THE INTERNATIONAL GEMINI TELESCOPES

Annual Report 1997

United States

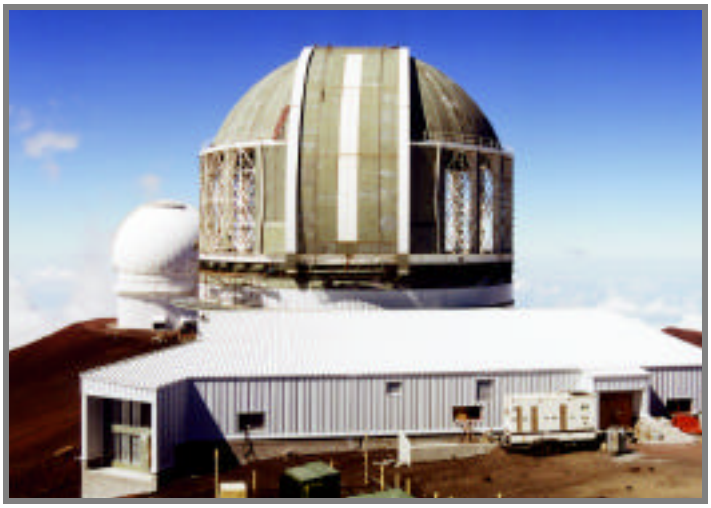
United Kingdom

Canada

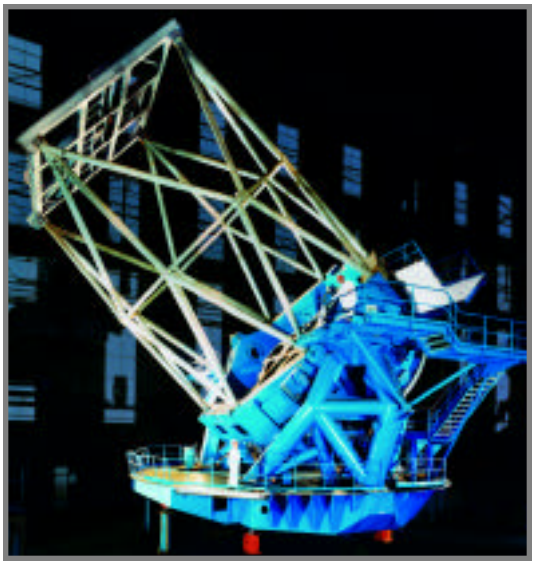
Chile

Brazil

Argentina



Mauna Kea dome and support facility, August 1997



Telescope structure preassembled at NFM, July 1997

Coating chamber in shipment to Hawaii, August 1997

Gemini Board at the La Plata Observatory in Argentina, May 1997

The cover photographs show (upper) the almost completed dome on Mauna Kea in October 1997, with the University of Hawaii telescope in the background; and (lower) the Cerro Pachón enclosure base and support building in October 1997.

Photograph credits: Gemini Board photo by Susan Kayser; all others from the International Gemini Project Office

The Annual Report for 1997 was prepared by the National Science Foundation, the Executive Agency for the International Gemini 8-Meter Telescopes Project.

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Message from the Gemini Board

The International Gemini Project has made tremendous progress on many fronts during 1997, and I am very pleased to report that this trend has continued during the first four months of 1998 while this 1997 Annual Report was in preparation. Many images documenting these recent developments can be viewed on the Gemini 8m Telescope Project web page at http://www.gemini.edu/.

We are still on schedule for first light on the Mauna Kea telescope in December 1998, having lost no more time since the bad weather delays during the winters of 1994/5 and 1995/6. Early in the new year, the primary mirror (M1) for the Gemini North telescope was accepted at REOSC in France. Its intrinsic surface figure-of-error of less than 16 nm rms makes it the best 8-meter-class astronomical mirror yet produced. As of late April 1998, the dome enclosure is complete, the telescope structure is nearly assembled, the primary mirror is on the site, and the mirror cell is expected to arrive at Kawaihae, HI in late June 1998. In response to the continuing problems associated with the acquisition of a silicon carbide secondary mirror (M2), the project has implemented a plan to obtain a Zerodur secondary in time for the December 1998 first light. The schedule calls for a 15 month commissioning phase, and handover of the telescope for community observations in March 2000.

Work in the southern hemisphere on Gemini South is progressing with equal vigor. At Cerro Pachón, Coast Steel has finished assembling the arch girders and ventilation-gate girders, and the ventilation gates and shell plates have been pre-assembled on the site. REOSC has already reduced the surface error on the southern primary mirror to below 1 micron RMS through fine grinding. The fine polishing stage has just been entered, and acceptance tests are expected to be complete by the end of 1998. TELAS is expected to deliver the telescope structure by mid-1998. First light at Cerro Pachón is expected in June 2000, with handover to community use in October 2001.

In the meantime, preparations for the testing and operations phases of Gemini North and South are progressing rapidly. Ground breaking for the Hilo base support facility was held on 24 June 1997, and completion is expected before first light. All of the instrument teams are making steady progress. Development of the second generation of instruments has begun, and the Project continues workshop activities with the astronomical community to plan for the use of Gemini. Project personnel continue their development of a streamlined, low-cost operations plan that will enable the operation of the Gemini telescopes with unprecedented efficiency. Several Board actions during 1997 have been taken to ensure a successful operations phase. First, we have encouraged the Director to pursue methods for augmenting the amount of available observing time so that the community's access to the telescopes is maximized. Second, recognizing the considerable enhancement in scientific value that Gemini would derive from a collaboration with the Australian astronomical community, and the interest that Australia expressed in joining Gemini, we recommended that the Partners open negotiations with Australian officials. An agreement based upon these negotiations may be reached in 1998.

A major reason that the project has adhered so successfully to schedule is because of the ardent spirit of cooperation that has been maintained by all of the member nations in keeping the project within budget and maintaining a stable cash flow. In particular, we are grateful to the Chilean officials who worked successfully toward the timely passage of the Chilean congressional action that enabled Chile to expedite its full participation in the project. We sincerely appreciate the assistance that AURA, Inc., through their representative Richard Malow, lent to CONICYT in framing the Gemini Bill.

We wish to thank the many organizations, national agencies, and project personnel who are collaborating on behalf of the Gemini Project. Project Director C. M. Mountain, Project Scientist F. C. Gillett, and Project Manager R. Kurz, through their steadfast leadership of the Gemini Project Team, have kept the project on track despite the many scientific, technical, and political problems they have had to solve.

The Board looks forward with great anticipation to the events of the coming year, and to those that will follow thereafter to turn Gemini's new 8-meter eyes on the universe.

Robert D. Gehrz
1997 Chair, Gemini Board
April 1998

Introduction

The year 1997 was another very successful one for the International Gemini 8-meter Telescopes Project, which remains on schedule and within budget, despite some unexpectedly adverse weather, an earthquake in Chile, and the usual financial and technical problems of a project of this size. Almost all the major contracts for construction have now been awarded and work is visibly pushing ahead fast on both sites. Enormous advances were made in the construction of all the key elements, the most dramatic of which were the completion on site of the Mauna Kea enclosure and of the telescope structures in the factory in France. As a result, the two telescopes are still on the schedule set back in 1994, with first light on Mauna Kea in December 1998, and on Cerro Pachón in June 2000.

1997 also saw the start of what will become a large build-up on Hawaii. Ground-breaking for the Hilo base facility took place on 24 June, and the number of staff based in Hawaii rose steadily through the year. A Memorandum of Understanding between PPARC and AURAformalising the close cooperation developing between the JAC and Gemini was signed on 15 October. The year saw the start of preparations for operations, and was marked by detailed and constructive debate in the user communities on how instrumentation development and upgrading should be carried forward. In May, the Board commissioned an ad hoc committee to advise it on instrumentation policy; the committee recommendations (which built on established practice) were adopted by the Board in November. There is now a well established process involving biennial workshops and twice-yearly forums, feeding into the Gemini Science Committee (and ultimately the Board), to advise on the future instrumentation program. The first Gemini Instrumentation Workshop to consider both planned and potential future instruments was held in Abingdon (UK) on 28-29 January, and follow-up Instrument Forums took place in March and September.

Early in 1997 there were fears that various legal and financial problems might force Chile to leave the partnership, so that preliminary discussions were opened with Australia. Chile was able to meet its obligations, but the Board saw advantages in enlarging the collaboration through Australia taking up an additional 5% share, and recommended in November that the Partners open formal negotiations. Broad agreement on the principles had been reached by the end of 1997.

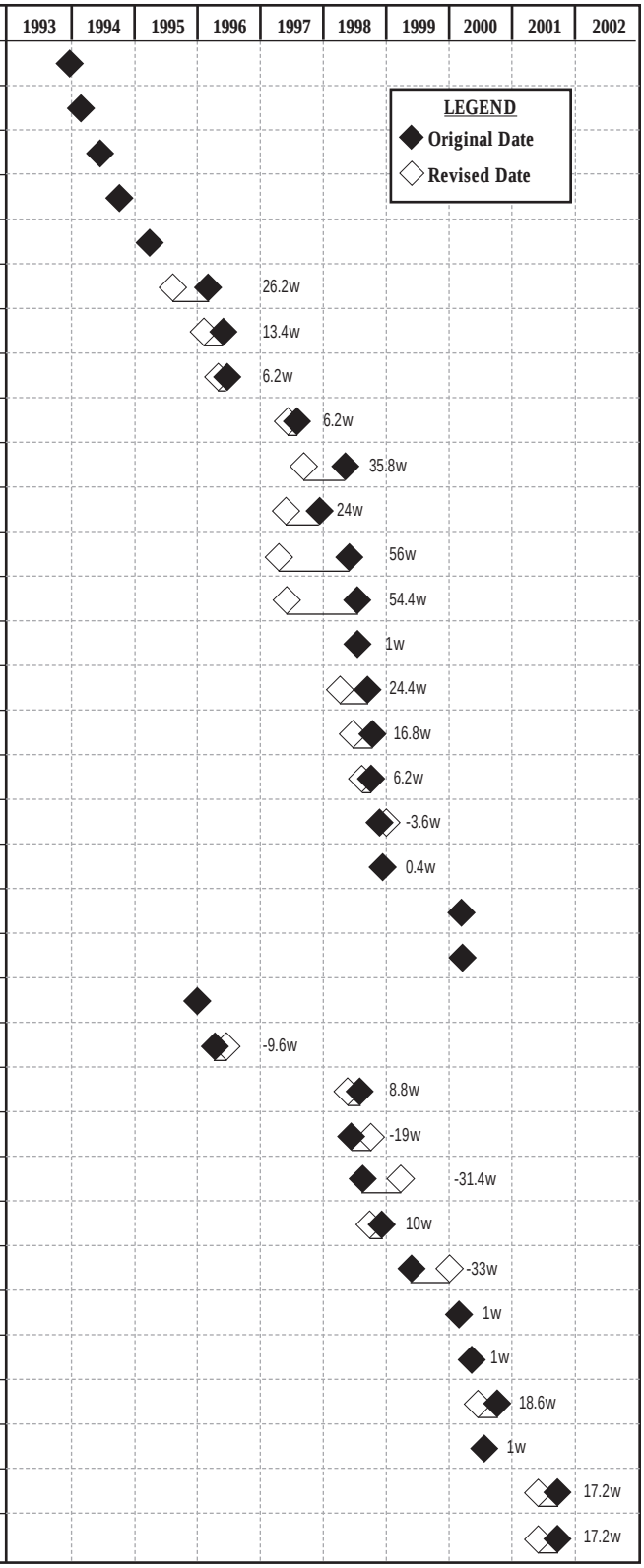
In a large project of this complexity, keeping costs under strict control and managing annual cash flow is always challenging. The project remains on schedule and within budget (even having some unspent contingency remaining), but the cash flow situation predicted for 1998 and 1999 is sufficiently marginal for the Partners to be concerned that all collaborators maintain their contribution schedule, and that contributions should be brought forward when possible.

Schedule

The present schedule for the Gemini Project is shown in Table 1. The original dates are from the schedule as of December 1994.

