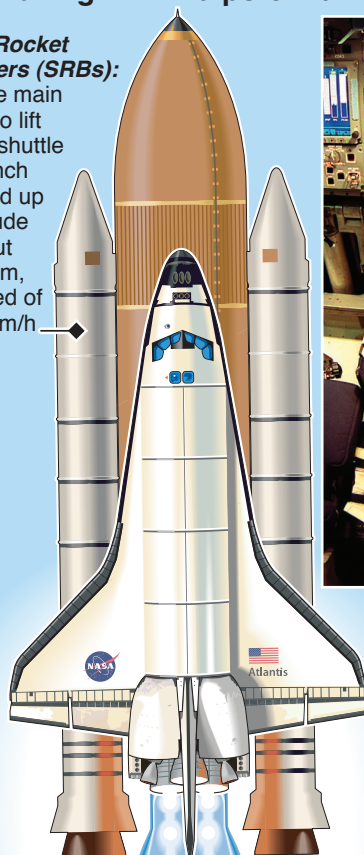


# Three decades of the space shuttle

NASA's space shuttle fleet has been flying since April 1981 and is set to retire after two final missions. *Endeavour* is scheduled to launch on April 29, before *Atlantis* makes the final flight with a potential launch date of June 28

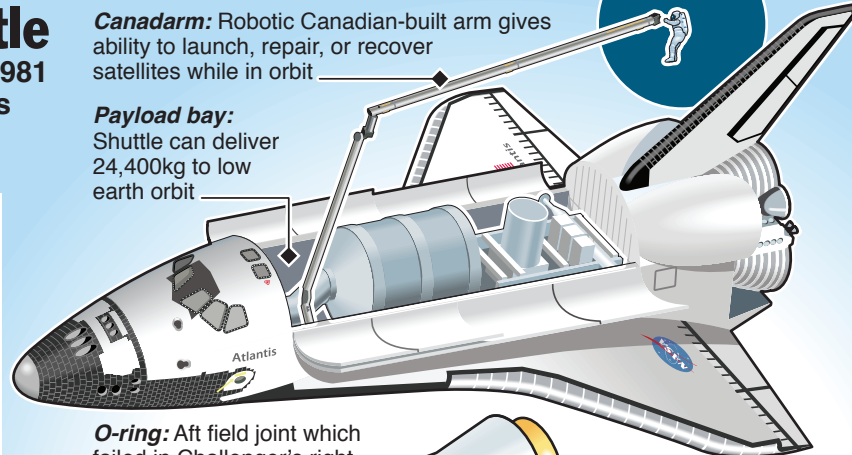
## Solid Rocket Boosters (SRBs):

Provide main thrust to lift space shuttle off launch pad and up to altitude of about 45,700m, at speed of 2,100km/h



**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

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

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

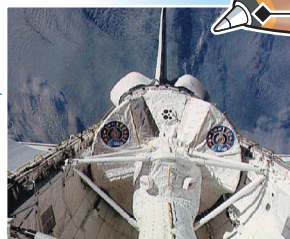
**External tank**

Safety valve for liquid oxygen tank

**SRBs:** Reusable solid rocket motor consists of four steel segments, lined with solid propellant. Forward segment contains igniter, aft segment acts as nozzle

**Propellant:** Each SRB contains 450,000kg of propellant, comprising...

<b>Fuel</b> – Atomized aluminium powder	16%
<b>Oxidizer</b> – Ammonium perchlorate	69.8%
<b>Catalyst</b> – Iron oxide powder	0.2%
<b>Binder</b> – Polybutadiene acrylic acid acrylonite	12%
<b>Epoxy curing agent</b>	2%



**Mission STS-1, Apr 12, 1981:** *Columbia* flies first shuttle mission, making 37 orbits of Earth during two-day flight

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

**STS-9, Nov 28, 1983:** First six-person mission, aboard *Columbia*, debuts *Spacelab*, orbital laboratory housed in shuttle's payload bay

**STS-26, Sep 29, 1988:** *Discovery* flies first mission following Challenger disaster

**STS-34, Oct 18, 1989:** Shuttle *Atlantis* launches *Galileo* probe to study Jupiter and its moons

**STS-31, Apr 25, 1990:** *Hubble Space Telescope* launched by shuttle *Discovery*



**STS-107, Feb 1, 2003:** Sixteen minutes from landing, during re-entry, searing hot gases seep into wing and incinerate shuttle *Columbia*, killing all seven crew

**STS-114, Jul 26, 2005:** *Discovery* flies first shuttle mission after *Columbia* tragedy. NASA's *Return to Flight* programme addresses 44 safety issues. Launch schedules to be dictated by available resources, rather than by management deadlines

**STS-5, Nov 11, 1982:** *Columbia* carries shuttle's first four-person crew. It is also first operational shuttle mission, deploying two commercial satellites

**STS-41-G, Oct 5, 1984:** *Challenger* carries first seven-person crew

**STS-51-L, Jan 28, 1986:** *Challenger* explodes 73 seconds after liftoff, killing all seven crew. Accident forces two-year suspension of shuttle programme



**STS-101, May 19, 2000:** *Atlantis* becomes first shuttle to fly with glass cockpit, replacing electro-mechanical instruments and gauges with 11 full-colour flat panel screens

**STS-135:** Final shuttle mission will deliver Italian *Raffaello* module to *International Space Station*. Shuttle *Atlantis* will complete 37 American missions to ISS and total of 135 flights since 1981