GNIRS PROGRESS REPORT

May 17, 2003 – June 13, 2003

Accomplishments / Status

Summary: 99% of the work from the Restart Review to delivery has been completed. Some of the work in the MS Project schedule was rephrased, so the schedule shows only 97% complete as a result. To date we have attempted four cold cycles, the fourth is reported in detail below. Daily progress reports are being produced to keep current on status and activities as the instrument nears completion. We currently have the instrument in the clean room for repair to the OIWFS, flexure compensator weight adjustment and sealing of a minor light leak. The next cold cycle should be the last needed and we should be ready to have the Pre-Ship AT in mid-July. The Manuals are now complete except for final revisions to the User's Manual and incorporation of Gemini's comments to the Service and Calibration Manual. The change order for delivery to Chile has been completed and signed off, and the spares list provided and agreed to by Gemini.

This is a summary of the past cold cycle with GNIRS, and plans in preparation for the Pre-ship Acceptance Test.

OIWFS problems:

*The circuit for the temperature control diode for the detector was open (all 4 wires, with one shorted to ground). This meant that the detector was running around 60K. The best explanation is that the ribbon cable was damaged external to the OIWFS bench. We were able to run the detector well enough for all tests, but this needs to be fixed.

*In the course of the last 2 cold cycles and associated OIWFS work, the detector lost alignment (probably when the wiring to the detector socket was repaired). The filter wheel pinholes are shifted off the quadrant by about 20 pixels relative to the desired location, so only parts of two images are seen.

*The gimbal mirror "flop" (jump in flexure) is still present, though reduced in amplitude by a factor of 4.

OIWFS good news:

*The focus adjustments now put the best images at f/16 near the center of travel (slightly negative). The image quality is the same as before at this best focus.

*The image quality at f/33 is significantly better, with FWHM not much above 1 pixel.

Science channel problems:

*The light leak at the detector mount has been eliminated, revealing another lower-level light leak. This amounts to a few tenths of an electron/pixel/sec (down by a factor of 20 or so from the previous cycle). Investigation using various configurations indicates that this originates inside the camera housing somewhere (after the fixed entrance baffle for the camera turret).

*Flexure testing shows that the compensator settings, now implemented correctly, come close to removing the elastic flexure components in the spectroscopic configurations. There will be flexure in the acquisition modes, but these are not intended for long exposures (flexure <1 pixel/hour in acquisition mode). There remain components due to hysteresis and drift. For the long cameras, the maximum combined effect appears to be ~0.3 pixels/hour. In addition, we saw a repeatable jump on one occasion when testing with the long blue camera, which is due to camera turret rotation. This was anomalous in that we did not see the same behavior previously or subsequently in the identical configuration. The one-way jump seen previously with the grating turret did not appear, so it has (probably) been cured.

*Image quality is affected by the cryocoolers, though we have reduced the size of the effect. The problem is still at the collimator, based on the distortion patterns. The effects are more readily apparent when operating at f/33, where the intrinsic image quality is better. Tests with the cryocoolers in different operating modes suggest that the cooler motor vibration and not the displacers may be the driver. We don't know why the effect was not seen during initial testing; it is probably a combination of operation at 60 Hz (where the motors are quieter), operation at f/16 (worse intrinsic images) and different weight settings.

Science channel good news:

*The f/33 image quality is quite good, but we have not quantified it yet.

*Detector performance is also good, though there is room for improvement still (apart from the light leaks). Effective read noise at low bias with maximum averaging is <8 electrons. Our testing so far has indicated that the optimum temperature for the detector is 31K or less (GNAAC temp readout). The read noise continues to decrease with increased averaging almost exactly as sqrt(N), so we have modified the GNAAC code to permit 64 and 128 low noise reads (this was a simple change). Increasing the number of digital averages is not nearly as simple and is not being considered. We did not test the larger LNR values because the light leaks would influence the apparent read noise. Note that at 128 LNR's, the minimum frame time (one set of reads) would be ~70 sec.

*The new detector mask is working well (does not scatter background), and it and the detector are nearly perfectly aligned (errors <1 pixel). We hope to re-align the detector to the same degree when it is re-installed after the warm work described below.

