		1350	-219	118	1	1.46	-75/+300
29.3	11.1	13:53:24	Alpha Modulation	Angle of attack modulation active		V90H0803C	29.3	13:53:24	V90H0803C		nn	nn	nn	nn	nn	nn
29.5	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		29.5	13:53:26								
30	11	13:53:31 / 53:34		Hyd Syst 1 LOE Return Line Temp - OSL	OSL was preceded by Nom Temp rise plus data loss 3 sec's prior to event	V58T0193A	30	13:53:31 / 53:34	V58T0193A		1377	-367	436	1	1.46	-75/+300
30.2	11.3	13:53:32 / 34		Unexpected Return link comm drop-out (Comm event 10)	On upper left aft antenna (TDRS 171/W). S-Band comm drop-out considered out-of-family based on previous flt data (same remarks as seq # 20.3 above).		30.2	13:53:32 / 34								
30.3		13:53:34 / 55:57	3rd Entry Heating Indication	Nominal Rise in Center Line Bond Temps (3) due to Entry Heating	13:53:34 - V09T1016A (Mid Fus Bot Port BL T X 620); 13:54:00 - V09T1022A (Mid Fus Bot Port BL T X 777); 13:55:57 - V09T1624A (Fwd Fus Lwr Skin Bot CL T)	V09T1016A V09T1022A V09T1624A	30.3	13:53:34 / 55:57	V09T1016A V09T1022A V09T1624A		nn	nn	nn	nn	nn	nn
30.5		13:53:34		Hyd Sys 2 LIE Return Ln Temp - Start of Off Nominal Trend	Temp trending down	V58T0257A	30.5	13:53:34	V58T0257A		nn	nn	nn	nn	nn	nn
31	11	13:53:36		Hyd Sys 2 LIE Return Ln Temp - OSL		V58T0257A	31	13:53:36	V58T0257A		1348	-219	116	1	1.46	-75/+300
31.5		deleted					31.5	deleted								
31.7		deleted					31.7	deleted								
32		deleted					32	deleted								

40.1	15.35	13:55:21 / 27		Debris #8 - Eighth report of debris observed leaving the Orbiter. Event was followed by momentary brightening of plasma trail.	Seen just aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	Debris: EOC2-4-0030; trail: EOC2-4-0005, 0017, 0021, 0028, and 0030	40.1	13:55:21 / 27										
40.2	15.35	13:55:25 / 29		Debris #9 - Ninth report of debris observed leaving the Orbiter. Event was followed by multiple secondary plasma trails.	Seen just aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0030, 0050	40.2	13:55:25 / 29										
40.3	15.35	13:55:26 / 30		Debris #10 - Tenth report of debris observed leaving the Orbiter	Seen well aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0005	40.3	13:55:26 / 30										
40.4	15.4	13:55:30		Remote sensors indicate off-nominal external event	GMT is approximate. Preliminary match to debris shedding seen in video from Ivins, UT (Debris #10). Strong confidence that this is an off-nominal event. No evidence of RCS jet firings (ref Atlas data and plots).		40.4	13:55:30										
40.5		13:55:32	Approx Veh Grd Location: 37.4 N / -114.1 W	Altitude 223400 ft / Mach 21.8 - Crossing the Nevada / Utah State Line	Data source: STS-107 GPS Trajectory Data		40.5	13:55:32										
40.6		13:55:33 / 35		Return link comm drop-out (Comm event 12)	First comm drop out after switched to upper right aft antenna (TDRS 171/W). While uncommon to have a drop out at this point, inconclusive if drop-out is off-nominal based on previous flt data.		40.6	13:55:33 / 35										
41		deleted					41	deleted										
41.5	15.45	13:55:36 / 42		Debris #11 - Eleventh report of debris observed leaving the Orbiter	Seen well aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0050	41.5	13:55:36 / 42										
