DEIMOS-2: Cost-Effective, Very-High Resolution Multispectral Imagery

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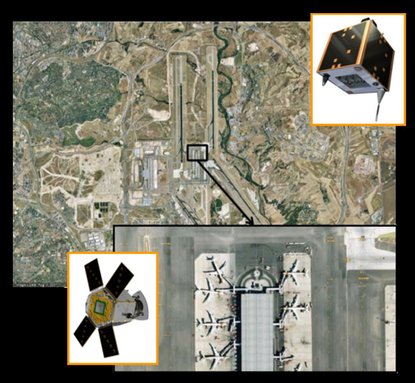
The DEIMOS-2 Mission Concept

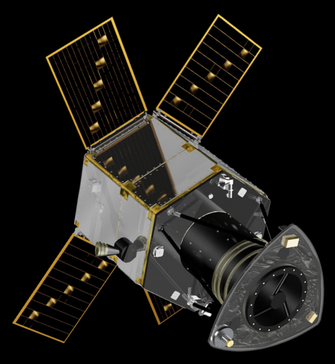
- The DEIMOS-2 end-to-end system has been designed to provide a **cost-effective** and **highly responsive** service to cope with the increasing need of fast access to very-high resolution imagery
- It **expands Elecnor Deimos Imaging portfolio**, complementing DEIMOS-1 with VHR multispectral imagery (1m Pan, 4m MS)
- The combined use of DEIMOS-1 (22-m) and DEIMOS-2 (1-m) will provide a wide range of capabilities for the generation of products in all optical Earth Observation market segments



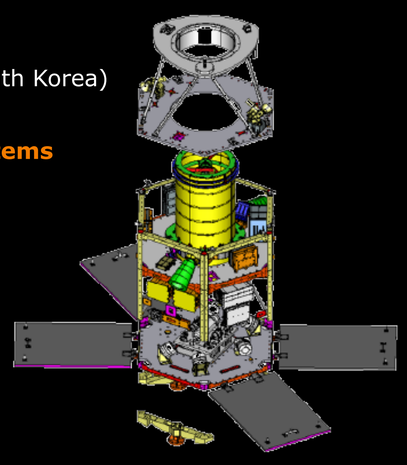
- With DEIMOS-2 Elecnor Deimos expands its capabilities into satellite integration with the creation of a new subsidiary: **Elecnor Deimos Satellite Systems**
- Its facilities are under construction in Puertollano (Spain), and will be ready in July 2012
- The premises will include more than 4,000 m² office space, a 430-m² clean room and a complete control centre with a 10-m X-band antenna

The Satellite

- The satellite is being developed together with **Satrec Initiative** (South Korea)
- Based on SpaceEye-1 concept (heritage from DubaiSat-1 and -2)
- It will be **integrated and tested in Elecnor Deimos Satellite Systems** premises in Spain

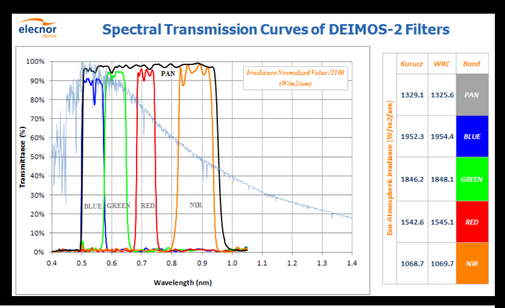


- Mass: 300 kg
- Size: Ø 1.5 m x 2.0 m
- Agile platform (±45º across-track)
- High-performance AOCS for pointing accuracy & stability
- 4 GaAs solar panels (450 W EOL)
- Dual redundancy in all critical systems
- Xenon gas thrusters (HEPS) for orbit control
- X-band antenna for 160 Mbps data transmission
- S-band antenna for telemetry & telecommand

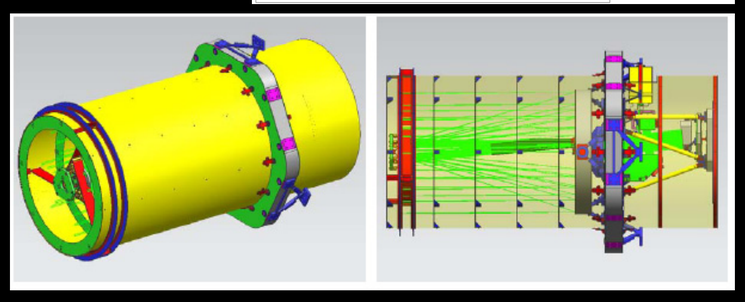


The Payload

- EOS-D pushbroom camera with multi-linear TDI sensor
- 40-cm Korsch telescope (5.75 m focal length, 1.2º FoV)
- **Spatial resolution of 1m Pan, 4m Multispectral**
- **Swath >12 km**
- **Pan** (450-900 nm) **+ 4 bands** (R,G,B, NIR)
- Radiometric resolution **10 bits**

