New Thrust in Indian Space Programme

...*A Glance*

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Vision: Harness space technology for national development

Space Applications

- Socio Economic Security: Food, water, Energy, Health, Shelter, Infrastructure & Information
- Sustainable Development: Agriculture, Urban, Coastal ecosystem, Climate change…
- Disaster Risk Reduction
- Governance: Planning , Monitoring & Decision support

Space Infrastructure

- Earth Observation: Land, Water, Cartography, Oceanography, Atmosphere & Weather
- Communication
- Navigation
- Space Science: Exploration, Solar Physics, Astronomy, Astrophysics, Space Probes
- Ground Segment

Space Transportation

- Polar Satellite Launch Vehicle (PSLV)
- Geosynchronous Satellite Launch Vehicle (GSLV)
- Advanced Launch Vehicle
  - Modular LV
  - Reusable LV
  - Human spaceflight

Capacity Building

- Human Resources
- Technical Infrastructure
- Enhanced Output (Outsourcing & TT)
- New Technologies Academia, Industries
- Indigenization
- International cooperation
- Outreach

FIVE DECADES OF INDIAN SPACE PROGRAMME ACCOMPALISHMENTS

Applications Driven, Self-reliant, Focusing on Supporting National Development

Commercial Satellites
Operational Satellites
Developmental Satellites
Experimental Satellites

PSLV, GSLV
SLV, ASLV, RLV-TD, Scramjet
Sounding Rockets

Cubesats,
Nanosats,Commercial
Satellites, University Satellite

Satellite Missions

Launch Vehicles

Satellites for other Countries

100 Spacecraft Missions including Student Satellites

65 Launch Vehicle Missions

2 Reentry Missions

237 Satellites from 28 countries

Drivers for New thrust in Indian Space Programme

1 Broadened Spectrum of Space Based Applications

- Space based solutions across all Govt.Ministries
- Bandwidth On Demand
- Satellite aided navigation
- High Resolution Imaging Satellites
- High Throughput Communication Satellite for Onboard Capacity building @ 500 Transponders
- E-Governance and Strategic communications

2 Capacity Enhancement

- Supporting Enhanced Demand of National Requirements
- Payloads for Increased Frequency of Launches
- Launch on Demand Satellite Services
- Advanced Satellite Technology Developments
- Productionisation of Satellites
- Satellite constellation for varied applications

