



ACCELEROMETER FOR THE NEXT GENERATION GRAVITY MISSION
ESA CONTRACT N°4000144320/24/NL/MG

STATEMENT OF WORK FOR THE PROJECT MANAGEMENT SUPPORT FOR NGGM
ACCELEROMETER PROJECT

NGGM-SW-ONE-007

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GEN-F276-1 (GEN-SCI-017)

CHANGE NOTICE

Version Revision	Date	Change notice description
1.0	26/11/2024	Creation of the document

TABLE OF CONTENTS

1	INTRODUCTION	5
1.1	OBJECTIVE OF THE DOCUMENT	5
1.2	APPLICATION DOMAIN.....	5
2	APPLICABLE AND REFERENCE DOCUMENTS.....	6
2.1	APPLICABLE DOCUMENTS:	6
2.2	REFERENCE DOCUMENTS:	6
3	DEFINITIONS AND ACRONYMS	7
4	OVERVIEW OF THE PROJECT	7
4.1	ESA NEW GENERATION GRAVITY MISSION	7
4.2	ONERA NGGM ACCELEROMETER PROJECT	7
4.2.1	Technical scope, performance and quality	7
4.2.2	Other project aspects.....	9
5	OVERALL ORGANISATION, ROLES AND RESPONSIBILITIES	11
5.1	NGGM ACCELEROMETER PROJECT TEAM.....	11
5.2	NGGM ACCELEROMETER PROJECT STAKEHOLDERS	12
6	PROJECT MANAGEMENT SUPPORT EXPECTED WORK PACKAGES	12
6.1	WORK PACKAGE LIST	12
6.2	WORK PACKAGES DETAIL	13
6.2.1	WP1000: Management of the contract.....	13
6.2.2	WP2000: NGGM PMS baseline activities.....	14
6.2.3	WP3000: NGGM PMS supplementary activities.....	17
6.2.4	WP4000: NGGM Project Management Support activities	19
6.2.5	NGGM Project Team, PMS position and reporting.....	19
7	SCHEDULE, MANAGEMENT AND QUALITY REQUIREMENTS.....	20
8	DELIVERABLE LIST	22
	ANNEX A DEFINITIONS AND ACRONYMS USED IN THE SOW	23
	ANNEX B WORK PACKAGES.....	25
	ANNEX C - NGGM ACCELEROMETER PROJECT CURRENT MILESTONES DATES.....	30
	ANNEX D DOCUMENTATION REQUIREMENT DEFINITION.....	32

Figures :

Figure 1: Principle of the servo-loop of one detector of one accelerometer	8
Figure 2: Schematic view of the MicroSTAR ASA subsystems.....	8
Figure 3: Electronics functions of the control loop for Y in MicroSTAR, with 4 redundancy electrode pairs.....	9
Figure 4: Project Team organization scheme	11
Figure 5: WBS for Phase Band relation with ESA SoW tasks	26
Figure 6: WBS for Phase C and relation with ESA SoW tasks, Option 1&2.....	28
Figure 7: WPS for Phase D1 and relation with ESA SoW (Option 2 in Ph. D1, Options 3 and 4).....	29

1 INTRODUCTION

1.1 OBJECTIVE OF THE DOCUMENT

This Statement of Work (SoW) specifies the tasks required from the Contractor for the Project Management Support¹ (PMS) that is to be performed in support to the NGGM accelerometer Project Team (PT) set up at ONERA for delivery of the Next Generation Gravity Mission (NGGM) space accelerometers to ESA. The ONERA project is called NGGM Project further.

The PMS will be done in all project key areas, focusing primarily on updating and maintaining a resourced schedule, on monitoring the actions, risks and potential changes, on ensuring transmission of deliverables to ESA in line with milestones payment plan and on preparing the NGGM progress report to ESA. In a second priority, the setup of a pragmatic early value management with key performance indicators is expected.

The PMS will intervene during the phases B/C/D1 and during the optional phase D2 of the project, which are defined as follows:

- Phase B/C/D1:
 - o Phase B: preliminary design of the Accelerometer System Assembly (ASA) and of its subsystems², concluded by the ASA Preliminary Design Review;
 - o Phase C: achievement of TRL6 for the ASA, through the realization of an ASA Engineering Model and concluded by the ASA Critical Design Review;
 - o Phase D1: achievement of a TRL7 for the ASA, through the realization of an ASA Engineering and an ASA Qualification Model and concluded by the ASA Qualification Review.
- Phase D2:
 - o Covers the Flight Model production and tests leading to the FMs delivery.

The activity will be realized in ONERA, Châtillon's site for the benefit of the DPHY/NGGM Project. Exceptionally, some meetings may be held in ONERA's Palaiseau's site³.

1.2 APPLICATION DOMAIN

The SOW applies to all phases of the NGGM Accelerometer Project, especially to the activities of design, development, manufacturing & integration, test, validation and instrument performance, which ONERA is responsible for.

¹ PMS = Project Management Support shall be seen as the activity, not the person

² The Accelerometer System Assembly (ASA) is broken down in the following subsystems (see §4.2.1):

- 3 ASHs (Accelerometer Sensor Head)
- 1 Accelerometer System Electronics Assembly (ASEA) itself broken down in:
 - o 3 Front-End Electronics Units (FEEUs)
 - o 1 Interface and Control Unit (ICU), itself divided into a Power Conversion unit (PCU) and a Control Unit,
- Related harnesses.

³ Note:

The Contractor is informed that a relocation of the labs in Palaiseau is targeted in 2028, and that subsequently the NGGM Project team will move there. Nevertheless, the current schedules of both NGGM Accelerometer and relocation's projects are consistent with the location indicated for the PMS activity location.

“He” is used all along the document when mentioning any post in the NGGM Project Team, or the Contractor’s staff by the Contractor. It shall be read irrespectively as “he” or “she”.

2 APPLICABLE AND REFERENCE DOCUMENTS

See [RD1], and *Annex A* for those used in the SOW.

2.1 APPLICABLE DOCUMENTS:

[AD1]	Project planning and implementation	ECSS-M-ST-10C Rev. 1
[AD2]	Cost and schedule management	ECSS-M-ST-60C
[AD3]	Configuration and information management	ECSS-M-ST-40C Rev.1
[AD4]	Risk management	ECSS-M-ST-80C
[AD5]	ESA contract - Standard Requirements for Management, Reporting, Meetings and Deliverables	Appendix 3 to ESA Contract No. 4000144320/24/NL/MG

2.2 REFERENCE DOCUMENTS:

The list of reference documents below is provided for information. The documents will be provided to the bidder at the time of the Kick-Off Meeting under a need-to-know criterion.

[RD1]	List of acronyms	NGGM-LI-ONE-021
[RD2]	Management & Quality Plan of NGGM Accelerometer Phase B/C/D1	NGGM-PL-ONE-034 (<i>update in progress</i>)
[RD3]	Management & Quality Plan of NGGM Accelerometer Phase B/C/D1	NGGM-PL-ONE-034
[RD4]	NGGM Accelerometer Schedule	NGGM-CH-ONE-0007 v1.3
[RD5]	MicroSTAR ASA Detailed Description File	NGGM-TN-ONE-018
[RD6]	MicroSTAR ACC Product Tree	NGGM-LI-ONE-014
[RD7]	NGGM Design & Development Plan	NGGM-PL-ONE-030
[RD8]	Accelerometer System AIV-AIT Plan	NGGM-PL-ONE-035
[RD9]	NGGM Risk Management Plan	NGGM-PL-ONE-029
[RD10]	Risk Register and Dependencies Analysis	NGGM-LI-ONE-019
[RD11]	NGGM Accelerometer Phase B/C/D Project Assurance Plan	NGGM-PL-ONE-040 (<i>in progress</i>)
[RD12]	NGGM Accelerometer Pre-Dev Phase Project Assurance Plan	NGGM-PL-ONE-006
[RD13]	Cost estimation analysis and risk associated	NGGM-TN-ONE-066 (<i>cf. Note (N2)</i>)
[RD14]	List of deliverables to ESA	NGGM-LI-ONE-022
[RD15]	NGGM templates (Progress reports, MoMs, PMAC, ..)	On ONERA’s server
[RD16]	Procédure de planification et conduite des études, essais, recherches et travaux	GEN-SCI-004
[RD17]	Guide d'élaboration de la suite documentaire d'un projet de réalisation	GEN-SCI-003
[RD18]	Compte Rendu d'Avancement de Projet	GEN-F31

[RD19] Procédure de maîtrise de la documentation relative à GEN-SCI-017
l'exécution des études

Notes:

- (N1) *Some referred documents may not exist anymore at the time of PMS start (e.g. for [RD7], closely linked to the schedule [RD4]).*
- (N2) *Documents related to costs of the project (NGGM-TN-066/067) may be delivered only when the PMS is on site, and only if he actually works on costs.*
- (N3) *ONERA internal assurance product procedures [RD16] to [RD19] are used optionally as guideline.*

3 DEFINITIONS AND ACRONYMS

See [RD1] and Annex A for those used in the SOW.

