DOCUMENT

Gaia
Science Implementation Requirements Document

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1 INTRODUCTION

This document – the Gaia Science Implementation Requirements Document (Gaia SIRD) – establishes the baseline for the technical and management requirements applicable to the tasks to be carried out by the Gaia Science Operation Centre (SOC) at ESAC in support of the Gaia mission. It defines the products and services to be provided by SOC, as well as the objectives, responsibilities, the technical and management requirements.

1.1 Applicable and Reference Documents

The following documents of the latest issue form part of this specification. In the event of a conflict between this document and other applicable documents, the conflict shall be brought to the attention of the Gaia Project Manager. In the case of a conflict between this document and reference documents, this document shall have precedence.

Applicable Documents:

[MRD]	Gaia Mission Requirements Document, issue
[MSI]	MOC-SOC IRD
[SMP]	Science Management Plan
[MIRD]	Mission Implementation Requirement Document
[ECSS]	Tailored ESA Approved ECSS
[PIP]	Project Implementation Plan for Gaia DPAC

Reference Documents:

[GCTSR]	Gaia Concept and Technology Study Report
[SOAD]	Gaia Science Operations Assumption Document
[SOSD]	Science Operations Scenario Document

1.2 Mission Objectives

The Gaia mission will perform scientific measurements in three domains: astrometry (the determination of stellar position, parallax, and proper motion); photometry (the measurement of photometric magnitudes in a number of different spectral bands and at each possible measurement epoch); and spectroscopy (for the acquisition of radial velocities and astrophysical parameters). The basic scientific mission objective is to generate, from the measurements made on the satellite, a complete star catalogue down to a magnitude limit ~20.0 mag, about 10^9 objects. Astrometry and Photometry shall be available for all objects while spectroscopy will be available for a smaller number of objects due to the sensitivity of the spectrometer. The exact limits are given in [MRD].

The Gaia spacecraft will be designed for a mission lifetime of 5.5 years plus extended mission duration of one year beyond the nominal mission.

A comprehensive mission overview is available on http://www.rssd.esa.int/gaia/.

2 MISSION OVERVIEW & RESPONSIBILITIES

2.1 Gaia Project

The Gaia Project has the overall responsibility for the implementation of the Gaia mission up to IOCR, which includes the definition of the mission requirements, design and building of the spacecraft and delivery of the spacecraft to the operational orbit and its commissioning. In the operational phase the remaining responsibility will be transferred to the Mission Manager.

2.2 Gaia Project Scientist

The Gaia Project Scientist takes responsibility for the achievement of the scientific objectives of the mission as documented in the SMP. To this end, he advises the Project Manager on all aspects related to scientific performances and represents the view of the scientific community. He chairs the Gaia Science Team. He will liaise with the Gaia Project Manager until completion of the satellite in-orbit commissioning, and thereafter with the Mission Manager. The Project Scientist will be supported by a small team of scientists, called the Project Scientists Team, to discharge his duties.

2.3 Mission Operations Ground Segment

The Mission Operations Ground Segment is composed of the Mission Operation Centre (MOC) located at ESOC, its interfaces to other elements of relevance for operations, in particular the Science Operations Centre (SOC), and the associated ground stations and communications network. The MOC is responsible for the preparation and execution of all operational tasks in order to achieve the optimum performance of the spacecraft in orbit. This includes, among other aspects:

- spacecraft and payload activities,
- orbit determination and control,
- attitude determination and control,
- on-board software maintenance, and
- making available the raw satellite data to the SOC.

Details about interfaces between MOC & SOC are reported in MOC-SOC IRD [MSI].

2.4 Science Operations Centre (SOC)

According to the Gaia Project Management Plan, the implementation and operation of the Science Operations Centre up to IOCR is a task delegated by the Gaia Project to RSSD. This includes the responsibility for the design, implementation, validation and

operations of the SOC elements and subsequent post launch data treatment and managing the programmatic aspects.

