Title: WIYN Operations Readiness Review - Final Report

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Reviewed and approved:

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Project Manager Date

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Revision History

Version 0.1D: 18 Feb 1996	DRAFT version, circulated to selected reviewers only.
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Version 1.0D: 29 Feb 1996	DRAFT version, Submitted to SAC/Board in March 1996 Yellow Book. Added "Panel Review of ORR Report" Section. Many miscellaneous corrections.
Version 1.0: 15 May 1996	Added Project responses to "Processed Issue Forms" section. Version approved by WIYN SAC as FINAL on 29 May 1996
Version 2.0: 09 Oct 1996	Added "Material Submitted After ORR Section" Contains reference to Reimager Status Report, dated 29 Feb 96 Added "Revision History" front page

WIYN Operations Readiness Review: Final Report

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1. Executive Summary

The WIYN Project convened an Operations Readiness Review (ORR) panel on 1 - 3 February 1996. All major technical aspects of the WIYN Observatory were reviewed. The panel commended the reviewers for their presentations and the WIYN Project (and associated groups) on the success of the Observatory. The following conclusions were reached:

- The panel recommended that the WIYN Observatory be accepted as complete in all areas except for the Instrument Adapter Subsystem (IAS).
- The panel recognized the remarkable progress that has been made by the Project team in commissioning the WIYN Observatory. Within six months of starting science operations, the entire facility, instruments included, is performing at a level which puts it at the forefront of its class, enabling the science programs envisioned for WIYN when the project was created.
- The panel developed a list of items originally considered to be Project deliverables that are either incomplete or have not met their original specification at this time. Except for the IAS, the panel recommended that these items be accepted "as-is". Completion or improvement of these items should become the responsibility of the Operations group. Prioritization relative to other Operations tasks should be the responsibility of the Site Manager and subject to review by the SAC.
- The WIYN Project should not be officially terminated until the IAS is completed, as certified by the SAC. A schedule and budget for the completion of the IAS was presented to the WIYN SAC at their March 1996 meeting.
- The ORR panel developed a second list of items that should be addressed to maximize the potential of the WIYN Observatory in the following areas: safety, operations efficiency, maintenance, and scientific & technical performance. The panel recommended that the following individual items be given highest priority:
    1. All safety issues should have the highest priority, especially telescope hardware limits & interlocks.
    2. IAS completion, especially the implementation of a more efficient wavefront measurement, active optics update process. The panel established 10 minutes as the upper limit for completing this process.
    3. Correcting the maintenance problems that could lead to sudden and prolonged telescope downtime, especially the lack of spares for the custom built control system circuit boards.
    4. Improving the Hydra fiber positioning accuracy until it meets the original specification of 0.2 arcsec RMS. (At this time, NOAO continues to work towards this goal with no additional charge to the Consortium.)
    5. Improving the computer reliability, in particular implementing strategies to minimize downtime when computers hang or crash.
    6. Complete the implementation of the telescope temperature-focus feedback mechanism.
- The ORR panel recognized the desirability of upgrading the current Imager detector to a 4096 x 4096 pixel device with 15 micron pixels.
- The ORR panel also developed a list of topics that were deemed outside the scope of this review but nevertheless potentially critical to the success of the WIYN Observatory. These topics are listed in Section 3.2.
- Questions, concerns, and comments raised by panel members during the review are presented in Section 4. The WIYN Project has written short responses to each topic.

2. The WIYN Operations Readiness Review (ORR) Process

2.1 The ORR Panel

The WIYN ORR occurred 1 - 3 February 1996 in Tucson at NOAO headquarters.

The ORR panel consisted of the following reviewers:

- The current WIYN Board President: Blair Savage (UW)
- The current WIYN SAC: Bob Mathieu (UW), Kent Honeycutt (IU), Bill van Altena (Yale), Dave De Young (NOAO)
- Dave Sawyer, WIYN Site Manager
- Bruce Bohannan, Kitt Peak Asst. Director for Operations
- Larry Daggert, head of NOAO/Engineering & Technical Services
- Matt Johns, Systems Engineer, Magellan Project, former WIYN Project Manager (1989 - 1994)
- Augustus Oemler, Director, OCIW, former WIYN SAC Chair (1990 - 1995)
- Bruce Gillespie, Site Manager, Apache Point Observatory
- Jim Oschmann, Systems Engineer, Gemini Project

Panel discussion was moderated by Dave Silva, WIYN Project Manager. Dan Blanco, WIYN Project Engineer, attended all sessions to provide technical assistance and insight.

