

Indian Space Perspective

Space Science and Security: The Role of Regional Expert Discussion

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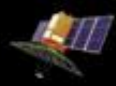

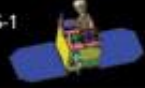



















































The Indian Space Programme

- Started as a civilian initiative in 1963
- Scope was atmospheric research to start with
- International cooperation was very evident
- Sounding rocket experiments, payload preparation, development of rocket technologies and creation of facilities took shape
- Progressed into launch vehicle and satellite activity.
- Stress on in house development and self reliance
- **Underlying intent was societal and public good**

Development Process

- Collaborative programs
 1. Sounding rocket experiments and building payloads
 2. Licence production of sounding rockets
 3. SITE & STEP and later Aryabhata (*Indigenous program and development content/ external hardware/launch support*)
- Experimental learning efforts—SLV, APPLE, Bhaskara
- Development and operational systems

Mission Profile 2006-13

MISSIONS	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
EARTH OBSERVATIONS	CARTOSAT-2 	TECSAR (Commercial Launch) 	CARTOSAT-2A  IMS-1 	OCEANSAT-2  RISAT-2 	CARTOSAT-2B  RESOURCESAT-2  RISAT-1 	MEGHA-TROPIQUES  SARAL  INSAT-3D 	CARTOSAT-3  DMSAR  RISAT-3 
SATELLITE COMMUNICATIONS & NAVIGATION	INSAT-4C  INSAT-4B(P) 	INSAT-4CR 		ANUSAT 	GSAT-4  GSAT-5  GSAT-6  GSAT-8(P) 	GSAT-9  GSAT-12  GSAT-10(P)  IRNSS 1&2 	GSAT-11  GSAT-13  GSAT-14  IRNSS 3&4 
SPACE SCIENCE & ENVIRONMENT	SRE-1 	AGILE (Commercial Launch) 	CHANDRAYAAN-1 		YOUTHSAT  STUDSAT 	ASTROSAT-1  ADITYA-1 	CHANDRAYAAN-2  SRE-2 
LAUNCH VEHICLES	C7  F02 	CB;C10  F04 	C9;C11 	C12;C14 	C15-17  F05;F06  D3 	C18-21  F07;08  D01 	C22-25  F09;10  D02 
Missions yet to be approved							
RISAT – Radar Imaging Satellite; SRE – Space capsule Recovery Experiment; IRNSS – Indian Regional Navigation Satellite System							

Space Sciences

Astronomical observatories, Giant Meter Wave Radio Telescope, National Atmospheric Research Laboratory (NARL), etc. Balloons, Sounding Rockets and Satellite Platforms

- First scientific mission to Moon, Chandrayaan-1
- ASTROSAT, a multi wavelength astronomy satellite
- Participation in international scientific campaigns



