

# Space Shuttle Endeavour

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**Space Shuttle *Endeavour*** (Orbiter Vehicle Designation: **OV-105**) is one of three currently operational orbiters in the Space Shuttle fleet of NASA, the space agency of the United States.<sup>[2]</sup> (The other two are *Discovery* and *Atlantis*.) *Endeavour* is the fifth and final spaceworthy NASA space shuttle to be built, constructed as a replacement for *Challenger*. *Endeavour* first flew in May 1992 on mission STS-49 and is scheduled for decommissioning in 2010.<sup>[3]</sup> Before being decommissioned, NASA expects to use *Endeavour* for the STS-130 and STS-134 missions.<sup>[4]</sup>

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## History

The United States Congress authorized the construction of *Endeavour* in 1987 to replace *Challenger*, which was lost in an accident in 1986. Structural spares from the construction of *Discovery* and *Atlantis*, two of the three remaining operating shuttles at the time, were used

### *Endeavour* OV-105



Space Shuttle *Endeavour* on launch pad 39A prior to mission STS-127, May 31, 2009.

<b>OV designation</b>	OV-105
<b>Country</b>	United States
<b>Contract award</b>	July 31, 1987
<b>Named after</b>	HMS <i>Endeavour</i>
<b>Status</b>	Active (currently in orbit)
<b>First flight</b>	STS-49 May 7, 1992 - May 16, 1992
<b>Last flight</b>	STS-127 2010-02-08

in its assembly. The decision to build *Endeavour* was favored over refitting *Enterprise* on cost grounds.

The orbiter is named after the British HMS *Endeavour*, the ship which took Captain James Cook on his first voyage of discovery (1768-1771).<sup>[5]</sup> This is why the name is spelled in the British English manner, rather than the American English ("Endeavor"). This has caused confusion, most notably when NASA themselves misspelled a sign on the launch pad in 2007.<sup>[6]</sup> The name also honored *Endeavour*, the Command Module of Apollo 15.

*Endeavour* was named through a national competition involving students in elementary and secondary schools. Entries included an essay about the name, the story behind it and why it was appropriate for a NASA shuttle, and the project that supported the name. *Endeavour* was the most popular entry, accounting for almost one-third of the state-level winners. The national winners were Senatobia Middle School in Senatobia, Mississippi, in the elementary division and Tallulah Falls School in Tallulah Falls, Georgia, in the upper school division. They were honored at several ceremonies in Washington, D.C., including a White House ceremony where then-President George H.W. Bush presented awards to each school.<sup>[7]</sup>

*Endeavour* was delivered by Rockwell International in May 1991 and first launched a year later, in May 1992, on STS-49. Rockwell International claimed that it had made no profit on Space Shuttle *Endeavour*, despite construction costing US\$2.2 billion. On its first mission, it captured and redeployed the stranded *INTELSAT VI* communications satellite.

In 1993, it made the first service mission to the Hubble Space Telescope. *Endeavour* was withdrawn from service for eight months in 1997 for a retrofit, including installation of a new airlock. In December 1998, it delivered the Unity Module to the International Space Station.

<b>Number of missions</b>	23
<b>Crews</b>	142
<b>Time spent in space</b>	266 days 15:33:20 <sup>[1]</sup>
<b>Number of orbits</b>	3,964
<b>Distance travelled</b>	166,003,247 km (103,149,636 mi)
<b>Satellites deployed</b>	3
<b>Mir dockings</b>	1
<b>ISS dockings</b>	10



*Endeavour* as photographed from the International Space Station as it approached the station during STS-118.

*Endeavour* completed its latest Orbiter Major Modification period, which began in December 2003, and ended on October 6, 2005. During this time, the Orbiter received major hardware upgrades, including a new, multi-functional, electronic display system, often referred to as glass cockpit, and an advanced GPS receiver, along with safety upgrades recommended by the Columbia Accident Investigation Board (CAIB) for Shuttle return to flight after the disintegration of sister-ship *Columbia* during re-entry on February 1, 2003.

