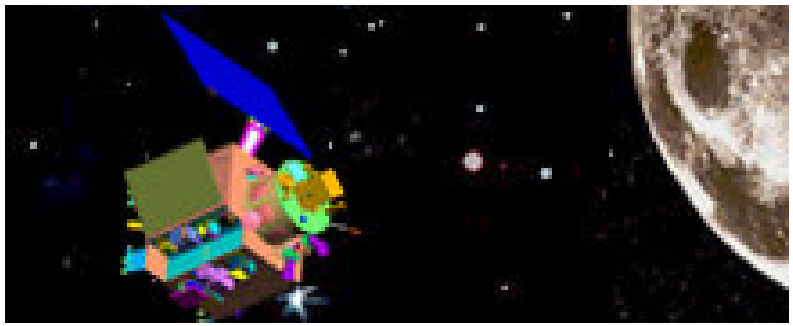
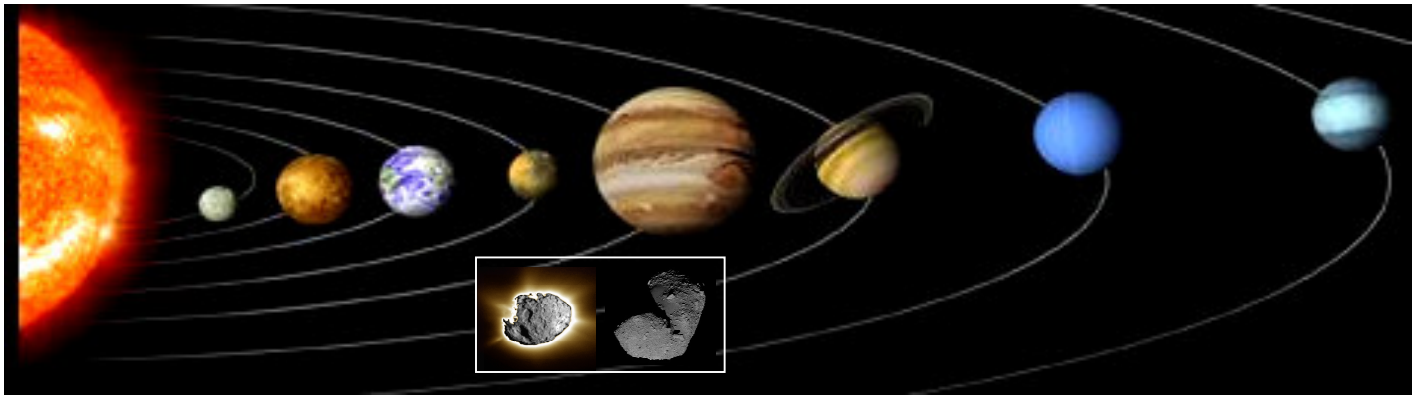
Plenary on Space Exploration





BN Suresh

Indian Space Research Organization (ISRO)

Structure of Presentation

1. Aspects of Ongoing Space exploration activities of India and the main objectives.
2. New phase of Space exploration planned in India and the driving factors.
3. Challenges and Opportunities for International Cooperation to enhance the benefits to all participating agencies.
4. Possible role for the UN System in the future global space exploration activities

Primary Objectives of Ongoing Space Exploration Activities of India

- The initial era of Indian Space programme was dedicated exclusively to the pursuit of Science and Scientific studies of the atmosphere.
- Subsequently efforts were aimed to meet Societal goals to enhance the quality of life and towards national development.
- Necessary capacity building in technologies to meet the national needs consistent with the core themes of space exploration.
- Right from the inception, the Indian space programme has pursued the International Cooperation as a fundamental tenet of our policy.

