

# How do we do the same as the big boys?

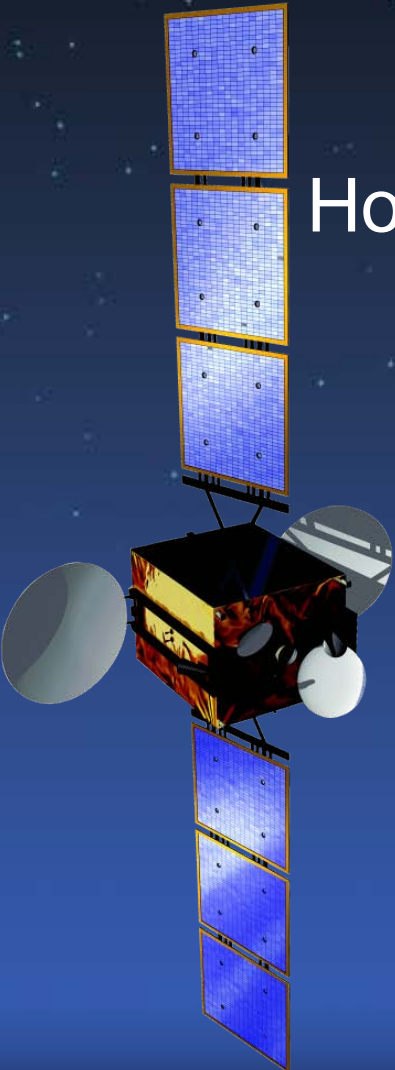
Enabling Systems and Technologies  
for Advanced Small Satellite Engineering

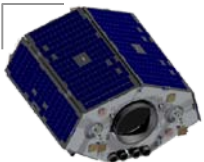
Andrew Carrel (presenting)

Andrew Cawthorne

Guy Richardson

Luis Gomes



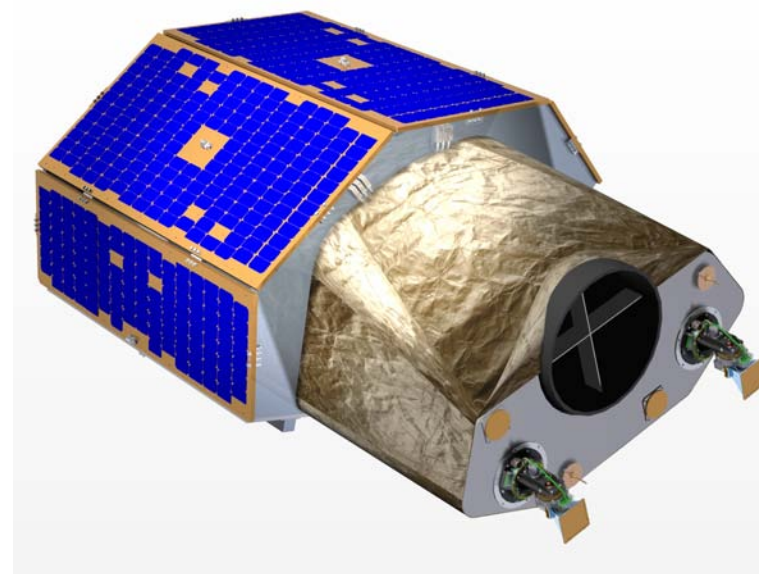


# SSTL-300 Platforms

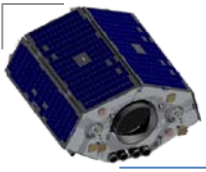
- The first SSTL-300 spacecraft is to be launch later this year – NigeriaSat-2.
- S1 variant incorporates a larger payload with 0.75m GSD



