Recent Indian Space Missions
- Update as on Feb 2016

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Indian Space Program

51 Launch vehicle missions

33 PSLV (3 configurations)
4 ASLV*
4 SLV*
9 GSLV
1 GSLV MK III-X

Launch frequency

No. of launches
0 1 2 3 4 5 6

Year

79 Spacecraft missions

Communication
Remote sensing
Societal application
Navigation
Exploration
End-to-end capability
Ground Segment Support

* Past Vehicles
Recent Indian Satellite Missions (2011-2016)

Earth Observation
- SARAL
- RISAT-1
- Megha-Tropiques
- Resourcesat-2
- INSAT-3D
- GSAT-7
- GSAT-10
- GSAT-12

Communication/Meteorological
- GSAT-15
- GSAT-6
- GSAT-16
- GSAT-14

Exploration
- ASTROSAT
- CARE
- MOM

Navigation
- IRNSS-1E
- IRNSS-1D
- IRNSS-1C
- IRNSS-1B
- IRNSS-1A
India’s current Space Assets

Communication Satellites
- **12 Operational** (INSAT-3A, 3C, 4A, 4B, 4CR and GSAT-7, 8, 10, 12, 14, 16, 15)
- **260 Transponders in C, Ext C & Ku bands**

Remote sensing Satellites
- **Three in Geostationary orbit** (INSAT 3D, Kalpana & INSAT 3A)
- **9 in Sun-synchronous orbit** (RESOURCESAT-2; CARTOSAT-1, 2, 2A & 2B; RISAT-1 & 2; OCEANSAT 2; SARAL)
- Equatorial orbit (MEGHA TROPIQUES)
- Both Optical & Microwave Sensors providing wide range of spatial, spectral, radiometric & temporal resolutions

Navigational Satellites: IRNSS 1A, IB, 1C, 1D and 1E

Inter Planetary Probe: Mars Orbiter Mission

Exploration: ASTROSAT
Launch Missions: 2015-16

- PSLV C27/ IRNSS-1D - 28 March 2015
- PSLV C28/ DMC3 - 10 July 2015
- GSLV D6/GSAT-6 - 27 August 2015
- PSLV C30/ ASTROSAT - 28 September 2015
- PSLV C29/TeLEOS-1 - 16 December 2015
- PSLV C31/IRNSS-1E – 20 January 2016
An Indigenous navigation system of seven-satellite constellation designed for providing position, navigation and timing services over Indian region.

- Five satellites already in orbit; 6th Satellite to be launched in March 2016
- Constellation planned to be completed by 2nd quarter of 2016

**Coverage area** is about 1500 km beyond Indian territory.

**Estimated positional accuracy** ~ 10m.

**Navigation and ranging payloads**

- Navigation payload – L5 band and S band, Rubidium atomic clock
- Ranging – C band transponder
GAGAN: Augmented Navigation

- **GAGAN**: GPS Aided GEO Augmented Navigation
  - Jointly implemented by ISRO & Airports Authority of India

- **Configuration**
  - Ground Component: (15 ref stn; 3 uplink stn, 2 control stn)
  - Space Segment: Payloads on GSAT8, GSAT10 and GSAT15

- **Certification**
  - APV 1 certification granted to GAGAN on 21 April 2015 approving the capability of GAGAN to offer precision approach services over the Indian land mass.
  - APV1 certified GAGAN signals are being broadcast with effect from 29 May 2015.

Interoperable global system
PSLV C30: ASTROSAT Mission

Multi-wavelength space based observatory of India, launched on September 28, 2015
Performance verification phase – half way
Five payloads for astronomy

NUV (200-300nm) image of Galaxy NGC 2336 taken using UV Imaging telescope (UVIT)

Scanning Sky Monitor (SSM) - to scan the sky in order to detect and locate X-ray transients in the energy range of 2-10 keV.
Stares performed on neutron star binary pulsar 4U0115+63. Figure shows the detection of the 3.6s rotation period of the neutron star using this payload.
24 Ku-band transponders
GAGAN payload in L1 and L5 bands

Launch Mass: 3164 kg
Dimension: 2.0 m x 1.77 m x 3.1 m cuboid
Power: Solar array providing 6200 Watts and Three 100 AH Lithium-Ion batteries
Launched on: November 10, 2015
Launched by: Ariane-5 VA-227
Mission Life: 12 Years
Orbital Slot: 93.5°E

260 Transponders in C, Ext C & Ku bands
GSLV MK III – The heavy-lift launch vehicle of ISRO

- 3 stage launch vehicle
- 4 tonne payload capability to GTO
- Total vehicle mass – 640 tonne
- Solid propellant boosters and Core Liquid engine qualified during the GSLV MKIII-X CARE mission.

Hot test of CE-20 Cryogenic engine accomplished on February 19, 2016
Full configuration flight expected in December 2016
International satellite launches in 2015

- Kent Ridge 1
  TeLEOS 1
  SINGAPORE

- CBNT 1
  SSTL, UK

- LEMUR
  USA

- LAPANA2
  INDONESIA

- NLS 14
  CANADA

- DMC3
  SSTL, UK

- Deorbit Sail
  SSC, UK

- Velox C1
  SINGAPORE

17 International satellites in 2015
Re-start capability for upper stage
• National Meet on Promoting Space Technology based Tools and Applications in Governance and Development – September, 2015

• ‘No Space should be left between the common man and Space technology’ - PM


• Close to 1,500 officials from the Centre and state governments

• The Secretaries of Central Ministries/Departments presented joint action plans on effective utilization of Space Technology to enhance functional effectiveness, facilitate planning and decision making
Upcoming Missions (2016)

Mission:

- IRNSS 1F – PSLV C32 – Q1
- IRNSS 1G – PSLV C33 – Q2
- Cartosat 2C – PSLV C34 – Q2
- Resourcesat 2A and SCATSAT-1 PSLV C35 – Q3
- INSAT 3DR (GSLV) – GSLV F05 – Q3
- GSAT 18 – Ariane 5 – Q3
- GSAT 19A - GSLV MK III – Q4

Application:

- Navigation
- Navigation
- High resolution RS
- RS and Ocean monitoring
- Meteorology
- Communication
- Communication
International Cooperation

- IRS Data support for International Charter, Sentinel Asia, UN-SPIDER
  - Drought assessment for Sri Lanka under UNESCAP-DRR
- CEOS & GEO participation
- CSSTE-AP
- IRS Data Reception
  - Resourcesat-2 at Cuiaba (Brazil), RISAT-1 by KSAT (Norway)
- NASA ISRO SAR (NISAR) Mission
  - Dual frequency (L&S) SAR Mission
- CNES ISRO Agreement on TIR Mission
- DLR-ISRO Workshop 2015
- SAARC satellite
- ISRO-UAE space agency MoU on peaceful uses of outer space
- BRICS constellation on Remote Sensing
Thank You