ASTROSAT



SOUNDING ROCKETS
for atmospheric research

UDAIPUR SOLAR OBSERVATORY



BALLOON
EXPERIMENT



MESOSPHERE-STRATOSPHERE-
TROPOSPHERE RADAR FACILITY



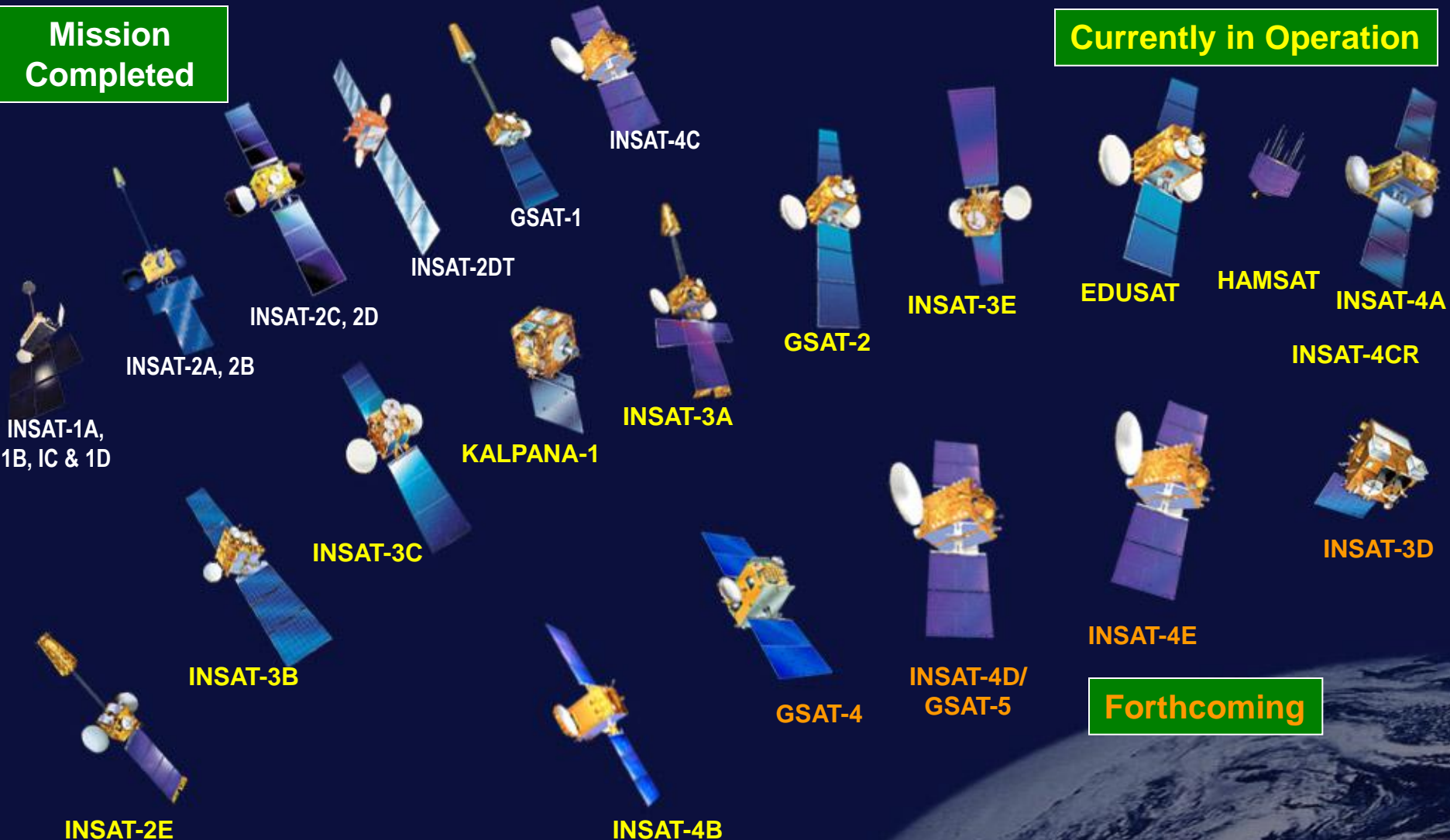
INSAT Satellites

Indian National Satellite (INSAT) System established in 1983, is a multipurpose system for telecommunications, television broadcasting and radio networking, meteorology and disaster warning.

Mission Completed

Currently in Operation

Forthcoming



Indian Remote Sensing Satellites

India has established the largest constellation of remote sensing satellites providing data in a variety of spatial resolutions and spectral bands for different applications.

