Genesis Science Workshop
3rd -4th April 2025
Matera, Italy

Science Exploitation Objectives 2025 & Beyond

W. Enderle

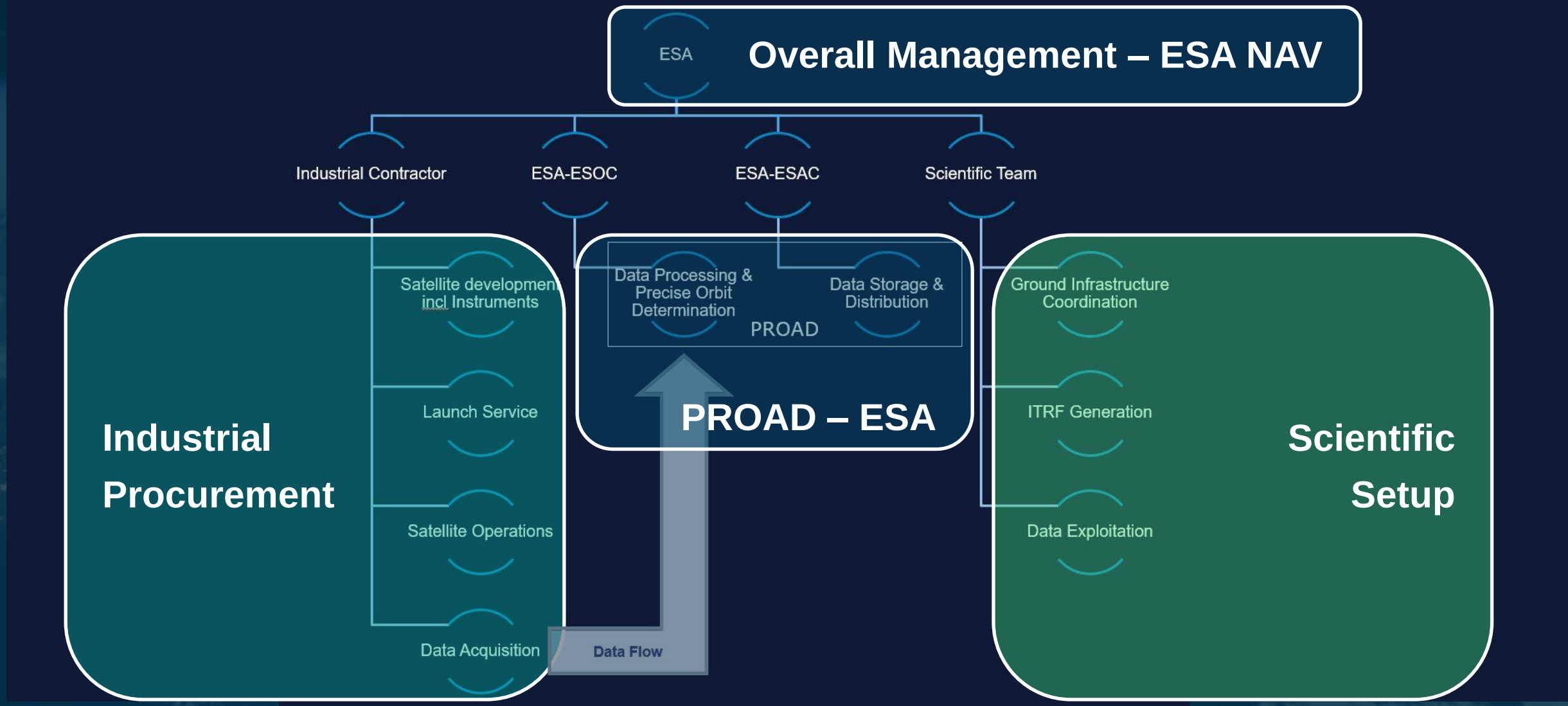
Genesis - End-To-End Procurement Approach

GENESIS Science Workshop, Matera, Italy

W. Enderle, E. Schoenemann, JC. Berton, T. Springer, S. Bruni, M.v. Kints, M. Otten

3rd/4th April 2025

GENESIS Mission – End-To-End Procurement Approach



GENESIS Mission – End-To-End Procurement Approach

ESA's Responsibilities

- Management of the overall Genesis contract within agreed budget and schedule
- Provision of high-level requirements related to
  - performance, function and interfaces
- Establishment of a working structure and processes, which allows to
  - interact with the international scientific, especially geodetic community
  - Ensure that the Genesis WGs will support ESA within the different phases of the project
- Monitoring and support the break down of the high level requirements into detailed requirements for system, subsystem, payloads, segments and elements
- Ensure that the overall Genesis mission objectives will be met by the mission concept developed by Industry
- PROAD -Process the Genesis data and generate precise orbits, archive all relevant data and also disseminate this data to the scientific community for further exploitation
- Initiate the development of new concepts and algorithms for the improvement of the accuracy and also the stability of the ITRF

Industry's Responsibilities

- Management of all aspects of the industrial procurement approach including the industrial consortium within agreed budget and schedule
- Develop an overall Genesis mission concept, based on the high-level requirements
- **Break down of high-level requirements, as provided by ESA, into detailed requirements**
- Provide a Genesis mission concept that will meet ESA's high-level requirements
- Procure, built, test, verify, launch and operate all elements needed for Genesis
- Provide all agreed data to PROAD for processing, archiving and dissemination to scientific community

GENESIS Mission – End-To-End Procurement Approach

Impact of the End-To-End Procurement Approach

- ESA provides high-level requirements for
  - Performance
  - Functionality
  - Interfaces

No **detailed** requirements from ESA for systems, subsystems , payloads, testing, operations etc.

