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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/.
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>Jan</th>
<th>Feb</th>
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FY 03

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RESOURCE ISSUES

- Following Barry Starr’s departure, the major resource issues will be centered on providing high level systems engineering and firmware coding as Monsoon moves from a carefully crafted master design to a fully detailed implementation plan and ultimately an operational data acquisition and control system.
- Peter Moore has assumed the mantle of lead engineer.

ACCOMPLISHMENTS

- Laboratory PC and Fiber Links were received and configured.
- The 36 Channel IR Acquisition Board prototype is composed of two physical PCBs (motherboard, daughter board) that mate together to form a single assembly and occupy a single chassis slot. Two mother boards have been assembled and partially tested with excellent results. Full test has been a very involved process lasting through December. Noise levels are within desired range to support ORION testing and have been measured at the 1-2 ADU level (14 to 15 bit) with a "non-optimized" system configuration. The daughterboards were delivered from the PCB manufacturer and passed initial tests.
- Completed assembly and initial tests of the IR Test Set DHE Chassis.
- Assembled an performed initial tests on an IR Acquisition Daughterboard and Combined Motherboard Daughterboard Assembly.
- Sent a completed Pixel Acquisition Node (PAN) PC for Chile. This includes Dell GHz PC, Systran Fiberlink, Redhat Linux Software, VMWare LINUX/WINDOWS Software, Windows 2000, XILINX WebPACK FPGA Development Package, and Rabbit 2000 Software.
- As anticipated, Chile provided a fully tested CLK & BIAS Board PCB prototype towards the end of the month. A partially populated board was produced in Tucson as a contingency.
• MONSOON Software development continues with emphasis of the low-level modules necessary for hardware development and test.
• Construction of the PAN daemon command processor, DHE control, and process initializer has continued.
• Construction of the PAN Capture, PAN algorithm and PAN Saver processes is proceeding in parallel with the command processor.
• Gustavo Rahmer arrived from Chile to provide valuable assistance on the CLK & BIAS Board firmware implementation here in Tucson and to participate team effort to push the Monsoon project as far forward as possible prior to Barry’s departure.
• Spent much of January focused on the detailed design and implementation plan for Monsoon through the delivery of a working lab test facility for Orion. This team effort culminated in a detailed plan covering the next 6 month for marshalling resources and measuring progress was produced.
• Established a Monsoon Configuration Control framework to identify, collect, collate, and control all system parameters.
• Established software and hardware performance requirements to operate ALADDIN and Orion devices.
• ALADDIN & Orion requirements approved.
• Began study for Sequencer back end (i.e. Waveform definition).
• Firmware coding for modifications to Sequencer interface logic about 70% complete.
• Created central repository for “Red Flagging” potential problems.
• Starting reporting framework to follow board specific modifications.
• Firmware version control and style guide has been implemented.
• All “top level” designs have been completed with the exception of the sequencer.
• Sequencer architectural design structure competed.
• Completed Top Level design for the CLK & Bias Board.
• Completed CLK & Bias board amplifier selections.
• Larry Daggert, Peter Moore met with Andy Rudeen of the Keck Asteroid team (visiting Tucson on other business) and used the occasion to brief Andy on the continued NOAO commitment to Monsoon, review plans and progress, and show him some real hardware.

PLANS:

• Complete populating CLK & Bias boards.
• Assemble and Test MCB Rabbit Adapter Boards.
• Optimization of IR Acquisition Performance.
• Continued test of IR PCB assemblies.
• Specify and Order Missing DHE Chassis Components.
• 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.
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](http://www.noao.edu/ets/newfirm/newfcon.html).

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<td>Actual Capital</td>
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GENERAL:
The NEWFIRM program is steadily progressing on top assembly definition of the instrument. A detailed work plan for completing preliminary design, covering the period through the end of May, has been established. This plan includes tasks to define and specify all internal and external interfaces to the instrument. A PDR is planned for early June.

