Management of the Gemini 8-M Telescopes Project

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ABSTRACT

The Gemini 8-M Telescopes Project is an international partnership of six countries to build and operate two 8-meter telescopes, one on Mauna Kea in Hawaii and one on Cerro Pachon in Chile. The construction phase of the project has demanding scientific requirements, a fixed budget that is tight, and an aggressive schedule. The work is distributed internationally between the Gemini Project Office in Tucson, organizations in the partner countries, and industrial contractors. The project organization and management procedures used to cope with this challenging situation are described. Plans are now being formulated for management of Gemini in the operational phase. The organization proposed to operate Gemini in a cost effective manner is also described.

Keywords: Gemini telescopes, management, international partnership, organization, management tools.

The international Gemini Agreement between the United States, the United Kingdom, Canada, Chile, Brazil, and Argentina defines the rights and responsibilities of the parties as well as the top-level organization of Gemini. The six parties contribute in the following shares - 50%, 25%, 15%, 5%, 2.5%, and 2.5%. Ten percent of the time on each telescope is allocated to the hosts, the University of Hawaii and Chile, with the balance allocated to the parties in proportion to their contributions. There are no formal constraints on the distribution of economic return amongst the parties, except in the area of scientific instrumentation. Because of the high intellectual interest in instrumentation, the work in this area is to be distributed as closely as possible in proportion to contributions. The goal of the management approach adopted for Gemini is to successfully construct and commission the Gemini telescopes within the constraints of a tight budget and schedule, while deriving maximum benefit from involvement and participation by the partner communities.

2. THE GEMINI ORGANIZATION

Figure 1 shows the top-level Gemini organization. The project is governed by the Gemini Board. The Board has four US members, two UK members, two Canadian members, one University of Hawaii member, one Chilean member, and one seat shared by Brazil and Argentina. The Board has no staff or capability to perform administrative functions. The US National Science Foundation (NSF) has been designated as the Executive Agency. The NSF has in turn designated the Association of Universities for Research in Astronomy, Inc. (AURA) as Managing Organization. AURA is a consortium of 28 member educational and other non-profit institutions (25 US and 3 international affiliates). In addition to Gemini, AURA operates the US National Optical Astronomy Observatories (NOAO) for the NSF and the Space Telescope Science Institute (STScI) for NASA. AURA has established the Gemini Project Office to manage the construction phase of the project. The top-level of the Gemini Project Office consists of the Gemini Director, the Gemini Project Scientist, and the Gemini Project Manager, all of whose appointments are subject to Gemini Board approval. As shown in the diagram, the Gemini Director reports to the Gemini Board via the President of AURA and the NSF.

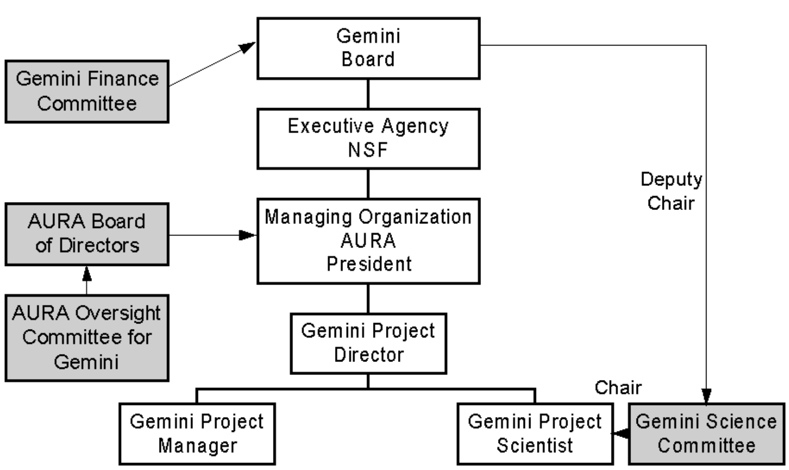

Figure 1. Top-level Gemini Organization.

A variety of committees oversee and advise the project. The Gemini Finance Committee of the Board oversees financial matters and reports to the Board. The AURA Board of Directors has established the AURA Oversight Committee for Gemini (AOC-G) to oversee the Gemini Project Office's management of the project. The Gemini Science Committee (GSC) is responsible for scientific oversight and advice. The GSC is chaired by, and reports to, the Gemini Project Scientist. The deputy chair of the GSC is a member of the Gemini Board who can report directly to the Gemini Director, the AURA President, or the Gemini Board, if necessary.

