GEMINI
8-M Telescopes
Project

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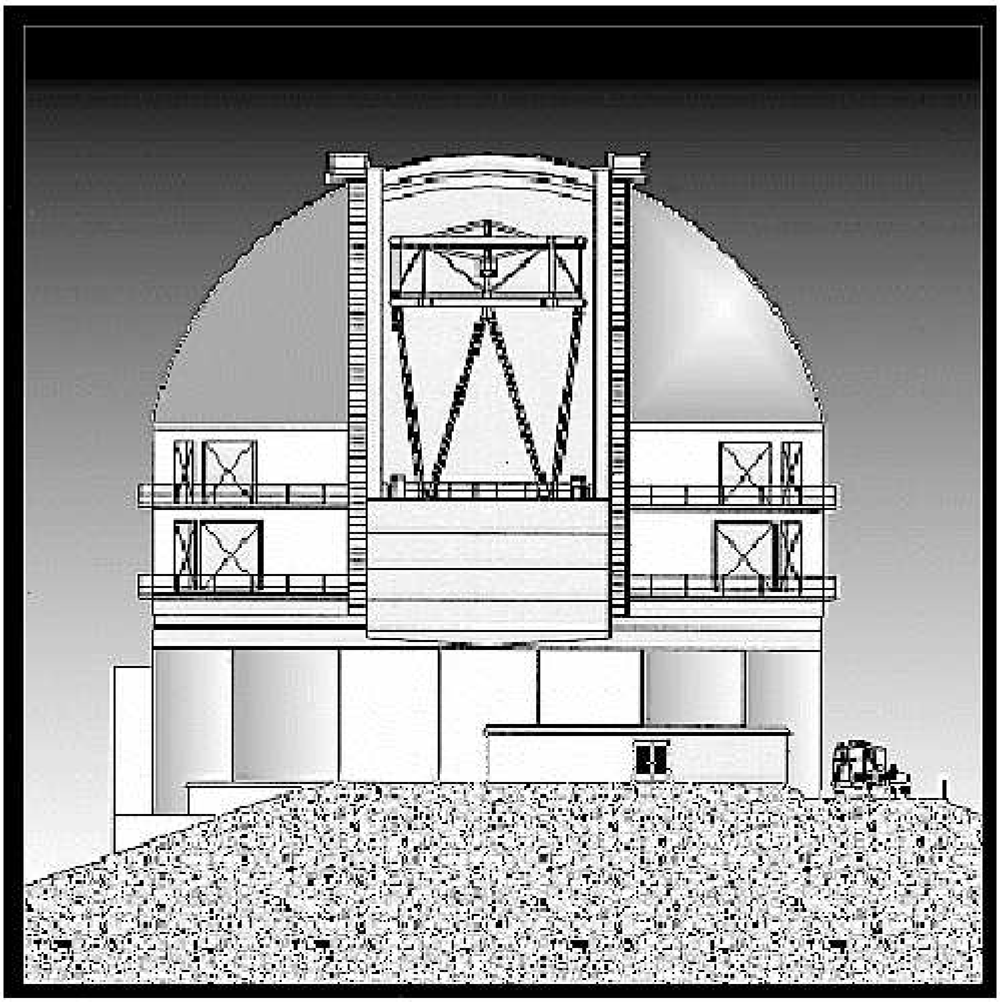
Programmatic Requirements for Gemini Instrumentation Development



December 10, 1997

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Programmatic Requirements for Gemini Instrumentation Development

Change Control Sheet

Version 1.0 dated: December 10, 1997 Original Controlled Release

Approval: ____________________
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Approval: ____________________
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Version 1.0

Foreword

This document defines the standard programmatic (as distinguished from scientific, technical, or design) requirements for facility-class, scientific instrumentation developed for use on the Gemini telescopes. It is intended to be incorporated by reference into Work Scopes governing the execution of instrumentation development for Gemini. [See Appendix A, Glossary, for definitions of these and other capitalized terms used in this document.] Deviations from these standard requirements for any particular instrument will be described in the Work Scope for that instrument. In case of conflict between a Work Scope and the requirements of this document, the Work Scope has precedence.

1. Management and Supervision

1.1. Personnel

1.1.1. Instrument Manager

The Developer will appoint an Instrument Manager to direct the instrument team, and to act as the formal point of contact between the Management Organization and the team.

1.1.2. Instrument Scientist

The Developer will appoint an Instrument Scientist, who is responsible for developing the performance requirements of the Instrument and ensuring that these are met.

1.1.3. Key Personnel

The Instrument Manager and the Instrument Scientist will normally be designated as key personnel. Key personnel cannot be appointed or changed without the prior written approval of Gemini.

1.2. Progress Reports

The Developer will submit written progress reports to Gemini describing the technical, schedule, and financial progress of the Work. These will include:

(a) On a monthly basis:

- (1) minutes of the Developer’s progress meetings for the previous month; and
- (2) any applicable technical reports produced during the previous month.

(b) Every three months:

- (1) information regarding the technical status of the Work;
- (2) an updated schedule to consist of the most current project plan to completion. This plan will be maintained in Microsoft Project, or equivalent;
- (3) a list of the major milestones with the original, previous, and current date by which they will be attained - any significant changes from the previous date will be explained, and each subsequent list will include all the explanations from previous lists;
- (4) problem areas related to the Work, including potential for delays;
- (5) action items for Gemini and the Developer (both open and closed), and associated status;
- (6) information on amounts committed and spent during the prior three months and broken

down into resource categories, labor, capital costs, and other direct costs such as travel, consumable materials, etc.; and

(7) proposed changes in key personnel.

1.3. Meetings

The project plan will include the costs of attending agreed meetings. Gemini may request that the Developer present information related to the Work before additional review committees from time to time. Gemini will provide at least thirty days notice of these reviews to allow for preparation of materials. Gemini will use its best efforts to phase the information required for additional reviews with the Work. Unless Gemini pays the additional direct costs of the Developer's attendance at additional reviews, the Developer is not bound to attend.

1.4. Reviews

(a) The Work Scope will include scheduled review meetings to address phases of the Work. After a Review, Gemini, the Developer's National Project Office, and the Developer will jointly generate a strategy for making progress.

(b) For each Review, Gemini and the Developer's National Project Office will jointly select a review committee Chair. Gemini and the Developer's National Project Office will also jointly select committee members with the concurrence of the Chair.

(c) Design reviews and other reviews conducted by Gemini are advisory. They do not relieve the Developer of any responsibility for the successful completion of the Work in conformity with the Requirements. Similarly, Reviews can not waive any of the Requirements or relieve the Developer of any obligation.

(d) Developer personnel responsible for the design will present the Instrument design at the Design Reviews.

(e) As part of the preparation for each Review, the Developer must carefully study and compare the current Instrument Science Requirements, the Requirements (including the FPRD, if the FPRD differs from the Requirements), the OCDD, the Error Budgets and documentation required for that Review and must promptly report to Gemini any error, inconsistency, or omission that it may discover in these documents, or with the Work Scope. The Developer and Gemini will coordinate to eliminate any such problems.

