Cover document for NAOMI Work Packages.

wht-naomi-59

AOW/GEN/AJL/6.8/07/96/WP Cover Document
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CONTENTS

1. Purpose of Document

The prime functions of this document are to outline management guidelines for the NAOMI (the Nasmyth Adaptive Optics for Multi-purpose Instrumentation) Work Packages and to supply

background information in support of individual Work Package Functional Requirements/specifications and which would otherwise have to be given in each document. Therefore it should be read in conjunction with at least the following documents;

Top-level NAOMI Science and Operational Requirements AOW/SYS/RMM/6.0/07/96
Technical Description of NAOMI AOW/SYS/AJL/4.0/07/96/Technical Description of NAOMI
WHT NGS System Overview AOW/SCI/RMM/2.0/03/96
Optical chassis work package description AOW/SUB/RAH/5.1/08/96
Baseline Wavefront sensor technical specifications AOW/SUB/RAH/6.1/08/96
Tip-tilt sensor technical specifications AOW/SUB/RAH/1.6/04/96
Software User Requirement Document (URD) AOW/SOF/APD/??
Work Package Boundaries Figure AOW/GEN/AJL/3.4/04/96
ELECTRA + NAOMI Programme Milestones AOW/MAN/AJL/4.3/07/96

These define the basic system and its goals. Other supporting documents include:

WHT NGS Mechanised Component Functions AOW/SYS/RMM/3.3/01/96
Notes from 1/2/96 Durham Consortium Meeting AOW/MAN/AJL/3.2/03/96
Proposals for ELECTRA-1 Technical and Scientific Goals AOW/GEN/RMM/8.0/03/96

Note that some of these documents are still being developed; managers should ensure by checking with the Project Manager that they have the latest version.

This document supplies the following information:

Overview of UKAO Programme in support of NAOMI Work Package descriptions
Describes relationships between work packages
Gives potential suppliers of WPs background information and guidelines against which to plan their costs and work
Management Reference for chosen suppliers of WPs

2. The UK AO Programme

2.1 Components of the Programme

The use of the word ‘programme’ in the context of ‘AO Programme’ in this document is historical in that there is no longer a centralised programme. However the AO Programme did initiate or contribute to several activities which still exist independently. The principal active items in the erstwhile UK AO programme are as follows:

1. An interim near-IR AO system on the WHT feeding a new Infrared camera (MARTINI + WHIRCAM).
2. NAOMI, a project to build a common-user intermediate-order AO system for the WHT with a goal of providing performance levels exceeding those currently being provided at other international 4m astronomical facilities.
3. Preparation of a guide star and source catalogue appropriate for specification of AO observations in order to ensure efficient common-user access to UK AO facilities.
4. Quantification of the AO-specific site characteristics at both La Palma and Mauna Kea (the Joint Observatories Site Evaluation Programme, JOSE).
5. Essential underpinning research and development required to support a laser beacon system at WHT thereby allowing virtually full-sky AO coverage.
6. Support for student training through earmarked studentships.

3. NAOMI Requirements

The system Scientific and Operational Requirements for NAOMI are described in document AOW/SYS/RMM/6.0/07/96. An extremely brief summary with the expected timescale is given in the bulletted list below.

?? Provide the WHT with a State-Of-The-Art AO facility meeting the scientific and operational specifications described in the above document. Simply, the NAOMI system is specified to be an intermediate order Adaptive Optics system for installation on the Nasmyth platform of the WHT. Its goal is to provide a common-user system with performance optimised for the 1 - 2.5?m spectral region.

?? Deliver and commission this system on the telescope by March 1998. At this time or within a few additional months the system should be sufficiently easy to use and to support that it can be described as 'common user', i.e. capable of carrying out its scientific programmes making efficient use of telescope time and supported by knowledgeable local staff who need not be experts in adaptive optics.

?? In the interests of providing a system or systems capable of carrying out new high angular resolution astronomical research at the earliest opportunity, a staged approach producing an intermediate working system based on ELECTRA is being adopted.

