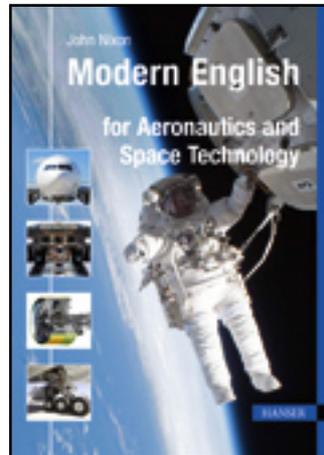


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sowie im Buchhandel.

■ 7.2 The Shuttle Program

The Space Shuttle is the world's first reusable spacecraft, and the first spacecraft in history that can carry large satellites both to and from orbit. The Shuttle launches like a rocket, maneuvers in Earth's orbit like a spacecraft and lands like an airplane. Each of the three Space Shuttle orbiters - Discovery, Atlantis and Endeavour - were designed to fly at least 100 missions.

Columbia was the first Space Shuttle orbiter to be delivered to NASA's Kennedy Space Center, FL, in March 1979. Columbia and the STS-107 crew were lost Feb. 1, 2003, during re-entry. The Orbiter **Challenger** was delivered to KSC in July 1982 and was destroyed in an explosion during ascent in January 1986. **Discovery** was delivered in November 1983. **Atlantis** was delivered in April 1985. **Endeavour** was built as a replacement following the Challenger accident and was delivered to Florida in May 1991. An early Space Shuttle Orbiter, the **Enterprise**, never flew in space but was used for approach and landing tests at the Dryden Flight Research Center and several launch pad studies in the late 1970s.

The Space Shuttle consists of three major components (Fig. 7.4): the Orbiter which houses the crew; a large External Tank that holds fuel for the main engines; and two Solid Rocket Boosters which provide most of the Shuttle's lift during the first two minutes of flight. All of the components are reused except for the external fuel tank, which burns up in the atmosphere after each launch.

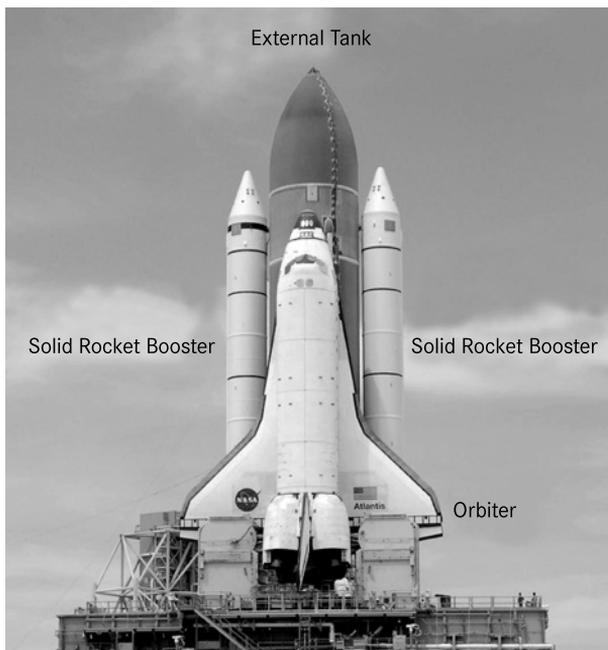


Fig. 7.4 The components of the Space Shuttle system: orbiter, external tank and solid rocket boosters

Length: Space Shuttle: 184 feet;
Orbiter: 122 feet
Height: Orbiter on runway: 57 feet
Wingspan: 78 feet
Lift-off Weight: 4.5 million pounds
Orbit: 115 to 400 statute miles
Velocity: 17,321 mph

The longest the Shuttle has stayed in orbit on any single mission is 17.5 days on mission STS-80 in November 1996. Normally, missions may be planned for anywhere from five to 16 days in duration. The smallest crew ever to fly on the Shuttle numbered two people on

the first few missions. The largest crew numbered eight people. Normally, crews may range in size from five to seven people. The Shuttle is designed to reach orbits ranging from about 185 kilometers to 643 kilometers (115 statute miles to 400 statute miles) high.

The Shuttle has the most reliable launch record of any rocket now in operation. Since 1981, it has boosted more than 1.36 million kilograms (3 million pounds) of cargo into orbit. More than 600 crew members have flown on its missions. Although it has been in operation for almost 30 years, the Shuttle has continually evolved and is significantly different today than when it first was launched. NASA has made literally thousands of major and minor modifications to the original design that have made it safer, more reliable and more capable today than ever before.



Fig. 7.5 Space Shuttle, mobile launcher platform and rotating service structure

Since 1992 alone, NASA has made engine and system improvements that are estimated to have tripled the safety of flying the Space Shuttle, and the number of problems experienced while a Space Shuttle is in flight has decreased by 70 percent. During the same period, the cost of operating the Shuttle has decreased by one and a quarter billion dollars annually – a reduction of more than 40 percent. At the same time, because of weight reductions and other improvements, the cargo the Shuttle can carry has increased by 7.3 metric tons (8 tons.)

