NASA

Demonstrating Technologies For Deep Space Habitation

Bigelow Expandable Activity Module (BEAM)

NASAfacts

This artist's concept depicts the Bigelow Expandable Activity Module (BEAM), constructed by Bigelow Aerospace, attached to the International Space Station. The BEAM will be launched to the space station aboard the eighth SpaceX Commercial Resupply Mission. Credit: Bigelow Aerospace

NASA is investigating concepts for habitats that can keep astronauts healthy and productive during missions that take them farther from Earth than humans have ever gone before. Through public-private partnerships with U.S. industry, NASA is evaluating different habitation concepts that can sustain astronauts who are living and working in the harsh environment of deep space.

Expandable habitats are one such concept under consideration. To demonstrate expandable habitation capabilities, NASA will attach the Bigelow Expandable Activity Module (BEAM) to the International Space Station for a minimum two-year technology demonstration. The space station is the world's leading laboratory for conducting cutting-edge technology research, development and testing in space to enable human and robotic exploration of destinations beyond low-Earth orbit, including asteroids and Mars.

Expandable habitats require less payload volume on a rocket than traditional rigid structures, and expand after being deployed in space to potentially provide a comfortable area for astronauts to live and work inside. They also provide a varying degree of protection from solar and cosmic radiation, space debris, atomic oxygen, ultraviolet radiation and other elements in space that could be harmful to humans.

Launching on the eighth SpaceX Commercial Resupply Services mission, BEAM will be removed from the SpaceX Dragon capsule and attached to the Tranquility Node using the station's robotic Canadarm2. After it is installed, the BEAM will be expanded for a planned two-year test period during which astronauts aboard the space station will conduct a series of tests to validate overall performance and capability of expandable habitats.

Space station crew members will enter the BEAM three to four times a year for a few hours at a time. They will take measurements and monitor its performance to help inform designs for future habitat systems. Learning how an expandable habitat performs in an orbital environment and how it reacts to temperature changes, radiation, micrometeoroids, and other forms of orbital debris will provide information to address key concerns about living and working in an expandable module in the harsh environment of space.

Following the approximate two-year test and validation period, astronauts will robotically jettison the BEAM from the space station. It will leave orbit to burn up during its descent through Earth's atmosphere—as many cargo spacecraft do.

JOURNEY TO MARS

The journey to Mars is complex and filled with challenges that NASA and its partners continuously work to solve. Engineers and scientists around the country are developing the technologies astronauts will use to one day live and work on Mars, and safely return home.

Before sending the first astronauts to the Red Planet, NASA will deploy several rockets filled with cargo and supplies to await the crews' arrival. Expandable modules, which require less volume on a rocket and could weigh less than traditional rigid structures, might increase the efficiency of cargo shipments, possibly reducing the number of launches needed and overall mission costs.

BEAM FACTS AND FIGURES:

- In its packed launch configuration, the module will measure 7.09 feet long and just under 7.75 feet in diameter.
- In its deployed, expanded configuration, the BEAM will measure 13.16 feet long and 10.5 feet in diameter, providing 565 cubic feet of habitable volume.
- The BEAM's mass is approximately 3,000 pounds (1,360 kg).
- The BEAM is composed of: two metal bulkheads, an aluminum structure, and multiple layers of soft fabric with spacing between layers, protecting an internal restraint layer and bladder system. It has no windows.
- The BEAM will travel to the space station in the unpressurized aft trunk of the Dragon capsule during the eighth SpaceX Commercial Resupply Mission.
- Robotics ground controllers will use the robotic Canadarm2 robotic arm to extract the BEAM from the Dragon capsule and attach it to the aft section of the Tranquility Node on the space station.
- The BEAM's planned mission duration is two years.
- The BEAM is outfitted with various sensors and radiation monitors.

The BEAM is an example of NASA's increased commitment to partnering with industry to stimulate the growth of commercial industry in space. The BEAM project is a public-private partnership between Bigelow Aerospace and NASA's Advanced Exploration Systems (AES) Division, which pioneers innovative approaches to rapidly and affordably develop prototype systems for future human exploration missions.

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