2.2 Mission Statement

The WIYN Operations Readiness Review had three main goals:

- review original project technical and scientific specifications vs the as-built telescope
- develop a complete list of open items and assign them to the responsible groups
- identify the highest priority items

In particular, the ORR panel was charged with developing a list of unmet scientific and technical specifications and goals originally approved by the SAC. The baseline specifications reviewed were contained in the documents entitled "Scientific & Technical Requirements" (WODC 00-01-05) and "Control System Requirements Document" (WODC 01-20-11).

2.3 Review Format

The ORR consisted of a series of 0.5 - 2.5 hour oral presentations covering all aspects of the WIYN Observatory, including present facility instrumentation, given on 1 - 2 February. Time was allowed during and after each presentation for discussion by the review panel.

Each reviewer was asked to submit short written summaries of any questions or issues they raised during the meeting. Forms were provided during the review for this purpose. These forms were collected and are summarized in Section 4. Reviewers were not asked to write a formal report at the conclusion of the review.

Time was set aside at the end of 2 February to develop two lists. The first list consisted of topics not covered by the review but deemed important to the future of WIYN by the panel. This list of undiscussed but important topics is presented in Section 3.3. The second list was a merger of all items the panel felt were either incomplete or had not met their original specification at the time of the review.

The morning of 3 February was set aside to discuss the overall status of WIYN and develop the final set of recommendations for future action. Three lists were developed:

1. All the tasks originally considered to be Project deliverables that were incomplete or did not meet their original specification at the time of the review. This list is presented in Section 3.1.
2. These tasks were then combined with all other currently open technical issues and sorted into four categories: safety, operational efficiency, maintenance, and scientific & technical performance. This list is presented in Section 3.2.
3. The panel then identified which tasks should be given highest priority. This recommendation is summarized in Section 1, the Executive Summary.

2.4 Major Sub-systems Reviewed

The sub-systems reviewed are listed below. Formal review documents have been assigned WIYN Observatory Documentation Control (WODC) numbers and filed with the other documents maintained under the WODC system. Materials handed out during each presentation have been collected and bound into a separate volume, considered to be Section 5 of this report.

2.4.1 Top-Level Science & Technical Requirements

- Presenters: Dave Sawyer, Site Manager, WIYN & Dan Blanco, WIYN Project Engineer.
- Specifications Document Reviewed: "Scientific & Technical Requirements" (Johns et al., WODC 00-01-15)
- Review Documents Submitted: "ORR Review of S&T Requirements" (Blanco & Sawyer, WODC 02-38-01) and presentation material.

2.4.2 Telescope General

This review was canceled due to inability to prepare during recovery from the January 1996 secondary failure. Blanco will submit review documents later.

- Presenter: Blanco
- Specifications Document Reviewed:
- Review Documents Submitted: TBD

2.4.3 Control System

- Presenters: Dave Silva, WIYN Project Manager, NOAO/KPNO; Jeff Lewis, Mountain Programming Group, KPNO; & Jeff Percival, Space Astronomy Lab, UW.
- Specifications Document Reviewed: "Control System Design Requirements" (Johns et al., WODC 01-20-11)
- Review Documents Submitted: "ORR Review of CS Design Requirements" (Silva, Lewis, & Percival, WODC 02-39-01) and presentation material.

2.4.4 System Integration & Interfaces

- Presenter: Lewis
- Specifications Document Reviewed: none
- Review Documents Submitted: presentation material only.

2.4.5 Control System Graphical User Interface

- Presenters: Dave Mills, Mountain Programming Group, KPNO; and Silva.

- Specifications Documents Reviewed: "Graphical User Interface Design Requirements (Johns, et al., WODC 01-22-02)
- Review Documents Submitted: presentation materials only.

2.4.6 Primary Mirror System (PMS)

- Presenters: Larry Goble & Nick Roddier (NOAO/ETS)
- Specification Documents Reviewed: "Primary Mirror Interface Specifications for the WIYN 3.5-M Telescope" (Johns et al., WODC 01-12-22)
- Review Documentation Submitted: presentation material only.

