ENHANCEMENT IN DEVELOPMENT OF ISRO'S SATELLITES &ITS APPLICATION IN REAL TIME SCENARIO

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Abstract

India's space program has made significant strides since the launch of its first satellite, Aryabhata, in 1975. The Indian Space Research Organisation (ISRO) has been instrumental in developing and launching a variety of satellites that have aided India's economic, scientific, and military goals. In this research paper, we will explore ISRO's advancements in the field of satellites, their contributions to the country and the world, and their future plans.

Introduction

A satellite is an object that moves around a larger object. There are two kinds of satellites: natural (such as the moon orbiting the Earth) or artificial (such as the International Space Station orbiting the Earth). Here in this research paper we will discuss about launch of these satellites done by Indian space Organisation , ISRO have emerged as one of the leading space organisation in the world with its mission with takes place over the entire year which are for the benefit of planet earth and also to find information on other planets , with the curiosity in mind of the scientist about the upcoming innovation and research these mission take place over the entire year from their centre , majorly Isro has launched all 6 kinds of satellites,

1. **All-weather satellites** - ISRO has launched several all-weather satellites, including INSAT-3DR and INSAT-3D. These satellites are used for weather forecasting and disaster management.
2. **Communication satellites**-ISRO has launched numerous communication satellites, including INSAT-4A, INSAT-4B, and GSAT-30. These satellites provide communication services like television broadcasting, telecommunications, and internet services.
3. **Navigation Satellites** -ISRO has launched multiple navigation satellites, including the Indian Regional Navigation Satellite System (IRNSS). The IRNSS is used for navigation and positioning services in India and the surrounding regions.
4. **Earth observation satellites** -ISRO has launched several Earth observation satellites, including the Cartosat series, RESOURCESAT-2A, and OCEANSAT-2. These satellites are used for remote sensing and monitoring of the Earth's resources and environment.
5. **Astronomical Satellites** -ISRO has launched astronomical satellites like ASTROSAT, which is India's first multi-wavelength space observatory. ASTROSAT is used for studying various celestial objects like stars, galaxies, and black holes.
6. **Miniaturised Satellites** -ISRO has launched miniaturised satellites like the PSLV-C51 mission, which launched 19 satellites, including Amazonia-1, a Brazilian Earth observation satellite, and several smaller satellites.

Advancements in Satellites:

ISRO has been actively involved in the development and deployment of various types of satellites, including communication, remote sensing, navigation, and astronomy satellites. One of the most significant advancements in ISRO's

satellite technology was the development of the Polar Satellite Launch Vehicle (PSLV) in the 1990s, which has become one of the most reliable and cost-effective launch vehicles in the world. PSLV has been used to launch satellites for various countries, including the USA, Germany, Canada, and Japan. With these advancements in launches ISRO has recently launched the first flight of its new satellite launcher, Small Satellite Launch Vehicle from the Satish Dhawan Space Centre in Sriharikota, Andhra Pradesh carrying two satellites - Earth Observation Satellite-2 (EOS-2) and AzadiSAT. Satellites carried by the vehicle, however, failed to reach the desired orbit due to an error in the terminal stage.

What was the Purpose of the Mission?

The purpose of this mission was to place the two satellites in circular low-earth orbits at a height of about **350 km** above the Equator.

- EOS-2: An optical remote sensing satellite designed and developed by ISRO.
- Azadi SAT: Array of 75 tiny payloads integrated by students, to measure the ionizing radiation, integrated by the student team of SpaceKidz India.

How is SSLV Different from PSLV? Cost-effective and Payload Capacity: SSLV has been designed to launch a 500-kilogram payload into a 500-kilometre planar orbit plus it is less expensive than PSLV. As the PSLV (Polar Satellite Launch Vehicle) can carry huge loads, small projects don't have a high cost-benefit ratio. Solid Propellant: The SSLV uses solid propellants and this is more economical and easier to handle than the liquid propellant stages of the PSLV. Faster Launch on Demand Service: PSLV's long turnaround time (over 60 days) makes scaling up launch on demand difficult. The SSLV has the flexibility to launch multiple satellites. It has a low turnaround time (72 hours) and can be assembled within a fortnight, allowing the space agency to provide launch on demand service in the fast growing low earth orbit launch sector. Few upcoming ISRO Mission are

What are the Upcoming Projects of ISRO?

- Gaganyaan- Indian Human Spaceflight Programme.
- Aditya-L1: To Study the Sun's atmosphere.
- NASA-ISRO Synthetic Aperture Radar Mission: To study hazards and global environmental change.
- Shukrayaan-1: Orbiter to Venus.

What are the Future Potentials?

