



# **ISIS – Innovative Solutions In Space**

**Small Satellites – Big Business**



# Small Satellites - Nanosatellites

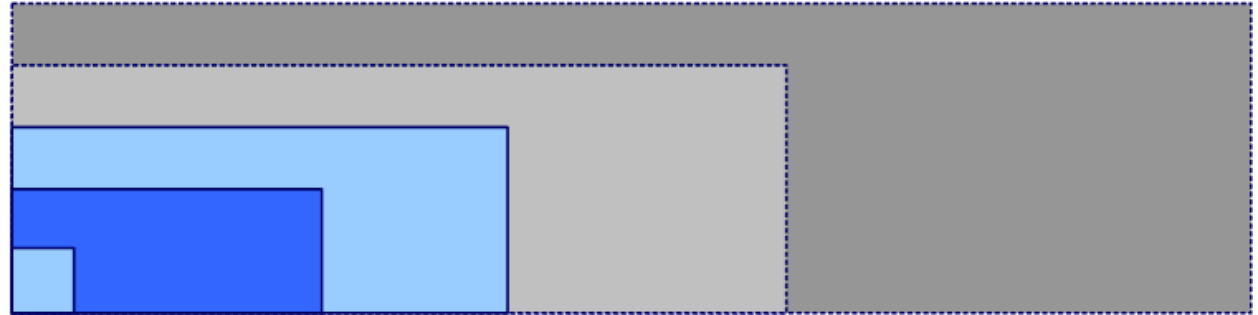
< 100.0 kg – Microsat

< 50.0 kg – "Small" Microsat

< 24.0 kg – "Large" Nanosat (12U CubeSat)

< 10.0 kg - Nanosat (6U CubeSat)

< 1.0 kg - Picosat (1U CubeSat)





# Scaleable Small Satellites

CubeSats: 1 kg (10x10x10cm) to 25kg (22x22x45)

