



EUMETSAT/NOAA

Jason-3 and Jason-CS



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Jason-3 – 1

- All Agreements have been signed
- Funding commitments have been obtained
- Partnership as for Jason-2, but:
 - NOAA and EUMETSAT – operational agencies – taking the lead
 - CNES serves as the system coordinator
 - All Partners – including NASA – support science team activities
 - Overall, **responsibilities sharing** has changed, but **activities sharing** remains almost the same as for Jason-2
- Launch date in mid 2013 to allow at least a 6-month overlap with Jason-2
- Orbit: Traditional T/P-Jason orbit – non-sun-synchronous, 1336 km, 66 deg inclination...
- Will use the last remaining PROTEUS platform



Jason-3 – 2

- Flight segment
 - Objective is to be as recurrent as possible from Jason-2, but carbon copy is not feasible after 7 years
 - Some changes in the instrumentation (mostly in GPS & DORIS)
 - New launcher: Delta II unavailable in 2013; candidates have been identified; compatibility/impact assessments are on going
- Ground segment
 - No major modification anticipated
 - Simultaneous Jason-2 and -3 operation needs to be taken into account
- Products/performance to be at least as good as Jason-2



Jason-CS Programmatic Context – 1

The approval process for Jason-3 was long, difficult and complex:

1. A reference altimetry mission based on the CryoSat-2 platform was made by ESA (Jason-CryoSat) as alternative to Jason-3
2. This evolved into the “Hybrid Solution”:
 - [First] Approval of **Jason-3** mission (today approved and in development)
 - [Then] Initiation of a Continuity of Service program (**Jason-CS**) as the follow-on Reference Mission spanning a 15- to 20-year period

Current programmatic constraints/assumptions for Jason-CS:

1. Spread the work across the Member States in Europe
2. At least a two-satellite program following the example of the Meteorological satellite programmes
3. Maintain collaboration between the U.S. and Europe



Jason-CS Programmatic Context – 2

- **What will remain the same?**
 - At least the same level of performance for Jason-CS as the Reference Mission of the OST Constellation
 - Continuation of existing partnership between the U.S. and Europe, but the detailed sharing of responsibilities has not yet been defined
- **What has changed/will change?**
 - Capability required to mitigate orbital debris
 - New satellite bus based on Cryosat
- **What may change?**
 - Altimeter – duplicate performance of Jason-3 or take advantage of recent developments?
 - The orbit



Current Status

- First draft of a Mission Requirements Document (MRD) has been prepared
- An outline of the Programmatic and Assumption Requirement Document (PARD) is in preparation
- Phase B1 (Industrial studies contracted by ESA) is about to be kicked off
 - Detailed analysis of the changes from Cryosat-2 to Jason-CS
 - Accommodation of payload
 - Satellite subsystems

Orbit definition is needed

- Orbit analyses have been made (CLS and Hamburg studies) suggesting the feasibility of lower orbits



The Agencies would like:

A clear **scientific** recommendation

- Acceptance of a change of orbit to meet the definition of reference climate mission and a ranking of preference for the proposed orbits
 - or –
- Justification for keeping the Jason orbit



Process for Orbit Selection

- Scientific recommendation by the OST ST
- The agencies will in parallel assess the other factors such as the incentive for a lower/different orbit
 - Potential reduction in launch cost
 - Potential extended lifetime due to decreased radiation
 - Potential improved instrument performance
 - Better prospects for orbital debris mitigation (see back-up slide)
 - Better high-latitude coverage
- And the incentives for remaining in the current orbit
 - Improved capability for the inter-calibration between Jason-3 and Jason-CS required to maintain the climate record of sea level
 - High-latitude, as well as mesoscale sampling, can be provided by other altimeters in the OST Constellation
 - Orbital debris at 1336-km is less a threat than at lower orbits



