# NASA Mission Summary

National Aeronautics and Space Administration

**Washington, D.C. 20546**
**(202) 358-1100**

## STS-133 MISSION SUMMARY — November 2010

## SPACE SHUTTLE DISCOVERY

Discovery will deliver to the International Space Station the Permanent Multipurpose Module (PMM), which was converted from the multi-purpose logistics module Leonardo. The PMM will provide additional storage for the station crew and experiments may be conducted inside it, such as fluid physics, materials science, biology and biotechnology. Discovery also will carry critical spare components and the Express Logistics Carrier 4 (ELC4) to the station. Express, which stands for Expedite the Processing of Experiments to the Space Station, is an external platform that holds large equipment that can only be transported using the unique capability of the shuttle. The STS-133 mission will feature two spacewalks to do maintenance work and install new components. Robonaut 2, or R2, will be the first human-like robot in space when it flies on Discovery inside the PMM to become a permanent resident of the station.

## CREW

**Steve Lindsey**
Commander (Colonel, USAF, Ret.)
- Veteran of four spaceflights
- Age: 50, Hometown: Temple City, Calif.
- Married with three children
- Logged 6,500+ hours in 50 different aircraft
- Enjoys camping and mountain/dirt biking

**Eric Boe** (bo)
Pilot (Colonel, USAF)
- Veteran of one spaceflight
- Age: 45 (46 on Oct. 1), Hometown: Atlanta
- Married with two children
- Logged 4,000 +hours in 45 different aircraft
- Enjoys outdoor sports, skiing & scuba diving

**Alvin Drew**
Mission Specialist-1 (Colonel, USAF)
- Veteran of one spaceflight
- Age: 47 (48 on Nov. 5), Born: Washington, DC
- Logged 3,500 hours in 30+ types of aircraft
- Flew 60 combat missions
- Member, Society of Experimental Test Pilots

**Tim Kopra** (CO-prah)
Mission Specialist-2 (Colonel, U.S. Army)
- Veteran of one spaceflight
- Age: 47, Hometown: Austin, Texas
- Married with two children
- Flew 44 days on station, Expedition 20
- Performed one spacewalk, 5 hours, 32 minutes

**Michael Barratt**
Mission Specialist-3 (M.D.)
- Veteran of one spaceflight
- Age: 51, Hometown: Camas, Wash.
- Married with five children
- Flew 197 days on station, Expeditions 19 & 20
- Performed two spacewalks while on station

**Nicole Stott**
Mission Specialist-4
- Veteran of one spaceflight
- Age: 47, Hometown: Clearwater, Fla.
- Married with one child
- Flew 87 days on station, Expedition 20 & 21
- Performed one spacewalk, 6 hours, 39 minutes

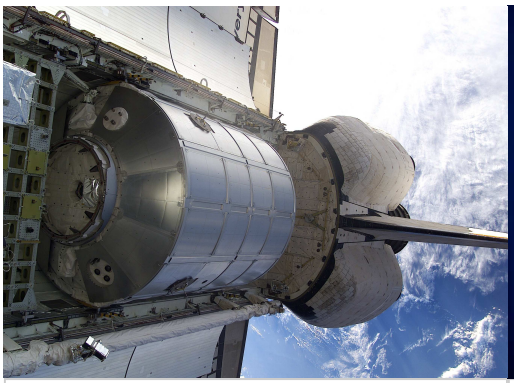
The mission patch is based on sketches from the late artist Robert McCall's final creations from his long and prodigious career. In the foreground, the shuttle Discovery ascends into a dark blue sky above a roiling fiery plume as if it is just beginning a mission. However, only the orbiter, without boosters or an external tank, is shown as it would be at mission's end. This is to signify Discovery's completion of its operational life and the beginning of its new role as a symbol of NASA's and the nation's proud legacy in human spaceflight.


**Space Shuttle Discovery**

Discovery flew its maiden voyage on Aug. 30, 1984, on the STS-41-D mission. Later missions included NASA's return to flight after the loss of Challenger (September 1988) and Columbia (July 2005), launch of the Hubble Space Telescope in April 1990, the final Shuttle/Mir docking mission in June 1998 and Senator John Glenn's shuttle flight in October 1998. When Discovery retires in 2010, it will have flown into space 39 times, more than any other shuttle. Discovery was named after one of the ships British explorer James Cook used in the 1770s during voyages in the South Pacific.

