

# SPACE SHUTTLE MISSIONS SUMMARY

FLT NO.	ORBITER	CREW (6+1 UP/6+1 DN)	LAUNCH SITE, LIFTOFF TIME,	LANDING SITE/ RUNWAY, CROSSRANGE	SSME-TL NOM-ABORT EMERG	SRB RSRM	ORBIT		FSW	PAYLOAD WEIGHTS, PAYLOADS/ EXPERIMENTS	MISSION HIGHLIGHTS (LAUNCH SCRUBS/DELAYS, TAL WEATHER, ASCENT I-LOADS, FIRSTS, SIGNIFICANT ANOMALIES, ETC.)
		(PCN4 Change Col 3) TITLE, NAMES & EVA'S	LANDING SITES, ABORT TIMES	LANDING TIMES FLT DURATION, WINDS	THROTTLE PROFILE ENG. S.N.	AND ET	INC	HA/HP			

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<b>STS-127/ISS-2JA</b>  SEQ FLT # 127  KSC-127  PAD 39A (50)  MLP-3  29 <sup>th</sup> SHUTTLE FLIGHT TO ISS	OV-105 (Flight 23) ENDEAVOUR  OMS PODS LPO3 -33 RPO4 29 FRC5-22  PLT Doug Hurley P795/R341/M295  MS 1 Christopher Cassidy P796/R342/M296  MS 2 Julie Payette (Canada) (Flt 2-STS-96) P797/R249/V205/F33  MS 3 Tom Marshburn P798/R343/M297  MS 4 Dave Wolf (Flt 4 - STS-58, Up to Mir on STS-86, Dn on STS-89, STS-112) P799/R173/V147/M151  MS 5 UP Stay ISS EXP20/FLT ENG T1m Kopra P800/R344/M298  Continued...	CDR: Mark Polansky (Flt 3 - STS-98, STS-116) P794/R262/V185/M228  PLT Doug Hurley P795/R341/M295  MS 1 Christopher Cassidy P796/R342/M296  MS 2 Julie Payette (Canada) (Flt 2-STS-96) P797/R249/V205/F33  MS 3 Tom Marshburn P798/R343/M297  MS 4 Dave Wolf (Flt 4 - STS-58, Up to Mir on STS-86, Dn on STS-89, STS-112) P799/R173/V147/M151  MS 5 UP Stay ISS EXP20/FLT ENG T1m Kopra P800/R344/M298  Continued...	KSC 39A 196:22:03:09Z 6:03:10 PM EDT (P) 6:03:10 PM EDT (A) Wednesday (15) 07/15/09 (10)  <u>LAUNCH WINDOW:</u> 10M 05 (Total) 5M 05 (Preferred) <u>EOM PLS:</u> KSC <u>TAL:</u> MRN <u>TAL WX:</u> ZZA.  <u>SELECTED:</u> <u>RTLS:</u> KSC15 N/N <u>TAL:</u> MRN20 N/N <u>AOA:</u> NOR 17 N/SFD S B <u>1<sup>ST</sup> DAY PLS:</u> EDW 22L N/N  <u>TDEL:</u> 0.000 (P) -0.308 (A)  <u>MAX Q NAV:</u> 722.7 (P) 705.3 (A)  <u>SRB STG:</u> 2:04.2 (P) 2:03.8 (A)  <u>PERF:</u> NOMINAL  <u>2 ENG TAL (MRN):</u> 2:29 (P) 2:35 (A)  <u>NEG MRN (2@ 104):</u> 3:53 (P) 3:58(A)  <u>PTA (U/S 158 FPS):</u> 5:02(P) 5:10(A)	KSC 15 (KSC 71) 212:14:48:07Z 09:48:07 AM CDT FRIDAY (15) 07/31/09 (12 )  <u>DEORBIT BURN:</u> 212:13:41:09.9Z <u>XRANGE:</u> 672.5 NM  <u>ORBIT DIR:</u> A/L (41)  <u>AIM PT:</u> Nominal  <u>MLGTD:</u> 1797 FT 212:14:48:07Z VEL: 208 KGS 209 KEAS HDOT: -2.8 FPS  <u>TD NORM 195:</u> 2865 FT  <u>DRAG CHUTE DEPLOY:</u> 186 KEAS 212:14:48:13Z  <u>NLGTD:</u> 5842 FT 212:14:48:19Z VEL: 152 KGS 150 KEAS HDOT: -5.0 FPS  <u>BRK INIT:</u> 71 KGS  <u>DRAG CHUTE JETTISON:</u> 56	104/104/10 9%  <u>PREDICTED:</u> 100/104.5/104.5/72/104.5  <u>ACTUAL:</u> 100/104.5/100//72/104.5 1 = 2045 (10) 2 = 2060 (1) 3 = 2054 (9)  <u>M 3 EOM:</u> <u>WEIGHT:</u> 215899.5 LBS X CG: 1089.8 IN  <u>LANDING:</u> <u>WEIGHT:</u> 215816.5 LBS X CG: 1091.7 IN	BI-138 RSRM 106 ET-131  SLWT 35  ET IMPACT 1:14:27 MET  LAT: 35.889 S  LONG: 157.79 W	51.6 (29)  DIRECT INSERTION  POST OMS-2: 123.8x32.3 NM  DEORBIT: HA 184.5 NM HP 22.2 NM  ENTRY VELOCITY: 25855 FPS  ENTRY RANGE: 4334 NM	OI-33 (3)  CARGO: 36253LBS  <u>PAYLOAD CHARGEABLE:</u> 24682 LBS  <u>DEPLOYED:</u> 24266 LBS  <u>NON-DEPLOYED:</u> 290 LBS  <u>MIDDECK:</u> 126 LBS  <u>SHUTTLE ACCUMULATE D WEIGHTS:</u> <u>DEPLOYED:</u> 1548698 LBS  <u>NON-DEPLOYED:</u> 1621661 LBS  <u>CARGO TOTAL:</u> 4090475 LBS  <u>PERFORMANCE MARGINS (LBS):</u> FPR: 2651 FUEL BIAS: 1059 FINAL TDDP: 2553 RECON:2734  <u>PAYLOADS:</u> PLB: ISS-2J/A, ANDRE-2, DRAGONSAT  <u>MIDDECK:</u> ISS-2A, MAUI, SEITE, SIMPLEX  5 CRYO TANK SETS ODS, SRMS (84), OBSS, SSPTS, ECSHS(2), ROE U, PPSUS(2)
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Gaseous hydrogen vent line leak caused STS-119 scrub in March 2009, also caused two scrubs on STS-127. This line connects the Ground Umbilical Carrier Plate (GUCP), attached to ET, to "flare stack" for burn-off of vented gaseous hydrogen.