Mission Completed

Currently in Operation

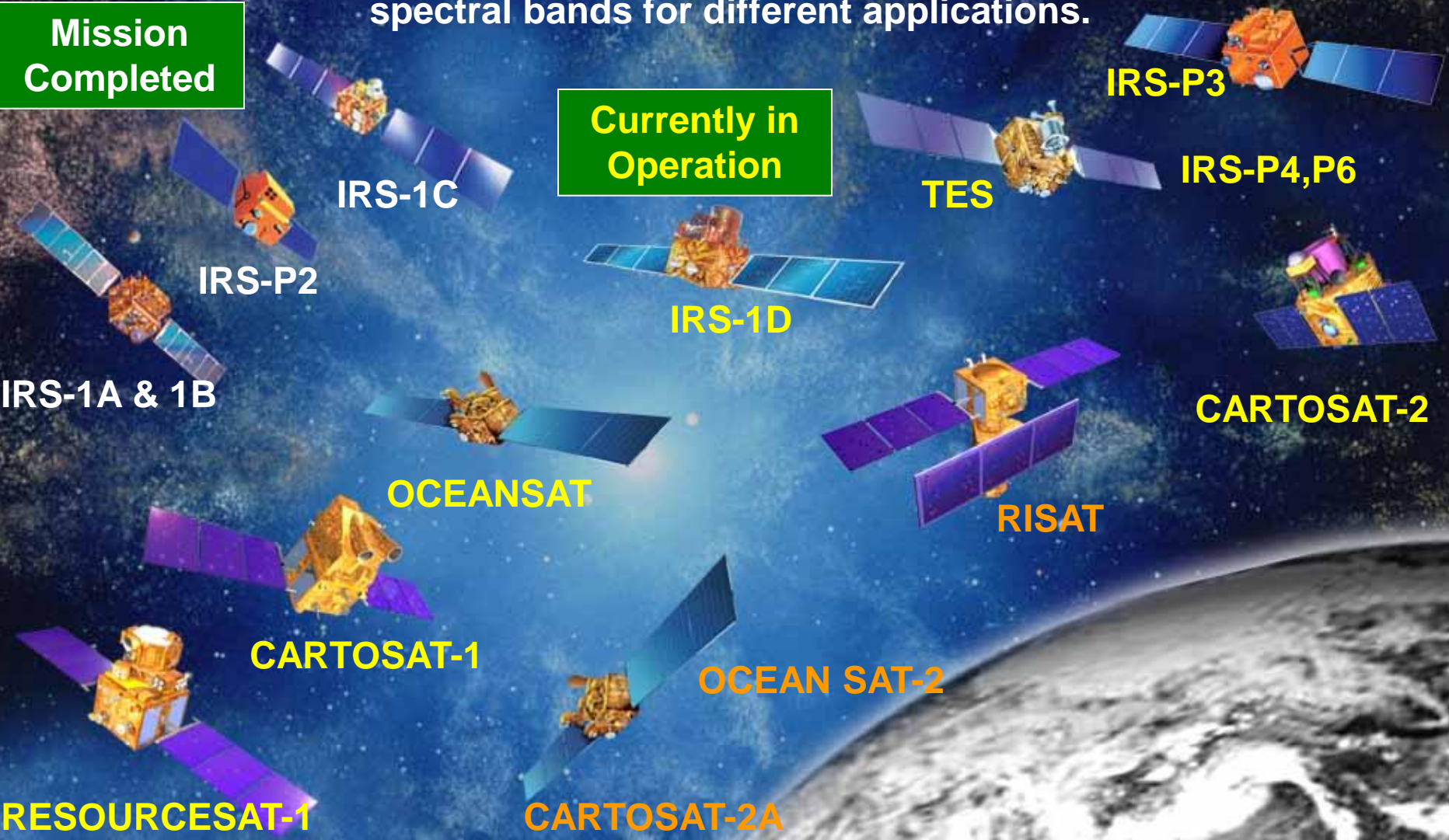


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