The SOC Development Manager is responsible to the Gaia Project Manager for the completion of the SOC elements of the ground segment corresponding to project requirements in terms of performance, schedule and costs.

Whilst the overall task for the SOC implementation is globally delegated to RSSD, a more detailed distribution of tasks within RSSD is as follows:

SCI-SA carries the overall responsibility for the delivery of the full SOC within cost, performance and schedule. The Project Scientist is a member of SCI-SA. SCI-SA has delegated the engineering tasks for the implementation of the SOC to SCI-SD. The latter is responsible for the implementation of the SOC and its operation at ESAC, Villafranca. The SOC manager is a member of SCI-SD and has therefore design, test and operational responsibilities but no financial authority.

The compatibility between spacecraft and the ground segment (MOC) will be demonstrated in a series of system validation tests. Data products generated during such tests together with simulated data will be used for system end-to-end tests to validate the overall ground segment, including the SOC and its dependence on critical DPAC deliveries.

Prime Contractor support will be provided for these tests as required. All SOC related activities that involve interfacing with the spacecraft will require involvement of the MOC.

During Launch and Early Orbit Phase and Commissioning phase, attendance of critical activities will require that relevant SOC and DPAC personnel be co-located at ESOC for a large part of the commissioning phase. ESOC will make available a user support room, equipped with access to required critical spacecraft data (via specialised terminals) and an open connection to the Internet. The science data which is required for commissioning activities will reside at the SOC. Hence personnel must also be available at SOC during commissioning with the relevant expert at MOC.

The Gaia's operational orbit will allow continuous scientific observations during the nominal and extended mission lifetime, in accordance with the Gaia Scanning Law, which will remain unmodified throughout the mission, except for instances of the modified Scanning Law for periods of high stellar density.

The SOC has a close interface with the Data Processing Analysis Consortium (DPAC) in view of required deliveries by DPAC to SOC and vice versa. The DPAC receives all its spacecraft data, related information and documentation via the SOC. Some of these tasks are schedule critical to the SOC for proper payload operations. In view of this close link, the respective responsibilities and lines of authority for these two distinctly different entities need to be kept clearly separated.

In summary, DPAC is responsible for its tasks as documented in AO-DPAC-20061106 and the SOC takes responsibilities to meet the requirements outlined in this document. All DPAC tasks will be very closely monitored by the SOC.

2.5 Science Operations Ground Segment

Gaia will produce an impressive volume of raw data with about 50 GB of uncompressed science data per day yielding at mission completion a telemetry data volume of roughly 100 TB. Transforming the raw data into scientifically meaningful quantities is the task of the Data Processing Analysis Consortium. This task will be performed by the Data Processing and Analysis Consortium (DPAC) in close co-operation with the SOC.

The launch-critical Science Operations Ground Segment elements shall be considered to be:

- MOC Interface,
- Initial Data Treatment,
- First Look,
- Telemetry Archive,
- Raw Archive,
- IDT/FL Database,
- Operational H/W and COTS supporting the above systems

The mission critical Science Operations Ground Segment elements shall be considered to be:

- AGIS
- Main Database
- Operational H/W and COTS supporting the above systems.

2.5.1 Data

The following levels of data products are defined:

- Level 0 – Science telemetry packets (from MOC)
- Level 1 – Unpacked star packets and auxiliary science data
- Level 2 – Calibrated observations and one-day calibration
- Level 3 – Final results

2.6 Major Project Milestones

Spacecraft Milestones

Phase B2/C/D Kick-Off	1 March 2006
System Requirements Review (SRR)	June 2006
Preliminary Design Review (PDR)	1st - 2nd quarter 2007
Critical Design Review (CDR)	1st quarter 2009

Flight Acceptance Review (FAR)	1st quarter 2011
Launch	1 Dec 2011
In-Orbit Commissioning Review (IOCR)	2nd quarter 2012

Science Operations Ground Segment Milestones

SOC System Requirements Review (SRR)	L - 4 years
SOC Critical Design Review (CDR)	L - 3 years
SOC Implementation & Acceptance Review (QR)	L - 1 year
SOC Readiness Review (AR)	L - 4 months

2.7 System decomposition

The system decomposition of the SOC tasks and interfaces is described in Figure 1 & 2.

