

## Balloon

The **balloon**, the oldest form of human-devised flight, is an aircraft that derives its lift from heated air or the gas [hydrogen](#) or [helium](#), rather than by means of wings or rotors. The gas or heated air is contained in a spherical envelope made of flexible, airtight material such as treated silk, rubber, plastic, or other clothlike composites. Hanging below this envelope is a platform, gondola, or basket, to carry scientific equipment or passengers.

The **balloon** rises because the contained air or gas is lighter and less dense than the surrounding [atmosphere](#) (see [Archimedes' principle](#)). Heated air was used in the first **balloons**, but hydrogen was found to be superior for filling a **balloon** because it has inherent buoyancy, whereas the ability of hot air to supply lift decreases as the air cools. The preference for hydrogen lasted well into the 20th century, despite the fact that it is highly flammable and potentially explosive. Helium did not become commercially available until after 1918. Helium is more costly than hydrogen and does not supply as much lift but is much safer.

**Balloons** rise or fall until the air density within the **balloon** matches that of the surrounding air. Altitude in gas **balloons** is controlled by jettisoning ballast to ascend and by releasing gas to descend. In hot-air **balloons** the temperature of the air in the sac determines the altitude, and these **balloons** have an aperture at the bottom that permits intermittent heating of the air within by burners mounted on the **balloon's** basket.

Most **balloons**, including passenger **balloons**, are totally subject to air currents. They are controlled by adjusting altitude up and down to different levels of wind direction. Blimps and dirigibles (rigid airframes enclosing **balloons**) are equipped with engines, rudders, and elevators and function similarly to steerable airplanes in all respects but lift. In the early 20th century, dirigibles were used for international travel, but the explosion of the German hydrogen dirigible [Hindenburg](#) at Lakehurst, N.J., on May 6, 1937, put an end to that use. (See also [airship](#).)

## History

The first recorded flight of a **balloon** was made by an uncrewed hot-air linen-and-paper craft at Annonay, France, on June 5, 1783. The creation of two brothers, papermakers by occupation, Joseph and Jacques [Montgolfier](#), this **balloon** rose to 1,800 m (6,000 ft) and traveled 1.6 km (1 mi). On Aug.

27, 1783, French chemist Jacques [Charles](#) launched an uncrewed hydrogen **balloon** that flew for two hours, traveling 43 km (27 mi).

The first crewed flight was made Nov. 21, 1783, by physicist Jean François Pilâtre de Rozier and the marquis d'Arlandes in a Montgolfier **balloon**. After a tethered ascent, they flew 8.3 km (5 mi) from the center of Paris to the suburbs. On Jan. 9, 1793, French **balloonist** Jean Pierre [Blanchard](#) made the first **balloon** flight in the United States, at Philadelphia.

## Military Use

During the Battle of Fleurus, June 26, 1794, a tethered **balloon** was used by the French for observation and artillery direction. Efforts to establish a **balloon** observation corps were unsuccessful. An attempt by the Austrians to attack Venice with 200 small bomb-carrying **balloons** failed because erratic winds sent them astray. Observation **balloons** were widely used in the [U.S. Civil War](#) (1861–65). During the [Franco-Prussian War](#) (1870–71), **balloons** carried important passengers, mail, and war messages in and out of besieged Paris.

The most widespread use of **balloons** for artillery observation was in [World War I](#). They were a favorite target of fixed-wing fighter planes, which led to outfitting **balloon** observers with parachutes. In [World War II](#), barrage **balloons** (small blimps) were used to suspend aerial cables in the sky and foul enemy bombers. The Japanese launched 9,000 **balloons** carrying small incendiary bombs in hopes that prevailing winds would carry them over the Pacific to the United States, but only about 300 reached the coast and all fell in sparsely populated areas.

Since World War II, **balloons** have been employed mostly for coastal patrol and antisubmarine warfare. U.S. attempts to employ **balloons** for aerial espionage during the cold war were largely unsuccessful, and they were supplanted by spy planes and, later, spy satellites.

## Scientific Use

Since the 1890s **balloons** have been used for meteorological research. Small pilot **balloons** are launched and tracked to determine wind direction and velocity; **balloons** containing packages of [meteorological instrumentation](#) record upper atmosphere temperature and humidity. Use of **balloons** has been augmented by fixed orbit weather satellites.