Four decades of Indian Space Exploration

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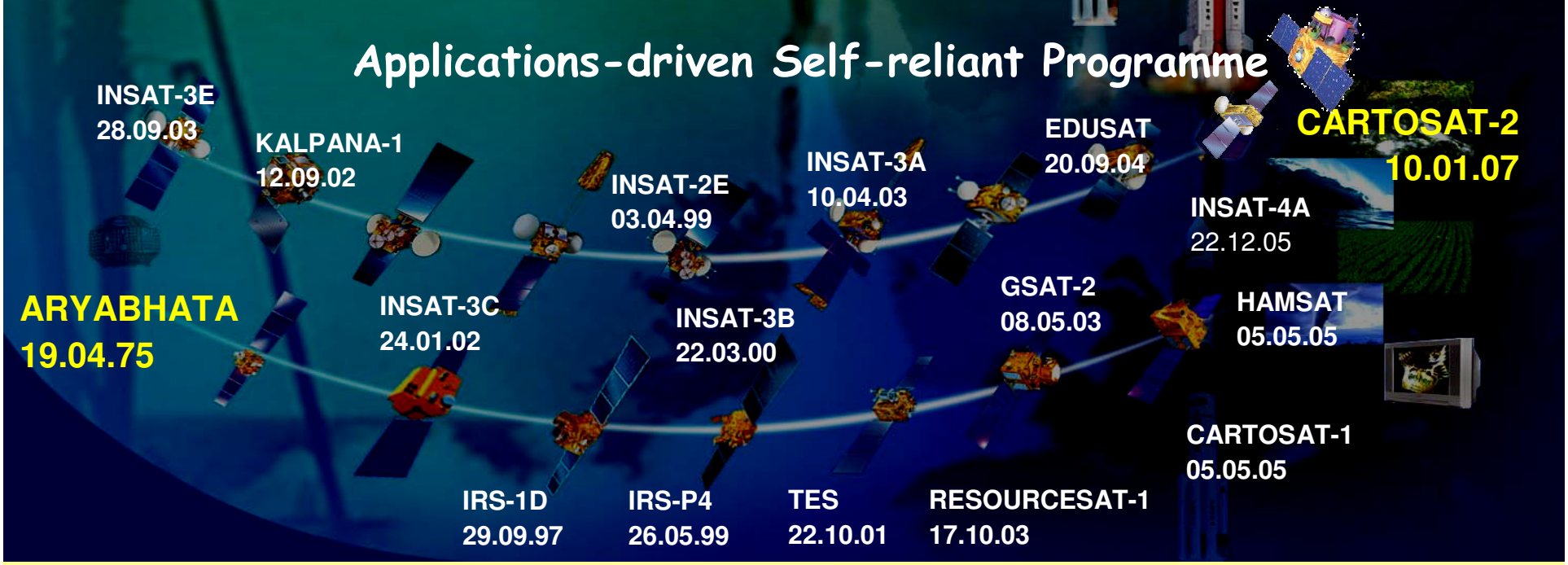
"……we must be second to none in the applications of advanced space technologies to the real problems of man and society." (V. A. Sarabhai)

