

# Significant Incidents and Close Calls in Human Spaceflight: Ground and Research Operations

A Product of the JSC SMA Flight Safety Office

## Legend

Loss of Life

Injury and/or Loss of Vehicle or Mission

<b>NASA STS-2 on Launch Pad</b>	9/22/1981
Ground half coupling failed due to iron nitrate buildup, resulting in release of nitrogen tetroxide onto vehicle, which damaged adhesive bond on 370 tiles.	
	Injury (1)
<b>NASA STS-1 on Launch Pad</b>	3/19/1981
Workers entered orbiter aft compartment unaware it was filled with nitrogen.	
	Loss of Life (3) Injury (3)
<b>NASA Apollo 7 on Launch Pad</b>	9/1968
Nitrogen tetroxide spilled during Service Module servicing. The spilled liquid was diluted with water, creating nitric and nitrous acids. De-stack was required to repair Saturn 1B instrument ring.	
	Injury (4)
<b>NASA Launch Pad 39A</b>	5/16/1968
Maintenance on erroneously pressurized high-pressure water line resulted in cap and high-pressure water striking worker.	
	Loss of Life (1)
<b>NASA Apollo 1 (AS-204) Test</b>	1/27/1967
Crew cabin fire due to electrical short and high-pressure oxygen atmosphere.	
	Loss of Life (3) Injury (6+)
<b>Russian Soyuz 7L-OK s/n 2 Launch</b>	12/14/1966
27 minutes after an aborted launch attempt, the Soyuz launch escape system ignited on the pad, pulling the Soyuz away from the booster. This ignited the third stage fuel tanks, causing an explosion that severely damaged the pad, killing at least one person and injuring many others.	
	Loss of Life (1) Injury (many)

LAUNCH SITE

<b>NASA EVA Training</b>	5/28/1993
Astronaut developed mild frostbite on the fingers of his right hand during an equipment test in a thermal vacuum chamber.	
	Injury (1)
<b>NASA LTV Ground Processing</b>	8/27/1968
A Bell Aerosystems employee was injured when a Lunar Landing Training Vehicle fuel tank ruptured during pressurization.	
	Injury (1)
<b>NASA Altitude Chamber Test</b>	1/14/1966
Failure of an oxygen valve resulted in fire on the exterior of the altitude chamber.	
	Injury (4)
<b>NASA Vacuum Chamber EVA Suit Test</b>	12/14/1965
Oxygen fitting disconnected from suit, resulting in test subject going from 3.8 psi to 0.1 psi in 10 seconds. Subject passed out, but a rapid re-pressurization prevented death.	
	Injury (1)
<b>NASA KC-135 Zero-g Training</b>	11/15/1964
Crew member sustained a shoulder injury while conducting weightless flight training aboard the NASA KC-135.	
	Injury (1)
<b>Russian Pressure Chamber Test</b>	3/23/1961
Alcohol wipe contacted hot plate and resulted in a fire in the test chamber with oxygen atmosphere.	
	Loss of Life (1)
<b>Russian Centrifuge Training</b>	7/16/1960
Centrifuge run resulted in fire in test chamber that precluded spaceflight.	
	Injury (1)

HUMAN TEST

<b>NASA Orbiter Ground Processing</b>	9/24/1989
While replacing a leaking valve, technicians inadvertently activated the OPF2 fire deluge system due to isolation valve handles not complying with industry convention.	
	Injury (1)
<b>NASA STS-6 Post-Flight Processing</b>	4/18/1983
Liquid MMH spilled on a technician when thruster ferry plug was removed. Low temperatures during ferry flight resulted in leaking valves.	
	Injury (1)
<b>NASA STS-2 Ground Processing</b>	Fall 1981
MMH spilled onto MLI blanket containing gold foil. Gold foil catalyzed the MMH, resulting in fire.	
	Injury (2) Loss of EMU
<b>NASA EMU Test</b>	4/18/1980
EMU material ignited in high-pressure oxygen. Probable cause was manufacturing error in combination with high-pressure oxygen and material selection.	
	Injury (2) Loss of EMU
<b>NASA Orbiter Ground Processing</b>	11/1/1979
Hydrazine leak after APU hot fire in OPF1 due to incompatible material in gauge saver fittings on servicing cart.	
	Injury (1)
<b>NASA Apollo 16 De-servicing</b>	5/7/1972
A ground support equipment cart exploded during safing operations after the flight. Size of ground cart did not account for increased oxidizer quantities resulting from changes made after Apollo 15 incident.	
	Injury (1)
<b>NASA Apollo Ground Processing</b>	2/29/1972
Explosion during battery charging operation due to lack of adequate hydrogen venting.	
	Loss of Life (1) Injury (1)

