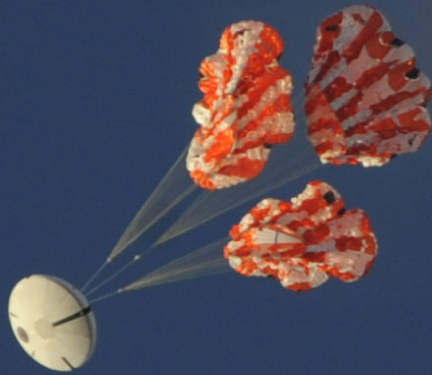


ORION'S PARACHUTE SYSTEM

Orion's parachute system is designed to ensure a safe landing for astronauts returning to Earth in the crew module at speeds exceeding 25,000 mph from deep space missions. This system is critical for the safe return of Orion's future crews who will travel beyond the Moon to explore other planetary bodies throughout our solar system, including Mars. While the Earth's atmosphere will initially slow the spacecraft down to 325 mph, the parachutes are needed to get to a safe landing speed of 20 mph or less.

11

Orion's parachute system consists of a total of 11 parachutes



Deployed at 9,000 feet in altitude and a vehicle speed of 130 mph, the main parachutes will slow the crew module to a landing speed of 17 mph.

3

Forward bay cover parachutes are used in conjunction with pyrotechnic thrusters to ensure separation of the forward bay cover (FBC), which protects Orion and its parachutes during the heat of reentry.

7 feet in diameter and 8 lbs. each, 100% Kevlar material (approximately 38 cubic feet)

Each FBC parachute is approximately 100 feet long from the FBC attachment to the crown (top) when inflated

Deployed at 26,500 feet in altitude and a vehicle speed of 475 feet per second (324 mph)



2

Drogue parachutes are used to slow and stabilize the crew module during descent and establish proper conditions for main parachute deployment to follow.

23 feet in diameter and 80 lbs. each, Kevlar/Nylon hybrid material (approximate 400 square feet)

Each drogue parachute is approximately 100 feet long from the crew module attachment to the crown (top) when inflated

Deployed at 25,000 feet in altitude and a vehicle speed of 450 feet per second (307 mph)



3

Pilot parachutes are used to lift and deploy the main parachutes from the crew module forward bay.

11 feet in diameter and 11 lbs. each, Kevlar/Nylon hybrid material (approximately 95 square feet)

Deployed at 9,500 feet in altitude and a vehicle speed of 190 feet per second (130 mph)



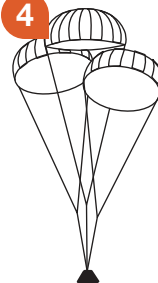
3

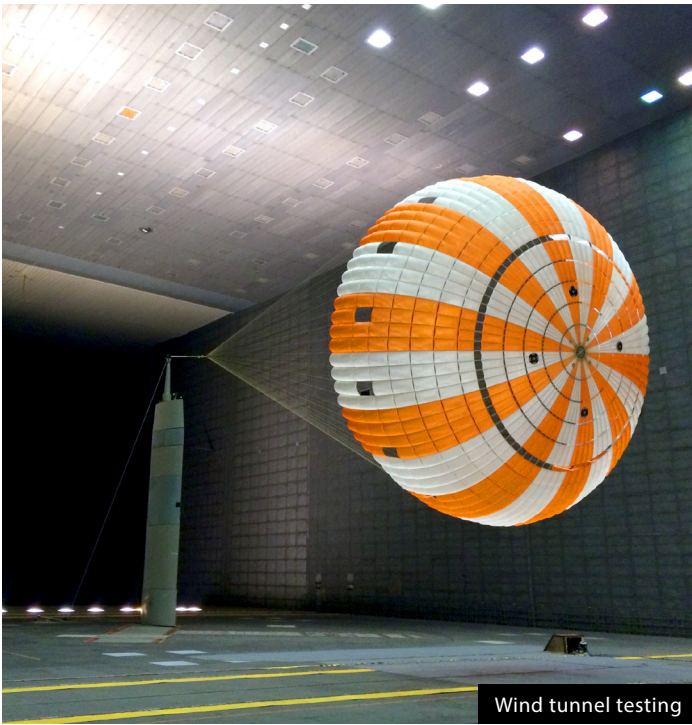
Main parachutes are used to slow the crew module for landing to a speed that ensures astronaut safety.

