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# Astronautic Technology (M) Sdn Bhd

Aziz Yusoff  
SVP Special Projects

**A Multi-tier and Multi-lateral Social Innovation Approach  
for Space Technology Development**

**GEO Smart Asia 2016**

# Introduction

# Company Background Summary



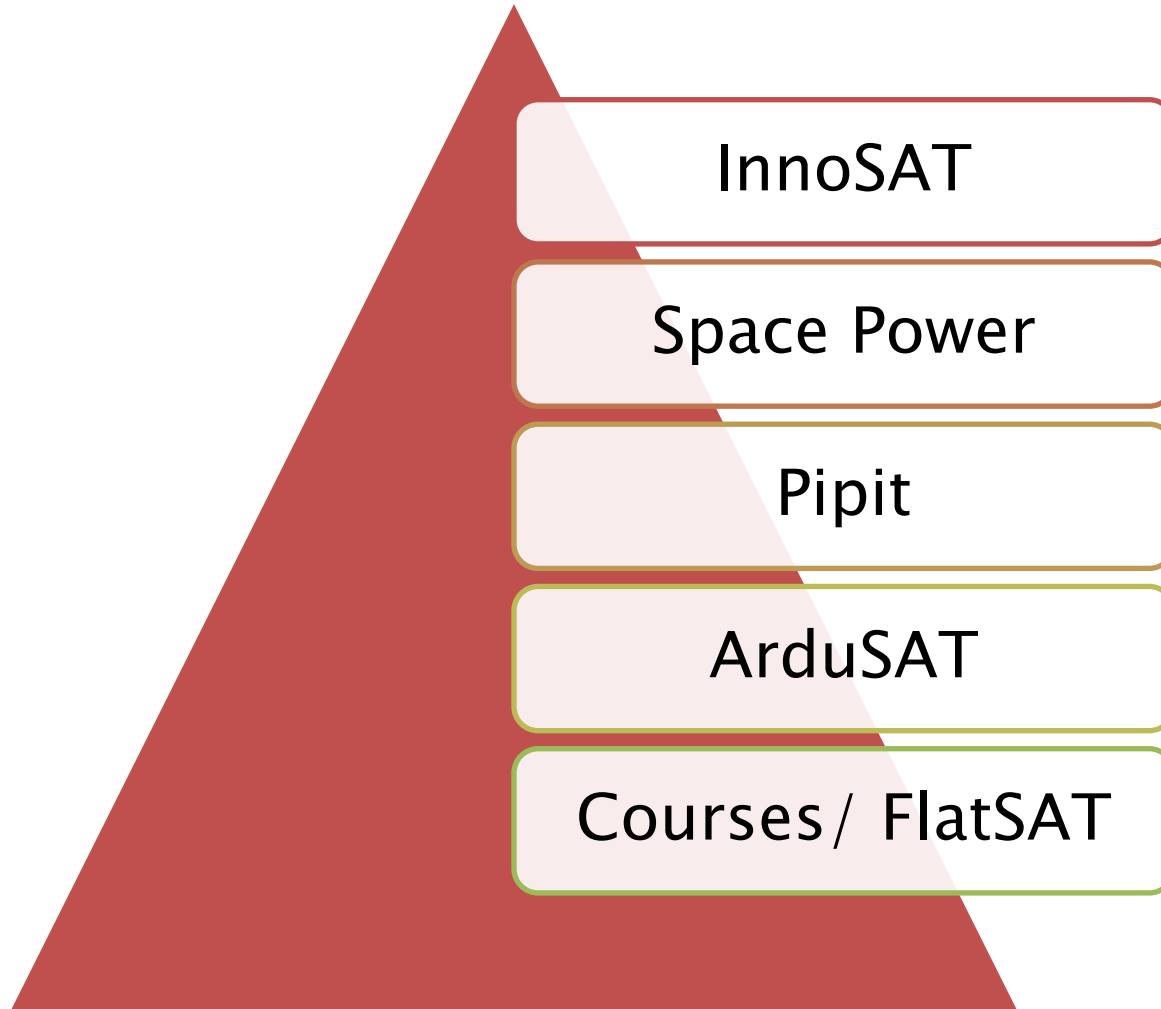
- ATSB is a Minister of Finance (MOF) company **mandated to develop Space and Advanced Technology for Malaysia**
- ATSB has successfully developed space capabilities for Malaysia even though it has not received any operational expenditures since its inception in 1997.
- ATSB has developed multiple technologies over the 19 years of its operations
- ATSB has implemented more than RM 350 million worth of significant projects

# Space for more?



- How developing nations can **nurture indigenous industry** development in advanced technology (especially Space Technology) where Direct Domestic Investment is extremely limited?
- ATSB proposes a **Multitier and Multilateral Social Innovation Approach for Space Technology Development.**
- The approach utilizes a formulation mix of satellite standards and other related self developed platforms in where various social segments from schools, academic institutions and related industries are offered opportunities of not only space technology activities but also in business.
- The ultimate goal is to nurture the local passion and concern for space technological development to the benefit of Malaysia future economic competitiveness.

