

Novel R&D efforts by emerging space entities of India



**Presentation by Indian delegation
to
60th session of STSC - UNCOPUOS
Vienna, Austria**

Presentation Date (TBC)

Space Enterprise of India



Enabling growth



Space research & Technology development



Commercial space tech / Industrial operations.

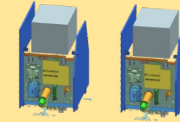


Promoting, regulating & handholding NGPEs

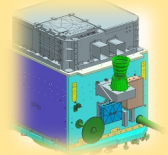


Engaging Industries

Production of launch vehicles



Small satellite



S/C production



Start-ups New players

Launch vehicles



Satellites



Excel Geomatics
A Consulting and Services Company



Space Applications



Public Private Partnerships



EO satellite



New LV Concepts



Spacecrafts:
Build in India

Thrust on R&D Projects and Fostering Industrial participation

ISRO : Technology Enabler | Industry : Lead and implement

- Public Private Partnership & Industrial Consortium models for launch vehicle & satellite development



LOX/CH₄

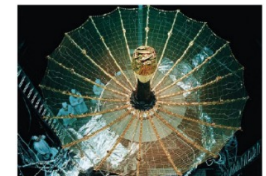
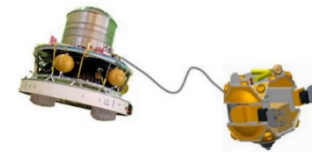
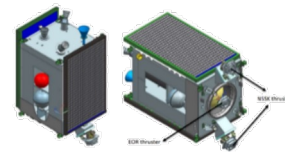


NGLV (10 T to GTO)

RLV – ORV & LEX

Air Breathing

- Technology transfer & handholding industries to learn the technology & commercialize