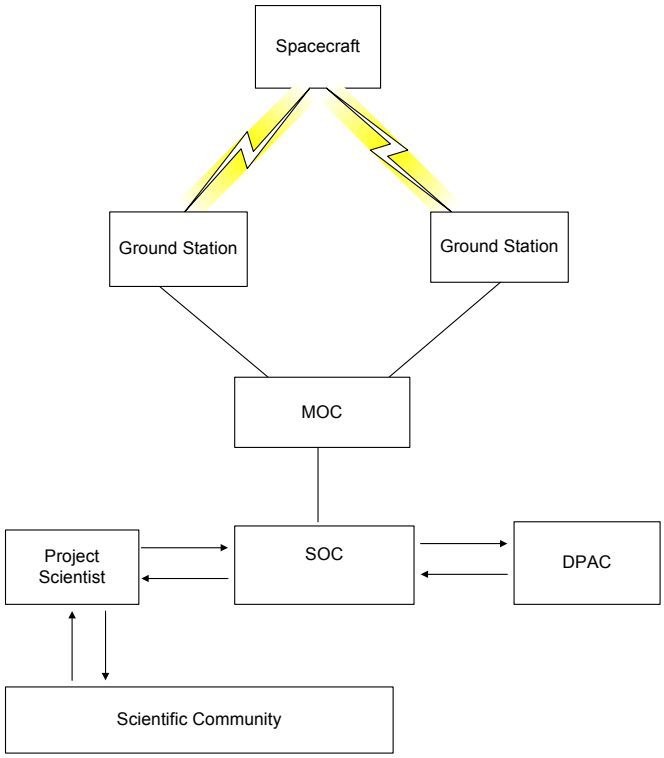

Figure 1: Gaia Flight & Ground Segment during Operational Phase

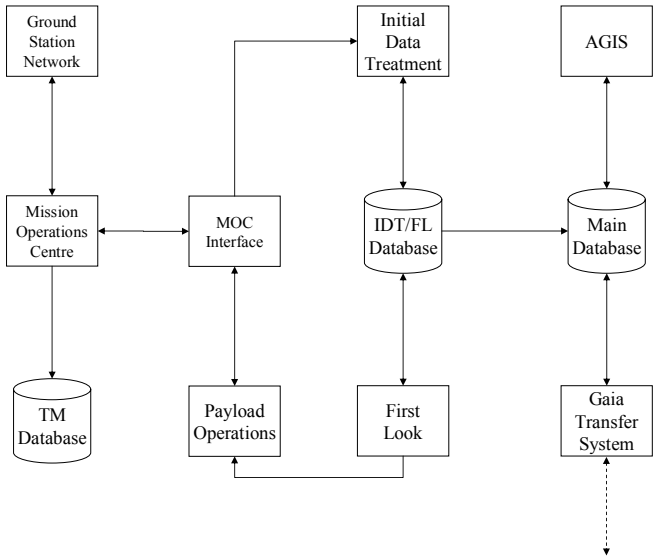

Figure 2: System decomposition

3 FUNCTIONAL & PERFORMANCE REQUIREMENTS

3.1 SOC Responsibilities

SOF-010	In the frame of the activities to be performed for the Gaia mission, the SOC shall: - define the on-ground data processing system architecture - define the Database technology and coordinate project-wide hardware - define the development environment - coordinate, develop and maintain common software resources - perform end-to-end system testing - unpack, decompress and process the science (and H/K) data retrieved from the data server (under MOC responsibility) - provide rapid monitoring and proper feedback to MOC of the spacecraft and payload performances at the accuracy level requested by the mission - contribute to key parts of the reduction of the science data and the generation of the final products (pre-processing and core-processing tasks) - provide the database, data storage, and hardware environment for the core processing - assist with instrument characterisation and calibration - disseminate subsets of the data base to the Data Processing Centres (DPCs) of the DPAC - re-integrate the results from the DPCs, in a controlled and validated manner, back in the database - manage the design, implementation, validation and maintenance the mission archive and interrogation software - manage all operations of the archive to distribute the Gaia intermediate and final product to the scientific community - provide support to DPAC.
SOF-020	Proper feedback (in terms of completeness, timeless, & adequacy) to MOC shall be provided by SOC for the : - routine delivery of payload parameter settings - analysis of the science performances and determination of parameters for optimum payload performance throughout all mission phases - instrument calibration - first look - investigation of payload anomalies - S/C database parameters & limits - mission planning inputs (e.g. scan law change, sky density predictions, etc.) - Optical observation data to improve knowledge of S/C position and velocity (Gaia ephemeris)
SOF-025	- The SOC shall support the definition of the S/C Calibration Plan and provide necessary inputs for the S/C calibration Operations tasks.