1U

1.5U

2U

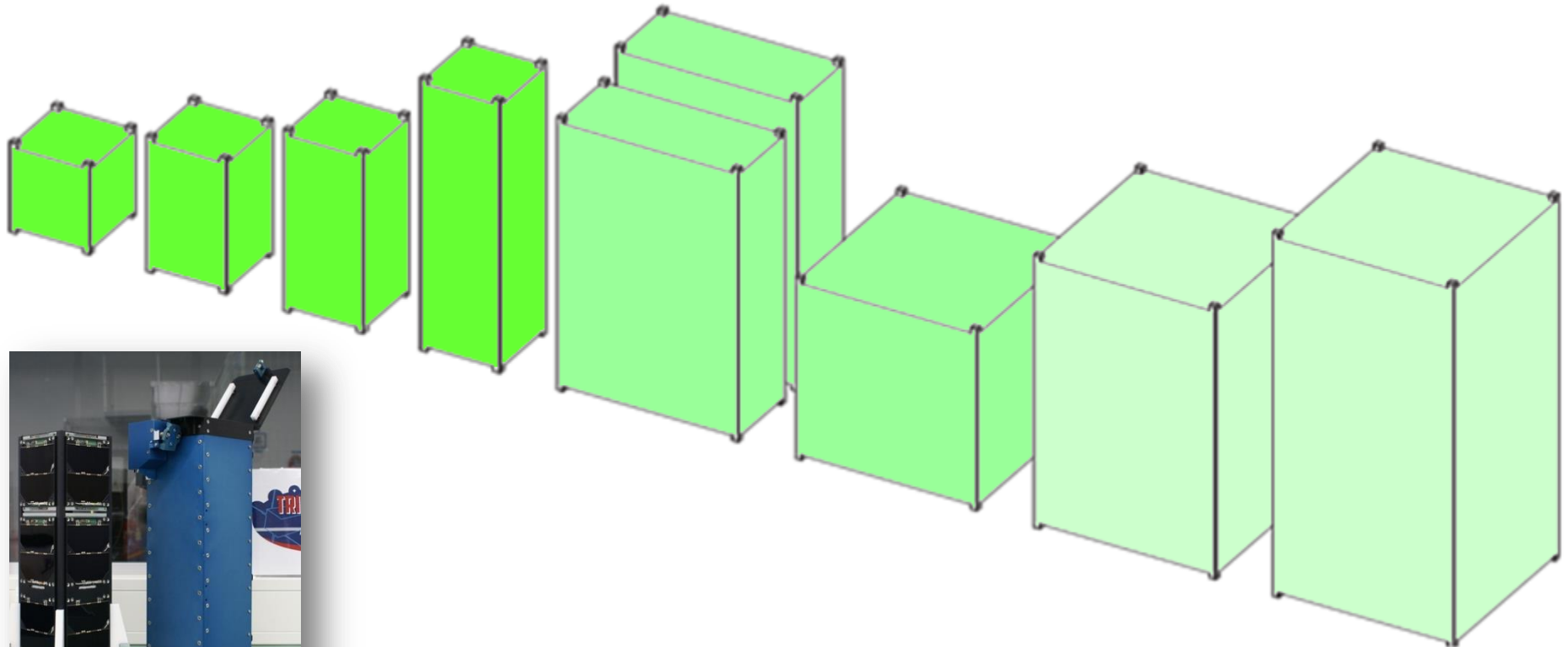
3U

6U

8U

12U

