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# RECENT TECHNICAL ACTIVITIES

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## Cassegrain Bonnette Control System Upgrade Project

After nearly twelve years of service, the control system that governs the moving components in the cassegrain bonnette (CB) is getting a well-deserved upgrade. Although the performance of the system from a scientific point of view has been quite good, operationally the CB control electronics has been difficult to maintain due to its layout, construction methods employed and the poor state of the bi-lingual documentation. These limitations have lead to lost observing time. The good news is that with the incredible advancements made in the electronics field over the past decade, there are many highly integrated and well-documented control systems commercially available that could alleviate the operational problems of the current control system. Based on our positive experiences with the servo control modules from Galil Motion Control Inc. on the Coude F/4 spectrograph, the new F/35 upper end and the new F/8 upper end, we have selected a highly integrated version of Galil's servo control system for the cassegrain bonnette.

The new system will condense the control electronics that is presently distributed between the cassegrain environment and the fourth floor back observing room through the CAMAC data acquisition system, into one enclosure mounted along side the bonnette. The new control system will continue to employ linear servo amplifiers (for X, Y and Z axes) mounted off the telescope to minimize radiated electronic noise and power dissipation near the light path. This upgrade will significantly reduce the amount of cables and electrical connectors, thus increasing system reliability and maintainability. This new control system will be a slave device to the TCS computer, through it's main RS-422 serial communications link. Communications from data acquisition computers to the bonnette will continue to be passed through TCS to keep the controller slaved to only one master.

A diagnostics interface console, that accesses the CB controller through an auxiliary serial port will be available for use during bonnette setups and troubleshooting, without going through the TCS computer. Appropriate communications interlocks between the TCS and diagnostics interfaces will be in place to insure the controller remains as a single user system.

No significant changes in the cassegrain bonnette functional specifications are planned for this system upgrade. The guide mirror positioning accuracy (for both X and Y axes) will remain at  $\pm 4$  microns over its 400 millimeters of X and Y possible motion. The constant velocity creep mode (for X and Y axes) for non-sidereal tracking of objects will remain at a range of 0.0002 mm/sec through 0.48 mm/sec. Guide camera focus (Z axis) will retain an accuracy of  $\pm 4$  microns. Full functionality of the guide camera color and attenuator filter wheels, and the CB central mirror will remain intact. The present electro-mechanical based security logic that prevents possible collisions between the guide probe mirror and the central mirror will be retained, although it will be upgraded with current programmable logic technology.

The design of this new control system is presently well underway, with the project's critical design review planned for mid-June 1993. Implementation and testing of this system will be conducted from early June through October. System installation on the telescope will begin on 2 December 1993, and be completed by 7 January 1994, over which time no cassegrain focus observing has been scheduled. With the exception of contracting out the fabrication of a few printed circuit boards, the entire design and implementation is being conducted by the CFHT technical staff.

*S. McArthur*

## Telescope Oil Spill

Last December, as the CFHT Board, just happened to be taking their annual stroll through our summit building, we were subjected to the ultimate embarrassment of the year. A Board Member casually mentioned that there appeared to be a pool of oil at the base of #7 coudé turret in the 3rd floor inner coudé!

At first, we thought this must be a leak from the small hydraulic hoist used in setting up the F/4 coudé train but alas - our worst fears were confirmed when we traced the source, all the way up to the south pier of the telescope bearing support!

Our telescope right ascension travel, moves very smoothly on a film of hydraulic oil 0.004" thick, introduced onto the bearing surfaces via seven hydrostatic oil pads, i.e., four journal types on the large horseshoe and two journal and one thrust type at the south pier. All seven bronze pads are mounted on pivots such that they are always self aligned to the surface they are supporting. The high pressure oil, 600 psi, is introduced through an aperture in the center of the pad and in theory the oil should return via a moat type groove near the edge of each pad.

In practice, a fair amount of oil gets past those grooves and especially in the case of the horseshoe with its large surface area, quite a bit of oil is left on the bearing surface and eventually runs into a large catchment tray below the horseshoe.

At one stage, the oil from this tray was allowed to flow directly into the gravity feed/return line to the reservoir tank in the first floor area. Since this fairly large volume of oil ran over most of the south side of the horseshoe, plus various parts underneath, before going to the collecting tray, the practice has been to empty the tray frequently, run the oil through a filtering process and pump it back into the reservoir.

However, in the case of the south pier, being so much smaller in surface area, the excess oil from the three hydrostatic pads, was allowed to feed directly into the gravity feed return line and be filtered with the remainder of the oil returning from the hydrostatic oil pads. Prior to entering the reservoir, all this oil has to pass through four, 10 micron filters. Conclusion from December '92 oil spill:

The accumulation of foreign material (paint flakes, dirt, water) plus filters overdue for replacement resulted in the 10  $\mu$  filters being clogged. Oil built up in the return line to the fifth floor level and then 'cascaded' down the coudé stove pipe to the third floor level.