November 21, 1963

Applications-driven Self-reliant Programme

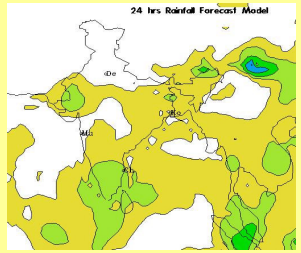


23 Launch Vehicle and 46+1+7 Space craft Missions

BUDGET
$ 800 Million/year

HUMAN RESOURCES EXPERTISE
16,500 strong

IRS System: E O Applications



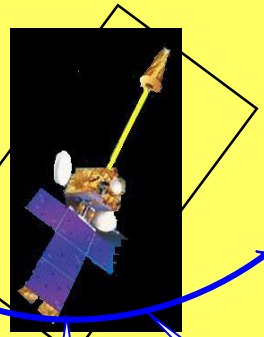
WEATHER & CLIMATE

OCEAN MAPPING AND
RESOURCES

INSAT System Applications

BROADCAST

- Television Broadcasting
- Direct To Home (DTH)
- TV & Radio Networking

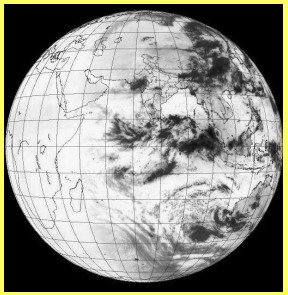


COMMUNICATION

- Speech Circuits On Trunk Routes
- VSAT Connectivity

METEOROLOGICAL

- Meteorological Imaging
- Data Collection Platform
- Disaster Warning

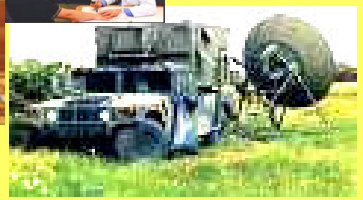


OTHERS

- Mobile Satellite Service
- Search and Rescue
- Satellite Navigation

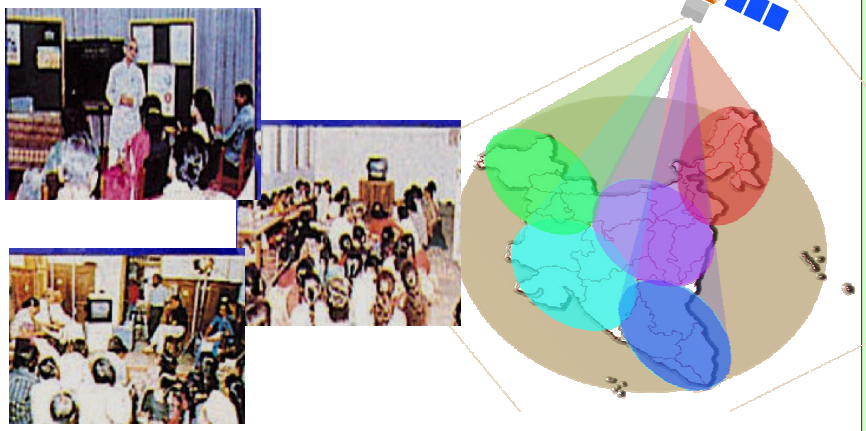
DEVELOPMENTAL

- Tele-health
- Tele-education
- Emergency Communication



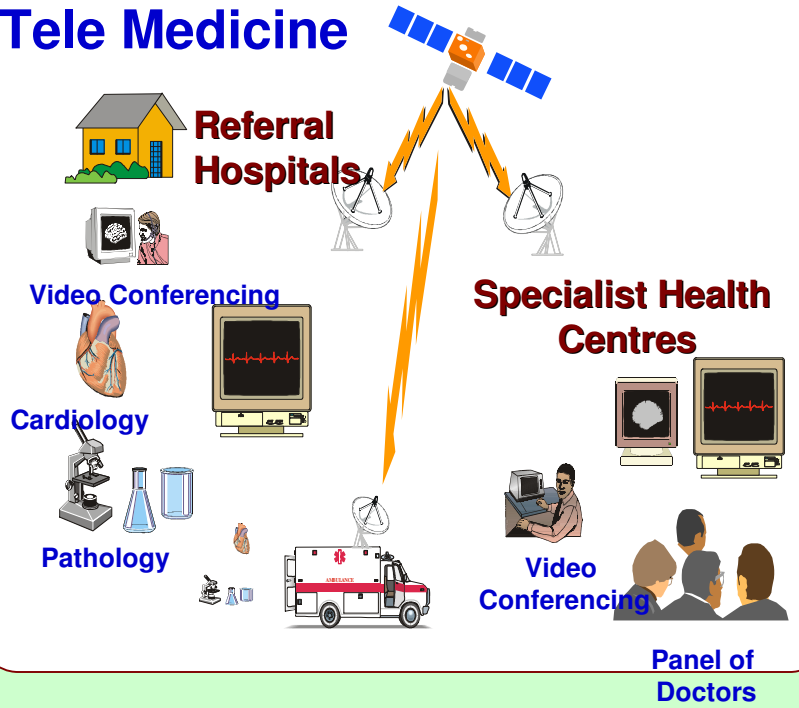
Edusat : Satellite for Education ...