- **Industry is responsible** for break down of high-level requirements into detailed requirements

- ESA needs support from Genesis WGs throughout the different phases of the project to analyze specific aspects so ESA can provide feedback to Industry and mitigate any potential impacts on the Genesis mission.

Genesis Objectives for 2025

GENESIS Science Workshop, Matera, Italy

3rd/4th April 2025

ESA's View - Objectives for 2025

System Requirements Review (SRR)

- SRR was concluded in Q3 2024 with Actions (AI)
- SRR actions will need to be completed before Preliminary Design Review (PDR)

⇨ Genesis WG's shall support ESA in the processes for closing the SRR AI

- Expertise in specific areas
- Analysis of impacts on respective areas

Preparation of Preliminary Design Review (PDR) in Q3/Q4 2025

- Definition of a consolidated baseline for Genesis mission

⇨ Genesis WG's shall support ESA in

- Expertise/impact analysis for specific areas
- execution of trade-offs needed in support of Genesis baseline definition

Generation of PROAD ICDs

ICD for Industry (space segment incl. payloads, ground segment, operations)

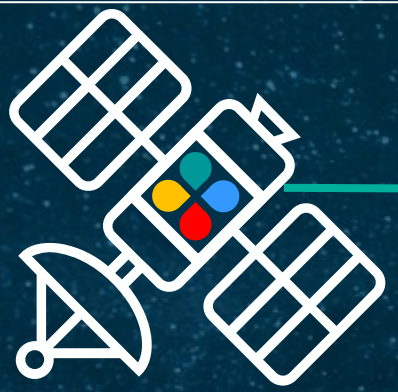
ICD for Science Community (International Community and international geodetic services)

PROAD – ICD Definition

GENESIS Science Workshop, Matera, Italy

3rd/4th April 2025

GENESIS – PROAD Overall Data Flow



GNSS
Galileo & GPS

DORIS

GNSS+Doris
Measurements

Industry

GNSS Measurements
Additional Data

CNES

Doris Products and
Measurements

DORIS Ground
Segment (IDS)

International Geodetic Services
SLR (ILRS)
VLBI (IVS)
GNSS (IGS)
DORIS (IDS) - TBC

PROAD

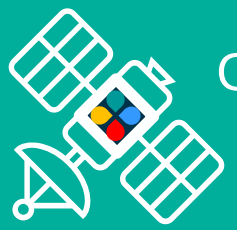
ESAC GNSS Science
Support Centre

ESOC Navigation
Support Office

GENESIS
POD Product
and other Data

GENESIS
Data and Products
Dessimination

GENESIS – PROAD High Level Data Flow



Genesis Satellite

On-Board Measurements GNSS/DORIS

OHB-I

Genesis Satellite Operations

International Communities

Geodetic Community
Science Community

ICD

ESA (PROAD)

Precise Orbit Determination
Data Archive
Data Dissemination

ICD

ICD

CNES DORIS

ICD

Ground Support Infrastructure

IGS Network
VLBI Network
SLR Network
DORIS Network - TBC

ICD

International Geodetic Community

IERS and four geodetic Services
International Geodetic Organisations

GENESIS – PROAD ICD Definition Process

PROAD will make use of **existing** Analysis Services products (RINEX, CRD, CPF, NGS, VEX…)

PROAD will get from OHB-I raw data, metadata and auxiliary data as per SRD

- SRD requirements to be **detailed** by ESA wrt Genesis design/manufacturing evolution

PROAD will distribute through GSSC any **data and metadata** required for performance analysis:

- database of Genesis fixed parameters (e.g. mass, ties…)
- calibration and qualification values (on-ground and after provisioning)
- real-time parameters (e.g. quaternions…)
- non-real-time parameters (e.g. temperature…)
- POD products detailed in the previous slide

⇨ any **need** from the geodetic services should be channeled to ESA via the relevant **Genesis WG**

⇨ **each Genesis WG** is invited to help evolve/review the geodetic services products supporting Genesis goals

⇨ ESA will produce an initial ICD proposal by **mid-2025**

Genesis WGs – ESA's Expectations

GENESIS Science Workshop, Matera, Italy

3rd/4th April 2025

ESA's expectations for Genesis WG's

ESA has the following expectations for the Genesis WGs

- Support ESA in all phases of the Genesis mission and help ESA to provide feedback to Industry and also within ESA's decision-making processes
  - Provide expertise in the subject areas
  - Provide advice/recommendations within limited timeframe (important until PDR)
  - Conduct analysis
- Development of
  - new ideas for concepts and algorithms related to potential evolution of the ITRF in terms of accuracy and stability
  - roadmaps for implementation of the identified potential evolutions
- Act as an interface for the International Geodetic Services and IAG/IERS
- ESA's Genesis WGs shall
  - not overlap with the decision making processes, which are well established within the International Geodetic Services and IAG/IERS
  - promote Genesis ideas for ITRF evolution within the International Geodetic Services and IAG/IERS
- WG1 shall act as a coordinator between the WG's related to the four geodetic techniques in case of different views