Table 1. Schedule for the Gemini Project as of December 1997

ID	Name	Start
1	Submit CDUA - Mauna Kea	12/23/93
2	Award Primary Mirror Polishing Contract - Mauna Kea	3/14/94
3	Award Enclosure Contract - Mauna Kea	5/25/94
4	Obtain CDUP and ODSA. Start Site Construction - Mauna Kea	10/1/94
5	Award Telescope Fabrication Contract	3/15/95
6	Award Coating Plant Contract	2/15/96
7	Complete Foundations/Site - Mauna Kea	5/3/96
8	Completion of Control System Simulator	7/10/96
9	Deliver Telescope Structure - Mauna Kea	8/1/97
10	Complete Coating Plant Site Acceptance - Mauna Kea	5/11/98
11	Complete Polishing Primary Mirror - Mauna Kea	12/15/97
12	Complete Enclosure - Mauna Kea	5/15/98
13	Completion of Functional Control System	6/15/98
14	Installation of Acquisition Guiding Unit - Mauna Kea	6/23/98
15	Delivery of Specification Control System	9/10/98
16	Install M2 Assembly - Mauna Kea	11/6/98
17	Install Primary Mirror - Mauna Kea	9/4/98
18	Install First Instrument - Mauna Kea	11/17/98
19	First Light - Mauna Kea	12/16/98
20	Acceptance of Control System - Mauna Kea	3/13/00
21	Handover of Operations - Mauna Kea	3/13/00
22	Complete Road Construction - Cerro Pachón	1/1/96
23	Complete Foundations/Site - Cerro Pachón	4/9/96
24	Complete Enclosure - Cerro Pachón	7/16/98
25	Deliver Telescope Structure - Cerro Pachón	5/22/98
26	Complete Polishing Primary Mirror - Cerro Pachón	8/21/98
27	Complete Coating Plant Site Acceptance - Cerro Pachón	12/10/98
28	Installation of Acquisition Guiding Unit - Cerro Pachón	5/19/99
29	Install Primary Mirror - Cerro Pachón	2/24/00
30	Install M2 Assembly - Cerro Pachón	5/11/00
31	Final Acceptance of First Instrument - Cerro Pachón	10/15/00
32	First Light - Cerro Pachón	6/15/00
33	Acceptance of Control System - Cerro Pachón	10/11/01
34	Handover of Operations - Cerro Pachón	10/11/01



1997 Accomplishments and Plans for 1998

Project Overview

1997 Accomplishments

This has been a year requiring enormous flexibility to maintain the Project schedule. Firstly, a long Mauna Kea winter at the beginning of the year threatened to delay the first enclosure erection, necessitating a considerable compression of the original schedule and a substantial amount of day-to-day coordination to allow several key tasks and contractors to run concurrently. By July of this year there were over six groups working simultaneously on Mauna Kea! The result was that by the end of the summer, the first coating plant was installed on Mauna Kea, the first enclosure was almost completed, and the azimuth track was installed and aligned to within ±50 microns (across a diameter of 10 meters). Installation of the telescope started in early November.

Polishing of the first primary mirror was finished at REOSC in France. By the end of the year, the mirror figure was better than $\lambda/30$. After slumping in June 1996, the second primary mirror blank unexpectedly exhibited a blue coloration in some fusion seal planes. This resulted in an extensive period of material research that established that the second blank could in fact be considered to be as reliable as the first blank from Corning. The second primary mirror is now through the fine grinding stage at REOSC. The figure is within one micron of its final figure.

Unfortunately, the uncertainties of material physics were less easily overcome in the production of the silicon carbide secondary mirror blanks. Morton, Inc., under contract to Zeiss, has experienced a series of failures in the chemical vapor deposition (CVD) of silicon carbide for the mirror facesheets. To minimize impact on the telescope schedule, Zeiss is producing a Zerodur secondary mirror for use during commissioning of the first telescope and to act as a spare throughout the life of the observatory.

Production of the two 30-ton telescope structures by NFM in France proceeded well, with full elevation axis tests of the first telescope in April. It has been shipped to Hawaii and the second telescope is two-thirds complete. Unfortunately, one of the simplest steel structures, the dummy mirrors, has proved difficult to fabricate. The steel dummy mirrors were subcontracted early in the year, but disagreements with the fabricator resulted in termination of the contract. TIW Fabrication and Machining, Inc. had to be engaged to finish the fabrication work with NFM, in France, doing the final machining. This has resulted in approximately 5 months delay. Availability of the first dummy mirror has become the time-critical item for testing of the primary mirror assembly in France, and it appears the testing period will have to be shortened. The second dummy mirror will be delivered to Mauna Kea in January 1998.

On Cerro Pachón, Coast Steel had 90% of the second enclosure shipped to Chile, just in time for El Niño to hit with an unusually severe winter. Just as the snow cleared and the washed-out roads were repaired, La Serena was hit by a 6.8 earthquake. The telescope pier and support structure were undamaged (the entire Gemini facility is designed to withstand 8.0 earthquakes). However, this did not stop an eight-ton boulder from rolling to block the road, which subsequently had to be dynamited away. Work is now proceeding well on Cerro Pachón, with the first parts of the enclosure already erected.

Despite all of these events, plus two senior project members leaving, morale in the project team is high. The telescope group is in Hawaii, and the temporary offices in Hilo already have over 20 residents. This year the second formal operations budget was approved, and the first Operations Manager recruited. He is now shuttling between Hilo and La Serena getting the infrastructure, people, and agreements in place to support the integration, test, commissioning, and operation of the Gemini telescopes. The Project contingency has been maintained at $1.5M, and the cost of change orders is still running below 5%. With the Hilo base facility started and with telescopes being built on both the sites, the Project is beginning to feel like an exciting, nascent observatory.

1998 Plans

Throughout this year the whole center of gravity of the Gemini Project will shift from Tucson to Mauna Kea. In Hawaii, the Hilo base facility will be completed by August and will open as the "Gemini Observatory Northern Operations Center". On Mauna Kea, assembly of the telescope, the primary and secondary mirror assemblies, and all the associated control systems will continue. The first instrument for Gemini North, the Near-Infrared Imager, is expected to arrive late this year.

On Cerro Pachón, the enclosure should be completed this year, and preparation begun for shipping the super-heavy loads up the mountain. In France, the second telescope structure will be completed, packed, and on its way to Chile by the end of 1998. Also in France, the second primary mirror will be finished by then.

With the change order costs still running at 5%, the remaining contingency in the construction budget of $1.5M is looking less precarious. However, alternative blanks for the secondary mirrors may still be necessary. Beyond this uncertainty is the need to maintain a positive cash flow throughout 1998 and through to 2001. The timeliness of the partner country contributions throughout 1998 and 1999 will be critical.

As the Project moves forward to operations, the continuing staff ramp-up in Hilo will be crucial to the support of the construction, integration, and test effort. With a combination of new hires and transfers from Gemini work sites throughout the partnership, this ramp-up will continue fairly steadily until the staff reaches 75-80 people at its peak in late 1998 (both construction and operations), before dropping off after first light as work begins to move south in 1999. Over 1998, a small increase in project staff is anticipated, to support the construction and administrative activities in Chile.

The initial implementation phases of the Gemini On-Going Instrumentation Program will be started in 1998. The first steps will be Announcements of Opportunity for conceptual design studies for polarization modulation for both Gemini telescopes, and for laser beacon adaptive optics for Cerro Pachón and a laser beacon upgrade for Mauna Kea. Also during this year, a Science Verification Plan will be established for the telescopes and instruments. The Gemini scientific staff, instrumentation scientists, and national Project Scientists from all six partners will be involved in defining and executing this plan, starting with a "Gemini Science Retreat" in February.

Science Activity

1997 Accomplishments

The first four Gemini Science Fellows were appointed in 1997. Jorge Garcia, from Chile, took up a Gemini Science Fellow position at Space Telescope Science Institute (STScI) working on the Guide Star Catalog-II project. Joe Jensen from University of Hawaii started early in September, in Hilo, Hawaii, working on environmental monitoring activities. Mark Chun, from University of Chicago, started in October and is working in Tucson on adaptive optics tasks. Doug Simons relocated to Hilo in November 1997, Phil Puxley will relocate to Hilo early in 1998, and Fred Gillett will relocate later in 1998.

During 1997, the staff scientists (Fred Gillett, Doug Simons and Phil Puxley), the Project Scientist Team, which includes the staff scientists and the national Project Scientists, and the Gemini Science Committee (GSC), focused on five principal activities:

- implementation and oversight of the Initial Instrumentation Plan (for those instruments planned and financed at the onset of the Gemini Project).
- definition of the On-Going Instrumentation Program (for future instruments and upgrades beyond that financed in the initial plan).
- development of the Gemini time allocation and observing process for classical and queue scheduling.
- definition of Gemini supporting capability needs (observations on other telescopes to aid in planning or to supplement Gemini's).
- scientific and technical support of project activities.

Gemini staff scientists participated in supporting capabilities workshops, held in the US, UK, and Canada, and presented overviews of the scientific utilization of the Gemini telescopes, instrumentation and time allocation and observation processes. They were also a part of the South American Workshop "Science with Gemini", held on 8-10 December 1997, in Brazil, and presented several talks at meetings outside the project in 1997, including:

- "Gemini Observation Planning and the Observing Tool" to UK National Astronomy Meeting on 10 April.
- "Gemini Science Operations Plans" invited talk at ESO, Santiago Headquarters on 12 December.

Two GSC meetings were held in 1997: 21-22 April in Edinburgh, UK and 20-21 October in Tucson, AZ. The first International Gemini Workshop on "Future Gemini Instrumentation" was held 18-20 January in Abingdon, UK to discuss the scientific basis for future Gemini instrumentation and to make recommendations for new instruments and their capabilities. In addition to these meetings, the Project Scientist Team met in March and again in September to participate in the Gemini Director's Review and the Gemini Instrumentation Forum.

Implementation and oversight of the Initial Instrumentation Plan.

The Instrumentation Program was reviewed in depth by the Project Scientist Team and Instrument Forum Group (see below) in March and September, with their perspective providing the basis for the Instrument Science Working Group (ISWG) meetings in 1997. The Infrared ISWG met in April, the Adaptive Optics ISWG in July, and the Optical ISWG in August. Recommendations for changes to the scientific performance requirements for the initial instrumentation, and performance guidelines for elements of the On-Going Instrumentation Program were formulated by these groups for GSC consideration. In addition, staff scientists participated in planning for and supporting all of the instrumentation design reviews held in 1997, including the Conceptual Design Review (CoDR) for the Mid-IR Imager, Preliminary Design Review (PDR) for the Gemini Adaptive Optics System, and Critical Design Reviews (CDR) for the Gemini Multi-Object Spectrograph, the Near-IR Imager, and the Near-IR Spectrograph.

Definition of the On-Going Instrumentation Program.

The Gemini Director has established the Instrument Forum Group, composed of the Gemini Instrumentation Manager, Project Manager, Project Scientist, Associate Project Scientist for Instrumentation, and the national Gemini Project Managers and Scientists, to provide advice at the working level from the Gemini partners on the management of the On-Going Instrumentation Program. The scientific input to this activity is provided by the Project Scientist and Project Scientist Team, with advice of the GSC, as for the Initial Instrumentation Program.

The scientific content and capabilities of the On-Going Instrumentation Program were recommended by attendees of the Future Gemini Instrumentation Workshop in January 1997. The major new capabilities envisaged at the Workshop were Laser Guide Star/Natural Guide Star Adaptive Optics (LGS, NGS AO) capability at Cerro Pachón, upgrade of the Mauna Kea AO System to LGS capability, a Near-IR Coronagraph/Imager for CP, an optical High Stability Laboratory Spectrograph for CP, and large and small field Near-IR Multi-Object Spectrographs (MOS; the large field is for MK, the small field for CP). The ISWGs, Project Scientist Team, and the GSC have refined the performance guidelines for these capabilities, and the Instrument Forum Group has determined budgetary costings and contingencies for the elements and recommended a preliminary On-Going Instrumentation Program to the Director for his consideration.

Development of the Gemini time allocation and observing process.

The Operations SWG, led by Phil Puxley, met in August to review the Gemini plans for time allocation and for preparation of observing programs. Recommendations concerning further definition of the observing process, data rights, and use of the Gemini archive were forwarded to the GSC for consideration and were adopted. A key software tool in the observing preparation processes, the Observation Tool, has been exercised by a number of scientists, both inside Gemini, on the Operations SWG, and in the community. While numerous suggestions for improvements have been received, the response has been overwhelmingly positive.

Definition of Gemini supporting capabilities requirements.

During 1997, the Gemini scientific staff, together with the national Project Scientists, have developed and carried out an activity to identify the types of supporting capabilities within the Gemini partner communities that will be required to support the efficient use of the Gemini telescopes. National workshops discussing this topic were organized and supported in the US, UK, Canada, and South America. These workshops identified a common need for significant amounts of observations on 4-m class telescopes, particularly deep, wide field, optical and IR imaging, in order to enable most effective use of the Gemini telescopes. The results of this activity will be compiled and synthesized early in 1998 so that the partner communities can assess the requirements for supporting capabilities.

Scientific/Technical Support of Project Activities.

The staff scientists participated in all project design reviews, some development activities, and the formulation and execution of the integration and commissioning plans for the Gemini telescopes and instrumentation. Such activities during 1997 included Cerro Pachón site characterization, the Guide Star Catalog-II support activities, and environmental monitoring for the Gemini facilities.

1998 Plans

During 1998, the Associate Project Scientist for Instrumentation, together with the Instrument Science Working Groups and the Project Scientist Team will be collaborating with the workpackage teams and the Gemini Instrumentation Group to continue assessment of requirements and review specifications for the detailed capabilities of the Gemini initial instruments.

Also during this year, a Scientific Verification Plan will be established to test the newly commissioned telescopes and instrumentation. The Gemini scientific staff, instrumentation scientists and national Project Scientists will be involved in defining and executing a plan for each instrument. A preliminary overview of this procedure will be developed at a "Gemini Science Retreat" in February 1998 and reviewed by the GSC at the April 1998 meeting.