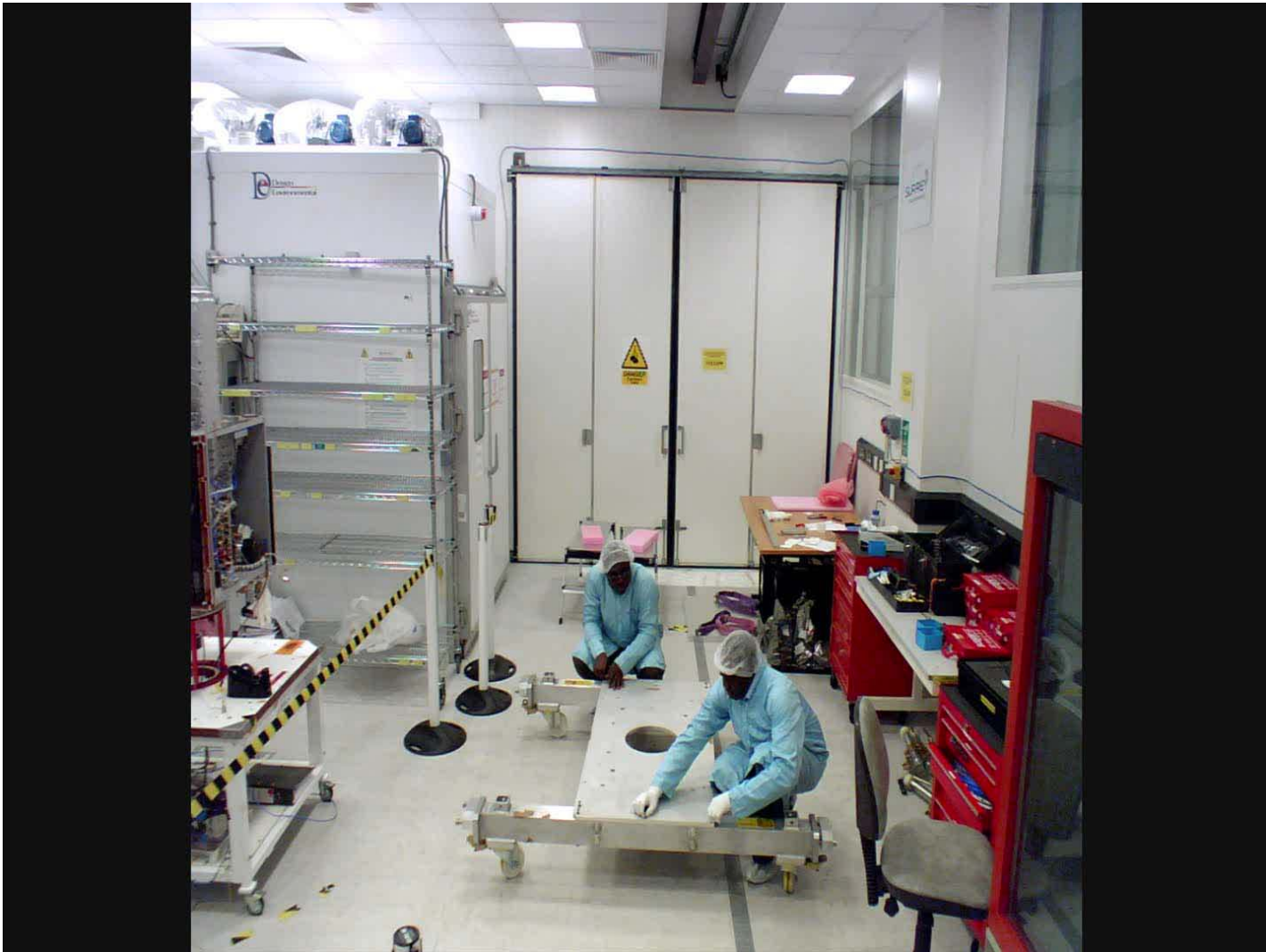
SSTL-300  
1.2 – 2.5 metre GSD



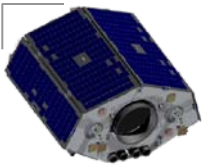
SSTL-300 S1  
0.75 – 1.0 metre GSD



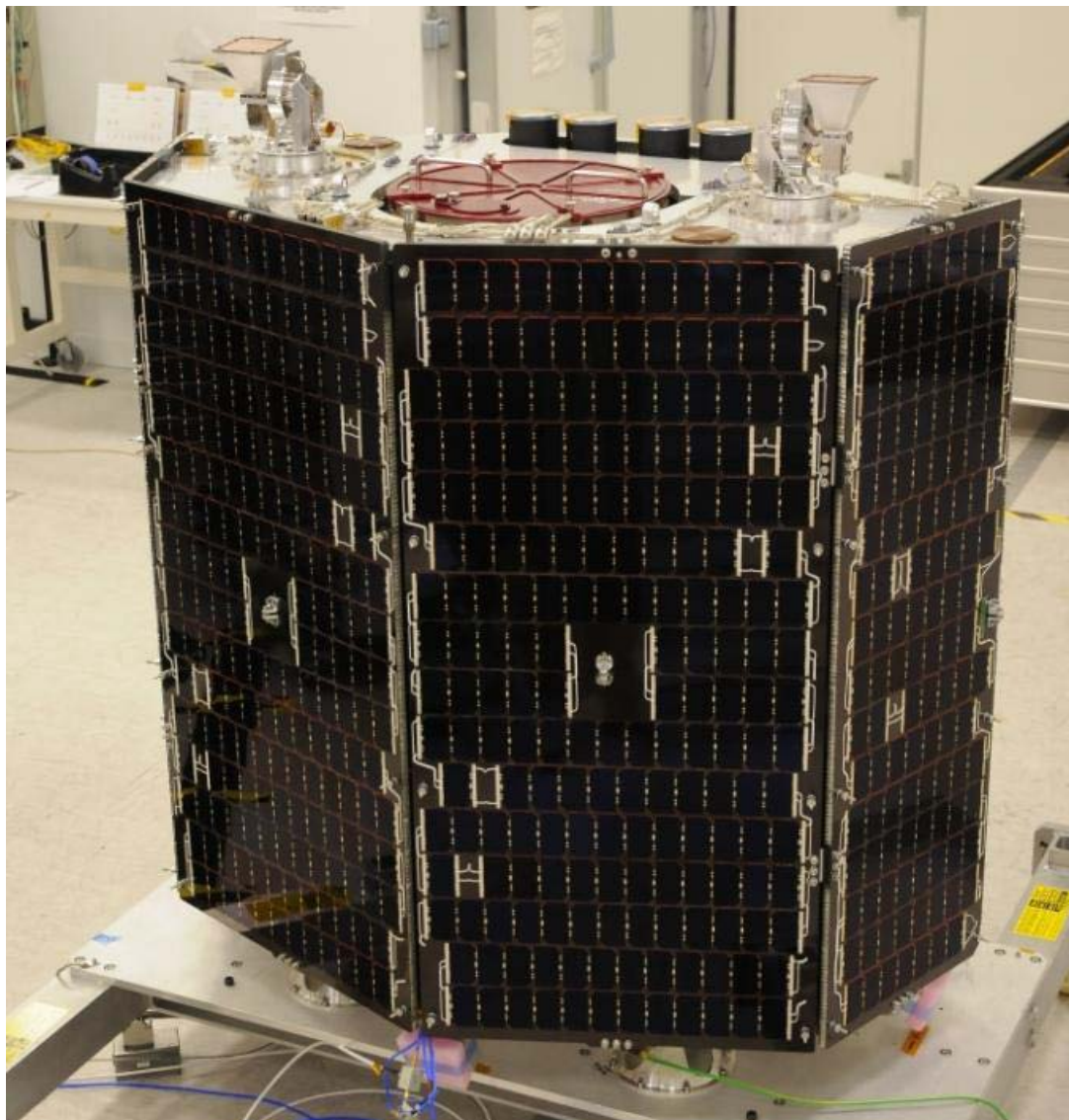
# NigeriaSat-2 Flight Model

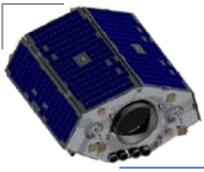






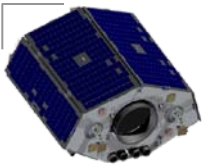
# NigeriaSat-2 Flight Model





# EO Requirements

- SSTL has had many EO customers and some themes are common:
  - Range of products
  - Capacity
  - Timeliness
  - Image quality
- All of these are achieved by the SSTL-300 platforms by using the technologies described here.