# Offering Space Technology to Society



InnoSAT

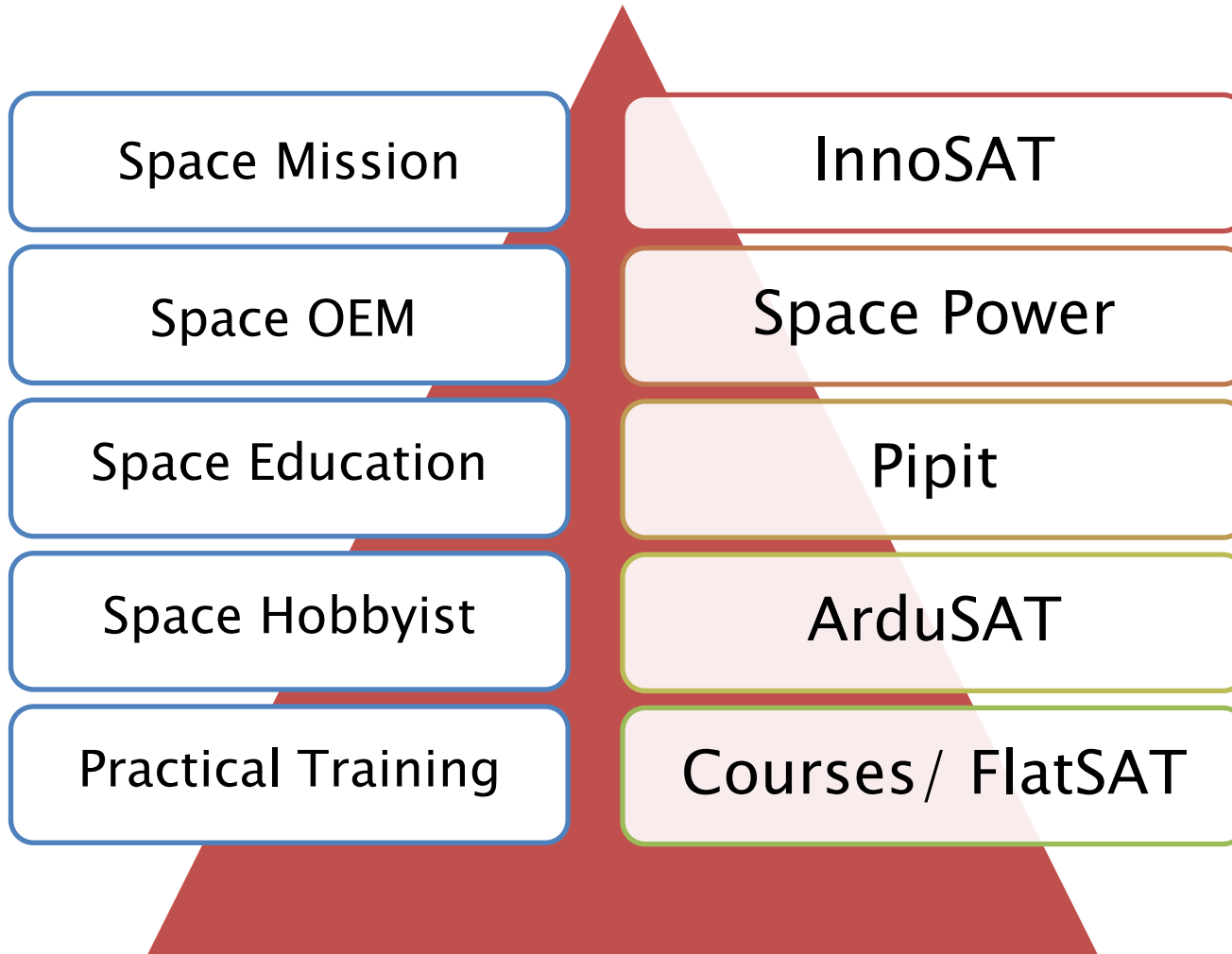
Space Power

Pipit

ArduSAT

Courses / FlatSAT

# Offering Space Technology to Society



# Ardusat



# Ardusat Introduction

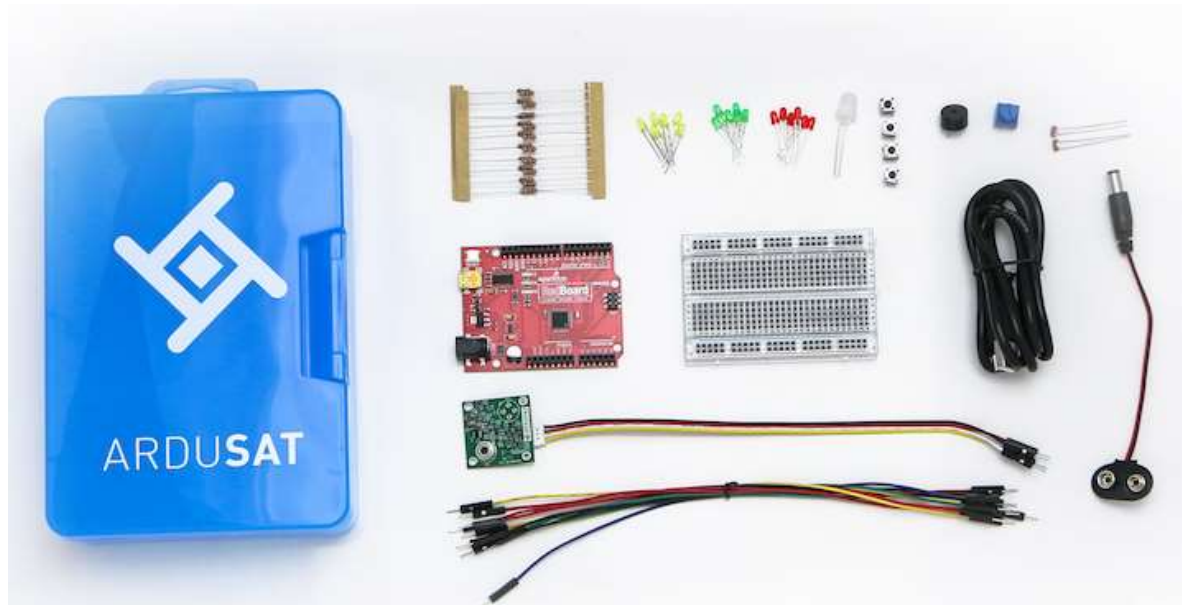
- ✓ ArduSat is an initiative by ATSB® in Malaysia to expand the space and satellite knowledge through space education especially in promoting Science, Technology, Engineering and Mathematics (STEM) disciplines.
  
- ✓ ATSB® is the exclusive distributor of ArduSat products in Malaysia and ASEAN.
  
- ✓ Unique features of ArduSat:
  - Customised STEM contents according to student's age.
  - Exploring space through fun learning presentation and videos.
  - Hands-on activity with electronics kit.
  - Exposing to open-source Arduino programming.
  - Visualizing real time scientific data with experiment hub.
  - Free online learning resources for purchased ArduSat products.

# ArduSat Space Kits

- ✓ Space Kits use technology to gather data and do science easy and fun.
- ✓ Contains the sensors found on the real satellites as well as basic electronic components to get started.

## Contents:

- Arduino
- ArduSat Sensor Board
- Breadboard
- LEDs (5 red, 5 green, 5 yellow)
- RGB LED
- Jumper Wires (5 yellow, 5 green, 5 blue, 5 red, 5 black)
- 100 Ohm and 220 Ohm Resistors
- USB Cable
- 9v Battery Clip
- Potentiometer
- Push Buttons
- Slide Switch
- Piezo Speaker



# Ardusat Demosat

- ✓ Demosat is a powerful tool for scientific measurement using the entire sensor kit.
- ✓ Fully assembled with a 3D printed frame designed to the CubeSat One Unit (1U) standard.
- ✓ Demosat is perfect for everything from performing experiments to learning about satellite technology.

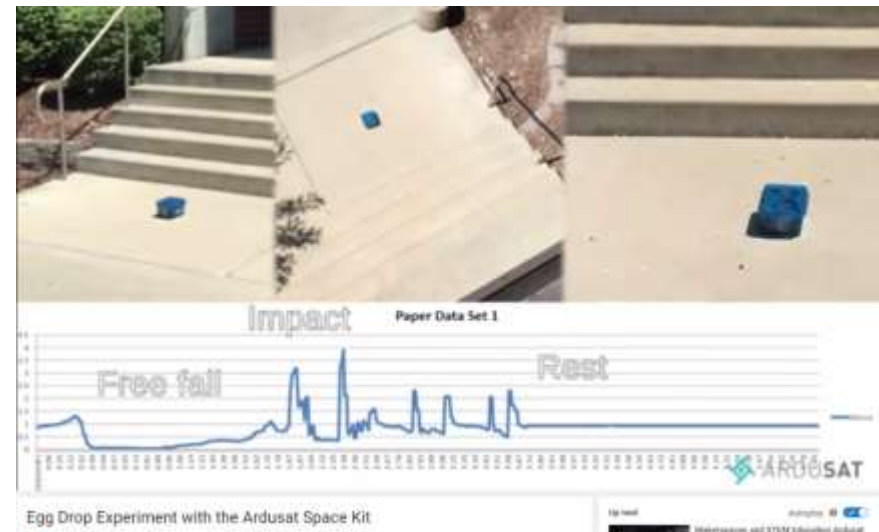
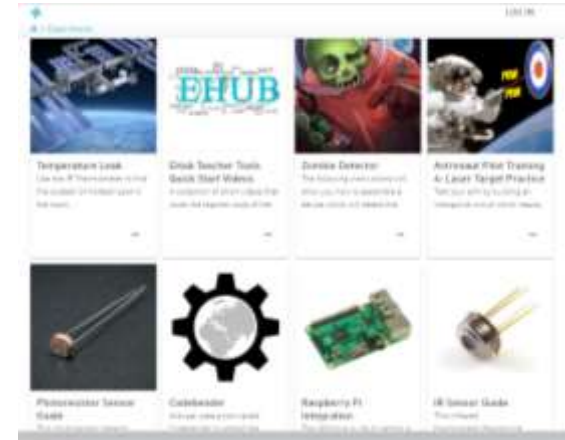
## Contents