4 OVERVIEW OF THE PROJECT

4.1 ESA NEW GENERATION GRAVITY MISSION

To achieve the ambitious ESA NGGM (Next Generation Gravity Mission) performance and reliability specifications needed to monitor the temporal variation of the Earth's gravity field, accelerometers with performances similar to GOCE's ones are required. As a baseline, each of the two NGGM satellites shall embark three electrostatic accelerometers, that are able to measure non-gravitational accelerations, ensure drag compensations and process the ranging data to retrieve gravity field variations. ONERA's MicroSTAR accelerometers technology, based on an electrostatic proof-mass suspension, already flown on past missions (GOCE, GRACE, GRACE-FO, ...) were identified as fulfilling completely NGGM needs and specifications.

As per [AD1], the feasibility was assessed during the frame of NGGM Phase 0 and Phase A System Studies from ONERA MicroSTAR accelerometers past instruments pre-development, and after ESA programmatic endorsement, the decision to pursue the development of the MicroSTAR accelerometers in phase B/C/D1 was met.

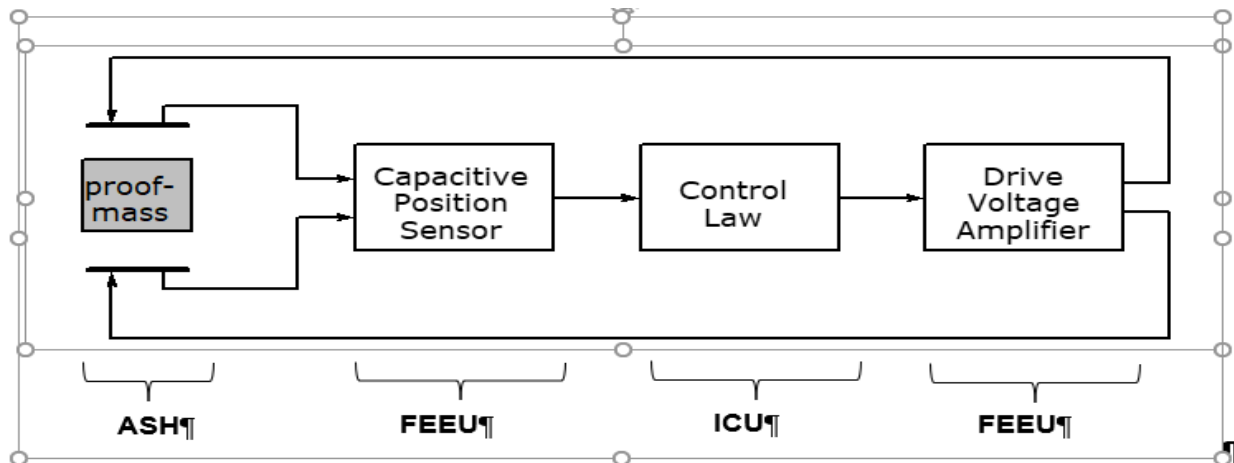
4.2 ONERA NGGM ACCELEROMETER PROJECT

ONERA participated actively in the pre-design of NGGM accelerometers until the achievement of an ASA TRL 5 under the Pre-Development Contract with a flexible and reactive project organization [RD3]. ONERA was selected to continue the development up to the end of Phase D1, so that the Project Team shall adapt now its management methods to the new scope of responsibilities, more focused on development, the monitoring of a dedicated supply chain, the integration of all the semi-finished products and the full qualification process [RD2].

4.2.1 Technical scope, performance and quality

Description of the Accelerometer system (ASA) is provided in [RD5], and its product tree in [RD6].

The Accelerometer principle is based on the electrostatic suspension of a proof-mass. The mass position and attitude are measured with capacitive sensors. Variations of the capacitances between the mass and the instrument cage depend on variations of gaps between the mass and the electrodes in regard. The accelerometer outputs derive from the voltages applied on the electrodes to levitate and to control the mass motionless at the cage center. The principle of the servo-control loop is exhibited on Figure 1: Principle of the servo-loop of one detector of one accelerometer.



Principle of the servo-loop of one detector of one accelerometer

Figure 1: Principle of the servo-loop of one detector of one accelerometer

A DC polarization voltage and a sine wave detection voltage are applied to the proof-mass through a thin polarization wire, which serves to fix the proof-mass potential, avoiding charging effect in space and linearizes the acceleration measure. The detection voltage is used in the capacitive detection too.

The accelerometer cage encompasses 6 pairs of identical electrodes⁴ used by both capacitive sensors and electrostatic forces and torques. The voltages applied on the electrodes to create the electrostatic forces and torques are the output of the accelerometer and an image of the satellite non-gravitational acceleration.

Figure 2: Schematic view of the MicroSTAR ASA subsystems shows the ASA resulting schematic design overview.

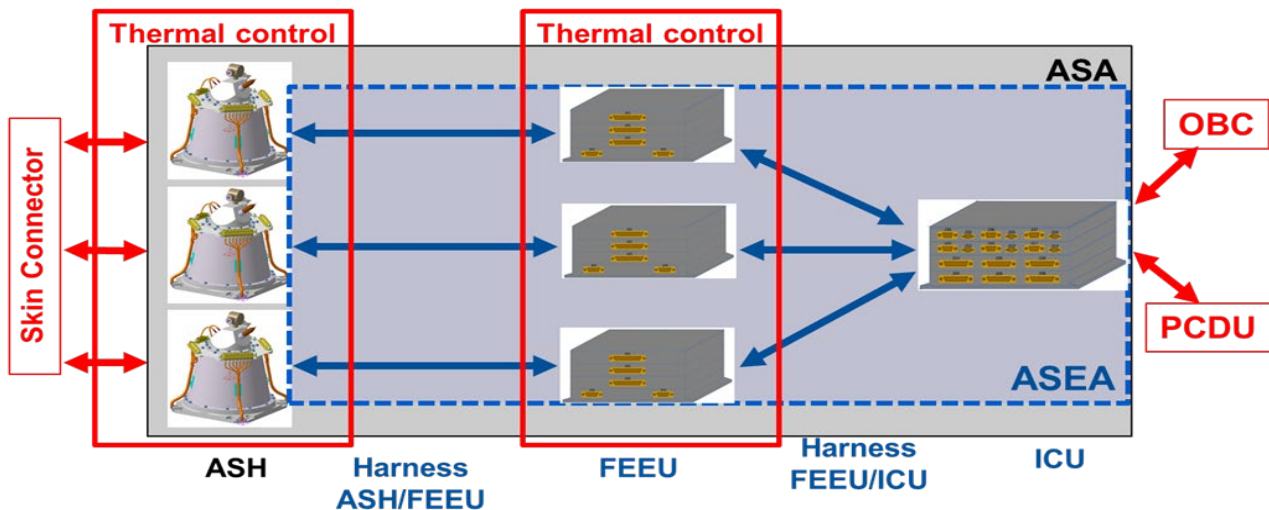


Figure 2: Schematic view of the MicroSTAR ASA subsystems

⁴ 12 electrodes currently but this is likely to be reduced pending on ESA's decision

Figure 3: Electronics functions of the control loop for Y in MicroSTAR, with 4 redundancy electrode pairs presents the associated electronics, in its current configuration⁵.

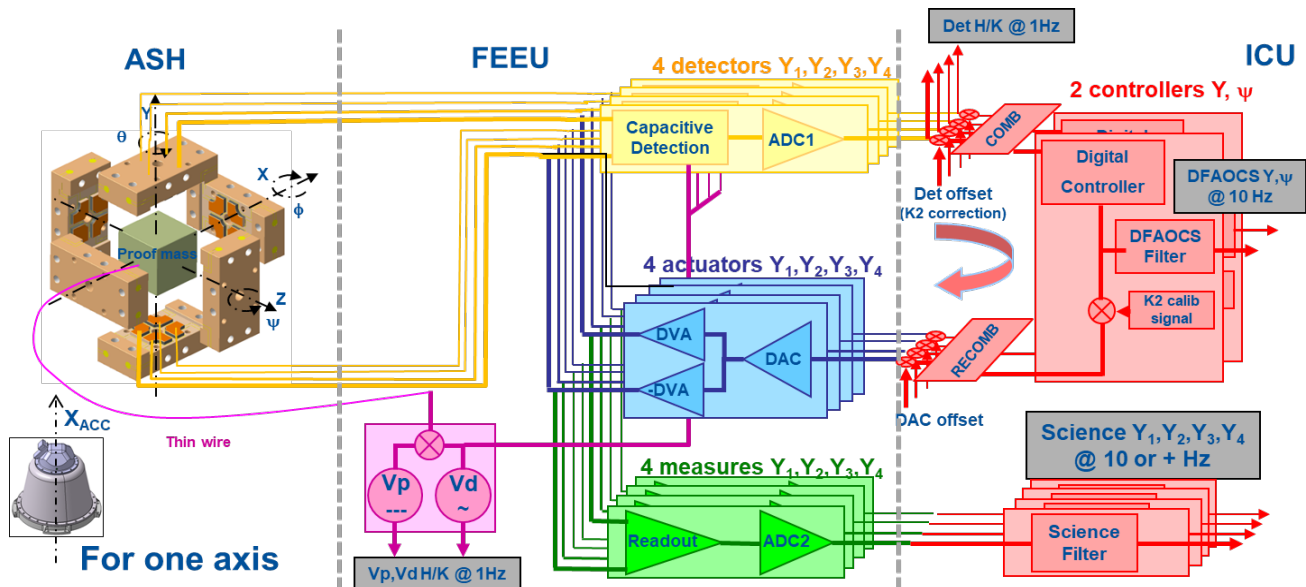


Figure 3: Electronics functions of the control loop for Y in MicroSTAR, with 4 redundancy electrode pairs⁶