Tele Education



EDUSAT
1 Nat'l Beam in Ku Band
1 Nat'l Beam in Ext C Band (6 Chs)
5 Spot Beams - 5 Ku Band

Tele Medicine



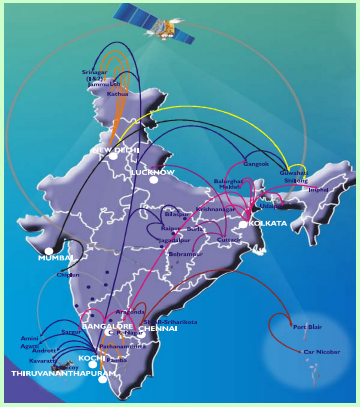
Utilization Status

More than 35 Networks: 9 National & 26 Regional

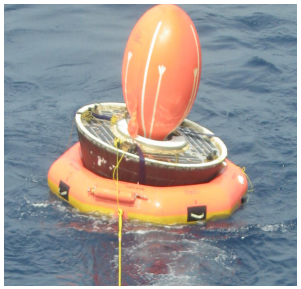
More than 14,000 Class Rooms

Regional Networks: 1140 SITs in 11 States; 8634 ROTs in 5 States

- More than 200 Hospitals Networked including 34 Super Specialty
- Over 160,000 patients benefited



Space Transportation System: Resources and Capabilities



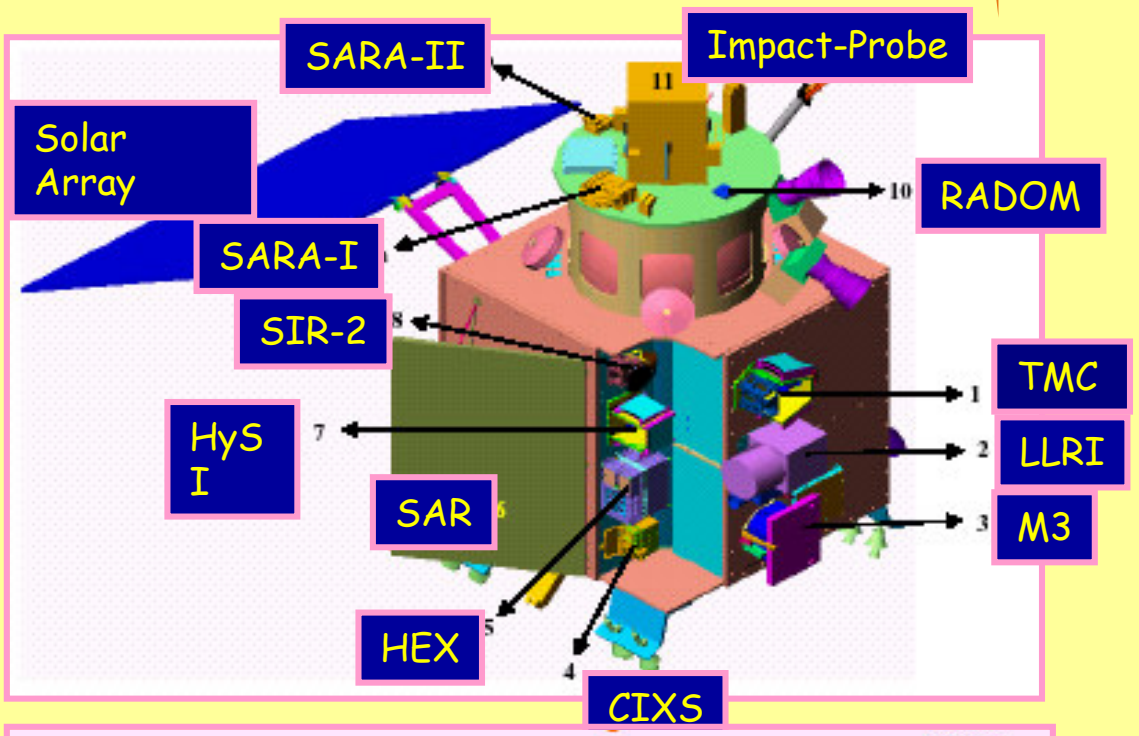
Space-capsule Recovery Experiment (21 Jan. 07)