- One unit (1U) satellite frame
- Wireless RF Radios
- Rechargeable Battery
- Seeeduino
- ArduSat Space Board
- Powerboost Charger
- SD Card Read/Write
- Real Time Clock
- USB Cable
- Breadboard



# Space Kit School Experiments

- ✓ Resources to search for experiments, guides to collect data from sensors, visualize and analyze that data, discover other datasheets, share findings and even write an experiment and share it online.



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# Space Technology Professional Courses with FlatSAT

- Professional Technical and engineering courses on satellite, space and other related technology. Providing industry driven training courses to meet workforce development needs.
- Sharing in-house expertise & associates' knowledge and experience in satellite or space programme management as well as industry related technical/engineering knowledge & practise.
- Courses experience enhanced by practical experience on FlatSAT, a 2D Satellite System
- Course Offering Standards:
  - Registered as PSMB training provider
  - MOF registered company
  - Affiliation with IEM/IEEE for CPD programmes
  - Training funding for MOHE, MOHR, MOF National HCD programmes

# Space Technology Courses



## SPACE, SATELLITE & MILITARY

|    |  |
|----|--|
| 1  | Understanding Space  |
| 2  | Low Cost Satellite Mission Analysis & Design               |
| 3  | Satellite Systems Engineering                              |
| 4  | Launch Selection & Spacecraft Interfacing                  |
| 5  | Orbital and Launch Mechanics                               |
| 6  | Attitude Determination & Control                           |
| 7  | Space Environment: Impact on Satellite Design & Protection |
| 8  | Satellite Communications                                   |
| 9  | Satellite Ground Station Operations and Maintenance        |
| 10 | Satellite and EOS Payload System Calibration & Validation  |
| 11 | Satellite Propulsion System                                |
| 12 | Solid Rocket Propulsion System                             |
| 13 | Satellite System Development, Test & Verification          |

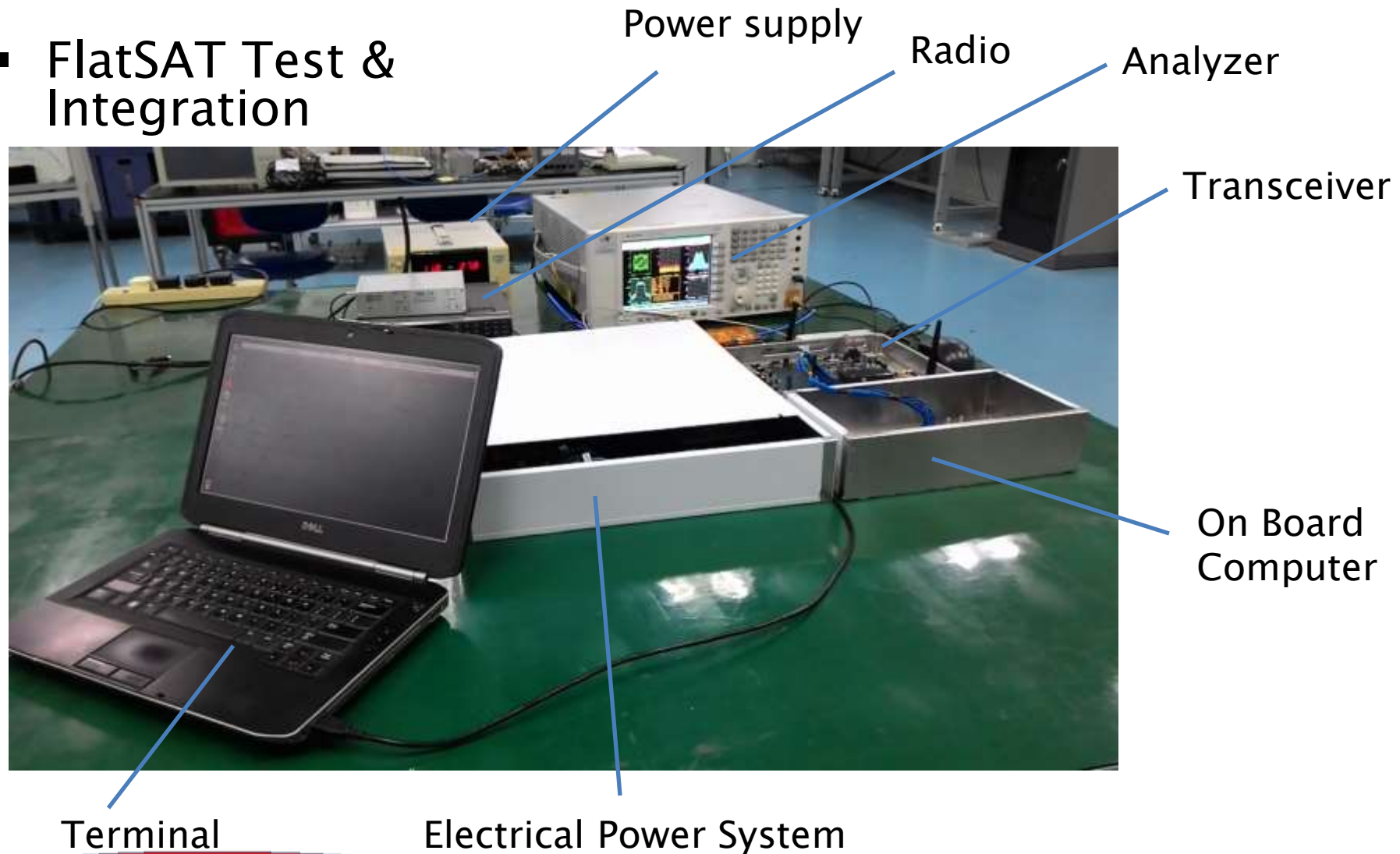
## SPACE, SATELLITE & MILITARY

|    |   |
|----|---|
| 14 | Satellite Risk Management                                     |
| 15 | Satellite Electro Optical Camera System                       |
| 16 | Satellite RF Communication System                             |
| 17 | Satellite Electrical Power System                             |
| 18 | Satellite Attitude Determination and Control System           |
| 19 | Satellite Structure, Mechanical & Thermal System              |
| 20 | Satellite Link Budget Training                                |
| 21 | Satellite Transmission Planning for Satellite Operators/Users |
| 22 | Practical on Amateur Radio Ground Station Set Up              |
| 23 | Satellite programme project management                        |
| 24 | Ground station design and implementation                      |
| 25 | Satellite Communication Regulations                           |