SOF-030	The SOC shall define the Science Operations for the Gaia mission and

	develop/procure the S/W necessary to support such operations. Operations shall deal with: - Initial Data Treatment - First Look - Routine assessment of scientific payload performance and corrective actions as needed - Provision of input into mission scheduling - Astrometric Global Iterative Solution (AGIS) - Science calibration - Operation of the Main Database
SOF-040	Regarding DPAC and within a very clear line of responsibilities, SOC shall be responsible for: - the overall system architecture - the transfer of associated data bases between the processing centres - the synchronisation of the overall processes - checking the consistency of the data generated by DPAC (processing centres) before their integration back into the main Gaia Database - organising dedicated and large scale end-to-end testing with external partners

3.2 SOC Development and Operation

SOF-050	SOC shall develop and/or operate & maintain the: - MOC Interface, responsible for the retrieval of data from the Mission Operations Ground Segment and the unpacking of science telemetry - Initial Data Treatment, the scientific pre-processing tasks to be performed on the telemetry data such as the application of the first-level calibration, etc. - First Look, the detection of payload anomalies through in-depth scientific assessment of the quality of the Gaia observations and initial (one-day) scientific calibration. - Telemetry Database, for storage of Level 0 data - IDT/FL Database, for storage of Level 1 and 2 data and necessary reference data during processing by the Initial Data Treatment and First Look tasks - Main Database, for storage of Level 1, 2 and 3 data - AGIS, for the generation of the fundamental astrometric mission products. - Gaia Transfer System node for SOC, to drive and prepare all the data transfers - Payload Operations, the software for scientific operations and scheduling, as agreed with the MOC - Interrogation software for the intermediate and final mission results, - Operational H/W and COTS supporting the above systems - S/C Calibration
SOF-055	SOC to monitor the development of the relevant S/W for photometry and Radial Velocity spectroscopy necessary for the ultimate mission product (The Gaia catalogue)

