EGNOS GEO Transponder Service Replenishment

Statement of Work

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Acronyms

AD	Applicable Document
AR	Acceptance Review
CDR	Critical Design Review
CFI	Customer Furnished Items
CPF	Core Processing Facility
DDP	Delivered Duty Paid
DG-TEN	Directorate General – Energy and Transport
EC	European Community
ECAC	European Civil Aviation Conference
EoL	End of Life
ESA	European Space Agency
ESP	EGNOS Service Provider
ESSP	European Satellite Service Provider
EGNOS	European Geostationary Navigation Overlay System
EGNOS-OP	EGNOS Operation System
EGNOS-TEST	EGNOS Test System
EGS	EGNOS GEO Transponder Service
EGSP	EGNOS GEO Transponder Service Provider
EGSPR	EGNOS GEO Transponder Service Progress Report
EGS-QR	EGNOS GEO Transponder Service Qualification Review
EGSSR	EGNOS GEO Transponder Service Status Report
ESSP	European Satellite Service Provider
EU	European Union
E2E	End to End
GEO	Geostationary Earth Orbit
GPS JPO	Global Positioning System Joint Program Office
GPSW	Global Positioning System Wing
GSA	European GNSS Supervisory Authority
I/F	Interface
IOT	In-Orbit Test
ITR	In-orbit Test Review
ITU	International Telecom Union
KOM	Kick-Off Meeting
KPI	Key Performances Indicator
MRD	Mission Requirements Documents

NLES	Navigation Land Earth Station
NLES-AR	NLES RF Station Acceptance Review
OJ	Official Journal (of the European Union)
OSD	Operations Start Date
PA	Product Assurance
PFM	Proto Flight Model
PMP	Project Management Plan
PRN	Pseudo Random Noise
QR	Qualification Review
RD	Reference Document
RF	Radio Frequency
RFP	Request for Proposal
RR	Requirements Review
SARPS	Standards and Recommended Practices
SBAS	Satellite Based Augmentation System
SBS	Service Breakdown Structure
SES	Single European Sky
SIS	Signal In Space
SOW	Statement Of Work
SPOC	Single Point Of Contact
SS	Sub-Service
TEB	Tender Evaluation Board
WBS	Work Breakdown Structure
WP	Work Package

Definitions

Commission	Commission of the European Communities;
EGNOS Arc	means the orbital arc suitable for providing the EGNOS GEO Transponder Service over the complete FIR ECAC coverage with a minimum elevation angle of 5 degrees.
EGNOS GEO Transponder Service (EGS)	means the service provided by the Contractor which includes the 2 following aspects: The procurement and the operations service of the EGNOS GEO transponder payload. The hosting and operations service of the 2 NLES associated to the GEO transponder (including adaptation of RF sections to uplink the signals to the satellite);
EGNOS GEO Transponder Service Provider (EGSP)	means the Contractor selected to provide the EGNOS GEO Transponder Service;
EGNOS GEO Transponder Service Project (EGS Project)	means the set of activities performed by the Contractor in view of the procurement of the EGNOS GEO Transponder Service;
EGNOS Service Provider (ESP)	means the ESSP selected to operate the EGNOS system and provide the EGNOS Signal In Space (SIS) service;
Hosting Site	means the premises where EGNOS NLES assets are located for the purpose of their recurrent operation;
Operations Start Date (OSD)	means the date at which the EGNOS GEO Transponder Service is qualified to start its operations within the EGNOS system (either in EGNOS-OP or in EGNOS-test).

1 SCOPE AND PRESENTATION OF SOW REQUIREMENTS

1.1 Scope

This Statement of Work (SOW) defines the two **EGNOS GEO Transponder Services (EGS)** procured by the European Community, and the deliverables of such services.

Each EGS shall consist of:

1. EGS Preparation Phase:
    a. Preparation of SBAS signal in-orbit capacity (not applicable if the operator who is awarded the contract is already flying a SBAS payload the use of which he has proposed in his bid);
    b. Preparation of the EGNOS NLES Hosting Site and RF Station and support to the NLES integration;
2. EGS Provisioning Phase:
    a. Operations of the SBAS payload;
    b. Operations of the NLES Station.

Detailed service technical specifications for the EGNOS GEO Transponder Services GEO-1 and GEO-2 are defined in Annex 1 Technical Specifications and form an integral and inseparable part of the present SOW.

1.2 Presentation of the SOW requirements

The language used to define the various items in the present SOW shall signify the following:

"Shall" is used to indicate a mandatory requirement compliance with which must be stated in the tenders. Within each requirement subject, each use of the word 'shall' is to be understood as a separate requirement, for which compliance must be stated separately.

- "Should" is used to indicate a preferred alternative of the EC but is not mandatory and tenderers may choose to propose a different alternative in their tenders;
- "May" is used to indicate an option and bidders are free to propose any alternative;
- "Will" and the present tense are used to indicate a statement of intention or fact;
- "Days" mean calendar days unless otherwise specified.

The numbering of requirements in this SOW follows the following nomenclature:

- Each requirement subject is numbered "EGN-ESP-SOW-x.y.z", where:
    - 'x' identifies a first level of sub-service within the EGS
    - 'y' identifies a second level of sub service.
    - 'z' identifies a specific subject ruled by the requirement heading.

2 BACKGROUND INFORMATION

This section is included for information purposes only to facilitate understanding of the SOW requirements and does not contain any requirements for the bidders.

2.1 Current EGNOS GEO transponders situation

The general objective of the public sector for the exploitation phase of EGNOS is to provide an EGNOS Signal-In-Space and associated services, with the level of performance adequate to meet the needs of the user communities, as defined by the mission requirements and applicable standards captured in the EGNOS Mission Requirements Document (MRD).

The EGNOS SoL service continuity and availability requirements defined in the EGNOS MRD imply that the ECAC service area is continuously covered by at least 2 GEO transponders. These 2 GEO transponders are part of the so-called EGNOS-OP system.

Besides, an additional GEO transponder has to be made available to the EGNOS operator. It is used either for technical qualification of EGNOS new releases/upgrades or for operational qualification of EGNOS operator before a new release if deployed in the operational GEO transponders. Moreover, the third GEO transponder is required in order to ensure the long term continuity and availability of the EGNOS service, as it is used in case of unplanned failure of one of the two "primary" GEO transponders. This additional GEO transponder is part of the so-called EGNOS-TEST system.

In the current baseline, INMARSAT AOR-E (3F2) and INMARSAT IND-W (3F5) are used by the *EGNOS-OP* system to provide the EGNOS service. ESA's ARTEMIS satellite is currently used and planned to be used for industrial qualification of EGNOS upgrades in the EGNOS-TEST system.

As indicated in the table below, it is expected that two of the three available GEO transponders will cease to be available in a time frame of 2011-2013:

- The ARTEMIS satellite End of Life (EoL) is foreseen around mid 2010 – 2011;
- The Inmarsat 3F2 satellite EoL is anticipated to be around 2012-2013.

