VLT I PROGRAMME

VERY LARGE TELESCOPE

Statement of Work for
PRIMA Astrometric Operations and Software

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CHANGE RECORD

ISSUE	DATE	SECTION/PARA. AFFECTED	REASON/INITIATION DOCUMENTS/REMARKS
1.0	16.04.2004	all	first issue
2.0	23.06.2004	Title 1., 2., 3.3.1/2/3/4, 4.5 3.3.3	Changed document title Small corrections for project kick-off Add distinction between "Calib & Obs Strategy" and "Op & Calib Plan"

ADxx	Applicable Document # xx
AT	Auxiliary Telescope
CIDL	Configuration Item Data List
CRE	Change request
DDL	Differential Delay Line
DRL	Document Requirements List
ESO	European Southern Observatory
FDR	Final Design Review
ICD	Interface Control Document
NCR	Non Conformance Report
PA	Product Assurance
PAC	Provisional Acceptance Chile
PAE	Provisional Acceptance Europe
PDR	Preliminary Design Review
RFW	Request for waiver
UT	Unit Telescope
VLTI	Very Large Telescope Interferometer

Table of Content

Table

1. Scope

This document defines the tasks and deliverables applicable for the Astrometric Operations and Software of the PRIMA project.

2. Applicable documents

The following documents form part of this statement of work to the extent specified herein. In case of conflict, the "Statement of Work of PRIMA Astrometric Operations and Software" shall be considered as superseding.

AD-1   Data Flow for VLT/VLTI Instruments
Deliverables Specification   VLT-SPE-ESO-19000-1618, Issue 2.0, 22.05.04

AD-2   Software Management Plan   VLT-PLA-ESO-00000-0006, Issue 2.0, 21.05.92

AD-3   Standard Procedures for Design Review   VLT-INS-ESO-00000-0251, Issue 2.0, 25.04.91

AD-4   Documentation Plan   VLT-PLA-ESO-00000-0005, Issue 1.A, 17.07.91

AD-5   Configuration Control Plan   VLT-PLA-ESO-00000-0002, Issue 1.0, 25.04.91

3. Requirements

3.1. Project definition

Using the specifications of AD-1, the Consortium shall establish and maintain the development of:

- The conceptual and detailed design of the Astrometric Operations and Software, which will be defined later by its "Data reduction library specifications and date reduction library design";
- The coding of the software and/or the documentation requested;
- The acceptance test of each deliverable according to the verification planning;
- The training of ESO personnel in the integration and usage.

The consortium will be asked to support and participate to the installation and commissioning on site.

3.2. Item Definition

The item definition will cover the following:

1. PRIMA astrometry error budget
2. PRIMA astrometry calibration and observation strategy
3. Observation preparation (angle calculator and exposure time calculator) library modules
4. Astrometry data reduction library (specifications, design and library modules)

3.3. Project Phases definition and task description

This section describes the project phases and technical tasks considered indispensable by ESO for the realisation of the PRIMA Astrometric Software. ESO does not lay any claim to their completeness.

3.3.1. Preliminary Design (from Kick Off to PDR)

3.3.1.1. Definition

During this first phase, the Consortium shall establish a preliminary design of the PRIMA Astrometric Software based on the proposal Planets-PRI-AOS-0003.

The Preliminary Design Phase consists of:

- the identification and exploration of solutions or concepts leading to the observation preparation and data reduction library specifications as described in AD-1;
- the preparation of the Astrometry Error Budget and Calibration & Observation strategy (draft);
- the evaluation of remaining development risk on a technical and schedule basis;

This first phase ends with the Preliminary Design Review (PDR) whose objective is to verify the conformity of the preliminary design with the technical specifications AD-1. For the PDR, software development specifications, input for software design documents, interface control documents and their corresponding verification/test plans shall be available.
The PDR is declared successful when all issues identified during the Review have been resolved and implemented.