**Brief Mission Summary: STS-127 ( 29th mission to ISS) was a "16 day marathon construction mission". The final pieces of the Japanese Kibo Complex including an Experiment Exposed Facility "Porch" and the unpressurized Experiment Logistics Module were delivered along with spare equipment intended to keep ISS operational long after Shuttle is retired. Five EVA's and operations of three robotic arms were conducted for completion of all objectives.**

**KSC W/D:**  
 OPF: 109 + 9H  
 VAB: 7 + 0C  
 PAD B: 32 + 10C + 1 SD (STS-125 launch) + 1 CR (Crew Rest Day)  
 PAD A: 42 + 3C + 1H  
 Total Work Days = 190 (OPF processing occurred over a total time period of 118 days.)

**POSTPONEMENTS:**  
 - Added STS-127 to FDRD - launch date of 04/23/09 on 04/24/08.  
 - Ppd. to 05/15/09 on 07/03/08. Slip due to ET deliveries.  
 - Ppd. to 06/13/09 on 03/10/09. Slip due to interim changes while Cx and SSP schedules were assessed and prioritized.

**LAUNCH SCRUBS:**  
 - Launch scrubbed officially on Saturday, 06/13/09 at 12:26 a.m. EDT due to gaseous Hydrogen leak at the GUCP - the same type of leak that scrubbed STS-119 in March. Launch rescheduled for 06/17/09. Technical Scrub.  
 - Launch scrubbed officially on Wednesday 06/17/09 at 1:55 EDT with the reoccurrence of the same type of GUCP leak as previous scrub. Launch rescheduled for 07/11/09. Technical Scrub.