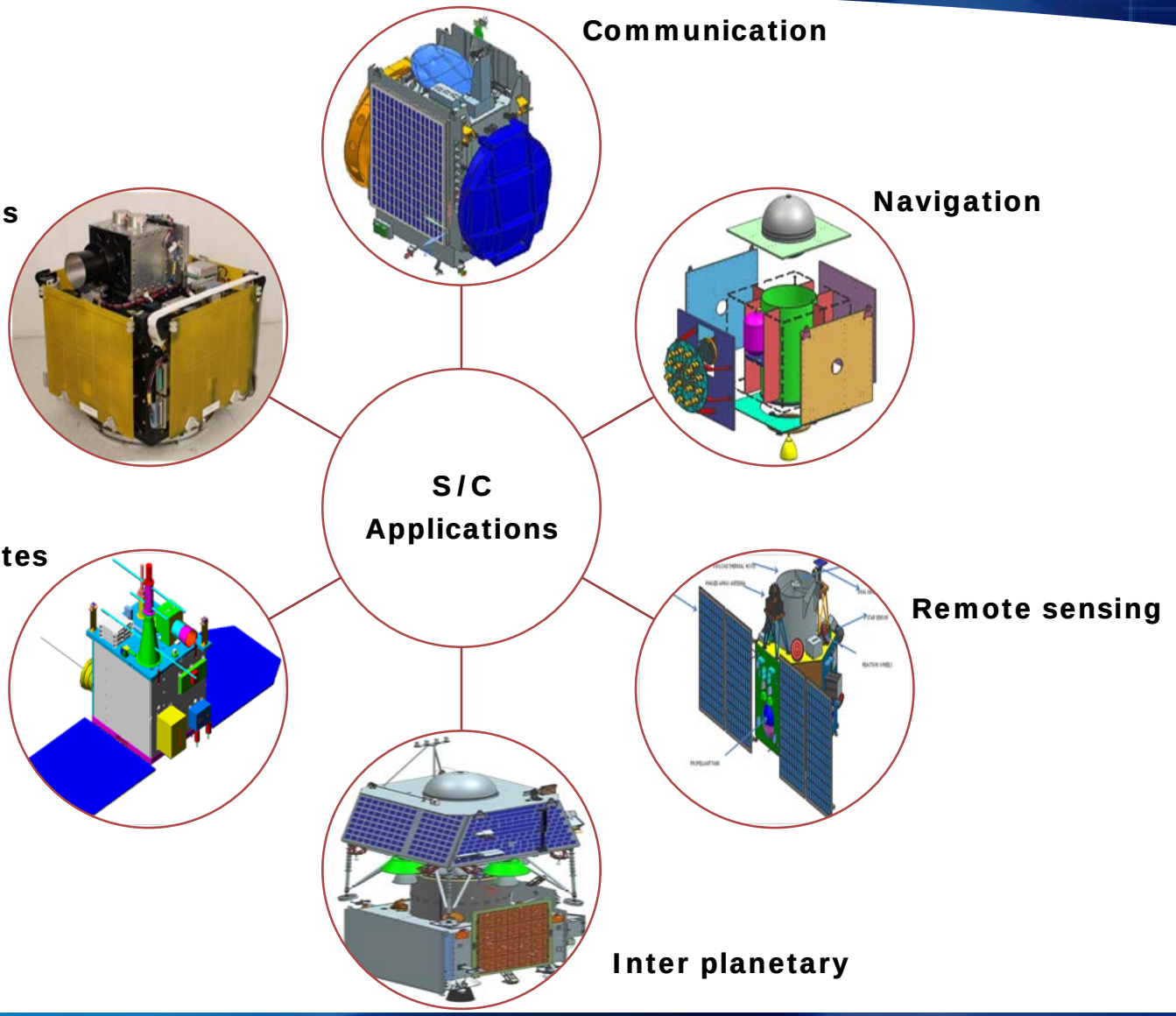
3 Increased Presence in Global Markets

- Changing Global Business Scenarios
- Opportunities in Global Market thro' Low Cost access to Space
- Colloborative Missions – Joint Data Sharing
- International Coperations

4 Thrust for Industry Participation

- Off-the-shelf availability of Subsystems
- Outsourcing Critical activities of Satellite systems Assembly Integration & Testing activities
- Infrastructure Augmentation
- Well orchestrated Supply Chain Management
- Hand Holding of Indian Industries

Design Diversity In Application



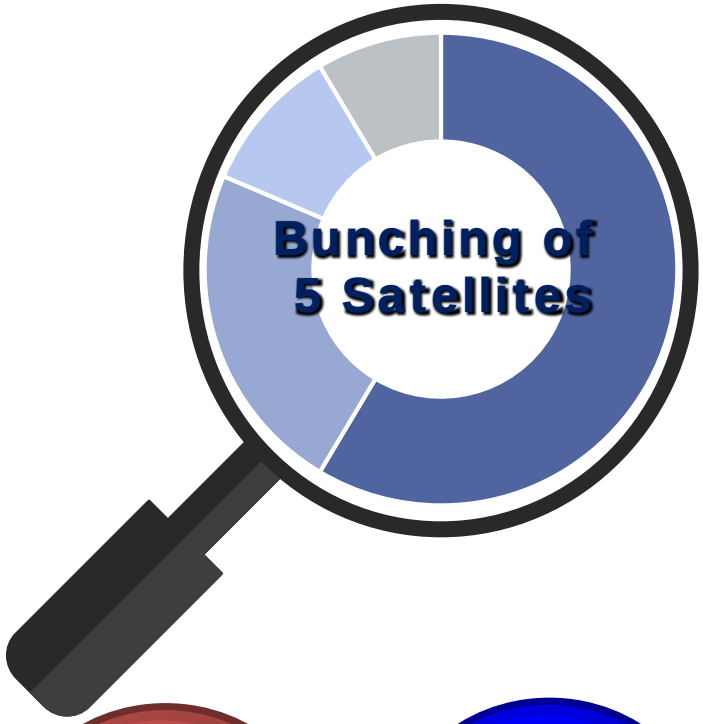
Scales Platforms for Different Needs

Areas of Challenges & Strategies :

1. Quantity & Quality balance
2. Schedule – Quick turn around time
3. Technology complexity
4. Project Life Cycle Management
5. Judicious Costing depending upon missions goals

Larger in number, Quicker in Time, Affordable in Cost still Better in QUALTY

Sliding Project Focus



Cons
Others loose attention

Pros
Get priority

Implemented successfully for three Consecutive years & effective

- Astrosat, RS-2A, Cartosat-2C,2D 2E, & 2F
- **IRNSS-1E, 1F,1G &1H**
- **SCATSAT, Microsat, Niusat**
- **INS- 1A, 1B 1C,**
- GSAT-15,17, 9 19, INSAT-3DR