Gemini will continue the collaboration with STScI to support the development of the Guide Star Catalog-II and database. The program to characterize Cerro Pachón for Adaptive Optics use will be carried out in 1998.

Implementation of the Gemini On-Going Instrumentation Program will begin in 1998, with Announcements of Opportunity and conceptual design activities for polarization modulation capabilities for both Gemini telescopes and for LGS/NGS AOS for Cerro Pachón and the LGS upgrade for Mauna Kea.

There will be a strong emphasis on further development of the scientific operations plan and oversight of and involvement in the development of the observatory control and observation planning, queue scheduling, and observation execution capabilities in 1998. This year will see the continuation of the development of the details of the telescopes' time allocation process, including proposal development assistance tools and forms, and detailed observation planning tools and forms.

There will be two more Gemini scientific staff hires in 1998. These positions are tenure-track positions and are open to all qualified scientists. Gemini staff scientists are expected to pursue an active research program and will play a key role in preparing the Gemini facilities for operational use.

In addition, the Gemini staff scientists will continue to arrange for and or provide scientific and technical support to the project as needed, participating in the commissioning activities for the Hilo base facility communications and laboratory, and integration and commissioning of the Gemini facility on Mauna Kea.

Telescope And Enclosure

1997 Accomplishments

Telescope Structure. TELAS completed the Mauna Kea telescope structure fabrication and preassembly at their factory in Le Creusot in France. After acceptance testing in April, the telescope was disassembled, packed, and shipped to Kawaihae on the Big Island. The structure arrived in August and was unloaded and stored at the Kawaihae dock storage yard. The azimuth track was transported to the Mauna Kea summit in August, and represents the start of the Mauna Kea telescope erection. The azimuth track has been leveled to an elevation tolerance of 100 microns ready for grouting. MK telescope installation started with the mount base and mount columns in place. Installation of the azimuth axis drives, cable wrap, utilities, etc. is underway.

The fabrication of the Cerro Pachón telescope structure at TELAS was approximately 65% complete at the end of the year.

The primary mirror covers, altitude and azimuth cable wraps, and the primary mirror cell cart are being fabricated by TIW. All except the last item were completed and delivered to Hilo. The primary mirror covers and the azimuth cable wrap were preassembled in Hilo and are now ready for transporting to Mauna Kea.

The telescope altitude hydrostatic bearings, manufactured by SKF, were delivered to NFM in France for the preassembly of the telescope structure. The completed Mauna Kea telescope bearing system, consisting of the bearings, preload devices, pumping and cooling systems, was delivered to Hilo.

Mauna Kea Site. Coast Steel started the site erection of the Mauna Kea enclosure in December of 1996. Progress was delayed due to many problems, including incorrect placement of the concrete anchors, unusually severe winter storms (two months lost to weather alone), equipment failure, union disputes and sub-contractor problems. Despite these difficulties, workarounds were successfully implemented to compress the schedule and to allow the installation of the telescope structure to proceed on schedule.

The main structure of the enclosure was completed and the structure made weather-tight by the end of October 1997, coinciding with the start of the telescope installation. Work on completing the enclosure continued through 1997.

The enclosure base and the support facility siding and roofing installation was successfully completed by Sure Steel.

San Juan started working on the completion of the enclosure base and the support facility in October 1996. Much of their work in the enclosure base required the area to be weather-tight. Delays in the enclosure erection also delayed this completion work in the enclosure base. The support facility is now almost complete, except for finishing work, while the enclosure base was finished by the end of 1997.

Contracts were placed with Nippon Express and HT&T for transportation of the heavy loads from Kawaihae to the summit of Mauna Kea. Nippon Express successfully transported three of the super-heavy loads, the upper and lower sections of the Coating Vessel and the telescope azimuth track, to Mauna Kea. Prior to transporting these loads to Mauna Kea, the access road to the summit was widened slightly by Mauna Kea Support Services.

The Gemini Hilo Base Facility design and construction bid package was completed by Oda McCarty. The construction contract was awarded to Isemoto and the construction started in August 1997.

Cerro Pachón Site. The Cerro Pachón enclosure structure was completed and shipped to Chile, and Coast Steel has begun installation of the rotating enclosure. Cladding of the support facility and enclosure base was completed.

When installation of the support facility and enclosure base equipment on Cerro Pachón was bid in Chile, the response from the bidders was poor, and the bid costs received were high. Subsequently, the bid packages were restructured to include separate mechanical, electrical, and finishing work, and re-bid. The materials and equipment for the support facility were purchased in the US and shipped to Chile.

Coating Plant. Construction of the coating vessel, vacuum pumping systems, sputtering system, coating mirror support and rotation systems was completed. The coating plant vessel was delivered and installed on Mauna Kea by PSI, followed by installation of the cryopumps by Leybold.

1998 Plans

Telescope Structure. In 1998 the Project will:

- complete the preassembly in France, disassembly, and shipment of the Cerro Pachón telescope structure.

Mauna Kea Site. In 1998 the Project will:

- complete the erection and acceptance testing of the Mauna Kea enclosure.
- complete the support facility and enclosure base buildings on Mauna Kea.
- complete the installation and commissioning of the coating plant.
- complete the installation of the telescope structure and mechanical systems on Mauna Kea.
- complete the assembly and test of the primary mirror cell cart.
- complete the construction of the Gemini Hilo Base Facility.

Cerro Pachón Site. In 1998 the Project will:

- complete the erection of the Cerro Pachón enclosure.
- finish 80% of the electrical and mechanical work for the Cerro Pachón support facility and enclosure base buildings.
- prepare for the installation of the Cerro Pachón telescope azimuth track.
- start the installation of the Cerro Pachón coating plant.
- negotiate contracts for the transportation of super-heavy loads in Chile.

Optics Group

1997 Accomplishments

Primary Mirror Blanks. Corning completed fabrication of the second primary mirror blank ahead of schedule, and it was accepted by Gemini on April 30. REOSC transported the second blank to their polishing facility in St. Pierre du Perray, France, in May.

Primary Mirror Finishing. Early in the year, REOSC bonded the lateral support pads to the edge of the first primary mirror. After they completed polishing the third VLT primary mirror in April, REOSC modified their polishing metrology mount to comply with the Gemini specification. The first mirror was transferred to the polishing machine 3 June. Polishing of the first primary mirror at REOSC reached the required accuracy in December, but REOSC continued to improve it. Final acceptance testing will take place in January, but preliminary indications are that the mirror quality is superb. The mirror figure is currently better than 16 nm rms over the 8-meter diameter.

The second mirror blank was placed on the grinding machine immediately after the first mirror was moved. Grinding was started in June, and was completed in October. The mirror figure is currently about one micron rms.

Primary Mirror Cell Assembly. The first cell structure was delivered by NFM Technologies on 25 June. In May, two Optics Group staff members relocated to Le Creusot, France, to supervise installation of the mirror supports, thermal control equipment, and utility services in the mirror cell. All of the equipment has been installed in the first mirror cell, including the thermal control radiation panels, which were delivered late in November.

The second cell structure was completed at NFM and delivered in November. Installation of the second cell's mirror supports and utilities began in December.

M1 Auxiliary Equipment. The primary mirror lifting fixtures have been fabricated by Ramsay Machine Works Ltd. The lifters were proof tested to 150% of the mirror weight. The Cerro Pachón mirror lifter was delivered to Le Creusot on August 1, and the Mauna Kea lifter was delivered to Hilo on 24 July.

The steel dummy mirrors were subcontracted early in the year, but disagreements with the fabricator resulted in AURA declaring them to be in breach of contract. The contract was subsequently terminated, and TIW Fabrication and Machining, Inc. was engaged to finish the work. This has resulted in approximately 5 months of delay, postponing delivery of the first dummy mirror until early December 1997. Availability of the dummy mirror has become the pacing item for testing of the primary mirror assembly, and it appears the testing period at Le Creusot will have to be shortened. The second dummy mirror is due to be delivered to Mauna Kea in January 1998.

The two chillers for the mirror thermal control system were delivered by NESLAB, one to Le Creusot, and the other to Hilo.

The contract to fabricate the primary stray light baffles and their handling equipment was awarded to Stevested Machinery and Engineering, Ltd.

The primary mirror wash carts are being fabricated. The two major parts of the cart structure were subcontracted to Royal Greenwich Observatory, and Moran Iron Works, Inc.

Secondary Mirrors. Technical difficulties have delayed production of the secondary mirrors. Carl Zeiss was awarded the contract for providing the secondary mirrors, and subcontracted the fabrication of the silicon carbide mirror blanks to Morton. Morton has experienced a series of failures in the chemical vapor deposition (CVD) of silicon carbide for the 1.0 meter mirror facesheets, despite a successful SiC process development run with deposition of a 0.5-meter curved facesheet.To minimize impact on the telescope schedule, Zeiss arranged for a lightweighted backup Zerodur secondary mirror for temporary use during commissioning of the telescopes. The lightweighted blank was delivered to Zeiss by Schott in December.

M2 Positioning System. Lockheed Martin was near completion of the first tip/tilt system in December 1997. The X-Y positioning systems for the secondary mirrors had to wait for completion of large custom-made eccentrically-mounted bearings, produced by ROTEK, and are several months behind schedule. After delivery in December, the first positioning system began integration.

M2 Deployable Baffle. Production prototype testing of basic parts of the deployable baffle, including a subset of the baffle blades, was completed in mid-1997. Composite Engineering was selected to fabricate the baffle blades with delivery at the end of November. Other components are being fabricated in the NOAO machine shop.

M2 Assembly Handling Equipment. Several pieces of equipment were designed to handle the secondary mirror and the other parts of the M2 Assembly and fabrication began on them in the last quarter of 1997.

1998 Plans

Primary Mirrors. The first primary mirror will be delivered to Mauna Kea in March. The mirror will be coated, and will be installed in the telescope in August. The second mirror will be finished by REOSC before the end of 1998.

Primary Mirror Cell Assemblies. Assembly of the first mirror cell was completed before the end of 1997, but testing will continue into January 1998, at which point the mirror cell assembly will be packed and shipped to Mauna Kea. Integration of the mirror cell into the telescope will begin in June, with the dummy mirror installed on the cell.

After the utility services, mirror supports, and thermal control equipment are installed in the second cell, which began in December 1997, the assembly will undergo several months of testing. Some portions of this testing will be extended to compensate for the reduced testing allowed on the first cell assembly. The second mirror cell will be packed and shipped to Cerro Pachón in third quarter 1998.

M1 Auxiliary Equipment. The Mauna Kea primary mirror lifting fixture will be assembled at the observatory in late January or early February, and then will be tested with the dummy mirror, the wash cart, and the coating chamber base. It will be used to move the mirror when it arrives on the summit in March. The Cerro Pachón mirror lifter will be used to test the mirror cell assemblies at NFM, and will then be shipped to Cerro Pachón with the second mirror cell.

The Mauna Kea dummy mirror will be used to test the Coating Chamber mirror support, the mirror lifter, and the wash cart, before these equipment items are trusted to work with the primary mirror. The dummy mirror will then be mounted on the mirror cell and will be installed in the telescope to provide the correct mass so telescope servo tests can be performed. The Cerro Pachón dummy mirror will be used to test the two mirror cell assemblies in France, and will then be shipped to Chile with the Cerro Pachón mirror cell.

One NESLAB chiller will be installed on Mauna Kea in February. The other has been installed in the NFM factory to be used in testing the mirror cells there. This chiller will be transported to Chile along with the second mirror cell.

The stray light baffles will be delivered in March. The first one will be installed in the telescope in August. The second one will be stored until it is shipped to Chile.

The first primary mirror wash cart will be assembled on Mauna Kea in February, and will be tested with the dummy mirror. When the primary mirror arrives in March it will be placed on the wash cart. The surface heating system electrodes will be bonded to the edges of the mirror and the mirror will be thoroughly cleaned. Then it will be placed in the coating chamber.

The second wash cart will be shipped to Chile in late 1998 or early 1999.

Secondary Mirrors. The first Zerodur secondary mirror will be delivered in August. It will be mounted on the M2 Assembly, and will be installed in the MK telescope in November. Delivery of the second mirror blank is expected in late 1998.

M2 Assemblies. The first deployable baffle will be assembled by January 1998. The tilt system, the positioning system, and the baffle will be tested together using a dummy secondary mirror. The first M2 Assembly will be shipped to Mauna Kea in May or June.

The second positioning system and deployable baffle will be assembled during first quarter 1998. They will be combined with the second tilt system when it is delivered in May, and will be tested with the dummy secondary mirror.

M2 Assembly Handling Equipment. Fabrication of equipment to handle the secondary mirror and the other parts of the M2 Assembly will be completed during the first quarter of 1998.

Software And Controls

1997 Accomplishments

General reorganization. This has been completed following the departure of Rick McGonegal in August.

