

Significant Incidents and Close Calls in Human Spaceflight: EVA Operations

KEY	#	%
Loss of Crew	0	0
+ Crew Injury	13	4
Early Termination	13	4

TOP INCIDENT CATEGORIES	#
System Issues	70
Operations	50
Inadvertent Releases	40

358 total spacewalks through July 12, 2011.
127 (36%) have experienced significant incidents.

EVA Inadvertent Releases:

Mission ID / EVA / # lost / year	Mission ID / EVA / # lost / year
ISS-28 / 1 / 1 / 2011	ISS-12 / US 4 / 1 / 2005
STS-134/ULF6 / 2 / 4 / 2011	ISS-11 / RS 13 / 1 / 2005
STS-133/ULF5 / 1 / 1 / 2011	ISS-4 / RS 6 / 1 / 2002
ISS-26 / RS 27 / 1 / 2011	STS-102/5A.1 / 1 / 2 / 2001
ISS-25 / RS 26 / 1 / 2010	STS-104/7A / 3 / 1 / 2001
ISS-24 / RS 25 / 4 / 2010	STS-100/6A / 2 / 1 / 2001
STS-126/ULF2 / 1 / 24 / 2008	STS-92/3A / 3 / 1 / 2000
STS-124/11 / 2 / 1 / 2008	STS-101/2A.2a / 1 / 1 / 2000
ISS-16 / US 14 / 1 / 2008	STS-103/HST / 3 / 1 / 1999
ISS-16 / US 13 / 4 / 2007	STS-96/2A.1 / 1 / 1 / 1999
ISS-16 / US 11 / 1 / 2007	STS-88/2A / 2 / 3 / 1998
STS-120/10A / 4 / 2 / 2007	STS-88/2A / 1 / 4 / 1998
ISS-15 / RS 18 / 1 / 2007	Mir / PE-13 / 1 / 1993
ISS-14 / RS 17A / 3 / 2007	STS-51-1 / 1 / 1 / 1985
STS-116/12A.1 / 3 / 1 / 2006	STS-51-A / 2 / 2 / 1984
STS-116/12A.1 / 1 / 1 / 2006	STS-41-G / 1 / 1 / 1984
STS-115/12A / 2 / 1 / 2006	STS-41-C / 2 / 1 / 1984
STS-115/12A / 1 / 1 / 2006	Salyut 7 / 1 / 1 / 1983
STS-121/ULF1.1 / 3 / 1 / 2006	Gemini 10 / 1 / 1 / 1966
ISS-13 / RS 16 / 1 / 2006	Gemini 4 / 1 / 1 / 1965

- Voskhod 2, 3/18/1965**
 - Suit ballooning impeded operations and made airlock ingress difficult.
 - Workload exceeded cooling capacity.
- Gemini 4, 6/3/1965**
 - Difficulty closing hatch after EVA.
 - Workload exceeded cooling capacity.
- Gemini 9, 6/5/1966**
 - Difficulty maneuvering.
 - Multiple areas of suit damage.
 - Workload exceeded cooling capacity.
- + Gemini 10, 7/19/1966**
 - EVA terminated due to eye irritations from LiOH being blown into helmets when suit fans were run simultaneously.
- Gemini 10, 7/20/1966**
 - Difficulty maneuvering.
 - Umbilical blocked view of instruments and caused inadvertent shutdown of Gemini radio.
- Gemini 11, EVA 1, 9/13/1966**
 - EVA terminated due to fatigue.
 - Workload exceeded cooling capacity.
- Apollo 11, EVA 1, 7/20/1969**
 - Some difficulty passing through LEM hatch.
- Apollo 12, EVA 2, 11/20/1969**
 - Lunar dust abraded EMU.
 - Lunar dust caused breathing difficulties post-EVA.