The STS-118 mission, the first for *Endeavour* following a lengthy refit, included astronaut Barbara Morgan, formerly assigned to the Educator Astronaut program, but now a full member of the Astronaut Corps, as part of the crew. Morgan was the backup for Christa McAuliffe on the ill-fated STS-51-L mission.

## Upgrades and features

As it was constructed later, *Endeavour* was built with new hardware designed to improve and expand orbiter capabilities. Most of this equipment was later incorporated into the other three orbiters during out-of-service major inspection and modification programs. *Endeavour's* upgrades include:

- A 40-foot (12 m) diameter drag chute that is expected to reduce the orbiter's rollout distance by 1,000 to 2,000 feet (300 to 610 m).
- The plumbing and electrical connections needed for Extended Duration Orbiter (EDO) modifications to allow up to 28-day missions (although a 28-day mission has never yet been attempted; the current record is 17 days, which was set by *Columbia*).
- Updated avionics systems that include advanced general purpose computers, improved inertial measurement units and tactical air navigation systems, enhanced master events controllers and multiplexer-demultiplexers, a solid-state star tracker and improved nose wheel steering mechanisms.
- An improved version of the Auxiliary Power Units (APUs) that provide power to operate the Shuttle's hydraulic systems.



*Endeavour* mounted on a Shuttle Carrier Aircraft.

Modifications resulting from a 2005-2006 refit of *Endeavour* include:

- The *Station-to-Shuttle Power Transfer System* (SSPTS), which converts 8

kilowatts of DC power from the ISS main voltage of 120VDC to the orbiter bus voltage of 28VDC. This upgrade will allow *Endeavour* to remain on-orbit while docked at ISS for an additional 3- to 4-day duration. The corresponding power equipment was added to the ISS during the STS-116 station assembly mission, and *Endeavour* flew with SSPTS capability during STS-118.<sup>[8][9][10]</sup>

## Planned decommissioning

According to NASA, *Endeavour* will be decommissioned in 2010, after 18 years of service, along with *Discovery* and *Atlantis*. NASA expects to have the *Orion* spacecraft ready no later than 2014. *Endeavour's* final flight was originally scheduled to be the last of the Space Shuttle program, on the STS-133 mission to the International Space Station, which will carry the final components in the ISS assembly sequence, the EXPRESS Logistics Carrier ELC5 and ELC1, to orbit. However, in 2008 one more mission (STS-134) was funded, and so *Discovery* is now slated to be the final Orbiter to fly.

NASA has offered two of the three remaining orbiters for museum donation once they are withdrawn from service. March Field Air Museum in Riverside, California has submitted a proposal to NASA for the display of an orbiter, and has stated a preference to receive *Endeavour*, due to the local connection of astronaut Tracy Caldwell, who grew up in Beaumont and flew on *Endeavour* during mission STS-118.<sup>[11]</sup>

## Flights

#	Launch date	Designation	Launch pad	Landing location	Notes
1	1992-05-07	STS-49	39-B	Edwards Air Force Base	First flight of <i>Endeavour</i> : Capture and redeploy Intelsat VI. First three-man EVA, longest US EVA since Apollo 17.
2	1992-09-12	STS-47	39-B	Kennedy Space Center	Spacelab mission J
3	1993-01-13	STS-54	39-B	Kennedy	Deploy TDRS-F
4	1993-06-21	STS-57	39-B	Kennedy	Spacelab experiments. Retrieve European

