MONTHLY STATUS REPORT

Engineering & Technical Services
April 2003

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DESCRIPTION: The Gemini Near Infrared Spectrograph is a $4.2 million long-slit spectrometer that will be mounted on the Gemini South 8-meter Telescope on Cerro Pachon, Chile. It will operate from 1 to 5 um and will offer two plate scales and a range of dispersions. The instrument is scheduled for completion early in 2003. See regular monthly reports on the web at http://www.noao.edu/ets/gnirs/.
N-NW 0 MONSOON

DESCRIPTION: The MONSOON Image Acquisition System is the NOAO solution for scalable, multichannel high-speed image acquisition system. Additional information can be found at the MONSOON website http://www.noao.edu/ets/monsoon/.

The initial focus of MONSOON is to develop an IR Laboratory Test Set for the RIO ORION Project. This capability will also support the RIO VIRGO and Rockwell HAWAII 2 family of FPAs, prove the MONSOON system concept and provide the baselinesystem for NEWFIRM implementation. This test set is composed of a Linux-Based Ghz PC, 1Gb/s FiberLink, Detector Head Electronics Chassis (DHE), one Master Control Board (MCB), one Clock & Bias Board (C&BB), and two 36 Channel IR Acquisition Boards (IRACQ), along with associated software.

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<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
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<tr>
<td>IR Lab Test Set</td>
<td>DHE Chassis</td>
<td>CLK &amp; BIAS Board</td>
<td>36 CH IR ACQ Board</td>
<td>Software Design</td>
<td>System Safety Verification</td>
<td>FPGA Design</td>
<td>Functional IR Lab System</td>
<td>Software PDR</td>
<td>Monsoon CD</td>
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<tr>
<td>Actual Hours</td>
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<tr>
<td>Actual Capital</td>
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RESOURCE ISSUES

- Jerry Penegor continues to be heavily involved with GNIRS and NEWFIRM.
- Kaviraj Chopra, the EE Intern working on VHDL issues, is scheduled to graduate in June.
- Peter Ruckle now available for programming, but still heavily involved with GNIRS.

RECENT ACCOMPLISHMENTS

- Software:
  - Software simulator for the Detector Head Electronics operational.
  - Debugging tool to check hardware functionality operational.
  - GP Utility level libraries completed
  - Low Level Hardware interface libraries completed
  - PAN processes near completion and should be ready for testing in early May
  - Coding for MONSOON User Interface started with help of Peter Ruckle
  - PAN-DHE configuration database ready for use
- System:
  - Verified correct MCB operation in local mode
  - Verified IR Acquisition Board to on-board access to read write memory
  - DACs successfully programmed from PAN
  - Assembler code compiler for Sequencer MPU completed
- Reached major milestone in April: Bits to FITS demonstrated in lab system
- Data path from the PAN computer to the sequencer mpu and PAN decode logic on the Master Control Board and then to the peripheral boards has been verified to perform as expected. Data path from peripheral boards to the master control board and then to the PAN computer have been verified as functional. Data taking at maximum
acquisition rates (80 MPix / sec across backplane and 50 MPix / sec across the fiber) using these paths has been reliably demonstrated.

- Sequencer mpu tests performed with the result that the sequencer mpu instruction set has been verified and test sequences run successfully but we are limited to half the expected time resolution (50 ns instead of 25 ns) because of a memory problem with the design. We'll go with this and fix the problem later as it doesn't restrict us for the current milestones.

- Systran boards that required the external clock have been successfully tested and prove that earlier problem with SYNC protocol definitely restricted to either one board and / or earlier firmware revision. In addition, to get the systran boards to work we had to run the master control board at 130% clock speed. The firmware in the fpgas and the board logic performed without fault at this speed.

- We have identified various faults in manufacture of the IR acquisition boards (SN001 & SN002) and with the associated daughter boards. One board (SN002) has been tested with 18 channels and shows a nominal 3.5 ADU rms noise term on all working channels (there is still one channel that needs work). 36 channels have been acquired (33 working) reliably with slightly higher noise for the channels associated with the daughter boards. This essentially tells us that the board layout is good and we are progressing with data taking to determine the boards characteristics for linearity, cross talk, and frequency response. So far these data strongly support the notion that the two board required for Orion can be built with no modification to the current board design. We will put more effort into bringing the noise floor down next month.

- IDL software tools have been produced and refined to allow analysis of the data taken from the IR Acquisition boards.

