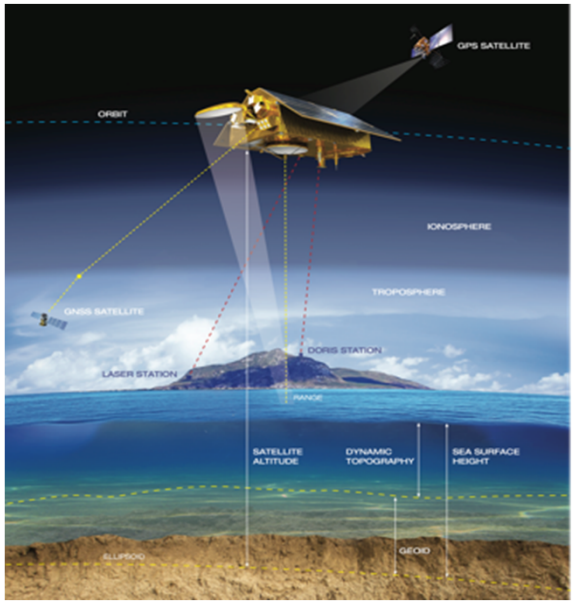
Sentinel-6 / Jason-CS

OSTST meeting 2018 - Status of the project

F.Parisot, P.Vaze, J.Loving, G.Tavernier, P.Vuilleumier

Sentinel-6/Jason-CS Mission Overview

- Operational ocean altimetry to provide continuity of ocean topography measurements beyond Jason-3;
- Global sea surface height to an accuracy of ≤ 4 cm every 10 days, for determining ocean circulation, climate change and sea level rise;
- NASA, EUMETSAT, ESA and NOAA partnership with CNES providing technical support;
- Operational mission as part of a *two-satellite* European Copernicus/Sentinel program.



- Ku/C-Band Radar Altimeter (Next gen Poseidon: Thales);
- DORIS (Precise Orbit Determination System);
- GNSS Receiver (POD System);
- Advanced Microwave Radiometer – Climate Quality (AMR-C);
- GNSS-Radio Occultation (GNSS-RO);
- Laser Retro-Reflector Array (LRA).

- Launch Vehicle: NASA (Space X, Falcon 9);
- Spacecraft Bus (Airbus: CryoSat/S2 Heritage);
- Mission life of 5½ years (sized for 7½ years);
- 1336 km Orbit, 66º Inclination.
- **Launch of Jason-CS A in November 2020**

System activities and status

- System (EUMETSAT coordinator with partners contribution)
  - System PDR close out in November 2017.
  - System Check point 1 (SCP 1) in April 2018 and SCP 2/CDR planned end of November 2018
  - Several multi partner working groups addressing system engineering, performances and science are in place and active.
    - Interface Control Documents and technical budget are being baselined
    - Multi partner system IV&V plan has been agreed, Test specifications and procedures are in preparation
    - System Requirement Verification Control Document agreed with partners
    - **Pre launch Mission Performance Budget has been drafted and will get consolidated with first instrument/satellite test results**
    - **CAL/VAL Concept and CAL/VAL Implementation plans have been drafted**
    - Operation documentation (Ops development plan, Routine operation plan…) available
    - SSVT plan has been agreed with ESA, first SSVT will take place in November 2018
  - Next MAG meeting hosted by EUMETSAT on 16/17th January 2019

Ground segment status

- EUM Ground segment
  - OGS PDR conducted in October 2017;
  - Payload Data Acquisition and Processing contract kicked off, Design Key Point organized in July 2018
    - This element host the altimeter and AMR processors and interfaces with the ground stations for data acquisition
    - V1 delivery on schedule for March 2019, fully representative in terms of data circulation, allows to start interface testing.
    - Launch critical version V2, planned for March 2020
    - Product format and product generation specifications reviewed by experts and consolidated, GPP outputs available
    - First version of JPL developed AMR-C processor delivered to PDAP contractor
  - Mission control and Multi Mission Element delta development on going, first SSVT (Ground system test with the satellite or its representative test bench) in November 2018

ESA project status

- Satellite
  - Satellite A integration is on going.
  - Poseidon-4 in production ; corrected ASIC available in EM ; HPA issue.
  - EM altimeter to be delivered in February 2019 to satellite AIT.
  - DORIS in production.
  - Satellite B integration will start end 2018 in a new clean room.

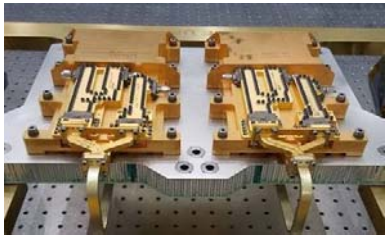
- Processors prototyping
  - Level 1 and Level 2 prototypes delivered (algorithms and verification data).

