GEMINI

8-M Telescopes Project

Gemini Laser Guide Star Program

CoDR Material – Secondary Support Structure Interface

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Revision Control

1. Draft document. April, 2000. For inclusion into Conceptual Design Review documentation - not for release.

Table of Contents

1. Purpose

This document contains material intended for inclusion in the Conceptual Design Review (CoDR) of the Gemini Laser Guide Star (LGS) program. It briefly examines the issues surrounding the addition of LGS equipment to the telescope top-end and the likely effects on the existing systems, notably the Secondary Mirror Tip/tilt system (M2TS).

2. The Secondary Support Structure

The Secondary Support Structure (SSS), Figure 1, currently holds the M2TS and its associated components; the Deployable Baffles and the XY Positioner. Also mounted there are sensor interface electronics and cabling junction boxes. Cabling runs through cable-trays on the rear of five of the eight vanes to a cooled electronics enclosure (the CEM) mounted on the top-end ring.

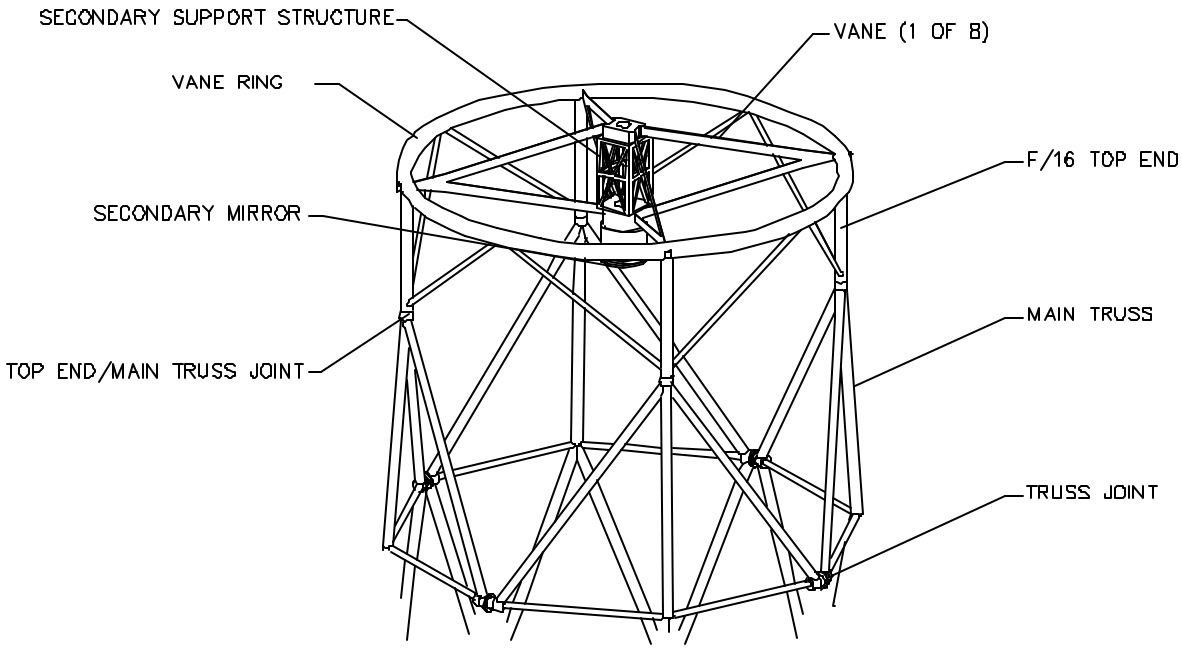

Figure 1: Gemini top-end and Secondary Support Structure

The LGS system will require additional equipment to be mounted on the SSS. This will fall into the following categories:

- Laser launch telescope; a deployable mirror mechanism that launches the laser beam pattern on the sky
- Beam steering mirrors and sensors, plus their local interface electronics
- Beam monitoring cameras and their interfaces
- Beam profiling and diagnostic equipment
- A beam shutter

- Miscellaneous junction boxes and other equipment, as required.

The addition of this equipment must be done in such a way that it can coexist successfully with the M2TS and not cause unacceptable performance degradation. This is of particular concern with regard to the tilt system chopping performance.

3. Impact on the M2TS

The addition of the LGS will increase the mass and reduce the available space on the SSS. Both of these may interfere with the M2TS. Any increase in power dissipation on the SSS must also be kept to an absolute minimum.

3.1 Effects of Increasing Mass

Adding mass will lower the frequency of the structural resonances seen by the M2TS. In the present configuration these have been measured at 18Hz and 32Hz, and have been compensated for using digital notch filters in the M2TS control system. Post-install of the LGS these notches would have to be readjusted before the tilt-system was used. Consideration must also be given to how much the resonances can be allowed to lower before chopping and tip/tilt performance of the M2TS is compromised. Resonances attributable to the mirror itself, on the order of 300Hz, will remain unaffected.

3.2 Available Space

There is a limited envelope into which new hardware can be inserted on the SSS. The largest addition in terms of mass and volume will be the LLT, which will also block the central line-of-sight through the SSS when deployed, and could potentially interfere with the operation of the Central Baffle. If no longer necessary the Central Baffle may be detached from the back of the XY Positioner and removed entirely. This would remove approx. 10lbs of mass from the SSS, but is subject to the approval of the Science staff.

3.3 Power Dissipation

Additional power dissipation within the SSS must be minimised. This precludes the siting of power supplies or amplifiers within the SSS unless absolutely necessary. In these cases low-disippation electronics must be employed as active cooling is not possible, due to the need to pipe coolant across the vanes.

3.4 Cabling

The only way to pass cabling from the SSS to the main trusses is across the vanes in the back-mounted cable trays. Currently three of the eight vanes have no cables inside, making them available for use by the LGS. The vane trays place a tight constraint on the quantity and overall diameter of the cables. This in turn implies the use of serial data transmission where possible, and also reinforces the need for low-power consumption of the SSS-mounted equipment in order to minimise conductor cross-sectional area.