(f) Within ten working days after receipt of the review committee report, Gemini and representatives of the Developer's National Project Office will produce a written report, based on the verbal and/or written input from the review committee, containing a list of proposed actions (the Review Actions). The Instrument Scientist, the Instrument Manager, and the Gemini Associate Director for Development will approve this report.

(g) Within ten working days of receipt of the Review Actions, the Developer will produce a response to this report (the Review Response), that includes what actions the Developer intends to take for each issue raised in the Review Actions, when the actions will be completed, and the Developer's position as to which of the proposed actions are within the scope of the Work. For actions that are considered by the Developer to be outside the scope of the Work, the Developer will provide a cost to Gemini of including the action with the Work.

(h) Within ten days of receipt of the Review Response (including the cost of work believed to be out of scope by the Developer) by Gemini, Gemini may direct that changes be made to the

Design Documentation that are required to make it consistent with the Requirements. The Developer will promptly comply with all such direction, and will complete the changes within a reasonable period of time (nominally 30 days).

1.5. Access by Gemini

The Developer will grant Gemini personnel access at reasonable times to all places where the Work is being performed, including access to locations where the Developer's subcontractors are performing any part of the Work.

2. Management Plan

(a) The Developer will develop a Management Plan that details the schedule, resources required, and cost to accomplish the Work. This plan will form the basis for managing and tracking the progress of the development program. This plan may be developed in stages that update and expand the level of detail for successive phases of the work. If this plan is developed in stages, the plan for each stage will include the effort for producing the next version covering the subsequent phase(s) of the work. The initial version of the Management Plan will provide top-level schedule, resources requirements, and costs for the entire development program plus detailed information for at least the initial phase of the work.

(b) The Management Plan will include at least the following:

(1) a work breakdown structure (WBS);

(2) a schedule that includes milestones to at least the second level of the WBS. The schedule will include start and finish dates for each WBS element, projected completion dates for each deliverable, and the identifiable critical path or critical items with estimated slack;

(3) a top-level cost breakdown including labor, capital costs and travel;

(4) detailed resources required for each WBS element, broken down into weeks or hours, for each labor category that will be engaged in the Work;

(5) detailed costing for each WBS element;

(6) capital costs, with a breakdown of major items that will be incurred in the work, including a list of all equipment proposed to be purchased as part of the work. This list will include model identification, purpose, estimated costs, supplier, and delivery (where appropriate);

(7) a list of all equipment supplied by Gemini, including software, with a description and the dates required;

(8) a list of key and supporting personnel (including discipline and labor category) that have been designated to perform the work. The time committed to the work will be given as a fraction of each person's full time;

(9) a tabular breakdown of the WBS to lowest level showing task, duration, start, stop, cost;

(10) a top-level breakdown showing timing of major phases of the work;

(11) a top-level milestone listing showing current dates;

(12) a plot showing cumulative costs and labor effort by quarter; and

(13) a plan for producing the work product documentation.

(c) After receipt of the Management Plan, Gemini will promptly review it. If Gemini does not approve the Management Plan it will provide the Developer with a description of the changes that the Developer will need to make to the Management Plan in order for it to be approved.

In this case, the Developer will then revise and resubmit the Management Plan for approval. The Developer may at any time submit a revised Management Plan to Gemini for approval. If Gemini approves a revised Management Plan all prior Management Plans are superseded.

(d) All Work performed by the Developer will be in conformance with the Management Plan.

3. Operational Concept Definition Document

(a) The Developer will develop the Instrument operational concept model based on the Gemini Instrument Science Requirements and discussions with Gemini and prepare an Operational Concept Definition Document (OCDD).

(b) The OCDD must present the science cases for which the Instrument will be designed, relate these to the Science Requirements, and discuss the key functional and performance requirements that the Instrument must meet.

(c) The OCDD will also identify and discuss the key operational scenarios of the Instrument, especially in terms of the requirements this instrument will place on other parts of the Gemini system. These scenarios should be described in sufficient detail for a technically and scientifically skilled, but non-expert, audience to understand.

(d) A draft OCDD will be prepared by the Developer and submitted to Gemini for review and comment by the date specified in the Management Plan. This draft OCDD will have a complete table of contents, a first draft of all sections, and some sections in nearly final form to indicate the organization and level of detail of the document, but will not necessarily be complete. The Developer will promptly incorporate into the OCDD all changes requested by Gemini that would be necessary to make it consistent with the Requirements.

(e) The Developer will deliver the completed OCDD to Gemini by the date specified in the Management Plan, and a meeting between Gemini and the Developer will be held to review the complete OCDD by the date specified in the Management Plan. After this Review, the Developer will promptly incorporate into the OCDD all changes requested by Gemini that are necessary to make it consistent with the Requirements, and submit the revised OCDD to Gemini for approval.

(f) After the Developer has incorporated all requested changes into the OCDD, Gemini will notify the Developer in writing of its approval of the OCDD.

(g) After approval the OCDD will be put under change control so that neither the Developer nor Gemini can amend or modify the OCDD without written approval from both for a change.

(h) The Developer may at any time submit a revised OCDD to Gemini for approval. If Gemini approves a revised OCDD all prior OCDDs are superseded.

4. Functional and Performance Requirements Document

(a) The Developer will develop the functional and performance requirements that the Instrument will have to meet in order for it to meet the requirements of the OCDD and the Requirements, and will prepare a Functional and Performance Requirements Document (FPRD).

(b) The Developer will describe the origin of each functional and performance requirement described in the FPRD, so that users of the FPRD will be able to determine why each functional and performance requirement was included in the FPRD.

(c) The FPRD must clearly state the Developer's assumptions regarding the characteristics or performance capabilities of the other parts of the Gemini system including, but not limited to, the telescope, the A&G, the science detector/controller and the calibration unit. For each of these, the FPRD must state whether the current performance of these systems support the Instrument requirements set forth in the FPRD.

(d) A draft FPRD will be prepared by the Developer and submitted to Gemini for review and comment by the date specified in the Management Plan. The draft FPRD will have a complete table of contents, a first draft of all sections, and some sections in nearly final form to indicate the organization and level of detail of the document, but will not necessarily be a complete detailing of the requirements. The Developer will incorporate into the FPRD all changes requested by Gemini that would be necessary to make it consistent with the Requirements.

(e) The Developer will deliver the complete FPRD to Gemini by the date specified in the Management Plan, and a meeting between Gemini and the Developer will be held to review the FPRD on the date specified in the Management Plan. After this Review, the Developer will incorporate into the FPRD all requested changes that would be necessary to make it consistent with the Requirements, and submit the revised FPRD to Gemini for approval.

(f) After the Developer has incorporated all requested changes into the FPRD, Gemini will notify the Developer in writing of its approval of the FPRD.