The science data telemetry includes the set of defined number of voltages provided by all readout channels of the 3 accelerometers. All data are time-stamped with the same date and sent on ground at a frequency of 10Hz.

The DFAOCS data telemetry includes the linear and angular accelerations of the 3 accelerometers. The data are sent under platform OBC's request, with a frequency of 10 Hz at maximum.

The housekeeping data telemetry for operation is sent with a frequency of 1 Hz and includes the detectors outputs and several measurements done to control the ASA correct status. The housekeeping data telemetry for science includes ASHs and FEEUs' temperature measurements, that can be used to correct the science data measurement.

4.2.2 Other project aspects

Among all key areas a project shall monitor, the PMS shall address the main following ones (*cf.* §5).

4.2.2.1 Project schedule

Since contract signature, a project schedule updated version has been edited [RD3], which itself is not fully relevant anymore due to slight delays at ONERA's level, changes at customer's level, and delay in some essential design reviews. It is under update, as needed for next reviews, as described below.

With respect to ESA, a significant milestone passed successfully with ASA PDR in October 2024. Significant upcoming events for the project are: the ASEA PDR currently planned in first quarter 2025 and the launch of the ITT for down selection of electronics subcontractor in second quarter, as well as the ASH CDR planned early 2025.

⁵ As design is in progress with satellites Primes at ESA system level, some slight design changes may occur (6 electrodes instead of 6, ...), mostly at electronics level (ASEA). They go towards a simplification of the presented design.

⁶ The choice of the combination for degrees of freedom can be different and use the other axes electrode pairs

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Annex C provides the overview of the current main milestones as presented at the ASA PDR.

4.2.2.2 Project cost management

The Project Team shall monitor the correct use of funds vis-à-vis its Customers, both externally (ESA) and internally (ONERA).

A first estimate at completion of the budget was performed in summer 2024 [RD13] and it shall be consolidated all along the project life cycle considering the progress, the expenditures, the changes and the risks.

The cost management is not in the PMS scope, in a first priority assessment. However, Earning Value Management monitoring being key in project efficiency, it is considered as a further high added value once priorities are treated.

4.2.2.3 Project risk management

Risk and opportunity management is applied within the Project, based on the risk management approach described in [RD9] and a change log managed with the ONERA's tool called ActiON!

Thinking about rationalization is started to render the use of risk management more systematic, while remaining focused on the right need.

4.2.2.4 Stakeholders management

The NGGM accelerometer Project is sensitive, as looked at as a promising mission for Earth Observation by ESA, while integrating critical items (e.g. the polarization wire). Numerous stakeholders are involved and interfacing smoothly with each of them is essential. See §5.2

4.2.2.5 Resources management

The resource management is not in the scope of PMS. However, the implementation of a resourced schedule, based on a realistic evaluation of the staff hours and the availability of technical means on time, is essential to meet program needs and anticipate/orient decision at higher level if required.

4.2.2.6 Change management

The technical/performance scope of the project, on ONERA's side is rather well fixed, due to the expertise and lessons-learned of the PT in the space accelerometers field and the outcomes of previous studies, performed during the pre-development phase mostly for the ASH subsystem (e.g. ASH design is almost at CDR step).

Nevertheless, on NGGM platform's side, the level of maturity is at Phase B, slightly behind, which induces some scope changes the PT has to manage.

Change management concerns also the PT high expert staff, by convincing of the interest of applying rigorous project management methods, enabling to be more efficient on minor activities while focusing on major ones.

4.2.2.7 Configuration and product assurance management

As usual for any space project, the traceability of any event (action, deviation, change, project management Non-Conformance) is mandatory to give confidence to stakeholders in the project performance (e.g. when preparing reviews) and ease the related project monitoring and control. Accordingly, a stress shall be put on configuration management to guarantee that at each moment, the right information is used or enables understanding the history of any action/decision.

5 OVERALL ORGANISATION, ROLES AND RESPONSIBILITIES

[RD2] describes the project management and full related organization to achieve the expected achievements.

5.1 NGGM ACCELEROMETER PROJECT TEAM

Schematically, the PT organization is shown in *Figure 4: Project Team organization scheme* below.

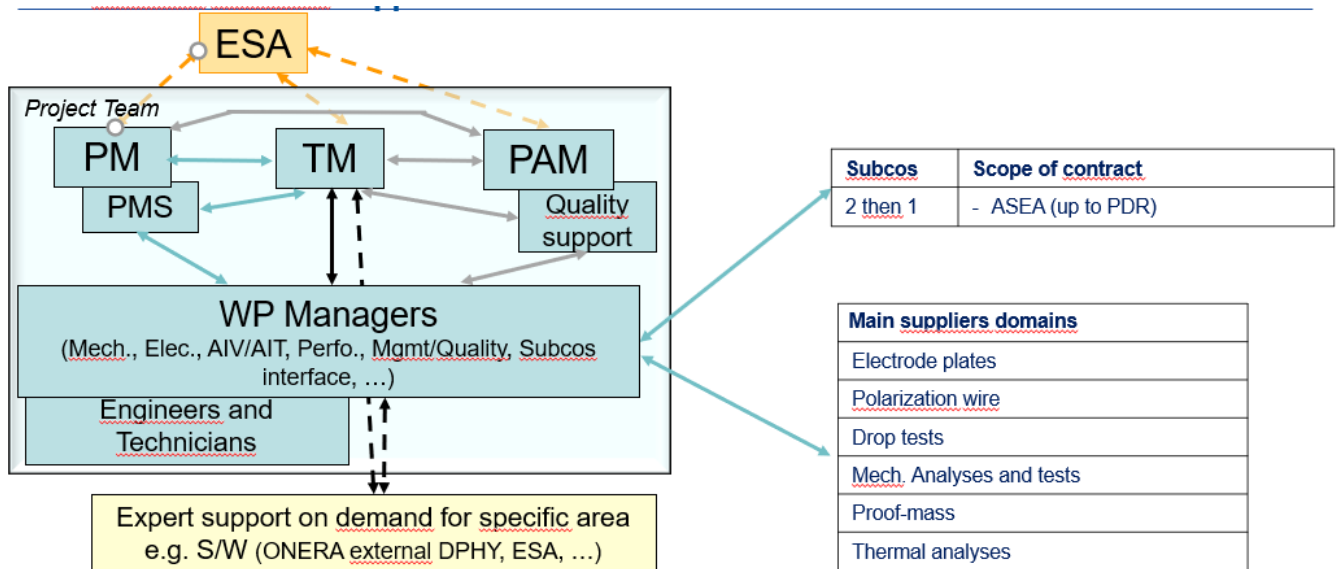


Figure 4: Project Team organization scheme

In brief, the PT integrates:

- A Project Manager (PM), responsible for the full achievement of the project objectives, in terms of scope, schedule, costs/expenditures and risks, in line with the Customer and Sponsor's expectations and requirements. He manages and coordinates the activities of the personnel and resources. He supervises the control of the subcontractors and suppliers, and anticipates/reacts in case of changes.
- A Technical Manager (TM) responsible for the technical and performance of the delivered product. This includes the responsibility for the system performance and quality in strong interface with Work Packages Managers.
- A Product Assurance Manager (PAM), responsible for the monitoring and control of all activities requiring a specific quality management (quality control and product assurance management)
- Work Packages Managers (WPM), responsible for the achievement of the Work Packages they are affected to, in line with the provided allocations (scope, subcontracts, hours, resources, outputs)
- Experts/Technicians working closely with the WPMs to perform dedicated tasks or bring a high-level expertise to the Project.