16U





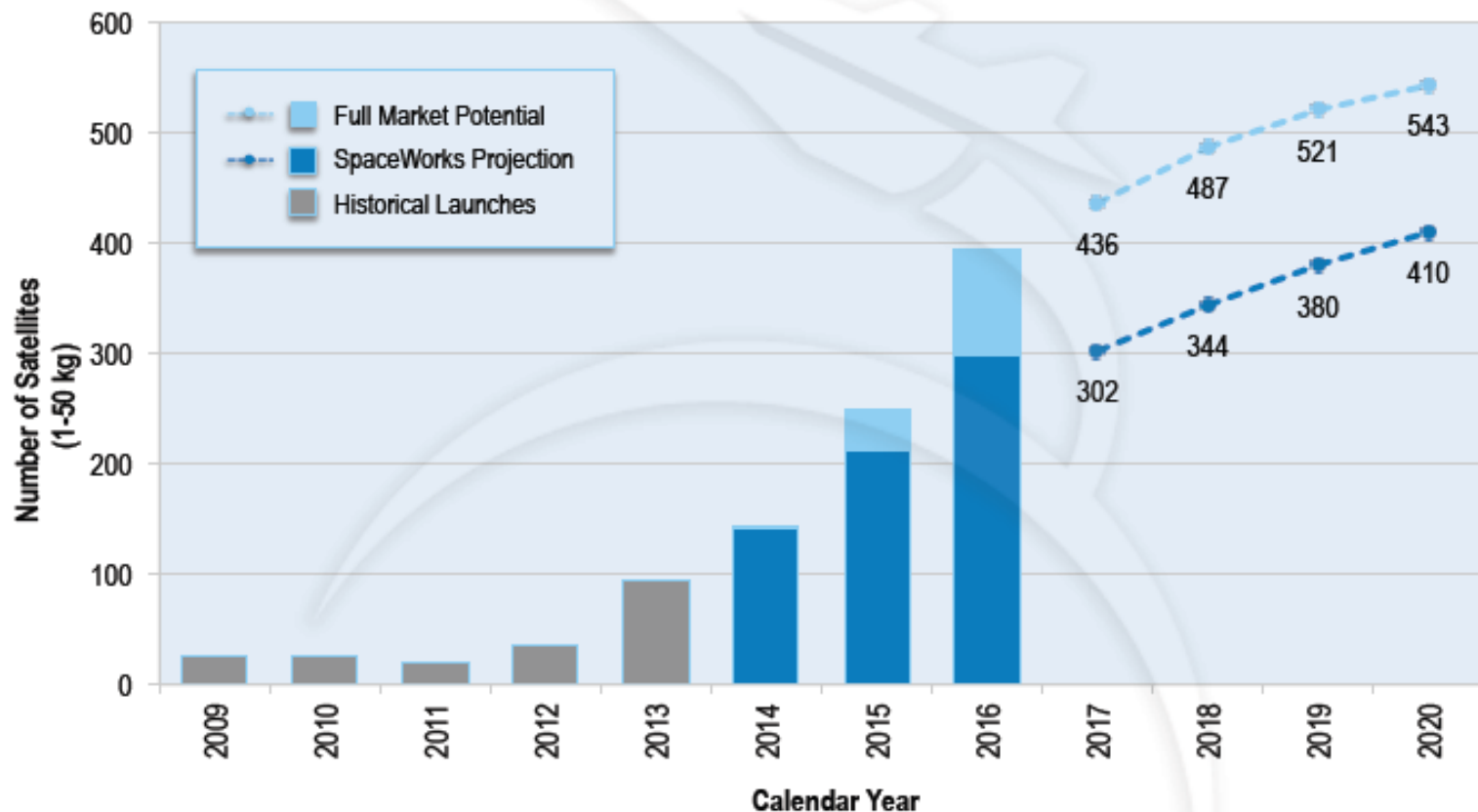
# Why CubeSats / NanoSats?