- Apollo 14, EVA 2, 2/6/1971**
 - EMU wrist cable broke on one of the gloves.
- Apollo 15, EVA 2, 7/31/1971**
 - Drink bag would not dispense water.
 - Rover front wheel steering failed.
 - Dust made EMU fittings difficult to operate.
 - Hand pain from gloves pressing against fingernails.
- Apollo 15, EVA 3, 8/1/1971**
 - Radio antenna broke – taped back in place.
 - Difficulty navigating back to LEM.
- Apollo 16, EVA 1, 4/21/1972**
 - Suit ingress problems due to spinal elongation during spaceflight.
 - Lunar dust problems (jammed connectors, accelerated wear, scratches).
 - Tripped over cable to heat-flow sensors.
- Apollo 16, EVA 2, 4/22/1972**
 - Broke EMU radio antenna.
- Apollo 16, EVA 3, 4/23/1972**
 - Temporary LRV navigation failure.
- + Apollo 17, EVA 1, 12/11/1972**
 - Minor contusions from extracting stuck core sample.
 - Broke off one LRV fender which resulted in crew getting showered by dust while driving.
- Skylab 3, EVA 3, 9/22/1973**
 - Water cooling system failed.
- Skylab 4, EVA 1, 11/22/1973**
 - Difficulty keeping umbilicals separated.
- Skylab 4, EVA 2, 12/25/1973**
 - Cooling water leak resulted in ice forming on pressure control unit. EVA continued.
- Skylab 4, EVA 3, 12/29/1973**
 - Cooling water leak resulted in ice forming on pressure control unit. EVA continued.
- Skylab 4, EVA 4, 2/3/1974**
 - Cooling water leak resulted in ice forming on pressure control unit. Cooling flow turned off.
- Salyut 6 PE-1, EVA 1, 12/20/1977**
 - Safety tether not secured, but umbilical in place.
- Salyut 6 PE-3, EVA 1, 8/15/1979**
 - Primary pressure bladder punctured.

- + Salyut 7 PE-1, EVA 1, 7/30/1982**
 - Tool use resulted in wrist ring pressing on wrist and numbing hand.
- STS-5, EVA 1, 11/1982**
 - EVA no-go due to failed fan.
- STS-6, EVA 1, 4/7/1983**
 - Difficulty retracting payload bay winch.
- STS-41-B, EVA 1, 2/7/1984**
 - Slide wire bracket pip-pin pulled free.
- STS-41-B, EVA 2, 2/9/1984**
 - Crew had to retrieve a foot restraint that came loose.
- STS-41-C, EVA 1, 4/8/1984**
 - Hardware configuration difference prevented EVA crew member from capturing satellite. Efforts resulted in satellite losing sun-lock and tumbling.
 - Low temperature of MMU led to false low-nitrogen reading.
- STS-41-C, EVA 2, 4/11/1984**
 - EMU urine containment failure.
 - EMU helmet fogging.
 - Small trash bag lost due to inadvertent release of MWS lock.
- + Salyut 7 VE-3, EVA 6, 8/8/1984**
 - One spacesuit experienced a failure of the cooling water pump.
 - Physician reported the hands of the EVA crew were injured.
- STS-51-A, EVA 1, 11/12/1984**
 - Gloves abraded by knurled tool handle.
 - Capture tool failed to work due to satellite configuration differing from drawings.
- STS-51-D, EVA 1, 4/16/1985**
 - EVA crew became cold, especially the hands, during night pass.
- STS-51-I, EVA 2, 9/1/1985**
 - EVA crew complained of being cold, especially the hands. Shutting off cooling water flow to warm up resulted in the visor fogging up.
 - Difficulty in handling satellite due to lack of sight/visual cues between EVA astronauts.
 - Accidentally reused LiOH canisters from first EVA.
- STS-61-B, EVA 1, 11/29/1985**
 - Glove-induced fatigue severe enough to force redesign.
 - Crew-induced loads contributed to redesign of Hard Upper Torso.
- STS-61-B, EVA 2, 12/1/1985**
 - Glove-induced fatigue severe enough to force redesign.
 - Crew-induced loads contributed to redesign of Hard Upper Torso.
- Mir, PE-2, EVA 1, 4/11/1987**
 - Incorrect switch setting resulted in temporary suit pressure decrease.
- Mir, PE-3, EVA 2, 6/30/1988**
 - High in-suit humidity resulted in false "ventilation low."
- Mir, PE-3/PE-4, EVA 4, 12/9/1988**
 - Cosmonaut kicked stubborn hardware to get it to deploy.