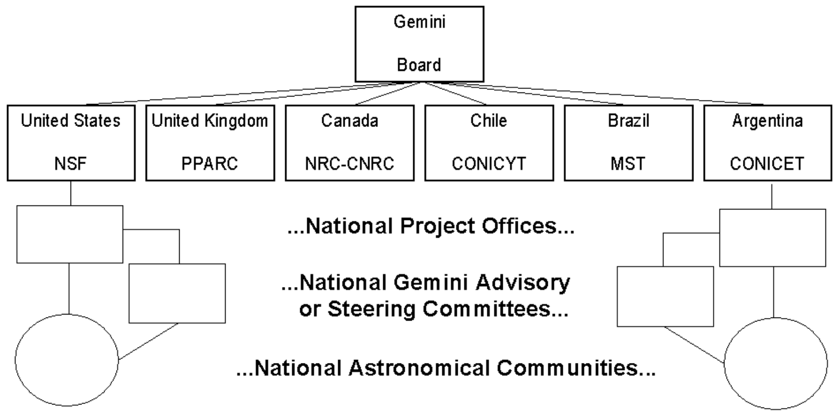

Figure 2. Gemini National Project Organizations.

Each of the partner countries has a national Gemini organization. Figure 2 shows the national agencies responsible for Gemini in the six countries and the typical national project organization. The responsible agencies are the NSF, the Particle Physics and Astronomy Research Council (PPARC), the National Research Council (NRC-CNRC), the Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT), the Ministry of Science and Technology (MST), and the Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET), respectively. Although the specific organization varies from country to country, each partner has a National Gemini Project Office, which typically includes the National Project Manager and the National Project Scientist. The National Project Offices provide the interface between Gemini and the national astronomical communities. As will be discussed more later, the National Project Offices also are responsible for execution of the work packages allocated to each partner. The National Project Offices usually are associated with or are part of a National Observatory (e.g., NOAO in the US, The Royal Observatories in the UK, the Herzberg Institute of Astrophysics in Canada, and the Laboratorio Nacional de Astrofisica in Brazil). Each country also has a Gemini Advisory Committee and/or Steering Committee, which reports either to the National Project Office or to the national agency responsible for Gemini. These committees provide another source of input from the national communities. In addition to the more formal procedures to be described later, the Gemini Project Manager and the National Project Managers communicate with frequent teleconferences, as do the National Project Scientists and the Gemini Project Scientist.

The Gemini science organization is shown in Figure 3. The Project Scientist takes the lead role in working with the scientific communities of the partner countries. As previously mentioned, the Gemini Project Scientist chairs the Gemini Science Committee, which has proportional representation from the partner countries similar to the Gemini Board. All of the National Project Scientists are members of the GSC. In many respects, the Gemini Project Scientist and the National Project Scientists act as an executive committee of the full GSC. In addition to the permanent scientific organization, there are currently four Gemini science working groups that report to the GSC as shown in the figure.

The organization of the Gemini Project Office is shown in Figure 4. The Project Director is responsible for the conduct of the project and is also responsible for interactions with AURA, the NSF, and the Gemini Board. The Project Manager and Project Scientist report to the Project Director. The Project Scientist is responsible for definition and documentation of the Gemini scientific objectives and priorities. The Project Scientist works with the Project Manager in deriving and clarifying engineering requirements based on scientific objectives and priorities. At present the scientific staff reporting to the Project

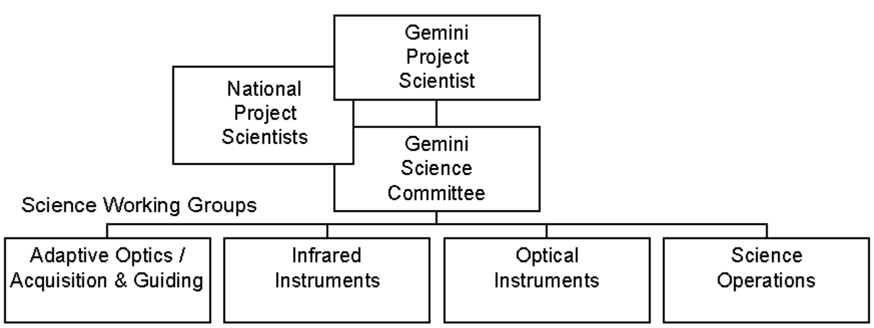

Figure 3. Gemini Science Organization.