(g) After approval the FPRD will be put under change control so that neither the Developer nor Gemini can amend or modify the FPRD without written approval from both for a change. Once the FPRD is approved by Gemini, it replaces all other documents as the controlling document specifying all requirements for the Instrument.

(h) The Developer may at any time submit a request to Gemini to consider waiving one or more specific aspects of the Requirements. To support this, the Developer will submit a written analysis to Gemini demonstrating the degree to which the Requirements, or any other aspects of the use of the Instrument, would be affected by the waiver and requesting specific changes to the Requirements. After receipt of such an analysis and request from the Developer, Gemini may either amend the Requirements as requested by the Developer or refuse the waiver.

(i) The Developer may at any time submit a revised FPRD to Gemini for approval. If Gemini approves a revised FPRD all prior FPRDs are superseded.

5. Interface Control Plan

(a) The Developer will prepare an Interface Control Plan and submit it to Gemini for review and approval by the date specified in the Management Plan. This plan will list all the Interface Control Documents required for the Instrument, including those covering interfaces between subsystems of the Instrument, and whether the Developer or Gemini is responsible for each interface. For each interface for which the Developer is responsible the document will list the person responsible for each Interface Control Document, and the date by which each Interface Control Document will be completed. The plan will also include a listing of all interface related information that the Developer will need to receive from Gemini, giving the date that the information must be received by the Developer in order for it to complete the Work on schedule.

(b) After Gemini has reviewed this document, the Developer will incorporate into the Interface

Control Plan all changes requested by Gemini and submit the revised Interface Control Plan to Gemini for approval.

(c) After the Developer has incorporated into the Interface Control Plan all changes requested by Gemini, Gemini will notify the Developer in writing of its approval of the Interface Control Plan.

(d) After approval by Gemini, the Interface Control Plan will be put under change control so that neither the Developer nor Gemini can amend or modify the Interface Control Plan without written approval from both for a change.

6. Error Budgets

(a) The Developer will develop, and maintain throughout the Work, a set of Instrument Error Budgets that include, but are not limited to, throughput and image quality. These Instrument Error Budgets include only contributions attributable to the Instrument. The top-level allocation for each error budget will be specified in the Requirements. Drafts of the Instrument Error Budgets will be presented at the Conceptual Design Review and Preliminary Design Review and final versions will be presented at the Critical Design Review.

(b) The Developer will promptly notify Gemini if at any time their predicted or actual performance would cause the Instrument to exceed the top-level allocation in any of the Instrument Error Budgets.

(c) The Developer and Gemini will cooperate to reconcile the Instrument Error Budgets with the top-level allocations maintained by Gemini. Gemini may refuse any Developer requests to increase the top-level allocation to any specific Instrument error budget. The Developer may refuse any Gemini requests to reduce the top-level allocation to any specific Instrument error budget without an equitable adjustment.

7. Drawing Numbering

The Developer will propose for Gemini approval a numbering scheme to be used by the Developer for numbering drawings. The Developer will place these numbers on each drawing as the drawings are prepared, or as directed by Gemini.

8. Conceptual Design Documentation

(a) The Developer will perform all design and engineering, and prepare all documentation, required for the Conceptual Design Review (CoDR). This will include all engineering and analysis required for the preparation of the following (the Conceptual Design Documentation):

(1) the initial Operational Concept Definition Document;

(2) the initial Functional Performance Requirements Document:

(3) a comparison of the Gemini Instrument Science Requirements with the Instrument FPRD and OCDD;

(4) draft Interface Control Documents where sufficient information exists to write them. These initial versions of the ICDs will list:

(i) all of the interfaces;
(ii) any existing standards for each interface; and

(iii) work needed to complete the ICDs for which the Developer is responsible.

(5) conceptual Instrument system design;

(6) preliminary design of the Instrument optical system;

(7) conceptual design of the Instrument mechanical layout and packaging;

(8) conceptual design of the Instrument control system; and

(9) preliminary engineering and analyses that verify that the conceptual design meets the requirements of the FPRD.

(b) An updated Management Plan for the completion of Instrument will also be provided to Gemini at the time of the PDR, although it will not constitute an element of the review.

9. Conceptual Design Review

(a) Gemini and the Developer's National Project Office will call and conduct a Conceptual Design Review of the Conceptual Design Documentation on the date specified in the Management Plan.

(b) Five copies of the Conceptual Design Documentation will be delivered to Gemini and one copy each will be delivered to the design review committee members at least two weeks prior to the date of the Conceptual Design Review.

(c) In accordance with subsection 1.4, following the Review the Developer will revise the Conceptual Design Documentation and submit it to Gemini, with all revisions arising from the Conceptual Design Review incorporated. Gemini will have the right to finally approve the Conceptual Design Documentation as modified by the Developer.

10. Preliminary Design Documentation

(a) The Developer will perform all design and engineering, and prepare all documentation, required for the Preliminary Design Review (PDR). This will include all engineering and analysis required for the preparation of the following (the Preliminary Design Documentation):

(1) most recent version of the FPRD with any proposed changes from the last approved version blacklined;

(2) Operational Concept Definition Document;

(3) a comparison of the Gemini Instrument Science Requirements with the Instrument FPRD and OCDD;

(4) Instrument performance predictions;

(5) draft Interface Control Documents for all those listed as the Developer's responsibility in the Interface Control Plan;

(6) preliminary system design;

(7) draft Instrument Error Budgets;

(8) results of simulations, trades and prototypes;

(9) detailed design of the Instrument optical system;

(10) preliminary design of the Instrument mechanical layout and packaging; and

(11) preliminary design of the Instrument control system.

(b) An updated Management Plan for the completion of Instrument will also be provided to Gemini at the time of the PDR, although it will not constitute an element of the review.

11. Preliminary Design Review

(a) Gemini and the Developer's National Project Office will call and conduct the Preliminary Design Review of the Preliminary Design Documentation on the date specified in the Management Plan.

(b) Five copies of the Preliminary Design Documentation will be delivered to Gemini and one copy each will be delivered to the design review committee members at least two weeks prior to the date of the Preliminary Design Review.

(c) In accordance with subsection 1.4, following the Review the Developer will revise the Preliminary Design Documentation and submit it to Gemini, with all revisions arising from the Preliminary Design Review incorporated. Gemini will have the right to finally approve the Preliminary Design Documentation as modified by the Developer.

12. Detailed Design Documentation

(a) The Developer will perform all design and engineering, and prepare all documentation, required to complete a detailed design of the Instrument that is based on the Preliminary Design Documentation and that meets the Requirements. The documentation of the design is referred to as the Detailed Design Documentation.