The NEWFIRM website is being revised and updated to include additional design data and SDN information.

SCHEDULE:

A detailed plan showing all work through “Freeze Configuration” is available on request.

ACCOMPLISHMENTS:

- Three cryo coolers will be used in the instrument. The type of cryo head chosen is the Leybold 5-100-2.
- Work is proceeding on lens cell and fold mirror cell design.
- Work has started on defining the electronics needed for detector interface and instrument control.
- The optical design is proceeding. The warm-cold design should be completed this month.
- The filter wheel assembly is being revised and updated.
- Several Systems Design Notes (SDN’s) are in process to specify critical requirements and interfaces.
- KPNO is working on the 4m Telescope interface specification for the NEWFIRM instrument.
PLANS:

- Complete the optical element design effort. Prepare the drawing package for bids by early March.
- Complete systems, opto-mechanical, electronics, and software preliminary design efforts by April 4, 2003.
- Complete a program plan, schedule and cost estimate by May 1, 2003.
- Present the NEWFIRM final configuration, with cost, schedule and resource requirements by June 2, 2003.
Electronic Design (D. Stover)

Most of my time has been spent on Monsoon documentation. Assembly and BOM's for the 5 cards finished in December before xmas break. I have also been doing sketches of the board stackups to extract dimensions for panel cuts. I will continue with redlines and use this hardware checkout period to reorganize how the current set of boards is located on my hard drive and update the doc's in the working group area.

A small portion was for reviewing KPNO documents on the wave front upgrade. The electronics drawing package is need of some clarification and can not be released at this time.

I will soon be working on a specific list of documents in my backlog list. I will need some technical support to accomplish this.
Instrument Shop (R. Repp)

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

NNU533-180, Perfection Powder Coating, Paint GNIRS Shipping Crate ........$595.00
NNU580-310, McMaster Carr, Misc. Metric Hardware (3 orders) ...............$499.85
NNU580-310, MSC, Threaded Inserts for Bulkhead Modification ...............$327.88
NNU580-310, EMJ, Steel Stock for GNIRS Tilt Adjustment Assy ...............$329.35
NNW053-407, Precision Plating, Anodize ..............................................$55.12
NNX510-003, Precision Plating, Anodize ..............................................$55.12
SNT400-145, Precision Plating, Anodize ..............................................$127.20
ZZXP00-053, Bralco Metals, Aluminum Stock (2 orders) .........................$606.42
ZZXP00-053, Tube Service, Rectangular Aluminum Tubing ....................$335.80
Total Non-Shop Expenses ....................................................................$2,931.74

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:

- 480 estimated hours of work in progress
- 616 hours in shop queue
- 160 hours of potential future projects for instrument shop (will actively seek more in February 03)

Projects Completed by Instrument Shop January 2003

- Gong: More Lens Slide Modifications
- GNIRS Shipping Container Painted
- Linear Slide Encoder Test for WIYN
- Bulkhead and Radiation Shield Modifications for GNIRS
- Numerous details and design modifications for GNIRS
- Lens Grinding Fixture for Echelle
- Dark Slide and Filter Wheel Modifications for SQIID
- Ongoing and extensive design and fab effort for NSO FTS
- First prototype of ATST Air Temperature Probe (5 more in progress)
## Instrument Shop (cont.)

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<th>DRAWING NUMBER</th>
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Upsgrades to FTS will consume 90% of Rath’s time this month.

| TOTAL HOURS IN SHIP: 2/4/03 | 480 |

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<th>INSTRUMENT SHOP QUEUE</th>
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<td>GONG BAY AND CAMERA PANEL MODS</td>
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| TOTAL QUEUE HOURS: 2/4/03 | 616 |

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<tr>
<th>ANTICIPATED UPCOMING PROJECTS</th>
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<tr>
<td>MANY/DEVELOPING</td>
<td>REDISEIGN AND BUILD SUNSPOTTER SCOPES</td>
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Infrared R&D Program (K. M. Merrill)

- Al Fowler and Michael Merrill are working on a revised work scope for the Orion Project in line with last month's decision by the Orion Project team to modify the readout design to make it more fault-tolerant.