In addition, the Inmarsat 3F5 satellite will be moved in November 2008 to a new orbital position (54°W), no longer suitable for serving the ECAC region. This will be replaced by the Inmarsat 4F2 following its relocation at 25°E.

Inmarsat AOR-E (3F2)	PRN 120	15.5°W	EoL 2012
Inmarsat IND-W (3F5)	PRN 126	25.0°E	EoL 2018 but will move out of the ECAC full coverage in Nov. 2008
ARTEMIS	PRN 124	21.5°E	EoL 2010/2011

2.2 Replenishment needs and timeline plan

In order to ensure the continuity of the EGNOS service during the exploitation phase of EGNOS, the European Commission representing the European Community has to prepare the replenishment of the EGNOS GEO transponders with the procurement of 2 new EGNOS GEO Transponder Services:

- **GEO-1, with an Operational Start Date in 2011; and**

- **GEO-2, with an Operational Start Date in 2012.**

Subject to the approval by the budgetary authority of the European Community regarding the availability of funds, the European Community expects to maintain EGNOS GEO Transponder Service for a total duration of minimum 13 years, depending on the satellite lifetime.

This long term perspective is required in order to secure the continuity EGNOS Service for Safety of Life applications. Therefore the Commission intends to maintain the EGNOS signal in space and services for the aviation sector for 20 years.

The new European GNSS Regulation, which shall be formally published on the EU Official Journal (OJ) by the time the present tender is issued, will provide a legal basis and spell out the main principles for the Community action in managing and implementing the EGNOS programme.

Figure 1 presents the desirable high-level replenishment plan of the Commission for the EGNOS GEO transponders, highlighting the Operational Start Dates (OSD) of GEO-1 and GEO-2. This plan will be finalised following the award decision taking into account the availability date of the two EGS proposed by the winning bidder(s).

As can be seen on Figure 1, it is expected that an additional third EGNOS GEO transponder service (GEO-3) will also be procured in the future with an operational start date in 2013/2014. This third EGS is not part of the present tender and is described solely to give full background information to the bidders.

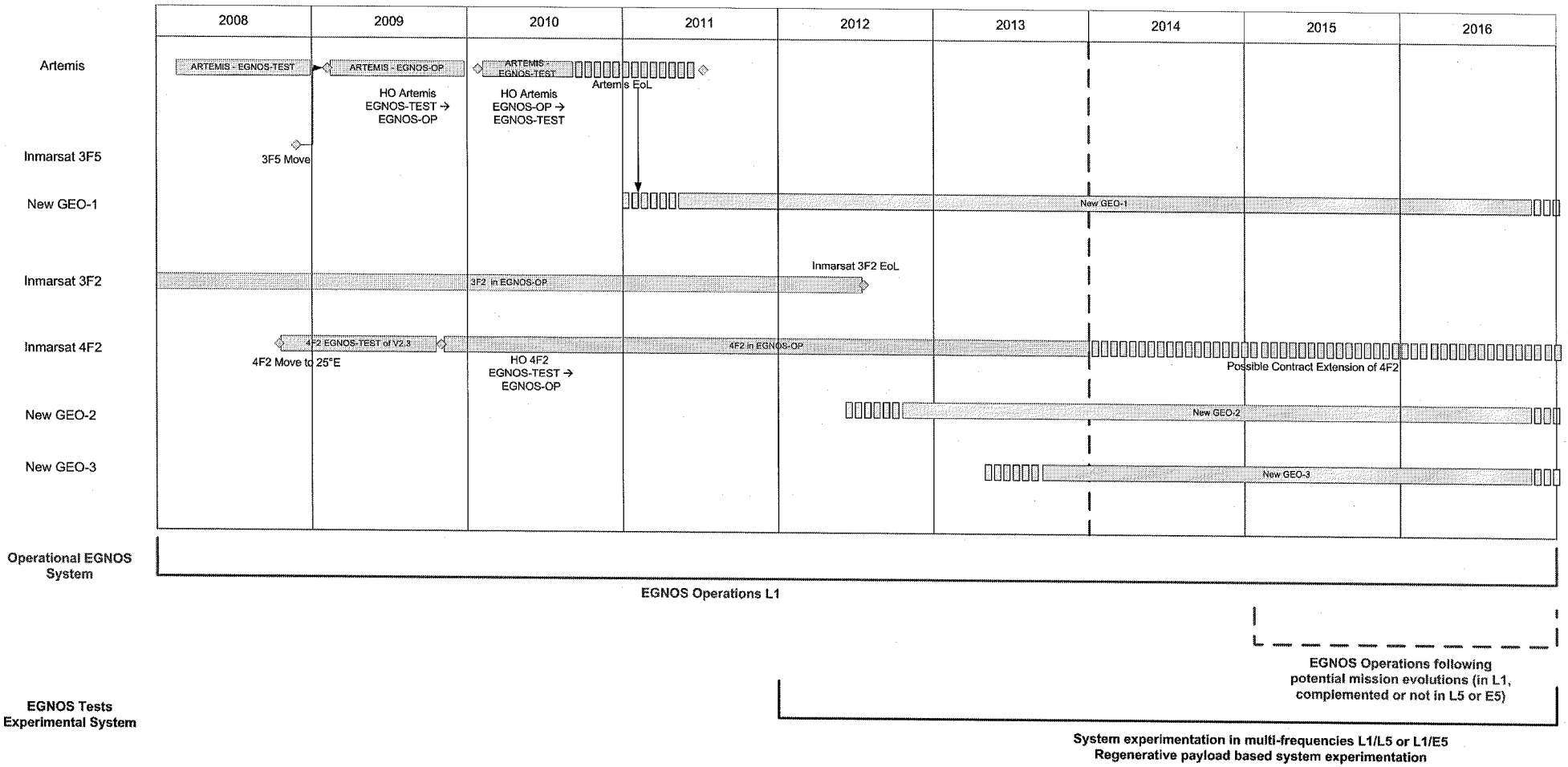


Figure 1 EGNOS GEO Transponder Replenishment Plan

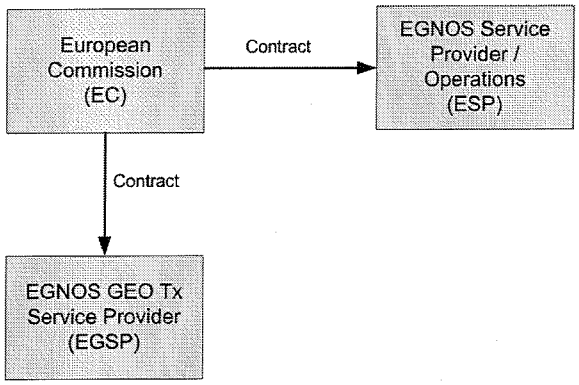
2.3 EC Project organisation principles

Current procurement and the resulting contract for the EGS is part of the EC EGNOS programme managed by the Commission. In general, the Commission has the responsibility to manage the exploitation phase of EGNOS and ensure operation, maintenance and service provision of the EGNOS system. In this capacity it considers organising the relationships with its various service providers as follows.