3.3.1.2. Task Description

The following tasks shall be part of the consortium activities:

1. Update the preliminary Management and Project Plan (Planet_PRI-MAG-0004/Planets-PRI-PRO-0005).
2. Perform, starting from the concept submitted in the technical offer and in accordance with the Project Plan, all trade-offs, analyses and impact statement. This shall result into the specifications of the astrometry data reduction library.
3. Generate a preliminary implementation & test plan.
4. Update the Project Plan for the next project Phases.
5. Prepare a PDR Data Package listed in Table 2
6. Prepare an Interface Control Document identifying and characterising the interface of the astrometric software with PRIMA instrument control software and VLT(I) software environment.

3.3.1.3. PDR Data Package

The PDR data package defined in the document list (Table 2) consists of:

- the Astrometry Error Budget (report);
- the Astrometry Calibration & Observation Strategy (draft report) as defined in AD-1;
- the specification of the Astrometry Data Reduction library as defined in AD-1;
- all managerial documents necessary for the proper conduction of the subsequent development phases.

3.3.2. Detailed design (from PDR to FDR)

3.3.2.1. Definition

The Detailed Design Phase is the period when the system and the items necessary for its support are designed in detail and the design is verified. During this phase the Final Design of the Astrometric Operations and Software is established such that:

- The ability of the design approach to meet the requirements can be evaluated;
- It garantees that software test and installation risks can be evaluated with a high degree of confidence.
- The error budget is updated and a first version of the Astrometry Calibration and Observation Startegy is developed.
- It allows the clear identification of the operational costs (manpower, etc…).

This phase ends with the Final Design Review (FDR). The purpose of this review is to demonstrate that the Final Design satisfies the specified requirements. The FDR is declared successful when all issues identified during the Review have been resolved and implemented.

3.3.2.2. Task Description

The following tasks shall be included in the Final Design Phase activities:

1. Develop the Detailed Design for the PRIMA Astrometric Software. At the end of the development activities, the compliance of the design with the requirements defined in AD-1 shall be demonstrated. The development of the Detailed Design shall include the analyses, which were performed on the Preliminary Design, in order to account for the detailed design.
2. Generate a preliminary version of the On-site Implementation Manual, Operation Manual, and Maintenance Manual.
3. Issue the CIDL –As designed of all documents, libraries and modules.
4. Update the Project Plan for the next phases.
5. Prepare a FDR Data Package listed in Table 2.
6. Freeze the ICD.

3.3.2.3. FDR Data package

The FDR data package defined in the document list (Table 2) consists of:

- the design of the Astrometry Data Reduction library as defined in AD-1;
- the specification of the Astrometry Observation Preparation Calculators as defined in AD-1;
- Issue the CIDL – as designed of all documents, libraries and modules;
- Any necessary update of the error budget and the calibration & observation strategy report;
- All managerial documents necessary for the proper conduction of the subsequent development phases.

3.3.3. Coding, Test and Acceptance in Europe (From FDR to PAE)

3.3.3.1. Definition

During this phase the Consortium shall code all software modules related to the observation preparation library and to the astrometry data reduction library.

The Consortium is requested to provide adequate resources and support to ESO for the Software Implementation phase (coding/testing) described in AD-2.

During this phase, the Consortium shall provide training to ESO for maintenance and operation of the libraries.

The coding phase ends with a Test Readiness review (TRR). The aim of this review is to verify that all coding has been successfully completed and the implementation activities and later the acceptance tests can take place. It reviews also the non-conformities, waivers or other open issues that may impact on the performance verification.

The TRR is declared successful when all issues identified during the Review have been resolved and implemented. It is directly followed by the test phase of the software. There is no deliverable attached to the TRR.

During the test phase, the consortium in collaboration with ESO will perform all test and any correction / optimisation / tuning necessary to assure correct function of the astrometric software. Furthermore, the Consortium shall carry out acceptance tests necessary for the Provisionnal Acceptance of the astrometric software.
The test and acceptance phase ends with the Provisional Acceptance Europe. The objective of the PAE is to verify that the astrometric software fulfils all interface and requirements as defined in AD-1 and that all relevant libraries are available and ready for implementation in Chile.

During this phase, the Error Budget and Operation & Observation Strategy reports are also being refined and updated. The Operation & Observation Strategy report is the basis for the preparation of the Operation & Calibration Plan, by the project scientist(s).

