1.0 Introduction:
The Gemini Project is building two, complex telescope system using contractors and partners spread over many countries. Consequently Gemini has to undertake a lot of reviews. In addition it is important that the integration of all these systems, which is the direct responsibility of the International Project Office, is extensively reviewed both internally and externally to ensure that the Science Requirements will be met by the fully integrated Gemini Telescopes.

This document describes the Gemini Projects approach to handling these reviews. We basically define two classes of reviews, System Reviews and Detailed Reviews.

The first are anticipated to be fully open reviews which tackle how Gemini will operate as a system, looking at the detailed performance of the overall system and interaction of the various components and sub-systems. These Systems Reviews will be tasked with taking a top-down examination of whether the Gemini Telescopes will meet the Science Requirements. As progress is made, emphasis will focus on (in addition to performance updates) various other system engineering concerns such as interface definition and tracking, integration and test plans, safety, reliability/maintainability, etc.

The second level of reviews, we have termed Detailed Reviews. The task of these reviews is to examine individual component or sub-systems being produced by our partners or contractors. By their very nature there will be very many of these types of reviews through the lifetime of the Project.

2.0 System Reviews:
System Reviews in general would be large reviews involving major aspects of the Gemini project. They would typically involve support from more than group and the emphasis of these reviews should address system level performance and interactions between the various subsystems. The review teams would usually be made up of both scientists and engineers including some representatives external of the project. Where possible, people who have participated in reviewing various aspects of Gemini in the past will be used to have some continuity. It is desirable to have a fair amount of overlap through each system review, so we would attempt to enlist the help of people who can take a long term interest in this process. We expect to have about two such reviews per year.
System Review #1  July 1994
Overall system review:
   Operational Concept Definition
   Implementation
   Performance
   Interfaces
   Preliminary Integration and Test Plan

System Review #2  January 1995
Primary mirror cell assembly plus related areas
   Primary mirror cell assembly
   Mirror Handling, cleaning, coating
   Interfaces: Telescope, Cassegrain rotator, controls, etc.
   Acquisition and Guiding -- wavefront sensing for control of primary

System Review #3  August 1995
Overall system review:
   Operational Concept & Implementation update
   Controls interactions with hardware
   Cass rotator / A&G
   Secondary mirror assembly
   Design & Fabrication status, other areas
   Performance update
   Interface update
   Integration and Test Plan Update
   Commissioning Instrument status

System Review #4  February 1996
Emphasis in the following:
   Adaptive Optics Design
   Controls interactions (update)
   System performance predictions
   Fabrication progress
   Integration and test plans/progress
   Commissioning plans/progress
   Operations hand over plans

System Review #5  August 1996
Overall Review
   Integration and Test plans
   Commissioning plans
   Verification of performance
   Instrumentation
   System Controls status
   Fabrication status, other areas
   Interface update

2.1 Organization:
Organization and planning of these reviews would be the responsibility of:
2.2 Charge:
Each review may have a different emphasis depending upon the current status of the project. As a general guideline though, the following should be emphasized in system levels reviews:

Early reviews: Operational scenarios
Description of design to date

Later reviews: Fabrication progress
Integration and test plans/progress
Commissioning plans/progress
Operations hand over plans

All reviews: Controls concepts/interactions
System performance predictions
Major interfaces
System safety

Advice is sought in finding potential problems in the interactions of the various subsystems which may limit the telescopes ability to reliably meet the scientific objectives. Constructive suggestions for changes, problems to look out for, and general improvements to enhance the capabilities and minimize risk in a cost effective manner as the project progresses through the various stages of design, manufacture, integration and test are sought and greatly appreciated.

Details of project costs estimates or budgets are not for review in this forum. Cost and schedule will be reviewed independently, but possibly in conjunction time-wise with these reviews.