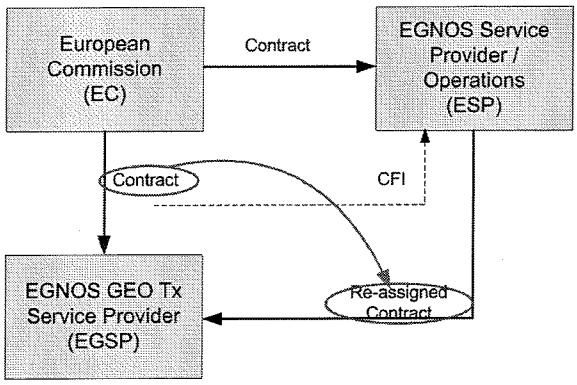
Figure 2 below represents the interactions between the different parties in relation to the procurement of the EGS before and after the start of EGNOS GEO Transponder Service operations.

At first, the EGS contract(s) is procured and signed by the Commission acting on behalf of the EC.

Prior to or at the start of the EGNOS GEO Transponder Service operations, the EGS contract may be transferred from the EC to the EGNOS Service Provider (ESP) through resorting to the EGS contract assignment clause (see the draft contract). In this case, the ESP shall than become the management interface of the Contractor for the execution of the contract. The Contract would be assigned as such so that no additional effort is created on the Contractor side.



INITIAL ACTORS INTERACTION



ACTORS INTERACTIONS AFTER START OF EGNOS GEO TRANSPONDER SERVICE OPERATIONS

Figure 2 General Contractual Organisation

3 DOCUMENTS

The EGS shall be provided in compliance with the documents identified below.

3.1 Applicable Documents

The Applicable documents are listed in Annex 1 Technical Specifications and may be obtained upon request (see Conditions of Tender for more information). These documents contain EGS requirements against which the tenderers ***shall*** state compliance in their tenders. In case of inconsistencies between the documents, the order of precedence is the order in which they are listed. Any such inconsistencies ***shall*** be brought to the attention of the Commission.

3.1.1 CFI Documents

A subset of the Applicable documents shall be delivered to the Contractor by the EC as Customer Furnished Items.

It is the Commission's objective to provide the Contractor before or at the start of the Kick-Off Meeting (KOM) with the complete detailed list of CFIs. These documents refer to the CFI items defined in section 4.2.

3.2 Reference Documents

The Reference documents are listed in Annex 1 Technical Specifications and may be obtained upon request (see Conditions of Tender for more information).

4 EGNOS GEO TRANSPONDER SERVICES

This section provides an overview of main requirements by which the Customer specifies how the Contractor ***shall*** execute the EGNOS GEO Transponder Service.

4.1 Service Requirements

EGN-GEO-SPEC-0.1.1 EGNOS GEO Transponder Service operations Duration

The EGNOS GEO Transponder Service solution proposed by the Contractor ***shall*** be capable to provide the service during at least 13 years.

EGN-GEO-SPEC-0.1.2 Service Underperformance and Service Interruption

The Contractor ***shall*** ensure that the EGNOS GEO Transponder Service meets a service availability of 99,9% as defined in Annex 1 Technical Specifications.

In case the EGNOS Transponder Service is unavailable for more than 0,1 over the each of 12 months periods after the OSD but less than 30 continuous days and less than 60 cumulated days over the each of 12 months periods after the OSD, it shall be considered as *Service Underperformance* and the Commission ***shall*** be granted *pro rata* service provision fee adjustment (outage credits) according to the following formula:

Service provision fee adjustment = Yearly Fee x (Cumulated Unavailability [%] – 0,1 %)

For the above equation, the unavailability events shall be considered after a continuous service unavailability of *5 minutes*.

In case the EGNOS GEO Transponder Service is unavailable for more than 30 cumulated days or 60 cumulated days over the each of 12 months periods after the OSD, it is considered a *Service Interruption* and related contractual clauses proposed by the winning tender shall be applied.

EGN-GEO-SPEC-0.1.3 Satellite Relocation Outside the EGNOS Arc

In case the Contractor decides to re-locate the satellite during the term of validity of the EGS contract outside the EGNOS Arc, the Contractor ***should*** notify the Commission of such a re-location with a **notice period of 30 months** or be in a position to offer an alternative satellite transponder within one month after the satellite relocation to ensure the continuity of the operations (in this case, the Contractor ***should*** ensure that the regulatory aspects for the use of this satellite within the EGNOS system have been performed).

4.2 Customer Furnished Items

The following elements shall be provided by the EC as Customer Furnished Items (CFI) for the Contractor:

1) NLES Equipments: These are the NLES baseband subsystems, which will be provided and deployed by the EGNOS Ground Segment Provider. These equipments are currently hosted in the current EGNOS Hosting Site and will be transferred in due time to the new

hosting sites proposed by the Contractor. A description of all NLES subsystem interfaces is provided in Annex 1 Technical Specifications.

4.3 EGNOS GEO Transponder Service (EGS) Organisation

The following Service Breakdown Structure (SBS) defines how the Commission expects EGNOS GEO Transponder Service to be organised. In his proposal, the Contractor shall submit a Work Breakdown Structure in order to ensure the provisioning of the required EGNOS GEO Transponder Service. The Contractor shall take this SBS as an input in order to define its project organisation (EGS Project) with its associated Work Breakdown Structure (WBS) and Work Packages (WP).

As a matter of definition, as illustrated in the figure, level 1 (or n) of Service is the EGNOS GEO Transponder Service provision (left column of Figure 3), level 2 (or n-1) is the headings of the main Sub-Services (middle column of Figure 3) and level 3 (n-2) is the breakdown of each Sub-Service (right column of Figure 3).

The EGNOS GEO Transponder Service is organised in 2 Phases:

1. EGS Preparation Phase
2. EGS Provisioning Phase

The EGNOS GEO Transponder Service is, as result, organised around 4 main Sub-Services (SS) as defined in the scope of the EGS (section 1.1:

1. SS1: EGNOS In-Orbit Capacity Provisioning
2. SS2: NLES Hosting and RF Station Preparation
3. SS3: EGNOS In-Orbit Capacity Operations
4. SS4: NLES Operations

Sub-Services SS1 and SS2 (highlighted in blue) belong to the EGS Preparation Phase while the Sub-Services SS3 and SS4 (highlighted in green) belong to the EGS Provisioning Phase.

The Management Sub-Service (SS0) is an ad-hoc Sub-Service defined for the overall management of the other Sub-Services.

