Syllabus subtopic: Science and Technology - developments and their applications and effects in everyday life; Achievements of Indians in science & technology; indigenization of technology and developing new technology.

Prelims and Mains focus: About the recent launch by PSLV, its achievements so far and their significance in making India a prominent player in satellite launching industry.

News: India’s Polar Satellite Launch Vehicle (PSLV) marked its ‘Golden Jubilee’ launch on Wednesday by injecting India’s advanced radar imaging satellite RISAT2BR1 and nine other customer satellites from Japan, Italy, Israel and the U.S. into their intended orbits.

Objective of RISAT2BR1 satellite

It will be used for agriculture, forestry, disaster management support and national security. ISRO will launch the next version of RISAT within the next two months.

Other achievements of PSLV

The PSLV, which has a history of successful launches of payloads that include Chandrayaan1, Mars Orbiter Mission and the space recovery mission, soared into clear blue skies at 3.25 p.m. from the refurbished first launchpad, marking the 50th launch for the vehicle.

Initially, the PSLV had a carrying capacity of 850 kg, and over the years it has been enhanced to 1.9 tonnes. The PSLV is very versatile, having various mission options.

The PSLV had helped take payloads into almost all the orbits in space, including the the Geo-Stationary Transfer Orbit (GTO), the moon and mars, and would soon be launching a mission to the Sun.

In the last 26 years, the PSLV had lifted more than 52 tonnes into space, of which about 17% were for commercial customers.

The PSLV has failed only twice — the maiden flight of the PSLV D1 in September 1993 and the PSLV C39 in August 2017. While it had taken ISRO 26 years to achieve 50 launches, the next 50 would likely be done in the coming five years.

What is the difference between GSLV and PSLV

Both PSLV (Polar Satellite Launch Vehicle) and GSLV (Geosynchronous Satellite Launch Vehicle) are the satellite-launch vehicles (rockets) developed by ISRO. PSLV is designed mainly to deliver the “earth-observation” or “remote-sensing” satellites with lift-off mass of up to about 1750 Kg to Sun-Synchronous circular polar orbits of 600-900 Km altitude.
The remote sensing satellites orbit the earth from pole-to-pole (at about 98 deg orbital-plane inclination). An orbit is called sun-synchronous when the angle between the line joining the centre of the Earth and the satellite and the Sun is constant throughout the orbit.

Due to their sun-synchronism nature, these orbits are also referred to as “Low Earth Orbit (LEO)” which enables the on-board camera to take images of the earth under the same sun-illumination conditions during each of the repeated visits, the satellite makes over the same area on ground thus making the satellite useful for earth resources monitoring.

Apart from launching the remote sensing satellites to Sun-synchronous polar orbits, the PSLV is also used to launch the satellites of lower lift-off mass of up to about 1400 Kg to the elliptical Geosynchronous Transfer Orbit (GTO).

PSLV is a four-staged launch vehicle with first and third stage using solid rocket motors and second and fourth stages using liquid rocket engines. It also uses strap-on motors to augment the thrust provided by the first stage, and depending on the number of these strap-on boosters, the PSLV is classified into its various versions like core-alone version (PSLV-CA), PSLV-G or PSLV-XL variants.

The GSLV is designed mainly to deliver the communication-satellites to the highly elliptical (typically 250 x 36000 Km) Geosynchronous Transfer Orbit (GTO). The satellite in GTO is further raised to its final destination, viz., Geo-synchronous Earth orbit (GEO) of about 36000 Km altitude (and zero deg inclination on equatorial plane) by firing its in-built on-board engines.

Due to their geo-synchronous nature, the satellites in these orbits appear to remain permanently fixed in the same position in the sky, as viewed from a particular location on Earth, thus avoiding the need of a tracking ground antenna and hence are useful for the communication applications.