4. NAOMI Implementation

It is intended to design and build NAOMI through four Work Packages put together to form a collaborative project. Because AO technology and modelling are both developing vigorously, the NAOMI system will need to be designed and built with dynamic interaction between the participating groups. The Work Packages are:

(1) Real Time Control System and Graphical User Interface, Deformable Mirror;

(2) Software/hardware Supervisory-level Control package, Telescope and Instrument Control Interface

(3) 'Opto-mechanical Chassis' package, comprising the main optical layout and its mountings, fast steering (or tip-tilt) mirror, off-bench calibration unit(s), engineering level control of components;

(4) Wavefront Sensor (WFS) package, to design and build the Shack Hartmann-type WFS.

The integration of the packages into a full system will be part of each work package and will be overseen by the Project Manager, Project Scientist and Project Engineer. Each work package provider will be expected to supply an adequate number of people with appropriate expertise in its own WP area to allow efficient commissioning at the telescope. The responsibility for the commissioning will lie with the Project Manager and Project Scientist. Acceptance tests at both integration and commissioning phases will be required by the Director, La Palma, to whom the system will be delivered.

5. List of Relevant Documents

A list of reports and papers associated with the AO Programme is kept in a database at ROE. These are tracked by an internal document numbering system, which should be adopted for

reports by WP holders. Recent documents particularly relevant to the production of the NAOMI system are listed below. The full list is available using the BSCW html facility in the ajln_NAOMI workspace on aops.dur.ac.uk. Details of the numbering system may be obtained from the Project Manager. Some of the following are historical precedents of the later documents, but are given so that the development of the project can be traced if necessary.

Scientific case AOP/SCI/GG/1.0/09/95
Top-level NAOMI Science and Operational Requirements AOW/SYS/RMM/6.0/07/96
Technical Description of NAOMI AOW/SYS/AJL/4.0/07/96/Technical Description of NAOMI
Science Overview AOW/SCI/RMM/2.0/03/96/Sci-Overview.
Conceptual Design Review April 1995 version 2.1
Optical chassis work package description AOW/SUB/RAH/5.1/08/96
Baseline Wavefront sensor technical specifications AOW/SUB/RAH/6.1/08/96
Tip-tilt sensor technical specifications AOW/SUB/RAH/1.5/02/96
Mechanised component functions AOW/SYS/RMM/3.2/03/96
Functional requirements description and error budget analysis AOW/SYS/RAH/2.2/08/95
ELECTRA considerations AOW/GEN/RMM/6.1/12/95/electra
ELECTRA description AOP/GEN/RMM/4.0/9/95/msl-elec
Work Package Boundaries Figure AOW/GEN/AJL/3.4/04/96
Software User Requirement Document (URD) AOW/SOF/APD/1.9/12/95
Software Requirements Document (SRD) AOW/SOF/GJ/1.1/01/96

6. Management and Reporting.

Any WP awarded to a site must have a single person nominated as responsible for all relevant work on that site (in Gemini terminology this is the 'WP Responsible'; in NAOMI Project Documents the term 'local manager' may also be used). If a group or site works on more than one WP, a single person should be responsible for providing the top-level summary of progress and resource usage within the group or site. The WPR shall provide regular reports on work progress and financial status to the AOPM. The frequency and level of detail are to be agreed with the Project Manager but financial and resources use summaries shall be provided at least monthly, approximately 2 weeks after the end of each month. It is intended that the reporting level should not be a burden on the WP itself, but see the section Progress Reports under Documentation, below.

7. Instrumentation Background.

It is hoped that the NAOMI first light instrument will be a 1-2.5?m HgCdTe 1024 x 1024 array camera. WHIRCAM, an existing 1 - 5?m imaging instrument feeding a 256 x 256 element InSb array having 35?m pixels, will be the fall-back option. The optical scale requirement is to fully sample a 1.65?m diffraction limited image from the WHT.

Other instruments which might be fed in the longer term via the science port are:

- an infrared spectrograph, requiring similar sampling in the image plane
- possible fibre feeds to optical instruments, by substitution of the IR reflecting dichroic mirror with an alternative mirror (e.g. optical beam-splitter).

Although these instruments are not yet defined, approximate space envelopes will be determined and being able to accommodate these should be taken into account in the overall system design.

8. Work Package Guidelines and Expectations

8.1 Standards and Infrastructure.

Some guidelines on software, electrical and other standards are given in the Science and Operational Requirements document. In general it is the responsibility of the WP supplier to confirm that components requiring maintenance and spares are of a type acceptable to ING (see Clauses 19 & 20 in the Scientific and Operational Requirements document).