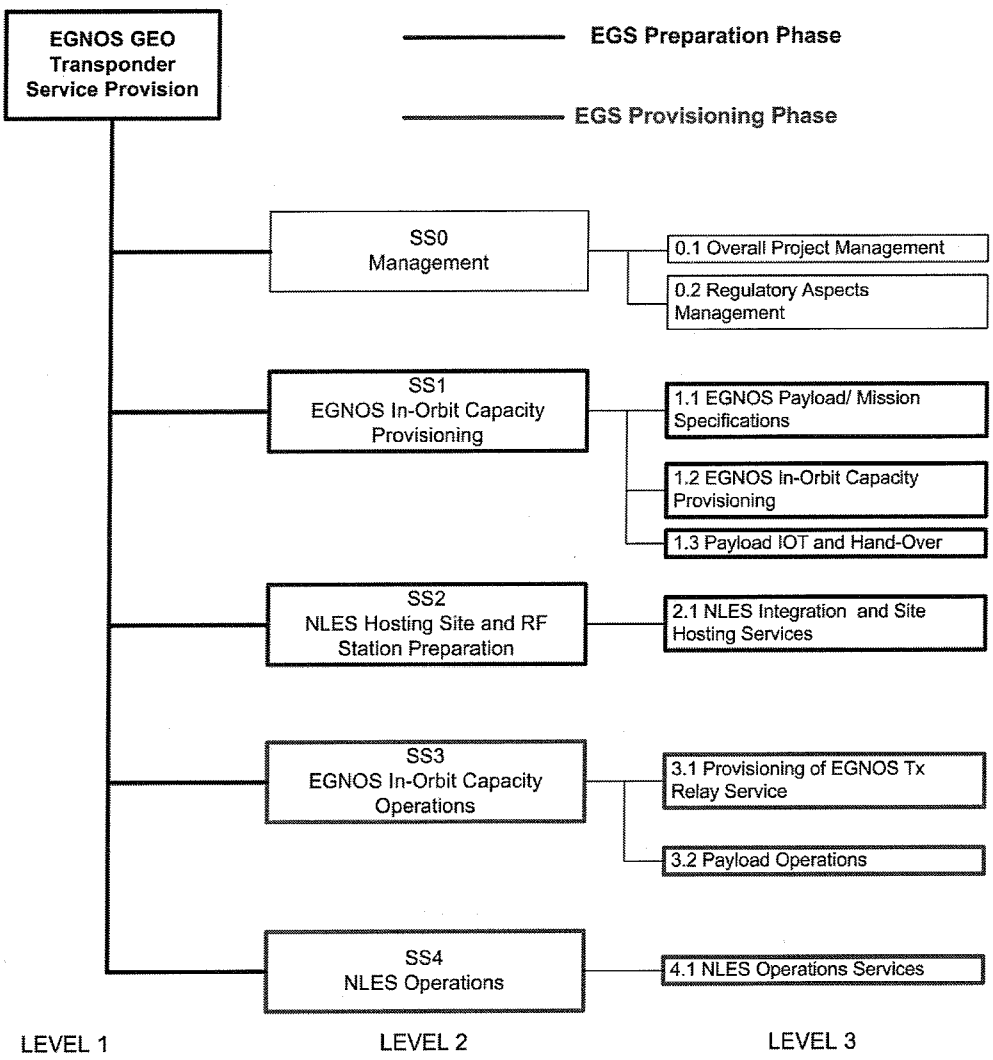


Figure 3 EGNOS GEO Transponder Service Organisation (SBS)

Figure 4 below presents an indicative schedule for the phasing of the different phases and their associated Sub-Services in the implementation of the EGS contract.

The tasks to be performed by the Contractor throughout the entire term of validity of the contract are considered to be an EGS project (Project) and shall cover the execution of the following Sub-Services:

- SS0: Management of the Project. This Sub-Service shall cover the entire duration of the project. This includes:
  i. Overall Project Management (coordination of activities, interface with ESA/EC/ESP for contractual, technical and managerial aspects, meeting and documentation preparation, execution of project management plan);
  ii. Regulatory aspects management (PRN registrations, frequency filing at ITU);
- SS1: EGNOS In-Orbit Capacity Provisioning. This Sub-Service shall be started as soon as possible after the Contract KO and shall last till the in-orbit delivery (In-Orbit Test Review) of the payload. It includes(*):
  i. Detailed specification of the EGNOS payload (not required if the proposed SBAS payload already in orbit) and preparation the *Requirements Review (RR)* for approval of any deviation in the Annex 1 Technical Specifications;

ii. EGNOS In-Orbit Capacity Provisioning under full responsibility of the Contractor (not required if the proposed SBAS payload already in orbit);

iii. EGNOS Payload IOT and Handover. This task is concluded by the *In-Orbit Test Review (ITR)* for approval by the Customer of the compliance of the payload/Signal In Space performances with the Annex 1 Technical Specifications (not required if the proposed SBAS payload already in orbit);

- SS2: NLES Hosting Site and RF Station preparation. This Sub-Service focuses on the preparation of the NLES Hosting Site and the RF Station and deployment of the NLES:

  i. NLES Hosting Site and RF Station Preparation with the ground/space interface validation, concluded by the *NLES Acceptance Review (NLES-AR)*, at which point the NLES Station is declared ready for the deployment of the NLES equipments.

  ii. NLES Deployment: This activity includes the deployment of the NLES in the Hosting Site and the End-to-End validation of the EGNOS GEO Transponder Service. This activity is concluded by the *EGNOS GEO Transponder Service Qualification Review (EGS-QR)*. This milestone corresponds with the Operations Start Date (OSD), i.e. the start of the EGNOS GEO Transponder Service Provisioning Phase.

- SS3: EGNOS In-Orbit Capacity Operations. This Sub-Service shall cover the entire duration of the EGNOS GEO Transponder Service Operations Phase (13-years lease term as baseline) and includes the following:

  i. Provision of the transponder relay service (nominal operations of the payload);

  ii. Payload operations (contingency operations).

- SS4: NLES Operations. This work shall cover the entire duration of the EGNOS GEO Transponder Service Operations Phase (13-years lease term as baseline)

  i. NLES Operations Services which includes the provisioning of the RF uplink service and monitoring of the NLES station.

(*) In case the winning bidder has proposed the lease of an SBAS payload already operating in-orbit for the EGNOS GEO Transponder Service, the procurement activities (i), (ii) and (iii) of SS1 will not be performed. However, the Contractor ***shall*** provide at Kick-Off Meeting the required documentation (In-Orbit Test Results Document) certifying the performances of the proposed payload in adequacy with the requirements expressed in Annex 1 Technical Specifications.