scientist consists of the Associate Project Scientists for Instrumentation and Operations. The Project Manager is responsible for construction of the Gemini observatories within the budget and schedule approved by the Gemini Board. The Project Manager has the decision authority for directing, planning, and controlling budget expenditures and the project staff. The bulk of the Project Office reports to the Project Manager. At present, the lead technical managers, who supervise the engineering staff, are the System Engineer and three Group Managers - Optics, Telescope & Enclosure, and Controls & Instrumentation. The Group Managers are responsible for design and production of all equipment in their respective areas. The System Engineer's responsibilities include configuration and interface control, as well as system integration and commissioning. Until his retirement in January 1996, Earl Pearson served as Gemini Chief Engineer. The administrative staff includes the Contracts Manager and Administrator, the Financial Administrator, and the Project Scheduler.

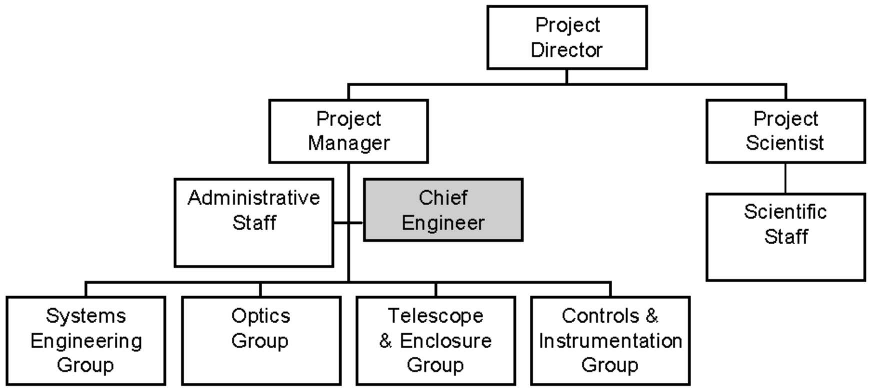

Figure 4. Gemini Project Office Organization.

Work outside of the Gemini Project Office is performed either as work packages or contracts. In all cases, as much of the work as possible is performed on a fixed price basis. Work packages are work for which responsibility is delegated to a National Project Office. The National Project Office is responsible for getting the work done within their country by national observatories, laboratories, universities, or industry. We call the contract for a work package a work scope. This agreement is negotiated between the Gemini Project Office and the responsible National Project Office. Figure 5 shows the major contracts and work scopes currently in place. As can be seen, most of the work in the optics and telescope & enclosure areas is performed under contracts with industry, while most of the work in the controls & instrumentation area is performed as work packages. Another paper at this symposium by the Gemini Controls & Instrumentation Group Manager deals specifically with the management of those work packages.[1] Management of the contracts is conventional - the Gemini Contracts Manager has formal responsibility for all Gemini contracts and the responsible Group Manager, or one of his engineers, acts as technical monitor for the contract.

3. MANAGEMENT TOOLS AND PROCEDURES

The management procedures and tools used in Gemini are standard for a project of this size. There are a variety of meetings and reviews. The Gemini Board and the committees previously described each meet twice a year and the Project Director, Project Scientist, and Project Manager present reports to the appropriate committees. The Gemini Director holds a semiannual programmatic review with reports from the Project Manager, the Group Managers, and the National Project Managers. Inside the Gemini Project Office, the Project Manager holds monthly budget and schedule reviews with the Group Managers, in additional to a weekly project status meeting. Naturally, the project holds the normal sequences of technical reviews (PDRs, CDRs, etc.) for each element of the system.

We use Microsoft PROJECT® for project schedules. Each of the groups maintains a detailed schedule for their area of responsibility. These group schedules incorporate the schedules for all contracts and work packages. The group schedules are in turn linked to an overall system integration schedule. We use CONTROL® for Financial Management to maintain a complete financial database from which a variety of financial reports are produced. The most important is a Long Range Projection that details commitments and expenditures for the entire construction project through scheduled completion. The Long Range Projection is rigorously controlled. All changes to the Long Range Projection are clearly documented and approved with Budget Change Requests. Monthly financial reports comparing actual and projected financial performance are produced from the CONTROL database, as well as the annual budget, which is approved by the Gemini Board each year.

