Inflatable Aerodynamic Decelerator (IAD)

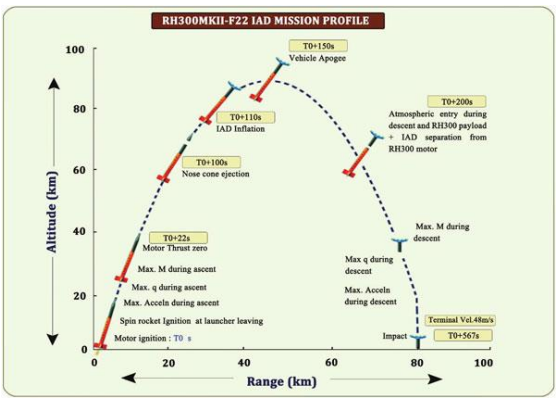
- The Indian Space Research Organisation (ISRO) just declared that it has successfully demonstrated the new technology with Inflatable Aerodynamic Decelerator (IAD)

What is IAD?

- Inflatable Aerodynamic Decelerator or IAD in short is a technique used for an atmospheric entry payload. An inflatable envelope and an inflatant (anything that inflates the envelope, like air or helium) make up the inflatable aerodynamic decelerator.
- The inflatant is designed to fill the inflatable envelope to a condition such that it surrounds the payload meant to enter the atmosphere of a planet or satellite and causes aerodynamic forces to slow it down.
- In simpler words, IAD is designed to increase drag upon entering the atmosphere of any planetary body, like Earth, Mars, or even Moon. Its shape is maintained by a closed, gas-pressured body and the inflatant gas is also generated internally. Some versions also use ram air or both.

ISRO's IAD

- ISRO's latest IAD has been designed and developed at Vikram Sarabhai Space Centre.
- The Liquid Propulsion Systems Centre (LPSC), an R&D wing of ISRO created the pneumatic inflation system for the IAD system. In the inflation system, it uses compressed nitrogen stored in a bottle.
- Where does ISRO intend to use it?
- The IAD will help ISRO in performing many space tasks effectively including recovery of spent stages of rockets, for landing payloads on missions to other planetary bodies.
- This is the first instance where an IAD has been specially created for spent stage recovery.
- "This demonstration opens a gateway for cost-effective spent stage recovery using the Inflatable Aerodynamics Decelerator technology and this IAD technology can also be used in ISRO's future missions to Venus and Mars.



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Nanourea

- The world's first nano urea liquid plant has been inaugurated by Prime Minister Modi at Kalol in Gujarat.
- India has become the first country to start commercial production of Nano urea in the world.

What is a nano urea liquid?

- Nano urea liquid is a nanotechnology-based fertilizer to increase the growth of crops by restoring nitrogen to plants as an alternative to conventional urea. It enhances the nutritional quality and productivity of the crop along with improving the underground water quality.
- Conventional Urea, a chemical fertiliser, is used to artificially fulfill the nitrogen need of the plant while Nano urea liquid is developed to replace the former and cut down its requirement by 50%.
- The Indian Farmers Fertiliser Cooperative Limited (IFFCO), a cooperative society, has developed and patented nano urea liquid technology.

What are the benefits of nano urea liquid?

- "The power of a full sack of urea has come into a half-litre bottle, leading to huge savings in logistics. The Plant will produce about 1.5 lakh bottles of 500 ml per day."
- Nano urea liquid will help in reducing the use of chemical fertilizers to save the environment because the imbalanced use of fertilizers is deteriorating the health of the soil. It is also causing air and water pollution. Nano Urea can be a game-changer as it will cut down the use of conventional urea up to 50%.
- It will also help in direct savings, reduce transportation costs, and make storage much easier.

How does it work?

- According to the IFFCO website, "When sprayed on leaves, Nano Urea easily enters through stomata and other openings and is assimilated by the plant cells.
- It is easily distributed through the phloem from the source to sink inside the plant as per its need. Unutilized nitrogen is stored in the plant vacuole and is slowly released for proper growth and development of the plant.