Sliding Project Focus

Realization

Integration

Testing

Launch

Design

Sliding Project Focus

Realization

Integration

Testing

Launch

Design

Sliding Project Focus

Realization

Integration

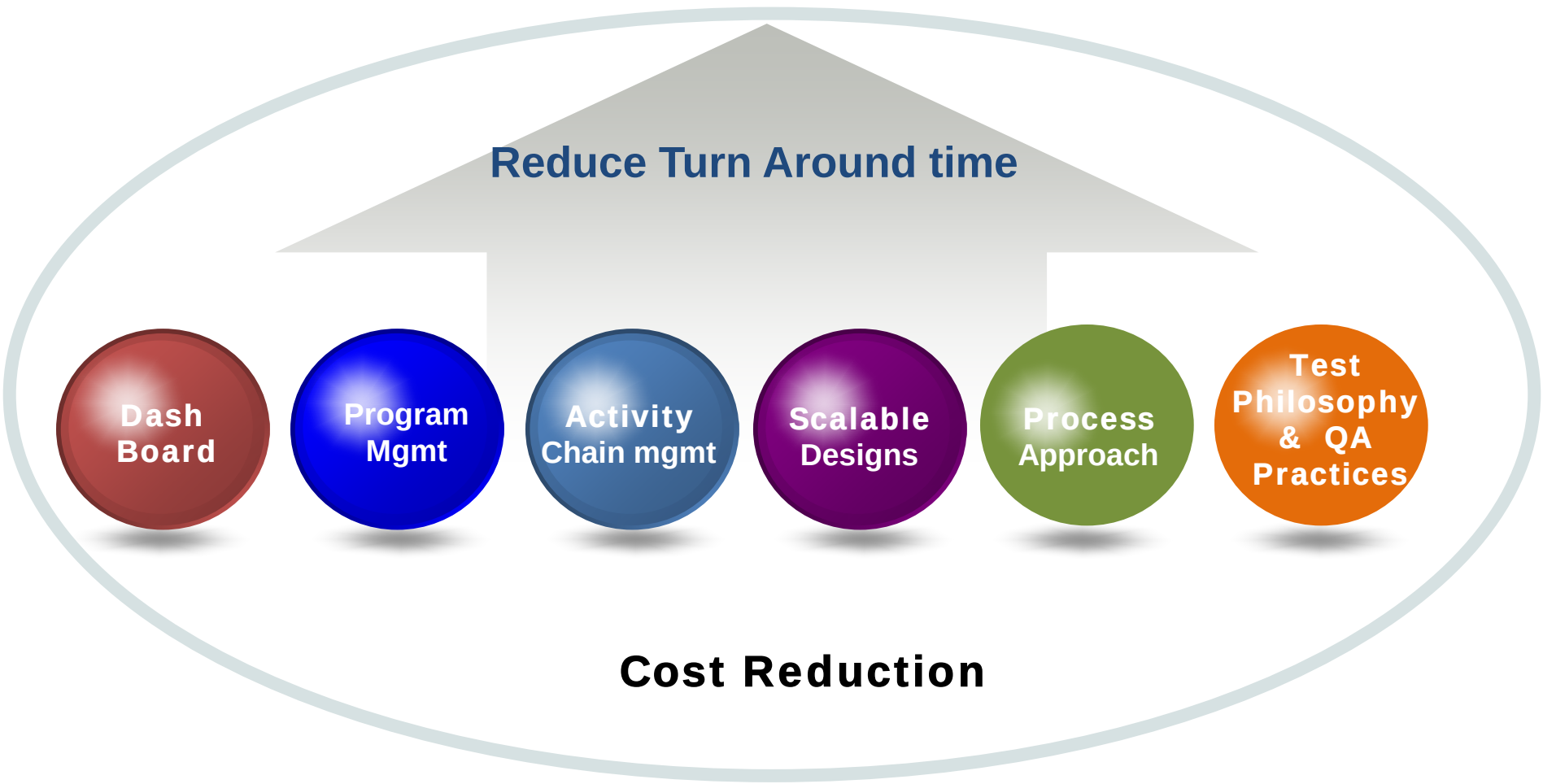
Testing

Launch

Design

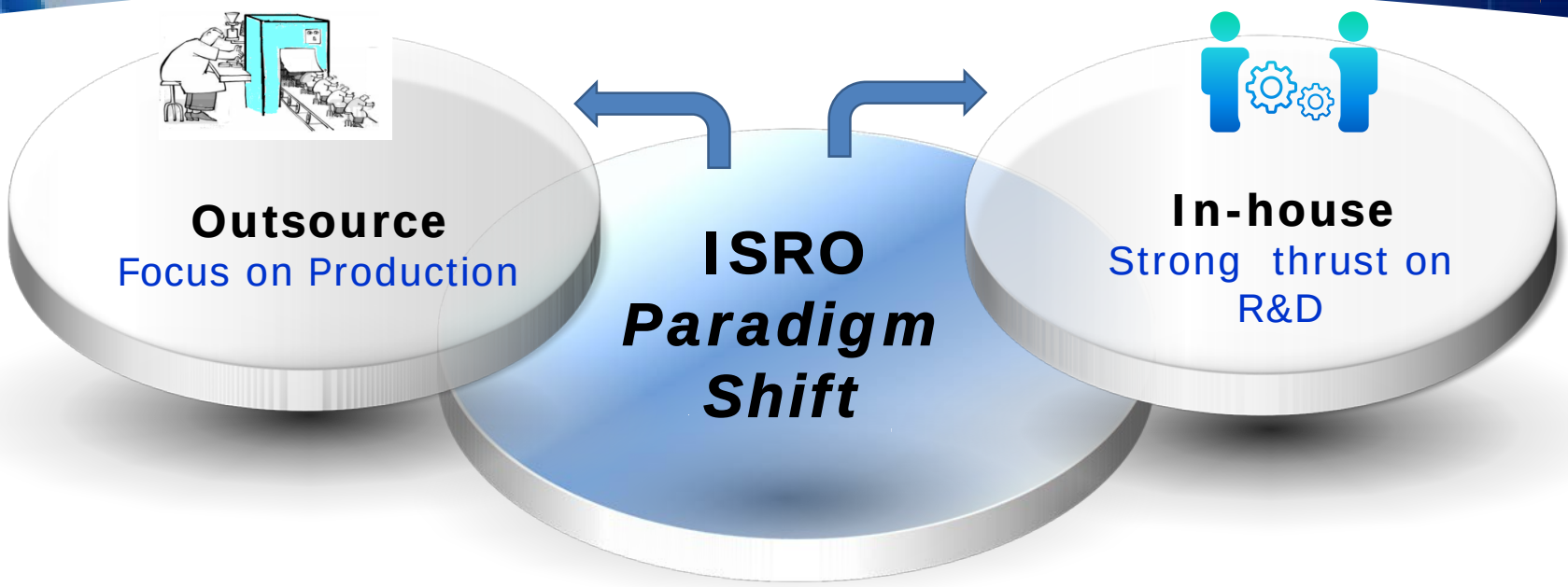
Quality Assurance Practices-Spacecraft Systems

