

Mission requirements and satellite overview

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- **Defence needs**

- ✓ Fulfil the Defence needs on confidentiality and security

- **Civilian needs**

- ✓ Fulfillment of the different needs of institutional users (National and International, i.e. GMES) scientific users commercial users
- ✓ Large quantity of civilian images to be acquired
- ✓ Open access to the system via public networks (internet)

- **Common needs**

Priority: Very urgent requests have highest priority

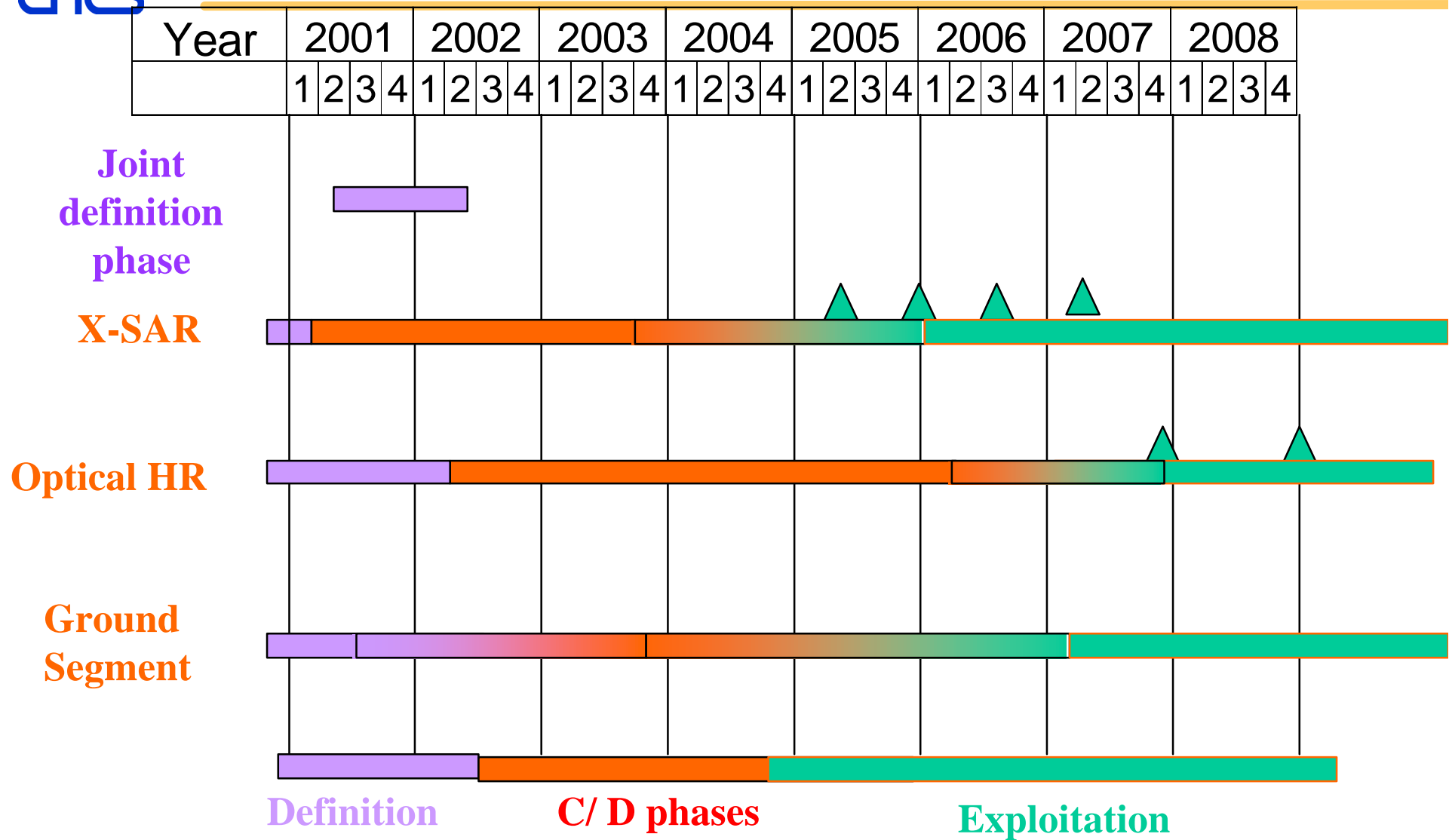
High Reactivity: Acquisition and delivery delays should be very short

- Three operational modes are specified in the mission requirement document:
 - Routine mode
 - daily basis mission planning, 7 days a week
 - Crisis mode
 - 12 hours mission planning, absolute priority on crisis area
 - Very urgent request
 - Reduce the programming delay to allow late introduction of emergency requests (PLEIADES will be used in GMES frame)
- Great care is taken to design a global system with high reactivity, reducing data acquisition and data dissemination delays.



