

Copernicus Sentinel-3 Next Generation Topography (S3NG-T) Mission Overview and Status

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- The Copernicus Programme is guided by the “Long Term Scenario”
 - ESA/EU non-binding document defining the timeframes and objectives of all Copernicus missions.
- For Sentinel-3:
 - Satellites A&B are operational in orbit.
 - Satellite C&D are sisterships and will be stored until launched for replacing the models A&B in orbit.
- The LTS is planning “Next Generation” mission beyond Sentinel-1, -2, -3 and -6.
 - In particular, Sentinel-3 Next Generation becomes two separate missions:
 - Sentinel-3 Next Generation Topography (S3-NGT)
 - Sentinel-3 Next Generation Optical (S3-NGO)

This presentation further describes the activities initiated for S3-NGT.

S3-NGT Mission Definition

- Missions are defined from user needs and derived mission requirements.
- S3-NGT has been defined through a convergence process:
 - The Copernicus Programme consulted users to define needs in line with EU policies.
 - ESA is responsible to translate these needs into mission requirements
 - Initially with the “Ad-Hoc Expert Group”
→ Mission Assumptions and Traceability Requirements (MATR)
 - Since Q1 2021, with the Mission Advisory Group (MAG)
→ Mission Requirement Document (MRD)
- The on-going Phase A/B1 studies are aiming at:
 - Deriving System Requirements from the MRD.
 - Define implementation concepts and validate predicted performance.
 - Estimate mission costs and assess risks in support of programmatic decisions.



S3-NGT mission objectives

The primary objectives of the S3NG-T mission are to:

PRI-OBJ-1. **Guarantee continuity** of Sentinel-3 topography measurements for the 2030-2050 time frame with performance at least equivalent to Sentinel-3 in-flight performance ('baseline mission').

PRI-OBJ-2. Respond to evolving user requirements and improve sampling, coverage and revisit of the Copernicus Next Generation Topography Constellation (S3NG-T and Sentinel-6NG) to ≤ 50 km and ≤ 5 days in support of Copernicus User Needs.

PRI-OBJ-3. Enhance sampling coverage, revisit and performance for Hydrology Water Surface Elevation measurements in support of Copernicus Services.

PRI-OBJ-4. Respond to evolving user requirements and enhance topography Level-2 product measurement performance.

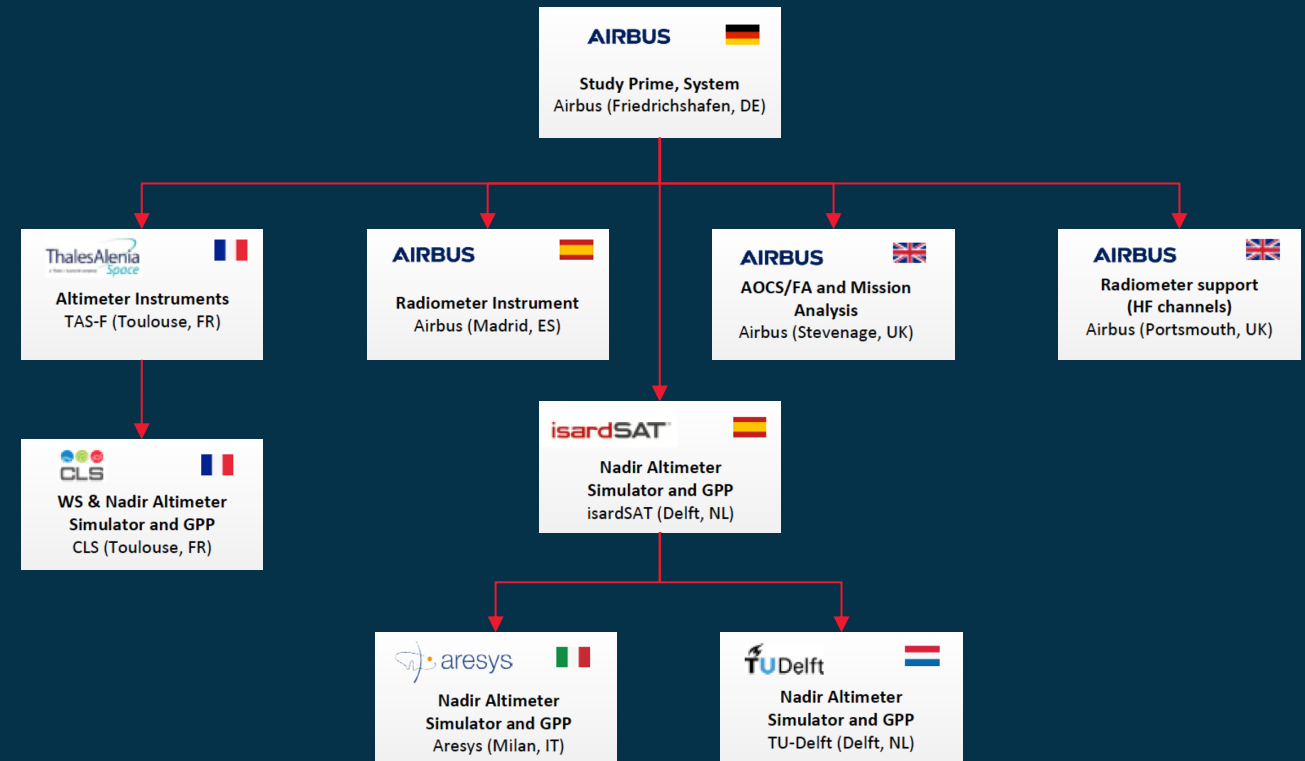
The secondary objectives of the S3NG-T mission are to:

SEC-OBJ-1. Provide directional wave spectrum products that address evolving Copernicus user needs.

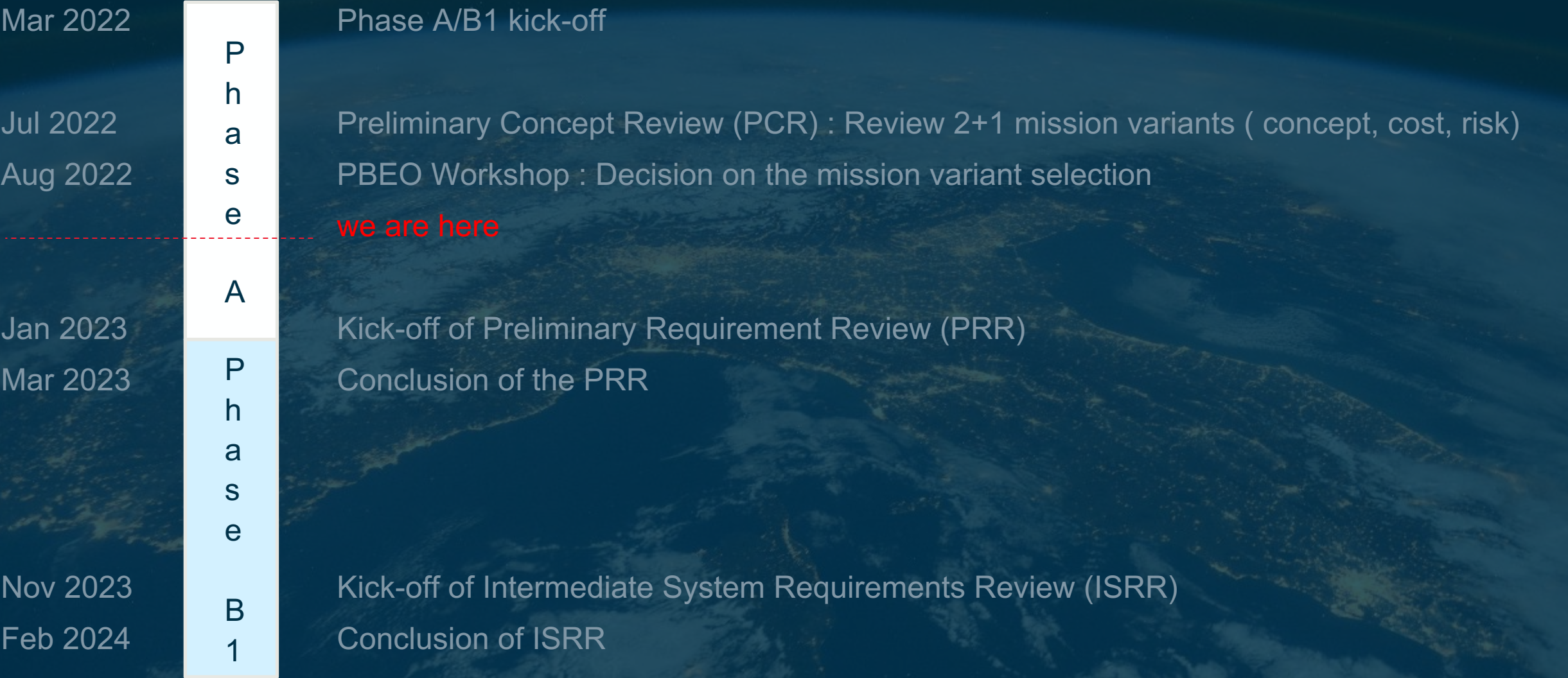
SEC-OBJ-2. Provide new products (e.g. sea surface height gradients and river reach averaged gradients, river width and water area) that address evolving Copernicus user needs.