8.2 Boundaries and Interfaces with other WPs.

There are two aspects to interfacing between WPs: (i) definition of the physical and software boundaries between the WPs and consequent division of labour; (ii) details of physical and software interfaces which require optical path matching, component compatibility, matched software protocols and structures, space envelope constraints, mechanical and electrical connections, combined total error budgets. The next few sections offer guidelines on handling these boundaries and interfaces.

8.2.1 WP Boundaries

Figure 1 is a colour-coded block diagram which shows schematically the components of the NAOMI system. Proposed boundaries between the three major WPs are indicated in Table 1 and in a work Package Boundaries figure (attached). Components common to a given WP are in the same colour. Areas which are considered currently by the AO Project Management possibly to be open to choice between two or more WPS are coloured brown. To ensure they are covered they are nominally attached to specific WPs in the WP Description Documents. The Project Management reserves the option to deem their location 'negotiable' in arranging WP placements. It is inevitable that as designs progress additional areas will be uncovered which could be dealt with under more than one WP heading.

Table 1: Work Package Boundaries

Work Package Area	Part of Work Package	Responsible Group(s)
Real Time Control System	1	Durham
GUI (top-level)	1	Durham
System C Task	2	RGO
Telescope Control / TC Interface	2	RGO
Instrument Control / IC Interface	2	RGO
Overall Optical Design and AO System Layout	3	ROE
Opto-mechanical Chassis Build	3	ROE
Mechanism control, to EPICS level	3	ROE
Off-bench calibration unit	3	ROE
Wavefront Sensor and Tip-tilt Sensor	4	RGO
GHRIL Environment	?	La Palma Observatory
Laboratory Integration	1,2,3 & 4	Durham, RGO, ROE
Commissioning	-	AO Programme Team

It is intended that work should remain at the locations described by the WP boundaries figure unless a change becomes absolutely necessary for the good of the project. Changes to the

location and responsibility for work are strongly discouraged and can only be made through discussion with the NAOMI Project Manager and any other relevant WP holders. However new items or areas where boundaries turn out to be insufficiently well defined will undoubtedly arise and WP holders are therefore expected to be co-operative in resolving the associated work requirement. The NAOMI Project Manager will make the final choice in the case of any unresolved boundary dispute. Re-allocation of funds will only be made on the basis of an outstanding practical or scientific reason and will need the approval of the Project Manager.

8.2.2 WP Interfaces

Some requirements for interfacing between WPs are given within the individual WP descriptions. Even more than with WP boundaries it is inevitable that as designs progress further requirements for interfacing will be uncovered and need to be defined. WP holders are therefore expected to be co-operative and reasonably flexible in resolving the interface details. WP holders may negotiate directly with each other over interfaces, provided decisions made do not adversely affect system specifications, delivery timescales or performance. Any changes to agreed interfaces must have the approval of the System Engineer. Any decisions involving modification to resources required by either WP must have the approval of the Project Manager.

8.3 Documentation

A summary of the documentation required is given in the sub-sections below.
The documentation requirements are not intended to burden the WP suppliers with unnecessary paperwork. For example, documentation appropriate for a space programme is not required. The intent is to insure that the participants in the programme are kept informed and that sufficient records are kept to resolve any problems that may arise at a later date, e.g. during operation at the WHT. Except for software listings and manuals, most documents need not exceed a few pages. Documentation should be sufficient to allow proper maintenance of the system after delivery; system diagrams and descriptions must therefore be consistent with the system as delivered.

8.3.1 Progress reports

Brief progress reports, e.g. one or two paragraphs, should be submitted to the programme manager at least every two weeks. The use of e-mail is acceptable for this purpose. Where problems arise or significant design changes are involved the programme manager should be notified by e-mail, telephone or Fax within one business day. More detailed formal written reports shall be provided for milestone reviews.

8.3.2 Test reports

Test reports shall be provided for the following types of tests:

Testing of prototypes, if any, during the design and development phases.

Critical tests during manufacture and integration that have been previously identified to be of specific interest to the programme.

Acceptance tests (unless performed by the programme at the location of system integration).

The test reports should reference the appropriate plan or procedure and note any deviations. The reports should be concise. The key results should be summarised in the body of the report; detailed test results should be included in an appendix where deemed appropriate. In addition, copies of specification sheets, operating and maintenance manuals and relevant test data supplied with any commercially acquired system components shall be the property of the NAOMI Project and shall be delivered with the relevant component of the WP.