Observatory Control System. The software development has been on the Planned Observing track, Observing Tool track, and the Telescope Console track. The Observing Tool is a Java application that enables an observer to plan his observing program and submit it to Gemini. It also allows the Operations staff to design the queue and classical time allocation by combining all the time requests. A beta release has been demonstrated to numerous groups and has been consistently well received. The Interactive Observing Infrastructure track was revisited and revised to accommodate changes to the EPICS interface and to support work on the Data Handling System. The Telescope Console track is at the beta review stage, but is moving into the Telescope Control System group in response to staffing changes at IGPO. The Instrument Console track has been folded into the Observing Tool track.

Core Instrument Control System. This was completed at ROE. The integration of the Data Handling System with the Core Instrument Control System was begun at IGPO.

Primary Control System. This was tested with the mirror cell #1 at NFM in France. Remote programming of the node boxes has been implemented and will allow software upgrades to be made to the node boxes in-situ.

Telescope Control System. After a successful beta release, the TCS was demonstrated to the Gemini Science Committee and was very well received.

Mount Control System. This passed its implementation Phase I review in August 1997. A prototype of the EPICS control system simulator was demonstrated at that time.

Data Handling System. This was tested end-to-end in prototype form. The system was released in November 1997 for use by instrument developers.

Secondary Control System. The interim release phases were completed. A release became available in November 1997 for testing with the M2 tip/tilt mechanism when that mechanism arrives in Tucson.

Communications System. This is under the direction of Jim Wright. The overall design was completed, and the networking equipment for Gemini North was ordered.

Enclosure Control System. This had a successful critical design review earlier this year, with a beta release later in the year.

Phase 1 Entry Tool. The software was started and a beta release completed. This Java application, like the Observing Tool, will enable a prospective user to submit his science program to Gemini.

Engineering Archive. This reached the end of the user-requirements definition phase. The software requirements definition phase started in December.

1998 Plans

Observatory Control System. The Planned Observing and Observing Tool tracks will be finished early in 1998 and begin integration with the other principal systems as they are delivered.

Primary Control System. The PCS for mirror cell #1 is scheduled to be accepted in February 1998, with acceptance for cell #2 in June 1998.

Telescope Control System. This will be delivered in March 1998. Efforts are underway now to ensure support from TCS group members during integration and testing throughout 1998 to help with TCS integration in Hawaii.

Mount Control System. This will be delivered in March 1998.

Data Handling System. This will be delivered in two phases during 1998. Early 1998 will see the delivery of all the core system components, with updated versions due in June 1998.

Secondary Control System. This will be delivered early 1998.

Communications System. The detailed design for Gemini South will be completed and equipment installation for Gemini North will begin.

Enclosure Control System. This will be completed and begin integration at Gemini North early in 1998.

Control Simulator #3. This will be tested as a merged system of a number of the principal and real time systems delivered from the work packages.

Computer Network Management. Staff was added to support the network and the communications between the Hilo base facility and the summit.

Scientific Instrumentation

1997 Accomplishments

Multi-Object Spectrograph (GMOS). A successful CDR was held for GMOS during February 1997. Soon thereafter a major reassessment of costs was completed and used as the basis for all parties signing a work scope to take GMOS to completion in 2000. Fabrication and generation of the final fabrication drawings ensued, with successful completion of the front-end mask exchange unit, several software subsystems, on-instrument wavefront sensor assembly, etc. over the course of 1997. The GSC endorsed the proposal to provide an IFU for GMOS, compensating the cost by having both GMOSs share a single mask maker. This project is a joint UK/Canadian activity with work carried out at DAO in Canada and at ROE and Durham in the UK.

High Resolution Optical Spectrograph (HROS). HROS held a conceptual design review in November 1996 at University College London. During that review a number of key design issues were identified, including overall flexure of the opto-mechanical assembly, and the effects of thermal gradients and non-uniformities in the refractive index of the massive cross dispersion prisms used in HROS's optical train. All of these concerns were addressed through modeling during early 1997 and a revised cost and schedule to completion was generated to place HROS within budget. After discussions with the Optical Instrument Science Working Group, Instrument Forum Group, and the GSC, a simplified HROS design was endorsed and the HROS team is now proceeding toward a PDR, expected to be held in 1998. The main changes in the HROS design that emerged from this process were elimination of the R=120,000 mode, high-stability (pier) mode, and articulation of the cross dispersing prisms. This work is being carried out primarily by the University College London with management and technical oversight from ROE.

Mid Infrared Imager (MIRI). In response to an RFP released during the summer of 1997, potential builders of MIRI were reviewed by an independent committee, which evaluated the proposals on the basis of technical, budgetary, and management criteria. NOAO subsequently opened contract negotiations with the group that submitted the top ranked proposal and a contract is likely to be signed with this group in early 1998.

Near Infrared Imager (NIRI). NIRI passed its CDR milestone during May 1997 and remains in an intensive design and fabrication state at the University of Hawaii's Institute for Astronomy. Optics were ordered and nearly all work on the mechanism prototyping was completed. Excellent progress was made in 1997 with NIRI's EPICS-based control software. The bulk of the machining of the massive vacuum jacket for NIRI is also expected to be completed by the end of 1997. The cold structure and several smaller components will be built during late 1997-early 1998 in commercial machine shops as well. (This is the instrument intended to commission Gemini North.)

Near Infrared Spectrograph (GNIRS). GNIRS successfully passed its CDR milestone in November and began its fabrication phase at NOAO in late 1997. An intensive effort was made during 1997 to reduce the weight of this complex instrument, which led to an estimated mass that is within its allocated 2000 kg limit. Long lead items (mainly optics) will also be purchased at the beginning of the fabrication phase of this instrument.

Near-IR Arrays and Controllers. The first of the series of 12 ALADDIN II 1024^2 InSb arrays were delivered from SBRC during the fall of 1997. None of the devices received to date are judged as clear science-grade devices. The majority of the hybrids from SBRC will continue to arrive through the first third of 1998. Early in 1998, NOAO will have nearly completed the fabrication of the near-infrared array controller that will be used in NIRI.

Michelle and COB. Arrangements have been made to share UKIRT's Michelle high resolution echelle spectrograph with Gemini North. NOAO's Cryogenic Optical Bench currently at Kitt Peak will be borrowed and moved to CTIO to commission the Gemini South telescope.

1998 Plans

Multi-Object Spectrograph. The GMOS team will continue to fabricate components for the spectrographs during 1998. Key elements include the dewars used to house the science CCD mosaics, which will be integrated with the detectors and controllers at NOAO. Progress in fabricating the grating turrets, filter wheels, and various truss support structures is also anticipated in an intensive build phase throughout 1998.

High Resolution Optical Spectrograph. A new work scope is being formulated to take the project to completion, with delivery of HROS to Cerro Pachón in 2001. Closure is expected on work scope negotiations during early 1998. The HROS team is now carrying the design process forward in anticipation of holding a PDR in 1998.

CCD Arrays and Controllers. Under the terms of the EEV contract, delivery is anticipated of all 12 devices during the first semester of 1998. They will be sent to NOAO where they will be characterized and integrated into dewars provided by the GMOS team. SDSU2 controllers will be integrated into these mosaic detector packages as well, before the completed systems are shipped back to GMOS for integration into that instrument.

Mid Infrared Imager. With contract signing anticipated in early 1998, the Project expects to hold a PDR for MIRI in early 1998.

Near Infrared Imager. NIRI will undergo its first cold tests during the first half of 1998, after key components are either built or received at UH, including the cold structure and infrared array controller. NIRI is expected to arrive in Gemini's Hilo lab near the end of 1998. Since NIRI is the commissioning instrument for Gemini North, and will be the only instrument available throughout most of 1999, close attention will be given to its status as it approaches completion next year.

Near Infrared Spectrograph. The spectrograph team at NOAO will focus on fabricating the various cold structures and mechanisms for GNIRS during 1998. Considerable effort is anticipated in the areas of electronics, instrument handling, and software within GNIRS. Much of the instrument will be made in NOAO's machine shop and various labs.

Near IR Arrays and Controllers. In early 1998 the array controller will be delivered to UH for installation into NIRI during the first half of 1998.The controller will be delivered to the NIRI team and integrated with an engineering grade ALADDIN detector, so the entire detector/array system can be tested and evaluated prior to integration into NIRI. The remaining ALADDIN arrays will be delivered to Gemini during the first semester of 1998. Individual arrays will then be selected to be installed in NIRI and GNIRS.

Systems Engineering And Facility Instrumentation

1997 Accomplishments

Systems Engineering

Due to a departure of one of the Gemini engineering managers, several areas were transferred to the Systems Group's area of responsibilities. These were mostly "facility" instrumentation activities. They include:

Cassegrain Rotator and Cable Wraps
Instrument Support Structure
Acquisition and Guiding System
Wavefront Sensing
Instrument Infrastructure (handling, thermal cabinets, test equipment, closed cycle cooling, etc)
Adaptive Optics
Calibration Unit
Gemini Interlock System
Hydrostatic Bearing Control System
Plant Room Controller
Castell Key System

Several people who were involved in many of the above systems were also transferred to the Systems Group.

The status and plans for these new areas are discussed below and in the 1998 plans.

Tasks

Interface Control. Continued progress in defining interfaces occurred, particularly in the areas of software, controls, and instrumentation. Some work has progressed to verification of critical interfaces by review of inspection reports from some manufacturers of critical subsystems. The Systems Group sometimes directly participates in reviewing the data, and at other times facilitates review of the data by people from different groups in areas that cross the group boundaries. Not all defined interfaces are under formal control, but most of the critical ones are, and the pace of completing interface descriptions in ICD's has greatly improved. The change control procedures set up previously have been working smoothly.

Integration planning. Preparation of the detailed integration, test, and commissioning plans has been a priority. Responsibilities for specific areas have been defined and iterated with the various engineering and science groups. Introductions for systems areas have been written and a few draft integration documents have been produced. Meetings to review the progress and organization have been held with the management team. Recently, an integration meeting was held which included most of the people doing the work at the site in Hawaii. There will be an ongoing series of such meetings, emphasizing the near term activities about to occur on the mountain. Part of the Systems Group has been transferred to Hawaii and new operations hires added to augment the effort there in the area of electronics and system cabling. Work on installation of the first cables and services is scheduled for the end of this year.

Error Budget. Work has continued, including expected delivered performance in the system error budgets. The NIRI system error budget has been incorporated into the overall Gemini system error budget. The GMOS has developed a complete error budget that is presently being tracked separately.

System electrical design integration. Much of the system cabling, hoses, and connections required have been purchased, and a small electronics work area was set up in the Hilo warehouse facilities. Most electronic interface details have been worked out in complete form. Those still incomplete have been worked through to the level that hardware (cabling) interfaces have been defined in the areas of instrument interfaces and interfaces through the telescope wraps.

Mechanical Systems Engineering. Definition of mechanical interfaces is proceeding well. Support is also being provided to the services design and implementation effort in the areas of coolant water and dry air distribution throughout the telescope and in preparation of drawings, review of interface designs, and help in problem solving in a number of areas.

Reviews. The systems engineer has participated in a number of reviews (both as a presenter to help a particular group and, more often, as a reviewer in other cases). Reviews attended in 1997 included:

Near-IR Imager CDR

Near-IR Spectrograph PDR

Telescope Control System beta review

Hydrostatic Bearing Control System final design review

Gemini Interlock System review

Cassegrain rotator/cable wrap final mechanical review

Zeiss A&G final review

Adaptive Optics PDR

Instrument Forum Group meetings

World Wide Web and Publications. Ruth Kneale has greatly expanded the Gemini WWW page, adding information on the project in general, and many photographs showing progress in each of the areas. The photography includes automatically updated digital images from a camera set up by the project on the cat-walk of the CFHT building to monitor construction on Mauna Kea. The main additions for this year were the Interface Control Documents database search tool, employment section, complete project document listings (some available electronically), and the science section.

Newsletters were published in June and December 1997.

Gemini preprints #18-25 were published this year. A list of these and other Gemini publications is in Appendix C.

Computer Network Management. The new software and controls group, run by Steve Wampler, now handles network management also. Prior to the change, most of the PC network was upgraded in hardware and software to Windows NT, through an NT server.

Systems Meetings. Meetings to communicate with the systems team in Hawaii are held every Monday. Other specific meetings are called as required, usually weekly, covering topics such as interface review, Change Control Board meetings, and Integration and Testing (I&T) planning meetings.

Test and handling equipment. The prime focus wavefront sensor has been manufactured and assembled for use on the Kitt Peak 4-m telescope. Kitt Peak offered two engineering nights to check this sensor out (as did UKIRT). To date, the runs on the Kitt Peak 4-m were successfully completed and runs are scheduled for UKIRT early in 1998. The sensor performed well and is believed to meet the Gemini requirements during integration. Some additional work is underway to prepare for UKIRT and Gemini.

Ramp-up in Hawaii. The systems group in Hawaii is currently at 5 people, expanding to about 7 by the end of the year. The Systems Engineering Manager is expected to relocate to Hawaii in the near term.

Facility Instrumentation

Interlock Safety System. This had its preliminary review and is in process of final design.

