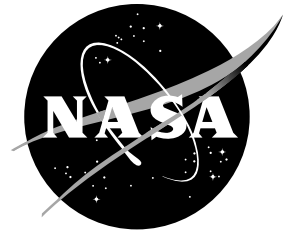


# NASA Facts

National Aeronautics and  
Space Administration

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## Super Lightweight External Tank

The gigantic rust-colored External Tank is the largest element of NASA's Space Shuttle at 27.6 feet wide and 154 feet tall—34 feet longer than the distance of Orville Wright's first flight made in 1903. NASA fuels discoveries that make the world smarter, healthier, and safer.

During the first eight-and-a-half minutes of launch, the External Tank feeds 535,000 gallons of liquid propellants—hydrogen and oxygen—to the Shuttle's three Main Engines, powering the Shuttle into space. Termed the structural backbone of the Shuttle system—which includes the Orbiter and two Solid Rocket Boosters—the tank withstands 7 million pounds of thrust exerted at launch.

The External Tank is the only Space Shuttle component that cannot be reused.

The present version—the third generation—is the Super Lightweight External Tank, first flown on STS-91 in June 1998. The tank, primarily made of an aluminum-lithium alloy, is 7,500 pounds lighter than the previous design, the Lightweight Tank.

The stronger, lighter alloy—and other weight-saving design changes—places the new Super Lightweight Tank at about 58,500 pounds empty, and 1.6 million pounds when filled with propellants.

The lighter tank enables the Space Shuttle to carry heavier components, such as those being used to assemble the International Space Station.

The original version of the External Tank weighed 76,000 pounds. A redesign was introduced on the

sixth Shuttle mission (STS-6) in 1983. It dropped 10,000 pounds from the tank's weight, resulting in the Lightweight Tank, or the second-generation Tank.

Each pound removed from the tank means either an extra pound of payload in the Orbiter's cargo bay, or it enables the Shuttle to go to a higher orbit.

The original version of the External Tank was made of aluminum alloy 2219. In 1986, Lockheed Martin Laboratories in Baltimore, Md., undertook the



challenge to develop a high strength, low-density replacement for the 2219 alloy—while retaining its excellent welding characteristics and resistance to fractures when exposed to extremely low temperatures. The result was a family of aluminum-lithium alloys called Weldalite®, from which the 2195 alloy was selected for the Super Lightweight Tank.

The 2195 aluminum-lithium alloy is 30 percent stronger and 5 percent less dense than the original 2219 alloy used. It can be welded and withstands fractures to a temperature of minus 423 degrees—the temperature at which the liquid hydrogen propellant is stored on board.

Al-Li 2195 is composed of 1 percent lithium, 4 percent copper, 0.4 percent silver, and 0.4 percent magnesium, with the remainder aluminum.

Lockheed Martin Space Systems Co. at NASA's Michoud Assembly Facility in New Orleans is the primary contractor for the tank. The External Tank project is managed by the Space Shuttle Propulsion Office at NASA's Marshall Space Flight Center in Huntsville, Ala.

For more information, visit <http://www.nasa.gov>.

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