SOF-060	SOC shall plan, specify, design, test, validate, implement, operate and maintain the S/W for the MOC Interface.
SOF-070	SOC shall specify, validate, operate and maintain the S/W for the Initial Data Treatment.
SOF-080	SOC shall specify, validate, operate and maintain the S/W for the First Look,
SOF-090	SOC shall plan, specify, design, test, validate, implement, operate and maintain the AGIS system
SOF-100	The Telemetry Database shall be specified by SOC and either procured or implemented by SOC as appropriate.
SOF-110	The IDT/FL Database shall be designed, developed, validated and maintained by SOC.
SOF-120	The Main Database shall be designed, developed, validated and maintained by SOC.
SOF-130	SOC shall define, design, verify, validate the Gaia Transfer System
SOF-140	SOC shall plan, specify, design, test, validate, implement, operate and maintain the Payload Operations software.
SOF-150	For the tasks dealing with the archiving and distribution of the Gaia intermediate and final results, the SOC shall be responsible for the procurement of the server H/W and the design, development, validation and maintenance of the interrogation S/W.
SOF-160	SOC shall retrieve on a regular basis from the MOC data server the S/C science telemetry and auxiliary data
SOF-170	For all S/W running at SOC it shall always be possible: - to recover missing inputs files - to monitor the proper execution of the processing tasks - to check the quality of the data generated by the processing tasks before positioning them into the database
SOF-180	SOC shall make available to Gaia Prime Contractor science data necessary for execution of the commissioning phase
SOF-190	SOC shall be responsible to alert the science community of the discovery of quick changes or unexpected objects in order to prompt astronomical follow-up observations.
SOF-200	NA
SOF-210	SOC shall closely monitor all algorithms developed in DPAC for the core processing.
SOF-220	SOC shall provide to DPAC all data & set of S/W tools necessary to allow the development and validation of algorithms for the core processing tasks
SOF-230	SOC shall provide support to coordinate the DPAC in terms of issuing of ICDs, generating data sets, producing the overall architecture, performing end-to-end testing, and overall algorithm implementation and phasing
SOF-240	N.A.
SOF-250	Throughout the operational and post-operational phases, dedicated system to periodically check out (based on past experiences) all S/W (internal and external to SOC) shall be implemented.
SOF-260	N.A.
SOF-025	The SOC shall coordinate with DPAC and Project for the definition/production

	of the following documents: - Overall S/C Calibration Plan - Commissioning Phase Science Operation Plan - Routine Phase Science Operation Plan - Inputs to SOC Operations Procedures

3.3 SOC Facilities

SOF-270	SOC shall procure, test and validate all H/W necessary to perform all tasks specified in terms of: - processing capabilities - initial data storage
SOF-280	System management of computer hardware and software shall be managed directly by SOC
SOF-290	Proper development (growth) plan of the H/W used for processing operations shall be submitted to Gaia project for approval.
SOF-300	The budgeting of the H/W purchased for Gaia shall be phased in line with the processing milestones.
SOF-310	The S/W developed for Gaia ground data processing (SOC and DPAC) shall be portable and flexible such to make use of newly available hardware and related S/W operating system.
SOF-320	The SOC facilities shall be sufficient to produce all intermediate and final Gaia products in accordance to the agreed schedule.
SOF-330	The final product shall as identified in the SMP be available not later than 3 years after the end of the operational phase of the mission.
SOF-340	The SOC facilities shall be designed in a way that they can support, without re-design, an extension of at least one year of the in-orbit operations.
SOF-350	The overall figure for availability shall be at minimum 95%
SOF-360	SOC shall archive all mission data until the start of the Active Archive phase of the mission.
SOF-370	The oveall time for S/C check out feedback shall be < 36 hours.

4 PRODUCT/QUALITY ASSURANCE REQUIREMENTS

SPA-010	The SOC Development Manager shall prepare a Product Assurance Plan (PAP) for all phases of the mission, covering all aspects of SOCs ground segment contribution (SOC & DPAC).
SPA-020	The SOC Development Manager shall ensure that the basic PA & QA requirements here defined are implemented in any processing centre within the DPAC.
SPA-030	The SOC Development Manager shall be responsible for ensuring the PA function of the operational ground segment, or shall designate a PA representative.
SPA-040	The PA/QA aspects shall be addressed at each review.
SPA-050	The development of the SOC and in particular of the S/W shall be in line with the ESA approved ECSS.
SPA-060	Provision shall be made to train SOC personnel in the use of the ESOC facilities.
SPA-070	The PA/QA function shall be performed throughout the mission lifetime to: - ensure during each phase conformity of the outputs with the inputs from the previous phase; - ensure traceability from requirements to design for both hardware and software elements; - ensure adherence to the standards established for the mission; - ensure that all elements of the SOC ground segment will comply with the mission requirements.
SPA-080	PA/QA shall ensure that validation of the SOC ground segment (including DPAC) is sufficient to demonstrate compliance with mission requirements.
SPA-090	PA/QA shall record, report, track, analyse and support the resolution and closeout of non-conformances, requests for deviations and requests for waivers.
SPA-100	The Hardware configurations (computers, work-stations, peripherals, LAN's, communication equipment, etc.) of the operational elements of the SOC shall be maintained under configuration control according to ECSS
SPA-110	The SOC (H/W & S/W) development shall be done in accordance with the ESA review cycle.
SPA-120	The SOC (H/W & S/W) development shall be done in accordance to the ESA Software Engineering Standard (ECSS).
SPA-130	The tailoring of the ECSS shall be submitted to the Gaia project team for approval.
SPA-140	All SOC S/W shall be under configuration control.
SPA-150	All SOC H/W shall be under configuration control.
SPA-160	All external S/W that will run at SOC shall be maintained to the same standard as SOC-developed S/W.