Hydrostatic Bearing System. This had its final design review this year. The hardware is complete and has been installed on Mauna Kea.

Instrument Support Structure. The ISS fabrication was completed by AMOS. They are storing the units for use by themselves and Zeiss for testing of the Cassegrain rotator units at AMOS and of the A&G unit at Zeiss.

Cassegrain Rotator/Cable Wrap. AMOS was awarded the contract for the Cassegrain rotator system. They have completed the final mechanical design and have started manufacture. They are currently about 1 month behind schedule.

Acquisition and Guiding. This is a work package allocated to PPARC and located at RGO. As part of this work, PPARC issued an international RFP and subsequently awarded a contract for the opto-mechanical subassembly to Zeiss Jena. Zeiss has passed its final design review and completed the fabrication and assembly stages on schedule by the end of 1997.

Wavefront Sensors. This is a joint UK/Canadian activity with work being carried out at DAO in Canada and RGO in the UK. The first few CCD's and controllers have been delivered and integrated, and appear to meet the requirements. The final camera head integration is underway at DAO in Canada, with the first few complete by the end of 1997.

Calibration Unit. A work package has been agreed with ROE and the design work is underway.

Instrument Infrastructure. In order to support the instruments during operations, there must be thermal enclosures for the electronics, closed-cycle cooling interfaces on the telescope, handling rigs to mount/dismount the instruments, access to the cabling, and laboratory space and tools. The thermal enclosures have been completed and are being distributed to the various groups who require them. The closed cycle coolers have been delayed until 1998 (they are not needed until then). Most of the handling equipment has been designed and the orders have been placed. Some of the equipment has been received and is in storage until needed.

Adaptive Optics. A work scope for the Gemini North telescope natural guide star AO system was signed with DAO in Canada. They successfully completed the preliminary design phase in October.

1998 Plans

Systems Engineering

Integration, Test, and Commissioning. Continued work on integration planning shifted into the system integration and test efforts on Mauna Kea at the end of 1997, with the installation of some of the system services. If the major subsystems are delivered on time, first light will occur at the end of 1998, as scheduled. Most of systems engineering will move to Hawaii to lead this effort early in 1998.

Error Budget. Trade-offs are expected to continue on the various system error budgets as the telescopes are integrated, using the margins achieved in some areas to compensate for the few areas where it is difficult to meet the derived subsystem specifications. The goal is to meet the top level science specifications in an economic way.

Reviews. Continued involvement in reviews is expected. Emphasis will be on organizing and running the integration meetings and reviews. Also, the facilities instrumentation will mostly be going through acceptance testing and final reviews.

World Wide Web. The world wide web pages will be continually updated. The camera currently showing the construction of the enclosure will be moved to the inside of the enclosure to show the progress there, but this will have to wait until the communications are hooked up.

Test and Handling Equipment. Tests of the prime focus wavefront sensor will occur on UKIRT and then Gemini as part of the integration effort. The software used and developed here will be converted for use with the high resolution WFS part of the acquisition and guiding.

Ramp-up in Hawaii. The integration team will continue to ramp up during the year.

Facility Instrumentation

Interlock Safety System. This is a key safety system required before the telescope structure is to be moved on a regular basis. It will be completed and installed in 1998.

Cassegrain Rotator/Cable Wrap. Fabrication will be completed. Delivery is expected in May 1998. This is currently one of the critical path items.

Acquisition and Guiding. Integration with the RGO supplied wavefront sensors is scheduled for early 1998 for the Mauna Kea unit. This unit is expected to be delivered in March 1998, followed by the second unit in a few months.

Wavefront Sensors. Integration with the Zeiss contract is scheduled for early 1998. Some of the processing work is expected to be finished in early 1998, but has been slow, due to the departure of a key RGO person.

Calibration Unit. The preliminary design is anticipated to take most of 1998. The early work will concentrate on interfaces with equipment already in fabrication.

Instrument Infrastructure. The remainder of the handling equipment is expected to be procured in early 1998. The closed cycle cooling system is likely to be subcontracted in early 1998 for integration by October 1998.

Adaptive Optics. The CDR for the natural guide star system is scheduled for October 1998. The overall planning will begin for a laser guide star upgrade and for an AO system for the southern telescope, if funds are approved. To prepare for the southern system, a site characterization contract has been placed (in 1997) to perform balloon and scidar measurements throughout the year (1998).

Operations Planning

Background. The Operations effort consists broadly of two different, though coupled, functions: 1) initially bridging the interval between facility construction and operational handover by supporting the integration, test, and commissioning (IT&C) effort, and 2) continuing the nominally steady-state operation of all facilities, North and South, as well as the instrument and facility development activities after operational handover.

In the operations era after handover, activities such as administration, engineering, software support, and so forth will flow from several single, though geographically distributed, functional units, as shown in the organization chart. The intention is to preserve a consistent set of standards, processes, hardware, software, and so forth, as is appropriate and essential to maintain efficient operations in a one-observatory, two-telescope model. Aided by modern communications tools, such as high-speed data transmission and video conferencing, these functional units will provide services to both the North and South telescopes.

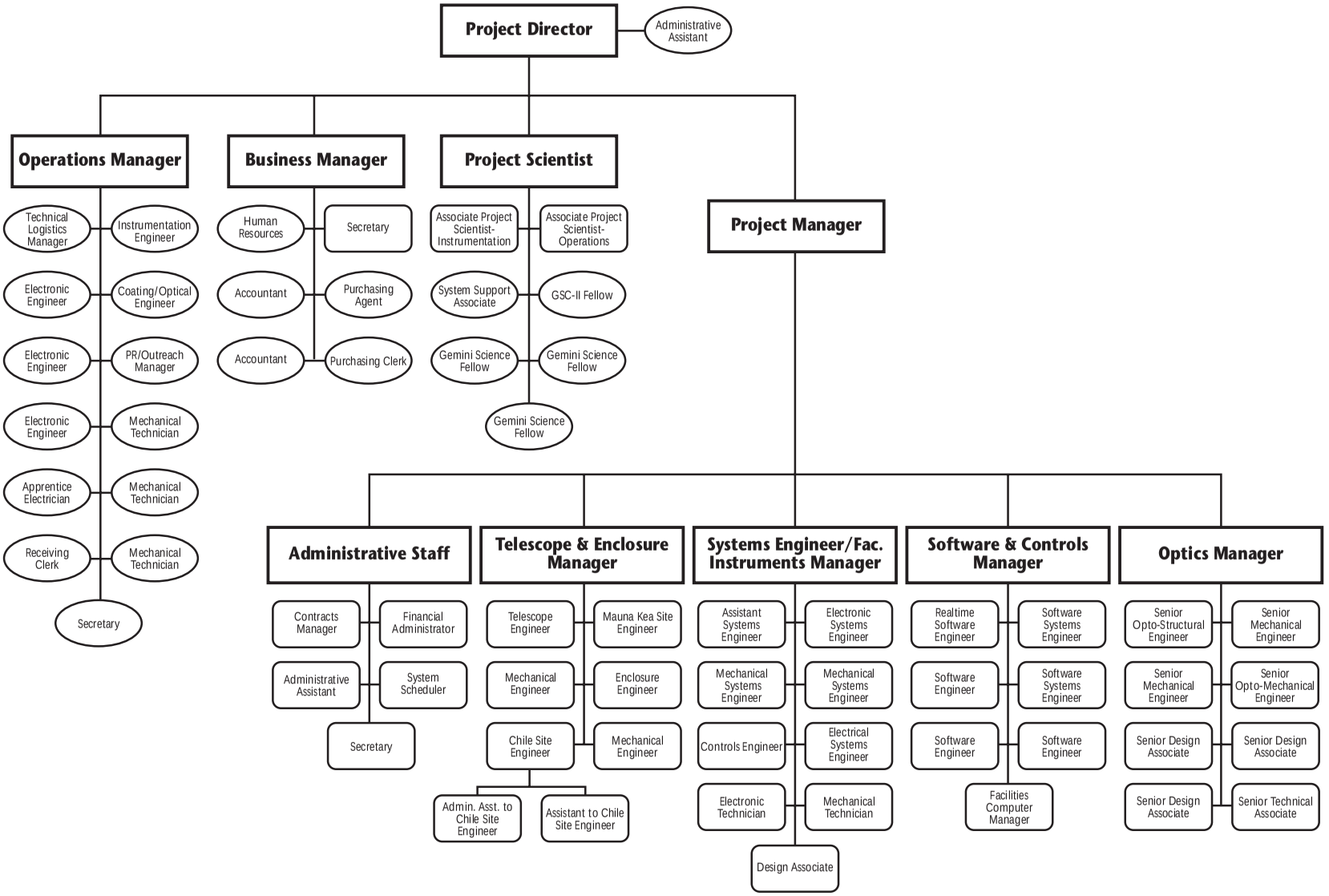
Infrastructure. In the near term, the development of the infrastructure to support such operations, including base and mid-level base physical plants, communications systems, laboratories, administrative systems, staff, staff training, safety, and working relationships with partners and neighbor observatories, is a project in itself, and one of nontrivial proportions.

Although the Project might have chosen to develop the infrastructure of each project phase separately, it has been more economical and efficient to consciously evolve them smoothly through the life cycle of the program from construction to true operations. It has been recognized that a significant fraction of the infrastructure required to support true operations is substantially the same as that required to support the Integration, Test, and Commissioning efforts. Consequently, the Operations program has been charged with developing that infrastructure to serve both IT&C and later operations. In the shorter term, much of this infrastructure is also supporting construction staff in Hawaii.

Staff. While it is true that many of the technical staff traditionally associated with an IT&C effort are, in some sense, itinerant, moving on to the next project after the completion of the previous one, this does not have to be the case for many staff members. Ideally, one would like to preserve some significant portion of the expertise and experience gained in the IT&C era for the Operations era as well. Consequently, as the staffing tables have been developed for IT&C, a deliberate effort has been made to identify both positions and applicants that might be suited to both IT&C and Operations. Many of the construction phase staff who have proven themselves and indicated an interest have been identified for longer-term Operations positions that will begin as IT&C support and continue into operations thereafter. In addition, with the cooperation of the respective national partners, certain key people involved in the work packages have similarly been identified for recruitment.

Notwithstanding this effort, the Project is not trying to force-fit people into positions for which they are ill suited, if only by temperament. There are still a fair number of IT&C positions that best fit the traditional itinerant mode, and these are also being filled from within the project and partnership, and from the outside as well.

Gemini Organization Chart (November 1997)



1997 Accomplishments

Hilo Base Facility. Although delayed about two months by administrative difficulties, the construction effort on the Hilo Base Facility (HBF) began in August 1997. Since that time, the contractor, Isemoto, has made good progress and completion is expected in the summer of 1998.

Hilo Plaza Office. In the meantime, the project has arranged for the phased-in leasing of up to about 5,000 square feet of office space in downtown Hilo. This space is being used as the temporary home for the Hilo effort. It is relatively low-cost space, although it is reasonably suited for the current needs. Eventually, it can support up to about 60 people.

Free Trade Zone. The Project has leased 11,000 square feet of nearly new warehouse space under cover and 22,000 square feet of outdoor space at the Hilo airport. This facility is very reasonably priced as a result of a local government program to attract new business into the area. The FTZ is being used as a delivery and storage place for small to medium loads, and as an assembly area for many of these systems.

Staffing. In May, the project had only three staff members based in Hilo. Since that time the group has grown at a rate of about four people a month, reaching 30 by the end of 1997. This rapid and continuous ramp up has required very rapid expansion of the Hilo Plaza office and Free Trade Zone, in terms of everything one can imagine required to start an operation *ab initio*, including floor space, telephones, networks, computers, furniture, vehicles, safety equipment, office supplies, and so forth. Many of these items have posed some real challenges in Hawaii, where supplies are limited, and many items have to come from the mainland. Nevertheless, the staff in Hilo, supported by the group in Tucson, have done a outstanding job in making this effort a success.

Sharing Agreements. The Project and the Joint Astronomy Centre (JAC) concluded negotiations and implemented a resource sharing agreement to support their activities on Hawaii. This agreement provides for the collegial sharing of staff and facilities between Gemini North and the JAC on a work-order basis. It formalized mutual working relationships that had informally been in place for some time and expanded the basis for these mutual help efforts.

Under this agreement, Gemini North and the JAC have also agreed to cooperate in the hiring of shared new staff, to take advantage of a few situations where both discovered they had the need for a fraction of a person in the same area. Two such hirings have taken place and the system is working out well for both groups.

The project is also sharing resources and obtaining support from AURA's Cerro Tololo Inter-American Observatory (CTIO) in Chile. Although the amount of true sharing is limited at the moment, since the development of Gemini South is phased a year or so behind the North, the Project, NOAO, and AURA are engaged in a serious effort to develop the proposed concept of a centralized AURAsupport unit, based in La Serena, that would provide infrastructure and at least some staff to all the AURA(and non-AURA) programs on Cerro Tololo and Cerro Pachón, including CTIO, Gemini South, and SOAR. The basic model is very much like Mauna Kea Support Services.