This represents a team of ca. 15 high expert people, who are fully involved in the project achievement. It is worth noting that some of them intervene also on other R&D projects or activities for the IEA unit, which is essential to keep on developing new skills to the benefit of ONERA. The good share of resources is key in the project success.

5.2 NGGM ACCELEROMETER PROJECT STAKEHOLDERS

The PT main stakeholders [RD2] are:

- The Customers, ESA being the main one. ESA develops the NGGM mission, in the frame of the Future-Earth Observation Programme,
- The Satellites Primes: Airbus Defense&Space (ADS) and Thales Alenia Space (TAS), via ESA⁷,
- ONERA intervening services:
 - o DPHY intervening parts i.e.:
 - DPHY/D: Sponsor of the PT
 - DPHY/IEA: DPHY unit, in which the PT is integrated, and with which resources may be shared between the different projects
 - DPHY/AOP: DPHY support, in charge of program management support at department level
 - o Other transverse services: e.g. the Procurement Directorate (DA), the Support & Sales Directorate (DSOC), the Financial Directorate (DAEF) or Department of Quality (DQO)
 - o On requests, high experts to bring a temporary expertise when required
- PT subcontractors and suppliers:
 - o Subcontractors for the ASEA electronic design and development subsystem: two currently and one after down-selection mid-2025
 - o Dedicated suppliers, some of them specially qualified due to the project scope or selected all along the project wrt. to the need or the expertise

The Contractor staff will interface daily and primarily with the PT, and potentially with DPHY/AOP. On request, he may interact with ESA for project reporting activities or schedule (e.g. milestones and related deliverables), risks, reviews, indicators...

6 PROJECT MANAGEMENT SUPPORT EXPECTED WORK PACKAGES

6.1 WORK PACKAGE LIST

The Project Management Support is expected to ensure the following tasks/WPs:

WP ID	WP Title	Framework contract
WP1000	Management of the contract	- Firm Fixed Price part
WP2000	NGGM PMS baseline activities A) Manage the schedule update B) Manage the project actions C) Manage the provision of deliverables to ESA D) Ensure the daily risk monitoring E) Ensure the monitoring of change management	- Firm Fixed Price part
WP3000	NGGM PMS supplementary activities A) Prepare the NGGM Progress Report to ESA B) Propose an Earning Value Management scheme Monitor the Earning Value Management scheme	- Purchase Order part on a quarterly basis
WP4000	Project Management Support in phase D2	- Purchase Order part on a quarterly basis

⁷ Note that Thales and ADS are also customers of ONERA for small services contracts. Only 1 Prime will remain after achievement of on-going discussions with ESA.

6.2 **WORK PACKAGES DETAIL**

Each Work Package is presented as follows:

- WP objective
- Main inputs
- Task or subtask description
- Some indicative figures
- Outputs (refer to §8 for deliverable list)

Note: Cost management

Due to ONERA's internal rules, cost management is a priori not included in the PMS scope. However, the cost consumption is strongly linked to project scope achievement, to resourced schedule⁸ and to setup of a representative and efficient earning value management: PMS scope may slightly evolve later on with an adaptation of data to be managed (e.g. workhours for a resourced schedule,).

6.2.1 WP1000: Management of the contract

❖ **WP Objective**

To manage the Project Management Support contract.

❖ **WP Inputs**

- This SOW
- Activity performed by the PMS during the previous period in the PT

❖ **Tasks description**

The Contractor shall:

- Prepare a "Plan de Prévention" for the PMS activity
- Manage the contract to guarantee the good performance of WP tasks, in particular in case of need of replacement of the PMS (see §7)
- Report periodically (frequency TBC by the Contractor, at least 3 months) on the performed activities and propose improvements of the PMS scope or efficiency if required.

Note:

The above report is the basis for the invoicing acceptance by ONERA

- If deemed mandatory by both parts, attend a progress meeting (on request).

❖ **Figures** N/A

❖ **WP Outputs**

- [DRL-1] Plan de Prévention
- [DRL-2] Contractor's acknowledgement
- [DRL-3] Competency matrix
- [DRL-4] PMS activity Progress Report
- [DRL-5] MoM of the Progress Meeting

⁸ Cash flow linked to specific milestones, internal need to manage the human resources among different projects

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6.2.2 WP2000: NGGM PMS baseline activities

❖ **WP Objective**

To perform the prior PMS activities, during the NGGM Project Phases B/C/D1, in support to the PT.

❖ **WP Inputs**

- This SOW
- [RD2] Management & Quality Plan of NGGM Accelerometer Phases B/C/D1
- [AD5] ESA contract - Standard Requirements for Manag., Reporting, Meetings & Deliverables
- + Inputs below for each sub-task

❖ **Tasks description**

In close link with the whole PT members and specifically in support to PM, the Contractor shall:

A) **Manage the schedule update**

Inputs:

- [AD1] ECSS-M-ST-10C "Project planning and implementation"
- [AD2] ECSS-M-ST-60C "Cost and schedule management"
- [RD4] NGGM Accelerometer Schedule
- [RD7] Design and Development Plan
- [RD10] ASA Risk Register List and Dependencies Analysis
- Internal/external PT meetings outcomes

Sub-task description:

- To detail the schedule more finely:
 - Integrate tasks with a better granularity, like subsystems development, programmatic milestones (e.g. ESA PB-EO, system/subsystem reviews, all milestones, dates to launch critical ITTs or ONERA Commission des Marchés ...)
 - Integrate the resources (human and means) to have an actual representative project situation and being able to manage it at program level,
 - Identify the Critical Path (CP) and Near-Critical Path (NCP), for the nominal project strategy and show the dependencies between the tasks and show Key-Decision Points, at which any lack of decision may endanger significantly the project achievements
 - Identify any risks or opportunities linked to the reference planning, and propose solutions to alleviate them, e.g. by levelling, reorganizing, ...
 - Propose few meaningful indicators (KPIs) to assess the sticking to expected schedule, alert the PM and propose mitigation actions if feasible
- To monitor the project progress periodically (1 month TBC) considering PT internal progress meetings (weekly) or external (e.g. bi-weekly with ESA) or any exchange with stakeholders, and monitor the related indicators
- To zoom on request on a specific schedule part to perform dedicated analyses.

Figures:

- Current schedule: 500 lines, managed under Microsoft Project
- Schedule update frequency: see above

Outputs:

- [DRL-6] NGGM schedule periodically
- [DRL-7] NGGM Design and Development Plan updated
- [DRL-8] ActION! Risk log updated
- [DRL-9] ASA Risk Register List and Dependencies Analysis
- [DRL-10] PMS improvement analyses (e.g. mitigation plan proposal)
- [DRL-18] KPIs on schedule updated

B) Manage the project actions**Inputs:**

- ONERA action management tool ActION!
- All meetings generating actions

Sub-task description

- Maintain the Action Register updated, for all actions related to project (i.e. coming from meetings with customer, internal project meetings, reviews, ...). This includes:
 - Adding new actions in the log, monitoring their progress with the assignee, following-up status until closure (incl. verifying that all justifications are joined)
 - When required, relaunching assignee or organizing face-to-face to do "cleaning"
 - Manage key indicators for action management to be proposed (e.g. numbers of actions open/in progress/closed, average treatment duration, other TBD)
 - *Note:*
The PMS staff could be assignee for some rare actions, if to his scope-related.

Figures:

- Actions flow: currently ca. 10-15 per week, expected to increase a little (15-20 TBC), more traceability.

Outputs:

- [DRL-11] NGGM ActION! log updated
- [DRL-12] PMS running notes/emails on actions
- [DRL-18] KPI on actions updated

C) Manage the provision of deliverables to ESA**Inputs:**

- [RD-14] ESA deliverables lists
- [RD15] NGGM shipping slip template
- Contract last applicable payment milestones plan

Sub-task description

- Gather or verify that deliverables are/were distributed to ESA according to the event/need (payment plan milestone, review preparation, ...) and prepare the PMAC
- Send the PMAC to ESA for acknowledgment signature,
- Track for recording in the related depository with ESA confirmation of acknowledgment

Figures:

- About 4-5 milestones per year

Outputs:

- [DRL-13] PMAC filled for a dedicated milestone
- [DRL-14] Update of the PMAC's list

D) Ensure the daily risk⁹ monitoring*Inputs:*

- [AD2] ECSS-M-ST-80C "Risk management"
- [RD9] NGGM Risk Management Plan
- [RD10] ASA Risk Register List and Dependencies Analysis
- Risk Register under ONERA Action! tool
- Internal/external PT meetings outcomes

Sub-task description

- Based on [RD9], maintain the Risk log updated for all risks and opportunities linked to the project (i.e. scope/perfo./quality, schedule, costs, procurement, resources, stakeholders, ...).