- Launch officially scrubbed during L-11 Hour Hold at MMT meeting on Saturday morning, 07/11/09, due to unstable weather and lightning strikes overnight in KSC area. Seven strikes hit the lightning protection system, but none hit the vehicle. Launch rescheduled for 07/12/09. Weather Scrub.  
 - Launch scrubbed during a final hold at T-9 minute mark on Sunday 07/12/09 due to predicted thunderstorms within 20 nm limit of SLF. Launch rescheduled for 07/13/09. Weather Scrub.  
 - Launch scrubbed at 6:39 PM EDT on Monday 07/13/09 due to weather violations in KSC area. Launch rescheduled for 07/15/09. Weather Scrub.

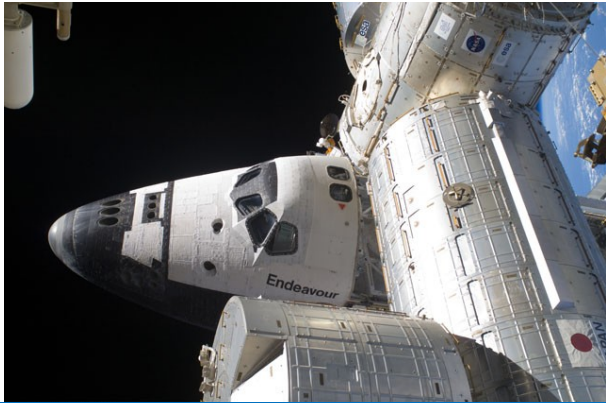

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NO.		TITLE, NAMES & EVA'S	LANDING SITES, ABORT TIMES	LANDING TIMES FLT DURATION, WINDS	THROTTLE PROFILE ENG. S.N.	AND ET	INC	HA/HP		PAYLOADS/ EXPERIMENTS	TAL WEATHER, ASCENT I-LOADS, FIRSTS, SIGNIFICANT ANOMALIES, ETC.)