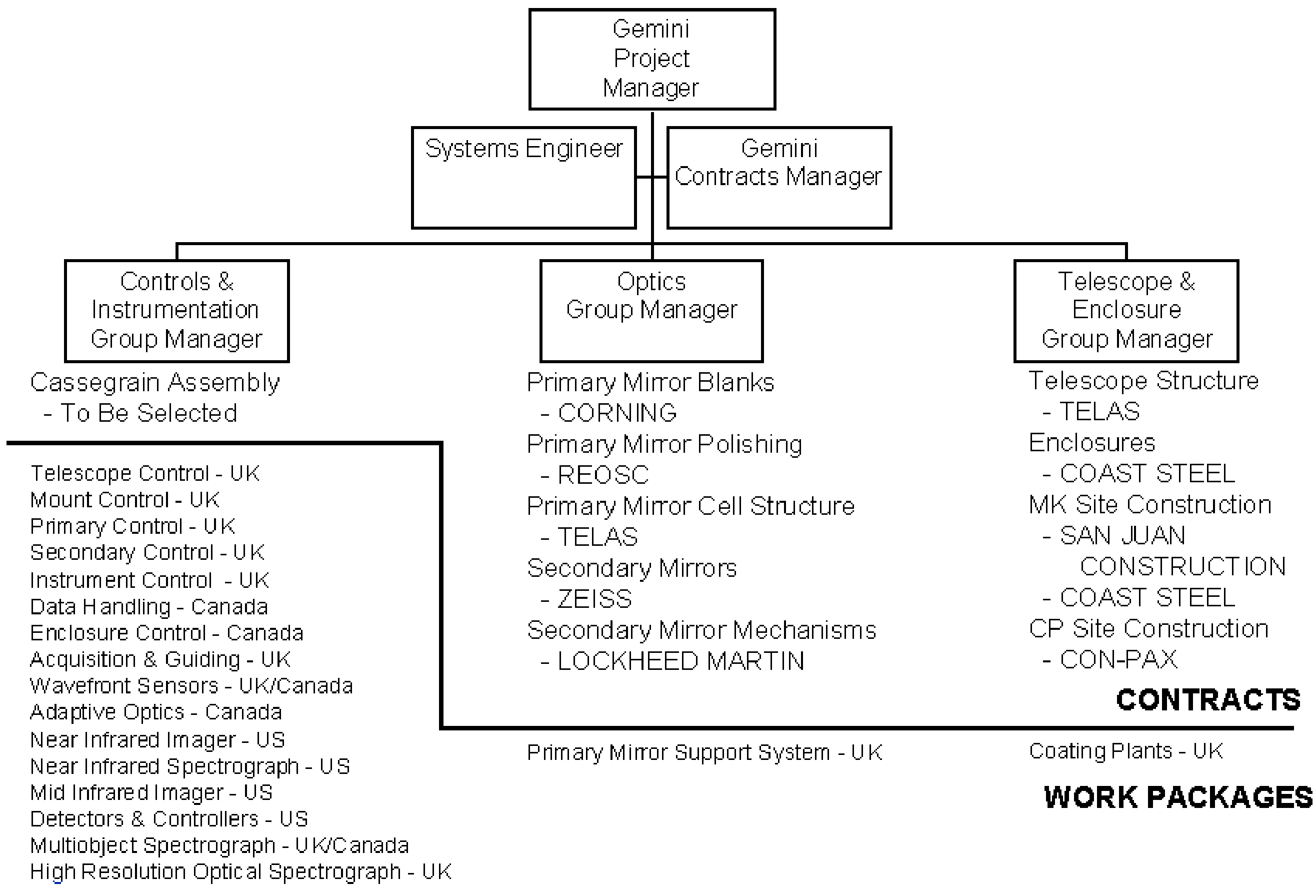

Figure 5. Gemini Contracts/Work Package Management.

4. OPERATIONS ORGANIZATION

Plans for management of Gemini in the operational era are currently being formulated. Figure 6 shows our present concept for the Gemini operations organization. The primary objectives are to: 1) operate Gemini as one observatory, with parity and maximum commonality between the two sites; and, 2) keep operational costs to a minimum. Each site will have a dedicated operations team overseen by the Associate Director for the site. The Associate Site Directors will be responsible for the scientific quality, scientific services, and scientific capabilities of their respective telescopes. The Staff Astronomers, Gemini Fellows, and System Operators (i.e., those responsible for the nighttime or scientific operation of the observatory) report directly to the Associate Site Director. The Site Managers will have responsibility for day-to-day technical support, operation, and maintenance of their respective telescopes, consistent with the scientific priorities set by the Associate Site Director. As such, the Site Manager will supervise the day crew and the engineering staff at the site. The Gemini organizations at each site will draw on or share resources with the partner's existing facilities at the Joint Astronomy Centre (JAC) in Hawaii and the Cerro Tololo Interamerican Observatory (CTIO) in Chile.