42	15.5	13:55:41		Mid Fus Port (Left) Sill Longn Temp at x1215 - start of off nominal trend	Unusually high temp rise with respect to STS-87 & 109. Went to 2.6 F/min from 0 F/min.	V34T1118A	42	13:55:41	V34T1118A	nn	nn	nn	nn	nn	nn			
42.3	15.45	13:55:45 / 49		Debris #12 - Twelfth report of debris observed leaving the Orbiter. Event was preceded and followed by secondary plasma trails.	Seen aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0028, 0050	42.3	13:55:45 / 49										
42.5		13:55:55	Approx Veh Grd Location: 37.0 N / -112.4 W	Altitude 222100 ft / Mach 21.5 - Crossing the Utah / Arizona State Line	Data source: STS-107 GPS Trajectory Data		42.5	13:55:55										
42.7	15.45	13:55:55 / 59		Debris #13 - Thirteenth report of debris observed leaving the Orbiter. Event was followed by momentary brightening of plasma trail adjacent to debris.	Seen well aft of Orbiter envelope. No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0005, 0017, 0021	42.7	13:55:55 / 59										
42.8	15.45	13:55:58 / 56:00		Debris #14 - Very bright debris observed leaving the Orbiter.	Seen just aft of Orbiter envelope. Debris events 6 and 14 are visually the biggest, brightest events and therefore may indicate the most significant changes to the Orbiter of the western debris events.- No evidence of RCS jet firings (ref Atlas data and plots).	EOC2-4-0005, 0017, 0021, 0028, 0030	42.8	13:55:58 / 56:00										
42.9		13:56:00 / 03		Return link comm drop-out (Comm event 13)	On upper right aft antenna (TDRS 171/W). While uncommon to have a drop out at this point, inconclusive if drop-out is off-nominal based on previous flt data.		42.9	13:56:00 / 03										
43		13:56:02	Qbar 40 psf	Aft RCS Pitch Jets Deactivated			43	13:56:02										
44	16	13:56:03		Left Lower Wing Skin Temp - start of off nominal trend	Temp reading trending down (potential sensor/wire damage)	V09T1002A	44	13:56:03	V09T1002A	1280.1	240	LWR	1	2.54	-200/+450			
44.2	15.45	13:56:09 / 13		Debris #15 - Fifteenth report of debris observed leaving the Orbiter.	Seen just aft of Orbiter envelope. Nearest jet firings: R2R jet firing at 032:13:56:17.30 / 56:17.54 for 0.24 seconds, & R3R jet firing at 032:13:56:17.28 / 56:17.52 for 0.24 seconds. (Ref: RCS Atlas data analysis and plots).	EOC2-4-0017	44.2	13:56:09 / 13										
44.5	16.5	13:56:16		Hyd Sys 1 LMG UpLK Actr Unlk Ln Temp - Temp rise rate change	Temp rise rate change from 0.7 F/min (nominal) to 3.9F/min and increasing to LOS	V58T0125A	44.5	13:56:16	V58T0125A	1159	-124	315	1	1.46	-75/+300			
44.6	16.5	13:56:17		Sys 3 LMG Brake Sw Vlv Ret Line Temp (FWD) - Temp rise rate change	Temp rise rate change from 1.5 F/min to 8.8 F/min (stayed at this rate to LOS)	V58T0842A	44.6	13:56:17	V58T0842A	1156	-110	314	1	1.46	-75/+300			
44.7	16.5	13:56:20		LMG Brake Line Temp C - Temp rise rate change	Temp rise rate change from 1.3 F/min to 9.9 F/min (stayed at this rate to LOS)	V58T1702A	44.7	13:56:20	V58T1702A	1140	-108	309	1	1.46	-75/+300			

44.8	16.5	13:56:22		LMG Brake Line Temp B - Temp rise rate change	Temp rise rate change from 2.1 F/min to 9.1 F/min increasing to LOS	V58T1701A	44.8	13:56:22	V58T1701A		1116	-139.6	282.8	1	1.46	-75/+300
45	16	13:56:24		Left Upper Wing Skin Temp - start of off nominal trend	Temp reading trending down (potential sensor/wire damage)	V09T1024A	45	13:56:24	V09T1024A		1280.1	240	UPR	1	2.54	-200/+450