- Mir, PE-6, EVA 1, 7/17/1990**
 - Airlock hatch damaged, prevented closure. Backup airlock used.
- Mir, PE-8, EVA 3, 1/26/1991**
 - Inadvertent kick knocked Kurs antenna off. Not noticed until subsequent EVA.
- STS-37, 4/1991**
 - Glove damage discovered postflight. It is unknown on which EVA it occurred.
- + STS-37, EVA 1, 4/7/1991**
 - Palm bar punctured glove and caused minor contusion.
 - Eye irritation in one crew member.
- STS-37, EVA 2, 4/8/1991**
 - Recommended against EVAs on consecutive days due to fatigue and time constraints.
- Mir, PE-8, EVA 4, 4/25/1991**
 - Cosmonaut separates from EVA partner when inspecting the Kurs antenna.
- Mir, PE-9, EVA 3, 7/15/1991**
 - Heavy air leakage through abrasions on glove.
- + Mir, PE-9, EVA 6, 7/27/1991**
 - Heat exchanger of one Orlan ran out of water, resulting in helmet fogging. Other cosmonaut guided crew member back.
 - Crew member had bruises on hands, elbows, and shoulders.
- Mir, PE-10, EVA 1, 2/20/1992**
 - Heat exchanger of one Orlan failed to work, requiring use of umbilical for cooling – limited translation range.
 - Crew member conducted portions of EVA alone.
- STS-49, EVA 1, 5/10/1992**
 - Failed attempt to capture Intelsat VI.
- STS-49, EVA 2, 5/11/1992**
 - Failed attempt to capture Intelsat VI.
- Mir, PE-13, EVA 1, 4/19/1993**
 - Orlan ventilation problems.
- STS-57, EVA 1, 6/25/1993**
 - Cold to point of experiencing hand pain.
 - Almost lost untethered piece of IUS tilt table equipment.
- Mir, PE-14, EVA 3, 9/28/1993**
 - EVA terminated due to Orlan cooling system fault.
- Mir, PE-14, EVA 4, 10/22/1993**
 - EVA terminated due to Orlan oxygen flow system fault.
- STS-61, EVA 2, 12/5/1993**
 - One EV experienced radio problems.
- STS-63, EVA 1, 2/9/1995**
 - EVA terminated when EV became "unacceptably cold."
 - One EV experienced eye irritation, likely from antifogging agent.
- STS-72, EVA 2, 1/17/1996**
 - Hand fatigue from testing of hose clamps.
- STS-80, EVA 1, 11/29/1996**
 - EVA terminated - loose screw jammed airlock hatch, preventing operation.
- Mir, PE-22, EVA 1, 12/2/1996**
 - Knocked antenna cable loose.
- STS-86, EVA 2, 10/1/1997**
 - SAFER pyro failed to fire during DTO. (Crew member in foot restraint.) Anomaly not discovered until post-flight (ground) checkout.
- STS-87, EVA 1 or 2, 11/25 or 12/3/1998**
 - First EVA cut glove. Discovered post-flight. Start of EVA sharp-edged effort.
- STS-88/2A, EVA 3, 12/12/1998**
 - SAFER flight DTO terminated due to erratic GN₂ indication. EV1 flew safely to handrail.
- STS-96/2A.1, EVA, 5/27 – 6/6/1999**
 - SAFER NSI (pyro) inadvertently fired on orbit, resulting in pyrotechnic isolation valve opening and loss of GN₂. Condition identified post-landing.