(b) The completed Detailed Design Documentation will contain all aspects included in the Preliminary Design Documentation, as modified as a result of the Preliminary Design Review and additional design efforts, and will also contain:

(1) final Instrument system design;

(2) Instrument performance predictions;

(3) final design of the Instrument control system. The design should include a software design which includes, but is not limited to:

(i) the Instrument data reduction, quick look display, and data storage server requirements. The Developer will produce a comparison of these requirements with the then current design of the Data Handling System and identify any modifications or additions to the Data Handling System required to meet the Instrument data handling requirements;

(ii) the Instrument control software detailed interface description. The Developer will produce a comparison of the detailed interface description with the current design of the Core Instrument Control System. Any modifications or additions to the Core Instrument Control System work, which are required to meet the Instrument control software requirements, will be considered part of the Work and should be included in the Developer's revised costing;

(4) drawings showing every assembly, subsystem, and fabricated part of the Instrument with all applicable dimensions, material designations, and specifications. In cases where the assembly or subassembly interfaces to areas outside of the Work, the drawings will be dimensioned and of sufficient detail for Gemini to determine if the interface(s) are correct;

(5) an adequate level of engineering calculations and analyses to demonstrate that the Requirements will be met by the Instrument;

(6) a report regarding the results of the Safety Review;

(7) a description of the packing and shipping methods to be used in delivering the Instrument to the Delivery Location;

(8) a description of the means for handling the Instrument while it is not mounted on the telescope;

(9) final Interface Control Documents (ICDs) specifying the interfaces between the Work and Gemini-Supplied Equipment. Gemini and the Developer will cooperate to prepare the ICDs:

(i) if Gemini fails to specify the aspects of any particular ICD for which Gemini has responsibility by the date provided in the Interface Control Plan, then Gemini will be responsible for any delays caused by its failure to specify; and

(ii) if the Developer fails to specify the aspects of any particular ICD for which the Developer has responsibility by the date provided in the Interface Control Plan, then the Developer will be responsible for any delays to Gemini caused by its failure to specify;

(10) final versions of all ICDs for which the Developer has sole responsibility;

(11) a copy of the Preliminary Design Review report and the Developer's responses;

(12) a detailed proposed table of contents for each of the Manuals as described in subsection 19.4; and

(13) A draft Spares List as described in subsection 19.5.

(c) Finite element analysis models will be compatible with a package mutually agreeable to Gemini and the Developer.

(d) All Detailed Design Documentation will have:

(1) mechanical drawings generated in (or be transferable to) AUTOCAD Release 13 or later;

(2) drawings organized by key Instrument subsystem, so that drawings related to each key subsystem are grouped together to assist in maintenance and operation of the Instrument;

(3) drawings dimensioned in metric units; and

(4) textual documents generated in Microsoft Word or Framemaker.

(e) An updated Management Plan for the completion of Instrument will also be provided to Gemini at the time of the CDR, although it will not constitute an element of the review.

13. Safety Review

(a) The Developer will conduct a Safety Review of the design of the Instrument, as it relates to safety in installation, maintenance, repair, and operation of the Instrument, by the date specified in the Management Plan, which will be in advance of the Critical Design Review.

(b) The Safety Review will determine compliance with all appropriate safety regulations then in effect at the Gemini Observatory. Gemini will advise the Developer of all appropriate safety regulations in effect at this location within thirty days of being so requested by the Developer.

(c) The Safety Review will include assessing risk to personnel and hardware during normal operations, maintenance operations, transportation, handling, and while being subjected to the environments specified in the Requirements. Gemini will advise the Developer.

(d) Gemini will advise the Developer of the areas to be covered by the Safety Review. These areas will include the following:

(1) are there any areas during instrument operation and maintenance in which personnel could be exposed to any of the following:

(i) electric shock,

(ii) cryogens,

(iii) pinch points,

(iv) sliding or rotating mechanisms which create a shearing or scissors action, or

(v) manual lifting of heavy items

(2) in regards to the instrument shipping and handling:

(i) is proper rigging supplied for safe handling of the Instrument, container and/or cart given their size, weight, center of gravity with respect to the type of transport vehicle (such as open or closed truck, ship, or airplane) and type of material handling equipment (such as crane, hoist, winch, forklift truck) utilized?

(ii) is the Instrument, either on its cart or in its container, safe from damage from other cargo while in transit, or from a material handling mishap during offloading the Instrument?

(iii) is material handling equipment in good condition and of adequate capacity and are the operators qualified?

(e) Subsequent to the Safety Review, the Developer will prepare a written report detailing any safety problems inherent in the designs, and this report will be presented to Gemini at the Critical Design Review.

(f) In the event that Gemini determines that any of the Instrument design is inadequate with respect to safety issues, Gemini may require the Developer to promptly revise the Detailed Design Documentation.

14. Critical Design Review

(a) Gemini and the Developer's National Project Office will call and conduct the Critical Design Review of the Detailed Design Documentation on the date provided in the Management Plan.

(b) Five copies of the Detailed Design Documentation will be delivered to Gemini and one copy each will be delivered to the design review committee members at least two weeks prior to the date of the Critical Design Review.

(c) In accordance with subsection 1.4, following the Review the Developer will revise and submit the Detailed Design Documentation to Gemini, with all revisions arising from the Critical Design Review incorporated. Gemini will have the right to finally approve the Detailed Design Documentation as modified by the Developer.

(d) Prior to Gemini's written approval of the Detailed Design Documentation the Developer will not commence fabrication or acquisition, including acquisition of materials and equipment, of any component of the Instrument without first submitting a written request to Gemini to do so. It is Gemini's intent to grant approval for long lead-time items, low risk components, and necessary prototypes of the Instrument. Should the Developer proceed to undertake any work without Gemini's written approval and should the work be either unsuccessful or not required, then the cost of doing so will be borne by the Developer.

(e) After written approval by Gemini, all of the Interface Control Documents listed in the Interface Control Plan will be put under change control so that neither the Developer nor Gemini can amend or modify the interfaces without written approval from both for a change.

15. Gemini-Supplied Equipment.

(a) Gemini will provide equipment to the Developer to be used in the design and fabrication of the Instrument, as provided in the Work Scope.

(b) Gemini will endeavor to ensure that all Gemini-Supplied Equipment is documented to the same level and standards as in section 19.4.

(c) If Gemini fails to deliver any item of Gemini-Supplied Equipment by the date provided in the Management Plan, then the delayed delivery of the equipment will be treated as a Change Order and the Developer will not be responsible for resultant delays to the Instrument schedule.

(d) If Gemini makes significant changes to an item of Gemini-Supplied Equipment subsequent to the delivery to the Developer and then requires the Developer to modify the Work to accommodate the changes, this will be treated as a Change Order and the Developer will not be responsible for any resultant delays or increased costs.

(e) If the Developer believes that the characteristics, including but not limited to the documentation, of any of Gemini-Supplied Equipment make it impossible or unreasonably difficult for the Developer to design and fabricate the Instrument so that it meets all of the Requirements, then the Developer will submit a written analysis to Gemini demonstrating this, and requesting specific changes to the Requirements. After receipt of such an analysis and request from the Developer, Gemini will either:

(1) amend the Requirements to the extent necessary to make it possible for the Developer to meet the Requirements; or

(2) repair or rework, at Gemini's expense, Gemini-Supplied Equipment; or

(3) provide the Developer with a written analysis showing that the Requirements can be met by the Developer using Gemini-Supplied Equipment without any amendment to the Requirements or repair/rework of Gemini-Supplied Equipment.