2.3 Committees:
Committees should be made up of scientists and engineers which are somewhat familiar with the Gemini project, but not typically involved on a day to day basis. In some cases, there may be separate science working groups appointed by the project scientist to review the science aspects prior to a separate engineering review. Possible sources of such people would include:

Project scientists from the partner countries
Scientists from the Gemini Science Committee
Other scientists from institutions in partner countries
Engineers from institutions in partner countries
Engineers from industry

In all cases, care should be taken to select people with appropriate expertise in areas being reviewed and not having any conflict of interest which may be of concern.

2.4 Documentation:
A review package will be available to committee members a minimum of 2 weeks in advance of these reviews. It will contain complete information on the subjects to be discussed and any relevant reference material. A package of presentation material is to be handed out at the review.

The committee will give an oral report to the Project Director and Manager at the end of the review. This is to be followed by a draft written report within one week and a final report within one month of the review.

The project shall prepare a written response to all questions and recommendations within one month from receipt of the final report which highlights answers with questions and recommendations where possible and plans for addressing all of the other issues raised.

### 2.5 Current Schedule of Systems Reviews

The following is the current list of system reviews planned with a brief description of the emphasis for each:

<table>
<thead>
<tr>
<th>System Review #</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Review #1</td>
<td>July 1994</td>
</tr>
<tr>
<td>System Review #2</td>
<td>January 1995</td>
</tr>
<tr>
<td>System Review #3</td>
<td>August 1995</td>
</tr>
<tr>
<td>System Review #4</td>
<td>February 1996</td>
</tr>
<tr>
<td>System Review #5</td>
<td>August 1996</td>
</tr>
</tbody>
</table>
3.0 Detailed reviews:
Detailed reviews will vary greatly depending upon the levels of work being covered. Some which cover a very substantial amount of work should be large, in person, reviews. Other cases may be a periodic review of work in progress of a small work package and as such may involve as little as a conference call. Planning of the appropriate level should be suggested by the responsible group manager. Many of the reviews will be of work in progress at institutions responsible for works packages and at contractors.

3.1 Organization:
Organization and planning of these reviews would be the responsibility of:

- Project Manager
- Group Manager

In consultation with:
- Project Scientist
- Systems Engineer
- Chief Engineer

3.2 Charge:
Each review would be appropriately planned. As a general guideline though, the following should be emphasized in the detailed reviews:

- Design details
- Manufacturing plans
- Controls Interactions
- Subsystem Performance /relation to Error Budget
- Interfaces to other subsystems

Details of costs will be discussed/reviewed only with appropriate project staff and reviewers with the appropriate nondisclosure agreements in place. This may be subject to separate management reviews/sessions. For contractor type reviews, emphasis is placed upon whether the institution or contractor is performing to the agreed contract or work package description statement of work and specifications. Verification of interfaces and progress against schedule will also be of prime concern.

3.3 Committees:
Committees should be made up of scientists and engineers which are very familiar with the Gemini project. No formal (separate) science working group would in general be set up. If the subject under review has been primarily worked on by one of the project groups in Tucson, the committee should include some level of members external to that group. For contractor or work package reviews, the committees would be mostly project people. This would be handled on a case by case basis.

Possible sources people for detailed reviews reviewing work done primarily by one of the groups in Tucson would include:

- Project scientist or his designee/ systems engineer/chief engineer
- Project scientists from the partner countries
- Project engineers from other groups
- Experts in relevant disciplines from institutions in partner countries

Possible sources people for detailed reviews reviewing work done primarily by contractors or done within work packages would include:

- Responsible Group Manager and his staff
- Project scientist or his designee/ systems engineer/chief engineer
- Project engineers from other groups
- Other project scientists
3.4 **Documentation:**
There are no formal advance documentation requirements. Some of the larger reviews may require advance documentation and reference material as requested by the appropriate group manager responsible. Packages of presentation material will be distributed at the review.

As a minimum, meeting minutes will be generated with a list of actions / recommendations to be considered. Written reports and/or an oral report from the committee may be requested by the Project Manager or Group Manager (in advance).

