

Facilitator Information

(All you need to know about the Space Shuttle to survive the day)

Modified from http://www.nasa.gov/returntoflight/system/system_STS.html and http://en.wikipedia.org/wiki/Space_Shuttle_program)

NASA's Space Shuttle, officially called Space Transportation System (STS), is the world's first reusable spacecraft, and the first spacecraft in history that can carry large satellites both to and from orbit. The Shuttle launches like a rocket, maneuvers in Earth's orbit like a spacecraft and lands like an airplane. The Shuttle usually carries five to seven astronauts (although eight have been carried) and up to 50,000 pounds (22 700 kilograms) of payload into low earth orbit. Three Space Shuttle orbiters now in operation - Discovery, Atlantis and Endeavour. Two of the spacecraft – Challenger and Columbia - have been lost in tragic accidents. The program started in the late 1960s and has dominated NASA's manned operations since the mid-1970s. According to the Vision for Space Exploration, use of the Space Shuttle will be focused on completing assembly of the ISS by 2010, after which it will be retired from service, and eventually replaced by the new Orion spacecraft (expected to be ready in about 2014).

Space Shuttle Components

The Space Shuttle consists of three major components: the Orbiter which houses the crew; a large External Tank that holds fuel for the main engines; and two Solid Rocket Boosters which provide most of the Shuttle's lift during the first two minutes of flight. All of the components are reused except for the external fuel tank, which burns up in the atmosphere after each launch.

Space Shuttle Missions

The longest the Shuttle has stayed in orbit on any single mission is 17.5 days on mission STS-80 in November 1996. Normally, missions may be planned for anywhere from five to 16 days in duration. The smallest crew ever to fly on the Shuttle numbered two people on the first few missions. The largest crew numbered eight people. Normally, crews may range in size from five to seven people. The Shuttle is designed to reach orbits ranging from about 185 kilometers to 643 kilometers (115 statute miles to 400 statute miles) high.

The Space Shuttle missions involve carrying large payloads to various orbits (including segments to be added to the International Space Station), providing crew rotation for the International Space Station, and performing service missions. The orbiter can also recover satellites and other payloads from orbit and return them to Earth, but its use in this capacity is rare. However, the Shuttle has previously been used to return large payloads from the ISS to Earth, as the Russian Soyuz spacecraft has limited capacity for return payloads. Each vehicle was designed with a projected lifespan of 100 launches, or 10 years' operational life.

For all of its capabilities, the Space Shuttle cannot get us to the Moon, and cannot land on the Moon. It is intended for lower orbit and structured for landing in an atmosphere (the Moon does not have an atmosphere).

NASA's New Spacecraft – To the Moon!

From http://www.nasa.gov/mission_pages/constellation/orion/index.html

America will send a new generation of explorers to the Moon aboard NASA's Orion crew exploration vehicle. Making its first flights early in the next decade, Orion is part of the Constellation Program to send human explorers back to the Moon, and then onward to Mars and other destinations in the solar system.

A component of the Vision for Space Exploration, Orion's development is taking place in parallel with missions to complete the International Space Station using the Space Shuttle before the Shuttle is retired in 2010.

Orion will be capable of carrying crew and cargo to the space station. It will be able to rendezvous with a lunar landing module and an Earth departure stage in low-Earth orbit to carry crews to the Moon and, one day, to Mars-bound vehicles assembled in low-Earth orbit. Orion will be the Earth entry vehicle for lunar and Mars returns. Orion's design will borrow its shape from the capsules of the past, but takes advantage of 21st century technology in computers, electronics, life support, propulsion and heat protection systems.

Orion will be similar in shape to the Apollo spacecraft, but significantly larger. The Apollo-style heat shield is the best understood shape for re-entering Earth's atmosphere, especially when returning directly from the Moon. Orion will be 5 meters (16.5 feet) in diameter and have a mass of about 22.7 metric tons (25 tons). Inside, it will have more than two-and-a-half times the volume of an Apollo capsule.

The larger size will allow Orion to accommodate four crew members on missions to the Moon, and six on missions to the International Space Station or Mars-bound spacecraft. Orion is scheduled to fly its first missions to the space station by 2014 and carry out its first sortie to the Moon by 2020.

For missions to the Moon, NASA will use two separate launch vehicles, each derived from a mixture of systems with heritage rooted in Apollo, Space Shuttle and commercial launch vehicle technology.

An Ares V cargo launch vehicle will precede the launch of the crew vehicle, delivering to low-Earth orbit the Earth departure stage and the lunar module that will carry explorers on the last leg of the journey to the Moon's surface. Orion will

dock with the lunar module in Earth orbit, and the Earth departure stage will propel both on their journey to the Moon. Once in lunar orbit, all four astronauts will use the lunar landing craft to travel to the Moon's surface, while the Orion spacecraft stays in lunar orbit. Once the astronauts' lunar mission is complete, they will return to the orbiting Orion vehicle using a lunar ascent module. The crew will use the service module main engine to break out of lunar orbit and head to Earth.

Orion and its crew will reenter Earth's atmosphere using a newly developed thermal protection system. Parachutes will further slow Orion's descent through the atmosphere.