This includes:

- Tracking the risks evoked during PT internal meetings, and adding risks in Act!ON!
- Attending regular meetings with the PT on risks identification and risk mitigation,
- Monitoring the progress of risk mitigation actions with the risk responsible, following-up status until closure (incl. verifying that justification elements are joined)
- When required, organizing face-to-face to do "cleaning"
- Manage few key indicators for risk management like numbers/criticality of risks, numbers of risk mitigation actions, average treatment duration, other TBC
- Note:
The PMS himself may be responsible for a mitigation action, if it deals with his scope (rarely).

Figures:

- Risk flow: currently ca. 5/10 per month, expected to be stable (even more systematically tracked) and then decrease

Outputs:

- [DRL-8] Risk log under Act!ON! updated
- [DRL-16] Contribution to Risk management process update
- [DRL-9] ASA Risk Register List and Dependencies Analysis updated
- [DRL-10] PMS improvement analyses
- [DRL-18] KPIs on risk management updated

E) Ensure the monitoring of change management*Inputs:*

- [RD2] Part - Change management process
- Act!ON! Tool for actions, Risks, NCRs, Changes,
- PT internal project meetings (weekly, on specific topics,)

Sub-task description

- Track and monitor in Act!ON! Tool, all changes identified by any PT staff, that are impacted or may impact the project. Most of changes are raised/discussed during internal PT meetings.
- Review periodically the status of the changes with the PT and the PM

⁹ Risks can impact the project negatively ("risk") or positively ("opportunity")

- For the changes which have occurred (except cost related ones), monitor the change process to enable an efficient decision on each of them, and/or the establishment of actions,
- Manage few key indicators for risk management like numbers/criticality of risks, numbers of risk mitigation actions, average treatment duration, other TBC

Figures:

- Change flow: currently max. 1 per month, expected to increase (more systematic approach) and then decrease, when configuration is frozen

Outputs:

- [DRL-17] Change log under Act!ON! updated
- [DRL-8] Actions log under Act!ON! Updated

6.2.3 WP3000: NGGM PMS supplementary activities**❖ WP Objective**

To perform the other activities during the NGGM Project Phases B/C/D1, in support to the PT.

❖ WP Inputs

- This SOW
- [RD2] Management & Quality Plan of NGGM Accelerometer Phases B/C/D1
- [AD5] ESA contract - Standard Requirements for Management, Reporting, Meetings and Deliverables
- + Inputs below for each sub-task

❖ Tasks description

In close link with the whole PT members and specifically in support to PM, the Contractor shall:

A) Prepare the NGGM Progress Report to ESA**Inputs:**

- Project weekly meetings running notes
- ESA-ONERA periodic meetings (bi-weekly, management meetings, ...)
- Act!ON! Tool for actions, Risks, NCRs, Contract Changes
- [RD15] NGGM Progress Report template
- Internal weekly meetings notes

Sub-task description

- Based on [RD15], and in link with PT and PM, prepare the first issue of the synthesis progress report to ESA, to present among all:
 - The general project technical progress achievement over the period e.g. main achieved milestones, events (e.g. NCs, reviews, ...),
 - The schedule progress and the Critical Path, Near-Critical Path, the coming events, e.g. specific key-points, reviews, inspection, audits,
 - The associated most critical risks and the status of related mitigation actions,
 - The status of the indicators (e.g. NCs, actions, risks, ...)
 - If existing, the project EVM key indicators like SPI and CPI, EAC,
- Make circulate the Progress Report internally for review to concerned PT staff (PAM, TM, PM, ...) and update it with comment
- Attend the Progress Meeting with ESA, if requested

Figures:

- 1 PMR each 2 months (proposal of simplification of Progress meeting/Progress Report by PM in progress)

Outputs:

- [DRL-15] Progress Report to ESA¹⁰

B) Propose an Earning Value Management relevant scheme

This task is the only one which is a one-shot task, meaning it will be done once to help defining and implement the EVM scheme on the NGGM Project.

Inputs:

- Knowledge like PMP/PMI or similar experience

Sub-task description

- Starting with the schedule, propose an Earning Management Value scheme to the PM, based on a simple and easily monitorable set of progress of the project (e.g. by weighting WPs, and setting progress percentage based on physical milestones,)
- Establish the KPIs accordingly
- Update them regularly (quarterly, monthly TBC)
- Propose project mitigation actions if a drift is identified (schedule first, costs TBC)

Figures:

- Not existing currently, planned to be established monthly TBC

Outputs:

- [DRL-18] Relevant KPIs created (SPI, CPI, EAC, ...)

C) Monitor the Earning Value Management*Inputs:*

- Outcome of WP3000 B) "Propose an Earning Value Management relevant scheme"

Sub-task description

- Based on PT's last available data, update regularly (quarterly, monthly TBC) the KPIs enabling an efficient EVM (quarterly, monthly TBC)
- Propose project mitigation actions if a drift is identified (schedule first, resources TBC)

Figures:

- Not existing currently, planned to be established quarterly or monthly TBC

Outputs:

- [DRL-18] Relevant KPIs updated (SPI, CPI, EAC, ...)

¹⁰ The PM is currently working on a simplification proposal of this Progress Report to ESA

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6.2.4 WP4000: NGGM Project Management Support activities

❖ **WP Objective**

To perform the Project Management Support activities during the NGGM accelerometer Project Phase D2 (i.e. Flight Model production and tests leading to the delivery of the FMs).

Note:

Fundamentally, the tasks are the same than for WP2000/ WP3000 (except WP3000 Task B), which is a one-shot task) with more monitoring of industrialization activities (supply chain manufacturing process, ...). Considering the project management methods assumed to be well implemented as early as possible during Phase B/C/D1, the activity is expected to be much smoother, even though continuous improvement proposal pro-activity is welcome (e.g. on EVM).

❖ **WP Inputs**

- This SOW
- Lessons-learnt and project management outcomes of Phase B/C/D1

❖ **Tasks description**

- In close link with the whole PT members, the Contractor shall ensure the same activities than those described in WP2000 and WP3000 (except WP3000 B), which is one-shot if already done)

❖ **Figures:**

- Likely much less than for WP3000 and WP4000, as the ASA will have been qualified fully at the end of Phase D1 and configuration will be fully fixed.

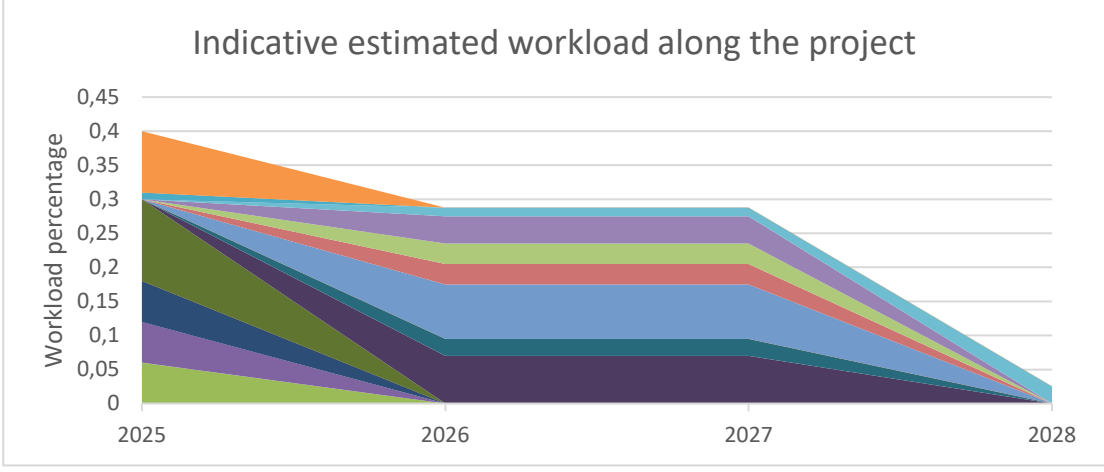
❖ **WP Outputs**

- Same than for WP2000 and WP3000
- Note:
Final WPs deliverables will be defined at the time of the Phase D2 firm up.

6.2.5 NGGM Project Team, PMS position and reporting

The Contractor's staff reports to the PM in a first line. However, due to his transversal position, he shall interface with the whole PT at least weekly to retrieve useful information and put them in perspective, as required.