- Standardization and Modularity
- Miniaturization
- Containerized Launch
- Using industrial / Automotive / Commercial technology – Spin-In
- Faster implementation
- Scaleability and series production
- More open and transparent innovation
- Allows for higher technical risk (in exchange for lower financial risk)
  
- Cost Advantage



# A growing market

Projections based on announced and future plans of developers and programs indicate between 2,000 and 2,750 nano/microsatellites will require a launch from 2014 through 2020



# End of an Era?





# Disruptive technology



Mainframe



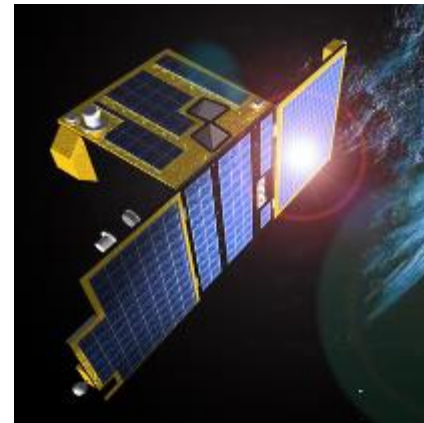
Mini-Computer



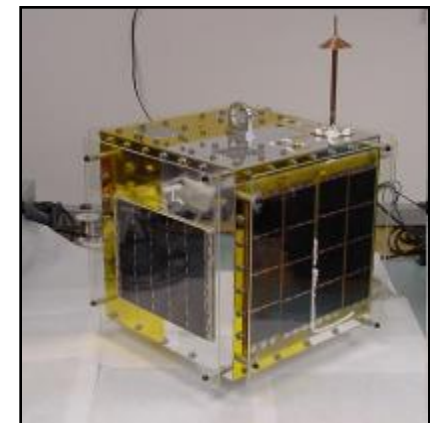
PC



Large Spacecraft



Microsatellite

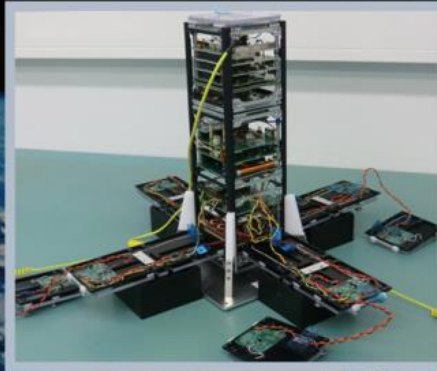


Nanosatellite



## Innovative Solutions In Space

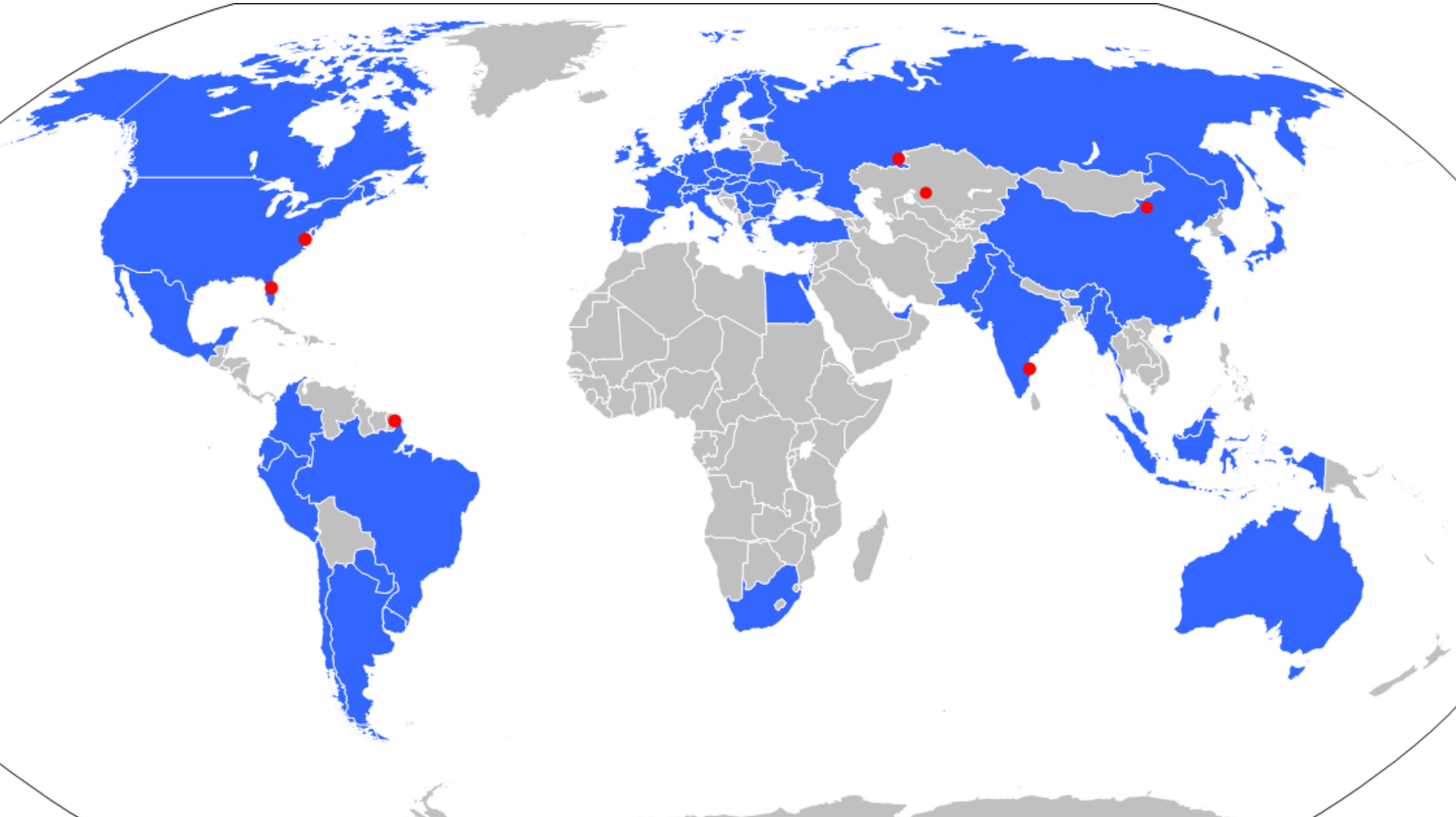
- Small satellite solutions (1 - 25 kg)
- Vertically integrated space company
  - Research and development
  - Components and subsystem production
  - Satellite mission design and implementation
  - Satellite launch services
  - Satellite operations
- 50 FTE based in Delft, The Netherlands