## SPACE, SATELLITE & MILITARY

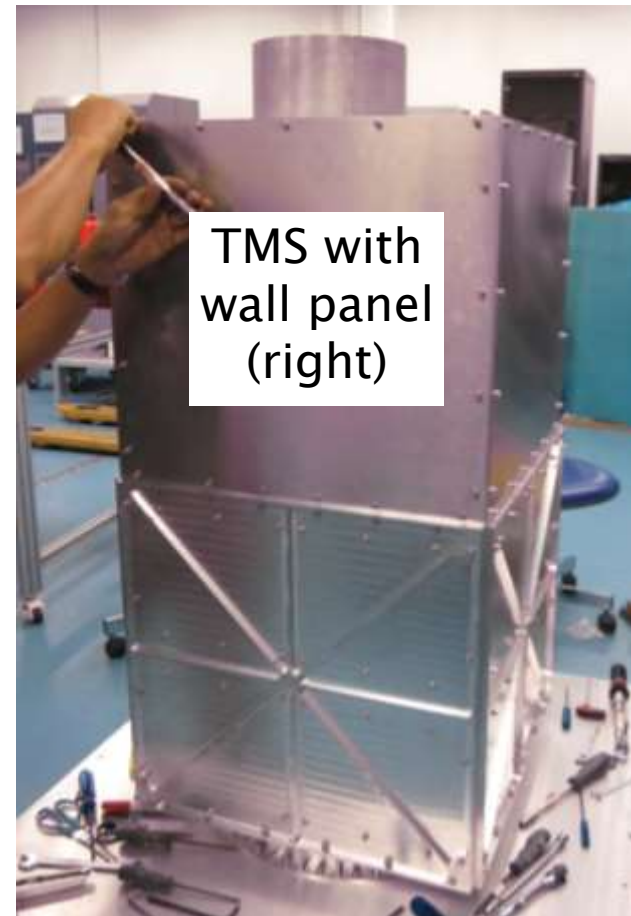
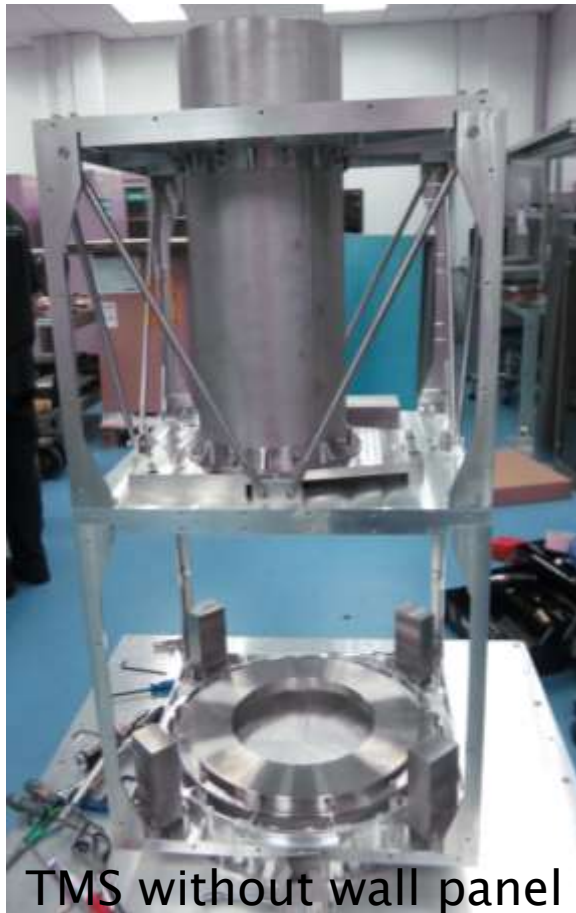
|    |  |
|----|--|
| 26 | Satellite Mission Analysis using STK   |
| 27 | Launch Early Operations Phase Training   |
| 28 | Solar Panel Assembly and Testing   |
| 29 | Hand manual soldering for Operators/Inspectors according to European Space Agency Specifications |

