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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