# Range of Imaging Products

- SSTL-300 incorporates two payloads:

- VHRI: 2.5m GSD (PAN)  
5m GSD (R, G, B, NIR)



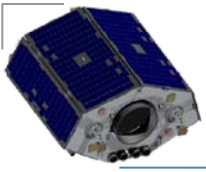
- MRI: Multispectral 32m GSD or 22m GSD



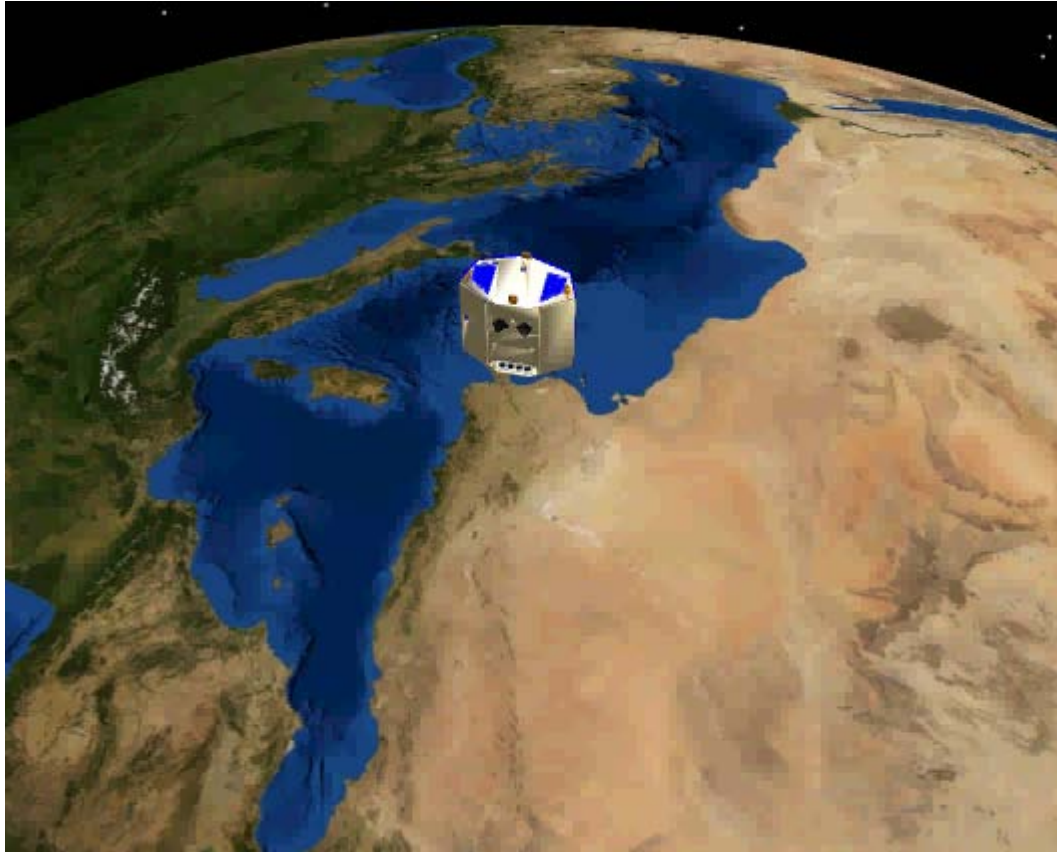
- SSTL-300 S1 incorporates enhanced payload:

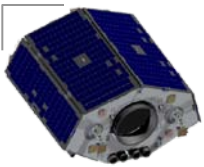
- 0.75m GSD (PAN), 3m GSD (R, G, B, NIR)