Planned activities:

GNIRS was warmed up and transferred to the basement clean room for the rework described below.

Once it is open, we will remove the detector and end caps and shields, and attempt to identify the light leak location. We will also verify our suspicion that the isolated camera jump is due to brake adjustment. Depending on our success in these activities, we will decide whether or not it is necessary to remove the main bench.

If we do need to do so, we will remove the bench and then the OIWFS. Otherwise we will remove only the OIWFS bench as has been done previously.

The OIWFS work comprises realigning the detector and tracking down the temperature control diode fault. Since the diagnosis for the gimbal mirror problem appears correct, but the compliance in the Ti spring plate seems inadequate, the best solution appears to be to fasten the plate to the mirror cell next to the problem spring finger, to eliminate the local "oil can" effect. This involves drilling and tapping in 2 locations. It remains somewhat puzzling that the NIRI OIWFS does not show this effect.

The detector optimization so far indicates that the nominal operating temperature of 34K is too high, so we need to shift the range of temperature control downward somewhat, by modifying (or replacing) the thermal resistor block on the cold strap. There is concern about allowing the detector to get too cold, so the target minimum temperature should be about 25K. (This probably corresponds to ~24K on Pachon, where it isn't 100F outside). This should allow us to see the expected upturn in read noise below 28K or so, and give us headroom for operation in the range 28-31K. The data so far show very similar performance at 28 and 31K.

Further work on damping the compensator is required. We can also tweak the adjustments to get rid of the residual elastic terms, though these aren't very large.

Next Milestones: The next major project milestones are:

- Complete Cold Cycle 5 by July 14
- Ready for Pre-Ship AT on July 14

Earned Value:

	July	August	September	October	November	December	Jan-Feb	Mar-May	May-June
BCWS	$3,567,153	$3,572,138	$3,572,138	$3,572,138	$3,572,138	$3,572,138	$3,572,138	$3,572,138	$3,572,138
BCWP	$3,202,553	$3,186,692	$3,206,344	$3,216,275	$3,254,387	$3,274,323	$3,276,019	$3,380,046	$3,375,194
ACWP	$4,068,240	$4,137,200	$4,205,116	$4,283,803	$4,370,562	$4,502,594	$4,581,247	$4,724,157	$4,745,416
SPI	.90	.89	.90	.90	.91	.92	.92	.95	.94
CPI	.79	.77	.76	.75	.74	.73	.72	.72	.71

This table reflects planned and actual charges to the project as of June 9, 2003. The project has spent $1,577,366 in capital to date. BCWS did not change for this reporting period because MS Project is reporting this number to the August 2000 baseline schedule, which does not reflect adjustments to subsequent schedule revisions. This number would change if the project schedule baseline were updated. We have no plans to update the baseline at this late date in the project.

Project Management: (99% complete) The project plan may be viewed on the GNIRS web site at: http://www.noao.edu/ets/gnirs/ under Management, Planning. A schedule showing work left on the project has been prepared and may also be viewed on the GNIRS web site. The instrument is scheduled to ship to Chile in the third quarter of calendar 2003.

Systems Engineering: (100% complete).

Mechanical Design, Fabrication, Assembly and Test: (100% overall).

Electronics: (100% complete).

Software Development: (100% complete).

Alignment and Integration: (99% complete overall)

	December	**Jan-Feb**	**Mar-May**	**May-June**
IV. Cold Tests	26%	41%	90%	98%

Deliverables: (99% complete overall). This task includes Instrument Hardware, Training, and Documentation.

Documentation	**November**	**December**	**Jan-Feb**	**Mar- May**	**May-June**
Test Plans	99%	99%	99%	100%	-
Software Maintenance Manual	66%	76%	100%	-	-
Service & Calibration Manual	40%	53%	66%	90%	90%
User's Manual	27%	44%	53%	99%	99%
As-Built Fabrication Drawings	75%	100%	-	-	-

Procurement: (99% complete overall). Only items being procured are miscellaneous parts and supplies, plus travel and shipping cost to Chile remain.

Problems / Solutions

OIWFS rework has required opening the instrument three times for repairs, and we have been able to use the periods when the instrument was open to make other adjustments and fixes to the instrument.

Key Personnel

No Changes.