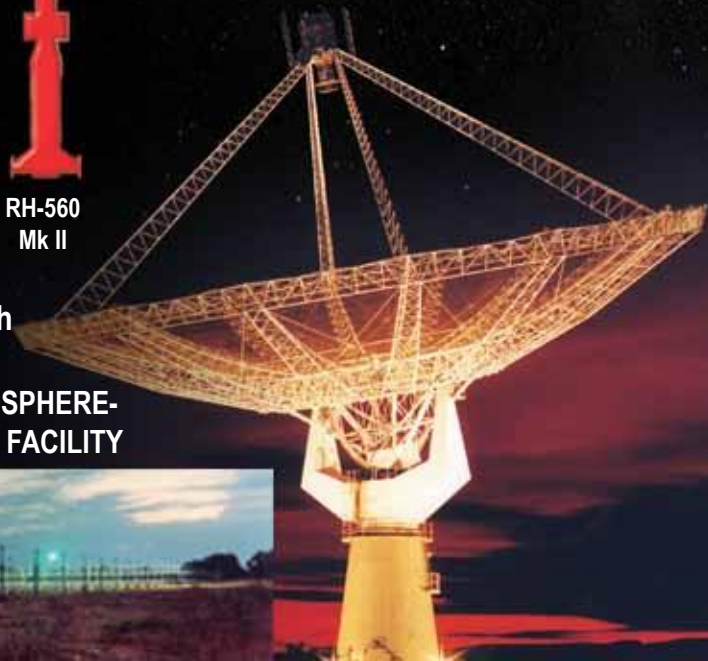
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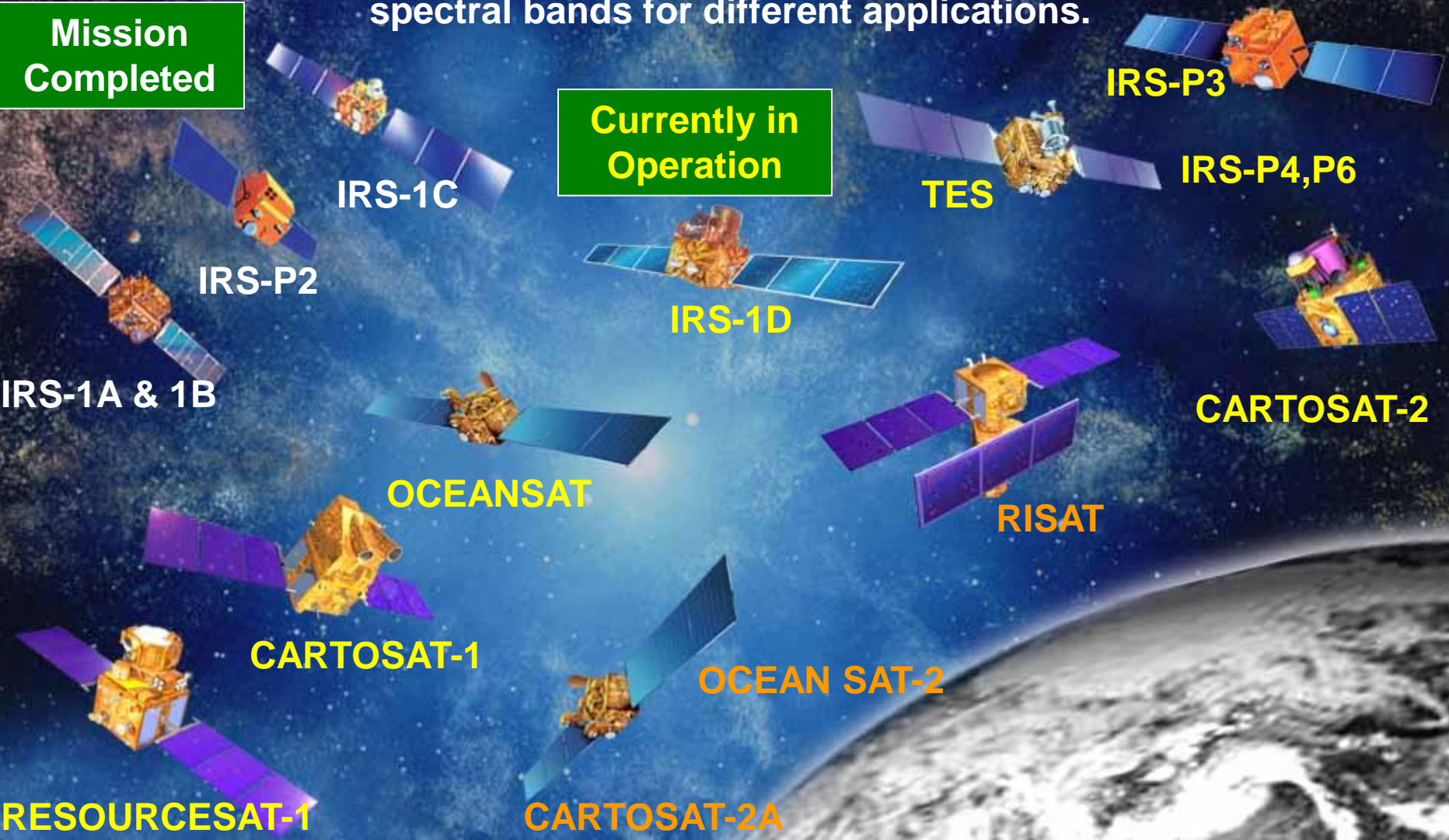


