Geomagnetic Storm that killed Starlink Satellites

What is the issue?

Elon Musk's Starlink has lost 40 out 49 of satellites that were caught in a geomagnetic storm a day after they were launched.

How does the space internet work?

- Broadband from space (BFS) is a high-speed wireless communication to bring internet traffic to a consumer's home/office via a satellite network in space.
- Satellite broadband data speeds can go beyond 300 Mbps, but initial peak speeds likely 100 Mbps.
- **Working-** A satellite network involves geostationary or low-earth orbit (LEO) satellites.
- The heart of a satellite network operation is an earth station gateway located in a particular region that links satellite network to the Net.
- Consumer needs a device, called a user access terminal (UT) and antenna to connect to a satellite network.
- Bharti-backed OneWeb, Elon Musk's SpaceX , Canada's Telesat and Amazon's Project Kuiper are in the row.

What is Starlink project?

- Starlink is the name of a satellite network developed by the private spaceflight company **SpaceX** to provide low latency, low-cost internet to remote locations.
- SpaceX eventually hopes to have as many as 42,000 satellites in this so-called megaconstellation.
- SpaceX's satellite internet proposal was announced in 2015.
- SpaceX launched its first two Starlink test craft, named TinTinA and TinTinB, in February 2018.
- The first 60 Starlink satellites launched in 2019 and were placed in Low Earth Orbit at an altitude of 340 miles (550 kilometers), so that it is easy to get pulled down to Earth by atmospheric drag by avoiding space junk.
- The current version of each Starlink satellite weighs 573 lbs(260 kilograms).
- As of early January 2022, SpaceX had launched more than 1,900 Starlink satellites overall.
- SpaceX plans to refresh the Starlink megaconstellation every five years with newer technology.

What are the concerns over the Starlink project?

- Light pollution- concerns about future images from highly sensitive telescopes as satellite streaks interfere in the data
- Interference from Starlink's radio-based antennas
- Threat to existing and future astronomical infrastructures
- Affects the pristine nature of the night sky

- Increased probability of space collisions
- At the end of their service, the old satellites will be steered into Earth's atmosphere where they will burn up that could actually alter the atmospheric chemistry
- Burning of satellites will produce aluminum oxide or alumina which is known to cause ozone depletion
- Alumina reflects light at certain wavelengths that may create scattering and eventually change the albedo of the planet leading to an out-of-control geoengineering experiment

What is the recent incident of geomagnetic storm?

- A geomagnetic storm is a major disturbance in Earth's magnetosphere that occurs when there is a very efficient exchange of energy from the solar wind into the space environment surrounding the planet.
- The disturbance that drives the magnetic storm may be a solar coronal mass ejection (CME) or a co-rotating interaction region (CIR), a high-speed stream of solar wind originating from a coronal hole.
- The frequency of geomagnetic storms increases and decreases with the sunspot cycle.
- In the current event, the passing of the latter part of the storm, with its high density core, possessed speeds higher than what was recorded during the storm’s arrival.
- This has caused the loss of 40 satellites in a single solar event that has been described as “unheard of” and “huge”.
- There are models capable of predicting a storm’s time of arrival and its speed but the storm’s structure or orientation cannot be predicted still.

What are the effects of solar storm on Earth?

- Not all solar flares reach Earth.
- But solar flares/storms, solar energetic particles (SEPs), high-speed solar winds, and coronal mass ejections (CMEs) that come close can impact space weather in near-Earth space and the upper atmosphere.
- Solar storms can hit operations of space-dependent services like global positioning systems (GPS), radio, and satellite communications.
- Geomagnetic storms interfere with high-frequency radio communications and GPS navigation systems.
- Aircraft flights, power grids, and space exploration programmes are vulnerable.
- CMEs can potentially create disturbances in the magnetosphere, the protective shield surrounding the Earth.
- Astronauts on spacewalks face health risks from possible exposure to solar radiation outside the Earth’s protective atmosphere.

References

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