46	16.55	13:56:30	Approx Veh Grd Location: 36.1 N / -109.0 W	1st Roll Reversal Initiation	Mach 21.13	V90H1044C	46	13:56:30	V90H1044C		nn	nn	nn	nn	nn	nn
46.5		13:56:45		Altitude 219000 ft / Mach 20.9 - Crossing the Arizona / New Mexico State Line	Data source: STS-107 GPS Trajectory Data		46.5	13:56:45								
46.7	16.5	13:56:53		Sys 3 Left Main Gear Strut Actuator Temp - Temp rise rate change	Temp rise rate change from 1.7 F/min to 12.9 F/min (stayed at this rate to LOS)	V58T0405A	46.7	13:56:53	V58T0405A		1183	-115	315	1	1.46	-75/+300
47	16.55	13:56:55	Roll Reversal #1	1st Roll Reversal Complete	Mach 20.76	V90H1044C	47	13:56:55	V90H1044C		nn	nn	nn	nn	nn	nn
47.5		13:56:55 / 57		Return link comm drop-out (Comm event 14)	On upper right aft antenna (TDRS 171/W). While uncommon to have a drop out at this point, inconclusive if drop-out is off-nominal based on previous flt data. Note: No further comm drop-out events are listed in the timeline thru LOS, since they are not considered out-of-family at this time.		47.5	13:56:55 / 57								
48		13:56:58		IMU Velocity Increase	Reflects accelerations imparted during roll reversal. Same signature observed on STS-109. Nominal event.		48	13:56:58								
49		13:57:nn		Bodyflap deflection up 3 degrees	Matches nominal aero simulation	V90H6410C	49	13:57:nn	V57HxxxxC		nn	nn	nn	nn	nn	nn
49.5		deleted					49.5	deleted								
49.55	16.8	13:57:19 / 29		Debris # 16 - Very faint debris observed leaving just aft of Orbiter (occurred over NM)	Observations by personnel from the Starfire Optical Range (Kirtland Air Force Base, NM). Note: nearest jet firings: L2L jet firing at 032:13:56:54.71 / 57:01.12 & 032:13:57:46.35 / 57:53.12 & L3L jet firing at 032:13:56:54.66 / 57:01.07 & 032:13:57:46.33 / 57:53.10 (all 4 occurred during data dropouts & were determined based on injector temps alone). Also, R2R at 032:13:57:43.94 / 57:44.42 & R3R at 032:13:57:43.92 / 57:44.40 for 0.48 secs ea. (Ref Atlas data analysis and plots.)	EOC2-4-0148-2	49.55	13:57:19 / 29								
49.6	16.9	13:57:19		MLG LH Outbd Tire Pressure 1 - start of off nominal trend	Bit flip up - off nominal thru comparison with previous flights	V51P0570A	49.6	13:57:19	V51P0570A		1074	-160	nn	1	0.67	230 / 401
49.7	16.9	13:57:24		MLG LH Outbd Tire Pressure 2 - start of off nominal trend	Bit flip up - off nominal thru comparison with previous flights	V51P0572A	49.7	13:57:24	V51P0572A		1074	-160	nn	1	0.67	230 / 401
50	17	13:57:28		Left Lower Wing Skin Temp - OSL		V09T1002A	50	13:57:28	V09T1002A		1280.1	240	LWR	1	2.54	-200/+450
51		deleted			Rationale for deletion: Originally indicated as "Start of Roll trim in elevons". Inserted independently early in the investigation, but is better defined by sequence no. 54. "Roll trim" is better indicated with aileron trim.		51	deleted								
52	17	13:57:43		Left Upper Wing Skin Temp - OSL		V09T1024A	52	13:57:43	V09T1024A		1280.1	240	UPR	1	2.54	-200/+450
53	19	13:57:54		Sys 2 LH Brake Switching Vlv Return Temp (AFT) - start of off nominal trend	Temp increase	V58T0841A	53	13:57:54	V58T0841A		1173	-107	313	1	1.46	-75/+300