PSLV	GSLV	GSLV-MkIII	
294	414	629	Weight (T)
1.3T SSO / 1.05T GTO	2.5 T GTO	4.5T GTO / 10T LEO	Payload
11 (94 –07)	4 (2001-06)	2009	Flight

Planetary Science & Exploration:

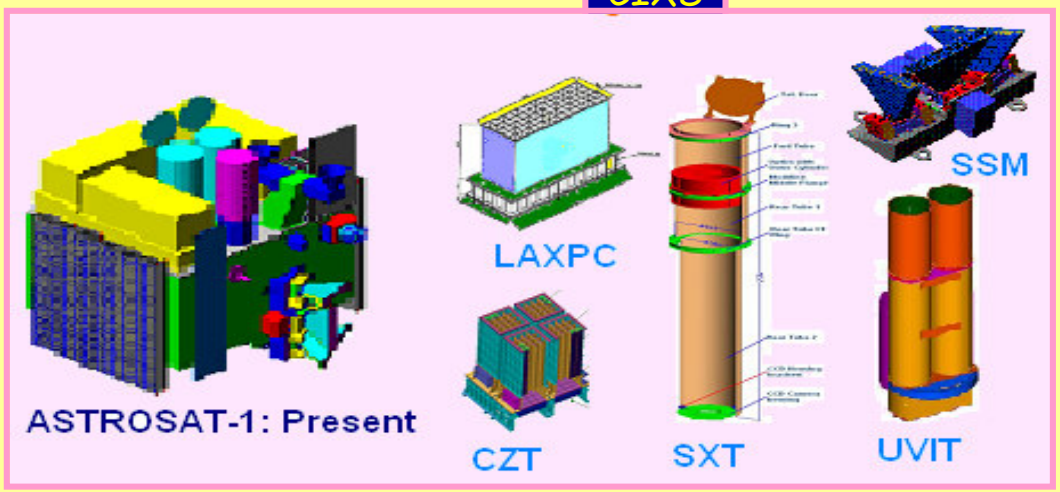
Chandrayaan-1

A low altitude (100 km) polar orbiter for Global imaging & mineralogical and chemical mapping with high spatial and spectral resolution sensors