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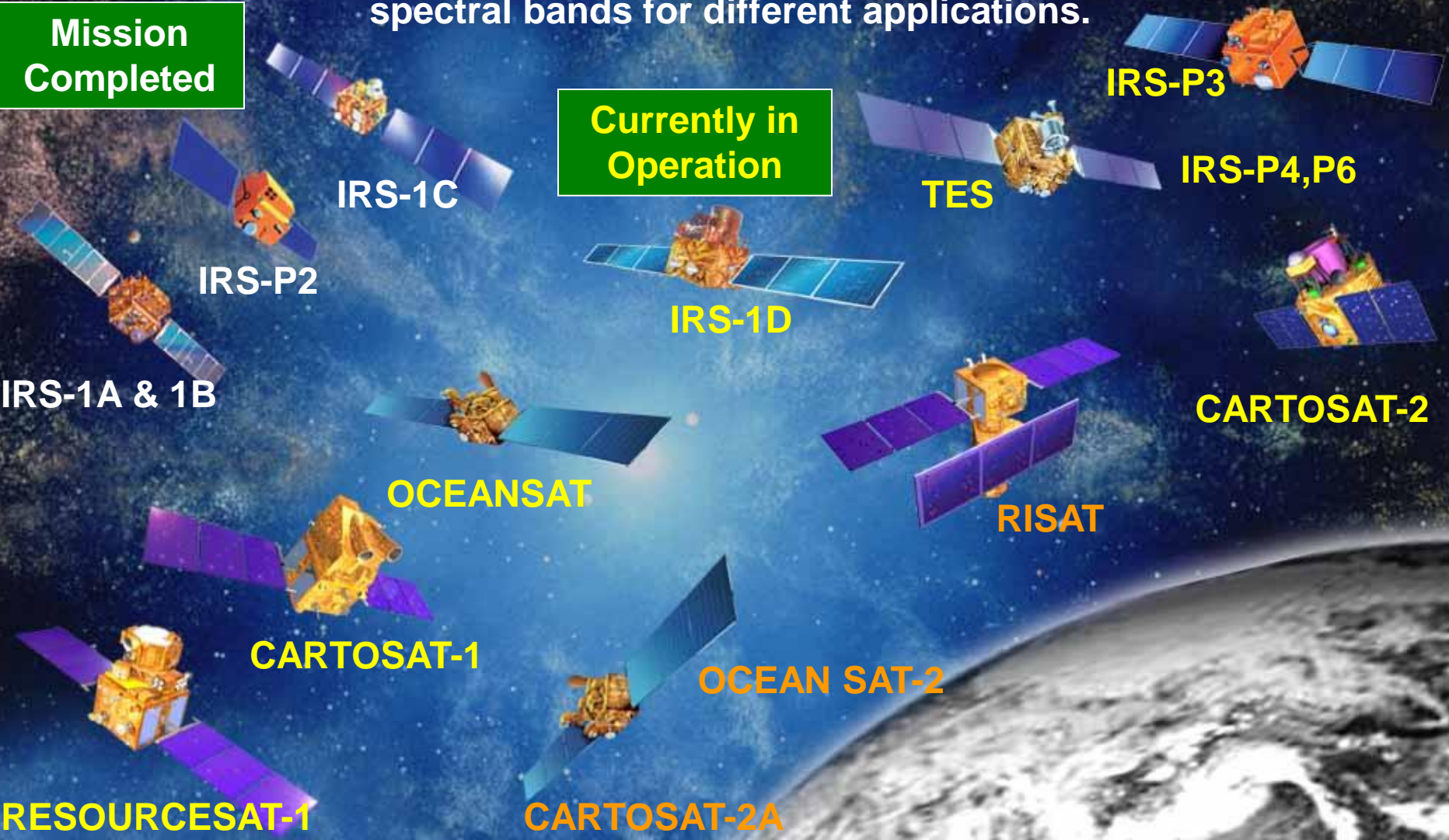