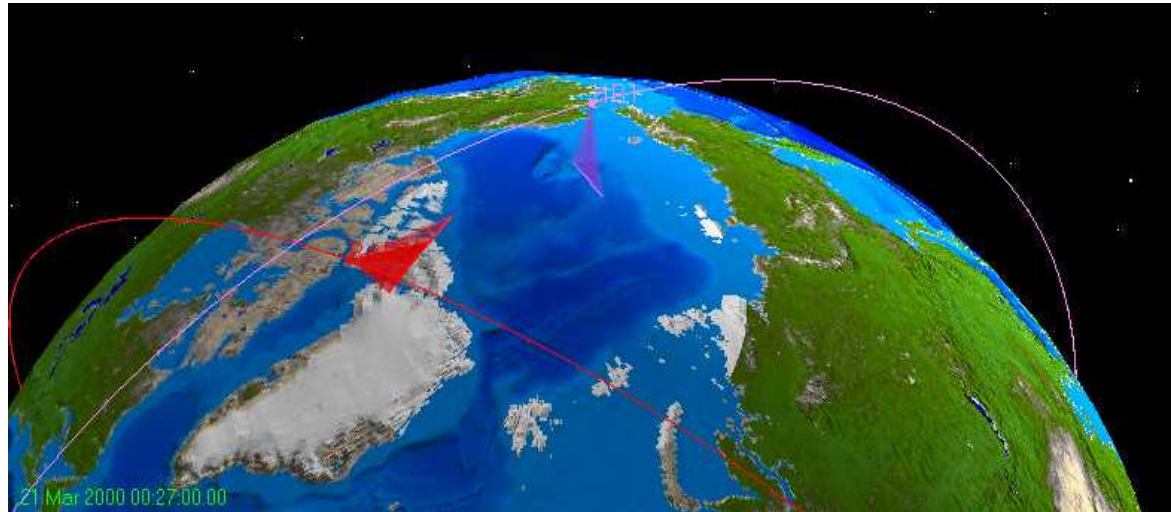
Dual System development planning

PLEIADES



Pleiades main characteristics

- 2 satellites phased at 180° (revisit time 24 hours)
- phased sun-synchronous 14+15/26
- altitude 695 km
- equator cross time around 10h30

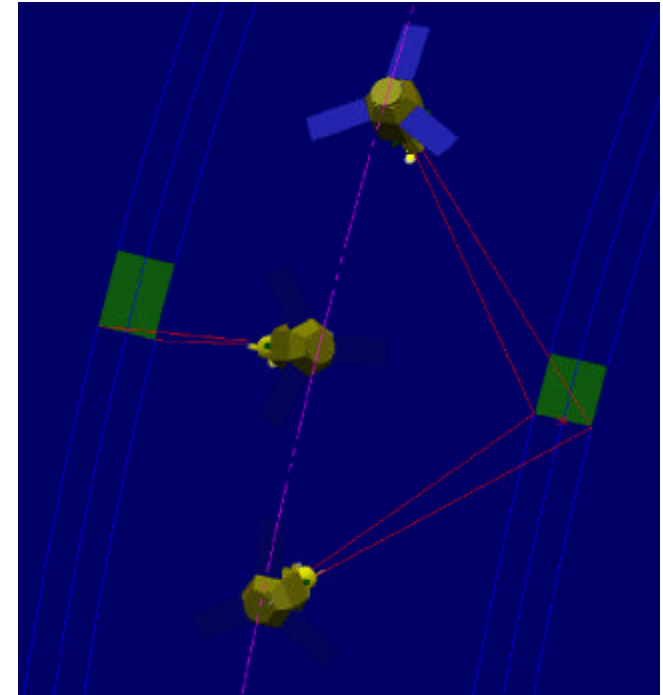


– Radar

- 4 satellites phased at 90° (revisit time 12 hours)
- phased sun-synchronous 14+13/16
- altitude 620 km
- equator cross time around 6h00