- Schedule
  - Satellite A FAR Q2 2020.
  - Launch satellite A November 2020.

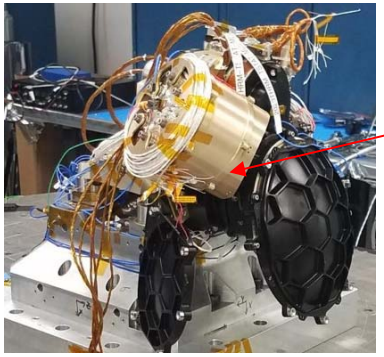
NASA Status (1) – AMR-C

- All major flight HW sub-systems successfully completed fabrication and sub-system testing.
- S6-A Instrument Integration & Test is in Progress.
- Focus on New On-board calibrator (SCS) to provide 2-point (warm/cold) stable reference to maintain path delay drift correction to less than 0.7 mm/year.
- HRMR (high-frequency radiometer channels (90,130,168 GHz) shares main AMR antenna.
- All flight HW completed.
- Testing meeting all major performance and science requirements.
- Delivery S6-A AMR-C on-schedule: March 2019.
- S6-B instrument build underway with delivery planned ~6 months after S6-A instrument.

Radiometer Electronics



Radiometer On-board Calibrator

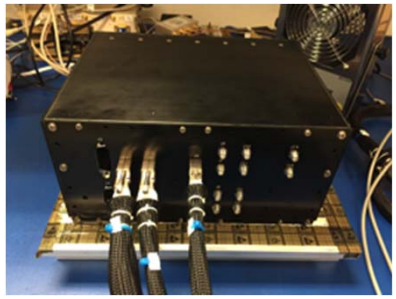


Radiometer Antenna

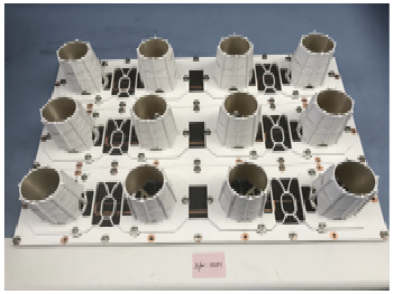
NASA Status (2)

GNSS-RO (Radio Occultation measurements for numerical weather modelling)

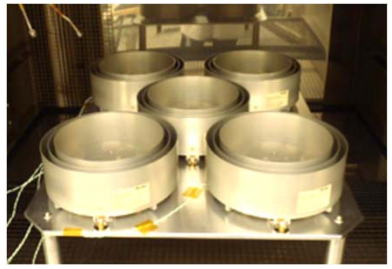
- POD and RO Antennas complete
- GNSS receiver electronics built and flight software testing in-progress
- Delivery by end 2018



GNSS Receiver Electronics



GNSS RO Antenna



GNSS POD Antennas

Laser Retroreflector Array (LRA): Complete & ready for installation on spacecraft

SpaceX Launcher development well underway. Completing early interface and mission analysis

NOAA status

- NOAA Ground segment
  - Network Expansion (N-Wave) contract awarded July 2018
    - Primary link between Seattle & Fairbanks to support higher bandwidth requirements to be completed Oct. 2018
    - Redundant 1 Gbps link funding is committed, solution covers end-to-end throughput.
  - ICD's under review by Security to obtain Interim Authority To Test (IATT)
  - Separately Configured CaTT's (Command and Telemetry Transceiver) for Jason-CS
    - S-Band CaTT contract to procure SLE (Space Link Extension) Services awarded August 2018
    - S-Band CaTT currently undergoing SLE software/firmware integration
    - RF Suitcase testing slot identified for Fairbanks (May-July 2019)
    - X-Band CaTT FAT (Functional Acceptance Test) February 2019

CNES

- Expert support
  - To ESA/AIRBUS: instruments (POD, topography mission)
  - To EUMETSAT: system engineering, mission analysis
  - 5-partner: book captain for Mission Performance Budget
  - 5-partner: CAL/VAL plan

- Studies
  - Poseidon-4 simulator
  - Poseidon-4 performance assessment (SAR-Raw & LRM)
  - On-board RMC processing impact
  - Fully-focused SAR
  - New OLTC tool

CNES

- Ground segment
  - DORIS services (operations, monitoring, software maintenance)
  - Support in the update of Poseidon-4 DEM/OLTC
  - POD services (MOE STC, POE NTC, DORIS, GNSS & SLR)
  - L2P/L3 products
  - Instrument and offline altimetry products quality monitoring
  - Contribute to CAL/VAL
  - Build-up: mid 2019

- Interactions with the science community
  - MAG
  - OSTST