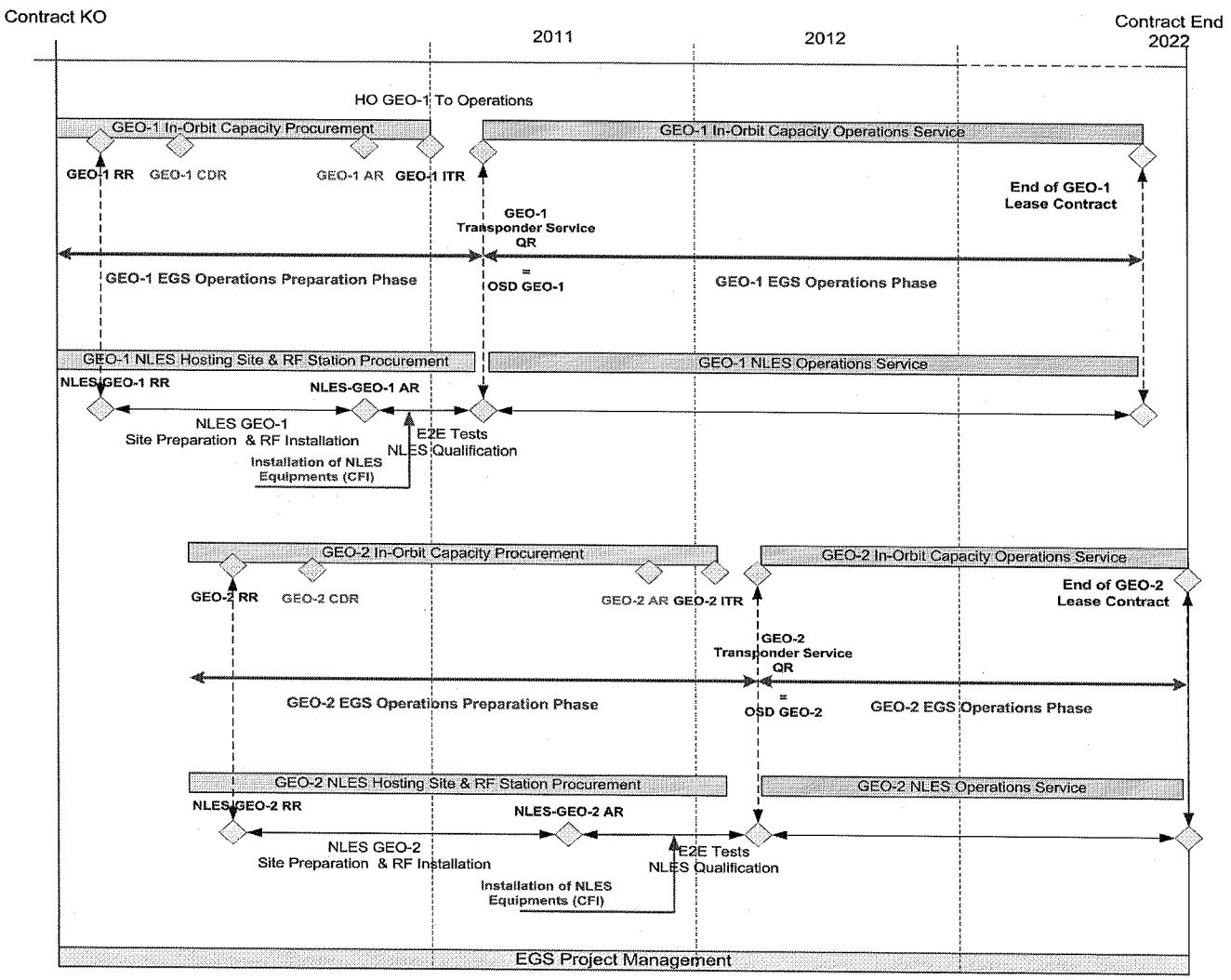


Figure 4 EGNOS GEO Transponder Service Phases

NOTE: The figure is only illustrative. The start dates for both contracts could be the same. The contract end should be understood as 2024 instead of 2022.

4.4 Meetings and Deliverables

4.4.1 Meetings and Reviews

EGN-GEO-SPEC-0.1.4 Preparation, and attendance to EGS Project meetings

The Contractor ***shall*** attend and support the preparation to all project meetings. Unless otherwise stated, the contractor ***shall*** be responsible for the organisation of the meetings as well as preparation and distribution of minutes for all meetings. In its proposal and Project Management Plan, the contractor ***shall*** propose the most beneficial location for the meetings based on the meeting objectives.

A number of reviews ***shall*** be organized by the Contractor in order to support the EGS Project execution. The following table presents the proposed reviews to be conducted during the execution of the project.

- Reviews R1 to R7 belong to the EGS Preparation Phase.
- Review 8 belongs to the EGS Provisioning Phase.

Reviews classified as "optional" are not mandatory for the EGS contract execution. However the Commission shall have the right to request visibility on these optional reviews. The Contractor shall adapt the proposed list to the actual status of its satellite procurement (existing in-orbit payload, initiated satellite procurement...).

#	Name	Purpose	Frequency	Review Type	Proposed Location
R1	Kick-Off Meeting (KOM)	Review of the Project Management Plan.	Once	Mandatory	Contractor's premises
R2	Requirements Review (GEO-RR)	Review of the EGNOS GEO transponder Service Requirements (not required if Contractor is proposing the lease of an existing in-orbit SBAS payload).	One per EGNOS GEO transponder Service	Mandatory	Commission's Premises
R3	Critical Design Review (GEO-CDR)	Review of the EGNOS GEO Transponder Design (not required if Contractor is proposing the lease of an existing in-orbit SBAS payload).	One per EGNOS GEO transponder Service	Optional	Commission's Premises
R4	Acceptance Review (GEO-AR)	Acceptance of EGNOS GEO Transponder following integration tests and validation (not required if Contractor is proposing the lease of an existing in-orbit SBAS payload).	One per EGNOS GEO transponder Service	Optional	Contractor's Premises or Payload Manufacturer Premises
R5	In-orbit Test Review (GEO-ITR)	Acceptance of the EGNOS GEO Transponder in-orbit performances. In case the Contractor is proposing the lease of an existing in-orbit SBAS payload, ITR test report shall be provided and the Commission may request to replay a subset of the tests.	One per EGNOS GEO transponder Service	Mandatory	Contractor's Premises

#	Name	Purpose	Frequency	Review Type	Proposed Location
R6	NLES Acceptance Review (NLES-GEO-AR)	Acceptance of the 2 NLES after integration of RF subsystem and site preparation	One per EGNOS GEO transponder Service	Mandatory	Contractor's Premises
R7	EGNOS GEO Transponder Service Qualification Review (QR)	Acceptance and qualification of the end-to-end operation of the EGNOS GEO transponder Service (this includes the NLES qualification)	One per EGNOS GEO transponder Service	Mandatory	Contractor's Premises
R8	Coordination Meeting	Review of operations performances, payload health status...	Yearly	Mandatory	Commission's premises

Table 1 List of Meetings and Reviews

EGN-GEO-SPEC-0.1.5 Actions items management

The actions managed in the frame of the project are the ones which answer to one, at least, of the following conditions:

Actions of which execution condition the progress of the project, on both technical and schedule levels

Actions decided by the Commission.

Actions decided by an entity of which responsibility falls under the Project managers (ex progress meeting, system board,..)

The decision to engage an action falls under the responsibility of the chairman of the meeting where the action has been decided. In case of meeting Commission/Contractor, the action ***shall*** be the result of a consensus between the two parties.

At each meeting, a status on the actions ***shall*** be done by the contractor

4.4.2 Deliverables

EGN-GEO-SPEC-0.1.6 Documents Deliverable List

The contractor ***shall*** deliver all documentation specified in the list of deliverable documents presented here below.