5 TEST REQUIREMENTS

ST-010	All operational and data processing functions of the SOC shall be tested and validated before launch.
ST-020	Subsystem, system and overall ground segment tests shall be conducted according to approved test plans and test reports shall be issued. SOC shall define in agreement with the Gaia Project the objectives, schedule and duration of these tests. The major tests are listed in the following requirements.
ST-030	A standard development approach shall be followed, which will require in the integration and validation phases a series of test involving all elements of the ground segment and the spacecraft.
ST-040	SOC shall define and execute, in cooperation with DPAC, End to End System Tests of the Science Operations Ground Segment to - Validate the interfaces between SOC and DPAC DPCs - Validate processing systems at SOC and DPCs - Validate ingestion and extraction tasks of the Main Database
ST-050	End-to-End System Tests (SVT or any other necessary test) shall be performed involving the MOC, SOC & DPAC to - Validate the overall ground segment and its performance end-to-end in its different operational configurations; - Validate data transfer processes and interfaces; - Validate the SOC capability to receive and process all data from the MOC.
ST-060	The SOC shall define, plan, execute, lead and analyse the tests needed to validate the Gaia Science Data processing. This include scheduling, data access and distribution, etc.
ST-070	As part of the testing activities a Test Readiness Review and Test Review Board shall be performed.
ST-080	Acceptance testing/procedure of SOC and DPAC processes shall be implemented after approval. In particular, at the time of the S/C FAR it shall be demonstrated the ability of the AGIS to meet the ultimate mission performances with simulated data and analysis including all predicted and/or measured S/C inaccuracies.

6 MANAGEMENT REQUIREMENTS

6.1 Planning Requirements

SM-010	The SOC Development Manager shall prepare the Science Implementation Plan (SIP) in response to the requirements specified in this document. The SIP shall be authorised by the Gaia Project Manager and Gaia Project Scientist on behalf of D/SCI. After approval the SIP shall serve for monitoring progress of the tasks identified therein.
SM-020	The SIP shall define: - the assumptions on which the implementation is based; - the baseline configuration for the SOC ground segment, including the computer facilities required to support the systems - the functional description of the corresponding mission software - the preparation activities; - the management; - the team structure and build up; - the work breakdown structure; - the work package description. For each WP: inputs required, deliverable items, tasks specifically excluded, progress measurement points, start and completion dates; - development schedules; - baseline cost plan (cost-at-completion); - the distribution of costs between Infrastructure and Project; - documentation trees; - deliverable items.
SM-030	DPAC related tasks carried out by SOC staff shall be identified and structured very clearly and be conflict-free with respect to responsibilities for the SOC implementation and operations
SM-040	SOC shall generate and submit for approval to Gaia project the following plans: - development - verification - maintenance - configuration control - deployment of resources
SM-045	SOC shall ensure timely deliveries to and from DPAC, in particular for launch- and science operations- critical tasks.

6.2 Cost, Schedule and Risk Management

SM-050	The SOC shall prepare the original baseline cost plan as separate annex to the SIP. The baseline cost plan shall provide for each work package the planned annual expenditures for manpower usage, facilities charges and project-specific investments.