- Agile imaging modes supported by both platforms



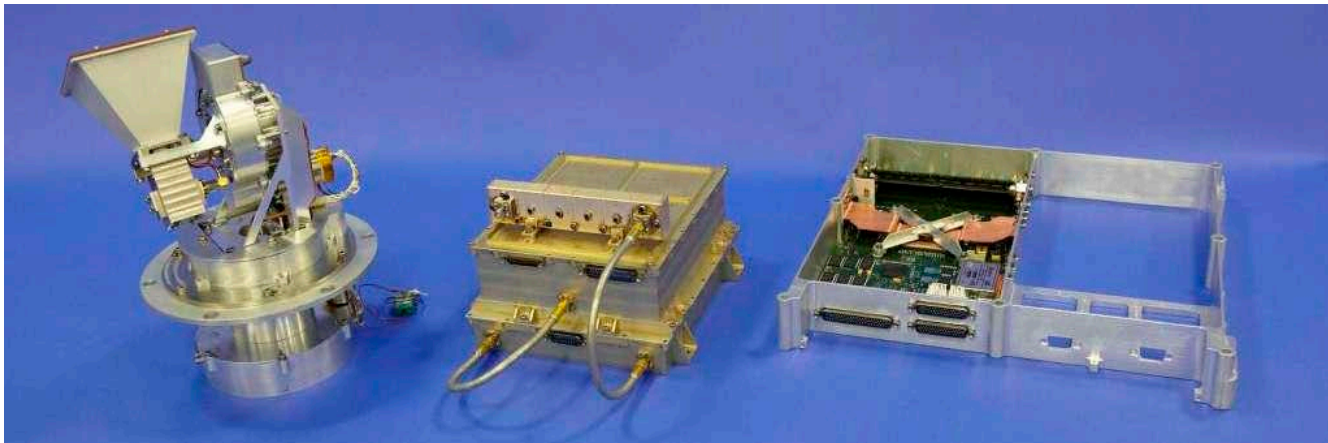
# Agile Mode Example: Mosaic



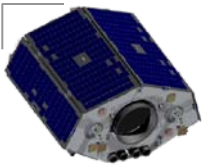


# Capacity: SSTL-300

- 16Gbyte High Speed Data recorder
- X-Band downlink at 210Mbps
  - 400Mbps upgrade under development
- Antenna Pointing Mechanism to track GSN during spacecraft slews & imaging

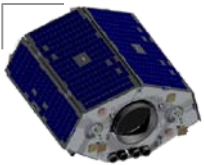






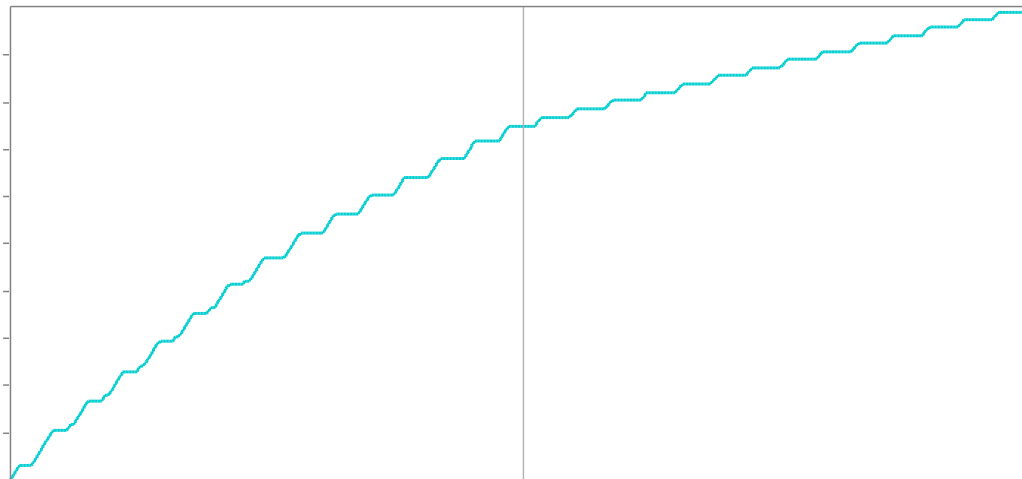
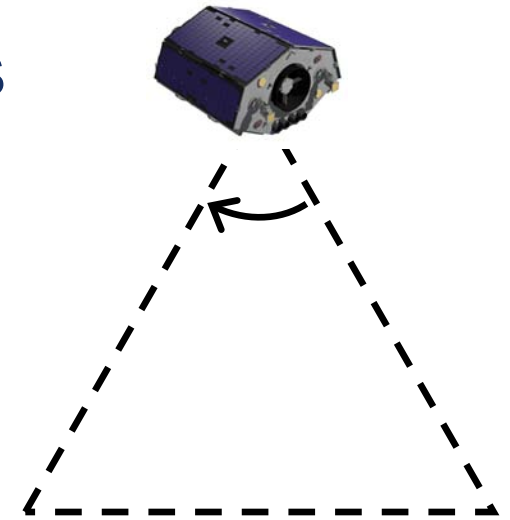
# Timeliness: Near Real Time

