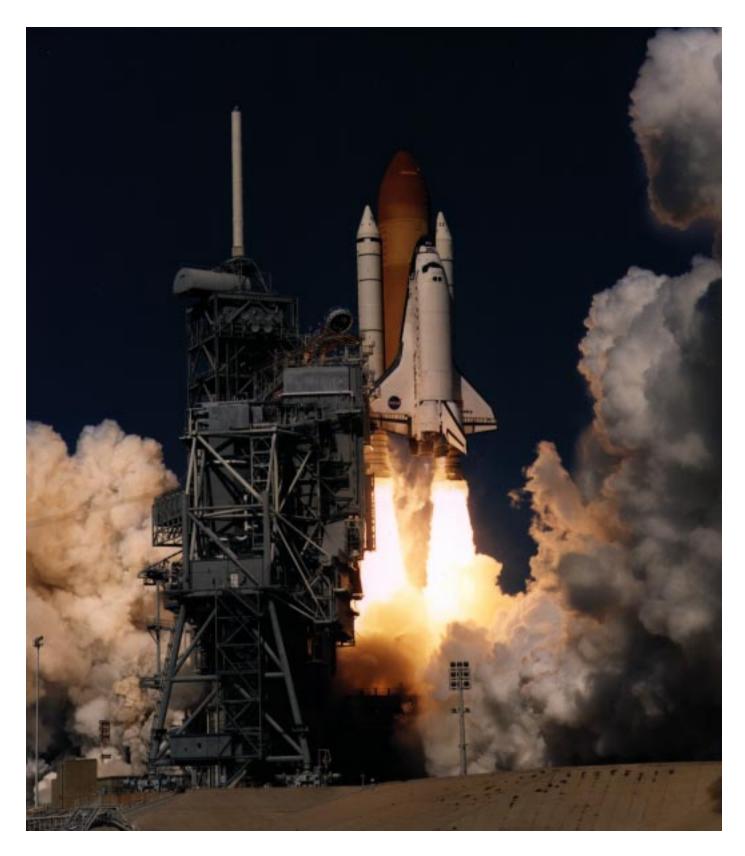


# Space Shuttle *Discovery*Lifts Off Into Space





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Launch Pad 39B as it climbs to space. Participating in the historic STS-95 mission are crew commander Curtis L. Brown, Jr., pilot Steven W. Lindsey, mission specialists Scott F. Parazynski, Steven K. Robinson, and Pedro Duque, and payload specialists Chiaki Nalto-Mukai and U.S. Senator John H. Glenn, Jr. Liftoff for the nine-day mission took place at 2:19 p.m. (EST) on October 29, 1998.

The main components of the vehicle are clearly visible: the orbiter, external tank, and two solid rocket boosters. Liftoff began with the ignition of the three main engines in the tail of the winged orbiter. Propellants for the engines, liquid hydrogen and liquid oxygen, were supplied from the orange external tank. Seconds later, the two solid propellant boosters placed on either side of the external tank ignited. The nuts from four bolts holding each of the boosters split with pyrotechnic charges, and the Space Shuttle leapt skyward.

In only 6 seconds, the 37-meter-high vehicle cleared the launch tower. By then, it was already traveling at 160 kilometers per hour. By steering the nozzles of the main engines in the orbiter's tail, the vehicle completed a roll maneuver. This turned the orbiter so that its back faced due east toward the Atlantic Ocean.

Two minutes later, the vehicle was 47 kilometers above the ocean, 250 kilometers down range from the Kennedy Space Center, and traveling at a speed of 6,150 kilometers per hour. With the solid propellant expended, the solid rocket boosters separated from the external tank and parachuted into the ocean below. Using just the thrust of the orbiter's three main engines, *Discovery* and the external tank continued upward. Six and a half minutes later, the propellants in the external tank were exhausted, and the tank was jettisoned. The tank was destroyed when it reentered the atmosphere. Following a brief firing of *Discovery*'s orbital maneuvering system engines to circularize the orbit, the crew began nine days of microgravity experiments and astronomy observations.

The gray structure seen in the picture is called the Rotating Service Structure. Except during the launch, the structure is rotated to the right to surround the back of the orbiter. It provides access points for reaching orbiter engines and other external areas. The dark circular feature near the top right of the structure is the gaseous oxygen vent cap or "beanie cap." It fits over the nose of the external tank and sucks away oxygen that boils from the external tank in the last few hours before launch. The cap is moved to the side just minutes before liftoff. Fine gray wires stretch from the structure off to the left of the picture. These are emergency slide wires. If an evacuation becomes necessary, the crew can abandon the vehicle and jump into baskets that carry them to explosion-proof bunkers.

#### **Electronic Resources**

Additional information is available over the World Wide Web at the following address: http://www.hq.nasa.gov/osf

## Facts and Figures

Orbiter

Wing Span 23.79 meters
Length 37.24 meters
Height 17.27 meters
Payload Bay 18.3 meters x 4.6 meters
Payload Weight (launch max.) 24,948 kilograms

Main Engine (each)

Thrust at 100% Throttle Setting:

Sea Level 1,670 kilonewtons Vacuum 2,100 kilonewtons

External Tank (ET)

Length47 metersDiameter8.4 metersGross Weight (full)750,980 kilograms

Solid Rocket Booster (SRB, each)

Length45.46 metersDiameter3.7 metersThrust at Liftoff14,685 kilonewtonsGross Weight (approx.)589,670 kilograms

**Operations** 

Gross Liftoff Weight (approx.)

Total Thrust at Launch

SRB Separation Altitude

SRB Splashdown Distance From Kennedy

ET Separation Altitude (approx.)

Orbital Velocity (approx.)

2,041,200 kilograms

33,327 kilonewtons

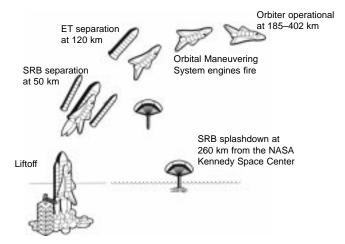
50 kilometers

260 kilometers

120 kilometers

27,869 kilometers/hour

## Space Shuttle Launch to Orbit Profile



Please take a moment to evaluate this product at <a href="http://ehb2.gsfc.nasa.gov/edcats/lithograph">http://ehb2.gsfc.nasa.gov/edcats/lithograph</a>
Your evaluation and suggestions are vital to continually improving NASA educational materials. Thank you.