- Measurements of the noise characteristics of Virgo readouts were completed and Al Fowler has generated a summary report of the noise versus temperature characteristics of this design.

- The dark slide assembly was installed in the lab dewar to allow dark current measurements next month using the prototype Orion science grade array (on loan from Raytheon Vision Systems (nee Raytheon Infrared Operations)).
Optical Coating Laboratory (G. Poczulp)

**SOLIS VSM Specific**
S-NT400-310
The Offner M1, M2 and M3 mirrors were mounted into their respective cells using electronics grade RTV and both units were assembled. The beamsplitter prism was mounted into its cell without any problems.

**SOLIS FDP Specific**
S-NT400-320
Preliminary work on assembling various lenses into their mounts was started.

**Indiana University – Echelle**
Z-ZXP00-055
A grinding fixture to hold four small plano convex lenses was designed and subsequently fabricated in the instrument shop. The fixture will also be used to hold the lenses when they are AR coated next month.

**SOML High Bay Lease**
The Steward Observatory Mirror Laboratory crew built an extensive deck around the stressed lap polishing machine located in the 4m high bay area. By the end of the month they were attempting to get power to the polishing machine in preparation for the beginning of polishing work.

**ORION Test Dewar**
N-NX519-132
Detector substrate serial number 5 was tested while warm and then after being cooled to operating temperature.

**GNIRS Cold Tests**
N-NU560-500
Working with Dick Joyce and Jay Elias, a number of interferometric tests of the GNIRS acquisition mirror were performed using a variety of techniques for mounting the front legs. The mirror was also tested in a freestanding condition as well as installed in the mounting fixture. The figure of the replicated mirror was found to be dependent on the torque of the screws used to mount the front legs. Spacing washers were also required to minimize the deformations due to the slight surface mismatch between the legs and the substrate.
The off-axis collimator mirror was also tested interferometrically to verify that the surface was unchanged after testing the mounting flexures with force gauges. The focus of the collimator was set to coincide with the focus of the f/3.3 diverging lens on the ZYGO interferometer. This produced a collimated beam that was reflected back to the collimator a second time using a large optical flat. The beam was focused and then returned to the ZYGO to complete the double pass test. The test showed that the collimator surface was essentially unchanged since the last time it was checked in May 2002.
### Upcoming Coating Lab Projects

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<th>Contact</th>
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### Completed Coating Lab Projects

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### Upcoming Optical Shop Projects

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<td>3 days</td>
<td>2/10/2003</td>
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**Optics Lab & Optical Shop (G. Poczulp)**
Computer Services (C. Danielson)

- Moved computer from DMAC to main computer room
- Added cabling in DMAC building
- Installed two dot-ten switches for wireless connectivity
- Replaced all the batteries in the computer room UPSs
- Installed CAT-5 cables for new director’s office
- Mike F re: fan for power supply
- Start new pc with Win2k load
- Get clone image on cd for win 2k load
- Get clone of fixed xp initial load
- Frank Bull - loan Win2k full install cd
- Jerry Penegor re: plain text password fix for w2k
- Jerry Penegor re: plain text password fix for W95
- New loaner pc - old graydawg now lanz-18
- Get John Andrew info on video board setup to try on his xp pc
- Update Al F's anti-virus program - Norton Corporate standalone - done
- Monitor up to drafting (spare & microfilm)
- Drop off monitors to Jerry Smith for salvage
- Let Jerry know about two monitors up in drafting printer area
- Assist Beth with Web mail problem
- Turn off Draftback
- Remove HP870 to basement
- Get extension cord for Win2K & XP machines in John Andrew's area
- Fletcher's loaner pc
- Lou's old pc needs work and parts
- Email Gateway re: Lou=PC power supply
- Email Gateway re: Al F's lapper battery
- Barry Star's person with Office XP-->Office 2K
- Get new drafting pc shipped to 3d labs and keep up email to support
- Order replacement video boards for failing Elsa's
- Replace failing Elsa boards with new 3d labs
- Continue with problems on new drafting pc's - keep Larry D updated
- Order another 1.5 v agp video board to test
- Order another P4 mb for tests
- Update eggs, chimi, nt-test-gate,
- Futz with anti-virus software
- Phone call from Beth re: continuos av scans on DS
- Talk to Carl re: Beth's concerns
- Req for more mice for stockroom
**Programming Group (R. Marshall)**