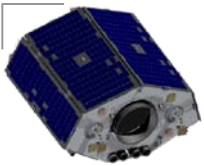




# Timeliness

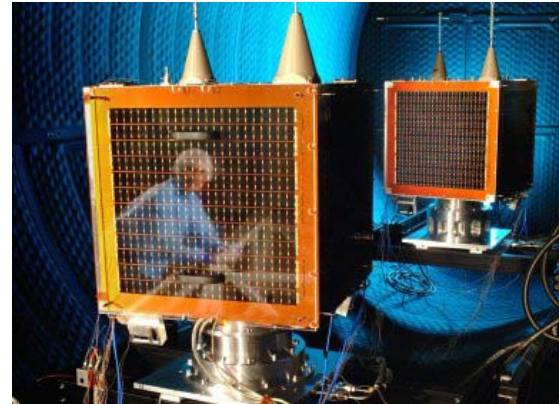
- Agile targeting capability operates over a wide  $\pm 45^\circ$  slew range
- Global access every 2 days

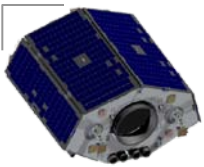




# Constellations

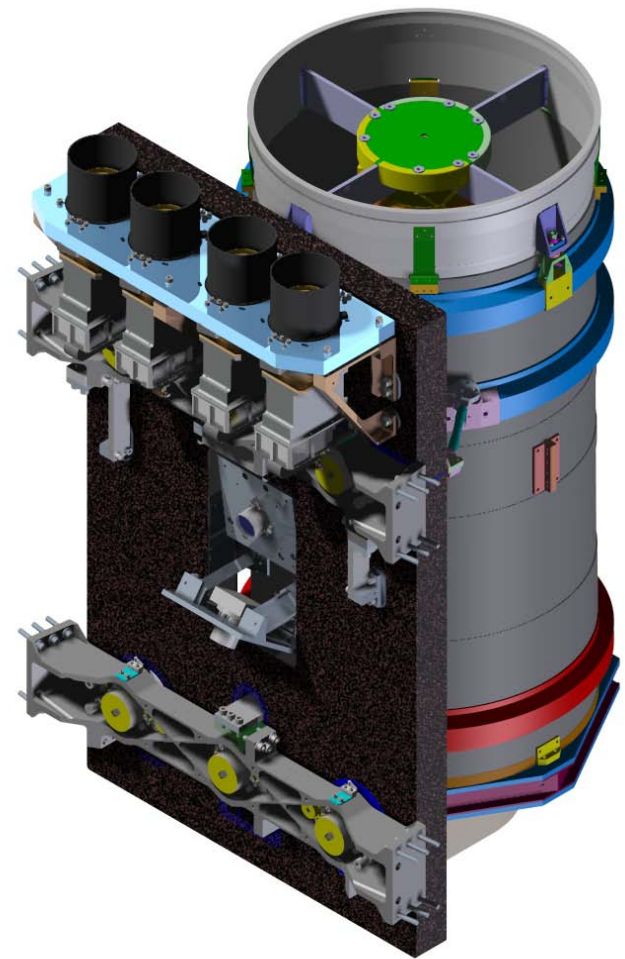
- Constellations improve timeliness and past experience has demonstrated this:
  - Disaster Monitoring Constellation (DMC)
  - RapidEye Constellation





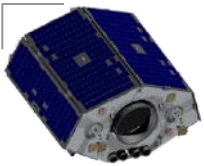
# Image Quality: Payload Isolation

- Geolocation without GCPs
  - $< 35\text{m CE90}$
- Thermo-elastic relief:
  - Compliant mounts for bench
  - 7x 1DoF compliant links
- High-freq attenuation
  - Removes mechanical noise
- Launch lock
  - Low-shock release system