(f) If the Developer does not agree with Gemini that the Requirements can be met by the Developer using Gemini-Supplied Equipment without any amendment to the Requirements or repair/rework of Gemini-Supplied Equipment, then Gemini and the Developer will submit their respective written analyses to the dispute resolution procedure specified in the Agreement.

16. Quality Assurance; Testing and Inspections

16.1. Quality Assurance Plan

(a) The Developer will prepare a Quality Assurance Plan, which will provide for inspections, quality assurance, and tests that are adequate to measure and ensure the Developer's compliance with the Requirements.

(b) The Developer will complete and submit the Quality Assurance Plan to Gemini by the date provided in the Management Plan.

(c) The Quality Assurance Plan will include plans for intermediate inspections and tests required to ensure that the Work meets the Requirements.

(d) Gemini may request changes in the Quality Assurance Plan that are needed to make it consistent with the Requirements. The Developer will promptly comply with all requests, and will submit the revised Quality Assurance Plan to Gemini within a reasonable period of time. Gemini will have the right to finally approve the Quality Assurance Plan, as revised by the Developer.

16.2. Quality Assurance Program

(a) The Developer will execute a quality assurance program that will apply to all operations of the Developer and its subcontractors related to the Work, and that is adequate to ensure compliance with the Requirements. The Developer will provide Gemini with all requested information related to the Quality Assurance Program.

(b) The Developer will provide, maintain, calibrate, and operate inspection and test equipment, fixturing, and methods adequate to ensure that the Requirements are met. These inspection and test equipment, fixturing, and methods will have a combined inaccuracy no greater than that required to make a meaningful measurement of the tolerance of the attribute or requirement that they are used to measure. The Developer will perform adequate test error analyses to ensure compliance with the requirements of this paragraph.

16.3. Testing and Inspection

16.3.1. Independent Examinations and Tests

Gemini may, at its own expense, engage an independent testing and inspection agency or agencies to inspect the Work, and to perform inspections and tests and prepare test reports, at any of the locations where the Work is being performed at any time Work is being performed. The Developer and its subcontractors will cooperate with the testing agency, and provide the testing agency with reasonable access to places where the Work is being performed so that required inspection and testing can be accomplished.

16.3.2. Obligations of the Developer

Gemini is not obliged to perform any inspection, examination or test for the benefit of the Developer or any other party, and any such tests by Gemini will not relieve the Developer of its obligations.

16.3.3. Witnessing of Inspections and Tests

Gemini personnel may witness any inspections and testing performed by the Developer or its subcontractors. The Developer will arrange for Gemini personnel to witness inspections.

17. Fabrication

(a) The Developer will fabricate and assemble the Instrument such that it meets the Requirements and will be consistent with the Detailed Design Documentation.

(b) Any storage required before acceptance of the Instrument by Gemini will be the responsibility of, and at the risk of, the Developer.

18. Acceptance, Delivery, and Commissioning

18.1 Pre-shipment Acceptance

18.1.1. General

(a) Gemini will have the right to inspect and test the Instrument upon completion of all fabrication, testing, and inspection, but prior to its packaging and shipment to the Delivery Location. Acceptance of the Instrument arising out of such inspection and testing is referred to as Pre-shipment Acceptance of the Instrument. Pre-shipment Acceptance of the Instrument will not be deemed to have occurred until completion of all of the following events:

(1) Gemini has had an opportunity to make a thorough inspection of the Instrument and all related information in accordance with the provisions of the Acceptance Test Plan;

(2) the Instrument has successfully completed all tests and inspections specified in the Acceptance Test Plan; and

(3) Gemini has provided the Developer with written notice of its Acceptance of the Instrument.

18.1.2. Acceptance Test Plan

(a) The Developer will prepare an Acceptance Test Plan for the tests and inspections leading to Pre-shipment Acceptance of the Instrument that will be consistent with the Requirements. The provisions of the Acceptance Test Plan will be as mutually agreed by Gemini and the Developer.

(b) The Developer will complete and submit the Acceptance Test Plan to Gemini by the date provided in the Management Plan.

(c) The Acceptance Test Plan will generally include the following:

(1) a matrix of verification methods to determine compliance of the Instrument with the Requirements and the Detailed Design Documentation (e.g., by design, demonstration or test);

(2) description of the tests, analyses, and/or demonstrations to be performed by the Developer, referenced to the verification methods matrix;

(3) a description of test equipment that will be utilized by the Developer, referenced to the verification methods matrix;

(4) description of test and inspection error analysis that will be used;

(5) a description of any software believed to be required and a justification of the need; and

(6) a demonstration of reasonable reliability of both software and hardware.

(d) After receipt of the Acceptance Test Plan, Gemini will promptly review it. If Gemini does not approve the Acceptance Test Plan, it will provide the Developer with a description of the changes that the Developer will need to make in order for it to receive approval. Any changes would be limited to those reasonably required to determine that the Instrument, including its interfaces, complies with the Requirements. The Developer will then revise and resubmit the Acceptance Test Plan for approval.

18.1.3. Pre-shipment Acceptance Testing

(a) The Developer will perform all tests, and facilitate all inspections by Gemini leading to Pre-shipment Acceptance, as provided in the Acceptance Test Plan,

(b) Pre-shipment Acceptance of the Instrument will be completed by the date provided in the Management Plan.

18.1.4. Deficiencies; Non-conformances

(a) Gemini will have the right to perform inspections of the Instrument before Pre-shipment Acceptance and also before Final Acceptance. As a result of the inspections, and the tests and inspections specified in the Acceptance Test Plan, Gemini will prepare a list of deficiencies and non-conformances that are observed during the tests and inspections (the "Non-conformance List"). Gemini will provide the Developer with a copy of the Non-conformance List, and the Developer will promptly correct all noted deficiencies and non-conformances. Promptly upon completion of the corrections, or within thirty days of the Developer's receipt of the Non-conformance List, if the corrections are not complete at the time, the Developer will provide a list, in the same format as the Non-conformance List, specifying the corrective action taken and the date action was completed with respect to each of the deficiencies and non-conformances. The Developer will provide Gemini with a complete list of all the corrections upon completion of the last of all the corrections. The descriptions of corrective action taken will correspond directly with each individual deficiency and non-conformance noted in the Non-conformance List. The Instrument will not be deemed complete until all deficiencies and non-conformances have been corrected by the Developer.

(b) The Developer will not proceed to the next phase until the Pre-shipment Acceptance is successful.