Schedule

- **This week**
 - Monday and Tuesday – Discussion during Splinter Sessions
 - Tuesday 18:20 Town Hall meeting – Science Requirements for the Jason-CS Orbit, including brief reports from Splinters
 - Wednesday 9:30 Plenary Session – Future Altimetry Mission and Orbit Choice – Synthesis of discussions
- **Until the end of 2010**
 - Complementary analyses as needed
 - Inter-calibration to be addressed
 - Detailed assessment by the agencies of any other factors
- Final choice in early 2011



Back up slides



Space Debris Mitigation

Context : Due to the growing amount of space debris, the international community has been taking steps to develop debris mitigation guidelines for routine activities in space:

- UNCPUOS (United Nations Committee on the Peaceful Uses of Outer Space)
- IADC (Inter-Agency Space debris Coordination Committee)
- European Code of Conduct for space debris mitigation
- ESA and NASA have developed their own requirements to address Space Debris Mitigation

As a consequence : We (the agencies) have to take this into account in the design and operation of new projects.

- Impact on Jason-CS for various orbits – including the T/P-Jason orbit – will be assessed in the context of the Phase B1 activities

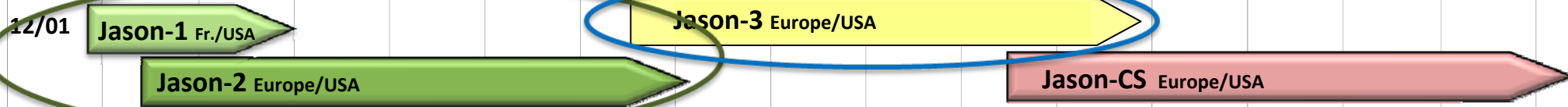
But the objective of discussions this week is not space debris mitigation, but rather the orbit recommendation for the Reference Mission

Which near-term missions have not agreed to provide access to their data for operational use?

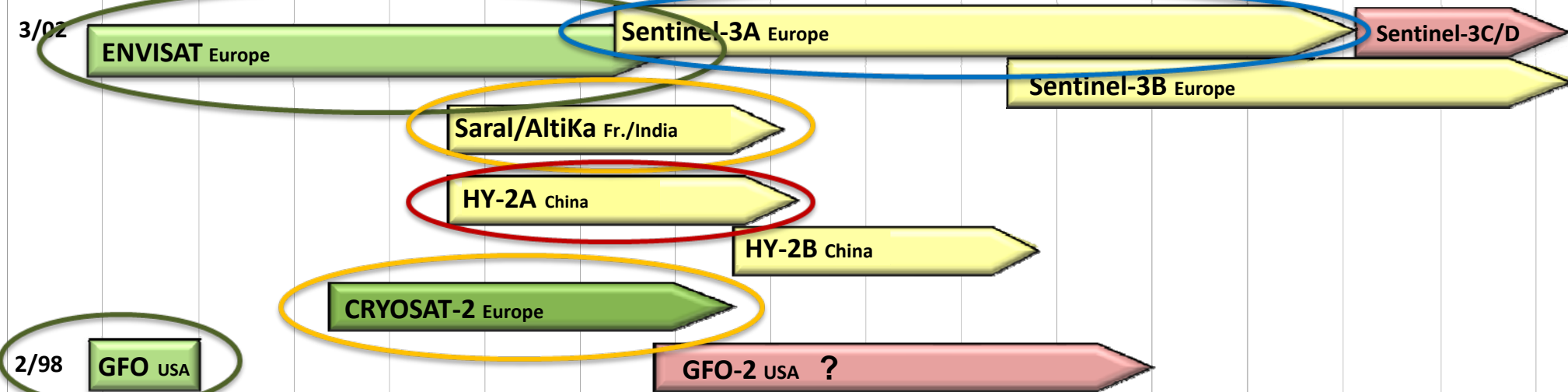
GLOBAL ALLIUMETER MISSIONS

Launch Date	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
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Reference Missions - Higher Accuracy/Medium Inclination