2.4.7 Instrument Adapter Subsystem (IAS)

- Presenter: Blanco
- Specification Document Reviewed: S&T Document (WODC 01-20-11), IAS Section
- Review Documents Submitted: "ORR Review of IAS Design Requirements" (Blanco, WODC 02-40-01)

2.4.8 MOS/Hydra

- Presenters: Taft Armandroff (NOAO/KPNO) (Bench Spectrograph) & Sam Barden (NOAO/KPNO) (Hydra fiber positioner)
- Specification Document Reviewed: relevant sections from S&T Document (WODC 01-20-11)
- Review Documents Submitted: "ORR - MOS/Hydra" (Barden, WODC 02-41-01) & presentation material.

2.4.9 Imager

- Presenters: Kent Honeycutt (IU), supported by Armandroff, Boroson, Reed, & Silva (NOAO)
- Specification Document Reviewed: relevant sections from S&T Document (WODC 01-20-11)
- Review Documents Submitted: presentation material only.

2.5 Original Sub-system Review Goals

For each major sub-system, presenters were asked to cover the following topics:

1. Operational Performance, including original specifications, results of performance testing, and operation limits & hazards.
2. Documentation, including drawings and operations & maintenance procedures.
3. Spares, including currently available and recommended additions.
4. Training Requirements, including transportation, installation, operation, and maintenance.
5. Remaining Open Action Items, of any nature.

3. ORR Outcome

As described in Section 2.3, the ORR panel developed a series of lists to guide future development work at the WIYN Observatory. These lists are described and presented in the sub-sections below.

The ORR panel also developed a small number of global recommendations. These recommendations are presented in the Executive Summary.

3.1 Undelivered Deliverables

The ORR panel developed the following list of items which were originally considered to be Project deliverables but were incomplete or did not met their original specification in some way as of 1 February 1996. The panel recommended that these items be accepted "as-is", with the exception of the IAS (Section 3.1.1), the Primary Mirror System (Section 3.1.2), and the Hydra/MOS fiber positioning accuracy (Section 3.1.3.1). In the case of the IAS, the ORR panel felt it was still the responsibility of the Project to complete the listed IAS items as Construction activities. In the PMS and Hydra/MOS matters, NOAO has stated that it intends to complete the PMS items listed in Section 3.1.2. as soon as possible and to improve the Hydra/MOS fiber positioning as much as possible. All other items become the responsibility of the Operations group, subject to prioritization by the WIYN Site Manager and WIYN SAC.

3.1.1 IAS Completion

1. Comparison Illumination Assembly (CIA) installation/commissioning
2. Complete Image Processor Subsystem (IPS) Manager
3. Wavefront Sensing Camera (WFScam) commissioning (wavefront & acquisition modes)
4. Verification/accomplishment of limiting magnitude specs
5. Implementation of more efficient wavefront measurement & active optics update pipeline (goal: 10 mins)
6. Reduce time needed to set up probes for autofocus and auto-guiding tasks.
7. Implement autofocus capability

3.1.2 Primary Mirror

1. Fix hydraulic leaks
2. Complete documentation/maintenance manuals
3. Reduce settling time

3.1.3 Hydra/MOS

1. Fiber positioning accuracy (does not meet original specification).
2. Time of fiber positioning (does not meet original specification).

3.1.4 Encoder/servo performance

1. Pointing (does not meet original specification).
2. Open-loop tracking (does not meet original specification).
3. Windshake/image jiggle (does not meet original specification).
4. Wind breakaway (does not meet original specification).

5. Blind spot radius (does not meet original specification).
6. Offsetting (may not meet original specification - requires further verification).

3.1.5 Operations

1. Complete and review mirror handling procedures/hardware.
2. Improve spares inventory.

3.1.6 Tertiary Mirror

1. Positioning repeatability (does not meet original specification).

3.2 Current Action Items by Category

The lists presented in Section 3.1 were then combined with other issues discussed by the panel into a single list. This list was sorted into four separated categories: safety, operational efficiency, maintenance, and performance & delivered science quality. A short description of the envisioned task is provided for each item.

3.2.1 Safety

1. Telescope operations safety
   - human-hazardous procedures: review & improve where necessary
2. Telescope hardware safety
   - hardware limits & interlocks: review & improve where necessary
3. Glycol flammability hazard (moat & PM thermal system): assess & rectify if problem
4. PM Hydraulic fluid leaks: fix