Improved Productivity



Satellite : Making to Manufacturing

Paradigm shift



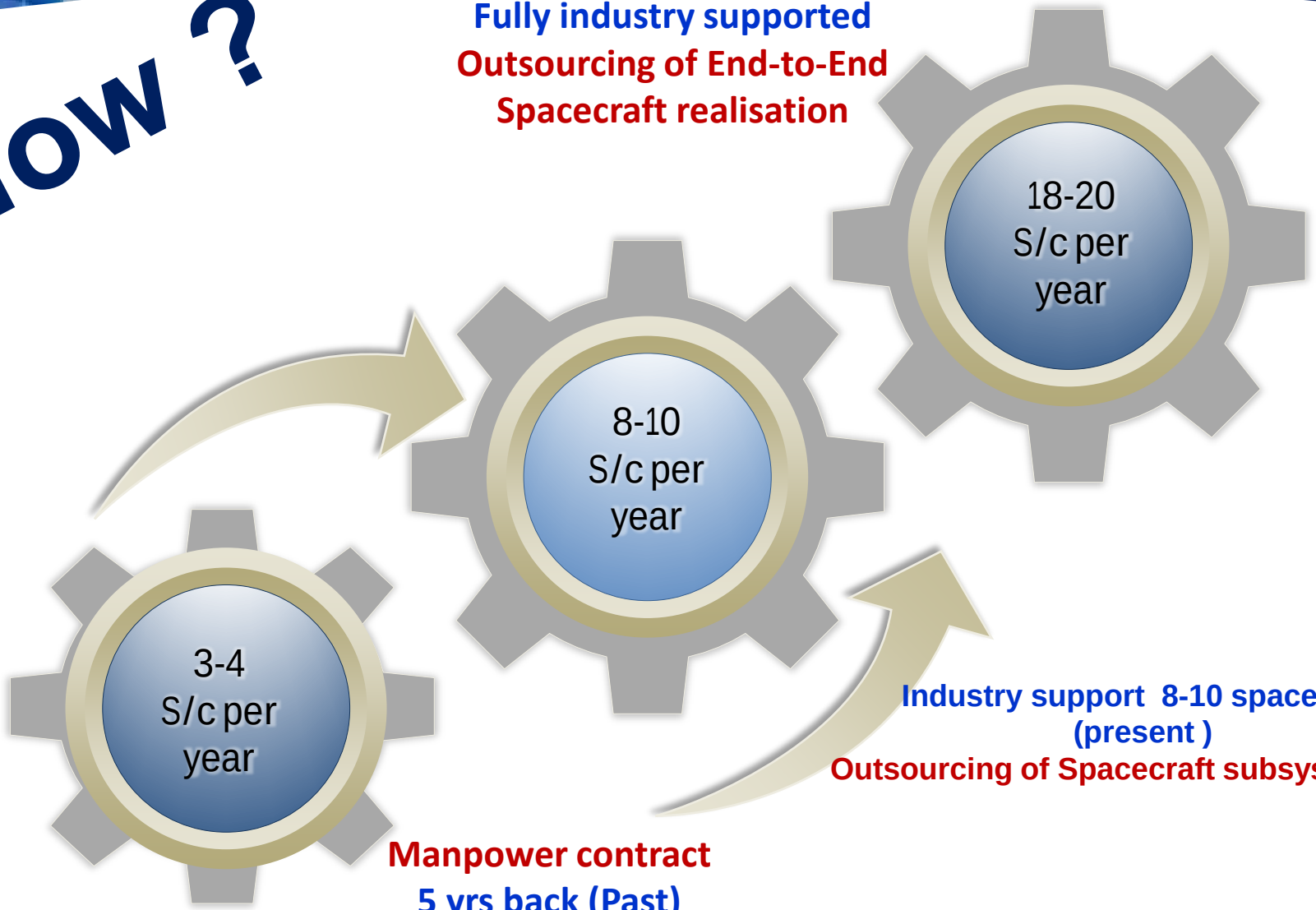
- Opportunity for vibrant Industry participation
- Established production entity
- Technical Know-how Sharing
- Standardization: Off-the-shelf availability of Subsystem
- Quicker turn around realization time of Satellite
- Infrastructure Augmentation

- Advanced Satellite Technologies Developments Entity
- Model Philosophy: Qualification of new technologies
- Joint Development - Academia & Research Opportunities
- Establish platform – Encouraging young minds for innovative ideas/ research proposals