# SPACE SHUTTLE MISSIONS SUMMARY

<p><b>STS-127/ISS-2JA</b> Continue d ...</p>	<p>Continued...</p> <p><u>MS 5 DN EXP</u> <u>18/19/20</u> <u>FLT ENG (Japan)</u> Koichi Wakata (Flt 3 - STS-72, STS-92, Up on STS-119 stay ISS) P801/R208/V164/M181</p> <p>SS EVA 137 DOCKED QUEST EVA 55 EMU/TETHERED EVA 130 SCHEDULED EVA 128 DURATION 5:32</p> <p>SS EVA 138 DOCKED QUEST EVA 56 EMU/TETHERED EVA 131 SCHEDULED EVA 129 DURATION 6:53</p> <p>SS EVA 139 DOCKED QUEST EVA 57 EMU/TETHERED EVA 132 SCHEDULED EVA 130 DURATION 5:59</p> <p>Continued...</p>	<p>Continued...</p> <p><u>SE TAL (ZZA 104):</u> 6:03(P) 6:08(A)</p> <p><u>PTM (U/S 181 FPS):</u> 6:01(P) 6:14(A)</p> <p><u>SE PRESS 104</u> 6:52(P) 7:01(A)</p> <p><u>MECO CMD:</u> 8:22.4(P) 8:24.9(A)</p> <p><u>VI:</u> 25819(P) 25820(A)</p> <p><u>OMS-2:</u> 35:45 (P) 38:30(A) 98.7(P) 96.9(A) FPS</p>	<p>Continued...</p> <p><u>WHEELS STOP:</u> 212:14: 49:13Z</p> <p>11856 FT</p> <p><u>ROLLOUT:</u>  10059 FT</p> <p>1:06 M:S <u>WINDS:</u> 7H KT 6R</p> <p>KTS OFFICIAL: 19008P13KT (X5P7 H7P11)</p> <p><u>DENS ALT:</u> 1916 FT</p> <p><u>FLT DURATION:</u> 15:16:44: 58</p> <p><u>S/T:</u> 1212:01:31:4 4</p> <p><u>OV-105:</u> 266:15:33:0 1</p> <p><u>DISTANCE:</u> 6,547,853 sm</p> <p><u>TOTAL SHUTTLE DISTANCE:</u> 497,402,2 18 sm</p>	 <p style="background-color: yellow; text-align: center;">ISS020-E-022626 (20 July 2009) --- Endeavour's crew cabin, along with the ISS's Kibo laboratory and Harmony node are shown during 2nd EVA.</p>  <p style="background-color: yellow; text-align: center;">S127-E-009372 (27 July 2009) Marshburn (left) &amp; Cassidy, STS-127 MS's, participate in fifth and final EVA as construction and maintenance continue on the ISS.</p>	<p>Continued...</p> <p><b>LAUNCH WINDOW:</b> Total launch window was 10M 5S with window open at 196:21:58:10Z and close at 196:22:08:10Z. Preferred Launch Time was 196:22:03:10Z (In-Plane Time) for a launch window of 5M 0S.</p> <p><b>LAUNCH DELAYS:</b> - None. Launch occurred on time at 196:22:03:10Z, 6:03:10 p.m. EDT, Wednesday, July 15, 2009. The Spaceflight Meteorology Group (SMG) forecast was challenged by thunderstorms along the east coast breeze throughout the day. However, the weather improved at the SLF and within the 20nm limit prior to launch for a "Go".</p> <p><b>TAL WEATHER:</b> TAL weather also cooperated for a Go for launch. A high pressure system produced dry and stable conditions across southern Spain. The two Spanish TAL sites were forecast for clear skies and winds within flight rule limits. Istres was forecasting a slight chance of a ceiling below flight rule limits for launch day.</p> <p><b>PERFORMANCE ENHANCEMENTS:</b> Include the standard set plus: 1) PE Operational High Q SUM/JUL, 2) OMS Assist, 3) a 52 nautical mile MECO, and 4) Del Psi</p> <p><b>FLIGHT DURATION CHANGES:</b> NONE - Planned landing at KSC on orbit 248. Landed at KSC Runway 15 on orbit 248 at 212:14:48:07Z on Friday, July 31, 2009.</p> <p><b>FIRSTS/SECONDS/LASTS:</b> - Five launch scrubs is second highest number: STS-73 in 1995 &amp; STS-61C in 1986 had six. - Koichi Wakata, first Japanese astronaut to have engaged in long-duration on-orbit, returned to Earth after 4 1/2 months. - First flight of SSME controller constant updates, an updated MPS propellant inventory, and an updated CMR. - Record-size space crew of thirteen (ISS &amp; Shuttle).</p> <p><b>NIGHT LAUNCH:</b> N/A</p> <p><b>RENDEZVOUS: #74</b> Rendezvous and dock with ISS.</p> <p>Continued...</p>
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Continue d ...

Continued...

SS EVA 140  
DOCKED QUEST EVA 58  
EMU/TETHERED EVA 133  
SCHEDULED EVA 131  
DURATION 7:12

SS EVA 141  
DOCKED QUEST EVA 59  
EMU/TETHERED EVA 134  
SCHEDULED EVA 132  
DURATION 4:54

MCC WHITE FLIGHT  
FCR (57)

**FLIGHT DIRECTORS:  
SHUTTLE:**

A/E- Bryan Lunney  
LD/O1- Paul Dye  
O2- Kwatsi Alibaruho  
Planning- Gary Horlacher  
- Mike

Sarafin  
MOD - John McCullough  
Team 4- Richard Jones

**ISS**

O1 - Brian Smith  
LD/O2 - Holly Ridings  
O3 - Derek Hassmann  
Team 4 - Ron Spencer

Continued...



**S127-E-009733 (28 July 2009) --- Record Size Space Crew:**  
The STS-127 and Expedition 20 crew members pose for a group portrait in ISS Harmony Node. From left (front row) are NASA astronauts Michael Barratt, Exp 20 FE; Mark Polansky, STS-127 CDR; cosmonaut Gennady Padalka, Exp 20 CDR; and NASA astronaut Dave Wolf, STS-127 MS. From left (middle row) are JAXA astronaut Koichi Wakata, STS-127 MS; Canadian astronauts Julie Payette, STS-127 MS and Robert Thirsk, Exp 20 FE; and NASA astronaut Tom Marshburn, STS-127 MS. From left (back row) are cosmonaut Roman Romanenko, Exp 20 FE; NASA astronauts Christopher Cassidy, STS-127 MS; Doug Hurley, STS-127 Pilot; Tim Kopra, Exp 20 FE; and ESA astronaut Frank De Winne, Exp 20 FE.