- Main specifications
 - revisit time less than 24 hours need of 2 HR satellites
 - reference daily capacity: 250 images per satellite
- performance domain : 30° half-angle cone
- instrument :
 - 20 km nadir swath
 - panchromatic résolution < 1.00 m in the performances domain (0.70 m at nadir)
 - 4 spectral bands :
 - resolution : 4 times PAN resolution
 - SPOT bands + blue band (=> natural color)

- Agility
 - roll and pitch:
 - 5° in less than 8 seconds
 - 10° in less than 10 seconds
 - 60° in less than 25 seconds
 - stereo and tri-stereo imaging capabilities
 - single pass multi-bands mosaiking
- Product localization on reference ellipsoid with a “perfect” DTM:
 - 12 m (circular error with 90% of probability)
 - 24 m (circular error with 99,7% of probability)



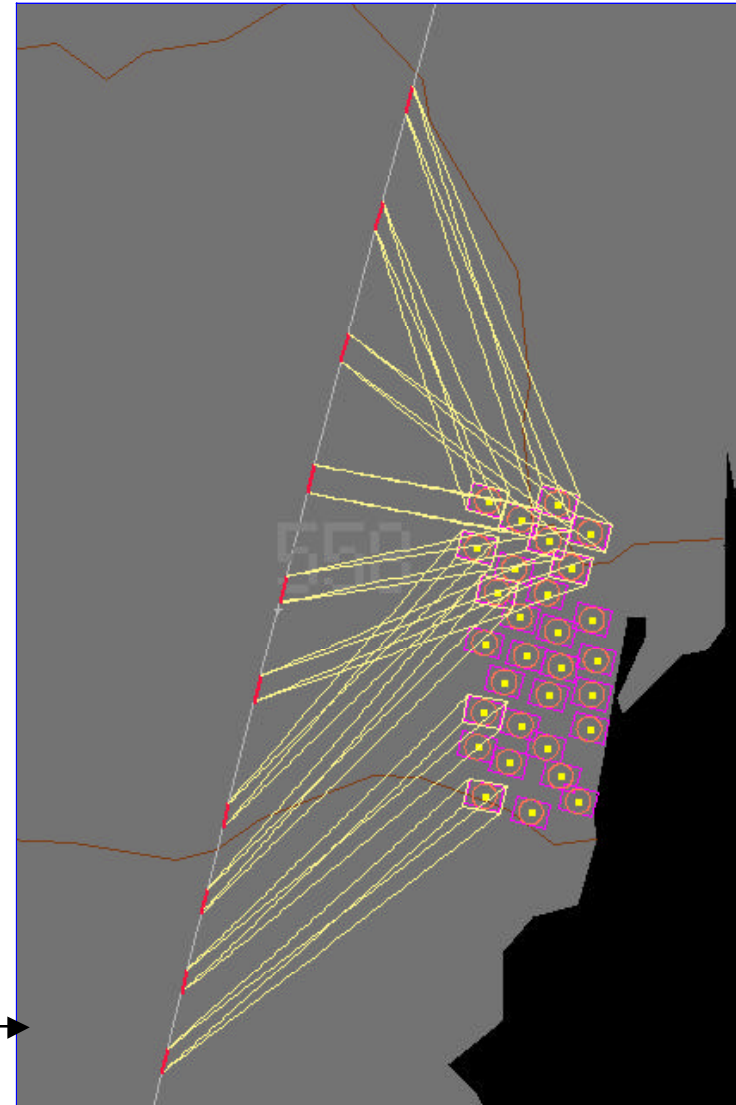
"Instantaneous" capabilities:

Crisis area:

- Over an area of interest of 100 x 200 km².

- 11 targets in one pass for 20° viewing angle authorised access
- 16 targets in one pass for 30° viewing angle authorised access

Example of 20° viewing angle in roll and pitch combined (10 images)