Criticism

- Nano urea sold in 500-ml bottles has only 4% nitrogen (or around 20 g).
- Plants need nitrogen to make protein and they source almost all of it from soil bacteria which live in a plant's roots and have the ability to break down atmospheric nitrogen, or that from chemicals such as urea into a form usable by plants.

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- To produce one tonne of wheat grain, a plant needs 25 kg of nitrogen.
- For rice, it is 20 kg of nitrogen, and for maize, it is 30 kg of nitrogen.
- Not all the urea cast on the soil, or sprayed on leaves in the case of nano urea, can be utilised by the plant. If 60% of the available nitrogen was used, it would yield 496 kg of wheat grain.
- Even if 100% of 20 g of nano urea, which is what is effectively available, is utilised by the plant, it will yield only 368 g of grain
- "Urea is highly water soluble and already reaches the lowest form of concentration when absorbed. How nanoparticles can increase the effectiveness of nitrogen uptake by being still smaller.

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Dark sky reserve

- In a first-of-its-kind initiative, the Department of Science & Technology (DST) has announced the setting up of India's first dark sky reserve at Hanle in Ladakh
- Hanle, which is about 4,500 metres above sea level, hosts telescopes and is regarded as one of the world's most optimal sites for astronomical observations.
- However, ensuring that the site remains well suited for astronomy implies keeping the night sky pristine, or ensuring minimal interference to the telescopes from artificial light sources such as electric lights and vehicular lights from the ground.
- A dark sky reserve is a designation given to a place that has policies in place to ensure that a tract of land or region has minimal artificial light interference.
- The International Dark Sky Association is a U.S.-based non-profit that designates sites as international dark sky places, parks, sanctuaries and reserves, depending on the criteria they meet.
- To promote astro-tourism, villages around Hanle would be encouraged to promote homestays equipped with telescopes that visitors can use to view the night sky. Villagers would also be trained to help visitors with astronomical observations.

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Staff level agreement

The story so far:

- The International Monetary Fund (IMF) on September 1 announced a staff-level agreement with Sri Lanka, months after the island nation's economic crisis intensified this year,

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following a serious Balance of Payments problem.

What is the staff-level agreement?

- It is a formal arrangement by which IMF staff and Sri Lankan authorities agree on a $2.9-billion package that will support Sri Lanka's economic policies with a 48-month arrangement under the Extended Fund Facility (EFF).
- However, even though the IMF has agreed to support Sri Lanka, the EFF is conditional on many factors.
- Sri Lanka must take a series of immediate measures that the Fund has deemed necessary to fix fiscal lapses and structural weaknesses such as raising fiscal revenue, safeguarding financial stability and reducing corruption vulnerabilities.
- Apart from making domestic policy changes to strengthen the economy, Sri Lanka must also restructure its debt with its multiple lenders.
- The IMF has said that it will provide financial support to Sri Lanka only after the country's official creditors give financing assurances on debt sustainability, and when the government reaches a collaborative agreement with its private creditors.
- The process could take several months.

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4G multiplexing

4G multiplexing

- With 4G-capable cell phones, people could make calls over the Internet instead of via telephone networks.
- This generation's evolution to 4G+ (LTE advanced), which offered download speeds of 200 to 300 Mbps, made it easier for people to connect and talk over the Internet.
- Secondly, 4G's multiplexing capability, technically known as orthogonal frequency division multiplex (OFDM), provided a level of efficiency in achieving high data transfer rates while allowing multiple users to share a common channel.
- The OFDM modulation scheme divides a channel into several subcarriers.
- These subcarriers are spaced orthogonally so they don't interfere with one another despite the lack of guard bands between them. "OFDM is a very good choice for a mobile TV air interface.
- It offers good spectral efficiency, immunity to multi-path, good mobile performance, and it works well in single-frequency networks such as those planned for mobile TV," according to a research paper titled.
- A 5G-based connected future is upon us. That means deploying services in a world filled with 4G compatible