Electric propulsion

On-Orbit refueling

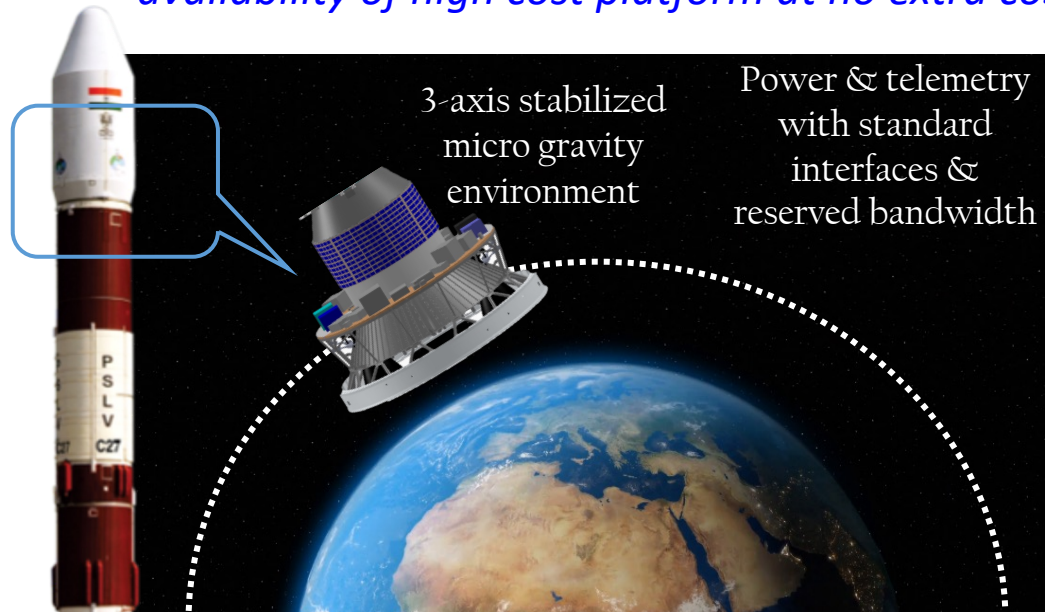
Deployable structures,
Bus Systems

- Collaborative developments with Industries for new products

Experimental platform: Opportunities for R&D

PSLV upper Stage as Orbital Platform

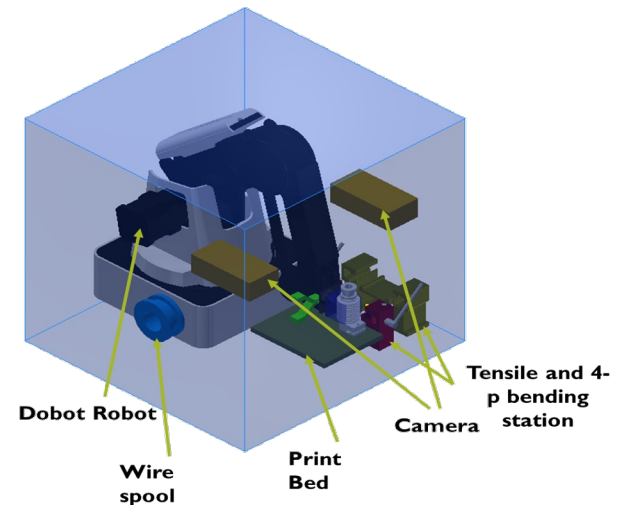
*Boon for scientific and student community;
availability of high cost platform at no extra cost*



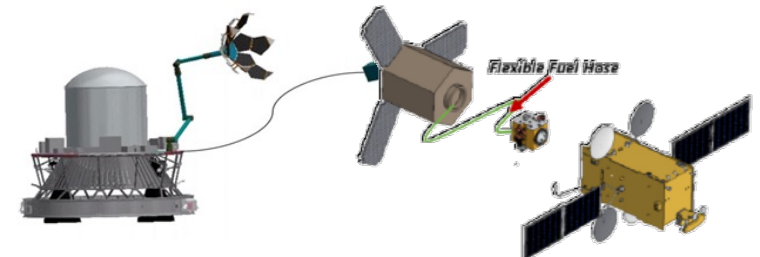
Experiments:

- Studies for Human Spaceflight
- Quantum technology
- Plant growth
- Robotic arm
- 3D printing in space
- Rendezvous & Docking
- Thermospheric study Instruments
- Experiments by private entities

Space 3D printing initiatives



Space Robotics

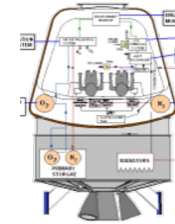


Rendezvous and capture

Technologies: Human Space exploration and Scientific missions

Technologies for sustained human space flights

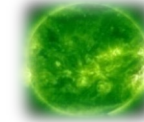
- ▶ Intravehicular and extravehicular flight suit
- ▶ Long duration life support systems
- ▶ Docking mechanism
- ▶ Inflatable habitats
- ▶ Development of MMOD shielding
- ▶ Soft landing system
- ▶ Digital human modelling
- ▶ Ergonomics and generation of anthropometric data base
- ▶ Space biology and bio astronautics research
- ▶ Microgravity payload development



ECLSS



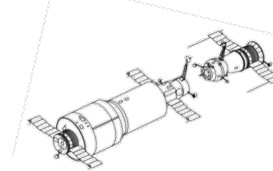
EVA suits



Radiation protection



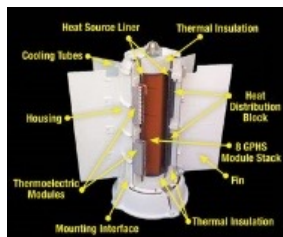
IAD



Rendezvous and Docking



Emergency Crew Rescue Vehicle



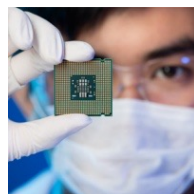
RTG



Rover



Robotic arm for sample return



Miniaturization

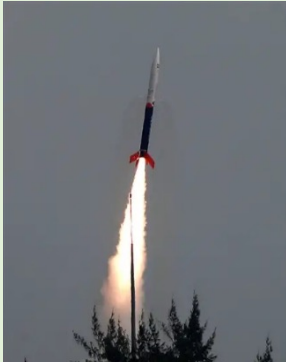
Technologies to aid future scientific missions

- ▶ Radioisotope Thermoelectric Generators (RTG)
 - ▶ Next-gen Rovers for Planetary exploration
 - ▶ Technologies for Planetary sample return
 - ▶ Miniaturised science instruments

India's emerging Private Space Sector

Space Transportation

Skyroot Aerospace



1st Suborbital flight
Composite structure



Agnikul Cosmos



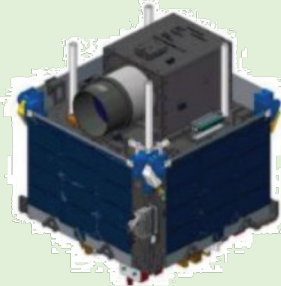
Semi-cryo Engine test
LOX-Methane



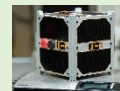
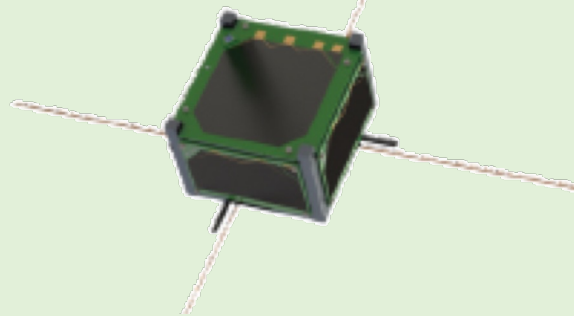
Space Infrastructure