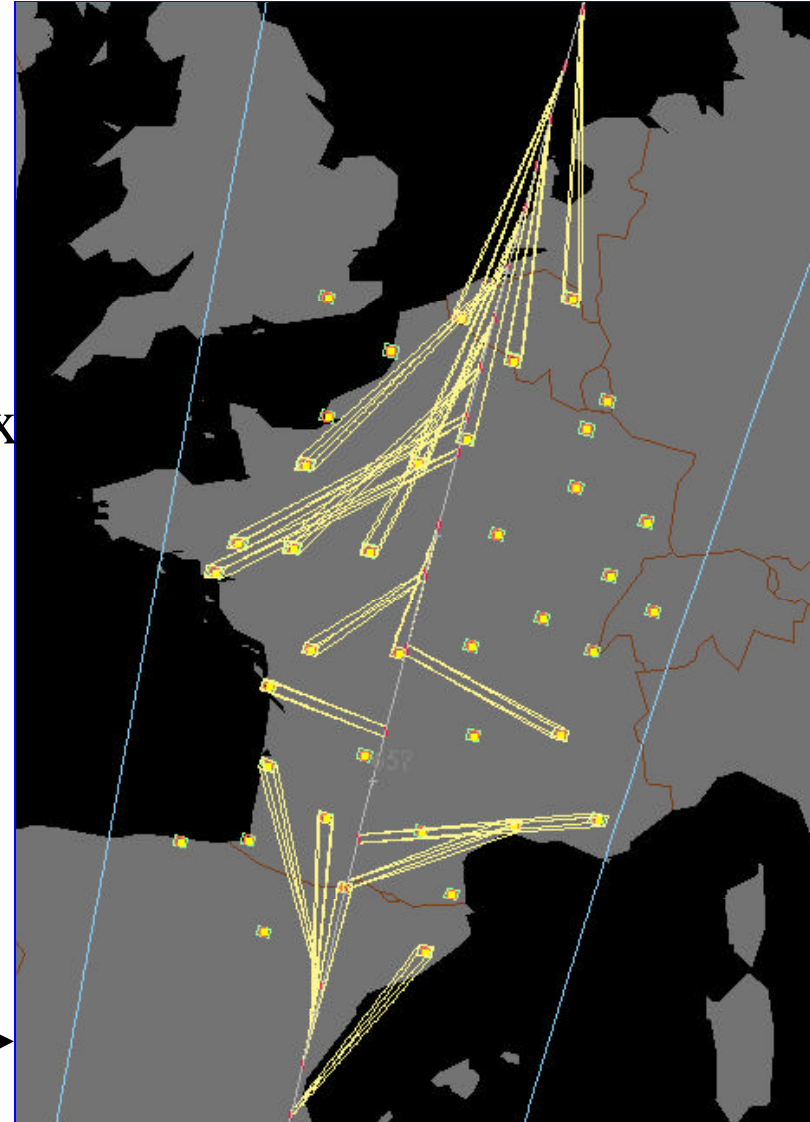
"Instantaneous" capabilities:

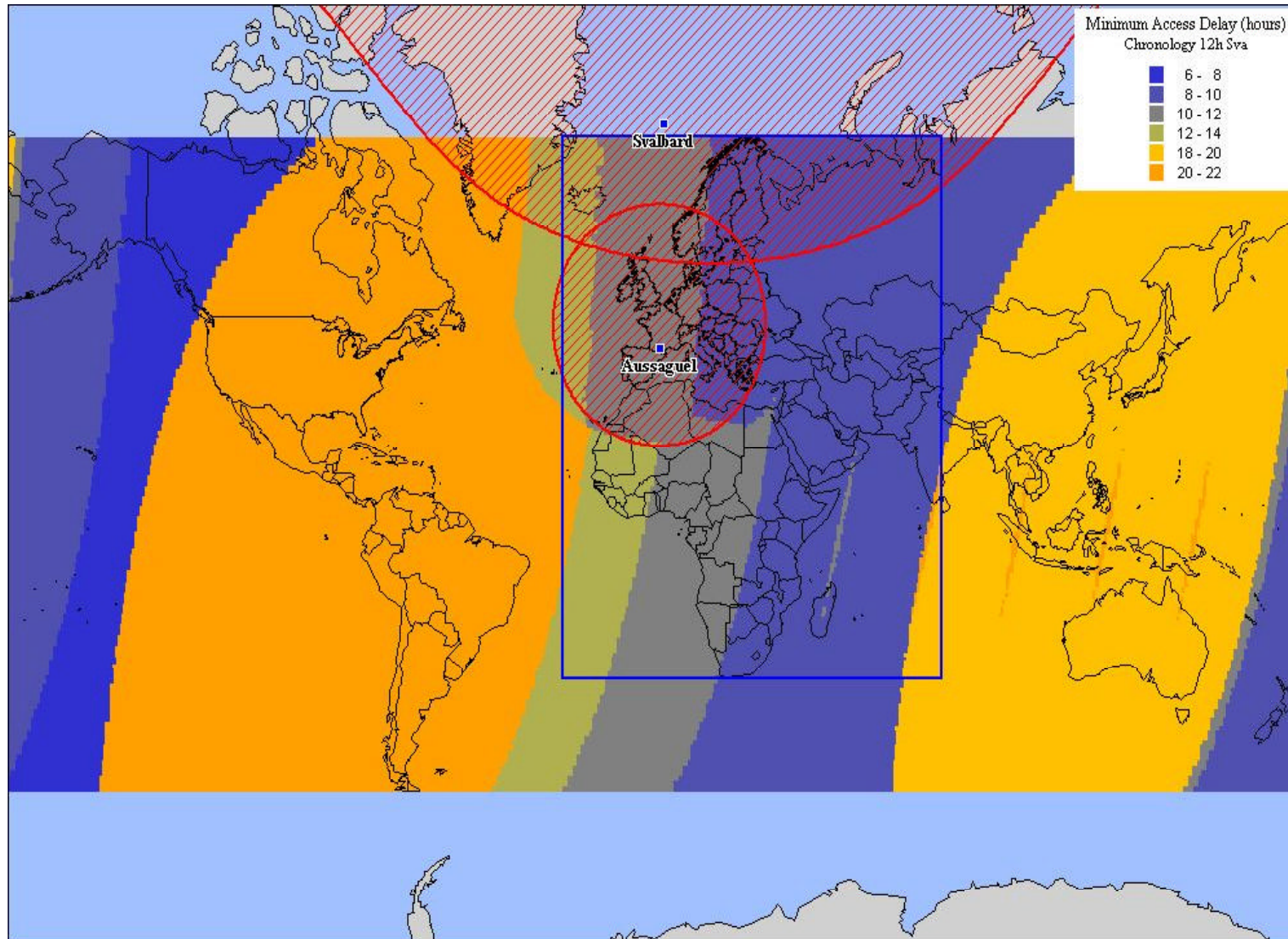
Commercial mission over Europe:

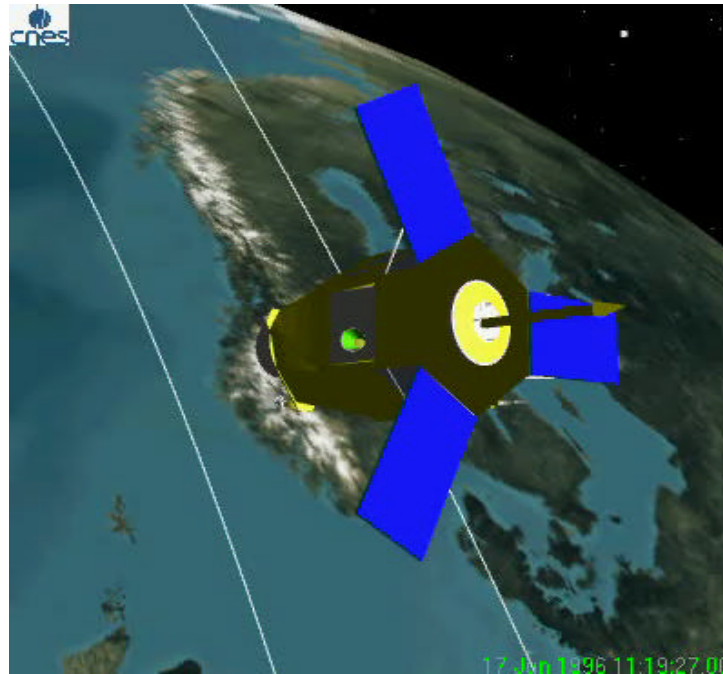
- Over an area of interest of 1000 x 1000 km².