#	Document Name	Description	Document Type	Document Delivery
D1	EGNOS GEO Transponder Project Management Plan	The Content of the Project Management Plan (PMP) is described in EGN-GEO-SPEC-0.1.7	For Approval	Draft at proposal level Updates at KOM Updates as appropriate
D2	EGNOS GEO Transponder Service Requirements	This document shall synthesize the requirements for the complete EGNOS GEO	For Approval	Requirements Review

	Document	Transponder Service. This includes the payload requirements but also the NLES interface requirements (RF interface, interface with NLES equipment)		
D3	EGNOS Transponder Service SoC	This document shall provide a complete Statement of Compliance to the technical requirements for the EGNOS GEO Transponder Service provided in Annex 1 Technical Specifications	For Approval	Draft at Proposal Level Update at the Requirements Review Update at the In-Orbit Test Review
D4	EGNOS GEO Transponder Architecture and Design Document	This document shall describe the complete architecture of the proposed transponder for the EGNOS GEO Transponder Service and its integration on the satellite.	For Information	Critical Design Review
D5	EGNOS GEO Transponder Acceptance Tests Definition Document	This document shall describe the set of tests that will be performed for the validation of the EGNOS payload. This document shall not be provided in case the proposed SBAS payload for the EGNOS Geo Transponder Service is already operating in orbit.	For Information	Critical Design Review
D6	EGNOS GEO Transponder Acceptance Tests Results Document	This document shall provide the results to the tests defined for the validation of the EGNOS payload. This document shall not be provided in case the proposed SBAS payload for the EGNOS Geo Transponder Service is already operating in orbit	For Information	Acceptance Review
D7	EGNOS GEO Transponder In-Orbit Tests Definition Document	This document shall describe the set of tests that will be performed for the validation of the EGNOS payload in orbit. In case the Contractor is proposing the lease of an SBAS payload already operating in orbit, this document shall be required by the Kick-Off Meeting.	For Information	Acceptance Review
D8	EGNOS GEO	This document shall provide	For Approval	In-Orbit Test

	Transponder In-Orbit Test Results Document	the results to the tests defined for the validation of the EGNOS payload in orbit. In case the Contractor is proposing the lease of an SBAS payload already operating in orbit, this document shall be required by the Kick-Off Meeting.		Review
D9	EGNOS GEO Transponder Service Regulatory document	This document shall provide evidence of: - ITU filings for the use of the downlink and uplink frequencies - PRN registration to the GPSW	For Approval	In-Orbit Test Review
D10	EGNOS GEO Transponder Service Tests Document	This document shall describe the set of tests that will be performed for the validation of the EGNOS GEO Transponder Service (combined system validation NLES + GEO).	For Information	In-Orbit Test Review
D11	EGNOS GEO Transponder Service Acceptance Tests Results Document	This document shall provide the results to the tests defined for the validation of the EGNOS Geo Transponder Service acceptance.	For Approval	EGNOS GEO Transponder Service Qualification Review
D12	EGNOS GEO Transponder Service Ground/Space Interface Document	This document shall describe the interface requirements to be met by the ground segment in order to access to the GEO Transponder	For Review	EGNOS GEO Transponder Service Qualification Review
D13	NLES Implementation Architecture Document	This document shall describe how the 2 NLES associated to each EGNOS GEO transponder will be implemented (site hosting, architecture, interface description, RF subsystem implementation...)	For Information	Requirements Review
D14	NLES RF Part List Document	This document shall provide the complete list of RF parts that shall be procured for NLES RF subsystem.	For Information	Requirements Review
D15	NLES Station Implementation Plan	The implementation plan shall describe the different steps the Contractor intends to follow to achieve the integration and acceptance of	For Information	Requirements Review

		the complete NLES station.		
D16	NLES Integration and Test Report	This document shall provide a complete report on the NLES integration activities at the Contractor selected sites.	For Approval	NLES Acceptance Review (Draft) EGNOS GEO Transponder Service Qualification Review (Final Issue)
D17	EGNOS GEO Transponder Service Status Report (EGSSR)	This report shall contain a description of the status of the EGNOS GEO Transponder Service. This shall include heath status of the payload and the satellite, achieved performances over the year, causes of unavailability, status of the NLES operations and an update of the expected End of Life of the GEO satellite.	For Information	Monthly (from start of operations)
D18	EGNOS GEO Transponder Service Progress Report (EGSPR)	The progress report shall present an overview of the project progress, project risks, schedule, and presenting the status of each WP described in this SOW.	For Information	Every 3 months
D20	Minutes of Meeting		For Review[1]	At each Meeting
D21	Risk Management Plan	The Content of the Risk Management Plan (RMP) is described in EGN-GEO-SPEC-0.1.7	For Approval	Draft at proposal level Updates at KOM Updates as appropriate

Table 2 List of Deliverable Documents

All deliverable documents ***shall*** be delivered in Microsoft Word and Adobe PDF formats. Reviews of documents ***shall*** be planned by the Contractor and agreed with the customer.

[1] Agreements taken during the meetings will be translated into the necessary amendments of the Contract.

5 EGNOS GEO Transponder Service Project Execution Requirements

5.1 SS 0: Project Management

5.1.1 Overall Project Management

5.1.1.1 Project Management Plan

The Commission will approve the Contractor's Project Management Plan (PMP) at the Kick-Off Meeting (KOM). The PMP identifies how the project will be executed and lays out in detail the tasks, completion criteria, deliverables, documentation and schedule for the project. The PMP will clearly spell out how its management structure meets the project objectives, and detail the interfaces between the different roles, in terms of interaction processes, decision key points, control boards, interaction points with the customer.

EGN-GEO-SPEC-0.1.7 Project Management Plan content

In light of the management requirements stated in the above sections, the contractor ***shall*** document and implement the Project Management Plan (PMP) which describes how these aspects of the project will be performed:

- The Contractor ***shall*** identify the project organization, key roles and responsibilities.
- The Contractor ***shall*** identify the key project stakeholders and state how these stakeholders will be managed.
- The Contractor ***shall*** define their subcontractor and major procurement management plans.
- The Contractor ***shall*** define the processes and procedures used by the project for program administration, correspondence, meetings, action items, documentation.
- The Contractor ***shall*** define their risk identification, mitigation and management process.
- The Contractor ***shall*** identify and quantify the risks for the project and associated mitigation plans.
- The Contractor ***shall*** identify their Product Assurance (PA), Configuration Management, Integrated Logistic Support and Manufacturing processes[2].
- The Contractor ***shall*** identify the milestones, tasks, task completion criteria, required resources, deliverables, documentation and schedule for the project. A Work Breakdown Structure to at least Level 3 and associated WBS dictionary ***shall*** be used to identify and describe the tasks.
- The Contractor ***shall*** identify a Single Point of Contact (SPOC), acting as an interface to the EGNOS Service Provider in order to ensure an optimal coordination between the EGNOS GEO Transponder Service Operations and the EGNOS System Operations performed by the ESP.

The Contractor ***shall*** execute the contract in accordance with the PMP.

[2] This requirement is only applicable for a new procurement and not to the lease of an already in-orbit transponder.

5.1.1.2 Risk Management

EGN-GEO-SPEC-0.1.8 Project Risk Management

Throughout the Contract Period, the Contractor ***shall*** write and maintain a Risk Management Plan. The Commission will approve the Contractor's Risk management Plan at the KOM. The Risk management Plan identifies how the contractor will monitor the risks of the project.