18.2. Packaging, Shipping, and Delivery

18.2.1. General

(a) The Developer will package the Instrument, ship it, and deliver it to the Delivery Location. For all items the Developer will be responsible for:

(1) packing and shipping all components, materials and equipment; and

(2) insuring them against loss or damage during the transportation and handling.

(b) The Developer may self-insure against loss or damage, if it provides Gemini with a written statement of that decision, signed by its responsible financial officer or executive officer.

18.2.2. Packaging and Shipping

(a) The Developer will perform the following in relation to the packing, shipping, and delivery of the Instrument:

(1) become thoroughly familiar with the transportation routes, legal requirements, and all other requirements related to the packaging and shipping of the Instrument;

(2) the shipping container fabricated by the Developer will be reusable by Gemini to transport the Instrument between Gemini's base facility and the telescope site or between the Gemini North and Gemini South telescope sites; and

(3) design and fabricate all shipping containers required to transport the Instrument, and will

prepare and package all components, materials and equipment comprising the Instrument for shipping, so as to ensure that the components comprising the Instrument are not damaged during shipment. The Developer will provide Gemini with general information regarding the shipping containers, packaging materials, and packaging methods to be utilized in packaging and shipment of the Instrument as a part of the Detailed Design Documentation. This information will be in enough detail to evaluate the sufficiency of the shipping containers, packaging materials, and packaging methods for their intended use. Gemini will have the right to reject any shipping containers, packaging materials, and packaging methods that are not in compliance with the requirements.

(b) In packaging all components, materials and equipment related to the Instrument, the Developer will:

(1) utilize appropriate packaging for the anticipated modes of transportation;

(2) ensure that the packaging materials provide full support for all components, equipment and materials that are a part of the Instrument and make adequate provision for handling of the packaging and shipping containers;

(3) protect all surfaces that are not painted or otherwise protected from corrosion by an appropriate method to prevent damage to them during packaging and shipment;

(4) package all electrical and electronic equipment and components with an adequate de-humidifying agent or desiccant to eliminate condensation-caused damage during transportation and storage;

(5) ensure proper and complete identification of all packaging such that Gemini or its representatives can quickly and accurately identify and locate each component, material and equipment item of the Instrument; and

(6) package the Instrument in such a manner as to prevent damage due to corrosion caused by high humidity and salt-laden air during storage.

(c) Upon arrival of the Instrument at the Delivery Location the Developer will unpack it, perform any required assembly, and then conduct all initial post-delivery tests and inspections, as provided below.

18.2.3. Delivery Location and Delivery Date

The Instrument will be delivered by the Developer to the Gemini base facility specified in the Work Scope (the "Delivery Location") by the date specified in the Management Plan.

18.3. Verification and Commissioning

18.3.1. Final Acceptance

(a) Gemini will have the right to inspect the Instrument after delivery to the Delivery Location and prior to Final Acceptance of the Instrument. Final Acceptance of the Instrument will be deemed to have occurred upon completion of all of the following events:

(1) Gemini has had an opportunity to make a thorough inspection of all of the Components of the Instrument after delivery to the Delivery Location, in accordance with the provisions of the Verification and Commissioning Plan;

(2) the Instrument has successfully completed all tests and inspection, up to and including Instrument Commissioning, provided for in the Verification and Commissioning Plan; and

(3) Gemini has provided the Developer written notice of its Final Acceptance of the Instrument.

18.3.2. Verification and Commissioning Plan

(a) The Developer will prepare a Verification and Commissioning Plan for the Instrument for tests and inspections, up to and including Instrument Commissioning, that will occur after the Instrument has been delivered to the Delivery Location. The Verification and Commissioning Plan will be sufficient to ensure that the Instrument meets all requirements set forth in the Detailed Design Documentation and the Requirements, after delivery.

(b) The Developer will submit the Verification and Commissioning Plan to Gemini by the date provided in the Management Plan.

(c) The Verification and Commissioning Plan will include the following:

(1) a matrix of verification methods to demonstrate that Instrument functionality has not deteriorated subsequent to Pre-shipment Acceptance, and to continue with any further tests which can only be done on the telescope (e.g., by design, demonstration, test, or observation of astronomical objects);

(2) a description of test equipment that will be utilized by the Developer;

(3) descriptions of tests, analyses, astronomical observations and/or demonstrations to be performed by the Developer, including initial post-delivery tests and inspections and Instrument Commissioning;

(4) description of test, inspection, and astronomical observation error analysis;

(d) As part of the Verification and Commissioning Plan, Gemini and the Developer will mutually agree on the members of the Instrument Commissioning team, which will have representation from Gemini. The Developer will select the Principal Investigator for Instrument Commissioning, with concurrence of Gemini.

(e) After receipt of the Verification and Commissioning Plan, Gemini will promptly review it. Gemini will approve the Verification and Commissioning Plan, if the activities it contains would demonstrate that the Instrument, including its interfaces, complies with the Requirements. If Gemini does not approve the Verification and Commissioning Plan, it will provide the Developer with a description of the changes that the Developer will need to make to the Verification and Commissioning Plan in order for it to receive approval. The Developer will then revise and resubmit the Verification and Commissioning Plan for approval by Gemini.

(f) After approval by Gemini the Verification and Commissioning Plan will be put under change control so that neither the Developer nor Gemini can amend or modify the Verification and Commissioning Plan without written approval from both for the change.

18.3.3. Verification and Commissioning

(a) Gemini will, at its own expense and risk, transport the Instrument from the Delivery Location to the telescope facility, including disassembly, packing, unpacking and re-assembly. The Developer will provide instruction to Gemini on the correct disassembly, packing, unpacking and re-assembly of Instrument.

(b) The Developer will perform all tests, and facilitate all inspections by Gemini leading to Final Acceptance, including initial post-delivery tests and inspections and Instrument

Commissioning.

(1) Initial post-delivery tests and inspections will consist of the following.

(i) Tests and inspections after arrival at the Delivery Location, but before mounting on the Telescope, to ensure that the Instrument meets the requirements of the Detailed Design Documentation and the Requirements after delivery. It is expected that this will be a subset of the Acceptance Test Plan.

(ii) Tests of the Instrument software and control system to ensure compatibility with the Observatory Control System and the Telescope Control System at the Gemini Observatory. Gemini will provide the Developer with ICDs specifying how the Instrument is to interact with these systems by the date shown in the Management Plan. If the Developer feels that any lack of compliance is due to errors or inconsistencies in Gemini-Supplied ICDs, then the Developer will submit a written analysis to Gemini demonstrating this, and requesting specific changes to the Requirements. After receipt of the analysis and request from the Developer, Gemini will either: (1) amend the Requirements to the extent necessary to make it possible for the Developer to meet the Requirements; or (2) repair or rework the Observatory Control System and/or the Telescope Control System; or (3) provide the Developer with a written analysis showing that the Requirements can be met by the Developer using Gemini-Supplied ICDs without any amendment to the Requirements or repair/rework of the Observatory Control System and/or the Telescope Control System. If the Developer does not agree that the Requirements can be using Gemini-Supplied ICDs without any amendment to the Requirements or repair/rework of the Observatory Control System and/or the Telescope Control System, then Gemini and the Developer will submit their respective written analyses to the dispute resolution procedure detailed in the Agreement.