Satellite manufacturing Capacity: Past , Present, Future

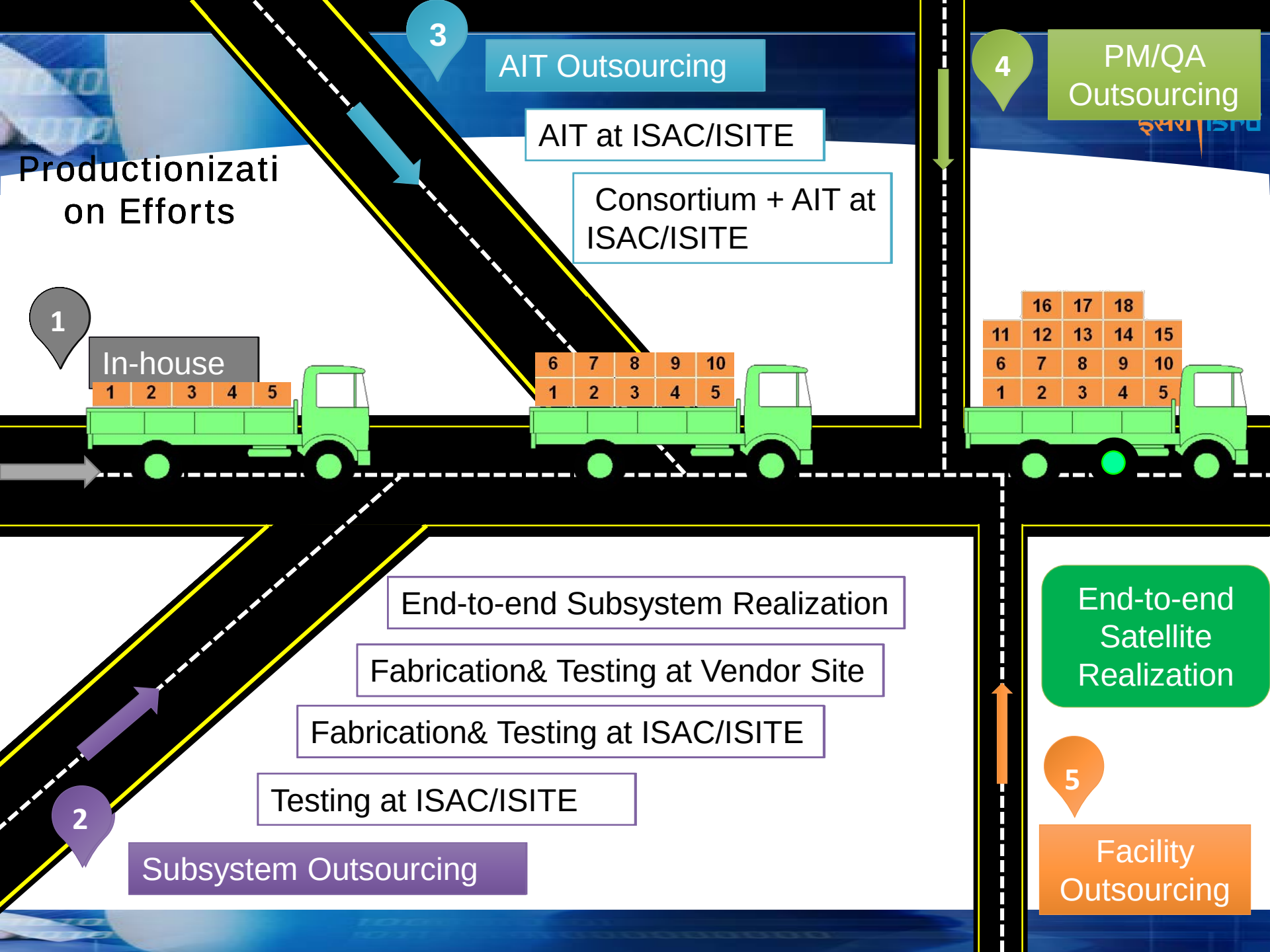
How ?