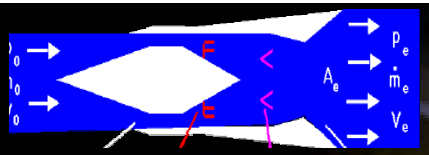
Astrosat-1

An Astronamical Observatory for studies of Cosmic sources



Vision & Missions

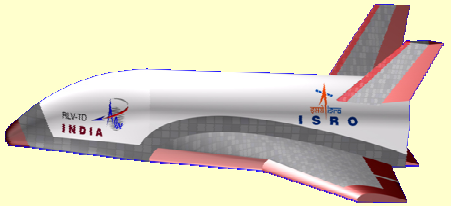
2025



Air breathing

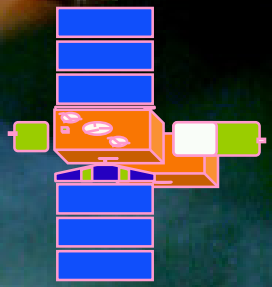
2025

TSTO

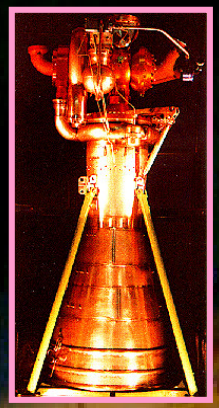


RLV

2015

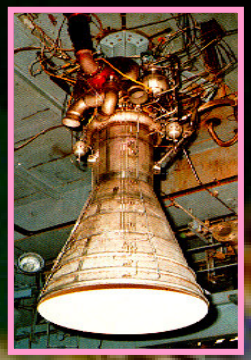


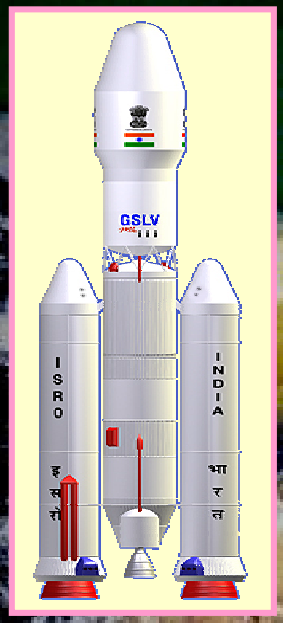
Satellite with replaceable Power & Propulsion System



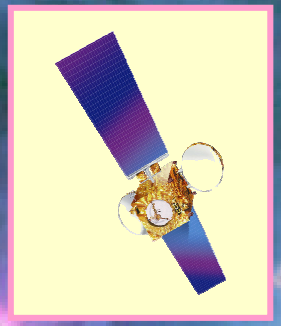
2010

High thrust Cryogenic Engines

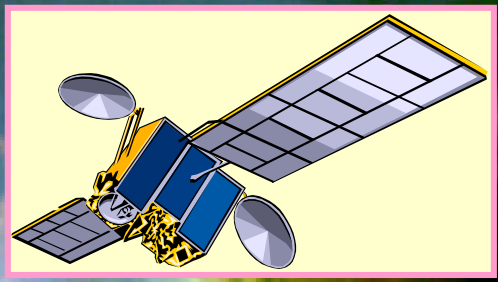




Semi cryogenic Engines



Newer Bands



Higher Power S/C Inflatable Antenna

Planetary Exploration

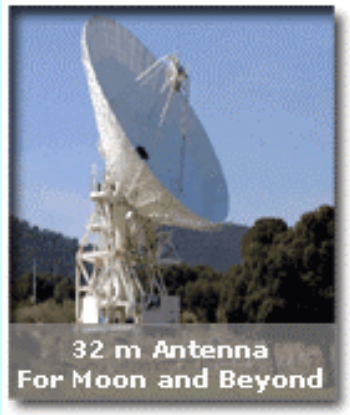
GSLV- MkIII

Future Planetary Exploration

I. Reaching There:

Launch vehicles : PSLV-XL; GSLV-MK-III

- Moon, Mars, Venus: Orbiter
- Moon Orbiter/Lander
- Asteroid Orbiter/Comet flyby
- Fly-by of outer solar system objects



