NASA parachute engineers have appetite for destruction

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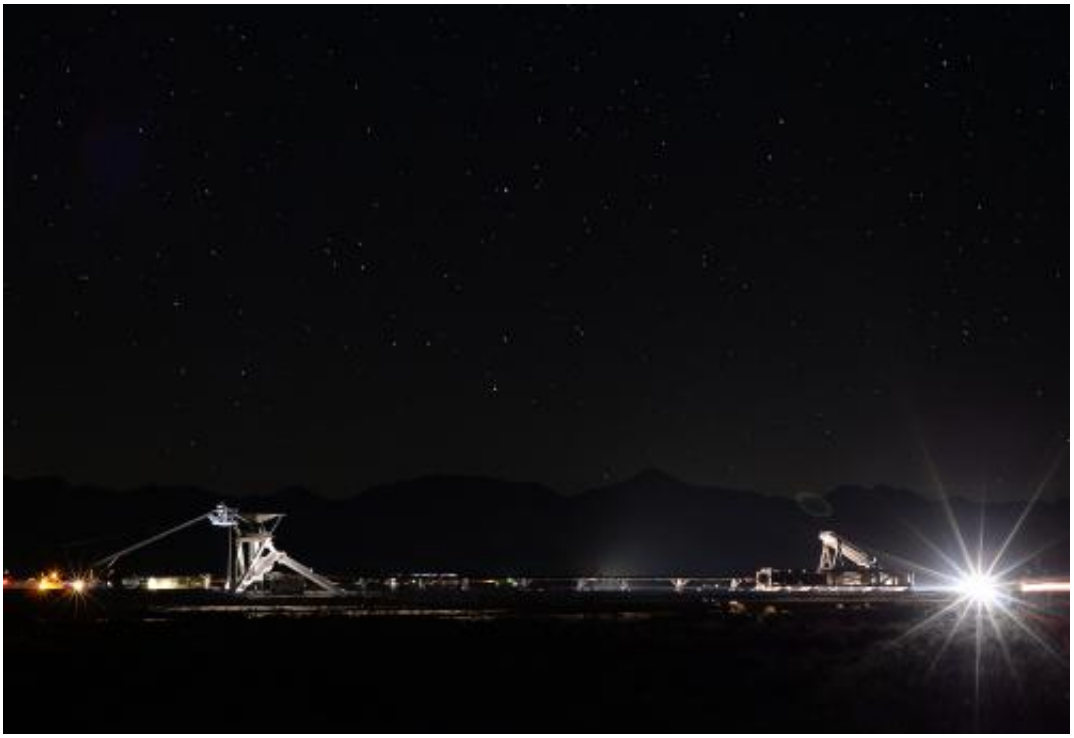

The tools of the rocket sled trade can be seen in this nighttime shot from the Supersonic Naval Ordnance Research Track (SNORT) at the Naval Air Weapons Station China Lake in California. Credit: NASA/JPL-Caltech

Engineers from NASA's Jet Propulsion Laboratory in Pasadena, California, are bound and determined to destroy a perfectly good parachute this week during the latest test for the Low-Density Supersonic Decelerator (LDSD) project. The parachute to be tested at

the China Lake Naval Air Weapons Station in California is the same 100-foot (30.5-meter) parachute design that flew during the first supersonic flight of LDSD this past summer. That test took place in June in Kauai, Hawaii, at the U.S. Navy's Pacific Missile Range Facility.

The upcoming test, employing a Navy Seahawk helicopter, almost 4,000 feet (1,200 meters) of synthetic rope and a rocket sled packing four solid rocket motors with 280,000 pounds (127,000 kilograms) of thrust, is scheduled to take place on Thursday, October 9, weather permitting.

"Whenever you get to see a rocket sled in action, that is a good day," said Mark Adler, project manager for NASA's LDSD project at JPL. "When you watch the sled rip apart something you worked very hard in creating, and be happy about it, that is a great day."

The goal of the LDSD project's Parachute Design Verification test 1-1B is to place stresses on NASA's Supersonic Disksail Parachute that will cause the 8,000 square feet (740 square meters) of synthetic fiber and ripstop nylon to fail structurally. It is the latest in a series of tests developed to evaluate two new landing technologies for future Mars missions.

"Our parachute has a not-to-exceed load during normal operations of 80,000 pound-force of pull," said Adler. "Then there is another load rating well beyond that, where we expect the chute to fail. That is 120,000 pounds-force of pull. Well, to ensure we get to see how the chute fails and at what load, we configured the sled so it can get up to 162,000 pounds-force of pull when all the rockets kick in. The details of the failure will be used to calibrate our models, and if the failure is earlier or in a different place than expected, we will address that in the parachute design before our supersonic flights this coming summer."

When the test begins, a Navy helicopter crew will lift the still-packed

parachute, trailing on a very long, very sturdy rope and a chunk of ballast known as the "bullet," to about 4,000 feet (1,200 meters) and then drop it.

At this point, a 300-horsepower winch—connected to the other end of the rope—begins pulling. The parachute inflates, and the whole setup—rope, bullet and inflated parachute—descends toward the surface and the rocket sled at about 15 mph (24 kilometers per hour).

Near the surface, the bullet will enter a funnel, which guides it into a latching mechanism on the rocket sled. When this latch-up occurs, the first two of four 70,000-pound (32,000-kilogram) thrust solid rocket motors fires. A few seconds later the second set of rockets kicks in. The test is expected to apply the full load on the parachute canopy in about five seconds.

The parachute is the same design used during the first high-altitude supersonic flight test of the LDSD project last June, which was launched from Kauai. During the Kauai test, which was a shakeout flight designed to explore the capabilities of LDSD's saucer-shaped test vehicle, the test parachute shredded during its deployment at nearly 2,000 mph (3,200 kilometers per hour).

"That test was such a blessing to this program," said JPL's Ian Clark, principal investigator for the LDSD project. "We got an early look at the parachute we were going to test in 2015 and found we needed to go back and rethink everything we thought we knew about supersonic parachute inflation. When we combine what we learned there with the data set from this test, we should have a new working model on how to build large supersonic parachutes."

A new supersonic parachute design is expected to be ready in time for the next round of Kauai flight tests scheduled for the summer of 2015.

"This is going to be fun," said Adler. "Basically, we are going to watch this test with every instrument we can get our hands on and then watch the parachute be destroyed. Then we will apply what we learn to our future parachutes."

Provided by JPL/NASA