Fully industry supported
Outsourcing of End-to-End
Spacecraft realisation

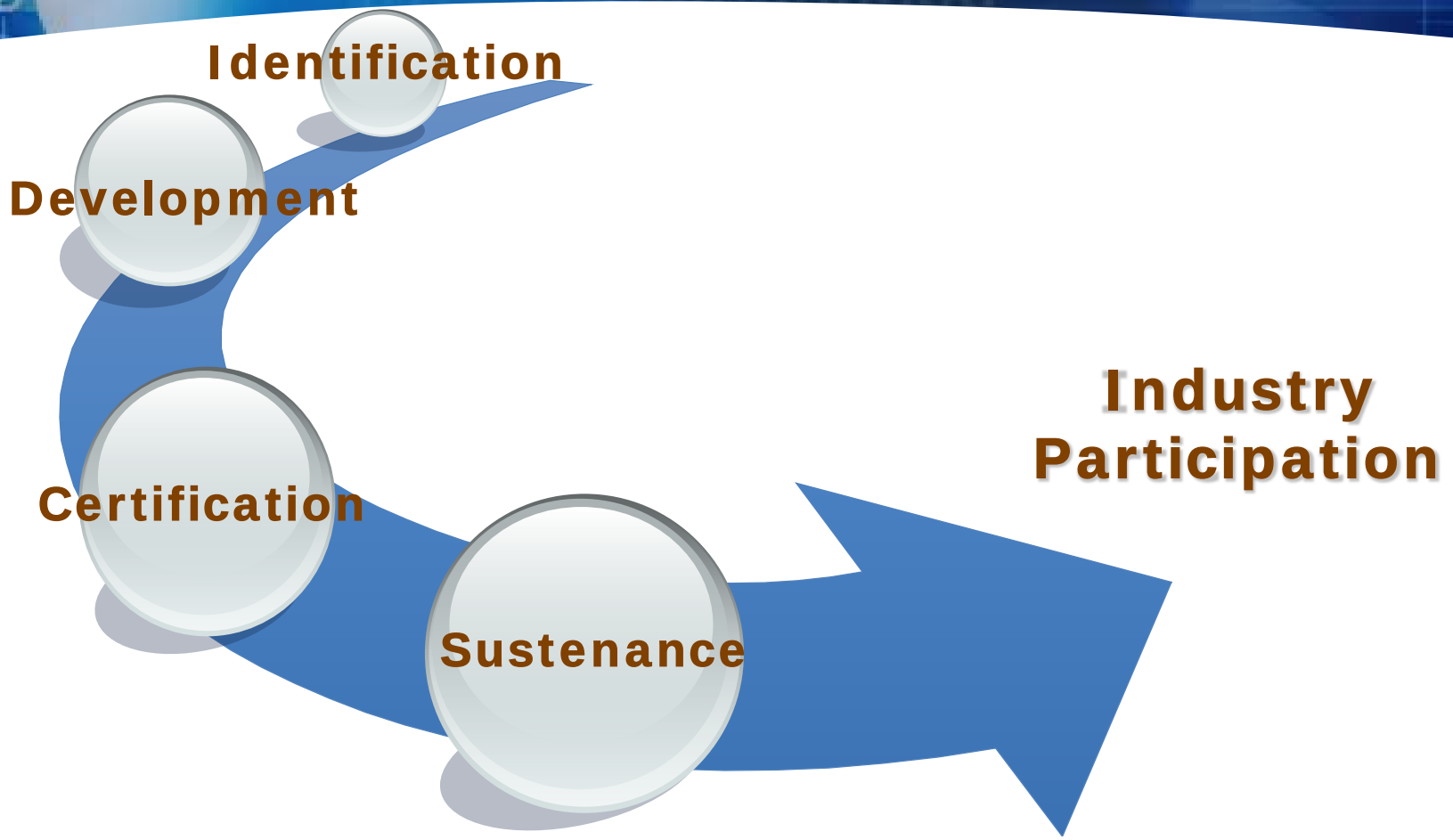


Industry support 8-10 spacecraft
(present)
Outsourcing of Spacecraft subsystem / AIT

Manpower contract
5 yrs back (Past)


Productionization Efforts
1
In-house
1 2 3 4 5
2
Subsystem Outsourcing
Testing at ISAC/ISITE
Fabrication& Testing at ISAC/ISITE
Fabrication& Testing at Vendor Site
End-to-end Subsystem Realization
3
AIT Outsourcing
AIT at ISAC/ISITE
Consortium + AIT at ISAC/ISITE
6 7 8 9 10
1 2 3 4 5
4
PM/QA Outsourcing
16 17 18
11 12 13 14 15
6 7 8 9 10
1 2 3 4 5
End-to-end Satellite Realization
5
Facility Outsourcing

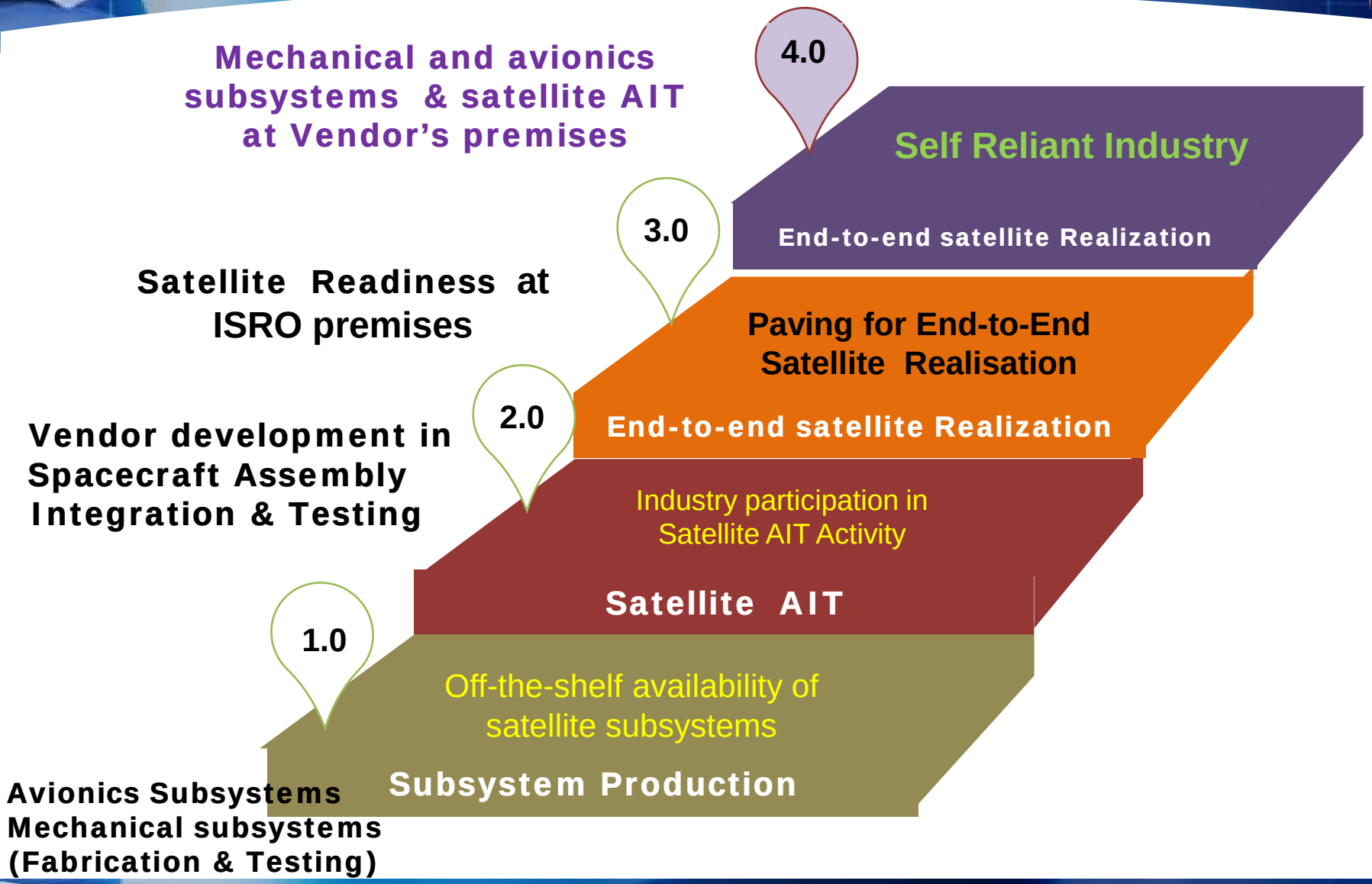
VENDOR DEVELOPMENT & QUALIFICATION APPROACH