Continued...

**EVENTS:**

- During liftoff several pieces of foam insulation came off the ET. Shuttle was hit two or three times, said Bill Gerstenmaier. Some scuff marks were spotted on the belly, but that probably is coating loss and considered minor, he said. That was later determined to be the case.
- FD1: OMS2 ignition at 196:22:41:40.0.9Z resulted in a 125.4 by 85.1 NM orbit.
- FD2: RCC inspection found no areas of concern
- T1 maneuver at 198:15:17:25.9Z resulted in a 188.7 by 184.0 NM orbit
- FD3: R-Bar Pitch Maneuver was performed. No issues.
- Hard Dock, hooks closed, occurred at 198:15:47:10Z (12:47 CDT, July 17, 2009)
- ISS Hatch opened at 198:17:48:10Z (2:48 PM CDT, July 17, 2009) welcomed by ISS crew.
- IELK Seat Liner Transfer at 198:19:22:10Z (9:00 PM CDT March 17, 2009). At that time Koichi Wakata became a member of STS-127 and Tim Kopra joined the ISS Expedition 20 as Flight Engineer.
- Reboost - ~2.5 fps posigrade delta V. Increased altitude approx 4700 ft. Cleared vehicles of conjunction with Object 84180.
- FD4: Based on review of launch imagery, MMT cancelled FD5 focused inspection of Orbiter heat shield.
- FD4: EVA 1: David Wolf & Tim Kopra: Activities included: JPM berthing mechanism prep and install, CETA cart mods, and the P3 Nadir UCCAS deploy. EVA was shortened due to suit consumables. The PAS deploy was ppd. EVA1 duration 5:32.
- Using the SSRMS and SRMS the JEM Exposed Facility (JEF) was successfully unberthed from the Shuttle P/B and captured on the Japanese Experiment Module (JEM).
- FD6: EVA2: Dave Wolf & Tom Marshburn: Activities included: Transfer of ORU's (Space-to-Ground Antenna, Linear drive Unit & Pump Module) from the Integrated Cargo Carrier (ICC) to the External Stowage Platform. Installation of the JEF forward Vision Equipment [VE] was deferred. EVA2 duration 6:53.
- FD8: EVA3: Dave Wolf & Chris Cassidy: Activities included: Node 2 WIF 14 removal and installation to COL WIF 2, JLE payload prep, completion of 2 Lab FPP grounding sleeves, changeput of 2 of 6 batteries on P6 (batts A & B from the ICC-VLD) and positioning of ICC-VLD in overnight parking configuration. EV2's LiOH performance caused early termination. EVA3 duration 5:59.
- FD10: EVA4: Chris Cassidy & Tom Marshburn: Activities included: successful R&R of all batteries and successful latching of the ICC-VLD back into the Shuttle P/L bay for return. EVA4 duration 7:12.

Continued...

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<b>STS-127/ISS-2JA</b> Continue d ...	Continued...
	<p><u>CAPCOMS:</u> <u>SHUTTLE</u> A/E - Alan Poindexter - Eric Boe (Wx) LD/O1 - Greg (Box) Johnson O2 - Janice Voss Planning - Stan Love - Shannon</p> <p>Lucid Team 4 - N/A</p> <p><u>ISS</u> O1 - Hal Getzelman LD/O2-Akihiko Hoshide O3 - Jason hutt Team 4 - N/A</p>



S127E011200

S127-E-011200 (28 July 2009) --- The ISS is seen from Space Shuttle Endeavour as the two spacecraft begin their relative separation.

**SIGNIFICANT ANOMALIES:** Continued...

ET:

- POST-LAUNCH CAMERA AND FILM REVIEW SHOWED LOSS OF FOAM AT SEVERAL LOCATIONS ON THE INTERTANK.

