Indo-Russian space cooperation

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***Source**: The Hindu*

Manifest pedagogy: Questions in mains generally on India Russia relations can be easily answered but when they become specific to sectors like trade relations and it becomes difficult for aspirants to answer. To tackle such questions the article below has been written.

In news: India and Russia have signed 15 Memorandums of Understanding (MoUs) and other agreements during PM Modi's visit to Vladivostok for the Eastern Economic Forum (EEF) summit.

Placing it in syllabus: India-Russia relations

Static dimensions: Historical aspects of Indo-Russia space cooperation

Important agreements and bodies working in the field

Current dimensions: Gaganyaan and Recent MOUs during EEF summit

Content: India and Russia are stepping up cooperation in the space sector with Moscow extending help in 4-5 critical areas of **India's ambitious manned mission to space, Gaganyaan**. This includes training of Indian astronauts at Russian facilities beginning later this year.

Following Prime Minister Narendra Modi's announcement on August 15, 2018 that an Indian will go to space by the 75th Independence Day, ISRO has outlined a road map to put a three-man crew in a low earth orbit for 5-7 days by December 2021 by an indigenous GSLV Mk-III launch vehicle from a third launch

pad under construction at Sriharikota. The process of astronaut selection will begin shortly. They will go through a 15-month training at the end of which further selection will be made. There will be further 6-8 months advanced training in India prior to the actual launch by end of 2021.

According to the source, a special ISRO unit would be established in the embassy in Moscow to facilitate increased cooperation between India and Russia in view of the Gaganyaan programme as, India sees Russia as a "reliable, long-term partner" with great experience in human space flight over the last 50 years.

Historical aspects of India-Russia space cooperation:

- Russia has played an important role in India's space journey, and space remains one of the key pillars of the strategic partnership between the two countries.
- The first man to travel to space, Russian cosmonaut Yuri Gagarin predicted a future collaboration between the two nations, back in 1961, when he spent 8 days in India.
- Two decades later, Rakesh Sharma became the first Indian to travel to outer space, on board the **Soyuz T-11 spacecraft** with a Russian commander and a Russian flight engineer.
- The former Soviet Union launched India's first two satellites, **Aryabhata and Bhaskar,** into orbit from Baikonur Cosmodrome.
- Aryabhata was launched from Kapustin Yar using a Kosmos-3M launch vehicle.
- Even today, both countries cooperate on lunar and Mars exploration missions.
- India made use of Russian isotope products in its lunar mission Chandrayaan-2 ((Radionuclide curium-244 (Cm-244) sources installed on the Alpha Proton X-Ray Spectrometer)).
- The long list of agreements is indicative of the shared commitment to jointly develop space programmes for

mutual advantage.

Bilateral agreements:

- When Russian President Vladimir Putin visited India in December 2004, the two countries signed two space-related bilateral agreements, namely the **'Inter-governmental Umbrella Agreement on Cooperation in Outer space for Peaceful Purposes'** and the **'Inter Space Agency Agreement on Cooperation in the Russian Satellite Navigation System GLONASS**'.
- In 2005, another agreement to take forward the implementation of the 2004 agreement envisaging joint development of user equipment for exploitation of the signals for commercial purposes and launching of GLONASS satellite using GSLV launch vehicle of India was signed.
- Agreement on cooperation in the field of solar physics and solar terrestrial relationships within the framework of Coronas-Photon project was also signed in 2005 to enable integration of the Indian RT-2 payload with the Coronas-Photon spacecraft.
- 2007 witnessed the signing of an agreement between ISRO and Russia's space agency Roscosmos to jointly develop India's Chandrayaan-2 mission. However, the failure of Russia's Phobos-Grunt mission led the Russian space agency, Roscosmos, to propose changes to Chandrayaan-2 that led India to reconsider the joint effort.
- In 2015, the ISRO and Russian Federal Space Agency (ROSCOSMOS) signed a new MoU on expanding cooperation in the exploration and use of outer space for peaceful purposes.
- This has opened-up opportunities for collaboration in the following areas of mutual interest:
- Satellite navigation
- Launch vehicle development
- Critical technologies for human spaceflight programme
- Remote sensing of EarthSpace science and planetary