3.3.3.2. Task description

During this phase, the Consortium shall:

1. Code the observation preparation and data reduction library modules according to the design documents produced at FDR.
2. Provide ESO with adequate support for software implementation, software installation and test.
3. Update, if necessary, On-site Implementation Instructions, Operation Manual, and Maintenance Manual provided at FDR.
4. Issue the CIDL –As built of all documents, libraries and modules.
5. Deliver the Acceptance Test Procedure to ESO for approval 3 weeks prior to the beginning of the test period.

3.3.3.3. PAE Data package

The PAE data package defined in the document list (Table 2) consists of:

- Issue 0.5 of the Astrometry Data Reduction library as defined AD-1;
- Issue 1.0 of the library modules of the Astrometry Observation Preparation Calculators as defined in AD-1;
- The CIDL-As built of all documents, libraries and modules;
- The User Manuals;
- All necessary updates of the error budget and calibration & observation strategy reports.
- All managerial documents necessary for the proper conduction of the subsequent phases.

3.3.4. Commissioning on site and Preliminary Acceptance Chile (PAC)

3.3.4.1. Definition

During this phase, the Consortium in collaboration with ESO will perform all tests on sky, on real data, and any correction/optimisation/tuning necessary to assure correct function of the astrometric software in Paranal.

Analysis of the obtained results will be performed in the aim of improving the knowledge of the PRIMA astrometric facility and of modifying accordingly the error budget, the calibration & observation strategy, the observation preparation library and the data reduction library.

3.3.4.2. Task description

During this phase, the Consortium shall:

1. Support and participate to the commissioning of the astrometric software in Paranal Observatory.
2. Correct/optimise/tune the software library to assure its correct function in the Paranal environment, following standard ESO procedures (AD-2).
3. Analyse the astrometric data obtained by PRIMA, especially their long term trends and modify accordingly the error budget and the calibration & observation strategy.
4. Upgrade every 6 months the data reduction library.

3.3.4.3. PAC Data package

The PAC data package defined in the document list (Table 2) consists of:

- Issue 1.0 of the Astrometry Data Reduction library as defined in AD-1, as well as upgrades every 6 months;
- Issue 1.x of the library modules of the Astrometry Observation Preparation Calculators as defined in AD-1.

3.3.5. Final Acceptance Review (FAR)

In the years following PAC, every six months a new issue of the Astrometry Data Reduction Library shall be delivered and a detailed report on the progress of the PRIMA Astrometry Error Budget and Calibration Model shall be delivered.

It is planned that 3 years after the PAE, ESO will declare the final acceptance of the Astrometric Software.

3.4. <u>Milestones and Schedule Requirements</u>

The minimum set of milestones of the project are defined as follows:

Milestone	Acronym	Schedule	Location of meeting
1. Kick-off meeting	KO	To	Consortium's Premises
2. Preliminary Design Review	PDR	To+8 months	ESO Garching
3. Final Design Review	FDR	To+16 months	ESO Garching
4. Provisional Acceptance Europe	PAE	To+29 months	Consortium's premises
5. Provisional Acceptance Chile	PAC	To+41 months	Paranal Observatory
6. Final Acceptance Review	FAR	PAE + 29 months	

Table 1 Milestones of the project

The Consortium shall include in his schedule all milestones defined in above. The Kick-off meeting, defining the start of the project (T0), shall take place in the 3 coming weeks after the agreement by ESO Council on the project.

4. Deliverables

The Consortium shall deliver to ESO the Astrometry Software (documentation, library modules, user manuals…) following the standards defined in AD-1 and the present Statement of Work including the items listed and described below:

4.1. PRIMA astrometry error budget

This document (report) shall contain the detailed study of the overall astrometric error budget for PRIMA with all its sub-systems as currently designed / built. It shall include, among other effects affecting the long term astrometric accuracy:

- Baseline errors
- VLTI thermal loading
- Climatic and atmospheric effects
- Chromatic effects
- Polarisation effects
- Astrophysical noises

An evaluation of the amplitude of all those effects and an analysis of the possibility to calibrate them shall also be provided. As far as possible, real measurements or evaluation of these parameters based on experimental data available shall be used. Suggestions for additional measurements can be proposed.

The deliverable shall be a detailed report on all noise sources. This report is needed for the PDR and should be updated during the commissioning phase, if necessary, according to real data obtained on sky and their analysis.