- POST-LAUNCH CAMERA & FILM REVIEW SHOWED LOSS OF FOAM IN THE AFT INBOARD CORNER OF THE LO2 ICE FROST RAMP AT STATION 718

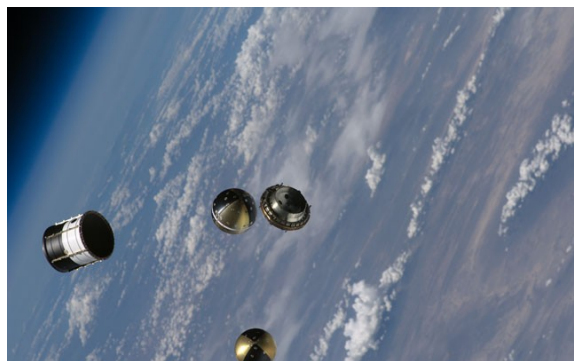
- ET TPS Loss Outboard Section of the -Y Bipod Closeout

MOD: None.

Integration:

- Unexpected Debris/Expected Debris Exceeding Mass Allowable Prior to Pad Clearance (Liftoff Debris)

- LH2 Leak at ET Ground Umbilical Carrier Plate (GUCP)



S127-E-012919 (30 July 2009) --- The DOD-Satellite ANDE-2 shown after release from Endeavour's P/L Bay. The satellite data will be used to better predict

**EVENTS:** Continued...

- FD13: EVA5: Chris Cassidy & Tom Marshburn: Activities included: completion of Z1 patch panel reconfig, SPDM covers, JEF Vision Equipment installation and several get-aheads (JEM handrail and WIF installation, Lab cable tiedowns, Node 2 Gap Spanner installation, and relocating two APFR's for STS-128). The S3 Zenith Outboard PAS task was not performed due to lack of time based on predicted METOX capability. EVA5 duration 4:54.

-Transfers:

24,638 Pounds of hardware transferred to ISS (inside & out)

10,479 Pounds of hardware returned aboard Endeavour  
2,175 Pounds of middeck items delivered to ISS aboard Endeavour

1,980 Pounds of middeck items returned from ISS to Endeavour

1,225 Pounds of water transferred to ISS

45 Pounds of Oxygen used for "stack maintenance"  
12 Pounds of Nitrogen transferred to ISS

- ISS Mass in space 685,986 mass - pounds

- FD14: Undocked at 209:17:26:00Z (12:26 PM CDT, July 28, 2009)

- After undocking, Hurley initiated Endeavour fly-around at a distance of 400 feet from ISS and completed Sep-manuever at 209:19:09:00Z (2:09 PM CDT, July 28, 2009)

- During Entry comm blackout occurred at 212:14:34:05Z - 212:14:36:24Z due to plasma effect.

**SIGNIFICANT ANOMALIES:**

Orbiter:

- MICROBIAL REMOVAL ASSEMBLY LEAKAGE

- FUEL CELL 3 SN 121 SUSTAINING HEATER TURNED ON WHEN THE FC STACK OUT TEMPERATURE REACHED A VALUE OF 185 DEG F

- DURING THE RCS HOTFIRE TEST, FORWARD RCS THRUSTER F2F

EXHIBITED LOW PC (V42P1542A) OF APPROXIMATELY 16 PSI. F2F

WAS DECLARED FAILED OFF AND AUTO DESELECTED BY RCS RM AT MET 14/10:45:40 (GMT 211/08:48:50).

KSC:

- The Istres Backup Azimuth system is in a Hard Overscan Alarm

- STS-127 Post Launch Debris

SRB:

- TOP LAYERS OF MSFC CONVERGENT COATING (MCC-1) MISSING ON AFT SKIRT TPS ACREAGE (BOTH LEFT & RIGHT HAND)POST FLIGHT OF STS-127/BI-138

- LEFT HAND SOLID ROCKET BOOSTER ENHANCED DATA ACQUISITION

SYSTEM (EDAS) ASSEMBLY CHANNEL 4 DID NOT RECORD NOMINAL

STRAIN RESPONSE.

RSRM: None.

SSME: None.

Continued at left...

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