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X-38 team flies largest parafoil parachute in history

A team developing a prototype International Space Station "lifeboat" called the X-38 Crew Return Vehicle successfully flew the world's largest parafoil parachute last month at the U.S. Army's Yuma Proving Ground in Arizona. They released a parachute with an area almost one and a half times as big as the wings of a Boeing 747 jumbo jet.

The unmanned January 19 parafoil test was part of the development of a re-entry system for the X-38 spacecraft. The parafoil recently tested in Arizona has a span of 143 feet and a total surface area of 7,500 square feet, making it the largest successful parafoil in the world.

"I think this is a world's record for a parafoil and it is a significant milestone and accomplishment for NASA," said John Muratore, who is leading the X-38 Crew Return Vehicle Project. "It puts us a major step closer toward our goal of providing the space station with the most flexible crew return option. This parafoil has the size and all the features to enable it to be used for returning humans from space."

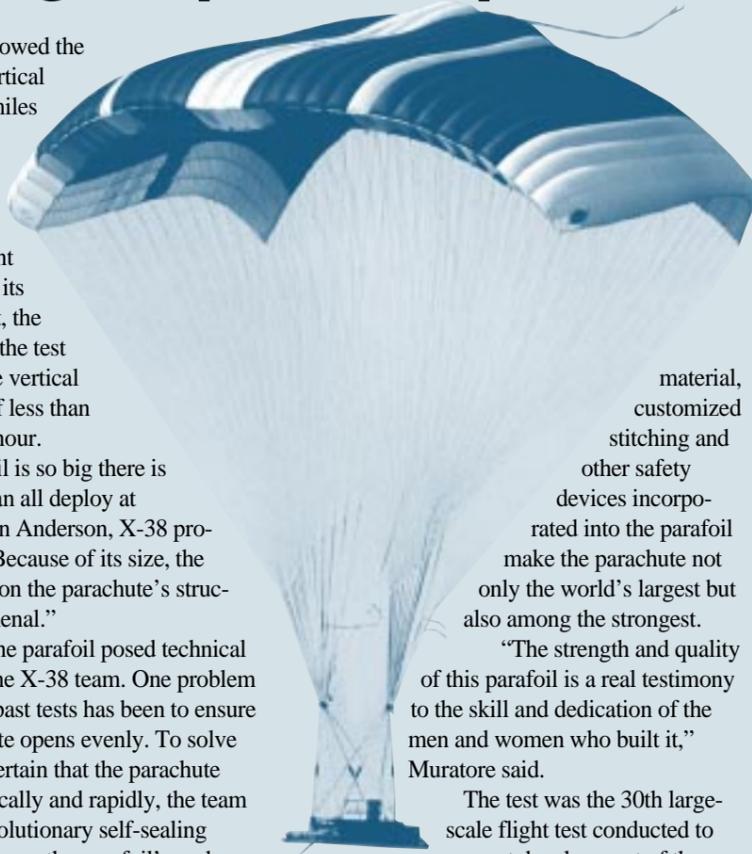
For the test, an 18,000-pound pallet, simulating the actual X-38, was dropped from the back of a C-130 aircraft at an altitude of 21,500 feet. A 28-foot diameter extraction parachute pulled the test platform from the aircraft at an air speed of 130 miles per hour to begin the flight test. Once out of the aircraft, a newly designed 80-foot diameter drogue parachute

stabilized and slowed the platform to a vertical airspeed of 62 miles per hour and enabled the parafoil to begin a five-stage deployment process. During its 11-minute flight, the parafoil slowed the test pallet to a gentle vertical landing speed of less than eight miles per hour.

"This parafoil is so big there is no way that it can all deploy at once," said Brian Anderson, X-38 project manager. "Because of its size, the dynamic forces on the parachute's structure are phenomenal."

The size of the parafoil posed technical challenges for the X-38 team. One problem encountered in past tests has been to ensure that the parachute opens evenly. To solve this and make certain that the parachute opens symmetrically and rapidly, the team developed a revolutionary self-sealing floor vent system on the parafoil's underside. During the recent test, the parafoil opened to its full size in only 30 seconds.

The parafoil was stitched together at Pioneer Aerospace's facility in Columbus, MS. Because of its unprecedented size and strength, personnel at Pioneer nicknamed the parafoil "Sampson." A unique ripstop nylon



material, customized stitching and other safety devices incorporated into the parafoil make the parachute not only the world's largest but also among the strongest.

"The strength and quality of this parafoil is a real testimony to the skill and dedication of the men and women who built it," Muratore said.

The test was the 30th large-scale flight test conducted to support development of the parafoil, although this was the largest and most comprehensive test to date. In addition to tests at Yuma, four large-scale atmospheric flight tests of prototype X-38 vehicles have been completed at NASA's Dryden Flight Research Center using a smaller 5,500-square-foot parafoil. For those tests, increasingly complex X-38 vehicles have

been launched from a B-52 carrier aircraft at increasingly higher altitudes. More such tests are planned during the next year and a half, leading up to a space flight test of the X-38 in 2002, when an unmanned vehicle now under construction at JSC will be released in orbit by the space shuttle to fly back to Earth.

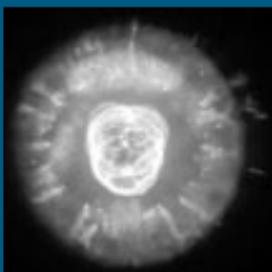
The X-38's design is called a lifting body. Unlike the space shuttle, it does not have wings. All of the lift necessary to maneuver and fly the X-38 comes from the lift generated by the flow of air over the body of the spacecraft and its fins. Lifting body configurations were studied extensively in the 1960s and 1970s as space entry vehicles. These vehicles all had very high landing speeds that proved difficult to control. The combination of the lifting body for the high-speed part of entry followed by the parafoil for the final landing has proven to be a winner in the X-38 project.

The large-scale drops of the parafoil were supplemented with more than 300 subscale drops.

"The subscale drops gave us the opportunity to test and refine techniques and gain the experience we needed for the large-scale drops at a much lower cost," said Jenny Stein, project lead for the X-38 parachute systems. The 7,500-square-foot parafoil will be tested at Yuma again this spring and will then be integrated with one of the X-38 vehicles at Dryden for a test flight there late this year. ■



Yuma Proving Ground photos by William Isbell



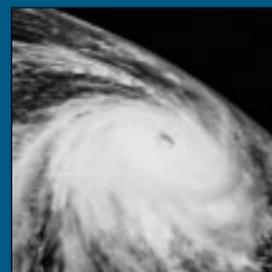
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