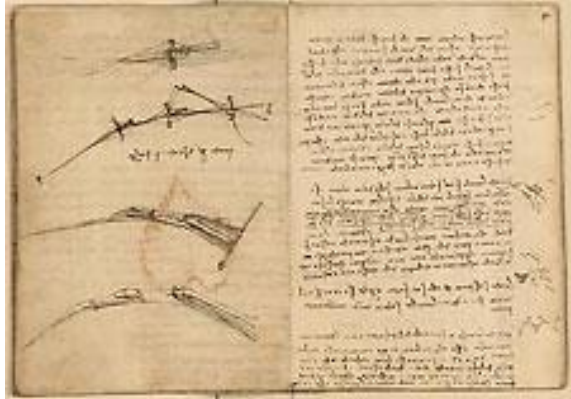


The Dream of Flight

BRIEF HISTORY

Man has always wanted to fly like the birds. Early inventions tried to copy the movement of bird's wings but this proved more difficult than was thought. Innovative inventors such as Leonardo da Vinci studied flight in great detail.



Leonardo da Vinci manuscript. In 1485-1500 he designed flying machines and parachute.

Aerodynamics (the study of the forces operating on a solid body (for instance, a wing when it is immersed in a stream of air) was studied by influential people such as Leonardo da Vinci, Galileo Galilei, Christiaan Huygens and Isaac Newton. Mathematicians Daniel Bernoulli and Leonhard Euler and British engineer John Smeaton explained the relationship between pressure and velocity and provided information that enabled a later generation of engineers to calculate aerodynamic forces.

Early flying machines were **ornithopters**. They had flapping wings to generate both lift and propulsion. These designs did not prove successful.

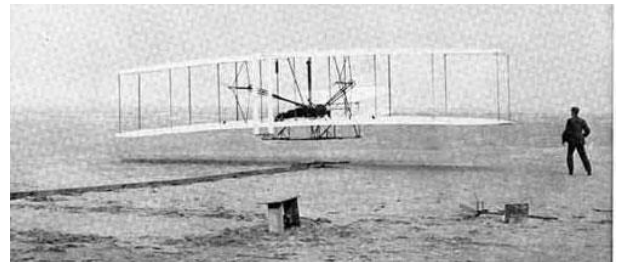
George Cayley was the first to identify the four aerodynamic forces of flight - weight, lift, drag, and thrust and their relationship. After experimenting with ornithopters (early 1800's) he began to experiment with fixed wing aircraft. His experiments led to the finding that an arched or cambered wing produces greater lift than a flat wing due to a lower pressure on top of a curved surface. He also determined that lift, propulsion and control were important for flight. Cayley went on to design biplane and multiplane wings. These provided maximum wing surface area.

In 1871 Francis H. Wenham and John Browning built the first wind tunnel. This led to further investigation of wing design and other improvements. Wind tunnels design improved and were essential to gather information to improve flying machine design.

In 1901 Wilbur Wright presented a talk to a group of Chicago engineers on the subject of "Some Aeronautical Experiments". He discussed the experiments he and his brother Orville had conducted. They concluded that

"The difficulties which obstruct the pathway to success in flying machine construction are of three general classes."

1. Those which relate to the construction of the sustaining wings.
2. Those which relate to the generation and application of the power required to drive the machine through the air.
3. Those relating to the balancing and steering of the machine after it is actually in flight.



First Flight of the Wright brothers' 1903 Flyer was photographed on December 17, 1903 at Kill Devil Hills near Kitty Hawk. Orville is the pilot and Wilbur is running alongside.

The Wright brothers used the information gained by their experiments and those of others to design their aeroplane.

Flying machines continued to evolve. The Apollo 11 space mission was 66 years after the Wright brothers first flight. The historic world circumnavigation flight of a solar plane concluded on 26 July 2016. A new chapter on flight has begun.

"We'll never know our full potential unless we push ourselves to find it."

Travis Rice (American professional snowboarder)

HISTORIC SOLAR FLIGHT COMPLETED 26 JULY 2016

The Swiss solar aircraft “**SOLAR IMPULSE Si2**” has completed the first ever round-the-world flight by a solar plane. The flight covered more than 40,000 km and used no jet fuel.



Solar Impulse Si2

INTERESTING FACTS

- The flight was made in two parts. Overheated batteries grounded it in Hawaii in July 2015. The tour resumed in April 2016 and finished on 26 July 2016.
- The plane stopped in 17 places.
- Wingspan: 72 metres
- Weight of plane: 2,300 kilograms
- Speed: maximum speed is 90km/hour
- No. of Solar cells on the wings 17,248
- Batteries: lithium polymer batteries
- Capacity: one pilot
- Cockpit size: 3.8 m³
- Construction material: carbon fibre
- The cabin is unheated and unpressurised
- Pilots experience temperature ranges from -40°C to 40°C.
- The plane can only fly in good weather
- The plane cruises at 8,500m during the day. At night it conserves energy by going to an altitude of 1,500 metres.
- Maximum flight distance: 8,183 km
- Maximum flight duration: 5-6 days
- CO2 emission per person: 0
- The plane is designed to fly 2,000 hours.
- The Si2 took 12 years to build
- The two pilots who took turns flying the plane were **Bertrand Piccard** (a psychiatrist, an explorer, a former Swiss Air force pilot, fighter pilot and helicopter pilot. Made the first ever non-stop round the world balloon flight in 1999) and

André Borschberg (an engineer). They were both involved in its design.



Bertrand Piccard (left) and André Borschberg (right)

- The plane carries a week's supply of water and specially prepared food, plus oxygen for use at higher elevations.
- In an emergency, the pilot can exit by parachute and float away on a life raft.
- The pilots only have 20 minute powernaps during the flight. The plane is placed on autopilot.
- The seat converts to a portable toilet.
- The Solar Impulse team has over 100 people including engineers, scientists and support crew who monitor data received via satellite.
- Solar Impulse was built to carry messages.
- Piccard and Borschberg hope their journey will demonstrate the possibilities of clean technologies and inspire people to use renewable energy.
- Solar Impulse engineers have been looking into the feasibility of solar drones

FURTHER

INVESTIGATION:

- 🔍 Research the route taken by the Solar Impulse Si2 plane.
- 🔍 What difficulties did the plane / pilots experience during the flight?
- 🔍 How is a solar cell made?
- 🔍 Investigate the construction materials used on the Solar Impulse Si2.
- 🔍 Investigate satellites – what is their function? How do they transmit data?
- 🔍 Research earlier solar planes. How do they compare with the Solar Impulse Si2?



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