Extremely high-altitude **balloons** are used by astronomers and physicists to detect [cosmic rays](#) and [gamma rays](#) arriving from outer space. These **balloons** are sometimes several hundred meters high, and their reusable instrument packages are returned to Earth by parachute. The highest flight by an uncrewed scientific **balloon** was made in October 1972 from Chico, Calif., reaching an altitude of 51,820 m (170,000 ft). NASA's Scientific **Balloon** Program launches numerous short-duration flights (lasting 12–24 hours) each year and, since 1990, has launched two longer-duration flights over Antarctica annually. In December 1998 one of the latter, which lasted 10 days, carried a telescope named Boomerang that was used to study the universe's cosmic microwave [background radiation](#). (See also [balloon, scientific](#).)

## Sport **Balloon**ing

**Balloon**ing has been a popular sport since the late 19th century, when the first National Aero Clubs formed. The James Gordon Bennett race, the first international **balloon** contest, was inaugurated in 1906 in Paris and continued until 1938. The race was revived in 1983 in the United States. The World **Balloon** Championships are held every two years. Hot-air **balloon** excursion flights, rallies, and competitions have become common in recent years. Hare and hound races, in which pursuing **balloons** attempt to follow and come closest to a lead **balloon** shifting altitude and direction, are popular.

## Record Flights

The great dream of 19th-century **balloonists** was intercontinental air travel. Because the prevailing wind in the Northern Hemisphere blows from west to east, the Atlantic crossing is easier from North America to Europe; thus most attempts have been eastward. John Wise, a 19th-century American **balloonist**, detected a "constant current of wind" that he was certain would carry him to Europe, but he was killed in a **ballooning** accident before he could try. That current of wind is known as the [jet stream](#).

The first transatlantic flight was finally achieved in 1978 aboard *Double Eagle II* by Americans Ben Abruzzo, Max Anderson, and Larry Newman, who flew their gas **balloon** from Presque Isle, Maine, to Miserey, France. U.S. captain Joseph Kittinger made the first solo Atlantic crossing, traveling from Caribou, Maine, to Savona, Italy, in 1984. The first Pacific **balloon** flight was achieved in 1981 by Abruzzo, Newman, Rocky Aoki, and Ron Clark, flying from Nagashima, Japan, to Covello, Calif. The first solo transpacific flight was

made in 1995 by American Steve [Fossett](#), who flew from Seoul, South Korea, to a point near Leader, Saskatchewan. Comdr. M. D. Ross and Lt. Comdr. V. A. Prather of the U.S. Navy set the world record for **balloon** altitude, 34,668 m (113,740 ft), over the Gulf of Mexico on May 4, 1961. Amid a flurry of unsuccessful efforts to circumnavigate the world by **balloon** for the first time, **balloonists** Bertrand Piccard (grandson of Auguste [Piccard](#)), Wim Verstraeten, and Andrew Elson—aboard the *Breitling Orbiter 2*—set a new record for time spent in the air in an unrefueled flight—9 days, 3 minutes, and 44 seconds—in February 1998. They beat not only the **balloon** duration-in-the-air record of Steve Fossett set a year earlier (though they did not break his distance record of 16,673 km/10,360 mi) but the duration record set in 1986 by Dick Rutan and Jeana Yeager in the experimental lightplane *Voyager*. In August 1998, Fossett set a new **balloon** distance record of 24,466 km (15,202 mi) in attempting another circumnavigation of the world. His solo flight ended in a dramatic, life-threatening crash in the South Pacific. A successful circumnavigation of the world was completed in March 1999, when Piccard and Brian Jones flew the *Breitling Orbiter 3* from Mauritania around the world to land in southern Egypt 20 days later. On July 2, 2002, on his sixth try, Fossett achieved his goal of circumnavigating the globe, doing so in the Southern Hemisphere in 12 1/2 days.

[Michael D. Kilian](#)

## **Bibliography:**

Darnall, Diane T., *The Challengers: A Century of **Ballooning*** (1990).

Denniston, George, *The Joy of **Ballooning*** (1999).

Devorkin, David H., *Race to the Stratosphere* (1989).

Riedler, W., and Torkar, K. M., eds., *Scientific **Ballooning*** (1995).

Smith, Anthony, ***Ballooning*** (1999).

Wirth, Dick, ***Ballooning: The Complete Guide to Riding the Winds*** (1991).