- Concentration moves to testing and evaluating performance of IR Acquisition boards.

- VHDL training session completed.

- Clock and Bias board code verified in simulation; ready for actual coding and verification through testing.

- Issues with raw throughput of Master Control Board Bus resolved by modest coding re-design that partitioning 32 bit data word into 24 data bits and 8 control bits. This enables 1 clock per transfer instead of 3 clocks per transfer. Long-term solution to allow 32 bit data word will be re-visited later as necessary.

**PLANS:**

- Complete populating CLK & Bias boards.
- Assemble and Test MCB Rabbit Adapter Boards.
- Optimization of IR Acquisition Performance.
- Continued test of IR PCB assemblies.
- Continued Test of IR System.
- Continued Development of FPGA based logic in all 3 PCB assemblies. Focus on IR Acquisition needs.
- Operate an ALADDIN readout in the NOAO ALADDIN test dewar with Monsoon and confirm that Monsoon operation meets or exceeds prior operation within extant NOAO systems.
- Continued Development of MONSOON Software with focus on IR Test system needs.
- Continued Test of CCD Prototype System.
- Software PDR to be held in the June time frame
- Hardware CDR to be held in the August time frame.
- Develop/identify/modify waveform definition language and create MPU sequencer compiler to enable efficient sequencer coding.
N-NW 1 NEWFIRM

DESCRIPTION: This is a multiyear project to develop a wide field, near infrared imager designed for use at the Cassegrain focus of the Mayall 4-M telescope. A draft of the concepts for this instrument can be found at http://www.noao.edu/ets/newfirm/newfcon.html.

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GENERAL: The top assembly definition of the instrument is essentially complete. Estimates of design, fabrication and test are done. The project plan is in process and should be completed by May 5th and the project schedule (MS Project) should be complete by May 14th. A plan outlining work required to get to PDR is in place and a dry run is scheduled for May 20th and 21st. The PDR review committee is in place and the review date has been set for June 4th and 5th.

Work is proceeding on the definition and design of the Guider, and the preliminary design will be completed by the PDR.

SCHEDULE:

ACCOMPLISHMENTS:
- Preliminary design of the instrument is essentially complete, including optics, electronics and mechanical.
- We are currently soliciting bids for the optics and the dewar.
- Good progress is being made on the guider definition and design.

PLANS:
- Complete a program plan, schedule and cost estimate by May 14, 2003.
- Dry run of the PDR presentation May 20-21.
- Hold the NEWFIRM PDR on June 4th and 5th.
**Electronic Design (D. Stover)**

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<td>GNIRS</td>
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<td>GONG - Camera Power Supply upgrade</td>
<td>SNG 100 500</td>
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<td>Documentation Wavefront</td>
<td>NNX 510 844</td>
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**Finished items**

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**COMMENTS**

Much time has been spent on the backlog of documents and have been able to finalize 45 documents. Although the status shows complete they have not been given to Beth since I am still working on other documents within the same project number. I will hand them over all at once when the series is finished or I have the need to put it aside for a while.

I have not gone back to the WTTM documents as of yet.

The GONG Camera Power Supply Chassis documents came back with minor redlines, most were in the form of notes for additional information. The boxes are being machined and I am expecting some as built redlines to come my way.
Instrument Shop (R. Repp)

Small Purchase Orders (Account Numbers, Vendors, Products Purchased, and Cost)

- NNK510-850, Precision Plating, Anodize ......................................................... $76.32
- NNU533-180, Perfection Powder Coating, Paint 1001 ....................................... $85.00
- NNU560-300, Precision Plating, Anodize .......................................................... $55.12
- NNU580-310, McMaster Carr, Stainless Steel Retaining rings ....................... $88.79
- NNU580-310, McMaster Carr, Stainless Lag Bolts ........................................... $23.94
- NNW053-009, Precision Plating, Anodize ......................................................... $65.72
- NNW053-408, Precision Plating, Anodize .......................................................... $55.12
- SNP140-110, McMaster Carr, Stainless Hardware ........................................... $4.98
- SNP140-130, McMaster Carr, Drum Stand and Hoses ....................................... $188.94
- SNZT04-009, Tube Service, Steel Tubing ....................................................... $262.00
- SNZT04-009, T.A. Caid, Angle Iron ................................................................ $56.13
- WWW370-201, McMaster Carr, Stainless Hardware ......................................... $27.59
- WWW370-210, McMaster Carr, Stainless Hardware ......................................... $15.75
- SNP140-110, McMaster Carr, Hose Nipples and Stainless Hardware ............... $16.36
- SNP140-1110, McMaster Carr, Large Stainless Hardware Order ...................... $285.27

Total Non-Shop Expenditures, April 03 ........................................................ $1,307.03

In addition to these expenses, the instrument shop budget contributed money to purchase needed stock, software and supplies for all projects that are manufactured at NOAO.