Complementary Missions - Medium Accuracy/Higher Inclination



Broad-Coverage Mission



Jason-3 MOU Mission Partnership Responsibilities

NOAA responsibilities:



- Lead with EUMETSAT the Jason-3. Program
- Provide support to the overall system engineering.
- Provide the U.S. payload consisting of the AMR radiometer, a LRA retroreflector and a GPSP positioning receiver package.
- Provide launch services compatible with the Jason-3 satellite and the mission requirements.
- Provide and operate a command and control center for the satellite, command and data acquisition stations.
- Provide and operate near real-time data processing for data collected by NOAA ground stations.
- Provide dissemination of all near real-time data products (NOAA and EUMETSAT) and offline data products.
- Provide a long-term archive of all near real-time and offline data products including telemetry, orbital and auxiliary data sets.
- Support the relevant Research Announcement process, and assess the relevance of investigation results for future operational services.

NASA responsibilities:



- Conduct and coordinate with the partners the preparation and release of relevant Research Announcements.
- Conduct, in coordination with NOAA the selection of U.S. Investigators.

EUMETSAT responsibilities:



- Lead with NOAA the Jason-3 Program.
- Provide support to the overall system engineering.
- Fund the European payload consisting of the Poseidon3B altimeter and the DORIS orbitography receiver package, the payload module and its integration.
- Provide and operate near real-time data processing for data collected by European ground stations.
- Provide dissemination of all near real-time data products (NOAA and EUMETSAT).
- Fund a command and control center for the satellite, a European Earth Terminal and the offline data processing, archiving and dissemination for the Program.
- Support the relevant Research Announcement process, and assess the relevance of investigation results for future operational services.

CNES responsibilities:



- Provide as in-kind contribution : system engineering and associated human resources, standard flightworthy PROTEUS platform, CNES human resources as part of the operations.
- Conduct and coordinate with the partners the preparation and release of relevant Research Announcements.
- Conduct, in coordination with EUMETSAT, the selection of European Investigators.



Jason-3 Mission Partnership Activities

NASA activities:

Project Management

Launch vehicle

Payload

Advanced Microwave Radiometer (AMR)

GPS Receiver (GPSP)

Laser Retro-reflector Array (LRA)

JPL Payload integration and test

Mission Operation support for JPL instruments



NOAA activities:

Project Management

Ground System & Operations

Satellite Operations Control Center (SOCC)

CDA Stations (2)

NRT product processing

All product distribution

All archiving

Ground network

Satellite operations after handover

User interface



CNES activities:

Project Management

Satellite, Proteus bus

Payload

Nadir Altimeter POS3B

DORIS

CARMEN3 - LPT

Ground System & Operations

Satellite Control Command Center (CCC)

OFL product processing and distribution

All archiving

Ground network

Satellite Operations before handover

Navigation, Guidance, Expertise for all mission

System integration & test

Mission Operation support for CNES instruments

System Coordination for all mission phases

User interface



EUMETSAT activities:

Project Management

Ground System & Operations

Earth Terminal (1)