The innovation we plan to introduce in Gemini operations is a single engineering team to cover both sites. The engineers on this team may be located at either site, but will report to the Chief Engineer. The Chief Engineer will be responsible for the provision, allocation, and overall management of all technical, logistical, and engineering support services required by the Gemini Observatory to fulfill its scientific mission. We expect to take advantage of modern communications (videoconferencing, remote electronic access to troubleshooting and diagnostics, etc.) to handle remotely as much engineering as possible. In addition, we will take advantage of the flexibility offered by queue observing to operate in an "adaptive" mode versus the usual "frenetic" mode. By this we mean that in case of a failure in a particular instrument or nonfatal failure in a telescope subsystem, we will switch to programs that can work around the failed equipment, rather than requiring immediate repair of the failed element. Hence, the engineering team will have some time to make repairs versus all operations ceasing until the failure is corrected.

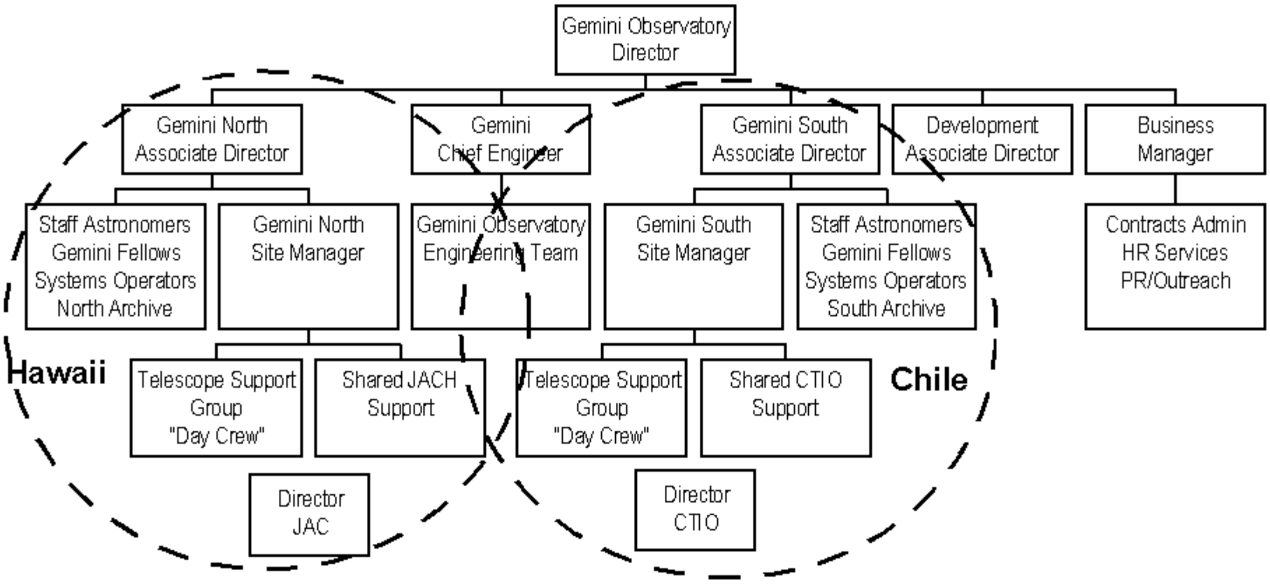

Figure 6. Gemini Operations Organization.

The vitality and competitiveness of the Gemini Observatory will rely on the quality of its ongoing development program. This program will fund upgrades, new instruments, and facility improvements across both Gemini Telescopes. The program will be performed in collaboration with the partner National Project Offices. The Gemini development program will be managed by the Associate Director for Development, reporting to the Gemini Director. The development program will be formulated and directed by the Associate Director, in consultation with the Associate Site Directors, the Gemini User's Committee, and National Project Offices in a manner sensitive to the aspirations and skills of all of the partners. It will, however, be the Associate Director's responsibility to provide leadership to the development program to ensure the instruments, capabilities, and upgrades provided are consistent with the overall scientific mission of the Gemini Observatory.

5. ACKNOWLEDGMENTS

The Gemini 8-Meter Telescopes Project is managed by the Association of Universities for Research in Astronomy, for the National Science Foundation and the Gemini Board, under an international partnership agreement.

6. REFERENCES

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