4.2. PRIMA astrometry calibration & observation strategy

Based on the error budget, the Consortium shall propose to ESO general observation strategies to allow minimising the errors, calibrating them and optimising the scientific return of PRIMA astrometric facility.
Requirements on the calibrators to be used with PRIMA shall be determined. A list of suitable calibrators and their related characteristics shall be developed.
Functional specifications for the PRIMA astrometric templates shall be prepared. Calibration procedures shall be proposed.

The deliverable shall consist of a report on the calibration & observation strategies, a report on the calibrator source requirements, a list of suitable calibrators and a document containing the functional specifications for the PRIMA astrometric templates.

4.3. Observation preparation (angle calculator and exposure time calculator) library modules

The Consortium shall develop software tools to help astronomers in using the PRIMA astrometric facility. This includes:

- tools to evaluate the feasibility of the astrometric observation knowing some target characteristics (proper motion, parallax …),
- tools to help scheduling astrometric observations,
- tools to determine the single exposure times and total observation time of a target to achieve a given astrometric accuracy.

The deliverables are:

- the functional specification and design documents of such software tools,
- the corresponding receipes and algorithms,
- the prototype library modules themselves under a format TBD (MatLab, IDL, Java)
- user manuals for the observation preparation library.

4.4. Astrometry data reduction library

The Consortium shall develop a general data reduction library and a data analysis facility to study the long term trends in the PRIMA astrometric data obtained during commissioning and operation of PRIMA.

The data analysis facility is an interactive system for the Consortium to check the validity of the error budget and calibration model of PRIMA. The task of the data analysis is to update, modify anb improve the PRIMA calibration model and to determine the model parameters with better accuracy. This interactive data analysis facility is not a deliverable to ESO but is of course a very important task in the project.

The analysis (during the design phase and commissioning) shall allow the Consortium to develop a data reduction library.
The Data Reduction Library has 2 aims:
- To provide on-line pipeline data reduction from PRIMA raw data to the best possible evaluation of the corresponding astrometric signal, taking into account the PRIMA model parameters as evaluated on previous data.
- To reduce off-line all PRIMA data collected from the beginning of operation and to deduce from this automatic analysis the best fit for PRIMA model parameters.

The PRIMA calibration model will not be modified by the data reduction library. Only its parameters will be updated.

The deliverables are:
- the functional specification document of the data reduction library,
- the design document of the library,
- the corresponding receipes and algorithms,
- the library of data reduction software modules coded in ANSI-C,
- three sets of simulated data to test the library, in the FITS format as agreed with ESO,
- detailed user manuals for the library (implementation, operation, maintenance).

4.5. Documentation

The Consortium shall deliver to ESO all documentation included in the Documentation Requirements List (DRL), Table 2. This table defines in particular the minimum set of documents forming the Data Package of the project's milestones, with their due date.

Other technical documents issued by the Consortium within the scope of the project and not listed in Table 2 shall be made accessible to ESO on request. This includes, for example, lower level specifications, reports, design specifications, etc.
The documentation shall comply with the Documentation Requirements Definitions to be agreed between ESO and Consortium and the documentation numbering system (AD-4).

All documents shall be prepared in A4 format and written in English. All deliverable documentation shall also be delivered in computer-readable form (format to be agreed between ESO and the Consortium).

Documentation shall be delivered to ESO-Garching unless otherwise agreed by ESO. When test reports are submitted, ESO requests a three-week period to approve the report.

The software documentation list shall comply with the VLT Software management plan AD-2.

#	**Document Title**	for[1]	Copy # per issue	KO	PDR	FDR	PAE	PAC	Com.
	When the Documents shall be delivered			+2w	-3w	-3w	-3w	-3w	Document Reference
	Management Plan	a	2	x					VLT-PLA-DDL-15720-0001
	Project Plan *[*] upgrade of Project Plan if necessary and up to date schedule*	a		x	[*]	[*]	[*]		VLT-PLA-DDL-15720-0002
	Error Budget (4.1) *[*] upgrade if necessary*				x	[*]	[*]	[*]	
	Astrometry Calibration & Observation Strategies (4.2) *[*] upgrade if necessary*				draft	x	[*]	[*]	
	Observation Calculators Specifications (4.3)					x			
	Observation Calculators Library (4.3)						x		Issue 1.0
	Observation Calculators Library (4.3)							x	Issue 1.x
	Data Reduction Library Specifications (4.4)				x				
	Data Reduction Library Design (4.4)					x			
	Data Reduction Library (4.4)						x		Issue 0.5
	Data Reduction Library (4.4)							x	Issue 1.0
	Data Reduction Library (4.4)								Upgrade every 6 months