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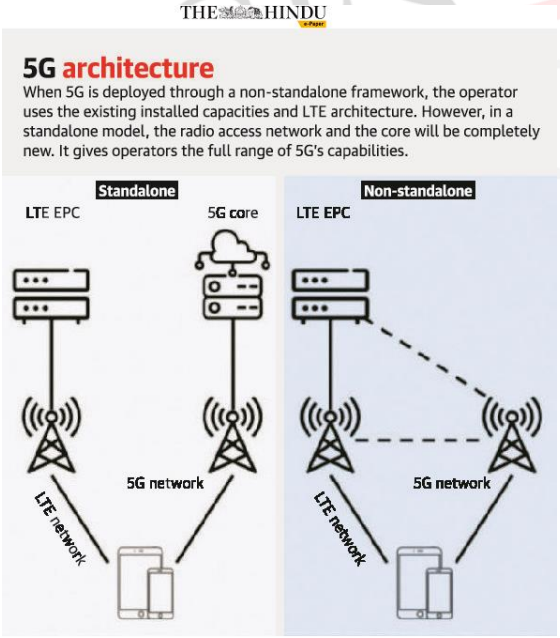
devices. So, telecom operators have two options.

- They can either build a non-standalone (NSA) or a standalone architecture.
- In an NSA framework, the operator can use their existing installed capacities and LTE architecture to deploy 5G services while implementing a new radio access network (RAN).
- The SA model, on the contrary, is a pure play 5G architecture that provides operators full range of the fifth-generation capability and lets them slice the network. In this architecture, RAN and the core are completely new.



THE HINDU

India and Bangladesh

- The two neighbours have expanded their partnership to include Artificial Intelligence, Fintech, cybersecurity, start-ups, and connectivity.
- Trade will be a focal point during Ms. Hasina's visit as the two countries gear up to sign a Comprehensive Economic Partnership Agreement (CEPA)
- Bangladesh is India's sixth largest trade partner with bilateral trade rising from $2.4 billion in 2009 to $10.8 billion in 2020-21.
- Bangladesh imports critical industrial raw material from India on which its exports are reliant.
- India's connectivity projects with ASEAN and Bangladesh will open up the region to economic growth. Bangladesh has expressed its interest in joining the India-Myanmar-Thailand highway project.
- India-Bangladesh bilateral waterway trade will get boosted as India can now use the Mongla and Chittagong ports.
- India is rallying Bangladesh to divert its exports through Indian ports in place of Malaysian or Singaporean ports.
- Enhancing connectivity through India's Northeast and Bangladesh is important for bilateral cooperation.
- Currently, three express trains and international bus services operate between Indian and Bangladesh.
- The sharing of the waters of the Teesta has remained a thorny issue

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between the two countries since 1947.

- For West Bengal, Teesta is important to sustain its impoverished farming districts which comprise 12.77% of its population.
- For Bangladesh, the Teesta's flood plains cover about 14% of the total cropped area of the country and provide direct livelihood opportunities to approximately 7.3% of the population.
- The countries are expected to sign at least one major river agreement during the upcoming trip.
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- In 2015, India and Bangladesh resolved the decades-long border dispute through the Land Swap Agreement
- Chinese inroads into the neighbourhood have been a cause of worry for India. China has been actively pursuing bilateral ties with Bangladesh. Bangladesh had successfully approached China for a mega project to enhance Teesta river water flow.
- Bangladesh also requires China's support in resolving the Rohingya refugee crisis. Bangladesh is the second biggest arms market for China after Pakistan. Bangladesh has also been warming up to Pakistan.

THE HINDU

India and Australia

- Apart from being two English speaking, multicultural, federal democracies that believe in and respect the rule of law, both have a strategic interest in ensuring a balance in the Indo-Pacific and in ensuring that the region is not dominated by any one hegemonic power.
- In addition, Indians are today the largest source of skilled migrants in Australia and the economic relationship.
- From cyber threats and artificial intelligence (AI) governance in a geopolitically turbulent region, to how they will decarbonise their economies and help each other develop trusted supply chains through critical minerals cooperation, to how India's tech talent can help address Australia's skills gaps through migration.
- Australia wants to find alternative markets to China and diversify supply chains for its critical minerals.

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- As a country with reserves of about 21 out of the 49 minerals identified in India's critical minerals strategy, Australia is well placed to serve India's national interests required for India's carbon reduction programme.

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