exploration

- Use of ground space
- Development of space systems and components
- Exchange of scientists
- Training and scientific and technical meetings
- When the Russian President and Indian Prime Minister met at the BRICS Summit 2016 in Goa, they emphasised that the space agencies of both nations would engage more actively on space technology applications, launch vehicle, satellite navigation, space science and planetary exploration.
- The two leaders welcomed the signing of an MoU to set up and utilise ground measurement gathering stations in each other's territories to enhance the navigation satellite systems GLONASS and NavIC respectively.
- As a result Russian GLONASS (Global Navigation Satellite System) is providing a key service in Indian transport sector being introduced on New Delhi-Mumbai Highway since January,2019.
- The vehicles will be equipped with onboard devices based on the GLONASS / IRNSS satellite system, which have been developed specifically for this project.

Mission Gaganyaan:

- The Gaganyaan programme, is an indigenous mission that would take Indian astronauts to space.
- Gaganyaan is an Indian crewed orbital spacecraft that is intended to send 3 astronauts to space for a minimum of seven days by 2022, as part of the Indian Human Spaceflight Programme.
- The spacecraft, which is being developed by the ISRO consists of a service module and a crew module, collectively known as the **Orbital Module.**
- It will be for the first time that India will launch its manned mission to space, making the country fourth in line to have sent a human into space.

- Isro’s GSLV Mk III, the three-stage heavy-lift launch vehicle, will be used to launch Gaganyaan as it has the necessary payload capability.
- The spacecraft will be placed in a low earth orbit of 300-400 km.
- GSLV Mk III is designed to carry 4 ton class of satellites into Geosynchronous Transfer Orbit (GTO) or about 10 tons to Low Earth Orbit (LEO).
- The Gaganyaan programme is expected to cost under ₹10,000 crore and there will be two unmanned missions prior to the manned mission to validate the technologies.
- The mission will enable ISRO to achieve higher levels of reliability in launch and satellite technology.
- The human spaceflight will take 16 minutes to reach the orbit where it will stay for five to seven days.
- The capsule will rotate around the Earth every 90 minutes, and astronauts will be able to witness the sunrise and sunset.
- The three astronauts will be able to see India from space every 24 hours, while they conduct experiments on microgravity.
- For its return, the capsule will take 36 hours, and will land in the Arabian Sea, just off the coast of Gujarat.
- ISRO has developed some critical technologies like reentry mission capability, crew escape system, crew module configuration, thermal protection system, deceleration and flotation system, sub-systems of life support system required for Mission Gaganyaan.

Recent MOUs during EEF summit:

- India and Russia have signed 15 Memorandums of Understanding (MoUs) and other agreements to boost co-operation between the two countries during PM Modi’s visit to Vladivostok for the Eastern Economic Forum (EEF).

- Russia will help **train Indian space travellers aboard the Gaganyaan** as part of the agreements signed.
- An agreement to operationalise the **maritime route between Vladivostok in Russia to Chennai in India** has also been reached. The route can help Indian businesses engage in activities in the Russian Far East, a resource rich but sparsely populated region.
- The two leaders held the delegation-level talks at the India-Russia 20th Annual Summit and discussed ways to bolster cooperation in trade and investment, oil and gas, mining, nuclear energy, defence and security, air and maritime connectivity, transport infrastructure, hi-tech, outer space and people-to-people ties.

Apart from this, Russia is planning to partner Delhi for joint collaborations including presence at the prestigious International Space Station (ISS). This includes cooperation in futuristic technologies including new space systems, rocket engines, propellants and propulsion systems, spacecraft and launch vehicle technology.

Cooperation in space has emerged as a key area of cooperation in the high technology sector between India and Russia. India’s rapidly growing capabilities in outer space is being acknowledged and Russia sees India as a key partner for promoting peaceful uses of outer space.