8.3.3 User documentation

Three copies of the following documents, unless agreed with the Project Manager as inappropriate for the specific WP (e.g. maintenance and safety manual for a software package), should be supplied no later than a calendar month after the WP delivery date:

Users' manual
Detailed interface descriptions/drawings (as built)
Maintenance and safety manual
Drawings and parts list (as built)
Software descriptions or listings

Copies of assembly drawings will be required by the project shortly after their completion to aid the AO system continuing design, integration and testing. All drawings supplied will be used only for purposes directly related to the UK AO programme unless otherwise agreed specifically with the supplier. See also the Science and Operational Requirements document, Clause 14.

8.4 Shipping container

If a WP deliverable item includes equipment, an appropriate shipping container (s) shall be provided for safe transport of the equipment when shipped by commercial carrier on land, sea or in the air.

8.5 Acceptance testing, integration and commissioning

WP suppliers are expected to participate in the integration of the WP with the rest of the AO system at a location within the UK yet to decided and in the commissioning at La Palma. The appropriate experienced personnel must be provided for both activities.

Note that acceptance testing at the location of system integration may be required for various reasons, e.g. cost, availability of equipment. The development of procedures for acceptance testing at the location of system integration will be primarily the responsibility of the programme (it is envisaged that the procedures will be agreed between the La Palma ING Director, the Project Engineer, the Project Manager and the Project Scientist; these procedures will be prepared with the co-operation and approval of the appropriate WP supplier. In such cases a maximum of two representatives of the supplier will have the right to witness and, where necessary, participate in the tests. Similarly the programme reserves the right to have two (maximum) representatives present at the supplier’s facility to witness tests.

8.6 Risk management

Designs shall be based on existing proven technology wherever possible.

Where a design cannot be implemented to specification without calling upon new or high-risk technology, the WP holder must supply in writing risk assessment information to the NAOMI Project Manager, describing the level of risk, consequences of failure in terms of cost and final

system performance, and if possible viable alternatives with approximate costings, performance and risk factors.

8.7 Design and Specification Changes

The programme will provide written notification of any changes in specifications that affect the work package or its interfaces with other packages. The notification will sent to the work package manager within 5 working days of the specification change. A further 5 days is allowed for a response which is required even if no effect on cost or delivery is anticipated.

Certain types of proposed changes, as summarised below, must be reported in writing to the project manager. Approval must be received from the manager before any change may be implemented. The time for the approval cycle will depend on the complexity and magnitude of the proposed change. The project manager will be responsible for notifying the managers of any other work packages affected by the proposed change. At least the following proposed types of changes must be reported:

Changes that are a major departure from the design guidelines.

Changes that affect overall performance, subsystem-level error budgets, interfaces with other work packages or exceed specified space envelopes.

9. Project Plan

9.1 Time guide-lines

A Gantt chart for the NAOMI project with indications of milestones and inter-relations of the ELECTRA stages with the integrated NAOMI project is available from the Project Manager. An expanded description of the plan is given in the NAOMI Management Plan document.

9.2 Cost guide-lines

An allocation to each WP Responsible, if necessary thorough a grant or other delegation of authority (e.g. Observatory Director), will be made by the Project Management on an annual basis but with guidelines for longer term requirements. The allocation shall be for a pre-agreed programme of work as described in the relevant WP Description, the Management Plan and the Project Plan.

9.3 Major work activities

These activities shall include at least the following:

