Mars Atmosphere and Volatile EvolutioN (MAVEN)

Prelims: *Current events of national and international relations | Science & Technology*

Why in News?

NASA *has lost contact with its MAVEN spacecraft, and engineers are still trying to re-establish communication.*

- **MAVEN –** It is NASA's ***1st mission*** devoted to understanding the ***Martian upper atmosphere***.
- **Launch Location –** Cape Canaveral Air Force Station, Florida.
- **Launched in –** 2013, had a nominal duration of one year but has been operating under extended missions since entering Mars orbit in 2014.
- **Goal –** To investigate how Mars lost its atmosphere and water over billions of years, transforming from a potentially habitable world into a cold desert.

Features

- **Launch Vehicle –** Atlas V01.
- **Mars Orbit Insertion –** Sept. 21, 2014, days before Mangalyaan entered Mars (Sep 24).
- **Science Payload –** 143 pounds (65 kg) across 8 instruments, including
  - **Imaging Ultraviolet Spectrograph (IUVS)** - Detects ultraviolet light to measure gases escaping Mars' atmosphere.
  - **Magnetometer & Mass Spectrometer -** Track solar wind penetration and elemental composition of escaping particles.
- **Orbit –** It typically follows an ***elliptical path,*** ranging from 150 km to 6,200 km above the surface, with periodic "deep dips" to sample the atmosphere directly.
- **Communications –** It is equipped with a high-gain antenna and an Electra Ultra High Frequency (UHF) package to relay data from Mars rovers and landers back to Earth.

Key Discoveries

- **Atmospheric Loss –** MAVEN observed oxygen, carbon, and hydrogen atoms escaping into space, once ***part of CO_2 and H_2O molecules.***
- **Solar Wind Impact –** It found that Mars loses atmosphere primarily due to solar wind particles striking its unprotected atmosphere.
- **Seasonal Variation –** Mars loses 10 times more hydrogen when closer to the Sun compared to farther away.
- **Auroras –** Unlike Earth's polar auroras, MAVEN detected planet-wide auroras on

Mars caused by solar wind penetrating deeply into the atmosphere.

- **Wind Mapping –** It has created the 1st global wind map of Mars' upper atmosphere.

Quick Fact

Mars Orbiter Mission (MOM)/Mangalyaan
• **Launched on** – November 5, 2013 • India became the ***1st nation*** to reach Mars on its ***very first attempt***. • **Launch Vehicle** – PSLV-XL (C25) • **Purpose** – It was primarily a technology demonstration venture, to explore and observe Mars surface features, morphology, mineralogy and the Martian atmosphere.

References

1. The Hindu | NASA loses contact with MAVEN
2. NASA | MAVEN
3. Planetary Society | MAVEN