# Operating in a global market





# Main Activities

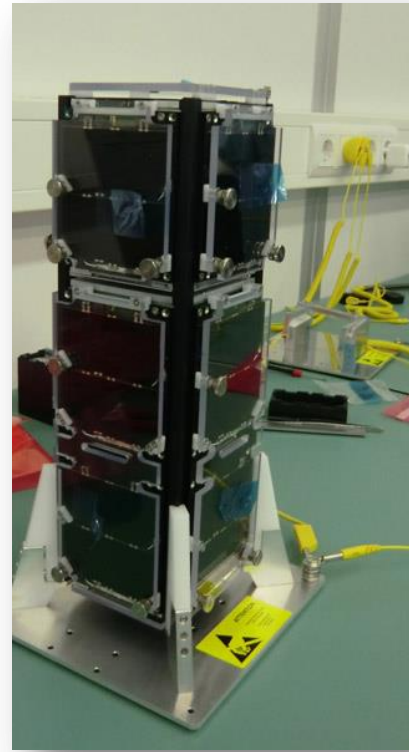
## Standard Products



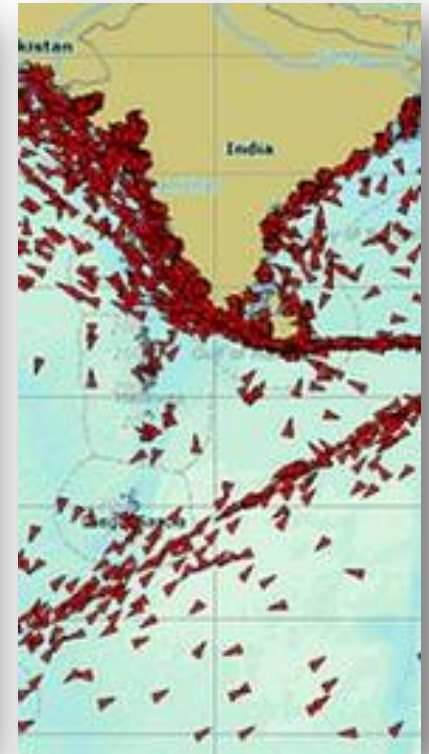
## Launch Services

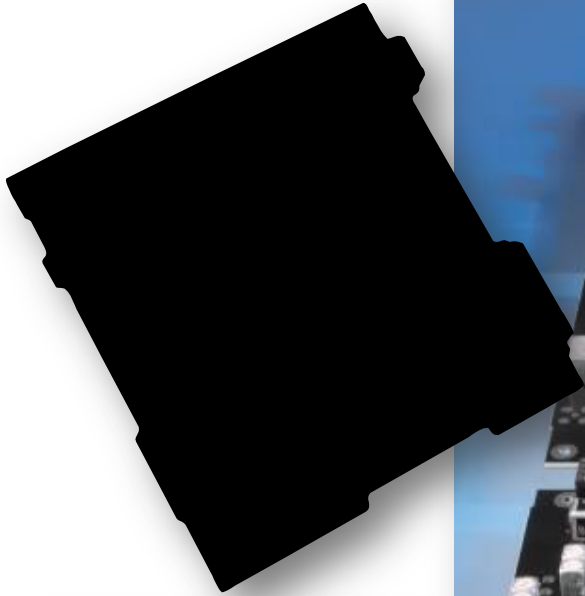


## Missions & systems



## Networks & Applications





## Standardized Nanosatellite Avionics

Standard low power avionics for CubeSats





# Nanosatellite Products



## CubeSatShop.com | isispace.nl | isilaunch.com

The one-stop-shop for all your CubeSat and nanosat systems...



CubeSatShop.com is an ISIS initiative

Search

Welcome to the CubeSatShop, the one stop webshop that offers a broad range of products for CubeSats and nanosatellites in general. The webshop offers standardized, off-the-shelf components and subsystems from a variety of manufacturers.

### Categories



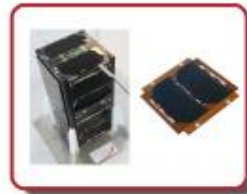
CubeSat Structures



Communication Systems



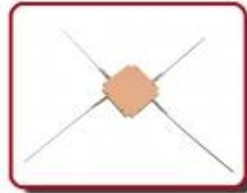
Power Systems



Solar Panels



Attitude Control Systems



Antenna Systems



Command & Data Handling



Cameras & Payloads



QB50



QB50 & CubeSatShop



QB50 Subsystems

**Login to Cubesatshop**

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Password

Remember me

Login

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### Shop News

#### Unveiling the ISIS On Board Computer

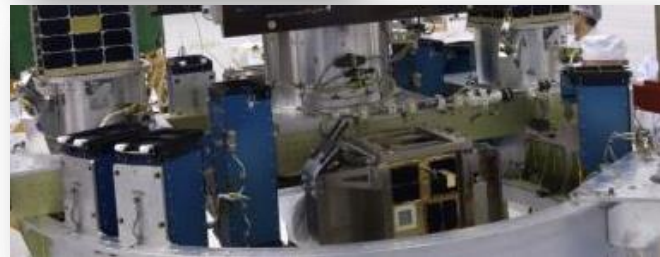


ISIS has now made available for you its new high performance On Board Computer, providing extra interface and