INTEGRATION, ASSEMBLY, PROCESSING

<b>Red Bull Stratos</b>	10/14/2012
During freefall the sky diver started spinning and tumbling at high rates. The trajectory stabilized when thicker atmosphere was reached.	
	Injury (1)
<b>Russian Volga</b>	11/1/1962
Parachutist damaged visor while exiting the cabin, resulting in loss of suit integrity.	
	Loss of Life (1)
<b>U.S. Strato-Lab High V</b>	5/4/1961
Open visor allowed water into suit after landing, resulting in loss of flotation and crew member drowning.	
	Loss of Life (1)
<b>USAF Excelsior III</b>	8/16/1960
Pressure glove failed during ascent, resulting in loss of hand function due to ebullism. Injury resolved after mission.	
	Injury (1)
<b>USAF Excelsior I</b>	11/16/1959
Drogue chute opened early and induced spin, which prevented parachutist from manually deploying parachute. Automatic opening device saved parachutist.	
	Injury (1)
<b>USAAC Explorer 1</b>	7/27/1934
Balloon envelope failed on descent. Crew exited cabin and parachuted to safety.	
	Injury (1)
<b>Russian Osoaviakhim 1</b>	1/30/1934
Balloon lost lift on descent. Dynamic loads and lack of hatch quick release prevented crew from bailing out.	
	Loss of Life (3)
<b>USAAC S-30-241, Flight 3</b>	11/4/1927
Insufficient oxygen for mission duration resulted in crew member succumbing to hypoxia. Malfunctioning clock may have contributed.	
	Loss of Life (1)

BALLOON & PARACHUTE

<b>SpaceX Amos-6</b>	9/3/2016
Failure of one of the three composite overwrapped pressure vessels during the hot fire test resulted in the loss of the vehicle and payload.	
	Loss of Vehicle
<b>Virgin Galactic SpaceshipTwo Test Flight PF04</b>	10/31/2014
Early release of the feather lock resulted in uncommanded feather extension and vehicle breakup during powered flight.	
	Loss of Life (1) Injury (1)
<b>Virgin Galactic SpaceShipTwo Development Test</b>	7/26/2007
Explosion during test of propulsion system.	
	Loss of Life (3) Injury (3)
<b>NASA Space Shuttle OV-101 Transport</b>	6/28/1977
Faulty seal design caused a hydrazine leak. The vented hydrazine entered the aft compartment through access panels and vent doors, damaging Kapton wiring insulation and thermal blankets.	
<b>USAF/NASA NF-104A Flight</b>	6/15/1971
Rocket motor exploded in flight, destroying motor portion of tail. Pilot was able to land safely.	
<b>NASA Lunar Landing Training Vehicle</b>	1/29/1971
Failure of fly-by-wire control system resulted in loss of control of vehicle. Pilot safely ejected.	
	Loss of Vehicle Injury (1)
<b>NASA Lunar Landing Training Vehicle</b>	12/8/1968
Failure of fly-by-wire control system resulted in loss of control of vehicle. Pilot safely ejected.	
	Loss of Vehicle
<b>USAF/NASA F-104C Flight Suit</b>	11/22/1968
Suit glove lost when cabin depressurized, resulting in incapacitation of pilot from hypoxia. Pilot died in resulting crash.	
	Loss of Life (1)
<b>NASA Lunar Landing Training Vehicle</b>	5/6/1968
Loss of helium pressure disabled steering jets, resulting in loss of control of vehicle. Pilot safely ejected.	
	Loss of Vehicle
<b>USAF/NASA X-15 Flight 191</b>	11/15/1967
Electrical short and crew error led to loss of control at 230,000 feet. First U.S. spaceflight fatality.	
	Loss of Life (1)
<b>USAF/NASA X-15 Flight 184</b>	6/29/1967
Electrical fault disabled both APUs during ascent. One APU recovered during entry, but the generator would not engage. Emergency landing successful, but pilot had difficulty exiting X-15.	
	Injury (1)
<b>NASA M2-F2 Flight 16</b>	5/10/1967
Poor roll authority and the pilot being distracted by a safety helicopter during a time of high task-loading led to the late deployment of the landing gear, resulting in a crash landing.	
	Injury (1)
<b>USAF/NASA NF-104A</b>	12/10/1963
Incorrect angle of attack during entry resulted in loss of control. Pilot injured during ejection sequence.	
	Loss of Vehicle Injury (1)
<b>USAF/NASA X-15 Flight 74</b>	11/9/1962
Engine failure resulted in emergency landing. Failure of the flaps to extend led to a heavy landing, during which the left main gear collapsed, resulting in a crash landing.	
	Loss of Vehicle Injury (1)
<b>USAF/NASA X-15 Ground Test</b>	6/8/1960
Explosion destroyed vehicle during ground-based engine test.	
	Loss of Vehicle Injury (1)
<b>USAF/NASA X-15 Flight 4</b>	11/5/1959
Explosion of reaction control motor resulted in emergency landing. Fuselage failed during landing.	
	Loss of Vehicle
<b>USAF/NASA Bell X-2 Flight 20</b>	9/27/1956
While travelling at Mach 3+, the pilot attempted to turn the aircraft, resulting in loss of control and high g-loads. The pilot jettisoned the capsule, again experienced high g-loads during capsule separation, and could not bail out.	
	Loss of Life (1)

FLIGHT TEST