Instrument Shop Spreadsheet (page 2) at a Glance:

- 437 estimated hours of work in progress
- 384 hours in shop queue
- 3,820 hours of potential future projects for instrument shop (Includes NEWFIRM)

Projects Completed by Instrument Shop April 2003

- Two Aperture Test Grids--WIYN (Harris)
- NEWFIRM Bushing Test Assembly (Harris-Final Inspection Required)
- Rework of three Lens Slides for GONG (Harris)
- Interometer Test Rail—ATST (Harris)
- Door Repair for CFO (Harris)
- Fine Tuning of Shipping Crate Details--GNIRS (Stein)
- Misc. Monsoon Electronic Panels (Stein)
- Misc. Details for Hydra WIYN (see database for details)—(Stein/Harris/Reddell)
- New Oil System Plumbing for FTS (Staff Shop/Rath)
- Eccentric Discs—GONG (Staff Shop/Rath)
- Assist with SOAR Interface Design (Staff Shop/Rath)
- Design and Fabricate Optical Lens with Rack Gear—WIYN (Staff Shop/Rath)
- Misc. Walk In Assignments, test boards, computer panels, pump repair (Staff Shop/Rath)
- Move of SOILS VSM to Farm (Mills/Hauth)
## Instrument Shop (cont.)

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<th>DRAWING NUMBER</th>
<th>DRAWING TITLE</th>
<th>PROJECT</th>
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<td>VISITOR CENTER METORITE STAND</td>
<td>PIO</td>
<td>RON HARRIS</td>
<td>2</td>
<td>5/16/2003</td>
<td>COMPLETE--NEEDS PLATING</td>
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<td>5 DRAWINGS</td>
<td>NEWFIRM BUSHING TEST</td>
<td>NEWFIRM</td>
<td>RON HARRIS</td>
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<td>5/9/2003</td>
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### INSTRUMENT SHOP QUEUE

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<td>AROUND THREE MONTHS FROM FAB--EST IS PLACEHOLDER</td>
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<tr>
<td>MANT/DEVELOPING NEWFIRM</td>
<td>NEWFIRM</td>
<td>3500</td>
<td>MUCH WORK UPCOMING, MAYBE IN OCTOBER?</td>
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Infrared R&D Program (K. M. Merrill)

- Al Fowler and Bill Ball have finished the modifications required to use the "Gold Standard" Go-Fish lab electronics to test Orion arrays in the Orion lab dewar using Wildfire. Data have been successfully taken using the Orion bare readout warm and cold tests will follow. We should be testing the Science Grade Orion readout in early May.

- The Orion 2 readout has been taped and sent to the chip manufacturer to be made.

- Al Fowler and Michael Merrill have been involved in drafting the IR detector portion of AURA NIO proposal for technical development funds related to the GSMT.
Optical Coating Laboratory (G. Poczulp)

SOML High Bay Lease
Work by SOML staff continued in the 4m high bay area with the delivery of the generated secondary blank. The glass is now on the machine and the swing arm profilometer is being modified to improve it’s stowed position. The start of polishing will probably begin in early May.

WTTM Beamsplitter Mounting
N-NX539-202
H. Yarborough successfully mounted a WTTM beamsplitter into the supplied cell with RTV.

