

# Milestones in America's shuttle programme

## Origin of shuttle programme

**1969:** Shortly after taking office, **President Richard Nixon** forms **Space Task Group** which recommends building space station and reusable launch vehicle known as **Space Transportation System (STS)**. Ultimately current design of space shuttle is chosen



## First Spacelab mission

**STS-9, Columbia, Nov 28-Dec 8, 1983:** First of 22 joint NASA-European Space Agency (ESA) Spacelab missions. Laboratory fits in shuttle's payload bay where scientists work inside pressurized area, or outside with instruments mounted on pallets. Germany's **Ulf Merbold** (above) becomes first non-American to fly on shuttle

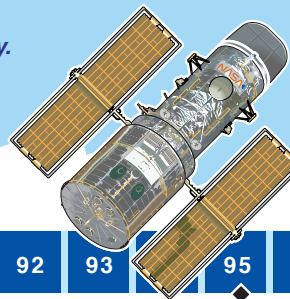
## Challenger disaster

**STS 51-L, Jan 28, 1986:** Challenger explodes 73 seconds into its flight, killing all seven crew. Failed joint allows pressurized booster rocket exhaust to penetrate external fuel tank, causing hydrogen and oxygen to ignite



## STS-31, Discovery.

**Apr 24-29, 1990:** Launch of **Hubble Space Telescope**. Hubble is joint NASA-ESA project



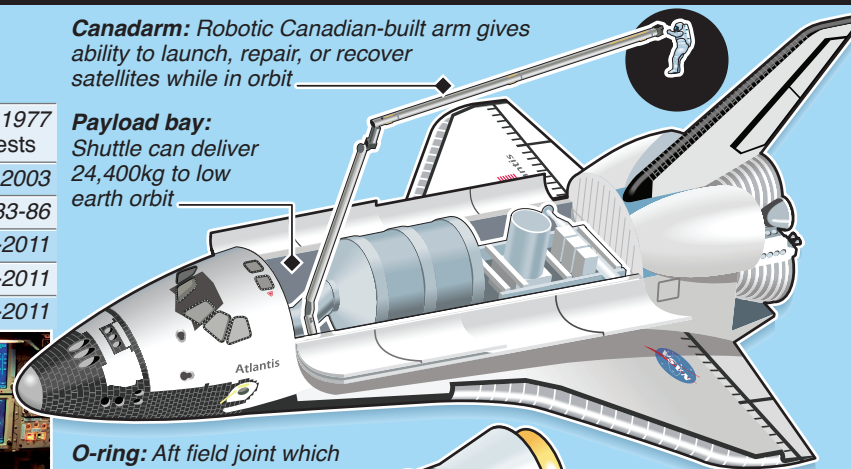
## Shuttle fleet

<b>Enterprise</b>	1977
Approach, landing tests	
<b>Columbia</b>	1981-2003
<b>Challenger</b>	1983-86
<b>Discovery</b>	1984-2011
<b>Atlantis</b>	1985-2011
<b>Endeavour</b>	1992-2011



**Canadarm:** Robotic Canadian-built arm gives ability to launch, repair, or recover satellites while in orbit

**Payload bay:** Shuttle can deliver 24,400kg to low earth orbit



**O-ring:** Aft field joint which failed in Challenger's right SRB in 1986

Shuttle aft attachment and propellant feed

Shuttle forward attachment

**External tank**  
Safety valve for liquid oxygen tank

**Oxidizer:** Liquid oxygen, 549,407 litres at -183°C

**Fuel:** Liquid hydrogen, 1,170,218 litres at -253°C

**SRBs:** Reusable solid rocket motors consist of four steel segments, lined with solid propellant. Forward segment contains igniter, aft segment acts as nozzle. Each SRB contains 450,000kg of propellant

## STS-115 to STS-132.

**2006-2010:** Discovery, Endeavour and Atlantis make 17 flights to space station, delivering **Harmony, Unity, Destiny, Columbus**, Japanese **Kibo** and Russian **Rassvet** modules. **STS-125A** is service mission to Hubble

## Discovery's final flight.

**STS-133. Feb 24-Mar 9, 2011:** Delivery of Italian **Leonardo** storage module to space station

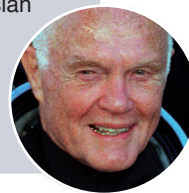


## STS-80, Columbia.

**Nov 19-Dec 7, 1996:** Shuttle's longest mission lasts 17 days. Among crew is 61-year-old **Story Musgrave**

## STS-95, Discovery.

**Oct 29-Nov 7, 1998:** At age 77, U.S. Senator **John Glenn** becomes oldest person to fly into space. Mission offers unique insight on health effects of space flight



## STS-71, Atlantis.

**Jun 27-Jul 7, 1995:** First of 11 missions to dock with Russian space station **Mir**. Missions set stage for construction of **International Space Station**

## Return to flight

**STS-26, Discovery. Sep 29-Oct 3, 1988:** Following Challenger disaster NASA makes extensive modifications to SRBs, main engine and external tank at cost of \$2.5 billion

## STS-8, Challenger.

**Aug 30-Sep 5, 1983:** First night launch and landing. **Guion S. Bluford** becomes NASA's first African-American astronaut. Over next 10 years Bluford logs more than 688 hours in space



**STS-7, Challenger. Jun 18-24, 1983:** **Sally Ride** becomes first U.S. woman in space

© GRAPHIC NEWS

Source: NASA

Pictures: Associated Press, Getty Images, NASA



**STS-92, Discovery. Oct 11-24, 2000:** 100th shuttle mission

## STS-107, Columbia.

**Feb 1, 2003:** During re-entry, 16 minutes from landing, searing hot gases seep into wing and incinerate shuttle, killing all seven crew

**STS-114, Discovery. Jul 26-Aug 9, 2005:** Two-and-a-half years after Columbia tragedy, shuttle programme resumes

## Endeavour's final flight. STS-134.

**May 16-Jun 1, 2011:** During 25 missions Endeavour makes 4,671 orbits, flying 197.76 million km

## STS-135, Atlantis.

**Jul 8-20, 2011:** Atlantis due to make final flight of shuttle programme