ISRO – INDUSTRIES

WIN- WIN STRATEGY

Roadmap for Space Industry Development

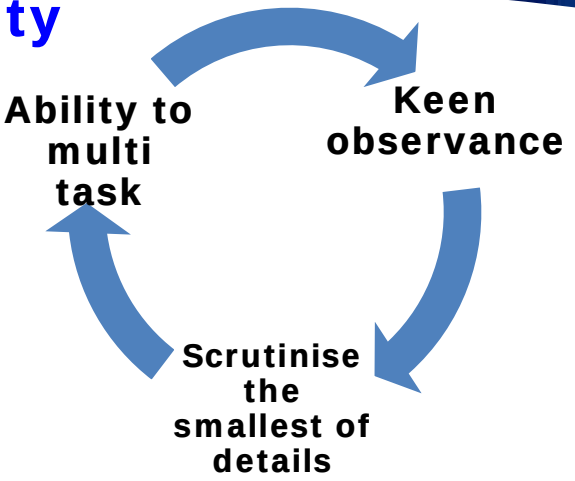


Way Forward for Indian Scenario

Emerging Trend

Mantra

Capability



Organisation working ...

Slogan...

Recent accomplishments ...

Increase in satellite throughput over the past 3 years

2018 3 Missions... Continuing

- Cartosat-2S 4
- INS-1C
- Microsat
- .....

2017 8 Missions + Student Satellites

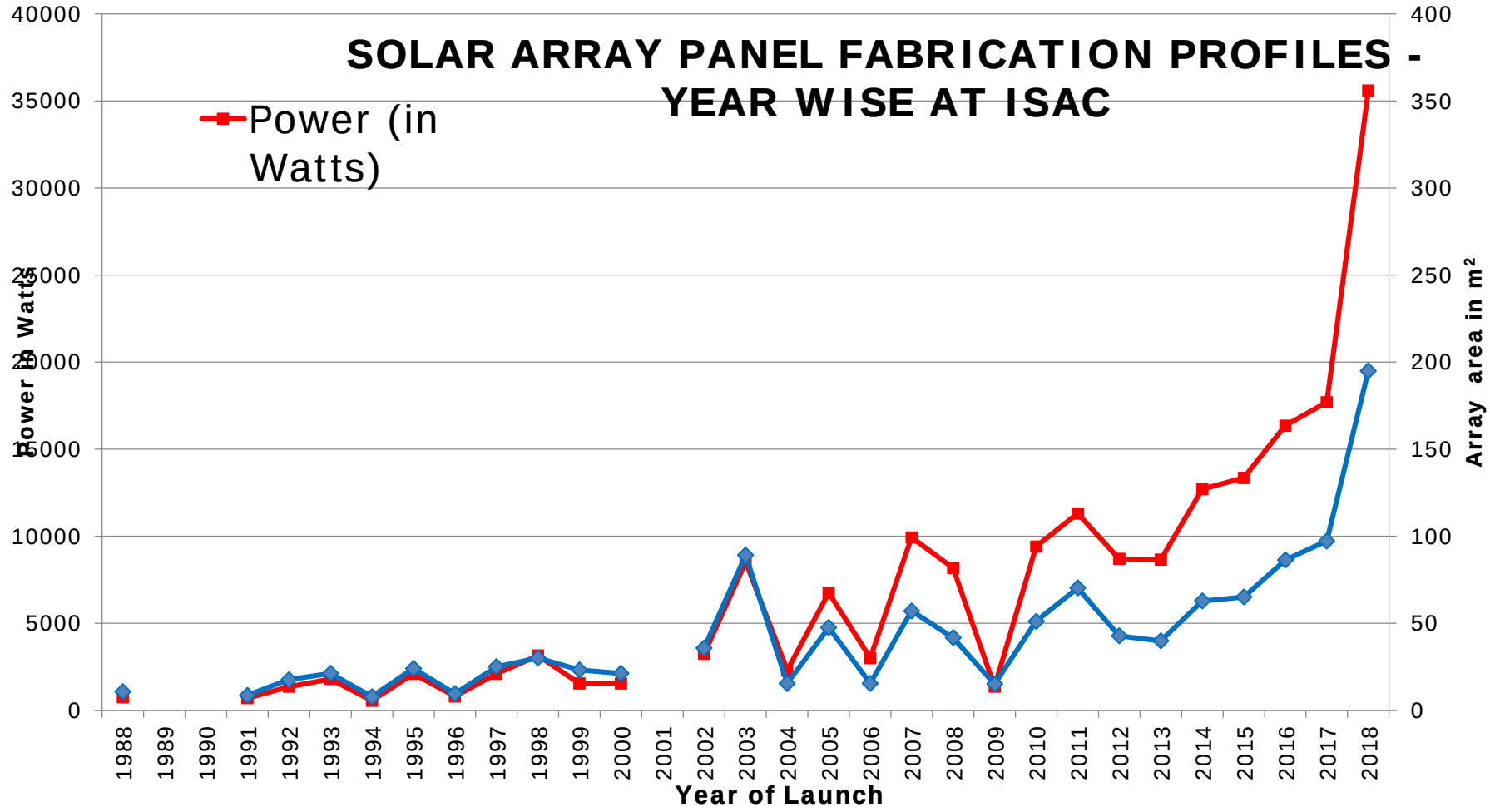
- 15th Feb, CARTO-2S-2
- 15th Feb INS-1A & INS-1B
- 5th May South Asia Satellite GSAT-9
- 5th Jun GSAT-19
- 23rd Jun, Cartosat-2S-3
- 29thJun GSAT-17
- 31st Aug, IRNSS-1H