The Contractor ***shall*** keep and document an EGS Project (EGSP) Risk Register according to the Risk Management Plan.

The Risk Register ***shall*** contain:

- Risk identification matrix and risk occurrence probability;
- Risk impact assessment;
- Risk mitigation plan.

The risk register ***shall*** be updated on a 3 months basis and provided to the Commission as part of the EGNOS GEO Transponder Service Progress Report (EGSPR) The contractor and the Commission ***shall*** have dedicated meeting for the analysis and mitigation of the major identified risks.

5.1.1.3 Service Status Reporting

EGN-GEO-SPEC-0.1.9 EGNOS GEO Transponder Service Performances and Status Reporting

The contractor ***shall*** provide to the Commission a monthly EGNOS GEO Transponder Service Status Report (EGSSR) presenting:

- The achieved value for the Service availability of the EGNOS GEO Transponder Service and specific signal performances.
- The health of the EGNOS payload and satellite
- Any planned specific operations for the next period, which could affect the EGNOS GEO Transponder Service.

5.1.2 Regulatory Issues Management

EGN-GEO-SPEC-0.2.1 ITU Filing

The Contractor ***shall*** be responsible for the regulatory aspects concerning the filing with the International Telecommunication Union (ITU) for the use of all downlink and uplink frequencies associated to the EGNOS Geo Transponder Service. Proper coordination with other satellite operators for uplink frequencies ***shall*** also be performed in due time.

A letter of support from the National Administration in charge ***should*** be provided.

EGN-GEO-SPEC-0.2.2 PRN Registration

The Contractor ***shall*** also submit an application to the Global Positioning System Wing (GPSW) of the Navstar Global Positioning System Joint Program Office (GPS JPO) for assignment of the necessary C/A (L1) code. In case Option 2 is selected, the Commission may also ask to the Contractor to register for the L5 SBAS PRN code as well.

The Contractor shall also coordinate with ICAO during the PRN registration process.

In case the Contractor is proposing the use of SBAS payload already in-orbit, evidence of the fulfilment of these requirements ***shall*** be provided in the proposal.

5.2 EGNOS GEO Transponder Service Preparation Phase

5.2.1 SS1:EGNOS In-Orbit Capacity Provisioning Service

5.2.1.1 EGNOS Payload Specifications

EGN-GEO-SPEC-1.1.1 EGNOS Payload Detailed Specifications

Based on the Technical Specifications provided in Annex 1, the Contractor ***should*** flow down the high-level system and payload requirements to detailed technical specifications for the payload and the satellite. This task ***shall*** be completed by the *Requirements Review* (RR). Any deviation proposed by the Contractor on the Technical Specifications ***shall*** be submitted for approval by the Commission.

EGN-GEO-SPEC-1.1.2 NLES RF Subsystem Specifications Consistency

The Contractor ***shall*** ensure that the NLES RF Subsystem specifications are consistent with the Payload Specification defined in EGN-GEO-SPEC-1.1.1. This task ***shall*** be completed by the *Requirements Review* (RR).

EGN-GEO-SPEC-1.1.3 Requirements traceability

The Contractor ***should*** establish and maintain a full traceability between the applicable customer technical requirements and the payload and NLES RF subsystem technical specifications. This traceability ***should*** be documented and provided at the *Requirements Review* (RR).

5.2.1.2 EGNOS In-Orbit Capacity Procurement

EGN-GEO-SPEC-1.2.1 EGNOS In-Orbit Payload Procurement Responsibility

The Contractor ***shall*** be responsible for the supervision of the design, qualification (if required), manufacturing, integration and test of the EGNOS payload and its equipment on the satellite throughout all phases of the satellite manufacturing process up to the satellite on-ground acceptance.

The Contractor ***shall*** be responsible to cover all the preparation activities linked to the launch of the satellite hosting the EGNOS payload.

EGN-GEO-SPEC-1.2.2 Participation of the Commission to major Reviews

The Contractor ***shall*** invite the Commission's representatives/experts to participate to the major reviews/progress meeting planned in the procurement of the EGNOS payload/Hosting satellite. This includes as a minimum the *Critical Design Review* and the *Acceptance Review*.

The Commission ***shall*** have the right to witness launch preparations activities.

5.2.1.3 Payload IOT and Handover

EGN-GEO-SPEC-1.3.1 In-Orbit Testing and Payload Commissioning

The Contractor ***shall*** be responsible for performing the In-Orbit Testing and commissioning of the EGNOS payload with support of the manufacturer. The Contractor ***shall*** provide to the

Commission the list of tests that shall be performed on the EGNOS payload during the IOT campaign. These tasks ***shall*** be completed by the *In-Orbit Test Review* (ITR).

Upon successful completion of the *In-Orbit Test Review* (ITR), the Contractor ***shall*** provide to the Commission a statement of Compliance of the in-orbit payload with regards to the Technical Specifications provided in Annex 1 and revised within EGN-GEO-SPEC-1.1.1.

The Contractor ***shall*** then ensure the handover of the payload to the operations teams.

5.2.2 SS2: NLES Hosting Site and RF Station Preparation Service

EGN-GEO-SPEC-2.1.1 RF Uplink Services and Site Preparation Study

The Contractor ***shall*** perform the following tasks in view of the NLES hosting site preparation and the provisioning of the RF Uplink services (RF Station preparation):

- Selection of the 2 locations of the hosting sites for the NLES;
- NLES RF Station Architecture definition, including interface between the NLES equipments and the RF subsystem (Annex 1 Technical Specifications) and possible interfaces with the main telecommunication mission RF uplink equipments. The definition of the architecture shall ensure that the EGNOS Transponder Service requirements are met. The Contractor ***shall*** also take into account the constraints introduced by the implementation of the EGNOS GEO Transponder and the different operational modes of the EGNOS GEO transponder;
- Definition of the required additional RF equipments to be procured. This includes:
  - Ku or C and L-band antenna(s) including tracking system;
  - HPAs and redundancy mechanism;
  - LNAs and redundancy mechanism;
  - Integration (rack harness);
- Definition of the site modification specifications.

The Contractor ***shall*** produce:

- Detailed level diagrams in transmission and reception chains (including signal and noise)
- Detailed reporting in the redundancies provided for the station in accordance with availability, reliability requirements.
- Equipment layout including cable path

The Contractor ***shall*** also produce the complete NLES implementation plan, which shall describe the different steps the Contractor intends to follow to achieve the complete NLES integration and acceptance (RF Station and deployment of NLES equipments). In the establishment of such an implementation plan, the Contractor ***shall*** also take into account the installation of the NLES subsystem equipments provided as CFI to this contract.

This task ***shall*** be completed at the *Requirements Review*. At the outcome of this task, the Contractor ***shall*** provide the following documentation (as defined in Table 2):

1. NLES RF Station Implementation Architecture Document
2. NLES RF Part List Document
3. NLES Implementation Plan Document

EGN-GEO-SPEC-2.1.2 NLES FR Station Implementation – RF Integration

Upon successful completion of the *Requirements Review (RR)*, the Contractor ***shall*** be authorized to procure the identified components and to proceed with the implementation of the proposed design according to the implementation plan.