(iii) The Developer will not proceed to the next phase of Verification and Commissioning until all initial post-delivery tests and inspections have been completed successfully.

(2) Commissioning of the Instrument will consist of four phases: Instrument Commissioning, Science Commissioning, Shared Risk Use, and Full Use. Although only Instrument Commissioning is normally part of the Work, the subsequent phases are described below in order to aid the Developer in understanding what should and should not be built into its planning for Instrument Commissioning.

(i) The intent of Instrument Commissioning will be to demonstrate that the scientific performance requirements, calibration, the key science cases, and key operational modes of the Instrument can be accomplished. The tests and inspections proposed for Instrument Commissioning will be based on the OCDD and will include sufficient observations using the Instrument to demonstrate that the scientific performance requirements, key science cases, and key operational modes can be accomplished.

(ii) Instrument Commissioning will involve nighttime use on the telescope. The exact number of nights of telescope time will be as specified in the Verification and Commissioning Plan, but will normally be approximately ten nights.

(iii) The data resulting from Instrument Commissioning will be the intellectual property of the Instrument Commissioning Team with the same rights and privileges as though the data had been obtained with an observing run granted through the Gemini time allocation process. In any case, the data will remain proprietary to the Instrument Commissioning team for a period of 18 months with the exception that the Developer agrees that Gemini will have full access to the data for engineering purposes and that Gemini may use the data for publicity purposes, as long as the Developer and the Instrument Commissioning team are properly credited.

(iv) Science Commissioning is normally not part of the Work. The intent of Science Commissioning will be to further refine the use of the Instrument to accomplish the science requirements of the Instrument, to verify all of the nominal operating modes including calibration, to determine the facility and operational characteristics for support of classical and queue observations by the partner communities and to illustrate the scientific potential of the Instrument. The makeup of the Science Commissioning team and the protocol for Science Commissioning will be developed by Gemini. Some of the non-Gemini members of the Instrument Commissioning Team will be members of the Science Commissioning team.

(v) Shared-Risk Use is normally not part of the Work. Shared-Risk Use of the Instrument will be allocated through the Gemini time allocation process to the partner science communities in both classical and queue mode. The intent of Shared-Risk Use will be to exercise and optimize the nominal Instrument operational modes through feedback from the users and to demonstrate the long-term reliability and utility of the Instrument. There will be no guarantee of either data or data quality during Shared-Risk Use as the ability to perform science observations and the data quality will be contingent on the Instrument and telescope facility readiness. The involvement of non-Gemini members of the Instrument Commissioning team in the Shared-Risk Use of the Instrument has yet to be determined.

(vi) Full Use is not part of the Work. The final phase, Full Use, will be when the Instrument enters regular operation as a facility with the intent of offering open access of the Instrument and to continue the optimization and development of the Instrument observing modes. There is no anticipated regular involvement of the Developer staff in this phase other than through the Gemini time allocation process.

(c) Verification and Commissioning of the Instrument will be completed by the date specified in the Management Plan.

19. Closeout Requirements

19.1. General

(a) The Work will not be deemed complete until the Developer has:

(1) completed and submitted all Record Documents to Gemini, as provided below;

(2) provided the required instruction to Gemini personnel;

(3) completed and submitted the required Manuals;

(4) provided the Spares List to Gemini; and

(5) Gemini has given the Developer written notification that the Work is complete.

19.2. Record Documents

19.2.1. General

(a) The Record Documents for each Instrument include the complete Detailed Design Documentation, as modified in accordance with the provisions of this Section. The Detailed Design Documentation that become Record Documents will accurately depict the final as-assembled condition of each item, component, subassembly, assembly, and subsystem of the Instrument, with all applicable dimensions, material designations, and notes.

(b) All Record Documents will comply with all requirements for the Detailed Design Documentation.

19.2.2. As-built Modifications

(a) To prepare the Record Documents the Developer will modify and supplement all Detailed Design Documentation to accurately depict the as-built condition of each item, component, subassembly, assembly, and subsystem of the Instrument. The Record Documents will include all addenda, change orders, and similar modifications that are issued during fabrication and assembly of the Instrument, as well as marked-up variations (of substance) reflecting differences in actual Work, as compared with the text of the Detailed Design Documentation and modifications, as issued.

(b) When any of the Work related to submitted product data varies from that specified in the Detailed Design Documentation, the Developer will note variations, either on or as an addendum to, the Record Documents. Notations will include variations in the product, as delivered and incorporated into the Work, and variations from the manufacturer's instructions and recommendations for installation.

(c) Prior to Final Acceptance of the Work for the Instrument, the Developer and Gemini will meet to determine which, if any, of the submitted samples maintained by the Developer during progress of the Work will be transmitted to Gemini for record purposes. The Developer will promptly package and ship all samples designated for transmittal to Gemini, and will comply with Gemini's instructions regarding packaging, identification, and delivery of the samples to Gemini.

19.2.3. Submittal of Record Documents

The Developer will deliver two sets of the Record Documents to Gemini in hard copy form and one set in computer readable form, by the date specified in the Management Plan.

19.3. Operation and Maintenance Instruction

(a) Promptly after delivery of the Instrument at the Delivery Location, the Developer will arrange to meet with Gemini personnel at the Delivery Location to provide basic instructions needed for proper operation and maintenance of the Instrument.

(b) The Developer will review the Manuals, Record Documents, tools, spare parts and materials, lubricants, identification system, control sequences, hazards, cleaning, preventive maintenance schedules, and similar procedures and facilities with Gemini personnel.

(c) Instruction will be sufficient to allow repair of all but the most extensive failure modes of the Instrument by the personnel trained, as provided above.

19.4. Manuals

19.4.1. General

(a) The Developer will prepare and submit to Gemini, by the date specified in the Management Plan, a complete set of maintenance and operation data for the Instrument in the form of Manuals.

(b) The Manuals provided by the Developer will consist of a Service and Calibration Manual, a Software Maintenance Manual, and a User's Manual. The Manuals will contain all information related to maintenance and operation of the Instrument, so that the information in the Manuals will enable Gemini personnel to perform the full range of expected operating and regular maintenance functions related to the Instrument without the need to seek information from a source other than the Manuals.

(c) The Manuals will have the information organized into suitable sets of manageable size, which will be bound into individual binders properly identified on both the front and spine of each binder. Each Manual binder will be a heavy-duty, vinyl-covered binder that is indexed (thumb-tabbed) and includes pocket folders for folded sheet information. In the interests of longevity of the documentation, folded sheets should be avoided wherever possible. The Developer will supply two sets of Manuals for the Instrument, one set in hard copy form and one set in computer readable form.