3.2.2 Operational Efficiency

1. IAS Completion
   - Comparison Illumination Assembly (CIA): complete installation/commissioning
   - Image Processor Subsystem (IPS) Manager: complete
   - Wavefront Sensing Camera (WFScam) commissioning (wavefront & acquisition modes): complete
   - WFScam limiting magnitude specifications: verify & improve if necessary
   - Wavefront measurement & active optics update pipeline: improve efficiency (goal: 10 mins)
   - Focus and guide probe autofocus/autoguiding set up times: improve
   - Autofocus capability: design & implement
2. PM settling time: minimize
3. Encoder/servo performance
   - pointing/open-loop tracking: bring up to original specification
   - Wind breakaway: engineering study, new motors or more current to present motors?
   - slewing parameters (e.g. time-to-time moves): coupled to above
   - WIYN port effective blindspot radius: implement closed-loop de-rotation

- Azimuth feedback circuit: implement elevation fix on azimuth axis

4. Dome rotation rate: investigate why this has degraded
5. Hydra positioning time: implement Hydra/CTIO upgrades when available
6. Telescope temperature/focus compensation: finish implementing
7. Computer reliability/efficiency: improve, reduce operations downtime
8. Science data distribution & archiving: implement CD-ROM based system?
9. Remote observing capability: implement (needs operational & technical specification)

3.2.3 Maintenance

1. PM documentation/maintenance procedures: develop & implement
2. Mirror handling fixtures & procedures: complete & review
3. Re-Imager documentation/report: UW must provide to Observatory
4. Enclosure wind survivability: verify M3 design report
5. Main axis brake system: review & upgrade as appropriate, esp. high pressure system
6. Grease on drive surfaces (leaks from motors): review & implement fix
7. Review & improve maintainability/serviceability of:
   - main drive racks
   - OSSCS box
8. Enclosure snow/ice issue: develop & implement procedure to safely remove snow and ice from enclosure surfaces
9. Review present Observatory documentation in all areas and finish as necessary
10. Custom control system boards: make spares
11. Spares inventory control: implement
12. Charger upgrade: design & implement
13. Azimuth drive skirt: design & implement skirt to prevent debris from falling from observing floor onto azimuth drive disks.
14. Engineering Data System: improve tools for efficient use of EDS archives and real-time data
15. Arcon software: improve documentation, improve maintainability

3.2.4 Performance & Delivered Science Quality

1. Windshake/image jitter (top-end mechanical resonances?): continue on-going investigation & correct ASAP
2. Hydra positioning accuracy: improve to original specification of 0.2" RMS
3. Tertiary positioning repeatability: improve to original specification
4. Imager detector: upgrade to 4096 x 4096 pix, 15μ system if possible
5. Enclosure thermal control: improve in following areas:
   - main drive racks: vent to main enclosure exhaust ducts
   - OSSCS box: vent to enclosure during day, prevent differential OSS heating

6. Exhaust louvers: implement on main enclosure exhaust ducts to prevent warm backflows into enclosure during summer months
7. Tertiary air bag replacement: implement

3.3 Topics Raised by Panel but Undiscussed

After all the technical reviews were completed, the panel was asked what topics were not reviewed or discussed that the panel felt needed further discussion. Time constraints did not permit the discussion of these issues during the ORR. Nevertheless, all of these topics merit some discussion within the Consortium. The topic list is presented below.

3.3.1 Philosophical Questions:

1. Is the WIYN Observatory as an organization functional or dysfunctional?
2. What constitutes technical completion of Construction & Commissioning activities?

3.3.2 Operations Issues

1. Is current level of Operations staffing adequate?
2. Remote Observing: where in priorities?
3. Is current storage space adequate?
4. What level of engineering support is expected from original developers of various sub-systems?
5. What is the maintenance philosophy?
6. What is systems approach to maximize observation efficiency?
7. Is current method of scheduling working?
8. Staff/User training: is it adequate? How can it be improved?
9. Support of "visitor" & University-class instruments: how? when? who?
10. Data Distribution/Archive: what method?
11. Schedules for Completion/Improvement plans: what are they?
12. Software System Engineering: is this needed? If yes, who? How?
13. Monitoring trends (efficiency, performance, etc.): how?
14. Opportunistic Observing (i.e. synoptic & target-of-opportunity programs): how?
15. The WIYN Five Year Plan, including new facility instrumentation: needs to be developed

3.4 Prioritized Action Item List

The ORR panel recommended a list of items that should have highest priority. These items are presented in the Executive Summary.

4. Processed Issue Forms

During the ORR, panel members were asked to briefly summarize any issues, concerns, or comments they raised during the discussion. They were asked to record their observations on forms which listed the following statements:

- Issue/Question: Please summarize your question, concern, or comment. Use back if necessary.
- Answer/Commentary: Please summarize the answer or commentary generated by Issue/Question, as appropriate. Use back as necessary.

