GEMINI OBSERVATORY, TRANSITION TO BASE FACILITY SCIENCE OPERATIONS

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I. INTRODUCTION

The Gemini Observatory is entering the planning stage of transferring full science operations from the summit facilities to the base facilities for both the both the Gemini North telescope at Mauna Kea, Hawaii and the Gemini South telescope at Cerro Pachon, Chile. We present the state of our current capabilities for base facility operation, some known system upgrade requirements and the process we intend to use to identify all all remaining upgrades necessary to achieve safe, efficient and continuous base facility science operations.

II. PROJECT STATEMENT:

This project includes the design, fabrication, procurement, integration, testing and commissioning of all systems necessary to remotely operate all observatory systems required for Science Operations from the Base Facilities with little or no human presence at the summits

Figure 1: The Base Facility Control Room at Gemini North in Hilo, Hawaii. The right monitor showing the summit control room while the left monitor displays images of the telescope. – *Photo by Joy Pollard (PIO-Gemini)*

III. SCIENCE OPERATIONS BACKGROUND

The Gemini Observatory has been running their telescopes semi-remotely during the day from the Base Facility, where the day crew prepares the telescope by turning on the telescope drives and removing the locking pins. All commands to move the telescope are sent from the base facility, from where troubleshooting and/or when new telescope software is released the telescope is put through rigorous motion testing. It is common practice to do all instrument calibrations and checks from the base facility. The Gemini Control Rooms at the summit and base facilities are similar to encourage operations from any location. See Fig 1 and Fig 2.

During instrument commissioning, the instrument scientist will frequently do their checks from the base facility. This avoids having to drive several hours to the summit, to do a job that takes less than an hour. After a telescope shutdown for instance, instrument check-outs can be done remotely from the base facility, and on several occasions the Gemini queue observer has operated from the base facility.

IV. PROJECT OBJECTIVES :

In a systematic way, the project will review all observatory systems to identify their current capabilities for remote operations, assess risks of remote operation of these systems and mitigate these risks by the design of upgraded features.

Perform a comprehensive and systematic review of all major telescope, enclosure and summit facility systems relative to their function, inputs, outputs, internal health monitoring capabilities, etc.. This exercise is intended to provide a complete set of baseline information for use in assessing the current state of the systems with regards to remote operation, status and health states.

Perform failure modes and effects analyses for the systems as appropriate to identify possible failure scenarios, the likelihood or probability of failures, the resulting effect of a particular failure and a determination as to whether the failure could have been detected in advance by some means.

Complete conceptual designs for upgrades necessary to give systems the capability to be operated remotely. These designs will also address changes to systems; allow for sufficient monitoring of health and status; address the risks and consequences of failures identified in the failure modes and effects analyses. Conceptual designs for the addition of cameras and microphones as well as an Observatory Status Display will also be completed.

Conduct a comprehensive Conceptual Design Review for all new designs or upgrades.

Complete the Preliminary and Final designs for all system upgrades with independent reviews as appropriate. It is intended that all design work will be completed by the end of the first quarter of 2012.

Procure, integrate, test and commission all upgrades. The procurement activity will cover both sites in parallel. The integration, test and commissioning will be completed in series starting with Gemini North.

Handover to full base facility operations will include a trial period where Science Operations are conducted at the Base facility with technical support personnel stationed at the summit. The trial period is scheduled for a duration of 1 year. The trial periods and handover to base facility operations will happen in series starting with Gemini North.

V. ASSUMPTIONS:

This project will deliver a system whereby all Science Operations can be performed from the Base Facilities with little or no human presence at the summit. The capability of remote operations from outside of the observatory will not be provided, however as a goal, all interfaces necessary to allow remote operation from outside of the Observatory will be provided.

To the extent possible, the ability to recover from a fault state will be provided through remote means. It is assumed though that under certain, yet to be defined failure conditions, Science Operations will cease and a technical support team will go to the summit to make repairs prior to resuming Science Operations.

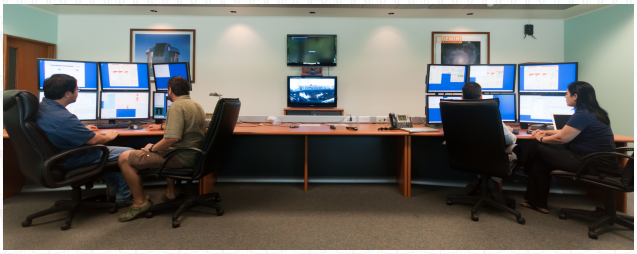

Figure 2: Gemini staff working at the Base Facility Control Room in La Serena, Chile. The bottom wall monitor showing the telescope. – *Photo by Ariel Lopez*

VI. PROJECT STAGES:

- Stage 1
  - Comprehensive system review
  - Failure modes and effects analyses
  - System requirements definition
  - Conceptual Design
- Stage 2
  - Preliminary Design and completion of Design Reviews
- Stage 3
  - Final Design and completion of Design Reviews
- Stage 4
  - Procurement
  - Integration, Verification & Validation
  - Commissioning
- Stage 5
  - Trial Period at Gemini North
  - Hand over to Base facility Operations at Gemini North
- Stage 6
  - Trial Period at Gemini South
  - Hand over to Base facility Operations at Gemini South