**Behzad Abareshi**

- Helped Charles Corson to install NIRIM software (including voodoo) on Almond. Also rearranged Almond IDE setup to free up a PCI slot for the NIRIM card. The only side effect, discovered later, was that cdrecord, which only works with SCSI drives and needs emulation to work with IDE drives, was not working. Bob Marshall notified Charles on how to fix the problem.
- Participated in final testing and commissioning of WIYN's spare encoder board; the board has been running on the telescope without a glitch for 3 weeks. Scott Bulau also fixed some minor noise problems with the original encoder board, which I am now using in my TCS simulator downtown.
- Installed the Tpoint software on 'piranha'.
- Made considerable progress on the new TCS Tpoint module. During the T&E we verified that the module was working well for Tpoint terms involving Az only or El only. We ran out of time to verify terms involving both Az and El, since the pointing map for these take considerably more time. We also identified a major problem area, the northwest quad, where the limit switches are; the TCS can reach most of this area either in CW or CCW motion, and depending on the target it guesses the best way to go to minimize a wrap-around during tracking. This ambiguous behavior affects any polynomial terms in Tpoint that involve Az, since in polynomials wrap-around makes a difference; in other words, there is a difference between -90 and +270 when we deal with polynomial terms involving Az. Later I used the simulator to perform the proper translation whenever TCS is in the northwest quad; the tests show an excellent fit and no discontinuity, which was a problem before. Using the simulator, I also verified all the time consuming tests involving both Az and El, and they all passed. Now we need some telescope time to verify the results on sky. We can probably do this during the Feb T&E and commission the new Tpoint module.
- Played a little bit more with the iServer, which emulates a serial connection over the network. I used a simple C program to open a socket and talk to serial devices (TCS console and Hydra motors) across the network. The iServer seems ideal for the Hydra upgrade project, where RS-232 daisy-chain topology is the best way to go, but distance between the host computer and the motors was an issue.
- During the T&E fixed the broken tcs.target.name stream. This stream was always set to "unknown" in the MPG router, and was reversed (not quite) on the WIYN router side! After inspecting the TCS code I realized where the problem was. This stream is the only one that is an arbitrary character string; as such, it was the only string that was not "packed" and "unpacked" byte by byte for transport across the network. Instead, strcpy() was used. This would have been fine if the platforms for both the TCS, where the stream is generated, and the router, where the stream is received and unpacked, had had the same endianness. But the Motorola 68K board is big endian and PCs are little endian (my guess is that this problem did not show up on SunOS, where it was originally developed, since Sun's are also big endian). I simply used the byte by byte packing and unpacking scheme, and also fixed the MPG router side.
- The MPG router now disconnects clients that are not picking up the data they subscribed to. I first implemented this so that the client would be disconnected as soon as it stopped picking up data. The only grace period here was the time it would take for the socket buffer to fill up, which depends on network traffic, and can take from 6 minutes to less than 30 seconds. We noticed that with this scheme the WFS camera client would get disconnected when taking exposures, when it suspends reading data streams. So I revised the scheme to set a limit for the number of dropped messages before the client gets disconnected. This limit can be set at the command-line level when the MPG router is started, and it also can be changed on the fly from the router's console (thanks to Bob Marshall's suggestion). In current operation we can in practice assume that MPG router has an update rate of 1 Hz, which means that setting the limit to, say, 60 gives a client a grace period of 60 seconds on top of the time it takes the socket buffer to fill up before it gets disconnected by the router. This should take care of clients such as WFS camera, and will be tested during the Feb T&E.
- The archiver now gzips its current archive file before starting another one or before quitting. This is one step towards automating the house keeping on bone, since the archive files are usually quite big and need periodic zipping to prevent the disk from filling up. This feature will be commissioned on the next T&E.