- FlatSAT Test & Integration





- Test Model Structure (TMS) Assembly & Integration



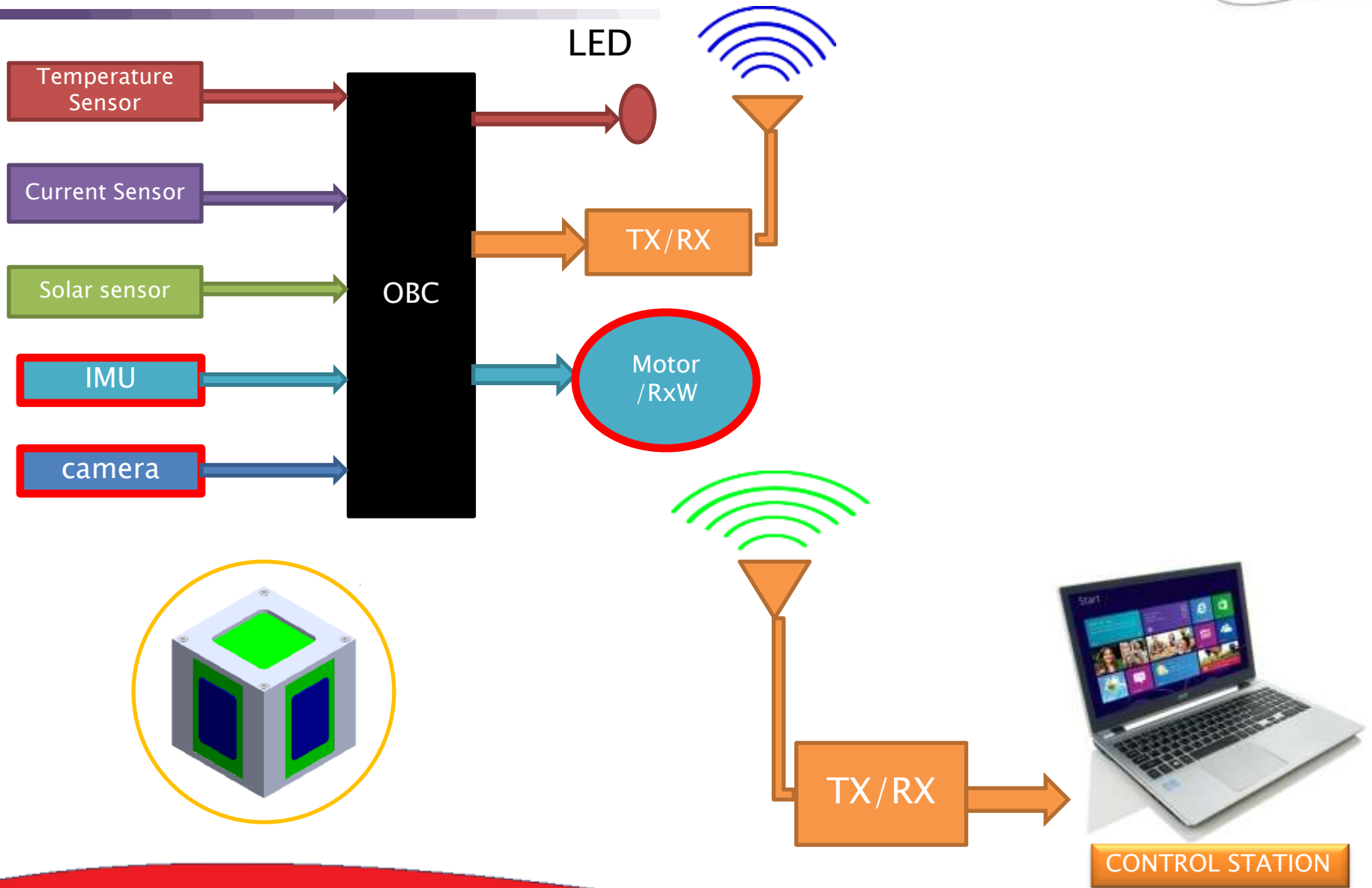
# Pipit

# Pipit Introduction

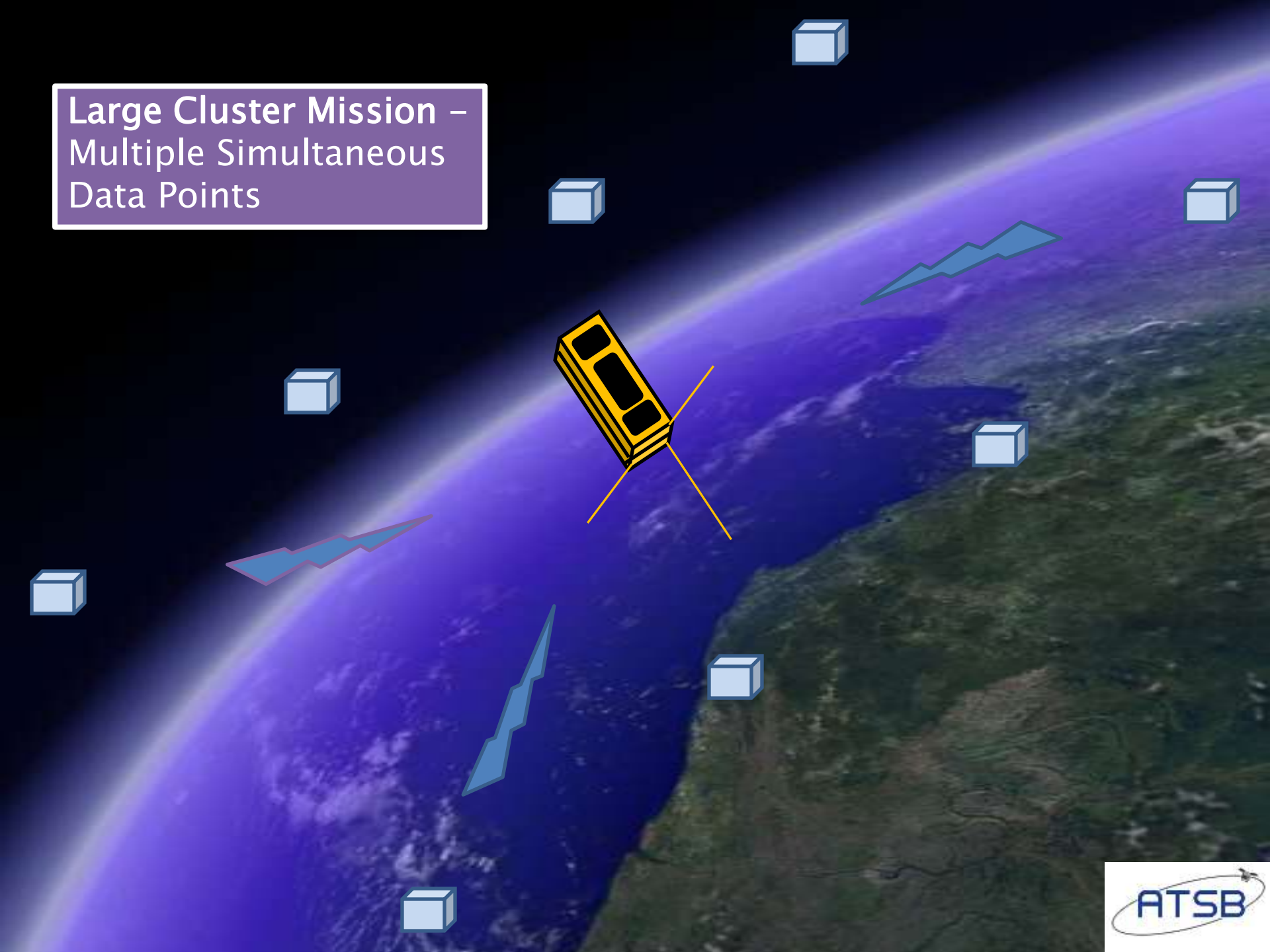
- Femto satellite platform ( $\cong 5\text{cm} \times 5\text{cm} \times 5\text{cm}$ ) weighing less than 1 kg
- Designed for operation in outer space
- Base module has core functionality of a satellite system such as On Board Computer, Power and Communications
- Functionality can be expanded with attached modules