2016 8 Missions + Student Satellites

- 20th Jan IRNSS-1E
- 10th Mar IRNSS-1F
- 28th Apr IRNSS-1G
- 22nd Jun Cartosat-2S
- 08th Sep INSAT-3DR
- 26th Sep SCATSAT-1
- 06th Oct GSAT-18
- 07th Dec RESO-2A

2015 4 Missions

- 27th Aug ,GSAT-6
- 28th Sep, Astrosat
- 11th Nov GSAT-15
- 28th Mar IRNSS-1D


SOLAR ARRAY PANEL FABRICATION PROFILES - YEAR WISE AT ISAC
Power (in Watts)
Power in Watts
Array area in m²
Year of Launch
40000
35000
30000
25000
20000
15000
10000
5000
0
400
350
300
250
200
150
100
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1988
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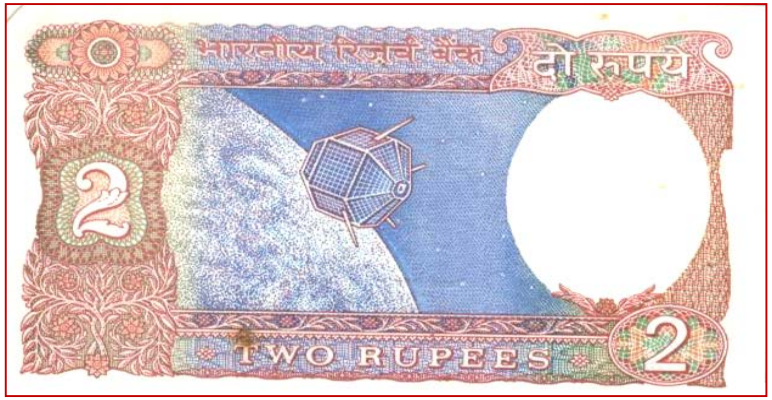
2018

BEFORE…
Experimental Phase
Development Phase



TODAY …
Operational Phase
Production Phase

Capacity Building Programme on Small Satellites Realisation

Objective

Capacity building of satellite technology in developing countries, who have no exposure to satellite making, by providing hands-on training in building and testing of Nano satellites

Programme highlights

- A comprehensive programme on 'Capacity Building on Small Satellites Realisation' of 8 weeks duration
- The programme will have theoretical courses and hands on training in assembly, integration & testing of nanosatellites
- The programme will be conducted under CSSTEAP
  - ISRO in coordination with CSSTEAP, will invite nominations from various countries through UNOOSA
- The programme is envisaged for a period of three years with one batch every year.

Overview

- Each year, the programme will select 3 teams to realize 3 nanosatellites
  - Each team may have 10 members from maximum 5 countries
  - Each participating country shall nominate a team of 2(one mechanical engineer & one electrical/electronics engineer)
- The 3 selected teams will undergo two weeks of basic theoretical course on satellite technology and its applications.
- Subsequently an intense two weeks course on nanosatellite missions and its realisation aspects.
- Further each team will be provided hardware and infrastructure required towards preparing a nanosatellite and a 4 weeks' hands on training on assembly, integration and testing will be provided.

Sum up

- Indian Space programme aligned to National needs
- Building a Strong base of Satellite Technology for Increasing productive Space Assets
- Thrust for higher efficiency and higher performance
- Accepting the innovation as part of fast changing demands
- Goal of achieving a balance of Tradition ,Trend, Co-operation and Colloboration

Thank you