**Nick Buchholz**

- Continued testing and revising the common DHE hardware libraries for MONSOON.
- Started revising communications libraries to deal with interface changes.
- Worked with Hardware Engineers on Capabilities and requirements document for Monsoon for Orion.
- Re-re-worked on hardware test code to support hardware development.
- Worked on revision of Addressing scheme to handle 32 bit writes to the DHE.
- Coordinated the Configuration File Format with Hardware Engineers.
- Worked with P Ruckle to allow him to pick up the wildfire software maintenance.
Phil Daly

- January was spent updating the "On An Observation Control System for NEWFIRM" document which is now posted on the NEWFIRM web site. This includes a new dictionary of commands that should meet all NEWFIRM science requirements.
- On MONSOON, I also updated the panDaemon to handle commands defined via a configuration file. The idea here is that any engineer might edit this file (say to add a new voltage) and the panDaemon reads the ASCII text and creates a command of the same name automatically. Such commands when issued (via a socket or the command line), are inherently read-only when no additional parameter is specified. If a parameter is specified (i.e. a value), then the command is interpreted as a write instruction.
- No progress on Java but Rob Seaman and others have just started a course at Pima Community College which I might be able to tack on to.

Shelby Gott

- Finished re-building four read sub-module boards for the 4-m cass guider. Tested them in the lab. Waiting for an opportunity to install and test them on the telescope.
- Took WUFF apart, sent biggest piece downtown for machine work to make room for connectors, then put it back together. Made a bracket to support Hall-effect sensors for the stage limits. Internal wiring is underway, expected to be done in a few days.
- Tested and refined WUFF software using the actual stage motor and sensors. Experimented with using a Newport iServer instead of running a serial cable. Developed technique to re-connect to the iServer automatically when the socket has been broken.
- WIYN SES spare parts are in hand, except a straggler or two. I have the EPLDs, but I'm waiting for low-level code files I've been promised before attempting to re-compile them from source.

Bob Marshall

- Project related work:
  - PMTC: collected all the log files for PMTC in preparation for creating a CD-ROM with all the PMTC logs files. I will fix the file names and make the logs consistent before burning the CD-ROM for Emma Hogan and Scott Bulau.
  - Provided a 1Q review of the KPNO software projects.
- Operations:
  - Tested ftp between 4-meter computers in response to reported problem with pecan.
  - PMTC: Fixed field width problem in the PMTC logs.
  - Fixed 'cread' in 'service' on ivory, bone and tan.
  - WIYN: Installed new "hosts.allow" and "hosts.deny" files for the SUNs. Tested new files on the Linux systems.
- Maintenance:
  - 2.1-meter: Investigated the 2.1-meter pointing problems. Reviewed the logs and the TCS code. Did some tests at the
  - 2.1-meter and found the problem to be bad absolute encoder values after the servos are reset. The absolute encoder cycles through bad values after each reset and is correct in one of four attempts.
  - WIYN: IDL license update, almond CD-RW.
  - Mountain: 'coral' printing problems.
- Other:
  - Completed performance evaluations.

Dave Mills

- Integration and testing of the 4m wavefront camera. A successful T&E run with the upgraded software revealed problems with the WFC mirror which are being addressed. Single-click wavefront analysis is now working.
Temperature control is also working with a power-supply work-around. Target star auto location and automatic clip of the dual ROI's implemented.