# PipitSAT System Block Diagram

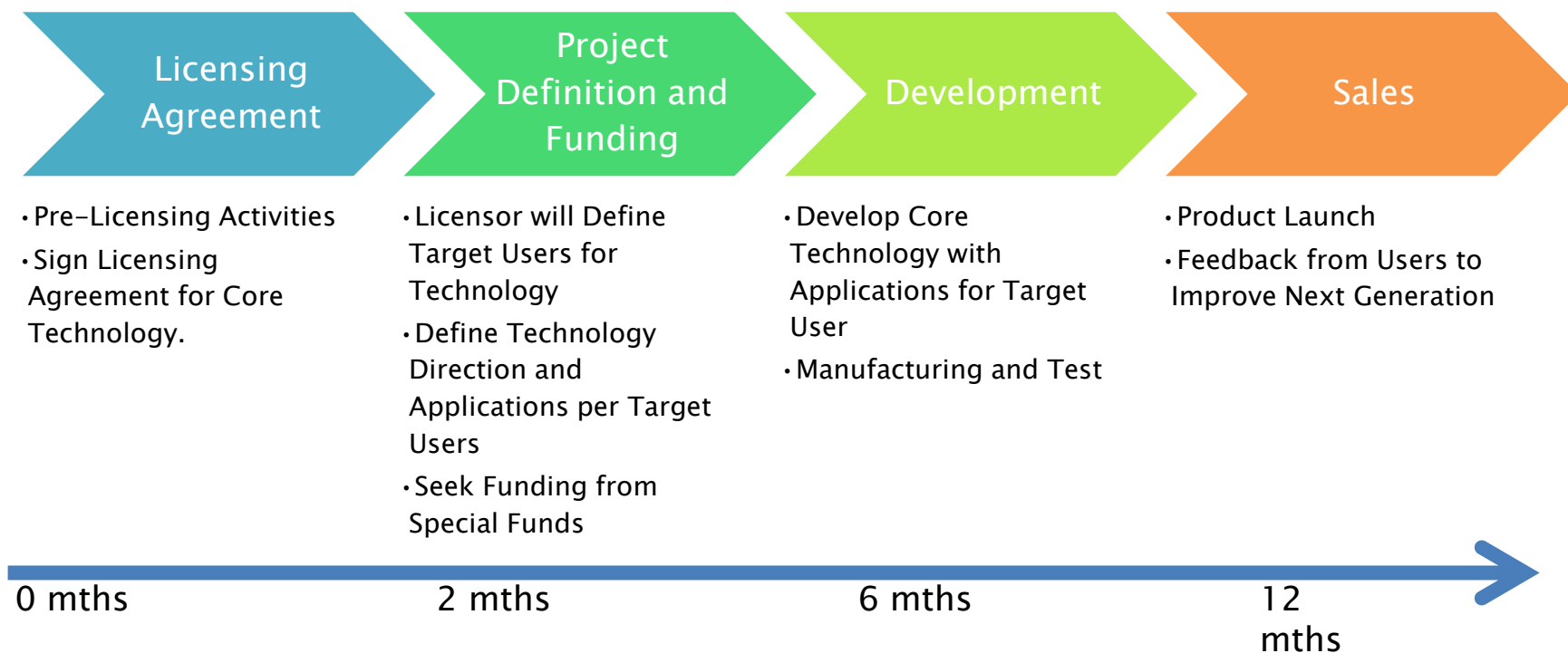


Large Cluster Mission –  
Multiple Simultaneous  
Data Points



# Licensing Business Model

- There is no upfront Licensing Fee required
- ATSB Licensing Fee will be charged only with Product Sales
- New IPs from Licensor will belong to Licensor



# Target Customers

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- Pipit is to be Licensed to the Education Market
- Suitable “tool” for Science, Technology, engineering and Mathematics (STEM) education
- Coaching/Learning Modules will teach and familiarize the user with space technology step– by– step
- Satellite platform is viable platform for Education, Technology Demonstrations and Space Measurements for High School Students and above
  - Winner Satellite of National Competition can be launched to Space?

# Value Proposition

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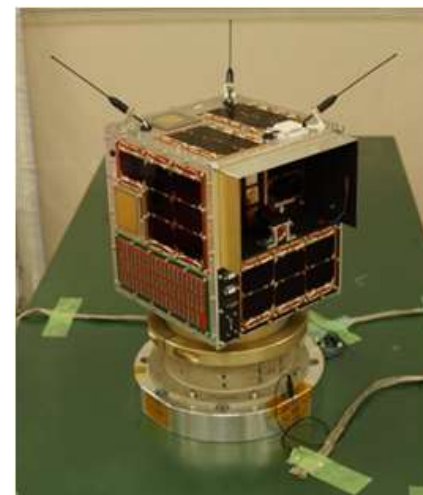
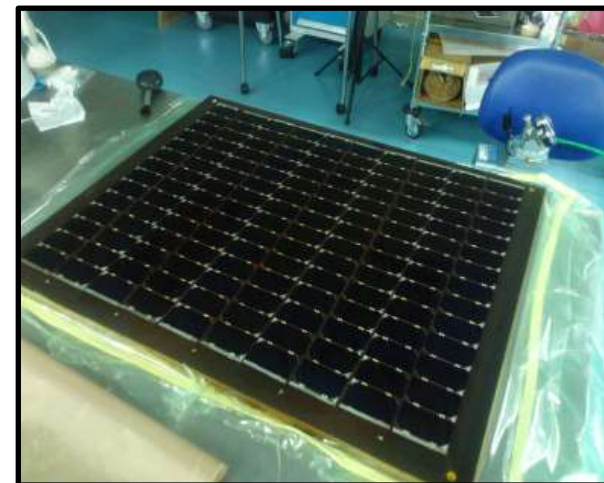
- ATSB seeking for Partners (Start-ups with New Funding/Investors?) to License Technology out to
- We can provide development, manufacturing and facility support
  - No fuss about the engineering work – we will do it for you
- Partners to help to take the Technology Base to the Next Level
  - We are not educators
  - We need help to develop applications such as Development for STEM Course Modules that are suitable for the Education market
  - How to defeat the Smart Phone and the attraction of Apps?



# Space Power

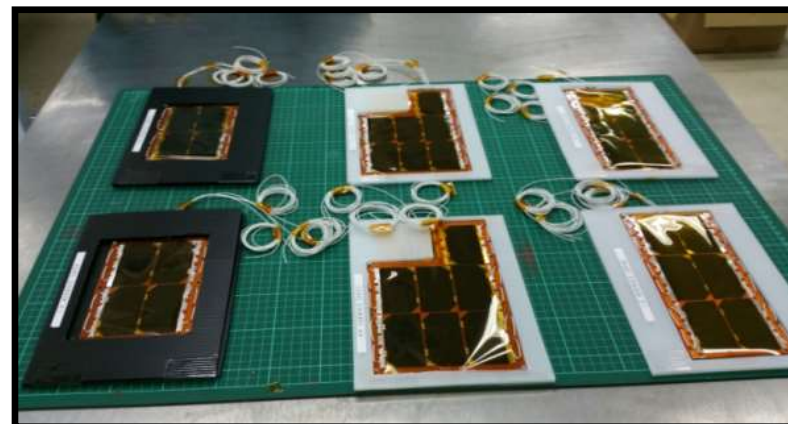
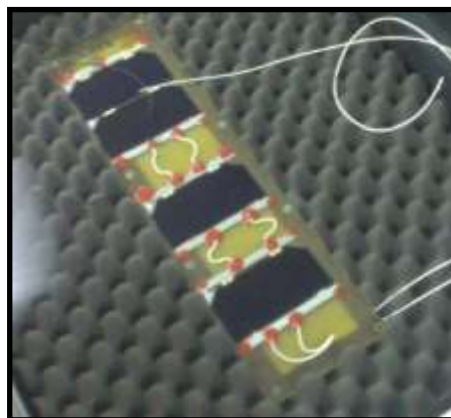
# Solar Power Introduction

- Triple Junction Ga-As Solar Cells packaged into Panel Form Factor
- Panel sizes can be designed from single cell up to 2m x 2m in size
- Proprietary Precision Manufacturing Process (ISO 9001:2008) with based on standards maintained by European Space Agency (ESA)
- The panels electrically tested in house via a Class A Large Area Solar Simulator (LAPSS).
- Space Proven on Horyu IV Japanese Satellite that was launched in February 2016