ATST Seeing Monitor Interferometer
S-NP412-000
Worked with E. Hansen to check out an optical spar that will be used to position a collimated beam through the slit of a dome at Big Bear Solar Observatory. The wavefront quality of the beam will be monitored using a phase shifting four-channel interferometer. Baseline measurements using a heat source and fan were taken in the optical shop with the spar in two positions, horizon pointing and near zenith pointing.
<table>
<thead>
<tr>
<th>Upcoming Coating Lab Projects</th>
<th>Chamber</th>
<th>Coating</th>
<th>Contact</th>
<th>Received</th>
<th>Need Date</th>
<th>Planned Start</th>
<th>Estimated Duration</th>
<th>Planned Completion</th>
<th>Delivery Date</th>
<th>Account #</th>
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<tr>
<td>CTIO H-alpha Filter</td>
<td>NRC-3177</td>
<td>cold MgF2</td>
<td>J. DeVeny</td>
<td>4/28/2003</td>
<td>3 days</td>
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<td>N-NCS04-000</td>
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<td>VPH Grating</td>
<td>NRC-3177</td>
<td>cold MgF2</td>
<td>S. Barden</td>
<td>4/28/2003</td>
<td>3 days</td>
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<td>N-NX517-200</td>
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<td>Three Lenses</td>
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<td>MgF2</td>
<td>A. Potter</td>
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<td>MDM 1.3m Primary</td>
<td>4m</td>
<td>Al</td>
<td>J. Halpern</td>
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<td>5 days</td>
<td>5/16/2003</td>
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<td>Z-ZKP00-044</td>
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<td>4m</td>
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<td>M. Klaene</td>
<td>9/8/2003</td>
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<th>Actual Start</th>
<th>Actual Duration</th>
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<td>2m Solar</td>
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<td>H. Schweiker</td>
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<th>Estimated Duration</th>
<th>Planned Completion</th>
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<td>MDM 0.5m Secondary</td>
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<td>K. Hinkle</td>
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<td>5/9/2003</td>
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<td>S. Barden</td>
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<td>N-NX517-200</td>
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<tr>
<td>SOLIS FDP Optics Alignment</td>
<td>J. Wagner</td>
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<td>S-NT400-320</td>
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<th>Actual Duration</th>
<th>Actual Completion</th>
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<td>WTTM Beamsplitter Mounting</td>
<td>C. Claver</td>
<td>4/10/03</td>
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<tr>
<td>ATST Seeing Monitor Interferometer</td>
<td>E. Hansen</td>
<td>4/14/03</td>
<td>5/2/03</td>
<td></td>
<td></td>
<td></td>
<td>S-NP412-000</td>
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</table>
Computer Services (C. Danielson)

- Beth's new printer install
- Get printer working for Larry
- Order scsi cable for Lepew
- Install new cable on Lepew and remove dds3 tape changer
- Make sure scanner still works on Lepew
- Try to fix Starjeep
- Rebuild Spider with failed Starjeep parts (HW ok!)
- Continue dialog with 3D Labs re: pc problems
- Start rebuilding Starjeep w/ W2K load
- Peter Moore's problems with two pc's in basement office
- Make backup of two problem pc's and pcmport
- Receive laptops from JS and try to make work
- Ask N Mills to borrow his old laptop to use power pack and floppy to load lappers
- Get drivers from ibm.com for lappers/drivers&bios updates
- Load first lapper; try to make it work for what we wanted it for
- Make cd of drivers and stuff for lappers
- Make ghost image of lapper working as well as it can
- Load 2nd lapper from ghost image of first; try to make 2nd lapper work for what we wanted
- Get Melissa's new solo 600 set up
- Work on sunchaser for adaptec software problems
- Dave H Compaq assistance
- Order new ps re: 3D Labs input - CarlD went and got
- Try out new ps
- Order same brand ps as 3D Labs had - 2 actually
- Dick Joyce getting Roy's lapper - need to check out & set up
- Check on cas reports to find out when ps are arriving cas reports don't work! - call Clark to check
- Solve problem rebooting on GBW1051 by going back to 512M Mem Sticks check with Ron H re: casters CarlD took out of cabinet Dave H re: cd writing problems
- Check w/ Fernando re: PS
- Install newly arrived power supplies into pc's
- Confirm correct operation of pcs
- Install Wildcat VP760 in intel MB pc - seems to work now
- Order additional ps & 1-case fix WallyB's email problem
- Get dead GBW from Drafting room and try to make it work assist John A on GBW's
- Get new pc for Drafting room and try to make it work
- Get new pc for Rich Gomez
- Get new pc for John Andrew
- Order more video boards for 733 replacements (for failing Elsa boards)
- Order hard drives (for replacement in 733 in peecee lab)
- Beth's Lepew problems
- HP DJ 990c for Al F
- Rich G re: Outlook reload after Beth install
- Contact Mike P re: Rich G Outlook 2000
- Deliver new pc to Rich Gomez
- Deliver new pc to John Andrew
- Beth problems with permissions on Tiba
• Rebuild pc for Lepew replacement
• Work on Steve Grandi laptop
• Ed Bell re: computer not getting to net (from .24 to .18)
• Fletcher re: email client
• Consult with Carl D re: Fletcher's request
• Basset move to Server room
• Draftback to pеееееee lab for rebuild to Tech File server
• Inkjet printer for techs (w Dryden & Beth)
• Assist Dryden w/ inkjet printer
Programming Group (R. Marshall)