In managing and operating the Space Shuttle, NASA holds the safety of the crew as its highest priority.

(Source: NASA)

■ 7.3 Delayed Discovery Launch

7.3.1 Vocabulary Exercise

The following is a list of difficult words or expressions taken from an audiotext from www.npr.org relating to one of the Discovery launches. *Match the words/expressions with their definitions.*

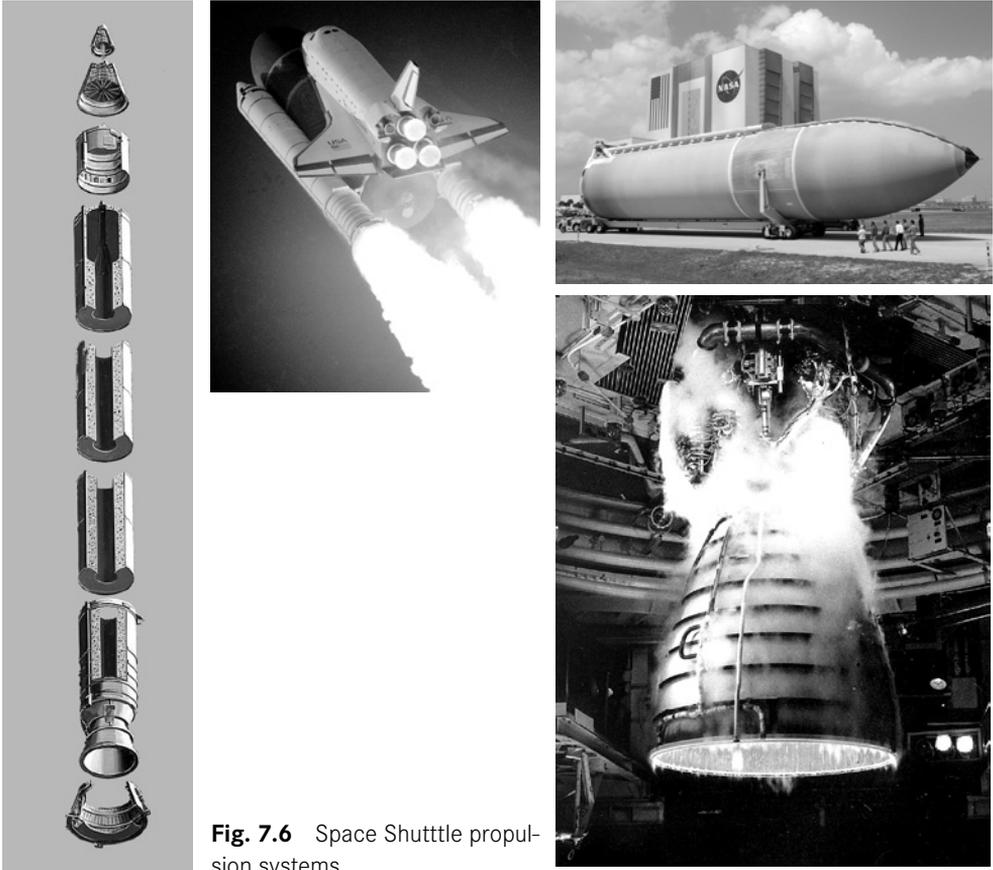
- 1) chunk
 - 2) lethal
 - 3) foam
 - 4) debris
 - 5) liberated
 - 6) condensation
 - 7) validate
 - 8) bellows
 - 9) deemed
 - 10) the clock is ticking
 - 11) requisite
 - 12) wrinkle
 - 13) as it happens
- a) expandable component used to protect screws, shafts, and other components from liquids, dirt and other debris
 - b) considered, regarded
 - c) sufficient to cause death
 - d) scattered fragments of something destroyed or wrecked
 - e) in fact, in reality
 - f) time is running out
 - g) a frothy, bubbly substance in a cellular mass
 - h) released
 - i) the reduction of a gas or solid to a liquid
 - j) needed by circumstances
 - k) a slight crease in a flexible surface
 - l) a thick solid slice or piece of something firm or hard
 - m)..... confirm

7.3.2 Audiotext: Delayed Discovery Launch

“Fuel Tank Issue Delays NASA Shuttle Launch”, April 29, 2005

<http://www.npr.org/templates/story/story.php?storyId=4625287>

Listen to the radio broadcast from National Public Radio relating to the one of the Discovery launches and answer the following questions. Point form instead of full sentences is sufficient. Enter the web address listed above into your Internet browser in order to gain access to the radio broadcast.



1) Why has the latest Discovery launch been delayed?

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2) Why did Columbia crash?

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3) What is the latest potential danger?

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4) Why is it a problem? How does this situation arise?

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5) How has NASA been working to solve this problem?

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6) What are the shuttles currently being used for?

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7) What is another use that has been proposed?

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Fig. 7.7 Space Shuttle launch