- 19 targets in one pass for 20° viewing angle authorised access
- 21 targets in one pass for 30° viewing angle authorised access

Example of 30° viewing angle in roll and pitch combined (20 images)







The Pléiades High Resolution optical satellite

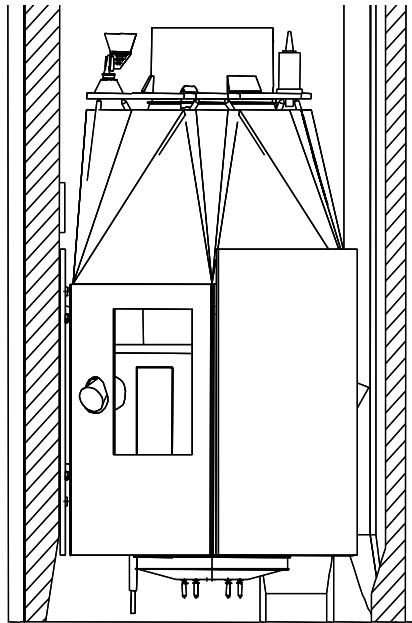


Pleiades HR Satellite

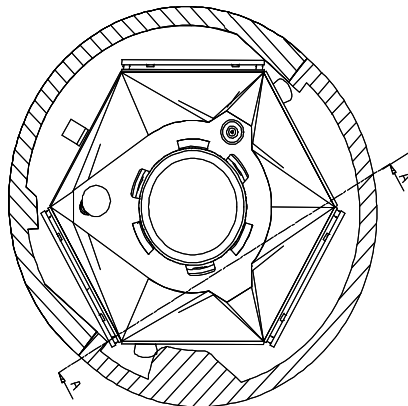
A new concept for European Earth Observation

PLEIADES

- Pléiades HR satellite
 - New generation of sub-metric Optical Earth Observation mini-satellite ready for 2007
 - Including new generation technologies for the satellite allowing high system performances
- Industrial organization highlights
 - Cnes is in charge of the system development
 - Astrium is prime contractor for the satellite and the bus
 - Alcatel is prime contractor for the optical instrument



Under Rocket fairing configuration



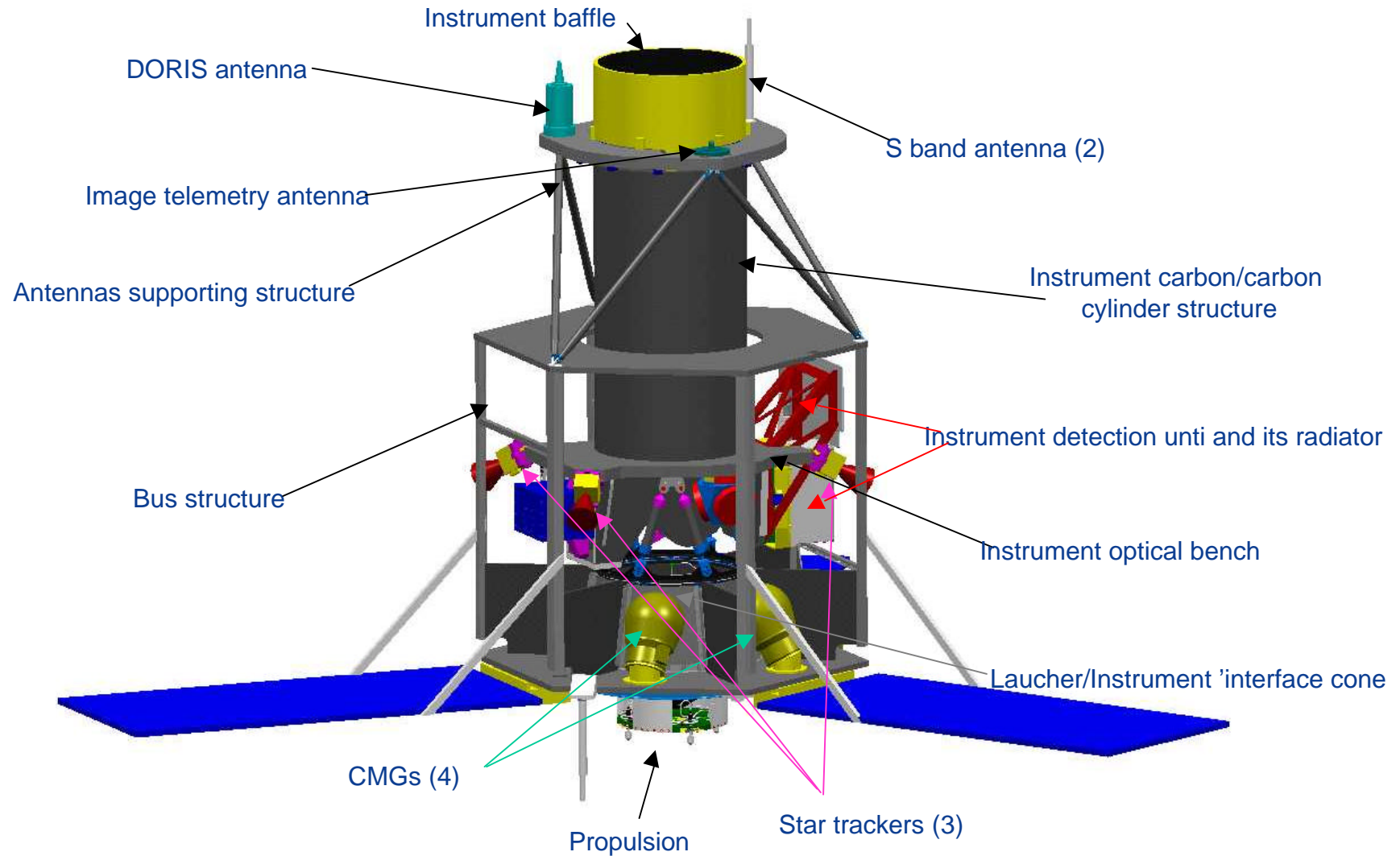
- **Low mass (<1000 kg) and high compacity allowing small launchers compatibility**
 - Rockot, Soyouz, Vega, ...
- **High performances optimized design**
 - **For agility**
 - Vertical instrument inside the bus for volume and inertia minimization
 - High stiffness fixed small solar arrays (three panels)
 - **For Image Quality**
 - Instrument mounted on the launcher interface cone with isostatic truss
 - Fine sensor heads mounted on the instrument for maximum geometrical quality accuracy

