

First Helicopter on Mars - Ingenuity

Why in news?

- NASA recently announced that Ingenuity had performed its first flight.
- The tiny helicopter Ingenuity took its first 40-second flight, ascending about 3 metres in the air.

What is Ingenuity?

- Ingenuity is the first helicopter to fly on Mars.
- It was carried by NASA's rover called Perseverance that was launched in July 2020.
- Ingenuity will help collect samples from the surface from locations where the rover cannot reach.
- **Features** - Ingenuity is able to fly using counter-rotating blades that spin at about 2,400 rpm.
- It has a wireless communication system, and is equipped with computers, navigation sensors, and two cameras.
- It is solar-powered, able to charge on its own.
- **Perseverance** landed at the Jezero Crater of Mars in February 2021.
- It will remain on the Red Planet for about 2 years and look for finding past signs of life.
- The rover is designed to -
 - i. study signs of ancient life
 - ii. collect samples that might be sent back to Earth during future missions
 - iii. test new technology that might benefit future robotic and human missions to the planet

What were the challenges for the flight?

- It is an engineering challenge to fly on Mars.
- The atmosphere in Mars 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).
- This is 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.

- The other challenge is to design a craft that will have its own power, communication and mechanical subsystems with such a small mass budget allocation.
- Ingenuity need to attend this high RPM and depend on solar panels for power.
- Besides this, it also had to survive the very cold Martian night [that can be brutal on batteries and the onboard computer].

Why is the mission so significant?

- This is the first flight of a powered aircraft on another planet.
- According to NASA, the helicopter was placed on the Martian surface to test, for the first time ever, powered flight in Mars's thin air.
- So the main task is to carry out a technology demonstration to test the first powered flight on Mars.
- Its performance during these experimental test flights will help inform decisions about small helicopters for future Mars missions.
- The helicopter's mission is experimental in nature and completely independent of the rover's science mission.
- Small helicopters can perform a support role as robotic scouts, surveying terrain from above, or as full standalone science craft carrying instrument payloads.
- Taking to the air would give scientists a new perspective on a region's geology.
- It would even allow them to peer into areas that are too steep or slippery to send a rover.
- In the distant future, they might even help astronauts explore Mars.
- NASA will try and demonstrate rotorcraft flight in the extremely thin atmosphere of Mars with this helicopter, which is why the mission is so crucial.
- Since the first flight has succeeded, the Ingenuity team will attempt up to four test flights within a 31-Earth-day window.
- Other technology demonstrations of the same kind include the Mars Pathfinder rover Sojourner and the Mars Cube One CubeSats that flew by Mars in 2018.

Source: The Indian Express



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