Finance and Accounting. The project has pursued its program of staged withdrawal from reliance on NOAO for administrative services support. In February, the Gemini administrative unit selected the accounting and control software package by American Fundware as the basis for its internal self-contained system. Beginning in June, the purchasing, tracking, and accounting for Operations fund items were taken over from NOAO and relocated in Hilo. By October, the Construction accounts were also assumed. Only payroll presently remains with NOAO.

Human Resources. Up until July, the project was relying entirely on NOAO for HR services. Subsequently, the project recruited its own full-time HR manager and direct responsibility for these services was gradually assumed by the Project. This effort was complete by the end of 1997.

Safety. Safety is a critical aspect of Gemini operations. A draft safety policy specific to operations has been prepared and is under review. An independent AURAinspection and review of safety practices at both Gemini North and Gemini South was conducted (with good reports) and the details of these inspections were used to improve processes and procedures.

Public Information and Outreach. The Project is committed to facilitating the dissemination of information about the science and technology developed and exploited by the Gemini project, as well as sharing with the general public the excitement of scientific discovery. The principal approach to outreach is to collaborate and facilitate work among the partner agencies and to participate in coordinating these efforts for the common good. A part-time manager for PIO shared with NOAO has been engaged and a plan for Gemini's role in PIO is under development.

1998 Plans

Hilo Base Facility. Depending on delays caused by weather and other factors, the HBF is expected to be ready for occupancy in July or August 1998, some four months later than originally planned. This will pose some challenges both in terms of the disruption of work caused by moving the staff from the Hilo Plaza as first light is drawing near, and in terms of the problem of sufficient accommodations for all staff at the Hilo Plaza for those extra four months.

Hilo Plaza Office. There is no problem with continued access to the Hilo Plaza space for the additional several months due to the delay in the HBF, other than the previously unplanned cost. However, as noted below, the baseline staffing plan calls for about 75 people to be housed there by August 1998. This is more than 15 people beyond what the currently available space can hold. Since the exact date of the availability of the HBF is uncertain to about two months and this vitally impacts the number of people the baseline ramp-up plan would place in Hilo, detailed solutions will have to be made in real time.

The Project has secured an informal agreement with the landlord to make an additional 850 square feet available, if needed in the summer of 1998. This space represents the landlord's own office suite. Another possibility is to consider throttling back the arrival of staff from Tucson and elsewhere into Hilo, if that can be done without serious impact on the first-light effort. Renting additional space at some other location is still another possibility.

Free Trade Zone. The warehouse space is already proving inadequate to permit all of the desired activity. This is being managed by careful staging of deliveries to the FTZ and scheduling of the work there. Additional lay-down space is available in Hilo and elsewhere and is being used as needed. There are some relatively minor cost impacts.

Staffing. A combination of new hires and transfers from Gemini work sites throughout the partnership will increase the staffing level in Hilo to 75 or 80 people at its peak in late 1998. After first light, as construction work begins to move south in 1999, the number of people based in Hilo will drop. There will be a small increase in project staff in Chile to support the construction and administrative units there.

Sharing Agreements. Pending final approval, the AURAObservatories Cerro Tololo/Pachón support unit will begin to take shape. This collaborative formation process will lead naturally to a resource acquisition and sharing agreement for the purchase of basic infrastructure services (roads, snow removal, utilities, etc.), Chilean-side procurement and human resources, general safety, purchased local labor, and resource sharing in the mode of the JAC-Gemini North agreement. Under this envisioned structure there may also be side agreements for sharing staff or facilities, for instance with the Gemini neighbor on Cerro Pachón, SOAR.

Finance and Accounting. The project will be totally self sufficient in all areas except foreign imports and exports, where NOAO may still provide some services. Payroll is scheduled to come in-house in April. While it is true that Gemini South will continue to use AURA's Chilean unit to effect local purchases, the booking of those transactions will occur on-line on the Gemini side of the interface, using Gemini South staff and the American Fundware software package.

Human Resources. Again, the project will be totally self sufficient, except for the HR aspects of Chilean hires in Chile. As with finance and accounting, Gemini will retain management responsibility, but work through an interface with the AURA Chilean unit to deal with the Chilean union and legal requirements.

Safety. The operations-specific safety plan will be fully implemented in 1998 and a formal safety officer will be appointed.

Public Information and Outreach. Upon receipt and approval of the draft PIO plan at the end of 1997, the project will move to implement that plan with the recruitment of a full-time Gemini-specific PIO manager. It is expected that a significant aspect of that plan will focus on the path to first light and facility dedication as a near-term objective. Other actions will be determined by the details of the approved plan.

Contracts

The contracts listed below are described in more detail in the preceding sections.

Major contracts in 1997

- To AMOS for both Cassegrain rotator and cable wrap assemblies.
- Work Scope to NRC for design and fabrication of the adaptive optics system for Gemini North.
- To TIW, for primary mirror cover assemblies, primary mirror cell handling carts, and telescope cable wrap assemblies. An amendment added completion of the dummy mirrors, originally contracted from APEC.

Contracts between $250,000 and $1,000,000 in 1997.

- To PPARC and NRC for wavefront sensors.
- To Nippon Express for heavy load transport in Hawaii.
- To PPARC for two facility calibration units.
- To Cisco Systems for networking hardware components.

Planned Contracts in 1998

Only two major subawards are expected to be awarded in 1998, listed in Table 2. The first and a small portion of the second will be paid for from Construction funds; most of MIRI's cost will come from the Operations budget.

Table 2. 1998 Contract Schedule

Contract Item	Source Contractor	Type	Planned Contract Approval Date
Cerro Pachón site completion	Int'l/Chile	Bid	2/98
Mid-InfraRed Imager	US	WP	2/98
Total Estimated 1998 Contracts and Work Packages—$2,645,373			

In Table 2, "Int'l" indicates an internationally selected contractor through a bid, and WP is a Work Package which is part of a Partner's share of Gemini work.

Changes in the Partnership

When it appeared that Chile, which had not made any of its scheduled contributions, was still unable to make any payment by the Board Meeting in May 1997, the Board declared that Chile was officially in arrears, and voted to open negotiations with Australia which had expressed strong interest in joining Gemini as a replacement 5% partner. A deadline of 1 September was established, determined by the date that the cash flow would go negative without the Chilean funds. On 20 August, the Chilean legislature passed the Gemini Law which authorized a total Chilean contribution of $8.8 M, appropriated the necessary funds to bring Chile out of arrears, and agreed that Gemini staff would have the same privileges as the staff of the other observatories in Chile. The full payment was made on 29 August, bringing Chile back into the Partnership.

However, Australia asked to be allowed to join as an additional 5% partner, augmenting the Project's total funding and supplementing its scientific expertise. The Gemini Science Committee unanimously considered this to be advantageous to the Project, and the Board recommended at its November meeting that the Partners open formal negotiations with Australia to this effect, with the understanding that these additional 5% funds for both construction and operations would provide added value, not a cost reduction for the existing partners.

Ad hoc Committee on Instrumentation Policy

An ad hoc committee was appointed by the Board to develop a Board position concerning the principles by which the Project will optimize the scientific return from the Gemini Instrument Development Fund (IDF) in the Operations phase. The committee consisted of one member from each Gemini partner. A report was made to and accepted by the Board at the November meeting. In summary, the report recommends:

- Designing innovative, timely, competitive instruments within the limitations of the IDF.
- Continuing re-evaluation of IDF strategy in connection with adaptive optics development.
- Involving the community in instrument design, offering inducements as necessary.
- Establishing good scientific verification plans, with broad partner participation.
- Staffing the Observatory with technical and scientific sabbatical visitors who can help with instrument development and user support.
- Planning initial classical vs. queue scheduling for a new instrument to enhance familiarization of astronomers with the instruments.
- Continue use of the Instrument Forum process with GSC oversight.

Financial Status

The year 1997 was the second full year of the Operations phase of the Gemini Project. Contribution and expenditure budgets for Construction and for Operations are kept separate. At the November 1996 Board meeting, a 5-year operation plan for 1997-2001 was approved, which is presented in Table 3d, updated for actual expenditure.

The following Tables 3-5 show the actual and projected contributions from the partners from 1991 to 2001 for the Construction Phase, and for 1996 to 2005 for the Operations Phase; the annual and projected expenditures during this period; the actual and budgeted expenditure breakdown for 1997; and the 1998 budgets as approved by the Board in November 1997. The construction figures include the $8 M authorized by the Board at the November 1995 meeting.

Contributions and Outlays

Table 3a shows the actual and projected contributions from the partners from 1991 until the end of the construction phase of the project in 2001. The actual contributions from each nation are shown through 1997, and the projected contributions thereafter. The bottom line gives the total cumulative contributions. For the United Kingdom, all contributions include work credits.

Table 3. Project Funding and Expenditure Tables

Table 3a. Calendar Year Annual Contributions for Construction (US $000)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
United States	3,815	12,063	14,000	17,120	41,000			4,002				92,000
United Kingdom			3,638	6,622	2,761	2,128	10,706	8,144	6,819	4,806	322	46,000
Canada			6,813	2,722	2,870		3,416	10,089	1,690			27,600
Chile							3,520	1,320	1,560	1,400	1,400	9,200
Brazil				550	550	550	550	600	600	600	600	4,600
Argentina				400		1,030	681	653	611	611	614	4,600
Total Ann. Contrib.	3,815	12,063	24,451	27,414	47,181	3,708	18,927	24,808	11,280	7,417	2,936	184,000
Cumulative Funding	**3,815**	**15,878**	**40,329**	**67,743**	**114,924**	**118,632**	**137,559**	**162,367**	**173,647**	**181,064**	**184,000**	**184,000**

The construction project expenditure profile, including work credits for the United Kingdom, is shown in Table 3b. The entries for 1991-1997 are actual expenditures; the remainder are projections. (The last line in Table 3b, the cumulative total funding, is repeated from Table 3a.) A negative cash flow is projected for 1998 and 1999 unless scheduled payments can be brought forward. The difference between the total funding and the expenditure profile is the funds carried forward. These funds are available to cover contingencies. Under the current long range projection, the contingency remaining at the end of the construction period will be $1.45 M.

Table 3b. Calendar Year Expenditures for Construction (cumulative in US $000)

Spending Profile	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Cash	2,156	7,243	15,292	30,074	55,410	82,247	119,858	147,673	155,356	160,657	162,592	162,592
UK Credits			138	955	2,620	4,747	10,680	15,687	17,796	18,946	19,268	19,268
Funds Carried Fwd	1,659	8,635	24,899	36,715	56,895	31,638	7,069	(652)	(185)	67	(0)	
Cumulative Funding	**3,815**	**15,878**	**40,329**	**67,743**	**114,924**	**118,632**	**137,607**	**163,100**	**173,647**	**181,064**	**184,000**	**184,000**

Tables 3c and 3d show analogous information for the first ten years of operations funding, from 1996 to 2005. Actual contributions and expenditures are shown through 1997; the rest of the entries are projections, with no allowance for inflation. The US has forward funded part of the operations in 1996-7, and will also do so in 1998, which will be reimbursed by the other partners in later years. By 2005, the cumulative contributions to operations from each partner will be proportional to that partner's share. Expenditures are broken down into Hilo base facility construction, operations and management, and instrumentation development.

Table 3c. Calendar Year Annual Contributions for Operations (US $000) (projected values are in 1996 $US; no inflation allowed for)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
United States	3,600	5,100	5,100	7,000	7,100	7,100	7,100	7,100	7,100	7,221
(US forward funding offset)		(1,688)	(1,013)	(1,858)	(226)	86	(306)	(25)	1	(120)
United Kingdom		1,212	2,296	3,302	3,773	4,004	3,812	3,603	3,510	3,510
Canada		906	1,631	1,873	2,156	2,294	2,179	2,162	2,106	2,106
Chile				1,335	764	810	771	721	702	702
Brazil			351	330	377	400	381	360	351	351
Argentina				330	377	400	464	462	437	437
Total Annual Contrib.	**3,600**	**5,530**	**8,365**	**12,312**	**14,321**	**15,094**	**14,401**	**14,383**	**14,207**	**14,207**

Table 3d. Calendar Year Projected Expenditures for Operations (US $000)

Spending Profile	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Hilo Base Facility	132	1,602	2,566							
Operations & Management	30	2,675	7,190	8,629	10,361	11,089	10,751	10,862	10,675	10,707
Instrument Devel. Fund		65	3,284	3,683	3,960	4,005	3,650	3,521	3,532	3,500
Total Ann. Expenditures	162	4,342	13,040	12,312	14,321	15,094	14,401	14,383	14,207	14,207
Funds Carried Fwd.	3,438	1,188	(4,675)							
Total Cash	**3,600**	**5,530**	**8,365**	**12,312**	**14,321**	**15,094**	**14,401**	**14,383**	**14,207**	**14,207**

1997 Expenditures

Table 4a shows the cumulative actual construction project expenditures through 1996, the revised budget and actual expenditures for 1997, and the difference between the budgeted and actual expenditures.