					Retrievable Carrier
5	1993-12-02	STS-61	39-B	Kennedy	First Hubble Space Telescope service mission (HSM-1)
6	1994-04-09	STS-59	39-A	Edwards	Space Radar Laboratory experiments
7	1994-09-30	STS-68	39-A	Edwards	Space Radar Laboratory experiments
8	1995-03-02	STS-67	39-A	Edwards	Spacelab Astro-2 experiments
9	1995-09-07	STS-69	39-A	Kennedy	Wake Shield Facility and other experiments
10	1996-01-11	STS-72	39-B	Kennedy	Retrieve Japanese Space Flyer Unit
11	1996-05-19	STS-77	39-B	Kennedy	Spacelab experiments
12	1998-01-22	STS-89	39-A	Kennedy	Rendezvous with Mir space station and astronaut exchange
13	1998-12-04	STS-88	39-A	Kennedy	International Space Station assembly mission (assembled the Unity Module (Node 1), first American component of the ISS)
14	2000-02-11	STS-99	39-A	Kennedy	Shuttle Radar Topography Mission experiments
15	2000-11-30	STS-97	39-B	Kennedy	International Space Station assembly mission (P6 truss segment)
16	2001-04-19	STS-100	39-A	Edwards	International Space Station assembly mission (Canadarm2 robotic arm and hand)
17	2001-12-05	STS-108	39-B	Kennedy	International Space Station rendezvous and astronaut exchange (Expedition 3/Expedition 4)

18	2002-06-05	STS-111	39-A	Edwards	International Space Station rendezvous and astronaut exchange (Expedition 4/Expedition 5)
19	2002-11-23	STS-113	39-A	Kennedy	International Space Station assembly mission and astronaut exchange/final successful shuttle flight before the Columbia disaster (Expedition 5/6 exchange; P1 truss segment assembly)
20	2007-08-08	STS-118	39-A	Kennedy	Four spacewalks conducted. <sup>[12]</sup> Installation of the International Space Station S5 Truss, of the Integrated Truss Structure. Carried a SPACEHAB module carrying 5,000 pounds of supplies and equipment to the International Space Station. Crew included the Educator Astronaut Barbara Morgan. Thermal tiles protecting the underside of the vehicle were damaged during launch. NASA decided not to fix this damage in-flight as it was not believed to be serious enough to result in loss of vehicle or crew. The craft landed a day early due to the possibility that Hurricane Dean would force Mission Control to evacuate.
21	2008-03-11	STS-123	39-A	Kennedy	International Space Station assembly mission which delivered the first element of Japan's Kibo module along with the Canadian Special Purpose Dexterous

					Manipulator robotic arm, and the Spacelab Pallet-Deployable 1.
22	2008-11-14	STS-126	39-A	Edwards <sup>[13]</sup>	International Space Station assembly mission that brought equipment and supplies in the Multi-Purpose Logistics Module <i>Leonardo</i> , and Expedition 18 crew rotation, Sandra Magnus replaced Gregory Chamitoff. <i>Endeavour</i> was the only orbiter to land on the temporary Runway 4 at Edwards AFB, as the refurbished main runway will be operational from STS-119 onwards. <sup>[14]</sup>
23	2009-07-15 <sup>[15]</sup>	STS-127	39-A	Kennedy	International Space Station assembly mission which delivered the last two elements of Japan's <i>Kibo</i> Module along with the Spacelab Pallet-Deployable 2, and an Integrated Cargo Carrier-Vertical Light Deployable. <sup>[16]</sup>
24	2010-02-08	STS-130	39-A	**	International Space Station assembly mission which will deliver the Node 3 and the Cupola observatory to the station. Once this is complete, the ISS will be 85-90 percent complete.
25	2010-07-29	STS-134	39-A	**	International Space Station assembly mission which will deliver the Alpha Magnetic Spectrometer and the ELC-3 to the space station. Once this is complete, the space shuttle program will have sent its penultimate flight to outer space.

- ‡ Longest shuttle mission for *Endeavour*
- + Targeted date as mission has yet to launch
- \* No Earlier Than (Tentative)

## See also

- List of human spaceflights
- List of Space Shuttle crews
- List of space shuttle missions
- Timeline of Space Shuttle missions
- List of human spaceflights chronologically
- Thiokol

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## External links

- Mission Summary Archive (<http://science.ksc.nasa.gov/shuttle/missions/missions.html>)
- Shuttle Orbiter Endeavour (OV-105) (<http://science.ksc.nasa.gov/shuttle/resources/orbiters/endeavour.html>)
- 04/16/07: Consolidated Launch Manifest: Space Shuttle Flights and ISS Assembly Sequence. (<http://www.exploration-space.com/16-apr-2007-nasa.html>)
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