Table 2: Documentation Requirement List (DRL)

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[1] a   (for) approval
   r   (for) review

5. Project Organisation and control

5.1. Project Organisation

The Consortium shall establish and maintain an effective project organisation to accomplish the objectives of this contract. This project organisation and its management shall be separated from other projects and operations to the extent necessary to prevent interference with the effective and timely completion of this contract. This organisation shall have effective control and support from appropriate senior company management.

The Consortium's Project Management office shall co-ordinate and control all technical activities, project resources and manage all disciplines required to successfully complete the contract.

The key personnel of the project shall consist of experienced personnel. Exchange of the key personnel during the execution of the contract shall be notified to and agreed with ESO in due time.

The project organisation shall ensure on all levels of the project the implementation, enforcement, and control of the methods and procedures covering the schedule control, configuration control, product assurance and the design implementation.

The Consortium shall assign a Project Manager as a single point of contact regarding all technical and programmatic aspects. The Project Manager will also be in charge of the preparation of contract negotiation with ESO or with subConsortiums/suppliers. Nevertheless, contractual agreement will be concluded by the Project Management Office and ESO contract officer.

If events occur which may cause an impact on the critical schedules, for example technical problems, or changes requested by ESO or initiated by the Consortium, the Consortium shall evaluate every possible way to avoid a negative schedule impact. This includes utilization of additional manpower and facilities.

5.2. Management and Project plan

After the Kick-off meeting, the Consortium shall submit to ESO an updated version of the management and Project Plan (single document).

The Project Plan and schedule shall contents at least:
• the master plan which describes the program logic, the main phases and the development philosophy (studies, hardware developments ...);
• the work breakdown structure matrix;
• the work package description;
• the preliminary schedule of the program with a PERT and GANTT;
• the relevant experience in the development of similar systems already built or developed.

5.3. Reporting

- Bi-Monthly Progress Report

  The Bi-Monthly Progress Report summarises the progress of the project over 2 months period.
  ⇨ It shall summarise the results achieved in this period including any deviations, description of critical schedule and technical issues arisen during the reporting period and anticipated for future.
  ⇨ It shall give an account on every problem detected at any level (technical, programmatic, finance,...) of the project during the reporting period and shall address the planned remedial activities.
  ⇨ The Progress Report shall also include the schedule planning with upgrades reflecting the updates versus baseline planning, reassessment of all start and completion dates for all activities and the Action Item List.

- Red Flag Report

  Independently of and in addition to the regular Progress Reports, the Consortium shall report any event with potential implications on Schedule, Design or Cost.

  The Consortium shall issue "Red Flag Report" by within 24 hours after occurrence of a major problem jeopardizing punctual delivery, the achievement of the contract milestones, or achievement of technical performance and requiring the immediate attention of ESO. This reporting shall apply to problems at all project levels.

5.4. Reviews

ESO will plan and prepare project reviews in consultation with the Consortium, particularly with regard to the agenda, participants and contents of the reviews. The major project reviews (KO, PDR, FDR, IRR, PAE, FAR) are defined in terms of objectives, date and location in section 3.3.

Design reviews shall be conducted according to AD-3. The Consortium shall prepare the various data packages as defined in the documentation requirement list (DRL) shown in Table 2. The data packages shall be submitted for comments to ESO in the time frame defined in Table 2. Upon reviewing these documents, ESO will submit potential request for clarification to the Consortium one week prior to the review meeting.

Completion of reviews is defined as resolution of all action items as per the minutes of the review meeting.