S3-NGT Phase A/B1 Study Consortia

- OHB Bremen and ADS Friedrichshafen are leading parallel consortia
- TAS Toulouse has mirrored role on both sides for the altimeter instruments
- Collaboration with CNES has started (F.Boy)



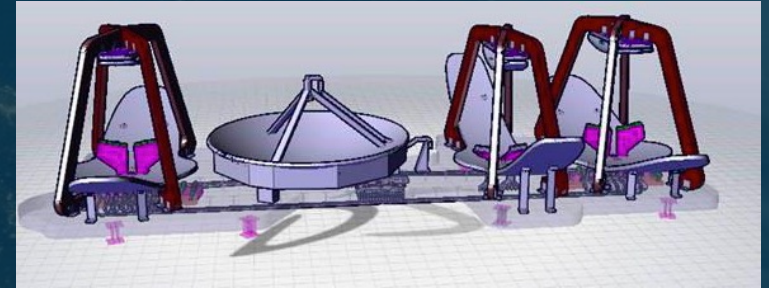
S3-NGT Phase A/B1 timeline



Variant 1:

Variant 2:

- Ku/C digital altimeter, 20kHz PRF, 500MHz BW (tbc). Enhanced OLTC.
- Ka swath altimeter. 10kHz PRF. 200MHz BW. Fixed antenna baseline 3m.
- Multi-beam/multi-channels radiometer (TBD among 18.7, 23.8, 36.5, 89, 166, 172 GHz)



Variant 3:

An hybrid configuration, e.g. 6 small satellites and 1 large.

All variants baseline GNSS POD and support embarking DORIS

- Science review outcome
 - Wait for SWOT results
 - Merit of hybrid variant 3 already in 2023

Science Review Team

- *“It would be extremely short sighted to ignore the great potential of a swath Interferometer given the proximity to the SWOT launch. Therefore, the SRT strongly recommend that any final decision on the inclusion of a swath altimeter within Copernicus as an operational mission is deferred until [proof of concept in-flight results confirm performance] from the the planned SWOT measurement validation workshop at Launch +14 months (ie. Mid 2024)”.*

- ESA executive statement at PBEO workshop
 - Swath variant 2 pursued within the phase A/ B1 study
 - **Mission Gate Review March 2024**
 - ISRR outcome (technical + programmatic)
 - SWOT initial cal/val outcome

Based on the PCR outcome and programmatic assessment, it is envisaged to continue the Phase A/B1 studies to implement the Sentinel-3 NG-T mission as:

- two dedicated large-satellites carrying Wide-Swath and Nadir altimeters, together with radiometer and POD instruments.
- in parallel, initiate activities in support of a back-up solution based on a small-sat ‘hybrid constellation’, including technology and industrialisation / implementation activities.
- Such approach will be confirmed after a dedicated gate review early 2024 taking into account the Phase A/B1 ISRR including affordability assessment and the return of in flight experience and validation of the SWOT mission.

- Assuming a positive outcome of the Mission Gate Review, the proposed development approach is the following, pending approval by ESA Member States:
 - The B2/CD payload development will be subject to tender in 2024. “Instrument First Approach”.
 - The selected payload suppliers will proceed under ESA direct responsibility.
 - Satellite procurement will be initiated in 2026, to select the Prime Contractor.
 - PDR payload maturity at the satellite kick-off. Risk reduction.
 - Satellite PDR Q1 2028, aligned with the availability of the EU/MFF funds.
 - Notional S3-NGT-A launch Q2 2032.

Thank you for your attention !