Behzad Abareshi

- Worked on Monsoon CCD prototype project. I started with familiarizing myself with Rabbit 2100, an 8-bit microcontroller that would serve as the brain of the DHE, and Dynamic C, the flavor of C used by Rabbit. Thanks to Dave Dryden for teaching me how to use an oscilloscope, and other tidbits on electronics. We used an LCD to learn how to control external peripherals with Rabbit. The latest development has been communication between Rabbit and the sequencer CPLD.
- Worked on Ra and Dec streams and their corresponding offsets, back calculated by the telescope. Before, the offsets were actually errors, the difference between where the telescope was and the specified target plus the specified offset. Removing the specified offset from the calculation provides the true offset, which is what we want.
- Fixed a minor bug with the WIYN archiver program, introduced after adding automatic gzipping of archives; moving the gzipping process to the background prevents the archiver from hanging when the size of the archive file is very large.
- Participated in Hydra upgrade meetings.

Nick Buchholz

- Continued debugging and modification of the common DHE hardware libraries for MONSOON.
- Completed testing of new hardware test program to support use of low-level libraries.
- Completed Testing Libraries to handle 32 bit Addressing scheme writes to the DHE.
- Continued working with Al Fowler to get wildfire ORION2 software system working.
- Continued development of panCapture and panProcAlg code for final PAN software system.

Phil Daly

- On NEWFIRM, some prototyping work was achieved regarding the Observation Header System (OHS) and the Instrument Control System (ICS). Progress was made on timelines towards PDR and post-PDR. A meeting was held on dewar control software with a view to identifying prior to PDR the path to take. This will spill over into May since code by Shelby may also be suitable but, right now, the best choice appears to be re-use of the Phoenix system.
- On MONSOON, a *major* hardware and software milestone was reached in the reporting period - "first bit" was achieved on 15 April 2003 when data flowed down the fibre from the prototype system constructed in the laboratory. Some quirks were found which were solved and the software now interacts with the hardware and produces the correct FITS output to disk!
- Other MONSOON developments include the re-arrangement of the miscUtil library to conform to the other util library way of doing things and the creation of top-level makefiles in the Apps, Hdw and Util directories of the source tree. Executing "make everything" at these levels not creates all subordinate software (in the right order).
- Added was a psync utility for keeping "external" systems up-to-date with decapod. This can be run from any machine or by any user (with a decapod account) but should *not* be executed on decapod or a machine which has the decapod disks NFS mounted.

Shelby Gott
- Installed iServer interface boards in both CassIAS and Wuff.
- Fixed re-connection problem in UWF software, and modified CassIAS software to support the iServer.
- Built a power supply to allow operation/testing of hollow-cathode lamps in the lab.
- Re-wired hollow-cathode lamp connectors inside CassIAS to conform to pin numbering used elsewhere, so lamp assemblies and cables can be interchanged.
- Continued work on replacement logic devices for the WIYN SES dome control circuit. I'm finding the compile-burn-test-debug-rewrite cycle to be very awkward with our only device programmer located downtown, so I've given that approach a rest while I make a logic module using an 8051 microcontroller, which I can reprogram and test on the mountain. Maybe we should have a universal device programmer up here?

Bob Marshall

- Projects:
  - Worked on the new KPNO Backup system. Wrote a script to check the current backup status and found many systems that did not have recent backups. Started to manually backup those systems, using some of the disks purchased for the new backup system.
  - Did planning for more disk upgrades.

- Operations:
  - Assisted Jim Hutchinson in verifying Sparc-20 components for mountain system upgrades.
  - Continued setup work on Sparc-20s for the CCD Lab. Installed 2 new 18GB disks in recycled enclosures, added memory and SBus boards. Copied files from 'navajo'. Had some unexplained system crashes while installing the files (CPU, memory or network errors).
  - Setup printing for 'tan' at the 4-meter.
  - Installed OpenSSL and OpenSSH on 'teal' at the 2.1-meter for Doug Williams' cache installer.
  - Setup a disk on 'bordeaux'.