5.5. Meetings

- Bi-Monthly Progress Meeting - ESO / Consortium project manager

  ESO reserves the right to request progress meetings on a bi-monthly basis. These bi-monthly Progress Meetings shall be held at the Consortium's premises and shall take place one or two weeks following the reception of the Monthly Progress Report by ESO. The purposes of these meetings are to review the progress of the work, to highlight and discuss detected and reported problems or issues in need of special considerations, and to determine - as appropriate - corrective measures to be taken. ESO participants will be limited: project engineer with one or two specialists in the field of reported problems.
  During the MAIT phase the Monthly Progress Meetings should be held every three months.

A week before the planned meeting date, the Progress Meetings agenda will be issued by ESO. All documentation needed for Progress Meeting such as technical reports, drawings, etc. which have not yet been delivered to ESO shall be sent prior to the meeting.

No Progress Meeting would be foreseen when a review is planned within the month.

- Special Progress Meeting - ESO / Consortium

ESO reserves the right to ask for a Special Progress Meeting, one week in advance. This Special Meeting shall take place either at the Consortium or ESO premises.

- Progress Meeting - Consortium / sub-Consortium or supplier

Progress Meetings between the Consortium and his subConsortiums or suppliers shall be held prior to the meetings or reviews between ESO and the Consortium. SubConsortiums shall attend the ESO-Consortium Review or Meeting if their contribution is required.

ESO reserves the right to participate in all Progress Meetings held between the Consortium and his subConsortiums or suppliers. Progress Meetings may, at the discretion of ESO, involve other participants upon agreement by the Consortium.
Therefore, ESO requires to be kept informed on proposed date and agenda of all Consortium / lower level meetings.

5.6. Minutes

Minutes, in English, shall be taken during all formal meetings or reviews.

If not specially requested otherwise by ESO representative, the Consortium shall write the minutes. Both parties shall always sign minutes. The signature of such minutes indicates solely that the wording is correct and properly reflects the outcome. The signature shall not be construed as a formal, contractual agreement. Any decisions affecting performance, cost, or schedule in order to become binding, require formal contractual coverage. Any matter having contractual implications shall be handled in accordance with the regulation of the contract.

The minutes will include an Action Item List.

5.7. <u>Product Assurance</u>

The Consortium shall, for the PRIMA Astrometric Software project, implement a Product Assurance (PA) approach that covers the following issues:
1. Quality Assurance (QA)
2. Reliability

5.7.1. Quality Assurance

The Consortium shall implement a QA system which reflects, as a guideline, the spirit of ISO 9001.
PRIMA Astrometric Software program shall pay special attention to the following aspects (the reference to ISO 5005:1995(E) is geven in brackets):

- Management responsibility
- Quality plan and quality system (5.2)
- Design control (5.4). Including handling of Change Requests and establishment of Configuration Item Data Lists.
- Document and data control (5.5). Establishing of a documentation system, following ESO guidelines.
- Inspection and testing (5.10). Including plan for testing of the product against established detailed requirements.
- Inspection and test status
- Control of non conforming product (5.13). Plan (and procedure) for handling of non conformities. This shall include establishing a review board to evaluate and to take decisions. Includes also the procedure for establishment and handling of Request for Waivers.

5.7.2. Reliability analysis

To ensure and document that the selected design fulfils the requirements for reliability and availability, the Consortium shall perform reliability analysis, starting during the preliminary design phase. The Consortium shall apply a recognized analysis method.

5.8. Configuration management

5.8.1. General rules

The Consortium shall apply effective Configuration Management (according to AD-5) to assure that:
- The manufacturing documentation is in line with the FDR documentation
- The product is in line with the manufacturing documentation
- The activities performed in verifying the product (analyses, tests) have been performed against the configuration of the delivered product
- Changes to technical specifications and statement of work are not implemented without prior approval by ESO (see section 5.8.3. Change Procedures, below)
- The design as agreed upon at the FDR is not changed without prior approval by ESO (see section 5.8.3. Change Procedures, below)
- Deviations from the requirements of the specifications are properly documented and submitted to ESO for approval by means of Request for Waiver (see section 5.8.4)

The Consortium shall, as a minimum, keep under configuration control the Statement of Work and the Technical Specification (including applicable drawings).