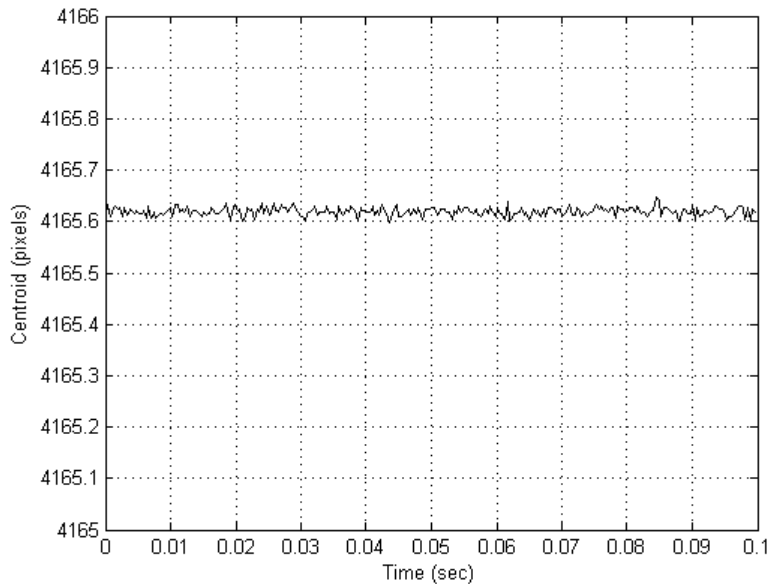
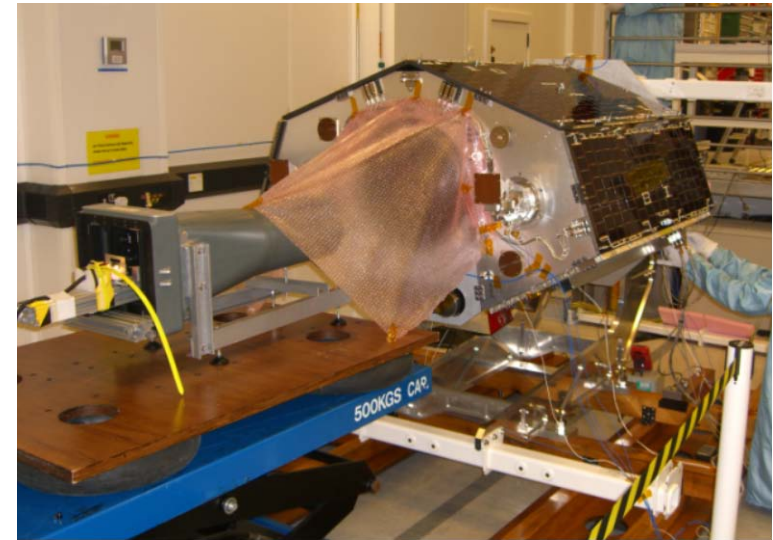
Payload Optical Bench Assembly



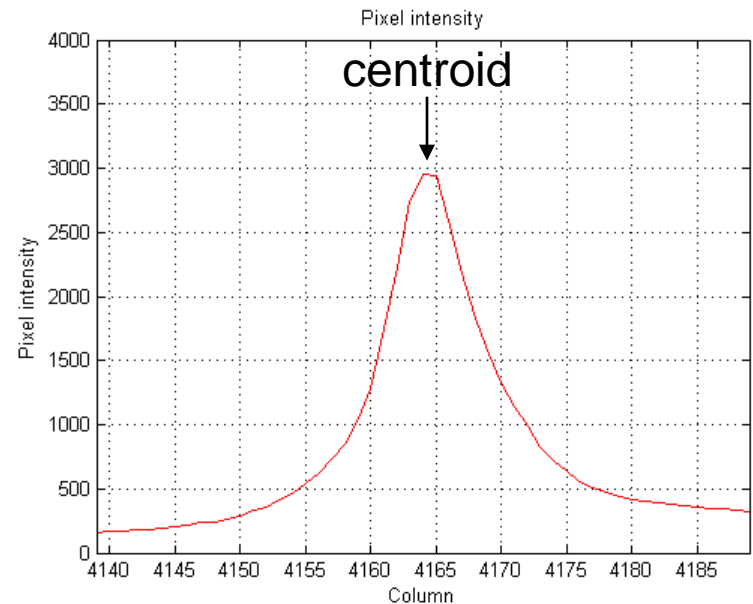


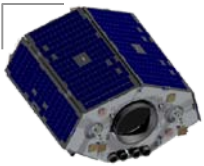
# Micro-vibration Testing

- Testing of fully assembled spacecraft
- Isolated from environmental noise
- Payload used to measure induced mirror motion
- Illumination centroid monitored while Microwheels and Antenna Pointing Mechanisms are running



One Pixel





# Conclusions

- Requirements for competitive Earth Observation platforms are wide-ranging:
  - Full Range of products
  - High Capacity
  - Excellent temporal resolution
  - Exceptional Image quality
- SSTL-300 platforms provide all of this in a Small Satellite solution.