Private Satellite launched by PSLV-C54

Dhruva Aerospace



Pixxel India



Space Application

- ▶ Space debris management & mitigation
- ▶ Geospatial solutions
- ▶ Communication services
- ▶ Orbital transfer vehicles

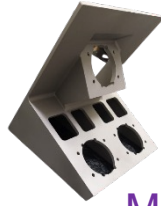


Private industry participation in Indian Space sector

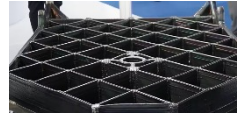
Additive Manufacturing



3D-printed Rocket engine
M/s Agnikul

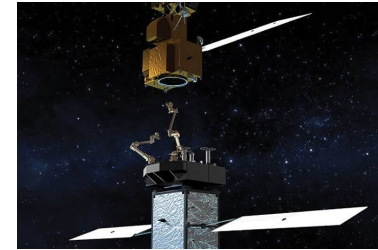


3D-printed
brackets
M/s Objectify
Technologies



3D-printed grid fins
M/s Ankit
Aerospace

On-orbit servicing



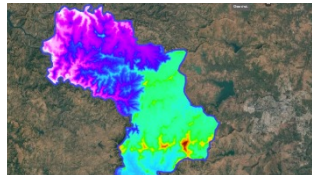
M/s Bellatrix Aerospace

Optical commn



M/s Astrogate Labs

AI & ML



3D map generation
M/s SatSure



Space deep
learning
M/s Vasundhara

Debris management solutions



M/s Digantara

Start-ups in Satellite Applications



Remote sensing | Machine learning | Big data analytics | Cloud computing
Create products and solutions for smart decision making

Crop insurance
Agriculture Trading
Agriculture Banking
Agriculture Inputs

Food Processing
Insurance
Credit
Banking



Remote sensing data from: Satellites | Aerial platforms | Field sensors
Deep learning algorithms to analyze biggest and heaviest datasets in a short time.



Urban



Agriculture



Environment



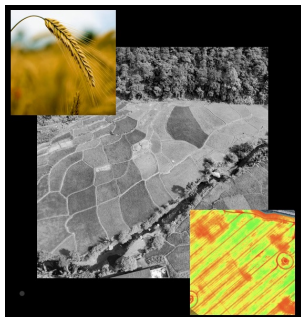
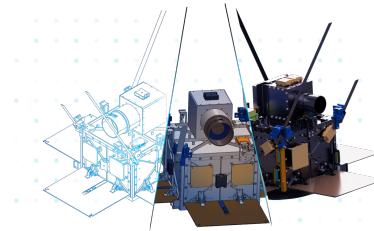
Disaster



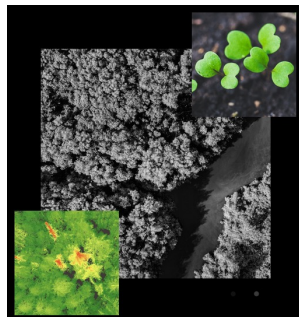
Defense



More frequent **hyperspectral imagery**; targeted monitoring, localised problem detection, and hyper optimised solutions



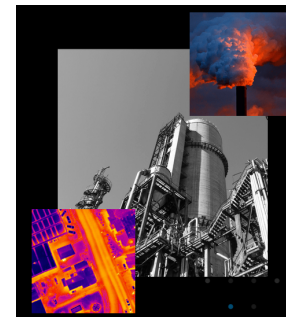
Agriculture



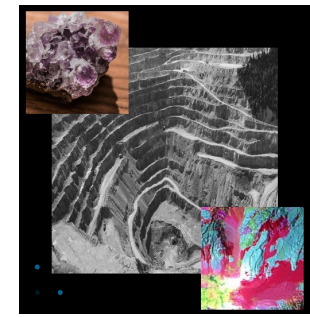
Environment



Government



Energy



Mining

Thank You