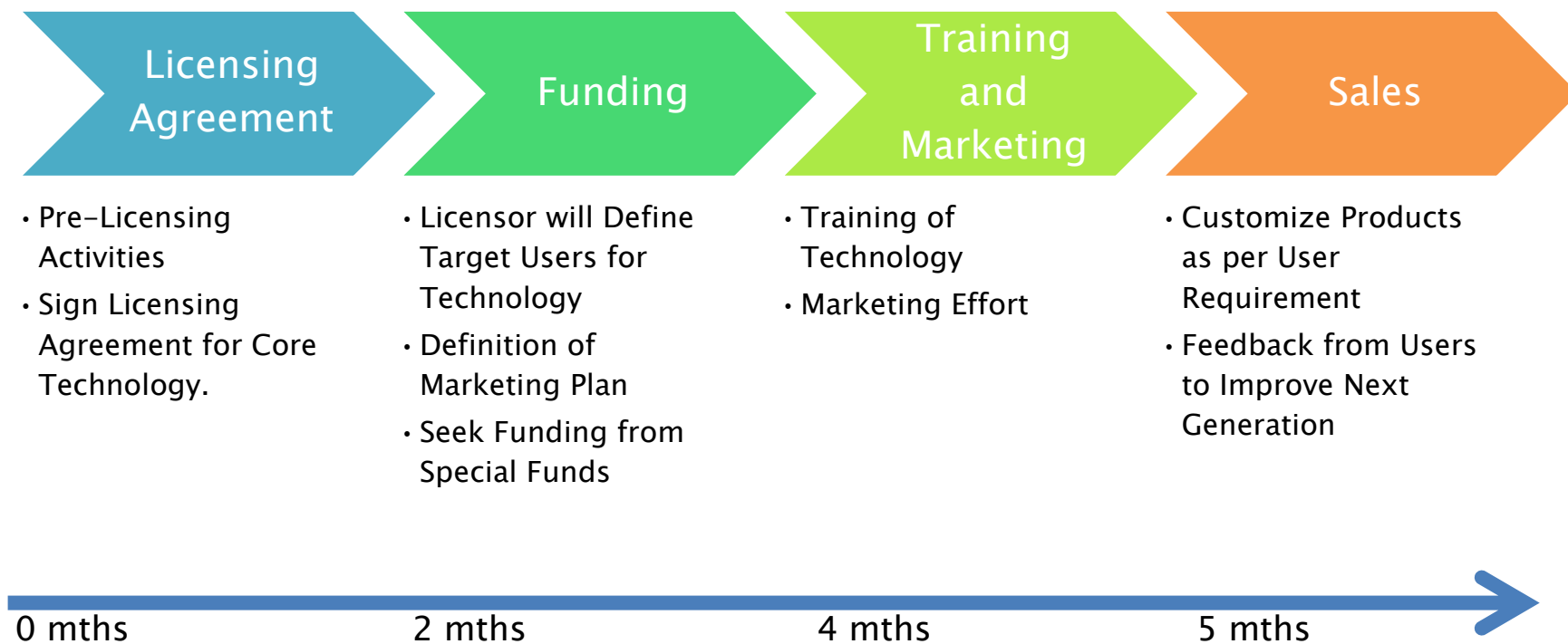
# Target Customers

- Original Equipment Manufacturer (OEM) Market for Space Grade Solar Panel
- All satellite developed locally (but only ATSB does it!)
- International Market for Small and Medium sized satellites to start with
- Competitive Pricing



# Licensing Business Model

- No Upfront Licensing Fees
- No Further Preparation of Product Necessary – Ready for Sales
- Licensor will learn the Technology & Customization Methodology
- ATSB Revenue will be from percentage of Sales



# Value Proposition

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- ATSB seeking for Partners to License Technology out to
- Product Ready to Market Immediately
- We can provide development, manufacturing and facility support
  - No fuss about the engineering work – we will do it for you
  - We will also train the Licensor to be familiar with the technology
- Partners to help to take the Technology to Market with International focus

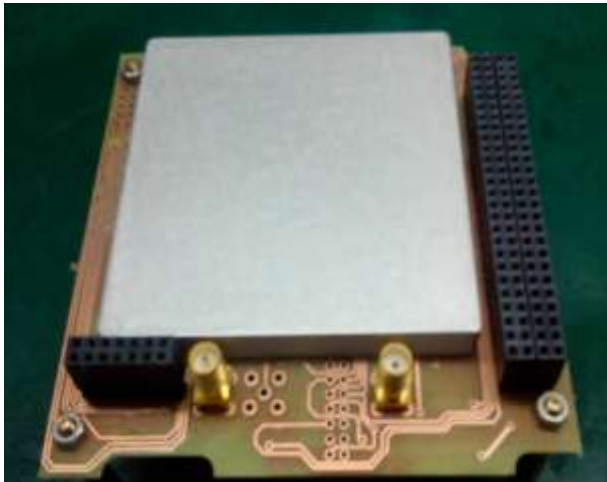
# InnoSAT

# InnoSAT Introduction

- A standardized flight model satellite bus platform to allow payload users and customers to concentrate on the payload development
- InnoSAT series provides solution and opportunity for a researcher demonstrate their experiment in the orbit
- Payload bay can be sized up to 2U with many means of interfacing
- Modules/subsystem are interchangeable between ATSB solutions or 3<sup>rd</sup> party
  - In-house design and prototyping available
  - Local material/component sourcing available

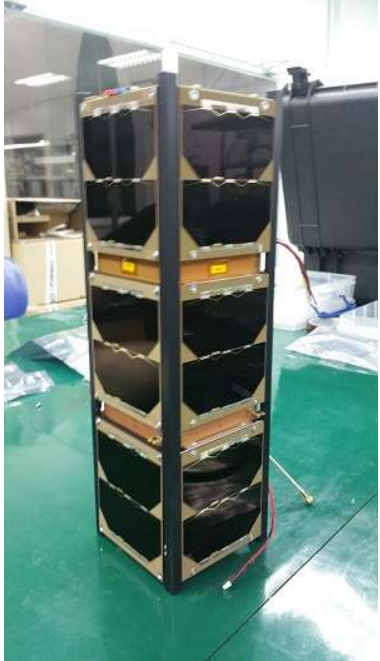
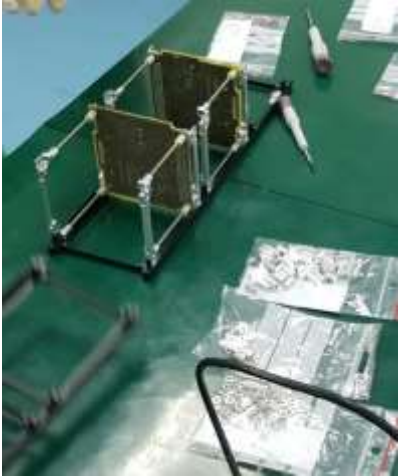