7 SCHEDULE, MANAGEMENT AND QUALITY REQUIREMENTS

NGGM_PMS_RQ-001	Title: NGGM project indicative workload profile
<p>Description: Due to the activities to be performed during Phase B and C mainly, the Contractor shall consider a workload based on the following profile for Phases B/C/D1 and Phase D2</p>  <p>Note: N/A</p>	
<i>Expected answer</i>	<i>Deliverable:</i> [DRL-2] Contractor's acknowledgment

NGGM_PMS_RQ-002	Title: Management overall experience
<p>Description: The Contractor's staff shall comply with management requirements in a general way, with a focus on project management activities scope.</p> <p>Note: <i>Experience on a similar project or a certification in project management are considered as an asset</i></p>	
<i>Expected answer</i>	<i>Deliverable:</i> [DRL-3] Competency Matrix

NGGM_PMS_RQ-003	Title: Technical field expected skills
<p>Description: With regard to NGGM project's customer and field, the Contractor's staff shall present a few years of experience in project management or support in research and development in space domain preferably or similar complex domain (nuclear, automotive...),</p> <p>Note: Knowledge of instrumentation for CNES, ESA or NASA scientific missions considered as an asset</p>	
<i>Expected answer</i>	<i>Deliverable:</i> [DRL-3] Competency Matrix

NGGM_PMS_RQ-004	Title: Language
Description: Due to the international context, the Contractor's staff shall present an English level B2 or better	
Notes: N/A	
Expected answer	Deliverable: [DRL-3] Competency matrix

NGGM_PMS_RQ-005	Title: Quality assurance/Product assurance expected skills
Description: With regard to space project specific constrains and processes, the Contractor's staff should present a good understanding of product and quality assurance requirements	
Notes: Are assets the mastering of: <ul style="list-style-type: none"> • ISO 9001 standard and management, or, • Quality and space engineering references of CNES and ESA (like ECSS or LS-SMs) 	
Expected answer	Deliverable: [DRL-3] Competency Matrix

NGGM_PMS_RQ-006	Title: Maintenance of skills on Contractor's side
Description: The Contractor shall manage within its team the set of skills enabling to master the requirements defined above. It shall in particular communicate to ONERA: <ul style="list-style-type: none"> • The controllable list of the skills of its teams or on which it can count according to the needs, at each modification of personnel, • Any personnel change at least 2 months before the effective date, • A human resource management plan that demonstrates how it may compensate an unforeseen or prolonged failure of a resource, a peak load, or any issue requiring specific project management skills 	
Note: Controllable list means with names if so requested	
Expected answer	Deliverable: [DRL-2] Contractor's acknowledgement [DRL-3] Competency matrix

NGGM_PMS_RQ-007	Title: Replacement of the Contractor's staff
Description: The Contractor shall inform ONERA in due time of any PMS's staff replacement. He shall make arrangement in due time, by ensuring the transfer of skills of at least one month towards the replacement. During the period, the outgoing actor and the replacement actor will be jointly assigned to the PMS with ONERA.	
Notes: ONERA will have a probationary period of one additional month during which it will be free to refuse the new staff proposed by the Contractor, without having to justify it.	
Expected answer	Deliverable: [DRL-2] Contractor's acknowledgment [DRL-3] Competency matrix

8 DELIVERABLE LIST

Delivery ID	Delivery title	WP	Due delivery dates (baseline and supplementary activities)								Comments
			ITT answer	KOM	Each week	Each mth	Each 2 mths	Each Quarter	As needed	Clos.	
[DRL-1]	Plan de Prévention	1000		Final							1 st version at selection
[DRL-2]	Contractor's acknowledgement	1000	X								By proposing the best scheme at ITT
[DRL-3]	Competency matrix	1000	X						X		
[DRL-4]	Progress Management Support Report	1000						X		Final	At least quarterly, See §Annex D
[DRL-5]	MoM ONERA-Contractor Progress Meet.	1000									
[DRL-6]	NGGM schedule	2000				X			X		At least monthly TBC
[DRL-7]	NGGM Design and Development Plan	2000							X		
[DRL-8]	Act!ON! Risk log	2000				X			X		
[DRL-9]	ASA Risk Reg. List& Depend. Analysis	2000							X		
[DRL-10]	PMS improvement analyses	2000							X		
[DRL-11]	NGGM Act!ON! log update	2000			X				X		
[DRL-12]	PMS running notes/mails on actions	2000							X		
[DRL-13]	PMAC filled for a dedicated milestone	2000							X		
[DRL-14]	Update of the PMAC's list	2000							X		
[DRL-15]	Progress Report to ESA	2000					X				
[DRL-16]	Contribution to Risk manag. process	2000							X		
[DRL-17]	Act!ON! Change log	3000							X		
[DRL-18]	KPIs update:										
	- Schedule	2000				X			X		
	- Actions	2000			X	X			X		
	- Risks	2000				X			X		
	- Changes	3000									
	- Earning Value Management	3000						X	X		

Annex A DEFINITIONS AND ACRONYMS USED IN THE SOW

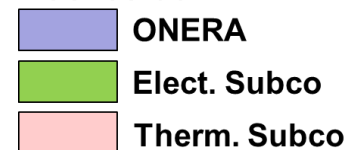
AA	Accelerometer Assembly
ACC	Accelerometer (=1 ASH + 1 FEEU + 1 ICU + harness)
AD + N	Applicable Document + Number
ADS	Airbus Defense&Space, one of the two Primes of ESA mission for the platform
AEA	Accelerometer Electronic Assembly
AIT /AIV	Assembly, Integration and Test / Assembly, Integration and Verification
AOP	Adjoint Opérationnel of DPHY allocated to NGGM Project (DPHY Department)
ASA	Accelerometer System Assembly (=3 ASHs + 3 FEEU s+ 1 ICU + harnesses)
ASEA	Accelerometer System Electronic Assembly (3 FEEU s+ 1 ICU + harnesses)
ASH	Accelerometer Sensor Head
CDR	Critical Design Review
CP / NCP	Critical Path /Near Critical Path
CPI	Cost Performance Index
Customer	ESA as main customer of NGGM Project of ONERA (mission hosted in ESA Earth Observation Future-Programme)
DA	Direction des Achats de l'ONERA
DAC	Digital to Audio Converter
DAEF	Direction des Affaires Economiques et Financières
DC	Direct Current
DDR	Detailed Design Review
[DRL-N]	Deliverable Reference + Number
DFAOCS	Drag compensation, Formation, Attitude and Orbit Control System
DPHY	Département de Physique, Environnement et Espace de l'ONERA
DPHY/D	Director of DPHY Department
DPHY/IEA	See IEA
DPHY/AOP	See AOP
DRB	Delivery Review Board
DRL + N	Document Requirements List+ Number
DQO	Direction de la Qualité et de l'Organisation de l'ONERA
DRD	Document Requirements Definition
DSOC	Direction du Support et des Offres Commerciales de l'ONERA
DVA	Direct Voltage Adapter
EAC	Estimate At Completion
ECSS	European Cooperation for Space Standardisation
EEE	Electronic, Electrical and Electromagnetic Parts
EIDP	End Item Data Package
EM / EQM	Engineering Model / Engineering Qualification Model
ESA	European Space Agency
ESAQ PB/EO	ESA Programme Board / Earth Observation
EVM	Earning Value Management
FEEU	Front-End Electronic Unit
FM	Flight Model
GOCE, GRACE, GRACE-FO	Previous space missions within which ONERA accelerometers flew
GRACE-C	Future NASA mission within which ONERA accelerometers will flow
ICU	Interface Control Unit
IEA	Département DPHY Unité Instruments et Equipements Aérospatiaux
ISO	International Standard Organisation
IRR	Integration Readiness Review

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ITT	Invitation To tender
MoM	Minutes of Meetings
MRR	Manufacturing Readiness Review
NGGM (mission)	Next Generation Gravity Mission, which is an ESA Mission
NGGM Project (Accelerometer)	For ONERA activities, NGGM designates the development, manufacturing, qualification of the accelerometer system(one of the NGGM instruments). To ease the reading, the term “NGGM Project” is used
OBC	On-Board Computer (in the platform)
PA/QA	Product Assurance/Quality Assurance
PAM	(NGGM) Product Assurance Manager
PCDU	Power Conversion Distribution Unit (in the platform)
PDR	Preliminary Design Review
Phase B/C/D1	<ul style="list-style-type: none"> - Phase B: Preliminary design of ASA and its subsystems concluded by the ASA PDR - Phase C: ASA TRL6 achievement (realization of an ASA EM and concluded by the ASA CDR); - Phase D1: ASA TRL7 achievement (realization of an ASA QM and concluded by ASA QR)
Phase D2	Covers the Flight Model production and tests leading to the delivery of the FM
PM	(NGGM) Project Manager
PMS	Project Management Support (the activity)
PT	(NGGM Accelerometer) Project Team
PTR	Post-Test Review
QM	Qualification Model
Q + i	Year NNNN Quarter i (1 to 4)
QR	Qualification Review
RD + N	Reference Document + Number
R&D	Research & Development
RR	Requirement Review
SM	Spare Model
SoW	Statement of Work
SRR	Software Readiness Review
SPI	Schedule Performance Index
SRR	Software Readiness Review
TAS	Thales Alenia Space, second of the two Primes of the ESA mission for platform
TAS-I	Thales Alenia Space – Italy, subcontractor of ONERA for NGGM project
TBC/TBD	To Be Confirmed / To Be Defined
TM	(NGGM) Technical Manager
TN	Technical Note
TRB	Test Review Board
TRL	Technology Readiness Level
TRR	Test Readiness Review
WP	Work Package
WPM	Work Package Manager