$5.6 M of the 1997 planned expenditures were delayed until 1998. Most of this is from subcontracts or work packages for which there were slower than anticipated receipts of invoices from work currently underway. The Direct Labor charge was above budget due to unbudgeted NOAO labor charges associated with engineering technical services. Some items budgeted as Subcontracted Services were bought off the shelf and so were accounted for as Supplies or Equipment. Freight charges to ship supplies and equipment to Chile for outfitting the enclosure and support building, included in Purchased Services, were higher than anticipated. "Revenue" results from such items as reimbursements from staff travel expenses paid by other agencies, and quarterly rebates from the travel agency.

Table 4a. Actual and Budgeted Construction Expenditures for 1997 and Prior Years (US $000)

	Prior Years	CY 1997 Expenditures		
Item	**1991 - 1996**	**Budgeted**	**Actual**	**Difference**
Subcontracted Services	57,472	34,690	27,840	6,850
Work Packages/UK Credit	4,484	5,932	5,870	61
Total Direct Labor	15,088	3,257	3,379	(122)
Total Purchased Services	2,623	653	745	(92)
Total Supplies/Material	1,815	2,579	3,725	(1,146)
Total Equipment	1,103	550	8,629	(313)
Total Travel	1,948	491	488	3
Total Overhead	2,502	644	647	(3)
Pending Alloc. & Contingency	0	344	0	344
Manager's Reserve	0	15	0	15
Revenue	(42)	0	(17)	12
Grand Total	**86,994**	**49,154**	**43,545**	**5,610**

Similar values for the Operations budget and actual expenditures for 1997 are shown in Table 4b. The 1997 underspend in operations stems mainly from slower than expected deliveries in the Instrument Development Fund and, in the Operations and Maintenance fund, late-year commitments carried over into early 1998 and the glass M2 commitment due in September 1998. Budgeted expenses in excess of cash contributions in 1997 reflect a projected use of cash carried forward from 1996. Actual expenses did not require the use of the cash carried forward from 1996.

Table 4b. Actual and Budgeted Operations Expenditures for 1997 and Prior Years (US $000)

Item	CY 1996 Expenditure	CY 1997 Expenditures		
		Budgeted	Actual	Difference
Operations & Management				
Subcontracts/Work Packages	132	1,212	70	1,142
Direct Labor		1,231	978	253
Purchased Services		421	469	(48)
Supplies/Material		301	463	(162)
Equipment	30	0	381	(381)
Travel		184	168	16
Overhead		0	155	(155)
Revenue		0	(9)	9
Total O&M	**162**	**3,348**	**2,675**	**673**
Instrument Development Fund				
Subcontracts/Work Packages		620	65	555
Total IDF		**620**	**65**	**555**
Hilo Base Facility				
Subcontracts		1,798	1,613	185
Direct Labor		3	0	3
Purchased Services		2	11	(10)
Overhead		2	8	(6)
Revenue		0	(31)	31
Total HBF		**1,805**	**1,602**	**203**
Grand Total	**162**	**5,773**	**4,342**	**1,431**

The column labelled "Budgeted" displays the totals approved by the Board in 1997 although allocation among the items differs. The revision in allocation is primarily a matter of accounting, since supplies, equipment, and services can be purchased on subcontracts, and the classification as supplies rather than equipment may reflect the method of acquisition. Furthermore, in mid-1997, the bulk of the administrative services being charged as overhead to Gemini by NOAO were replaced a combination of straight hourly charges by NOAO and ordinary labor charges by newly hired Gemini employees, while the approved budget counted all of this as direct labor.

The financial data shown in Table 4 have been examined and verified by AURA's auditors (Coopers & Lybrand LLP) through 30 September 1997. (AURA's fiscal year coincides with that of the United States government.) The next audit will cover 1 October 1997 to 30 September 1998.

Proposed Budgets for 1998

A summary of the 1998 construction project budget as approved by the Board in November 1997 is shown in Table 5a. The amount of planned expenditures and new commitments is down significantly for 1998, with almost all major subcontracts and UK work packages awarded by the end of 1997. Included in the Direct Labor category are anticipated credits for PPARC-paid salaries to the Project staff. The new commitments are the part of the cash-plus-credit expenditures that represent commitments to be started in 1998. Table 5b shows the Board-approved operations budget for 1998. There are no contribution credits shown, as operations will be conducted on a cash basis.

Table 5a. Summary of Calendar Year 1998 Construction Budget ($000)

Expense Category	Cash Expenditures	Contribution Credit	New Commitments
Subcontracted Services/Work Pkgs	15,521,731	0	2,375,862
Work Packages for UK Credit		5,129,201	86,000
Direct Labor	2,937,422	51,600	2,989,022
Purchased Services	454,804	0	454,804
Supplies and Material	527,931	0	527,931
Equipment	53,757	0	53,757
Travel	419,103	0	419,103
Overhead	113,834	0	113,834
Manager's Reserve	349,317		349,317
Pending Alloc. & Contingency	539,404		539,404
Total	20,917,303	5,180,801	7,909,034
Grand Total (cash + credit)		**26,098,104**	

Table 5b. Summary of Calendar Year 1998 Operations Budget ($000)

Expense Category	Cash Expenditures	New Commitments
Subcontracts / Work Packages	1,004	1,004
Direct Labor	3,168	3,168
Supplies and Material	492	492
Travel	352	352
Purchased Services	1,204	1,204
Equipment	309	309
Overhead	48	48
Total	**6,577**	**6,577**
Instrument Development Fund	2,729	7,599
Hilo Base Facility	2,255	
Grand Total	**11,561**	**14,176**

Organization

The Gemini Agreement, between the US, UK, Canada, Chile, Brazil, and Argentina, establishes the management structure of the Gemini Project. The Gemini Board is the supervisory and regulatory body, an Executive Agency is empowered to act on behalf of the parties to arrange for construction and operations of Gemini, and a Managing Organization is responsible for day-to-day management of the Project.

The Gemini Board

Board members are appointed for two-year or longer terms by the respective funding agencies of the partner nations. The semi-annual Board meetings were held in Buenos Aires in May and in Tucson in November in 1997. The members of the Gemini Board during 1997 were:

Board Member	Institution	Country
Dr. Judith Pipher	University of Rochester	US
Dr. Robert Gehrz (Chair)	University of Minnesota	US
Dr. Robert Kirshner	Harvard University, CfA	US
Dr. G. Wayne van Citters	NSF	US
Dr. Robert McLaren	University of Hawaii	UH (US)
Dr. Ian F. Corbett	PPARC	UK
Dr. Richard Ellis	University of Cambridge	UK
Dr. Donald C. Morton	NRC	Canada
Dr. Gordon A. H. Walker (to 6/97); Dr. Jean-René Roy (from 7/97)	Univ. of British Columbia; Université Laval	Canada
Dr. Enriqué d'Etigny (to 5/97) Dr. Mauricio Sarrazin (from 6/97)	CONICYT	Chile
Dr. João Steiner (Vice Chair)	University of São Paulo	Brazil
Dr. Jorge Sahade (observer)	CONICET	Argentina

The Executive Agency: NSF

The Executive Agency for the Gemini Project is the National Science Foundation (NSF) of the United States. It is empowered to execute the decisions of the Gemini Board, to handle the financial contributions of the Gemini partners, and to communicate decisions of the Board to the Managing Organization.

Dr. G. Wayne van Citters, acting for NSF, is a member of the Gemini Board. Other personnel are the Executive Assistant, Dr. Susan Kayser, and the Executive Secretary, Mrs. Mary Lou Renninger. Several offices within NSF provide support to the Project.

The Managing Organization: AURA

The Association of Universities for Research in Astronomy, Inc. (AURA) was designated by the Board as the Managing Organization for construction and through the operations phase until 2000.

The senior key personnel since 1995 have been:

Project Director:	Dr. C. Mattias Mountain
Project Scientist:	Dr. Fred Gillett
Project Manager:	Dr. Richard Kurz

The AURA corporate office contact is Mr. Richard Malow.

National Project Offices

Gemini can operate successfully only if the Project makes effective use of the infrastructure that already exists in the Partner countries. To facilitate this, each Partner to the Gemini Agreement has established a National Project Office. The functions of these offices are to formulate input to the Project through national Science Advisory Committees, to provide engineering support for managing instrumentation and other projects and for technical reviews, to support the user community in pre- and post-observing activities, to provide technical support beyond that available at the telescope sites, and to be responsible for instrumentation undertaken by the partner countries. The National Project Offices will also manage the national telescope time allocation.

A National Project Office typically has a Project Scientist and a Project Manager. The personnel during 1997 were:

US	Project Scientist	Dr. Todd Boroson
UK	Project Scientist Project Manager	Dr. Patrick Roche Dr. Adrian Russell
Canada	Project Scientist Project Manager	Dr. Gordon Walker; Dr. Jean-René Roy Dr. Andrew Woodsworth
Chile	Project Scientist Project Manager	Dr. Maria Teresa Ruiz Dr. Oscar Riveros
Argentina	Project Scientist Project Manager	Dr. Emilio Lapasset Gomar Dr. O. Hugo Levato
Brazil	Project Scientist Project Manager	Dr. Miriani Pastoriza Dr. Thaisa Storchi Bergmann

Gemini Science Committee

The Gemini Science Committee (GSC) has the responsibility of making science policy recommendations to the Project Director, with an independent report to the Board. The 1997 meetings were in Edinburgh in April and in Tucson in October.

The members of the Gemini Science Committee during 1997 were:

Dr. Fred Gillett (Chair)	International Gemini Project Office
Dr. Tim Davidge (Secretary)	Canadian Gemini Project Office
Dr. Todd Boroson	US Gemini Project Office
Dr. Luis Campusano	Universidad de Chile
Dr. Suzanne L. Hawley	Michigan State University
Dr. James H. Hough	University of Hartfordshire
Dr. Buell Jannuzi	NOAO/KPNO
Dr. Robert Joseph	University of Hawaii
Dr. Emilio Lapasset Gomar	Observatorio Astronómico, Córdoba
Dr. Simon Morris	Herzberg Institute of Astrophysics
Dr. Miriani Pastoriza	Instituto de Física, UFRGS
Dr. Patrick Roche	University of Oxford
Dr. Jean-René Roy	Université Laval
Dr. Ray Sharples	University of Durham
Dr. Stephen Strom	University of Massachusetts, Amherst
Dr. Charles Telesco	University of Florida

Gemini Finance Committee

The Gemini Finance Committee of the Gemini Board oversees the financial matters of the Gemini Project. It provides advice on keeping the budget within the constraints of cash flow and of total expenditure. The 1997 meetings were in Kona, Hawaii in April and in Weybridge in the UK in October.

During 1997, the members of the Finance Committee were:

Mr. Jeff Down (Chair)	PPARC
Dr. G. Wayne van Citters	NSF
Mr. Albert Muhlbauer	NSF
Mr. Aaron Asrael	NSF
Dr. Donald C. Morton	NRC
Mr. Michael Pawlowski	NRC
Dr. Ian Corbett	PPARC
Dr. Guillermo Ramirez Rebolledo	CONICYT
Dr. Jorge Sahade	CONICET
Dr. Ubyrajara Alves	CNPq

Appendix A

Schedule of Events for the Gemini Board

According to the International Agreement and the Rules for Procedure, the annual schedule of activities for the Gemini Board is as follows:

February The Chairman and Executive Assistant write the Annual Report for the previous year, which is sent to all parties involved in the project. The report describes progress, expenditure, long-range plans, usage of manpower and schedules for the project.

March In early March, the official date and venue of the May meeting is communicated to Board members by the Executive Assistant.

April Before mid-April, meetings take place of the Finance Committee and the Science Committee.

May In first week of May, papers for the May meeting and a draft Agenda are sent to Board members by the Exective Assistant. Papers relating to reports from the Project are sent directly by the Project.

At least one week before the Board Meeting, attendance at the meeting is confirmed by Board members or their alternates.

The Board Meeting normally takes place in the 3rd or 4th week of May. The following items must be undertaken at the May meeting:

Accept the auditors' report.

Take formal note of the projected financial status of the previous calendar year.

The Executive Agency provides an annual report of payments and accepted Work Packages credited to the Parties' contributions, sums transferred to the Managing Organization, and contributions received but not yet provided to the Managing Organization.

Review of the Managing Organization.

June In mid-June, the minutes and the actions and decision list of the May meeting are sent to Board members. (Note: a draft set of decisions is recorded at the May meeting as a basis for action by the Board, the Executive Agency, the Managing Organization and the Project).

September In early September, the official date and venue of the November meeting is communicated to Board members by the Executive Assistant.

October Before mid-October, meetings take place of the Finance Committee and the Science Committee.

November In the first week of November, papers for the November meeting and a draft Agenda are sent to Board members.

At least one week before the Board Meeting, attendance at the meeting is confirmed by Board members or their alternates.

The Board Meeting normally takes place in the 2nd or 3rd week of November. (Note: the budget for the following year has to be approved by 30 November of each year.) The following items must be undertaken at the November meeting:

Approve the budget and work program for the following year.