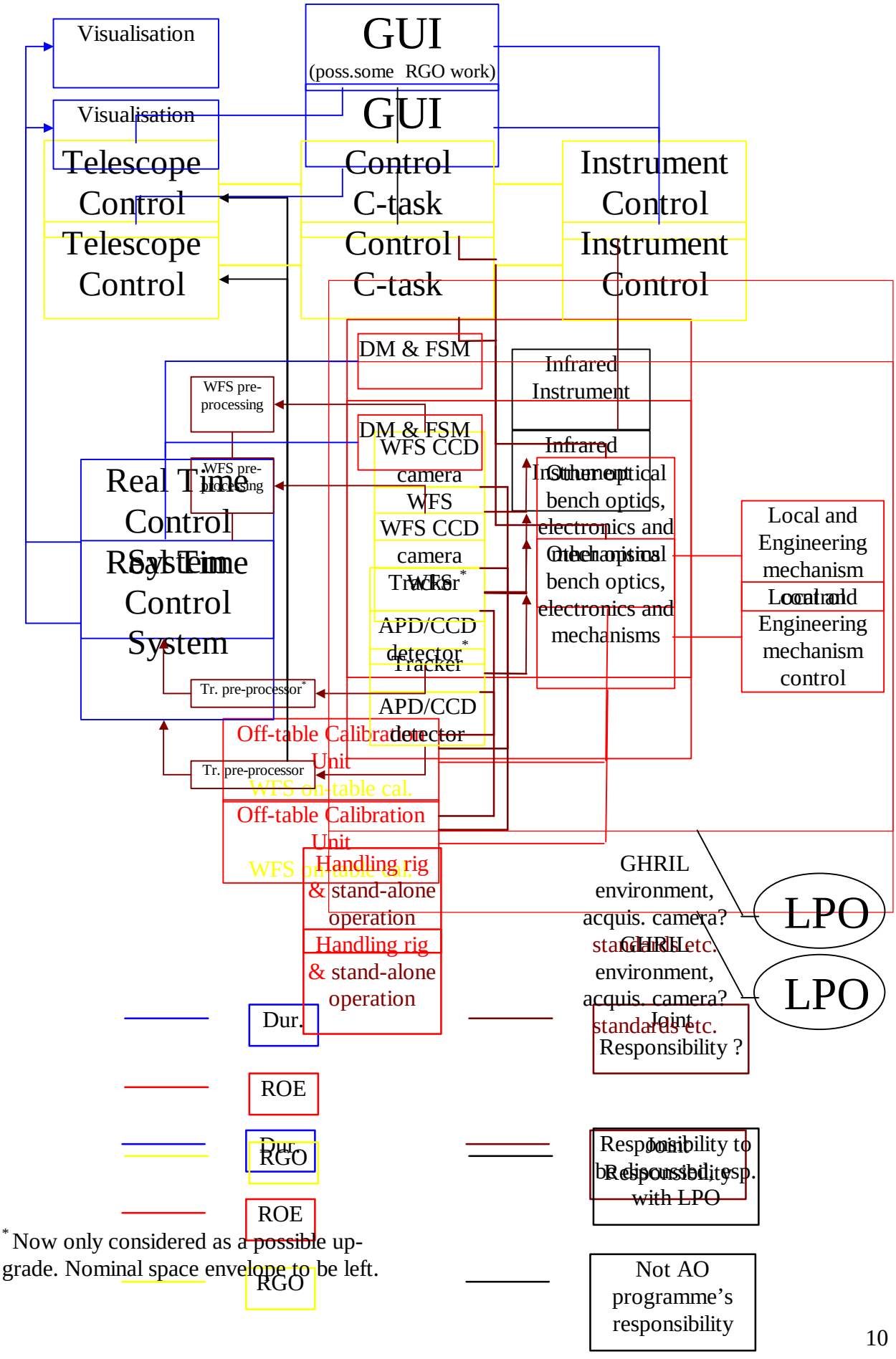
Preliminary Design
Critical Design
Implementation
Acceptance Testing
Support to System Integration
Documentation

9.4 Reviews

Preliminary and critical design reviews are required. These reviews may be informal in nature. The definitions of requirements for PDR, CDR and System Reviews are given in the document

AOW/MAN/AJL/8.0/07/96. Their format should involve a minimum of preparation to avoid impeding the programme's progress. However all critical aspects of the design must be covered. The location of the reviews will be agreed by the programme and the supplier. Thereafter in addition to the regular, brief progress reports mentioned in the Documentation section, a small number of internal progress reviews will be held. These will probably be associated with appropriate key milestones, to be agreed between the WP holder and the Project Manager during discussion of the detailed WP schedule.

The Project Manager will in addition organise a small number (~4) of overall progress reviews during the course of the NAOMI project. WP holders should expect to supply at least two attendees to each review who between them have sufficient knowledge of the WP to describe progress and to answer system-level technical and management questions related to the WP. People with specific more detailed knowledge of sub-systems may be requested to attend by the AO Programme Manager.



* Now only considered as a possible up-grade. Nominal space envelope to be left.