SM-060	Changes to the baseline cost plan resulting from alterations to the products and services to be provided by the SOC are subject to approval by the Project Manager.
SM-070	The SOC shall maintain the baseline cost plan with changes agreed by the Gaia project manager.
SM-080	The SOC shall carry out a risk assessment of their overall activities and maintain a risk register. Risk mitigation measures shall be identified, agreed and implemented. The status shall be reported as part of the regular reporting and as part of each review (cycle and major reviews).
SM-090	SOC shall establish a baseline master schedule and maintain and update the schedule for presentation at every second Project/SOC progress meeting
SM-100	The baseline master schedule shall link proposed hardware updated with major development of the AGIS runs, secondary star solutions, ICDs, and development in the data base versions.

6.3 Reporting Requirements

SM-110	The SOC shall provide quarterly progress reports in the form of viewgraphs which include: - brief summary of the progress achieved since the previous reporting period; - concise description of the main problem areas, their criticality and anticipated impacts (e.g. delays in the schedule or non-conformance with the requirements); - status of the technical design and operations preparation, of proposed solutions to the problem areas and of engineering, PA/QA and testing activities; - risk mitigation status - financial status wrt. CAC - update of the overall schedule with latest prediction of the completion dates of the identified milestones; - a list of relevant action items and their status.
SM-120	Bimonthly progress meeting shall be held between Gaia project and SOC for monitoring purpose

6.4 SOC Reviews and Progress Meetings

SM-130	SOC reviews listed in section 2.6 shall be planned and organised in conjunction with the Gaia Project Team and ESOC.
SM-140	S/W & lower levels review within the SOC and DPAC shall be organised shall be planned and organised in conjunction with the Gaia Project Team.
SM-150	SOC shall prepare for all the above reviews the related review procedure and associated review package.
SM-160	SOC shall participate in major project reviews (e.g. SRR, PDR, CDR, FAR, FRR), shall review and comment the relevant data packages.
SM-170	SOC shall provide the relevant expertise and support to ground segment and

	related Working Groups, as well as reviews covering the MOC.
SM-180	Regular progress meetings shall be held with the Project Manager or his designated representative.

6.5 Documentation and Configuration Management

SM-190	All information used for the ground segment development shall be properly documented.
SM-200	A documentation tree shall be established to define the hierarchical relationship of all operations ground segment documents.
SM-210	All documents shall be placed under configuration control.
SM-220	The requirements for configuration and documentation control applicable in SOC to the Gaia mission shall be specified in a SOC Configuration Management Plan to be prepared by the SOC Development Manager.
SM-230	The SOC shall maintain configuration control of the software & algorithms needed to accomplish all tasks. Particularly, SOC shall be responsible for the configuration control of all Gaia launch and mission-critical developments executed by SOC and DPAC.

7 PROJECT SCIENTIST

SPS-010	A dedicated team of scientist shall be set up by project scientist to support and advise the Gaia project team, the SOC and DPAC in all scientific aspects of the mission
SPS-020	The project scientist will organise and chair the Gaia Science Team to provide support and advice to ESA and DPAC on all scientific aspects
SPS-030	The project scientist will interface the DPAC and participate to DPACE meetings
SPS-040	The project scientist and his team shall be responsible to: - provide, validate and maintain tools (e.g. Gaia parameter database, accuracy models, etc) and resources on the web for the scientific Gaia community and ESA project - support ESA outreach and education activities in relation to Gaia - support studies, tests and data analysis addressing specific issues (e.g. radiation damage on the CCD)

