

Mars Ingenuity Helicopter

April 20, 2021

In News: Today at 6:46 am EST, data downlink from Mars showed that Mars Ingenuity, the tiny helicopter, had taken its first 40-second flight where it ascended about 3 metres in the air.

The First Flight Test on Mars

- Once the team is ready to attempt the first flight, Perseverance will receive and relay to Ingenuity the final flight instructions from JPL mission controllers.
- Several factors will determine the precise time for the flight, including modeling of local wind patterns plus measurements taken by the Mars Environmental Dynamics Analyzer (MEDA) aboard Perseverance. Ingenuity will run its rotors to 2,537 rpm and, if all final self-checks look good, lift off.
- After climbing at a rate of about 3 feet per second (1 meter per second), the helicopter will hover at 10 feet (3 meters) above the surface for up to 30 seconds. Then, the Mars Helicopter will descend and touch back down on the Martian surface.
- Several hours after the first flight has occurred, Perseverance will downlink Ingenuity's first set of engineering data and, possibly, images and video from the rover's Navigation Cameras and Mastcam-Z.
- From the data downlinked that first evening after the flight, the Mars Helicopter team expected to be able to determine if their first attempt to fly at Mars was a success.

History

- While Ingenuity will attempt the first powered, controlled flight on another planet, the first powered, controlled flight on Earth took place Dec. 17, 1903, on the windswept dunes of Kill Devil Hill, near Kitty Hawk,

North Carolina.

- Orville and Wilbur Wright covered 120 feet in 12 seconds during the first flight. The Wright brothers made four flights that day, each longer than the previous.
- A small amount of the material that covered one of the wings of the Wright brothers' aircraft, known as the Flyer, during the first flight is now aboard Ingenuity.
- An insulative tape was used to wrap the small swatch of fabric around a cable located underneath the helicopter's solar panel.
- The Wrights used the same type of material – an unbleached muslin called “Pride of the West” – to cover their glider and aircraft wings beginning in 1901.
- The Apollo 11 crew flew a different piece of the material, along with a small splinter of wood from the Wright Flyer, to the Moon and back during their iconic mission in July 1969.

About Ingenuity

- Part of NASA's Mars 2020 mission, the small coaxial, drone rotorcraft will serve as a technology demonstrator for the potential use of flying probes on other worlds, with the potential to scout locations of interest and support the future planning of driving routes for Mars rovers.
- The Ingenuity Mars Helicopter was built by JPL, which also manages the technology demonstration for NASA Headquarters.
- It is supported by NASA's Science Mission Directorate, the NASA Aeronautics Research Mission Directorate, and the NASA Space Technology Mission Directorate.
- NASA's Ames Research Center and Langley Research Center provided significant flight performance analysis and technical assistance.

Helicopter in Mars mission

- **Fast forward a hundred years**

- The desire to try the ambitious experiment, bordering between the insane and the ambitious, because the atmosphere is so thin on Mars, came from the Jet Propulsion Laboratory.
- Somehow, this experiment did not gel with the broad goals of the Perseverance Rover that was tasked with science goals from looking for evidence of life to manufacturing Oxygen on Mars.
- But, officials at NASA HQ took the long view and signed on to this ambitious technology: with a very important consideration that the technology demonstration might fail.

- **Engineering challenge**

- It is an engineering challenge to fly on Mars: the atmosphere is 1% in density compared to the atmosphere on Earth.
- To sustain flight, the helicopter blades have to rotate at 2400 rpm (Rotations Per Minute) or about 8 times as fast as a passenger helicopter to fly on Earth.
- For a helicopter to fly a few metres from the ground on Mars, is equivalent for a helicopter to fly 2-3 times the height of Mt Everest.
- To provide a context, airplanes like the Boeing 747 fly at 30,000 ft or approximately, the height of Everest.
- The best fighter jets like the SR-71 of the US Air Force, could fly as high as three times the height of Mt. Everest.