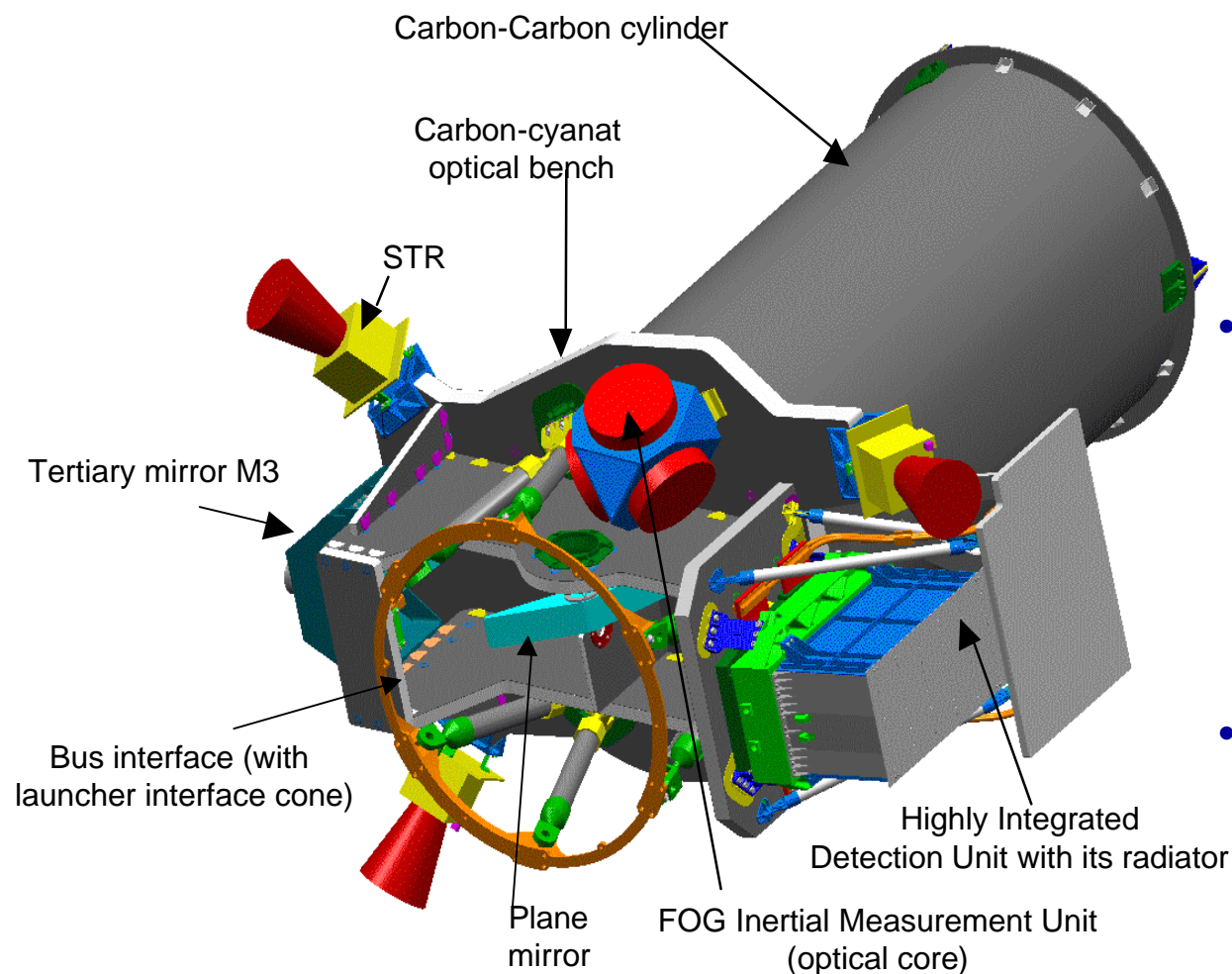


Satellite In-flight configuration

Satellite architecture

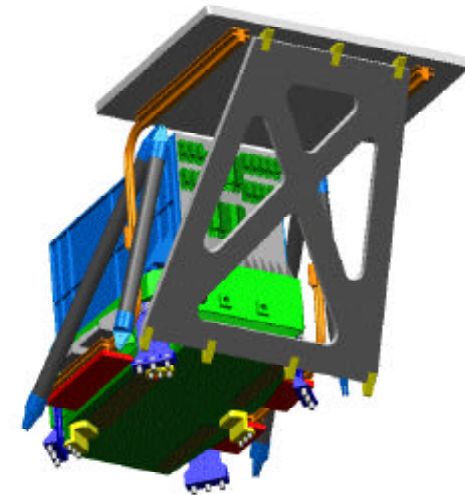
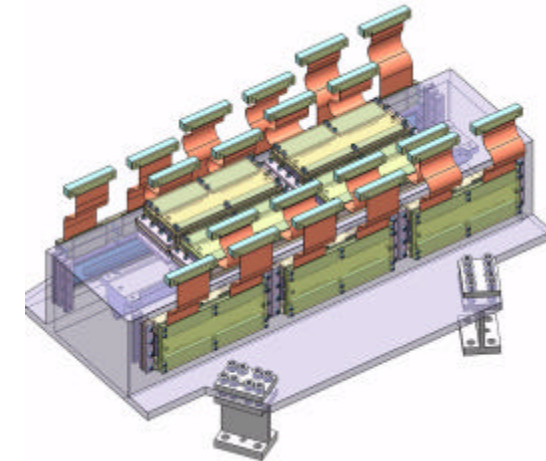
Instrument accomodation into the bus





- Optical design based on Korsch solution
 - Focal length of 12.9 m
 - Primary mirror with 650 mm diameter
 - Three zerodur mirrors plus one plane mirror
- Mechanical Design
 - Central plane structure supporting all telescope elements
 - M1, M3, plane mirror, fine sensors
 - Carbon-Carbon cylinder for M1-M2 structure
- Thermal design
 - Passive cooling plus heaters
 - Cold tube M1-M2
 - Decoupled detection unit with heat pipes and dedicated radiator

- Detection Unit Focal plane
 - 5 TDI Panchromatic detectors of 6000 pixels each with lateral anti-blooming
 - 20 to 50 lines of integration
 - 5 4-color detectors of 1500 pixels each
- Detection Unit proximity electronics
 - 5 PAN and 3 XS in dedicated PCB's housed behind the focal plane providing analogical video processing and A/D conversion
 - Pan detector output : 58 Mpixel/s
 - Total Pan output : 3.5 Gbit/s
 - Total XS output : 0.875 Gbits/s



- Compression Unit based on wavelet algorithm ASICs with mean ratio of 2 bits/pixel in panchromatic band and 2.5 bits/pixel in XS bands
 - Input rate of ≈ 4.5 Gbit/s
- Mass Memory Unit of 600 Gbits (EOL) storage capacity
 - 1.5 Gbit/s max input rate,
 - auxiliary data (satellite attitude and position) through 1553,
 - three 155 Mbit/s outputs
- Image Telemetry
 - Three parallel trellis-coded 8-PSK modulators in X band coupled to travelling waves tubes power amplifiers (TWTA)
 - One omni-directional 64° conical aperture antenna