APPENDIX 1: ACRONYM LIST

AD	Applicable Document
ACMS	Attitude Control and Measurement System
AIV	Assembly Integration Verification
AOCS	Attitude and Orbit Control System
AR	Acceptance Review
APH	Attitude Pointing History
CaC	Cost at Completion
CCB	Configuration Control Board
CDMS	Command and Data Management System
CDR	Critical Design Review
C/O	Check-Out
CPV	Commissioning and Performance Verification
DDS	Data Distribution System
DPAC	Data Processing & Analysis Consortium
DPC	Data Processing Centre
DTCP	Daily TeleCommunication Period
DVD	Digital Versatile Disk
ECSS	European Cooperation for Space Standardisation
EGSE	Electrical Ground Support Equipment
EM	Engineering Model
EOL	End of Life
FAR	Flight Acceptance Review
FCP	Flight Control Procedure
FCT	Flight Control Team
FD	Flight Dynamics
FDIR	Failure Detection, Isolation and Recovery
FL	First Look
FM	Flight Model
FMECA	Failure Mode Effects and Criticality Analysis
FOD	Flight Operations Director
FOP	Flight Operations Plan
FRR	Flight Readiness Review
FTP	File Transfer Protocol
GSCMP	Ground Segment Configuration Management Plan
GSDR	Ground Segment Design Review
GSIR	Ground Segment Implementation Review
GSM	ESOC Ground Segment Manager
GSPAP	Ground Segment Product Assurance Plan
GSRQR	Ground Segment Requirement Review
GSRR	Ground Segment Readiness Review
GST	Ground Segment Team
Gb	Gigabit
HK	Housekeeping
H/W	Hardware
ICD	Interface Control Document
IDT	Initial Data Treatment
IFOP	Instrument Flight Operations Plan
IFCP	Instrument Flight Control Procedure
IOCR	In-Orbit Commissioning Review
ITT	Invitation to Tender
KAL	Keep Alive Line
Kb	kilobit
LEOP	Launch & Early Orbit Phase
LIT	Listen-In-Test
LGA	Low Gain Antenna
LOS	Loss Of Signal
LOS	Line of Sight
LRR	Launch Readiness Review

L2	2nd Lagrangian point of the Earth-Sun System
Mb	Megabit
MCR	Main Control Room
MCS	Mission Control System
MGA	Medium Gain Antenna
MIRD	Mission Implementation Requirements Document
MIP	Mission Implementation Plan
MOC	Mission Operations Centre
MTL	Mission TimeLine
NDIU	Network Data Interface Unit
OBCP	On-Board Control Procedure
OBDH	On Board Data Handling
OBSM	On-Board Software Maintenance
OBSW	On Board Software
OBT	On-Board Time
OD	Operational Day
OIRD	Operations Interface Requirements Document
OOL	Out of Limit
ORR	Operations Readiness Review
PA	Product Assurance
PDR	Preliminary Design Review
PDHU	Payload Data Handling Unit
PLM	Payload Module
PM	Project Manager
PROM	Programmable Read Only Memory
PS	Project Scientist
PS-ICD	Packet Structure Interface Control Document
PSS	Portable Spacecraft Simulator
PUS	Packet Utilisation Standard
QMS	Quality Management System
QR	Qualification Review
RAM	Random Access Memory
RCS	Reaction Control System
RF	Radio Frequency
RFD	Request for Deviation
RFW	Request for Waiver
rms	root mean square
ROM	Read Only Memory
RT	Real Time
S2K	SCOS 2000
SCI-S	Scientific Directorate-Research and Science Support Department
SCOS	SpaceCraft Operations Control System
ScQL	Science Quicklook
SDB	Satellite Data Base
SDE	Software Development Environment
SETET	System End-To-End Test
SGICD	Space-to-Ground Interface Control Document
SIRD	Science Implementation Requirements Document
SIP	Science Implementation Plan
SMP	Science Management Plan
SREM	Standard Radiation Environmental Monitor
SOC	Science Operations Centre
SPF	Single Point Failure
SPR	Software Problem Report
SRD	Software Requirements Document
SSMM	Solid State Mass Memory
SSO	Solar System Object
STR	Star Tracker
SVF	Software Validation Facility
SVM	Service Module
SVT	System Validation Test
S/C	Spacecraft
S/W	Software

TBC	To Be Confirmed
TBD	To Be Defined
TB-TV	Thermal Balance-Thermal Vacuum (test)
TC	Telecommand
TM	Telemetry
TTC	Telemetry, Tracking & Commanding
UM	User Manual
URD	User Requirements Document
UTC	Universal Time Coordinated
VC	Virtual Channel