Note the long-range plans for the completion of the construction and commission ing phase of the project.

Note the likely projected financial status at the end of the current calendar year.

December In mid-December, the minutes and the action and decision list of the November meeting are sent to Board members. (Note: a draft set of decisions is recorded at the December meeting as a basis for action by the Board, the Executive Agency, the Managing Organization, and the Project).

Note: There is one important variant in this proposal as compared with the Gemini Agreement. According to the Agreement, the proposed budget for the following year is to be made available to the Board by the 31 October of each year. This would not allow enough time for the Finance Committee to iterate with the Project and agree upon a set of recommendations to the Board in time for inclusion in the papers which have to be sent out in the first week of November. The Board, therefore, requests the Project to bring forward the date of submission of the proposed budget for the following year to 30 September, thus allowing iteration with the Finance Committee and allowing the papers to be included among those to be circulated during the first week of November.

Appendix B

Acronyms

A&G	Acquisition and Guiding
AO	Adaptive Optics
AMOS	Advanced Mechanical & Optical Systems
AURA	Association of Universities for Research in Astronomy, Inc.
CDR	Critical Design Review
CoDR	Conceptual Design Review
CONICET	Consejo Nacional de Investigaciones Cientificas y Tecnicas [Argentina]
CONICYT	Comisión Nacional de Investigación Científica y Tecnológica [Chile]
CTIO	Cerro Tololo Inter-American Observatory
DAO	Dominion Astrophysical Observatory
GFC	Gemini Finance Committee
GMOS	Gemini Multi-Object Spectrograph
GSC	Gemini Science Committee
HROS	High Resolution Optical Spectrograph
ICD	Interface Control Document
IfA	Institute for Astronomy
IGPO	International Gemini Project Office
ISS	Instrument Support Structure
IT&C	Integration, Testing, and Commissioning
JAC	Joint Astronomy Centre
M1	Primary mirror
M2	Secondary mirror
MST	Ministry of Science and Technology [Brazil]
NIRI	Near Infrared Imager
NIRS	Near Infrared Spectrograph
NOAO	National Optical Astronomy Observatories
NRC	National Research Council [Canada]
NSF	National Science Foundation [US]
NTAC	National Time Allocation Committee
PDR	Preliminary Design Review
PPARC	Particle Physics and Astronomy Research Council [UK]
PS	Project Scientist
RFP	Request for Proposal
RGO	Royal Greenwich Observatories
ROE	Royal Observatory of Edinburgh
SAC	Science Advisory Committee
SBRC	Santa Barbara Research Corporation
SOAR	Southern Observatory for Astronomical Research
SWG	Science Working Group
TAC	Time Allocation Committee
UH	University of Hawaii
VLT	Very Large Telescope
WFS	Wave Front Sensor

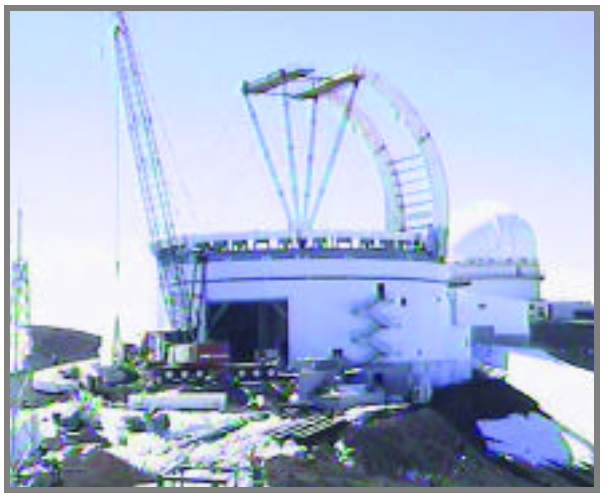
Appendix C

List of Publications in 1997

Doc_No	Author	Release Date	Title
TN-PS-G0048	Simons	01/01/97	Nightly data storage requirements for Gemini instruments
SPE-S-G0041	Oschmann	01/02/97	Gemini System Error Budget Plan
REV-I-G0095	Various	01/10/97	Gemini Aladdin Controller Design Review Materials
REV-I-G0113	USGP	01/10/97	Aladdin design review materials
REV-C-G0093	J. Wilkes	01/13/97	MCS CDR Report
SPE-C-G0009	Wright	01/16/97	Software Programming Standards, Ver 05
SWG-I-G0040	Gillett	01/18/97	Gemini Instrumentation Workshop
ICD-04	Hill/Gaudet	01/23/97	(Software) Logging Information, Ver 11
ICD-16	Wampler	01/23/97	(Software) The Parameter Definition Format, Ver 07
GPRE18	Puxley	01/28/97	Observations of Millimetre-Wavelength Hydrogen Recombination Lines in the Galaxy NGC253
REV-C-G0096	Mayer	01/30/97	The TCS Alpha Review
SPE-C-G0070	Goodrich/Foster	01/30/97	Gemini Record Reference Manual
REV-C-G0097	Beard	02/06/97	CICS Beta Review
RPT-PS-G0075	Gillett et al	02/11/97	Future Gemini Instrumentation
REV-I-G0100	Zeiss	02/17/97	A&G PDR at Zeiss
REV-C-G0099	ROE	02/26/97	GMOS CDR (3 volumes)
REV-C-G0098	Stewart	02/27/97	SCS Alpha Review Report
TN-PS-G0049	Puxley	03/01/97	Scientific User Requirements for the Gemini Phase I Applications Tool
REV-C-G0101	Maclean	03/12/97	PCS Alpha Review Deliverables
PG-PM-G0015	Kurz	03/31/97	Gemini Relocation Policy
REV-I-G0103	Zeiss	04/01/97	A&G CDR at Zeiss
REV-I-G0104	IfA	05/01/97	NIRI CDR Material (2 volumes)
PG-PM-G0009	Kurz	05/12/97	Gemini Project Safety Program, Rev C
REV-C-G0102	Stewart	05/12/97	PCS Alpha Review Report
ICD-G0015	Montgomery	05/15/97	Gemini Facility Handling Equipment and Procedures
SPE-C-G0071	Wright/Jaque	05/28/97	Communications System Functional Performance Requirements
TN-PS-G0051	Puxley	06/02/97	Use of Gemini for a Short, Quick Response to Time Critical Observations
ICD-07b	Taylor	06/03/97	(Software) TCS Subsystem Interfaces

Doc_No	Author	Release Date	Title
REV-I-G0106	Yamada	06/09/97	NIRI and OIWFS CDR documents
REV-C-G0105	RGO	06/19/97	PCS Beta Review Documents
GPRE21	Gillett	06/25/97	On the Comparative Performance of an 8m NGST and a Ground Based 8m Optical/IR Telescope
GPRE22	Smith/Gillies	06/30/97	User Interface for the Control of the Gemini Telescopes
GPRE23	Wright	06/30/97	Communications Challenge for the Gemini 8m Telescopes
TN-PS-G0052	Simons	07/01/97	Basic Assembly and Use of the Cerro Pachon Weather Station
REV-C-G0107	Wooff/Yeung	07/08/97	ECS prototype review documents
ICD-19	Goodrich	07/16/97	(Software) Allen-Bradley PLC Interface, Ver 03
REV-C-G0108	Paterson	07/17/97	SCS Beta Review Documents
GPRE19	Puxley	07/28/97	Execution of Queue-Scheduled Observations with Gemini
GPRE20	Wampler	07/28/97	Science Planning for the Gemini 8m Telescopes
TN-C-G0053	Wampler	08/01/97	Health and Alarms
GPRE24	Vukobratovich/ Gerzoff/Cho	08/06/97	Therm-optic analysis of bi-metallic mirrors
PG-I-G0010	Hunten	08/20/97	Gemini Instrument Site Safety Policy
PG-O-G0011	Stepp	08/20/97	Safety Plan for M1 Cell Assembly Area at NFM Technologies
REV-C-G0109	Stewart	08/20/97	PCS Beta Review Report
REV-C-G0110	Stewart	08/20/97	SCS Beta Review Report
REV-C-G0111	Stewart	08/20/97	ECS Prototype Review Report
REV-C-G0112	Stewart	08/20/97	MCS Implementation Phase I Review Report
SWG-I-G0045	Gillett	08/21/97	OISWG Report
GPRE25	Puxley	08/22/97	Hydrogen recombination lines in the compact HII region K3-50a
RPT-I-G0076	Mountain	08/26/97	Instrument Forum pre-mailing and information
ICD-G0004	Warner	09/03/97	(Hardware) Telescope Hard Stop Angular Limits, Decelerations, Rev D
TN-I-G0054	Dillon et al	09/06/97	Self-learning Bayesian centroid estimation
REV-S-G0114	Hunten	09/25/97	Hydrostatic Bearing Control System Design Review Report
TN-PS-G0045	PT Wallace	09/25/97	Astronomical Coordinate Frames
ICD-07a	Beard et al	10/03/97	(Software) ICS Subsystem Interfaces, Ver 20
ICD-14	Beard	10/03/97	(Software) Core Instrument Control System, Ver 06

Doc_No	Author	Release Date	Title
REV-C-G0115	RGO	10/08/97	TCS Beta Review Materials
REV-O-G0116	Optics	11/03/97	Mirror Stripping Prodecures Review
TN-C-G0055	Goodrich	11/10/97	Writing EPICS Device Support
SPE-O-G0039	Roberts	11/14/97	Functional Specification, f/16 Secondary Mirror Tilt System, Rev E
REV-I-G0117	NOAO	11/17/97	GNIRS CDR (7 vols)
ICD-03	Hill/Gaudet	11/20/97	(Software) Bulk Data Transfer, Ver 22
ICD-10	Johnson	11/20/97	(Software) EPICS Synchro Bus Driver, Ver 02
ICD-13	Goodrich/ Johnson	11/20/97	(Software) Standard Controller, Ver 04
SPE-I-G0074	Kurz/Gillett	12/10/97	Programmatic Requirements for Gemini Instrument Development
REV-I-G0118	Trueblood	12/11/97	GNIRS CDR Report



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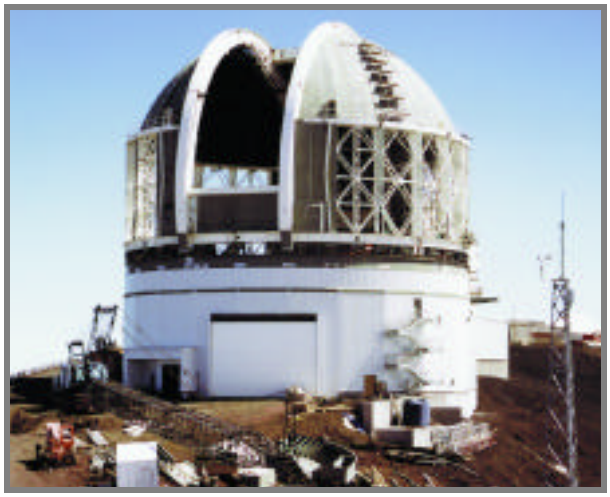

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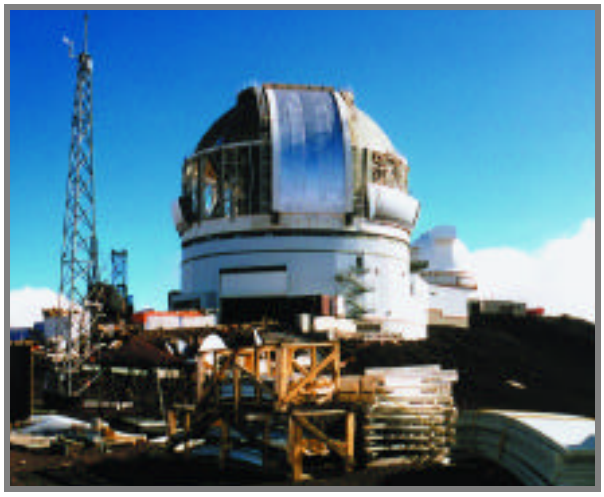
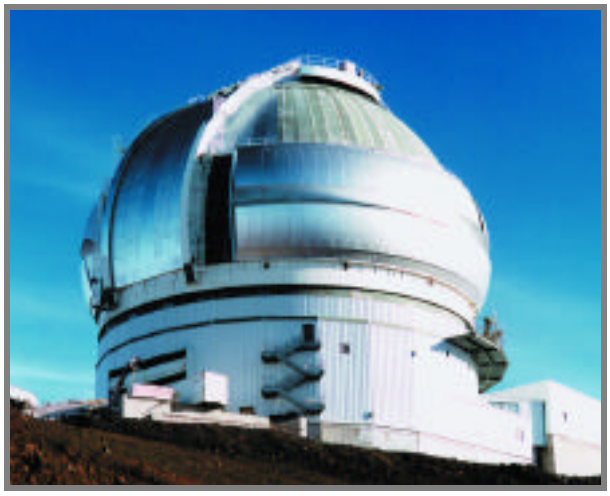


September, 1997



October 1997

Mauna Kea construction in 1997

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