EGN-GEO-SPEC-2.1.3 NLES RF Station Tests and Acceptance

The Contractor ***shall*** submit the acceptance tests procedure to the Commission at least one month before the *Acceptance Review*. The Contractor ***shall*** perform the tests and report the results in the NLES Integration and Test Report document.

The *NLES RF Station Acceptance Review (NLES-AR)* ***shall*** be performed in the presence of the Commission Representatives and possibly of the Contractors in charge of the NLES deployment. Documentation and acceptance test results ***shall*** be reviewed during that meeting.

Upon request from the Commission, the Contractor ***shall*** reproduce a set of the acceptance tests that will be witnessed by the Commission's Representatives.

All the information deemed necessary for the following phase (deployment, NLES qualification and operations) should be reported in the minutes of the review (site security features, site access requirements, local installation rules and standards...)

EGN-GEO-SPEC-2.1.4 Support to NLES Deployment

After successful completion of the *NLES RF Station Acceptance Review (NLES-AR)*, the station will be declared ready for the deployment of the NLES.

The Contractor ***shall*** ensure access to the site for the delivery of the NLES equipments as well as for external staff involved in the NLES deployment activities. Suitable office accommodation with fax/telephone/internet access ***shall*** be provided to this staff by the Contractor.

The Contractor ***shall*** take in charge the subsystems delivered on site, providing suitable storage compliant with the storage specification (room, environment...)

The Contractor ***should*** participate to the Commissioning activity and ***should*** witness the executed deployment activities. Namely, local host technicians who will act later as local maintenance staff, should follow-up the deployment activities in order to familiarize themselves with the equipment. In addition, the Contractor ***shall*** provide the NLES deployment team with a technical support by means of qualified personnel. The personnel involved shall be suitably skilled and available on-site throughout the entire deployment activity during normal working hours.

The duration of the NLES deployment ***should*** not exceed 15 working days.

EGN-GEO-SPEC-2.1.5 EGNOS GEO Transponder Service Qualification

Once the physical installation of the NLES equipment is completed, test and end-to-end (with the GEO transponder provided by the Contractor) validation tests activities will be carried out before the NLES (and EGNOS GEO Transponder Service in general) can be declared as operational.

The Contractor ***shall*** support this qualification phase through:

- Provision of skilled personnel to operate the station during the tests (e.g. switch HPAs, depointing the antenna, control of EGNOS payload on-board etc.)
- Provision of skilled personnel for troubleshooting activities and to analyse the test results
- Lending of test equipment (e.g. spectrum analyser, power meter...)

The personnel involved ***shall*** be available on-site throughout the entire qualification phase during normal working hours.

This task shall be completed by the *EGNOS GEO Transponder Service Qualification Review (EGS-QR)*.

After qualification has been successfully performed, the EGNOS GEO Transponder Service will be considered as operational. This milestone corresponds to the *Operations Start Date* (*OSD*), i.e. the start of the EGS Provisioning Phase (Operational Phase)

5.3 EGNOS GEO Transponder Service Provisioning Phase

5.3.1 SS3: EGNOS In-Orbit Capacity Operations Services

5.3.1.1 EGNOS Geostationary Transponder Services

EGN-GEO-SPEC-3.1.1 EGNOS GEO Transponder Service Availability

The Contractor ***shall*** ensure the availability of the EGNOS GEO Transponder Service in order to meet the requirements expressed in Annex 1 Technical Specifications. The availability of the EGNOS GEO Transponder Service will depend on the availability of:

- EGNOS GEO Transponder;
- NLES Stations.

EGN-GEO-SPEC-3.1.2 Outages Reporting

The Contractor ***shall*** report in due time to the Commission any outage in the EGNOS GEO Transponder Service Operations.

Every month, the Contractor ***shall*** also provide an EGNOS GEO Transponder Service Status Report (EGSSR) as defined in EGN-GEO-SPEC-0.1.9. The EGSSR will include a summary of the cumulative outage duration in the EGNOS GEO Transponder Service.

EGN-GEO-SPEC-3.1.3 EGNOS GEO Transponder Service Operational Mode Switching in Option 2

In case Option 2 is selected, and upon request from the Commission, the Contractor ***shall*** ensure Operational Mode Switching of the EGNOS GEO Transponder Service in accordance with the Operational Mode Specification defined in Annex 1 Technical Specifications, OPTION 2:

- C1->L1
- C1/C5 -> L1/L5
- C1/C5 -> L1/E5
- C1/C5 -> L1/E5b

Availability of the EGNOS GEO Transponder Service ***should*** be guaranteed during operational mode switching.

5.3.1.2 Payload and Satellite Operations

EGN-GEO-SPEC-3.2.1 Contingency Operations

In a contingency situation, the Contractor ***shall*** ensure that the most appropriate actions are taken in order to maintain the EGNOS GEO Transponder Service or reduced the duration of the service outage.

EGN-GEO-SPEC-3.2.2 EGNOS GEO Transponder Service Switch-Off

If in a contingency situation, the Contractor is forced to switch-off the EGNOS GEO Transponder Service (payload switch-off or RF link switch-off), the Contractor ***shall*** inform the Commission in the shortest delays, preferably before proceeding to the service switch off.

EGN-GEO-SPEC-3.2.3 Planned Orbital Manoeuvres

In the event of a planned orbital manoeuvre of the satellite (such as station keeping) by the Contractor, the Contractor ***shall*** assess if such manoeuvre will affect the EGNOS GEO Transponder Service (e.g. outage) and ***shall*** report the conclusions to the Commission in the EGSSR.

EGN-GEO-SPEC-3.2.4 Satellite Relocation inside the EGNOS GEO Orbital Arc

In case the Contractor decides to relocate the satellite in a new orbital position inside the orbital arc compatible with the EGNOS coverage requirements, the Contractor ***shall*** assess and provide information to the Commission on:

- The duration of the foreseen Service unavailability (falling into the Service Underperformance regime described in EGN-GEO-SPEC-0.1.2)
- The updated coverage map of the EGNOS payload
- The updated on-ground received power geographical distribution

The Contractor ***shall*** ensure that compliance to the service specifications as defined in Annex 1 Technical Specifications is maintained.

EGN-GEO-SPEC-3.2.5 External Data Server Access

The Contractor shall set-up an external Data Server on which the Commission can access in real time the main parameters related to the satellite and the payload:

- Orbital parameters of the satellite
- Planned manoeuvre and orbital parameters after the manoeuvre
- Navigation payload telemetry

This server shall be used as an interface between the Commission and the Contractor.

5.3.2 SS4: NLES Operations Service

EGN-GEO-SPEC-4.1.1 NLES RF Uplink Service

The Contract ***shall*** ensure the availability of the NLES RF Uplink service in accordance with the requirements expressed in Annex 1 Technical Specifications.

EGN-GEO-SPEC-4.1.2 NLES Equipment Monitoring

The contractor ***shall*** monitor all systems, subsystems, and operational functions of the Navigation Land Earth Stations (NLES) and report all issues to the ESP.