

Air and Space this Week

Item of the Week

Happy Montgolfier Day!

First Non-tethered Balloon Ascension

Originally appeared November 15, 2021

KEY WORDS: Montgolfier De Rozier d'Arlandes Charles Blanchard

*The Montgolfier brothers, Joseph-Michael and Jacques-Etienne, designed and built the first successful hot-air balloon. They tested their balloon several times, and then made the first ascension with a human aboard, Jean-Francois Pilatre de Rozier, on October 15, 1783. That flight was tethered to the ground at all times, but demonstrated that the Montgolfier's balloon had enough lift to carry a person. De Rozier, accompanied by Francois Laurent d'Arlandes, made the first free flight (no tether) on **November 21**, 1783. To celebrate the Montgolfier's invention and de Rozier's first flight, balloonists everywhere celebrate November 21 as "**Montgolfier Day!**"*

The MONTGOLFIER BROTHERS

As a young man, Joseph noticed that clothes drying over a fire would lift up with the heated air. The brothers were also aware of current events, including the unsuccessful assault attempts on the fortress of Gibraltar, by both land and sea. As the cloth billowed from the fire's updraft, Joseph had an inspiration. Warm air is less dense than cold air, so a balloon filled with hot air would rise if surrounded by colder air, a version of the Archimedean principle of buoyancy. A fire beneath a confining canopy might create enough lift to allow for a military attack *from the air*.

The brothers experimented with a variety of balloon sizes and envelope compositions. Finally, they were ready to test their new invention in public.

There was an intense rivalry between England and France in those days, sometime hot, sometimes cold, but always there. King Louis XVI and Marie Antoinette took a personal interest in what the brothers were doing.

On September 19, 1783, the Montgolfiers went to Versailles, set up their balloon, loaded a duck, a rooster, and a sheep into its gondola, and up they all went (the critters, not the brothers). The King and the ~130,000 in attendance roared their approval. The resulting flight was short (2 miles in 8 minutes), and the balloon and the animals landed unharmed.

The next step would be to have a human aboard a free-floating balloon. The King did not want to risk either of the brothers or anyone else "important;" he recommended that condemned prisoners be used instead. I reckon he didn't share the brothers' confidence in their invention...

BALLOON COMPETITION

Meanwhile, other inventors were busy at work on balloons of their own design. The envelopes of hot air balloons in those days were not particularly well-insulated thermally; they cooled of quickly and lost lift. A fire would need to be used more-or-less continuously, a difficult and dangerous prospect. However, hydrogen gas had been recently discovered, and its low weight prompted testing with sealed balloons containing hydrogen.

Jacques Alexandre Cesar Charles was a proponent of the newer hydrogen balloon. He had more engineering expertise than the brothers, and was able to launch a public demonstration (~400,000!) in December, 1783 where two passengers flew 27 miles. Cue ominous music and a subliminal flash of the *Hindenburg*. Hydrogen made a wonderful gas for ballooning, if you overlook that whole burning like crazy bit.

PILATRE de ROZIER

Pilatre de Rozier had been involved in the earlier Montgolfier test flights, including “piloting” the first manned tethered flight on October 14, 1783. He now stepped forward to point out to the King that the first manned balloon free flight would be a feather in France’s cap, and that if prisoners were the first balloonists, it would hurt France’s image and they’d lose a good propaganda victory. The King thought it over a bit, and agreed. Further, he named de Rozier as the pilot of the first free flight! He also arranged for Marquis Francois Laurent d’Arlandes to accompany de Rozier, a person of significantly higher social status than a condemned prisoner.

De Rozier and d’Arlandes would make the first free flight (untethered) on **November 21, 1783**. They launched from downtown Paris and traversed some 5.5 miles in 25 minutes before coming back to Earth. The King was in attendance, as was the U.S. envoy, Benjamin Franklin.

The inaugural flight of Charles’ balloon came a month later, and it was clear from the start that it was superior than the original hot air designs. Ballooning technology improved continuously, and two years later the first flight across the English Channel was (bare-ly) successfully concluded by Blanchard and Jeffries, using a hydrogen balloon.

De Rozier was not satisfied with the performance of the newer hydrogen balloons, although he acknowledged they were superior to the early hot air models. He envisioned a hybrid type, utilizing an envelope of hydrogen suspended above a traditional hot air balloon. What could go wrong with a fire burning beneath a highly-flammable gas in a waxed envelope? De Rozier’s third foray aloft (June 15, 1785) ended in a blazing heap of wreckage, the crash killing him and his companion (some sources say he was de Rozier’s brother, some say he was “Pierre Roman”).

Combining a flammable gas with a hot air envelope is the essence of modern ballooning, but with the gas burning to heat air in the envelope while aloft, not to reside in the envelope for combustion at an unfortunate time. De Rozier just had it a bit backward, to his detriment.

Ballooning in the early days was fraught with deadly peril. Blanchard of cross-Channel fame died in a balloon crash in 1809. His widow stepped up and became the first woman balloonist. She was setting off fireworks from her balloon on July 7, 1819. Her balloon caught fire, but she

wasn't up very high and was able to get to roof-top level before the envelope disintegrated. The wind was gusty and she fell from the roof/balloon to her death.

FRANCOIS LAURENT d'ARLANDES

Little is known of de Rozier's companion on the first crewed balloon free flight. He was a Marquis, and an officer in the French Royal Guard. He met Joseph Montgolfier at the college at Tourmon. By his own admission, he was not particularly courageous on that first flight. After his ascension with de Rozier, d'Arlandes put forward a plan to fly a hydrogen balloon across the English Channel a year before Blanchard accomplished the feat, but nothing came of it. He was dismissed from service for cowardice during the French Revolution and died in disgrace, perhaps from his own hand.

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Last Edited on 14 November 2021