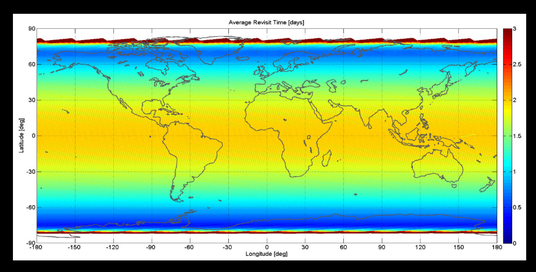


- Images are stored on a high-capacity solid-state recorder
- During transmission of the stored image data using X-band transmitter, the solid-state recorder **compresses, encrypts and encodes the data in real time**

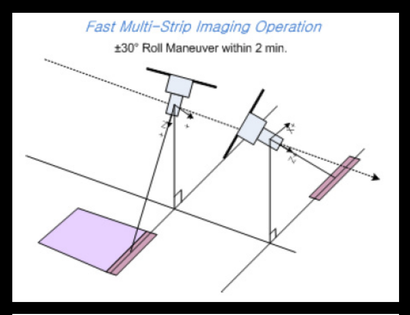


Imaging Capabilities

- **Fast Multi-Strip** Imaging with 12-km swath (up to 1,400 km long)
- **Single-pass Stereo** Imaging
- **Single-pass Wide-Area** Imaging (24-km swath)



- Nominal acquisitions: ±30º roll angle
- Emergency acquisitions: ±45º roll angle
- **Average revisit time of 2 days, worldwide**, in emergency mode



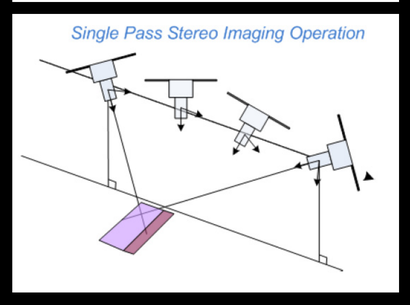
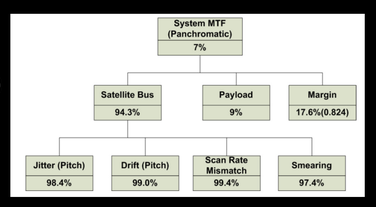
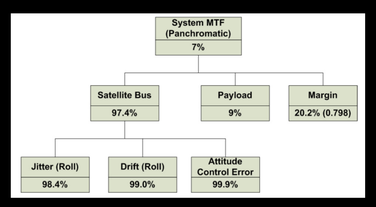
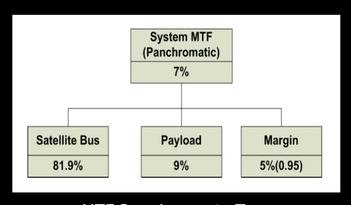


Image Quality

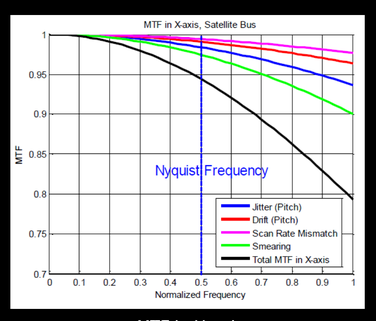
- **MTF Pan**: >7% (at Nyquist)
- **MTF Multispectral**: >15% (at Nyquist)
- **SNR**: >90 (at nadir)



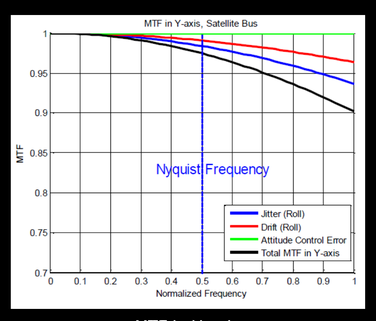




MTF Requirements Tree



MTF in X-axis

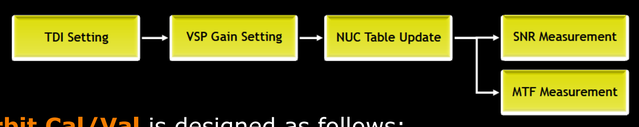


MTF in Y-axis

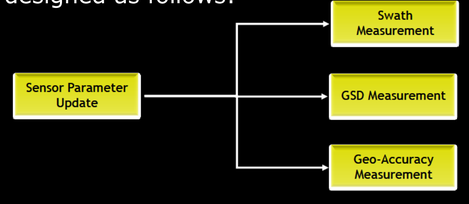
Cal/Val

Pre-Launch Cal/Val activities include:

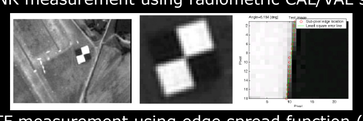
- Pixel Line-of-Sight (LOS) measurement
- Field of View (IFOV, FOV, EFL) measurement
- Spectral responses measurement
- CCD response uniformity measurement
- SNR measurement



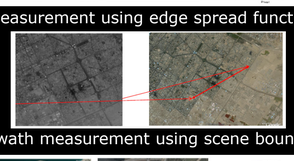
- **In-Orbit Cal/Val** is designed as follows:



SNR measurement using radiometric CAL/VAL sites

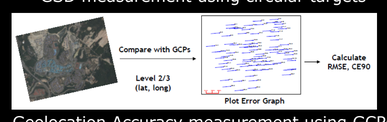


MTF measurement using edge spread function (ESF)



Swath measurement using scene boundary

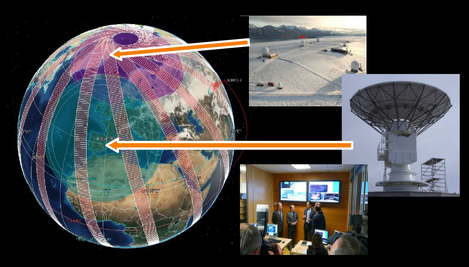
GSD measurement using circular targets

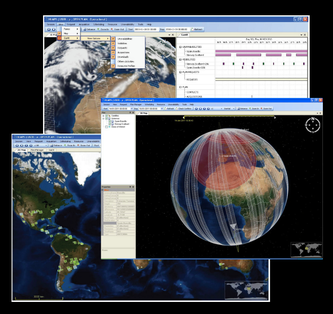


Geolocation Accuracy measurement using GCPs

The Ground Segment

- **2 ground stations** with 10m X-band antennas (Svalbard, Norway and Puertollano, Spain) assure one contact every orbit
- **The Ground Segment is completely developed within Elecnor Deimos**, using the large heritage and know-how of more than 10 years of Earth Observation projects for the European Space Agency



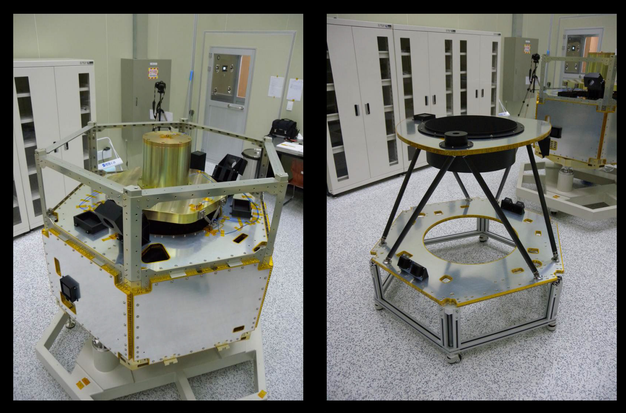


- **High-end but very cost-effective ground segment**
- The Mission Control, the Flight Operations, the Payload Data Processing & Archiving will be duplicated in Boecillo and Puertollano premises, to assure redundancy
- The advanced mission planning software (**PlanEO**) developed in-house for DEIMOS-1 is being customized for DEIMOS-2 operations

Development Status

- The development is fully on schedule
- PDR (Preliminary Design Review) in May 2011
- CDR (Critical Design Review) in May 2012
- FRR (Flight Readiness Review) in May 2013
- **Launch is scheduled for 4Q 2013**

DEIMOS-2 Qualification Model, March 2012



DEIMOS-2 Structural Model, March 2012

- Operational orbit: Sun-Synchronous at 620 km
- Local time at ascending node: 10h30
- Lifetime: >7 years

JACIE 2012 - Civil Commercial Imagery Evaluation Workshop
Marriot Hotel
Fairfax, VA
April 17-19, 2012

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