- + STS-97/4A, EVA 1, 12/3/2000**
 - Crew member experienced eye irritation. Suspect anti-fog agent used in helmet.
- STS-98/5A, EVA 1, 2/10/2001**
 - EV2 sprayed with ammonia requiring decontamination procedure (aka "bakeout").
- + STS-100/6A, EVAs 1&2, 4/22 & 4/24/2001**
 - EV1 experienced eye irritation in both eyes. Attributed to leaking in-suit drink bag and anti-fog agent used in helmet.
- ISS-9, EVA 1 (1st attempt), 5/19/2004**
 - EVA canceled due to EMU cooling loop contamination, resulting in temporary loss of ISS US EVA capability.
- ISS-9, EVA 1, 6/24/2004**
 - EVA terminated due to mis-configured valve depleting Orlan O₂ supply at start of EVA.
- ISS-9, EVA 3, 8/3/2004**
 - CMGs saturated while crew was EVA. ISS went into free drift. No IVA crew.
- STS-121/ULF1.1, EVA 2, 7/10/2006**
 - EV1's SAFER left tower latch was bumped into the unlatched position, resulting in the left tower disengaging from the EMU. EVA was suspended until latch could be re-engaged by EV2.
- STS-121/ULF1.1, EVA 3, 7/12/2006**
 - EMU "boot bubble" noticed post-EVA. Likely a manufacturing defect. Backup boot was available.
- ISS-13, EVA 2, 8/3/2006**
 - SAFER hand controller inadvertently deployed in airlock. Re-latched successfully.
- STS-116/12A.1, EVA 1, 12/12/2006**
 - EV1's SAFER HCM inadvertently deployed during airlock egress. EV2 re-stowed HCM on second attempt. SAFER NSI (pyro) accidentally fired.
 - Glove damage discovered postflight (EVA unknown).
- STS-118/13A.1, EVA 3, 8/15/2007**
 - EVA terminated due to cut glove.
- STS-118/13A.1, EVA 4, 8/18/2007**
 - EV2's SAFER HCM inadvertently deployed during airlock egress. EV3 re-stowed HCM.
- STS-120/10A, EVA 1, 10/26/2007**
 - One glove damaged, unusable after EVA.
- STS-120/10A, EVA 3, 10/30/2007**
 - One EMU unusable after EVA due to degraded sublimator.
 - One glove unusable after EVA due to thermal garment damage.
- STS-122/1E, 2/2008**
 - Glove damage discovered postflight. It is unknown on which EVA it occurred.
- STS-123/1JA, EVA 2, 3/15/2008**
 - RTV debonded from thumb on both of EV3's gloves. Switched to backup gloves.
- ISS-17, EVA 1, 7/10/2008**
 - Jettisoned Soyuz thruster cover collided with US radiator.
- STS-126/ULF2, EVA 2, 11/20/2008**
 - One EV experienced high CO₂ levels. EVA terminated early.
- STS-126/ULF2, EVA 4, 11/24/2008**
 - One EV experienced high CO₂ levels. EVA terminated early.
- ISS-18, EVA 2, 3/10/2009**
 - EVs working close to rotating port Service Module solar array. Solar arrays should have been parked for EVA.
- STS-119/15A, EVA 3, 3/23/2009**
 - Suit CO₂ sensor failed.
 - Two occurrences of SAFER HCM deployment slider bumped partially up, resulting in HCM door partially opening, with no HCM deployment.
- STS-125/HST, EVA 4, 5/17/2009**
 - Tear in palm of EMU glove noticed when EVA was near completion. EVA terminated.
- STS-127/2JA, EVA 3, 7/22/2009**
 - One EV experienced high CO₂ levels. EVA terminated early.
- STS-128/17A, EVA 3, 9/5/2009**
 - EMU camera and light detached from helmet, but held captive by electrical cable.
- STS-129/ULF3, EVA 3, 11/23/2009**
 - SAFER HCM deployment slider bumped partially up, resulting in HCM door partially opening, with no HCM deployment.
- STS-130/20A, EVA 1, 2/11/2010**
 - EV2 observed large water droplets in helmet and water at feet.
- STS-130/20A, EVA 2, 2/14/2010**
 - EV2 exposed to ammonia from leaking quick-disconnect.
- STS-130/20A, EVA 3, 2/17/2010**
 - EV1 observed large water droplets in helmet.
- ISS-24, EVA 2, 8/7/2010**
 - EV1 exposed to ammonia from leaking quick-disconnect, and experienced difficulty actuating quick-disconnect.
- ISS-24, EVA 3, 8/11/2010**
 - EV1 exposed to ammonia from leaking quick-disconnect, and experienced difficulty actuating quick-disconnect.
- STS-134/ULF6, EVA 1, 5/20/2011**
 - CO₂ sensor failure resulted in reduced EVA timeline.
- + STS-134/ULF6, EVA 3, 5/25/2011**
 - One EV experienced eye irritation, likely from anti-fogging agent.

Cumulative US Hours: 1326 (through July 12, 2011)

2000s: 900 hrs

	# of EVAs	Hours
US	113	756
Russia	30	144
China	1	0.25
Total	144	900

Cumulative Russian Hours: 581 (through July, 12 2011)

1990s: 557 hrs

	# of EVAs	Hours
US	36	231
Russia	70	326
Total	106	557

1980s: 145 hrs

	# of EVAs	Hours
US	14	69
Russia	20	77
Total	34	146

2010s: 161 hrs

	# of EVAs	Hours
US	19	131
Russia	5	30
Total	24	161