5.8.2. Configuration Item Data List

The Consortium shall establish and maintain a Configuration Item Data List (CIDL) which reflects the edition/revision status of documents under configuration control. The purpose of the CIDL is to assure that the Consortium and ESO agree upon the status of the documentation under configuration control.
The initial version of the CIDL shall be delivered together with the Project Plan. Updates shall be delivered, as a minimum, with the PDR data package, FDR data package and the Users Manual.

The required CIDL shall contain:
- list of the valid version of the specifications
- list of valid plans and procedures
- list of valid software

All documents shall be recorded in the CIDL with their:
- document title
- identification number
- issue/revision number
- date of status
- approval status (Consortium and/or ESO if required)

5.8.3. Change Procedures

Each party (Consortium and ESO) may propose at any time a change to be introduced into the contract and/or related documentation. Such a Change Request (CRE) may affect:

- Contractual conditions (delivery, payment, schedule etc…)
- Technical specifications
- Baseline documentation approved by ESO or submitted by the Consortium
- Interfaces
- Other written agreements between Consortium and ESO

All Change requests are prepared and forwarded to ESO by the Consortium.

Changes initiated by ESO shall be completed by the Consortium as CREs. The CREs shall include reasonable proposals, justified in price and schedule. Both parties, ESO and the Consortium, shall respond to any change request within 4 weeks.

The Consortium is obliged to perform the work upon agreement of the change. If the Consortium wants to introduce third parties to complete the work, proposed in the CRE, such parties shall be identified in the CRE.
ESO reserves her right to involve any third party for the implementation of a change if no satisfactory agreement can be achieved by negotiations with the Consortium.

5.8.4. Request for Waiver

The Consortium may submit to ESO a Request for Waiver (RFW) in order to obtain relief from specifications, test procedures, integration requirements, etc.

The RFW shall not be used to request changes to contractual requirements. The RFW can cover only a determined number of already produced material.

The decision, which is an ESO responsibility, will be given after assessment of the supporting information to the RFW. An approval of an RFW shall not establish a precedent for the submission of RFWs concerning similar non-conformities.

The Consortium will be informed whether ESO decides to approve or to reject a RFW within 4 weeks.

5.8.5. Action Item Control

The aim of the Action Item Initiation and Reporting Procedure is to provide a simple way to ensure that actions are raised and cleared effectively. Actions will normally originate from meetings and reviews or may be raised at ESO's request.

Actions should proceed immediately on the basis of acceptance. This acceptance can be reached during the meeting, or, if requested by the actionee, after confirmation by his management. The change procedure defined above shall be applied for all actions, which may have an impact on the scope of the contracted work.

The Consortium shall keep an Action Item List and provide ESO with an update of the list regularly together with the Progress Reports or upon request.

5.9. Documentation

The Consortium shall operate a centralised documentation system to fulfil the information requirements of the project. This system shall be capable of providing up-to-date information on all aspects of the project at all times including those relating to the subConsortiums.

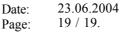All documents are subjected to configuration control.

All documents are given a reference number as defined in chapter 4 of AD-6, the code of the Product Structure (chap 4.2.4 AD-4) of the PRIMA Astrometric Software is **15750.**

The documentation numbering for Fax, Letter, Minutes is defined by VLT-CCC-year/ffff.

Where "CCC" is the acronym of the company which issues the document and "year" four digits including preceding zeros, and "ffff" a sequential identification number e.g. 2002/0001.

5.10.   Training

The Consortium shall provide full support to allow training of ESO technical staff at His premises. This includes office space and access to computer and network facilities.

A first training period shall be provided before Provisional Acceptance of PRIMA ASTROMETRIC SOFTWARE. The following topics shall be covered during this training:

- implementation of PRIMA ASTROMETRIC SOFTWARE on site,
- optimisation / tuning,
- operation of the PRIMA ASTROMETRIC SOFTWARE (including nominal, emergency, failure and misuse conditions),
- basic maintenance operations.

The training shall be based on the manuals, instructions and procedure due at PAE

5.11.   Accommodation and Services for ESO Personnel at Consortium's Premises

The Consortium shall provide on his premises adequate offices, furniture and communication facilities as may be required for two or three ESO representatives who visit the Consortium to monitor critical project phases such as system integration, testing etc.

6. Appendix

6.1. Document Requirement Description

Document Requirement Description will be communicated if needed to the Consortium.

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