# Hardware Development





# Assembly and Test



# InnoSAT-2 Hardware



Payload bay

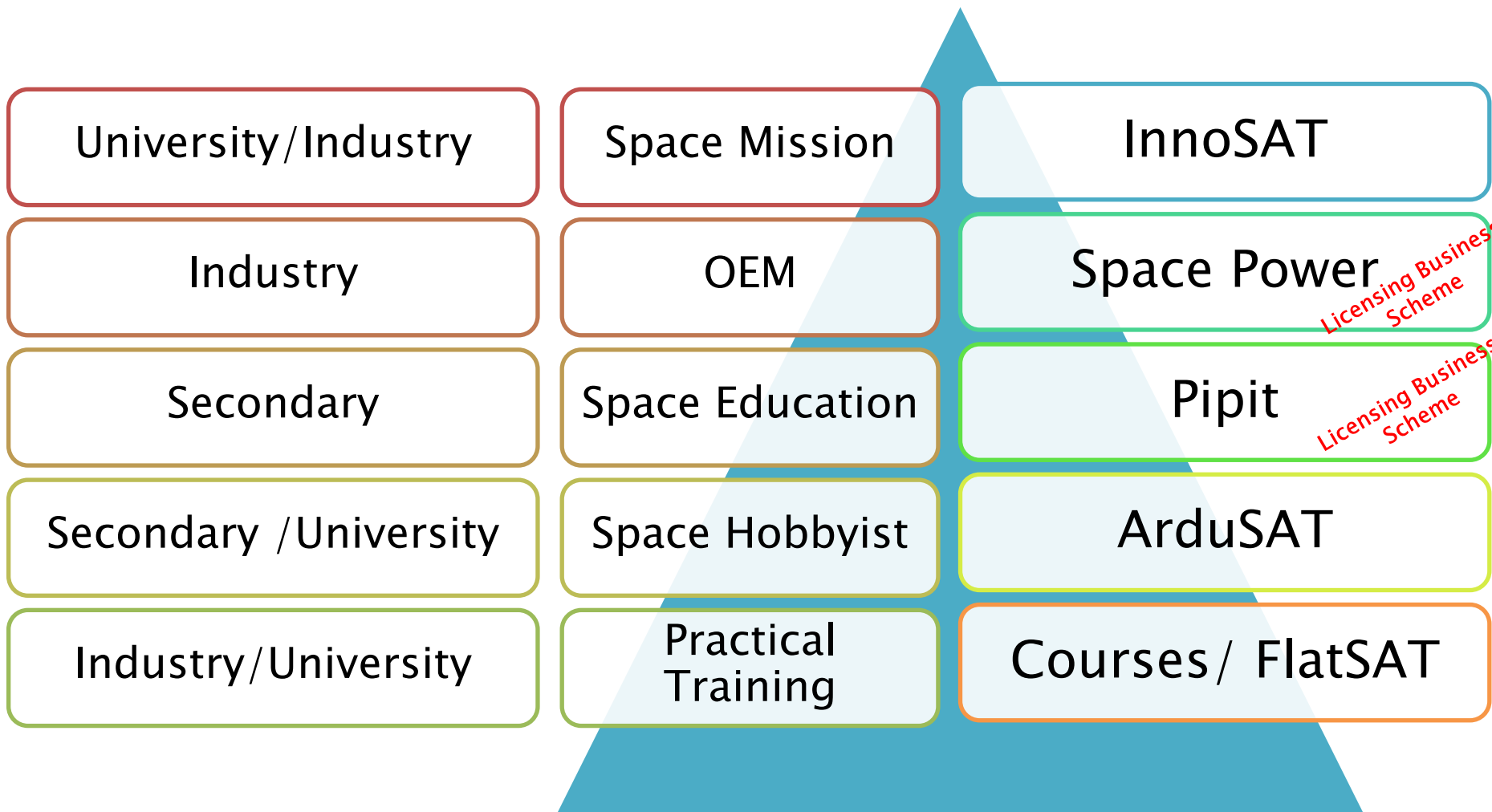
Solar panel

Electronic bus

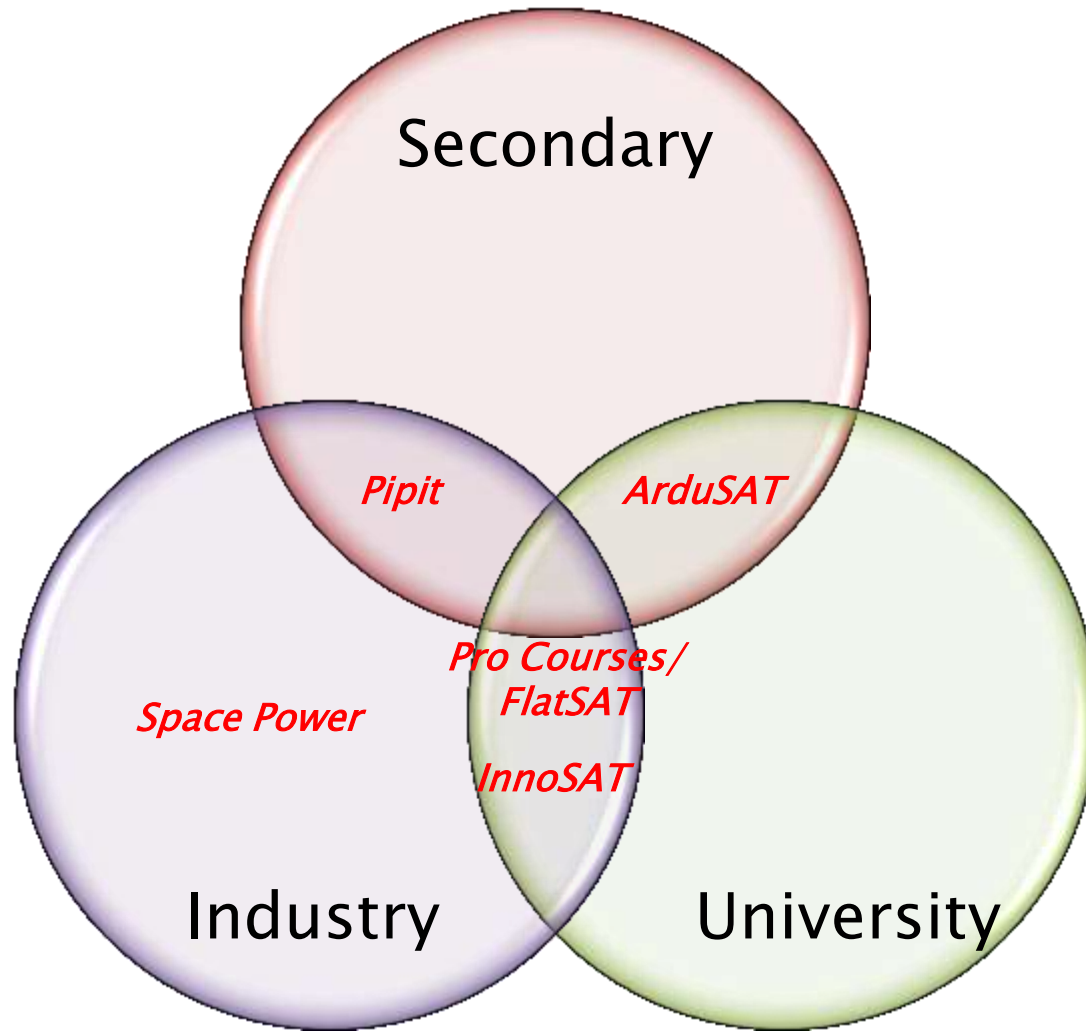


# Conclusion

# Offering Space Technology to Society



# Product Map



# Way Forward

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- Multi-tier approach:
  - Secondary => exposure
  - University => development
  - Industry => commercial
- Multi-lateral approach:
  - Hardcore research and/or Customer Space Missions
  - Commercial Licensing/OEM
  - Professional training with real hardware for hands on experience
  - STEM education / guided learning
- ATSB® has the **flexibility to work** in our customer/partner in different **business arrangements** as required offering more for society

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# Thank You