53.5	16.8	13:57:53.7 / 55.7		Flare 1: Asymmetrical brightening of Orbiter shape observed (occurred over NM)	Observations by personnel from the Starfire Optical Range (Kirtland Air Force Base, NM). Note: nearest jet firings: Same as seq no. 49.55 plus L2L at 032:13:58:00.50 / 01.46 & L3L at 032:13:58:00.48 / 01.44 (in both cases there was no start up data, but good tail off/shutdown) - 0.96 sec pulse each. Also, R2R at 032:13:58:03.18 / 09.16 & R3R at 032:13:58:03.18 / 09.16 - (in both cases firings occurred during data dropouts and were determined by injector temps). (Ref Atlas analysis and plots.)	EOC2-4-0148-4	53.5	13:57:53.7 / 55.7								
53.7	16.8	13:57:59.5 / 58:01.5		Flare 2: Asymmetrical brightening of Orbiter shape observed (occurred over NM)	Observations by personnel from the Starfire Optical Range (Kirtland Air Force Base, NM). Note: same jet firing information as for event seq no.s 49.55 & 53.5. (Ref Atlas analysis and plots.)	EOC2-4-0148-4	53.7	13:57:59.5 / 58:01.5								
54	20	13:58:03		Start of "sharp" aileron trim increase	Mach 19.79; GMT is approximate (13:58:03+/-10 seconds)	V90H1500C	54	13:58:03	V90H1500C		nn	nn	nn	nn	nn	nn
54.3	20.5	13:58:09		Increase in derived rolling and yawing moment increments	Sustantial increase in observed growth rate of both roll and yaw moment increments. Derived by analysis.	n/a	54.3	13:58:09								
54.5	22.5	13:58:16		LMG Brake Line Temp D - Temp rise rate change	Temp rise rate change from 0.9 F/min to 11.7 F/min (stayed at this rate to LOS)	V58T1703A	54.5	13:58:16	V58T1703A		1183	-108	312	1	1.46	-75/+300
55		deleted					55	deleted								
55.5		13:58:20	Approx Veh Grd Location: 34.2 N / -103.1 W	Altitude 209800 ft / Mach 19.5 - Crossing the New Mexico / Texas State Line	Data source: STS-107 GPS Trajectory Data		55.5	13:58:20								

106	46	14:00:03.637		PASS Fault Message annunciation - DAP DNMODE RHC	The software process which logs the PASS message runs every 1.92 seconds, so event could have occurred as early as 14:00:01.717 GMT. The fault message was corroborated by an initialization flag for the aerojet DAP roll stick function. However, during the 2 sec period, available vehicle data indicates RHC was in detent & DAP was in AUTO. Data is potentially error prone. Note: BFS downlist bits indicating CSS mode are initialized to "ON" for entry because BFS does not have an "Auto" mode, is always CSS, and will drive the eyebrow panel lights ON if engaged. These bits are always on in BFS through all of OPS 3 until touchdown.		106	14:00:03.637												
107	47	14:00:04.826	End of 2 second period of reconstructed data	Last identifiable OI Downlink frame	GMT derived by MER data personnel. Last recognizable Downlist frame (BFS & PASS) was approx 60 ms earlier.		107	14:00:04.826												
108	48	14:00:17/21		Debris B observed leaving the Orbiter	Time is for debris first seen well aft of Orbiter envelope.	EOC2-4-0024 EOC2-4-0118	108	14:00:17/21												
109	48	14:00:18/22		Debris C observed leaving the Orbiter	Time is for debris first seen well aft of Orbiter envelope.	EOC2-4-0024 EOC2-4-0118	109	14:00:18/22												
110	49	14:00:21/25		Vehicle Main Body break-up	Onset of vehicle main body break-up	EOC2-4-0024 EOC2-4-0018 EOC2-4-0118	110	14:00:21/25												
111	50	14:00:53	End of Peak Heating		Determined by analysis		111	14:00:53												

= Expected/Nominal performance or event
 nn = data still needed

= Expected/Nominal performance or event
 nn = data still needed