Annex B **WORK PACKAGES****Legend:****ESA SoW Tasks****Consortium**

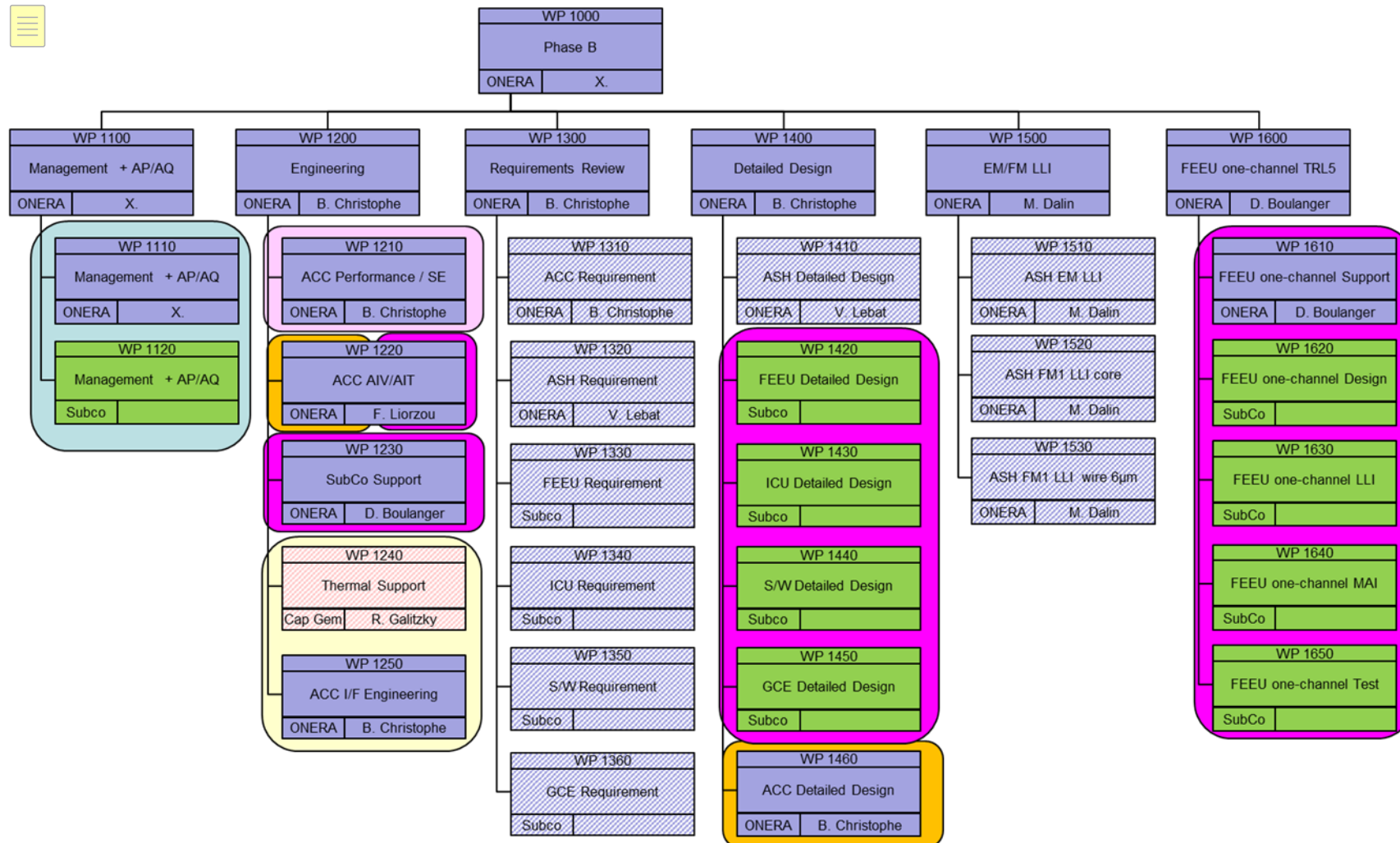


Figure 5: WBS for Phase Band relation with ESA SoW tasks

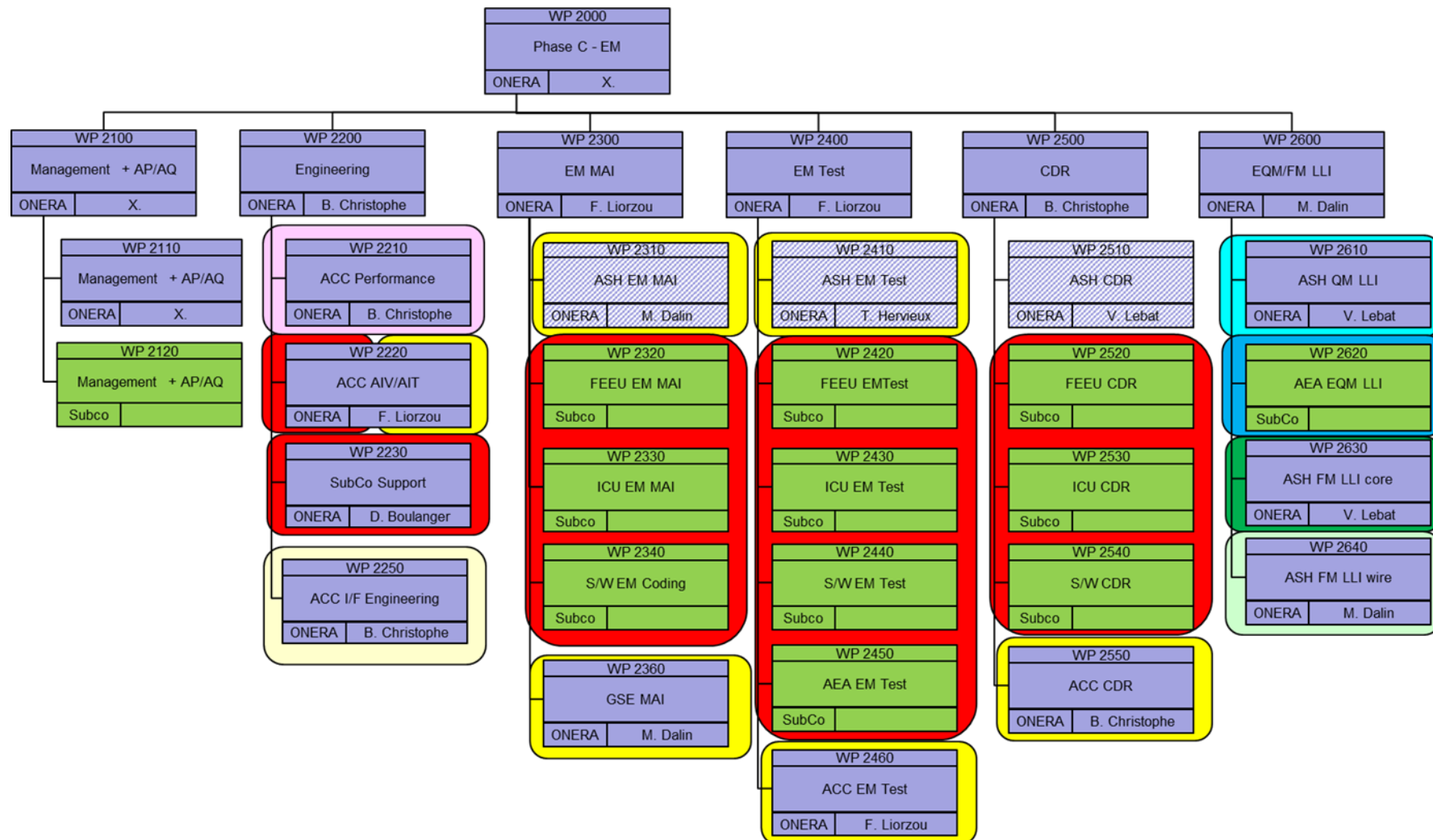
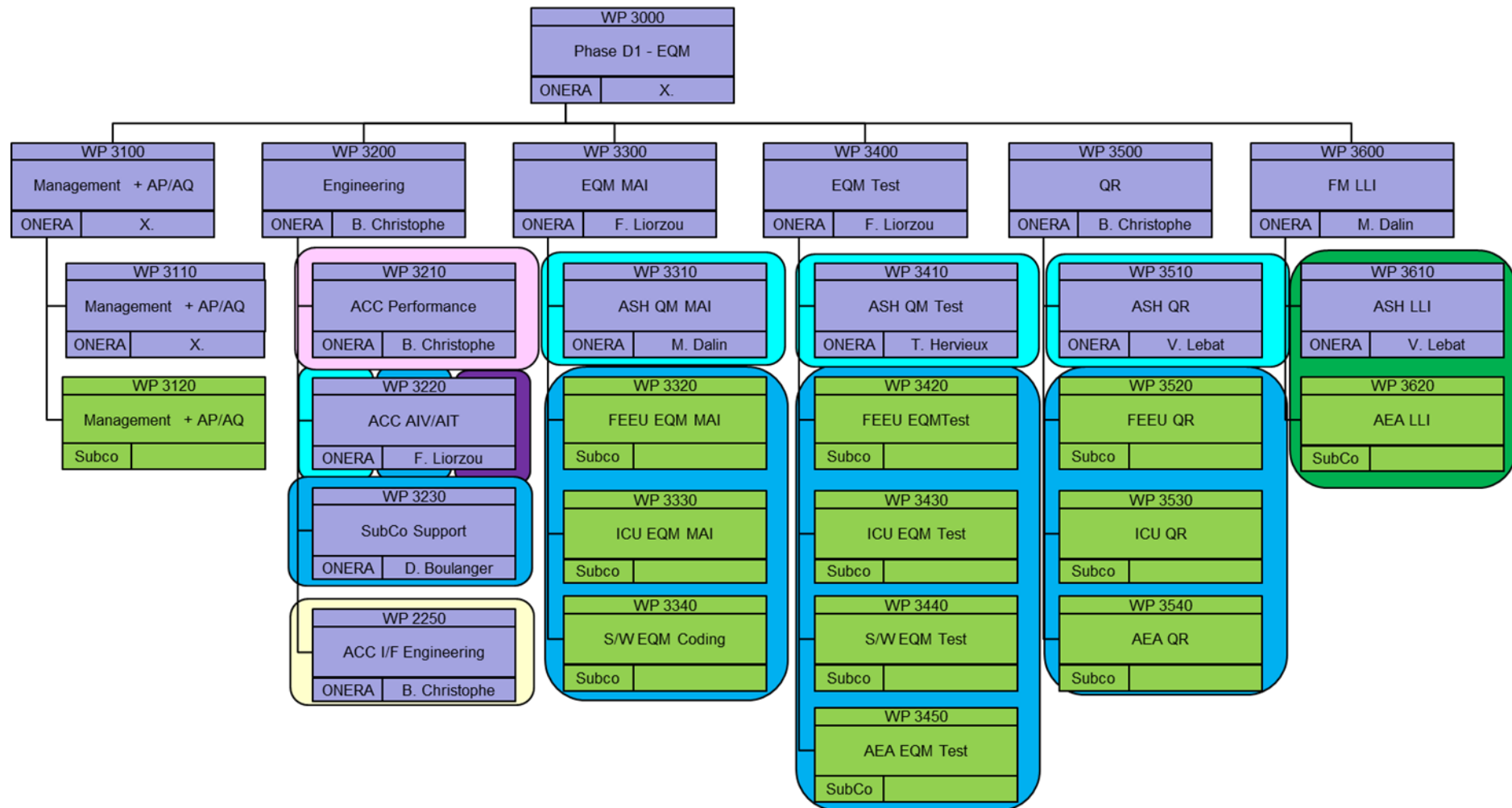