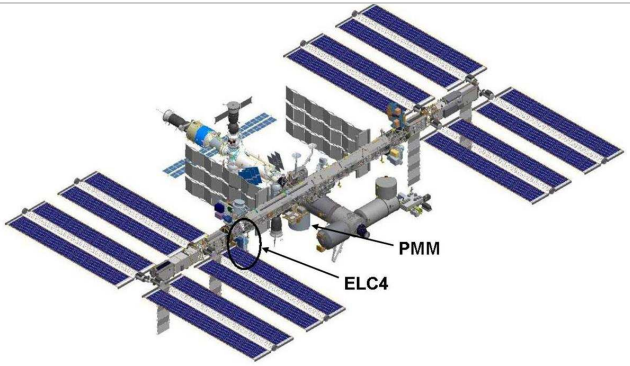
**SPACEWALKS** Each spacewalk will last approximately six hours. Kopra will wear a suit with solid red stripes and Drew an unmarked, or pure white suit.

- On flight day 5, Drew and Kopra will install a power extension cable between the Unity and Tranquility nodes to provide a contingency power source should it be required. The spacewalkers will move the failed ammonia pump module that was replaced in August from an attachment bracket to a stowage platform adjacent to the Quest airlock. Drew and Kopra will install a piece of hardware that will go under a camera on the truss. The hardware will tilt the camera to provide clearance for a spare part to be installed on a future mission. They next will replace a guide for the rail cart system used for moving cargo along the truss. The guides were removed when the astronauts were performing work on the station's starboard Solar Alpha Rotary Joint, which rotates the solar arrays to track the sun.
- On flight day 7, Drew will remove thermal insulation from a platform, while Kopra swaps out an attachment bracket on the Columbus module. Kopra then will install a camera assembly on the Dextre robot then remove insulation from Dextre's electronics platform. Drew will install a light on a cargo cart and repair some dislodged thermal insulation from a valve on the truss then remove other insulation from Tranquility. The final task will be to “fill” a special bottle with space for a Japanese education payload. The bottle will be part of a museum exhibit for public viewing.



**Leonardo in Payload Bay**

**R2**




**PMM Installation Location**

**FACTS & FIGURES**

- One flight to the station remains after STS-133 before the shuttles are retired in February 2011. STS-133 is the 133rd shuttle mission and the 35th shuttle flight to the station.
- ELC4 will carry several spare parts, a heat rejection system radiator, flight support equipment and a mechanical system support component for a cargo carrier attached to the truss.
- To convert the Leonardo MPLM into the PMM, modifications in three areas were made: hardware not required for long-duration use was removed to reduce weight and allow more storage area; the module’s interior was modified to be more user-friendly for station crew members, such as making panels easier to open and close; and the outside of the module was armored with a micrometeroid mattress, basically a bullet -proof vest that lies underneath the metallic shield.
    - The PMM will be attached to the Earth facing side of the Unity node on flight day 6.
- For the first time, the public is helping to choose songs to wake up the astronauts. Two songs with the most votes from the top 40 previous wakeup calls will be played to the STS-133 crew. Traditionally, friends and family of the crews select songs. For more information, visit: https://songcontest.nasa.gov.
- Discovery will fly a test navigation system for Space Exploration Technologies, or SpaceX. The DragonEye's Laser Imaging Detection and Ranging (LIDAR) system will help guide the Dragon spacecraft as it approaches the space station.
- Stott will send mission updates to her Twitter accounts, @Astro_Nicole.
- R2’s primary job for now is demonstrating to engineers how dexterous robots behave in space, With upgrades, it could one day help spacewalkers make repairs or perform scientific work.
    - When R2 is unpacked - likely several months after it arrives - initially it initially will be operated inside the Destiny laboratory for testing, but over time both its territory and its applications could expand. There are no plans to return R2 to Earth.
    - R2, a collaboration between NASA and General Motors, is composed primarily of aluminum with steel and nonmetallics. It weighs 330 pounds and is 3 feet, 4 inches from waist to head.
    - With the help of its supporting team, R2 is sending updates on Twitter, @AstroRobonaut and will documenting its work aboard the station.