- North probe position (WFC) is now enabled on the operators VDU. WFC desktop is available via VNC.
- More new FOPS autofocus algorithms were implemented and tested at WIYN. The new method is much better!
- Made some small changes to the WFScam software. Fixed problem with the calibration GUIs. Fixed problem with WIYN DSS disk, now uses Journaling file system and is mounted read-only to avoid lengthy fsck'ing at reboots.
- The DIMM telescope has arrived and is under test. Test CCD readout has been setup using the driver and GUI developed for WFC. Requested RoboDIMM software from Chile as it was not included. Loaded a VMware virtual machine with Windows in anticipation of its arrival.
- Rebuilt my desktop system (RH7.3) as the system disk was occasionally locking up (SCSI errors). Old Sun monitor also died. Replacement requested.
- Continued working on the new guider software upgrade.
- Implemented automatic south guide probe focus adjustment at 4meter, based on the excellent characterization data provided by Bill Gillespie.
- Did some more research on possible future acq/guider CCD cameras/interfaces.

Peter Ruckle

- The computers are set up in the flex rig and should be ready to run the instrument. There is now a DHS server and a software server for GNIRS in the flex rig so there are no network delays.
- I am starting to familiarize myself with some aspects of MONSOON in order to help on the project.
Risk Management (C. Gessner)

- No OSHA recordable injuries were reported to this office in the month of January. There was a workers compensation claim filed by a Kitt Peak employee that is being viewed as personal medical condition.
- We experienced a minor vehicle accident involving two Kitt Peak employees. No one was injured and an internal accident report was filed.
- As an annual requirement, the OSHA 300A log was completed, signed by the director and posted throughout the Tucson and Kitt Peak facilities before February 1. Provided consultation to Sac Peak for the completion of their OSHA 300A log.
- Submitted the last annual NOAO Tucson and Kitt Peak Site Safety Report. From this time forward the risk management department will be contributing to the quarterly reports.
- The NOAO Management Committee approved NOAO Contingency Plan on January 29. The management committee agreed to add NSO interest into the document. Minor changes will be made and the document with supporting information will be distributed to key managers on CD-RW’s.
- Electronic access control system continues to be implemented, 264 cards have been made. Thanks to Pete Marenfeld for the card design and Brenda Jensen for helping with card distribution. After we have issued cards to all employees, we will address visitors and determine the type replacement locksets.
- Completed and submitted a report summarizing the progress of ITT Hartford’s recommendations to Mr. Harry Feinstein AURA Vice President for Administration.
- Nine additional Kitt Peak employees and tenants attended a two-part class on First Aid, CPR and AED on January 22 and 29.
- Submitted hazardous waste generation fee paperwork to the Arizona Department of Environmental Quality. NOAO and NSO were not required to pay any fees this year.
- At the request of Robert Wilson I made Kitt Peak risk management presentation to the January 27 Docent meeting. We discussed the new Kitt Peak Emergency Manual and other procedures.
- On January 22, met with Mr. Harry Feinstein to discuss risk management issues, we primarily discussed the progress of NOAO’s efforts.
- Finalized the first offered course of wild land firefighting training at Kitt Peak. Eleven Kitt Peak personal and three tenants completed the in class training. Practical experience will be scheduled through out the year.
- As we continue with our strategy to reduce the fire hazards at Kitt Peak and we are reminded of the fire damage of Mt. Stromlo, John Glaspey and I met with T.O. DPS Fire Chief Jeff Gilbert and Fire Marshal Guy Acuna on January 31. We conducted a survey of Kitt Peak and reviewed a fire mitigation plan that was produced in 1995 and agreed that the plan is still useable. The Chief and Fire Marshal will contact us by February 7 to determine what resources may be available to Kitt Peak.
- Initiated a dialogue with Ms. Peti Singletary, the new Gemini Safety Officer.
- Consulted on a number of risk management issues including, hazardous materials, oxygen sensors, safe driving, emergency notification, eye protection, illegal parking, security, restocking of CPR masks in vehicles and first aid kits, and ergonomic design.