Figure 6: WBS for Phase C and relation with ESA SoW tasks, Option 1&2



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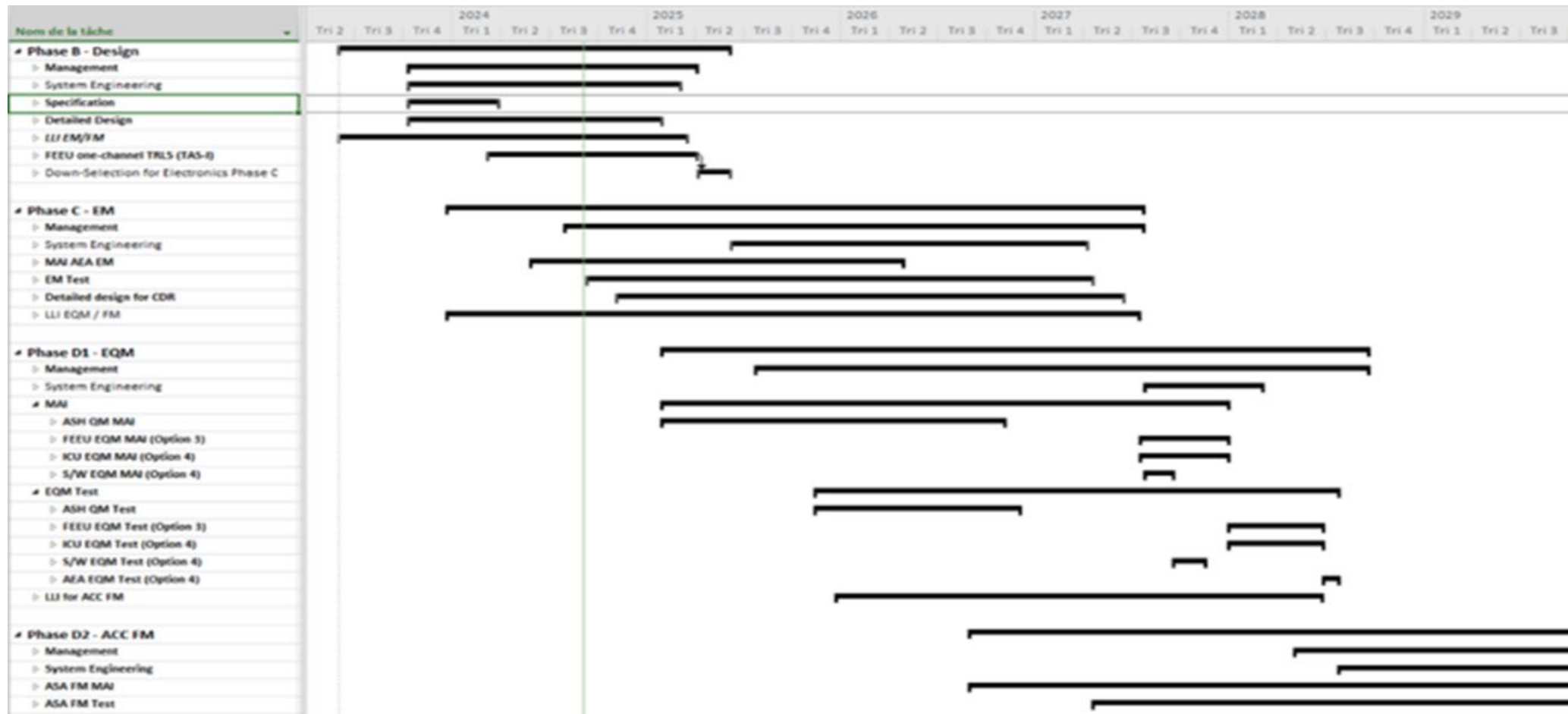
Figure 7: WPS for Phase D1 and relation with ESA SoW (Option 2 in Ph. D1, Options 3 and 4)

Annex C - NGGM ACCELEROMETER PROJECT CURRENT MILESTONES DATES

As per the current known dates, presented to ESA on October 2024, for Phases B, C and D1:

Activities	Duration	Contract date	Current schedule
Phase B	12 months	Mars 2024 to February 2025	
Cost Review		June 21, 2024	
ASA PDR		September 23, 2024	End Oct. 2024
ASEA PDR		December 20, 2024	End Feb. 2025
ASEA Selection		February 25, 2025	End June 2025
Phase C	35 months	From March 2024 to January 2027	
ASH CDR (in CCN-6)		September 27, 2024	End Jan. 2025
ASEA CDR		October 2, 2026	End July 2027
ASA CDR		January 21, 2027	End July 2027
Phase D1	39 months	From November 2024 to January 2028	
ASH QR		May 15, 2026	End Aug. 2026
FEEU QR (Option 3)		May 14, 2027	
ICU QR (Option 4)		May 14, 2027	
AEA QR (Option 4)		July 9, 2027	
DRB of the last ASH LLI	(Option 2)	January 18, 2028	

Phase D2: The master schedule extract below extracted from [RD-4], last update on 29/08/2024, provides a summary picture of Phase D2



Annex D DOCUMENTATION REQUIREMENT DEFINITION**[DRL-7] PMS Progress Report**

Shall include as a minimum, for the activities performed during the Project management support, the synthetized description of:

- The list of activities performed by the Contractor's staff in line with any of the tasks described in the WPs (schedule update, actions management, provision of deliverables to ESA, risks & opportunities management, change log management, progress report preparation, EVM related activities and all KPIs related updates)
- The attendance to specific meetings
- The achievements reached during the period
- Events anticipated during the next reporting period
- Any recommendation/suggestion to optimise the staff achievements, and/to improve the NGG Project management practices overall

END OF THE DOCUMENT