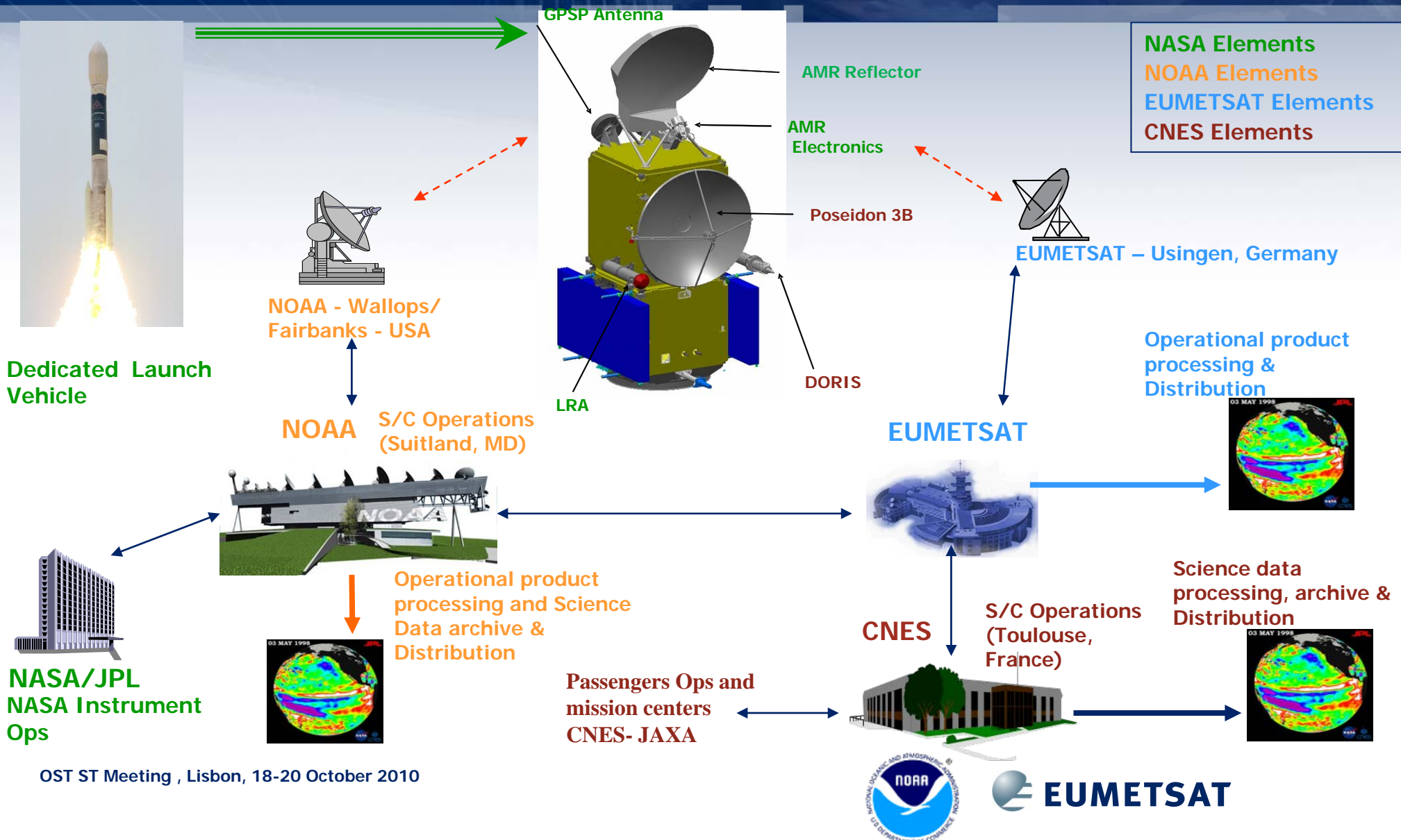
NRT product processing, archiving and distribution

Ground network

User interface



System elements





Incentives for a lower/different orbit

- Reduced Launch Costs
- Extended expected lifetime
- Better deorbiting possibilities
- Optimisation of spatial temporal sampling, in a constellation context
- Higher Inclination to get more polar ocean observations (alignment with SWOT)



Incentives for remaining in reference 10-day orbit

- Guaranteed continuity of climate data record – primary objective of Jason-CS
- Jason-CS will have a new altimeter, new bus, & possibly new radiometer – hence, great need for cross-calibration.
- 10-day orbit provides simultaneous collinear cross-calibration in 'formation-flight' phase. (New orbit will only provide non-simultaneous crossover calibration.)
- Orbital debris at 1336-km much less than at lower orbits, greatly reducing need for avoidance maneuvers and risk of mission loss
- High latitude & meso-scale will be covered concurrently by at least 2 Sentinel altimeters.
- What defines a reference mission if not the present 10-day orbit?