19.4.2. Service and Calibration Manual

(a) As a part of the Manuals, the Developer will provide a Service and Calibration Manual. The Service and Calibration Manual will include, but not be limited to, all information related to realignment, calibration, and maintenance of the Instrument.

(b) The Service and Calibration Manual will include assembly and disassembly procedures, wiring diagrams, inspection procedures, performance curves, and similar applicable information as necessary to guide service and maintenance of the Instrument. The Service and Calibration Manual will include pictorial references where appropriate; with photographic or videographic documentation of assembly procedures. The pictorial references should include, but not be limited to, a photograph of each major subassembly both installed in the Instrument and on the bench.

(c) Mechanisms requiring calibration or lookup tables will have standard calibration procedures included in the Service and Calibration Manual. Previous histories or results will be included in the Service and Calibration Manual as an indicator of normal operating parameters and as a diagnostic tool.

(d) The Service and Calibration Manual will include all test data pertaining to the Instrument's optical components, including but not restricted to mirror reflectivities, beamsplitter characteristics, and anti-reflection coating performance.

(e) Each major component and item of equipment comprising the Instrument will have a separate section in the Service and Calibration Manual.

19.4.3. Software Maintenance Manual

(a) As a part of the Manuals, the Developer will provide a Software Maintenance Manual, that describes the software at a level of detail that a programmer familiar with the Gemini software environment, but not initially familiar with the software, can maintain it properly.

(b) The manual will include detailed written descriptions of all software systems and subsystems at a high level, describing purpose, organization, and interaction with other software systems and subsystems. The manual will include any systems analyses, data flow diagrams, data dictionaries, structure charts, and specifications developed during the software design process, updated to reflect as-built condition. The manual will also include listings of all software delivered as part of the Instrument, including firmware in ROMs, PROMs, and DSPs, etc.

(c) All software source code modules will include a standard header documenting the module contents, and each module will contain a sufficient number and quality of comments explaining the purpose and function of each few lines of code so that a programmer unfamiliar with the software can understand it.

(d) Any systems engineering analyses that led to the allocation of functions between hardware and software or the software design used will be included.

19.4.4. User's Manual

(a) As a part of the Manuals, the Developer will provide a User's Manual that will contain all information necessary to enable a user who is familiar with the Gemini telescopes, but not necessarily familiar with the Instrument, to understand the operation of the Instrument. The User's Manual will include, but not be limited to, the following areas:

(1) Instrument performance characteristics;

(2) Instrument design and configuration;

(3) modes of operation;

(4) calibration procedures;

(5) observer interface where this is not provided by OCS; and

(6) observing techniques and sample scenarios.

19.5. Spares

(a) The Developer will prepare a list of recommended spares for Gemini's review (the Spares List), by the date provided in the Management Plan.

(b) The Spares List will include all components of the Instrument whose function and useful lives require occasional replacement to prevent interruptions in operation of the Instrument. The Spares List will include a listing of all spare parts and identification of which subassembly the spare part belongs in, organized by major assembly and subassembly.

Appendix A. Glossary

Acceptance Test Plan. Defined in Section 18.1.2.

Agreement. The Working or Operating Agreement between the Gemini Managing Organization and the Agency(s) that are parties to the Gemini Agreement and that have been assigned responsibility for development of the Instrument. These Agreements concern the assignment and facilitation of Work Packages and define the agreed general terms under which Work Packages will be performed.

Change Order. Change Orders are one of the mechanisms by which the Managing Organization can make changes to the Work within the general scope defined in the Work Scope. Generally, Section 12 of the Agreements defines the change order process.

Conceptual Design Documentation. Defined in Section 8.

Conceptual Design Review (CoDR). Defined in Section 9.

Core Instrument Control System. The Gemini-supplied software that forms the core of the Instrument control system and provides access for the Observatory Control System to the Instrument.

Critical Design Review (CDR). Defined in Section 14.

Data Handling System. The Gemini control system responsible for handling of all data above the real-time level.

Delivery Location. Defined in Section 18.2.3.

Detailed Design Documentation. Defined in Section 12.

Developer. The Developer is the organization responsible to Gemini for the development of the Instrument. Normally, the Managing Organization enters into a Work Scope(s) assigning responsibility to one or more of the National Project Offices and the National Project Offices in turn “contract” with institutions within their community (national observatories, universities, or industry) to perform the Work.

Final Acceptance. Defined in Section 18.3.1.

Full Use. Defined in Section 18.3.3(b)(2)(vi).

Functional and Performance Requirements Document (FPRD). Defined in Section 4.

Gemini. As used in this document, Gemini refers to the Gemini Managing Organization, which is currently the Association of Universities for Research in Astronomy, Inc. (AURA).

Gemini Instrument Science Requirements. The top-level requirements for Gemini scientific instruments that have been approved by the Gemini Science Committee and the Gemini Board, and incorporated into the Gemini Science Requirements Document.

Gemini-Supplied Equipment. Defined in Section 15.

Instrument. The scientific instrument being developed for Gemini to which this document applies.

Instrument Commissioning. Defined in Section 18.3.3(b)(2).

Instrument Error Budgets. Defined in Section 6.

Instrument Manager. Defined in Section 1.1.1.

Instrument Scientist. Defined in Section 1.1.2.

Interface Control Document (ICD). The document describing the interface between two elements of the overall Gemini system. ICDs are initially agreed between the parties responsible for each side of the interface and maintained and controlled by Gemini.

Interface Control Plan. Defined in Section 5.

Management Plan. Defined in Section 2.

Manuals. Defined in Section 19.4.

National Project Office.

Non-conformance List. Defined in Section 18.1.4.

Observatory Control System. The Gemini control system responsible for coordinating and performing most of the high-level tasks within the control system.

Operational Concept Definition Document (OCDD). Defined in Section 3.

Pre-shipment Acceptance. Defined in Section 18.1.

Preliminary Design Documentation. Defined in Section 10.

Preliminary Design Review (PDR). Defined in Section 11.

Quality Assurance Plan. Defined in Section 16.1.

Record Documents. Defined in Section 19.2.

Requirements. The requirements defined in the Work Scope governing the development of the Instrument.

Review. Defined in Section 1.4.

Review Actions. Defined in Section 1.4(f).

Review Response. Defined in Section 1.4(g).

Safety Review. Defined in Section 13.

Science Commissioning. Defined in Section 18.3.3(b)(2)(iv).

Service and Calibration Manual. Defined in Section 19.4.2.

Share Risk Use. Defined in Section 18.3.3(b)(2)(v).

Software Maintenance Manual. Defined in Section 19.4.3.

Spares List. Defined in Section 19.5.

Telescope Control System. The Gemini control system responsible for controlling the telescope subsystems.

User's Manual. Defined in Section 19.4.4.

Verification and Commissioning Plan. Defined in Section 18.3.2.

Work. The work to be performed under a Work Scope and described therein.

Work Scope. The document describing the agreement between Gemini and the Developer that governs the conduct of the Instrument development.