II. Spacecraft Resources, Communication, Navigation & Orbit management

- Sufficient for Exploring the Inner Solar System

Goal 2020: 1. **Exploration of Inner Solar System**

2. **Development of Capabilities for Exploration of Outer Solar System**

Opportunities for International Collaboration

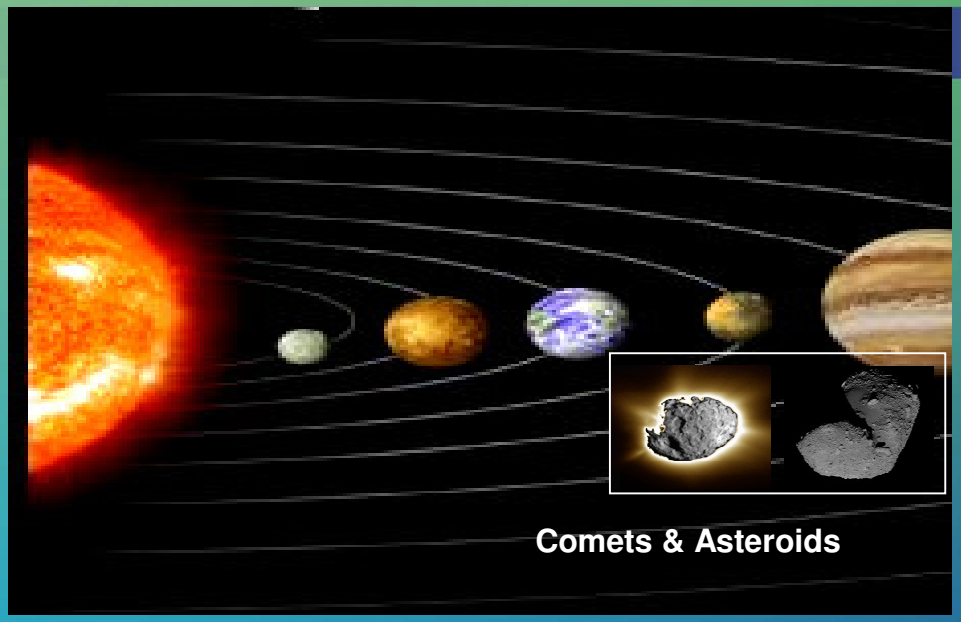
- International Collaboration would continue to be an important tenet of the Indian Space Exploration programme and the model followed in Chandrayaan-1 Mission will be continued in future.
- Excessive cost of Space Exploration and dwindling budgetary support for space make global partnership inevitable. However appropriate form of cooperation beneficial to all participating agencies is yet to be evolved.
- The principle of equality and reciprocity would have to be woven in the collaborative arrangements.
- Planetary exploration needs to be more affordable and more accessible for larger participation keeping in view the economic and technological capabilities of participating nations.
- The international cooperation should address the capacity building and ways and means of meeting the interests of the developing nations including the entire humanity.

Role of UN system in the future global Space exploration activities

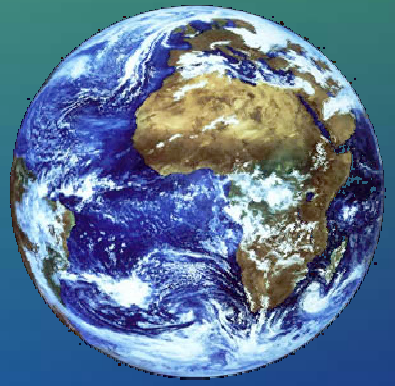
- It is essential to develop a common vision for space exploration particularly to protect the interests of all space faring and space using nations.
- The Exploration architecture including all its components should be sustainable in the long run. Critical evaluation to avoid any pitfall is essential as mid-term corrections may not be viable for long-lead and high-end products requiring huge investment.
- The exploitation of planetary resources comes accompanied with the question of sharing the commercial benefits. This issue needs greater attention and suitable legal framework.
- The Moon Treaty although well framed to address many of these issues it is yet to get the unanimous acceptance. It is essential to revisit, refine and revise as necessary the “Moon Treaty” in light of the renewed interest for moon expeditions by several space faring nations.

Role of UN system in the future global Space exploration activities (Continued)

- The global environment and global warming needs greater attention. The space based monitoring and global collective efforts would greatly assist to find solutions to this important issue.
- UN COPUOS which has played a major role in formulating five space treaties, now the cornerstones of the International Space Law has a major role
- It has to address all the above issues and formulate appropriate guidelines and framework of rules acceptable to all so as to benefit all participating nations.



Thank you for your kind attention



Expanding knowledge about our own environment & beyond ---- up to the edge of the Universe