The organization being reviewed shall prepare a plan to respond to all questions and recommendations within one month from the review which highlights answers to questions and recommendations where possible and plans for addressing all of the other issues raised.

3.5 **Current Schedule of Detailed Reviews:**
The current schedule of detailed reviews planned is attached for reference in appendix B.
4.0 Interactions between detailed and system reviews:
The major emphasis of any of the systems reviews should be correlated with the work in progress at the
time. This will often be evidenced by the areas under detailed review. These systems reviews, however,
should cover broad areas of the project detailing interactions between subsystem that have evolved and
presenting any changes in major interfaces.

Once a year, this review might be considered an overall project review. An example might be the first
systems review (to be held in the summer of '94). This will cover the project as a whole. It will have a
major emphasis on how the telescope will be used, the controls interactions, all major interfaces, and a
preliminary integration and test plan.

The systems reviews in between these overall reviews may have more of a concentration in a particular
area. An example may be the second systems review (currently scheduled for early '95). This may have an
emphasis on the primary mirror assembly. Since a detailed review of the mirror cell assembly, preliminary
reviews of the coating plant, mirror cleaning, coating stripping will have recently occurred, this review may
concentrate on this assembly and the interactions with these other areas and the required mirror handling
involved. The appropriate level should be decided on a case by case basis.

A brief list of areas to be covered in each system review is given below. It was generated by comparison of
our current schedule of detailed reviews given earlier and the overall expected project progress at each
review:

System Review #1 July 1994
Overall system review:
  Operational Concept Definition
  Implementation
  Performance
  Interfaces
  Preliminary Integration and Test Plan

System Review #2 January 1995
Primary mirror cell assembly plus related areas
  Primary mirror cell assembly
  Mirror Handling, cleaning, coating
  Interfaces: Telescope, Cassegrain rotator, controls, etc.
  Acquisition and Guiding -- wavefront sensing for control of primary

System Review #3 August 1995
Overall system review:
  Operational Concept & Implementation update
  Controls interactions with hardware
  Cass rotator / A&G
  Secondary mirror assembly
  Design & Fabrication status, other areas
  Performance update
  Interface update
  Integration and Test Plan Update
  Commissioning Instrument status

System Review #4 February 1996
Emphasis in the following:
Adaptive Optics Design
Controls interactions (update)
System performance predictions
Fabrication progress
Integration and test plans/progress
Commissioning plans/progress
Operations hand over plans

**System Review #5 August 1996**

Overall Review
Integration and Test plans
Commissioning plans
  Verification of performance
  Instrumentation
System Controls status
Fabrication status, other areas
Interface update

Further reviews to update integration and test progress, commissioning, etc. may be scheduled at a later date.

Appendix A contains the agendas for each of these reviews (as they are generated) for reference.
Appendix A
System Review Agenda

Systems review #1 Agenda (Draft)
3/20/94

The following summarizes a draft ‘agenda’ for the systems review in July. Possible agenda topics/areas to be covered:

1). Top look at overall system
   - SRD version 2.0 plus?
   - Description of overall telescope
   - Results from previous reviews

2). How we use Gemini
   - Operational Concept Definition
     - Observation Scenarios
     - Software Design
     - Implementation
       - Tip/tilt
       - Auto focus
       - WFS
       - Computers, networks, etc.

3). Interfaces
   - Descriptions of all major interfaces
   - Interface Control

4). Performance
   - Error Budget (note assumptions used)
   - Performance predictions
   - contingency planning?

5). Integrated Schedule
   - Operations ramp up
   - Contingency planning

6). Facility Integration
   - System Integration and Test
   - Operations support
   - up to First Light
   - through Hand over

7). Specialty Engineering
   - Safety
   - Maintainability / reliability
     - Cleaning / coating / handling
Appendix B
Gemini Reviews