- Maintenance:
  - Fixed the system setup for 'azure' at the 2.1-meter: login problems, mounts and links, disk cleanup.
  - Responded to disk errors on 'cinnamon' at the 4-meter. Jim Hutchinson replaced the old disk with 2 new 18GB disks and rebuilt the system on a new disk and setup an online backup on the other new disk. Updated WEB documentation for our new disk setups along and added Solaris specific information.

Dave Mills

- Implemented another batch of header updates on vanilla, pearl, and navajo. This solved some old issues with telescope position and offsets.
- Updated calibration lamp info in WIYN GUIs.
- Supported reinstallation checkout of 4m wavefront hardware.
- Modified mosaic logfile strategy to avoid extra-large files.
- Added a mosaic-focus predictor to XTCS mosaic inspector.
- Implemented a log-all-stream events router client at WIYN, logs to a mysql database on thistle.
- Fixed WTTM filter name in headers and filtered out spurious error reports during filter moves.
• Obtained Roper software in preparation for testing cascade CCD cameras (possible future guider) at 4m/WIYN. Investigated possible interface solutions (Fiber/Camlink-LVDS, embedded micro-PC with Fiber ethernet).

• Continued guider upgrades. Tested some functions at 4m T&E. Guide sample rate is now up to 30Hz full frame (25Hz with realtime LUT manipulation). Lock positions working. Added optional output to DS9/Ximtool, warp-to-star can find and use multiple targets. Added compatibility wrapper to allow old guider GUI code to operate with only minor mods.

Peter Ruckle

• Most of the month was spent with GNIRS. Doing cold testing and hardware and software debugging. Any free time is spent either on the monsoon labtest system or familiarizing myself with the Phoenix motor software.
Risk Management (C. Gessner)

- There were no OSHA reportable injuries reported this month. Completed the necessary regulatory paperwork for the injury that occurred in March.

  Investigated a hit and run vehicle accident in the parking lot and vandalism to an illegally parked vehicle. Reviewed archived images with no success in determining the perpetrators. U of A police was notified on the illegally parked vehicle.

- A considerable amount of time was spent on the Kitt Peak fire reduction strategy. Met with T.O. Fire Management Officer Guy Acuna and U.S. Fish & Wildlife Service Wildland/Urban Interface Specialist Curtis Heaton. Mr. Heaton has been a tremendous help sorting through fire regulations and agencies. We agreed that the short-term plan would be to trim trees and bushes, remove undergrowth vegetation and non-native species near critical structures by using the NOAO funds. We are investigating a long-term solution that would require an environmental assessment. By having an environmental assessment, Kitt Peak could utilize Wildland/Urban interface grant funds to establish and maintain defensible spaces at Kitt Peak. To date a physical survey was conducted on Kitt Peak to determine priority areas and the landscaping “scope of work” package with the necessary approvals has been submitted to procurement. A pre-bid walkabout is scheduled for May 9.

  In preparation for the fire season, Kitt Peak Facilities has reinstalled the foam fire-fighting machine on the 5000-gallon tender. Witness a trail run of the machine and rewrote the operation procedure.

- Conducted a safety review of a 2.1 M top change. Discussed several recommendations to enhance the safety of our staff, including fall protection. Ordered and received new fall protection equipment that will help in this procedure and others. Two additions to our fall protection equipment include a temporary horizontal lifeline and two vertical lifelines.

- Distribution of key cards to NOAO South, friends of NOAO, visitors and contractors continue, but the volume of requests has been lower. Modifications to all affected door locksets have been completed. Interior lobby doors are locked with limited issues. By request, interior lobby doors are open for the NSO Brown Bag Colloquium and NOAO Flash meetings. TAC participants have been issued individual key cards.

- Made a few additions to the NOAO & NSO Contingency Plan master copies including a file containing employee photos and a few address changes. A master copy is located in my office and one in my brief case.

- Participated in the lifting of the SOLIS instrument and transportation from the basement to the GONG farm. Was asked to be the head rigger for the first of two GNIRS moves this month.

- Consulted on a number of risk management issues including security, eye and foot protection, 4M tripping hazard, RMT safety walkabout, workers compensation, positioned a spare radio at CAS for after hour communication with the security guards and industrial hygiene matters.