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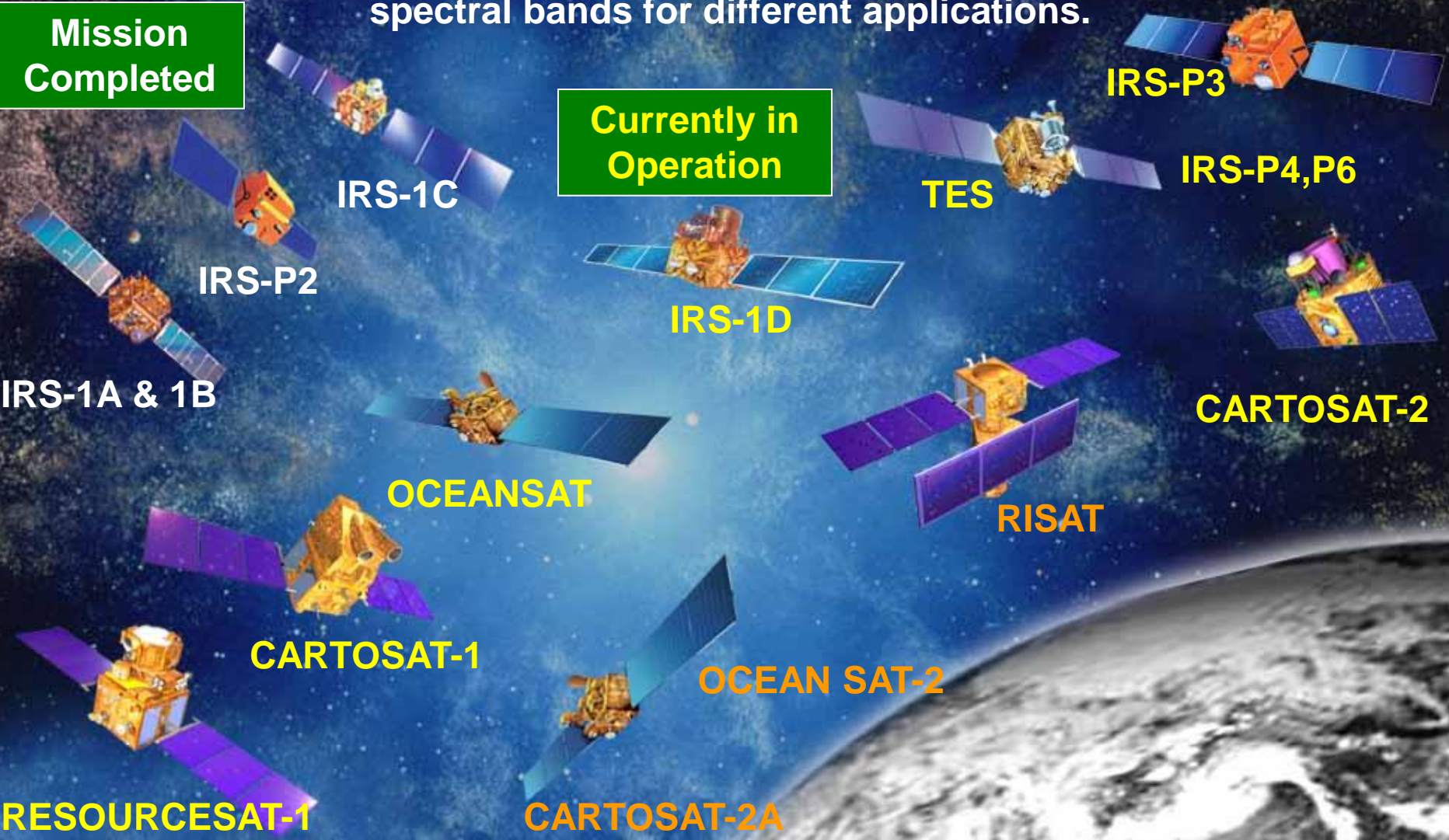


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ISRO LAUNCHERS



	PSLV	GSLV	GSLV MkIII
Weight (T)	294	400	629
Payload (Kgs)	1500 SSO	2250 GTO	4000 to 4500 GTO
Flights	11 (1993-07)	5 (2001-07)	--

Threats to Indian Satellites

- The worth of India's space-borne assets is quite high
- Any nation which has the capability to launch and maintain satellites in space has the ability to interfere with their use.
- ASAT test is one example
- Increasing debris on account of intended/accidental collision is a threat
- Result Reduction in national confidence in securing the benefits