Doorway Commercial Satellite Launch Market: The SSLV is India's official doorway into the commercial small satellite launch market around the world. The rocket is expected to be operated by New Space India Limited (NSIL), India's commercial space operations arm. Attractive for commercial earth observation and communication. Launch of the SSLV from Pole to Pole: ISRO intends to launch the SSLV in future from its upcoming spaceport in Kulasekarapattinam in Tamil Nadu. Doing so would allow SSLV to enter into a pole-to-pole,

or polar orbit around the Earth. The SSLV will take off over the Lakshadweep Sea without manoeuvring around Sri Lanka , saving fuel and payload capacity. Towards Nano-Satellites Launch Vehicle: With the advancement of technology, the size of satellites has come down significantly with CubeSats and nano-satellites becoming the norm of the day. ISRO has the opportunity to lead the development of cost-effective nano-satellite launch vehicles.

Major Accomplishments of ISRO

The first "Experimental Satellite Communication Earth Station (ESCES)" was set up in Ahmedabad in 1967. The ISRO developed a television program called "Krishi Darshan" to provide farmers with agricultural information. The Satellite Instructional Television Experiment (SITE), called "the world's largest sociological experiment," took place from 1975–1976. Around 200,000 individuals benefited from this initiative, which used the American Technology Satellite to send development-oriented programs to 2400 villages across six states (ATS-6). SITE deserves recognition for educating 50,000 primary school science instructors in a single academic year. After SITE, ISRO and the Postand Telegraphs Department (P&T) collaborated on the Satellite Telecommunication Experiments Project (STEP), which used the Franco-German Symphony satellite from 1977 to 1979. The purpose of STEP was to develop the necessary indigenous competence for the proposed operational domestic satellite system, INSAT, and to offer a system test of using geosynchronous satellites for domestic communications. After SITE, the "Kheda Communications Project (KCP)" served as a field laboratory for transmitting need-based and location-specific programming in Gujarat State's Kheda area. In 1984, KCP received the UNESCO-IPDC (International Program for the Development of Communication) award for excellence in rural communication.

The first Indian spacecraft, called "Aryabhata," was created during this period and launched with a Soviet launcher. Another significant achievement was the SLV-3, which had its first successful flight in 1980 and was the first launch vehicle capable of putting 40 kg into Low Earth Orbit (LEO).

A significant turning point in our space program was the development of multistage rocket systems with appropriate control and navigation systems to orbit a satellite.

During the testing stage in the 1980s, the Bhaskara-I and Bhaskara-II missions made significant advances in remote sensing. At the same time, the “Ariane Passenger Payload Experiment” (APPLE) served as a prototype for a new generation of communication satellite systems. Major space infrastructure was built during the operating phase in the 1990s under two broad categories:

- **The Indian Remote Sensing (IRS) Satellite system**
- **The multipurpose Indian National Satellite (INSAT) system.**

Significant accomplishments during this phase included creating and operationalizing the PSLV and the GSLV.

The organization started its lunar mission in 2008 by launching the Chandrayaan-1 orbiter to the moon. A decade later, the Chandrayaan-3 mission, which is expected to launch late next year, and the second lunar mission, which, despite not being able to do a soft landing on the moon's surface, had a

functioning orbiter, have both been scheduled. Following the success of the Mars Orbiter Mission, ISRO decided to explore Venus. Additionally, ISRO launched the Mars Orbiter Mission, popularly known as the "Mars craft" or “Mangalyaan”, to the Red Planet. In 2014, the spacecraft successfully landed on Mars, making India's space agency the fourth organization to do so. A record-low $74 million was spent to complete the mission.

Future of ISRO

Becoming one of the six largest space agencies in the world, ISRO has consistently fulfilled its mission to use space for the benefit of the general public and the country. ISRO operates one of the largest fleets of INSAT (Indian National Satellite) communication satellites and IRS (Indian Remote Sensing) satellites.

The GAGAN and NAVIC satellite navigation systems, run by ISRO, also have the largest constellation of remote-sensing satellites. Broadcasting, communications, weather forecasts, disaster management tools, geographic information systems, cartography, navigation, telemedicine, and dedicated distance education satellites are just a few of the application-specific satellite products and tools that ISRO develops and provides to the nation.

Until now, ISRO has made every Indian proud with its astonishing achievements in space exploration. Now, with the emergence of space warfare and space defence, the big responsibility again lies on the shoulders of ISRO to make India secure in space defence. The US has already set up a US space force in 2020, and now there is a common consensus among the defence experts that future wars will largely be fought in space and cyberspace.

In March 2019, a successful anti-satellite test was conducted, which placed India in the company of China, Russia, and the US, which have the anti-satellitecapability.

More importantly, in 2019, India established two new bureaucracies for space, the Defense Space Research Organization (DSRO) and Defense Space Agency

(DSA). One of the critical future roles of ISRO will be to coordinate with these two bodies and with the Indian Armed Forces to ensure space security in India.

Conclusion:

To conclude, one can say that in its journey of over five decades, ISRO has played a paramount role in making India a “Space Superpower” today. Once a dream of a few visionaries has today become the brand ambassador of strong and new India.

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