# ISILaunch Launch Services



**CubeSat**  
Cluster Launches

**Nanosatellites**

**Microsatellites**

**Other Payloads**

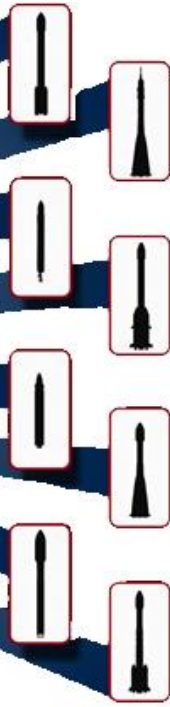
INNOVATIVE SPACE LOGISTICS BY  
**ISILaunch Services**

**Launch Adapters**

**Test Services**

**Launch Insurance**

% risk € \$  
% risk £ ¥



**ISILaunch 01**

PSLV-C14

ISIRI, SwissCube, MARSAT, UWE-2

**ESTCUBE**

ISILAUNCH 06

esa, swisscube, vegs

**ISILAUNCH 02**

ISIRI, M11, Cosmos-2

ISIL, spaceflight

**ISILAUNCH 03**

ISIRI, M11, Cosmos-2

**ISILAUNCH 05**

Deepf Cluster 2012

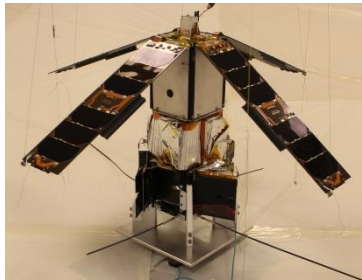
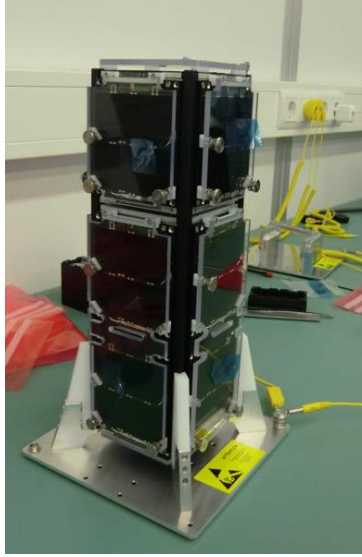
ISIL, YUZHNOYE



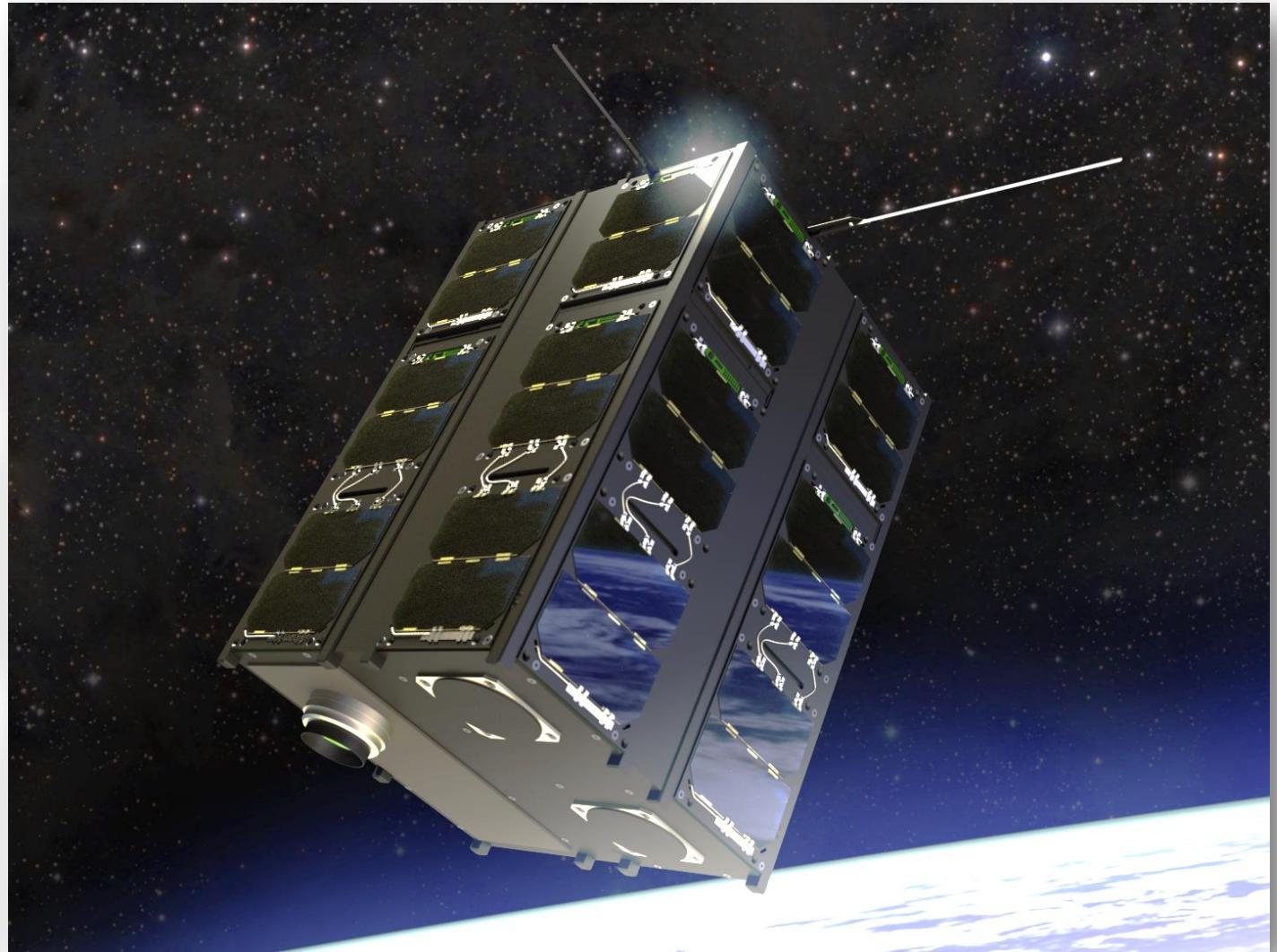
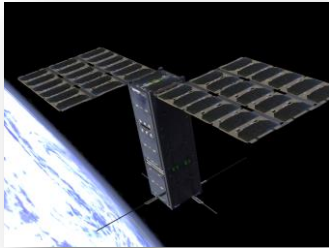
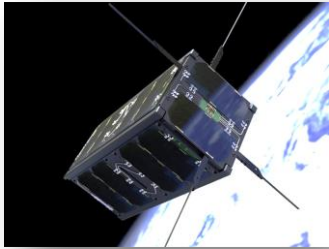
## CubeSat Deployers and sequencers

