On a mission to bring the International Space Station to full power, space shuttle Discovery lifted off March 15 from NASA's Kennedy Space Center in Florida, beginning the first shuttle mission of 2009. Once in space, Commander Lee Archambault, Pilot Tony Antonelli and the rest of the crew got to work as they inspected Discovery using the robotic arm and the orbiter boom sensor system extension. During the second full day of the mission, the shuttle rendezvoused with the space station. As the hatch opened, the two crews greeted each other and delivered the newest member to join the station crew, Japan Aerospace Exploration Agency astronaut Koichi Wakata. Wakata's arrival signaled the end of station Flight Engineer Sandy Magnus' stay aboard the station as she prepared to return to Earth aboard Discovery. The station's robotic arm maneuvered the 31,000-pound, 45-foot-long S6 truss segment to a position overnight to await the start of the first spacewalk by Mission Specialists Steve Swanson and Ricky Arnold. After spending the night in the station's Quest airlock, the spacewalkers got to work outside the
Inside, shuttle Mission Specialist John Phillips and Expedition 18 Flight Engineer Koichi Wakata remotely controlled the station's robotic arm holding the S6 truss, placing it into position. Swanson and Arnold immediately went to work bolting the segment in place, connecting the power and data cables, which allowed station flight controllers to remotely command the segment to life. The successful installation paved the way for extending the S6's two solar wings the following day. The two-stage extension took less than an hour for each as the panels unfurled, extending the pair to their full combined length of 240 feet. Work inside the station continued as the station's Expedition 18 Commander Mike Fincke and Mission Specialist Sandy Magnus turned their attention to the replacement of a failed distillation unit. The unit is part of the elaborate water purification and recycling system on the station that helps set the stage for increasing the station's crew size from three to six. The newly installed unit was successfully tested later in the mission.
The mission's second spacewalk that teamed Swanson with Joe Acaba, and third by Acaba and Arnold, prepared the station for future work, including shuttle Endeavour's STS-127 mission. March 24 brought a call from the White House, as President Barack Obama spoke to the two crews about their mission.

With all the work done, the crew members of both the station and shuttle prepared for undocking, which was followed by a final inspection of Discovery's exterior.

The shuttle was given the "go" to prepare for landing in Florida on March 28. Although weather caused mission managers to wave off the first landing attempt,

Discovery glided home safely at 3:14 p.m. EDT after traveling 5.3 million miles, ending a successful mission that paves the way for a six-member station crew.