116 feet in diameter and 310 lbs. each, Kevlar/Nylon hybrid material (over 10,500 square feet)

Main parachutes are deployed (lifted) from the crew module forward bay by pilot parachutes

Each main parachute is approximately 265 feet long from the crew module attachment to the crown (top) when inflated





Wind tunnel testing



Drop test in Yuma, Arizona



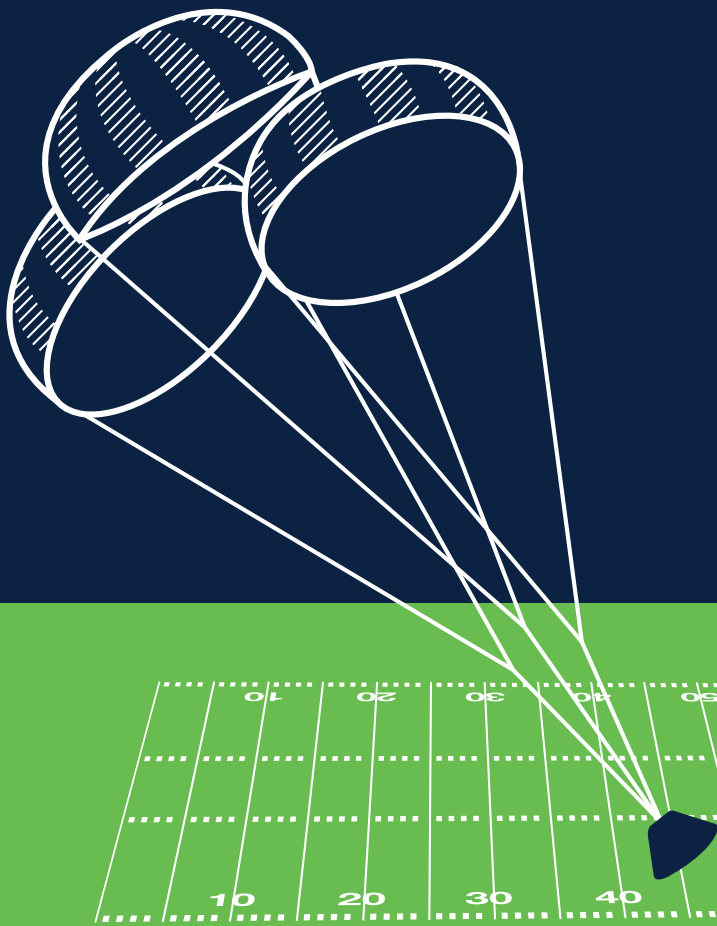
Pad Abort flight test



Return from space

Orion's parachute system was designed with crew safety in mind: it can withstand the failure of either one drogue or one main parachute, and it can ensure a secure landing in an emergency, as witnessed during the successful 2010 Pad Abort 1 flight test. The system underwent additional tests to validate the design and demonstrate repeatability before the crew actually flies in the spacecraft.

The parachute system was developed and tested by NASA and the agency's contractor partners. Parachutes are designed and fabricated by Airborne Systems in Santa Ana, California; the mortars are provided through Lockheed Martin by General Dynamics Ordnance & Tactical Systems, located in Seattle; and project management is performed by Jacobs Engineering's Engineering Science Contract Group in Houston. Parachute system testing was performed at the U.S. Army Yuma Proving Ground in Yuma, Arizona.

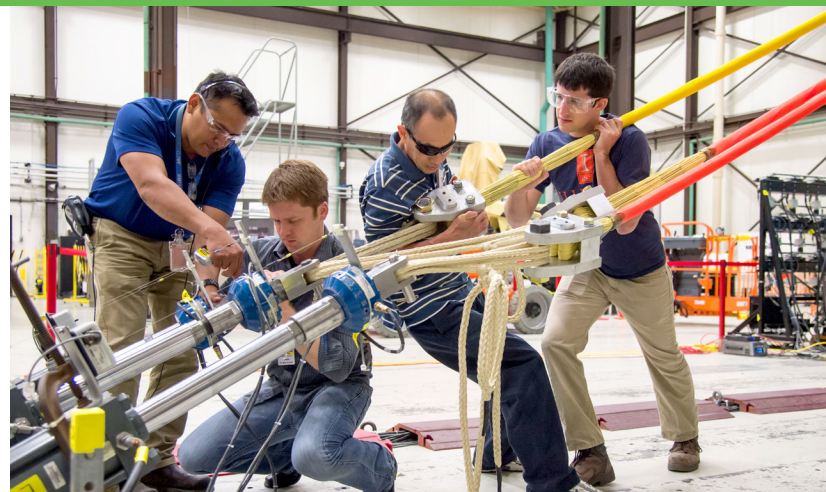


All three of Orion's main parachutes combined would cover a football field from 10 yard line to 10 yard line.

The suspension lines on the three main parachutes combined are approximately 10 miles in length.

Each drogue suspension line is rated to carry at least 5,000 lbs. That's strong enough to lift most passenger cars. Each drogue parachute has 24 of those suspension lines.

Each main suspension line is rated to carry at least 1,500 lbs. That's strong enough to hold six adults with some margin to spare. Each main parachute has 80 of those suspension lines.



Suspension line testing at the Johnson Space Center in Houston, Texas

Parachute test vehicle loaded on plane ahead of drop test in Yuma, Arizona



Orion's forward bay cover, drogue and main parachutes are packed with a hydraulic press to the density of oak.

Main parachute nylon broadcloth (what is typically thought of as "silk" in parachutes) has a mass that ranges from 1.2 to 2.0 ounces per square yard. The broadcloth required to cover the floor in a typical home would weigh roughly 25 lbs. Main parachute nylon broadcloth is so thin that you can actually see through it.