Flexible, scaleable system to get CubeSats in Space





## CubeSat platforms and turnkey solutions



## ISIS 1 kg to 20kg Nanosat Solutions


Low cost (pre-operational), rapid turnaround time, one-stop-shop





# End goal – mass production



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# Using CubeSats / Nanosatellites

## Changing Applications

- Education
- Tech Demonstration
- Small Scale Science
- PreOperational Demonstrators
- Medium and Large Scale science (Radio Astronomy)
- RealTime, Global Monitoring
  - Remote Sensing (Agri, realtime “Google Maps”)
  - Tracking and Tracing (AIS, ADS-B)
  - (Space) Weather
- Commercial Telecom (M2M, data backhaul)

## Changing User / Customer Base

- Academia
- Research Groups and SME’s
- Agencies and LSI’s
- Full Commercial Ventures based on data services



# Using CubeSats / Nanosatellites

- **Changing Operating Environment**
  - LEO
  - MEO, GTO and GEO Orbits
  - Lunar, Interplanetary
- **Changing Economic Environment**
  - Regional Markets (apart from GEOSATCOM) dominated by LSI's
  - Global market working with local funding regimes
  - SME's can be competitive as a prime
- **Changing Regulatory Environment**
  - Focused on small number of stakeholders, long timelines
  - Small Satellites have become numerous in number and stakeholders faster than anyone could imagine
  - Debris Mitigation, LEO regulation, Frequency Management are all under pressure for reform



# Conclusions

- CubeSats and Nanosats are fast becoming a more established segment in the overall space sector
- Starting out as a low-cost innovation acceleration platform, the use of such systems is now changing dramatically.
- Real time, global monitoring might become a reality using nanosatellites or small satellites, but regulatory obstacles abound.
- Specific Science and Exploration domains may get a boost by including larger number of inexpensive, CubeSat-like spacecraft, provided the systems can be sufficiently hardened and scaled up for non-LEO usage.
- Small Satellites offer great opportunities provided a number of profound obstacles can be overcome !





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**Thank you for your attention!**

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