After the review, these forms were sorted into five categories: safety, maintenance, performance, observing efficiency, documentation, and future development. Each issue was assigned a number. If multiple reviewers commented on the same topic, their summaries were grouped until the same number.

The issues raised are reproduced below.

The Project staff, principally Silva, Blanco, and Sawyer have added responses to each item.

4.1 Safety

4.1.1

(De Young)

Q: Secondary runaway: software only limits for moving components makes no sense.

A. A well defined program needs to be put in place to address this.

(Bohannan)

Q: Should not only inspect to see that current safety requirements are met but the facility should be reviewed/evaluated annually from a safety viewpoint (look for changes in facility, evaluate procedures for possible safety concerns, etc.)

A: Dave Sawyer actually said this -- not on his transparency.

(Oschmann)

Q: Safety and interlocks. Too many subsystems rely on software interlocks.

A: Effort already underway to address all areas of safety interlocks and assess risk and improvements for hardware interlocks is to be encouraged!

(Bohannan)

Q: Expedite inventory of motion limits to identify those not on hardware. It is imperative that e-stops trip power by hardware -- not software -- at a very low level (i.e., at the source).

A: Plan for action as outlined by Dave Sawyer.

Response:

> The "secondary event" of January of this year has raised our awareness of all site safety, and the implementation of limit switches and e-stops in particular. A global review identified a few other points where the system may be prone to a similar kind of failure. These have been targeted for upgrades.

4.1.2

(Oemler)

C: Animals are a potential health hazard.

Response:

Noted.

4.1.3

(Bohannan)

Q: What is in the system to stop the active support system from driving the mirror up into some hard stop which would cause damage to the mirror (or maybe even to "fall" down into something)? (Software limits are not acceptable.) Rather than answering my specific questions, I/we would appreciate an analysis of the PMS to see what protection is in place or needed to prevent damage to the primary mirror.

A: Unknown. (Software will shutdown if LVDT fails.)

(Johns)

Q: Issue: Are the limit provisions in primary mirror system adequate in light of recent experience with failure of secondary mirror actuators?

A: Review failure modes and limits in primary mirror system as part of overall limits review.

Response:

The Primary Mirror Group has been tasked with reviewing these issues and reporting back to the Site Manager.

4.1.4

(Johns)

Q: Fixation of dome panel to resist positive outward pressure while observing into wind under maximum operating wind speeds.

A: Review M3 correspondence file for letter responding to early WIYN concerns.

Response:

In a letter dated 19 October 1992, Dennis Mulligan of M3 Engineering & Technology Corp. wrote: "Based on [data provided by the panel manufacturer and a review of the M3 enclosure design] M3 feels the data used originally in the design phase is correct and the panels should be stable within the design/performance criteria desired." This letter is contained within a binder entitled "M3 Notes, Volume 4", stored with archived Project material.

In particular, the "open" dome should be able to easily withstand peak wind gusts up to 60 mph and the "closed" dome should be able to withstand peak wind gusts up to 150 mph, as originally specified by the Project.

Nevertheless, the Operations staff should regularly inspect the enclosure panel fasteners for signs of wear and failure to ensure continued enclosure survivability under windy conditions.

4.1.5

(Oschmann)

Q: Flammability of propylene glycol (versus known problem of ethylene glycol)?

A: Can tests be done to assess flammability

- Soak into polystyrene, let sit for weeks? try to ignite?

- Other sources of information?

This is of concern to Gemini and others?

Response: Mack Rhoades (NOAO Safety officer) provided this information:

"Propylene glycol (1,2-Propanediol) is classified as a combustible liquid which means that it has a flashpoint at or above 100 degrees F (38C) as compared to a flammable liquid which has a flashpoint below 100 degrees F. Its flashpoint is 210 degrees F. It is a substitute for ethylene glycol and glycerol. From the standpoint of flammability it is relatively safe.

It is slightly toxic by ingestion, skin contact, and other routes. It is explosive in the form of vapor (2.6-12.6% concentration in air) when exposed to heat or flame.

At this time I am not aware of a safer antifreeze. From an overall safety standpoint propylene glycol is relatively safe, particularly in its watered down form (50/50 mix)."

However, we further inquired about the issue of enhanced flammability of materials which have been wetted by propylene glycol and the dryed out, such as drywall or foam. (We had the 1995 fire incident at the CTIO Blanco 4m in mind when we asked this question.) Rhoades replied that he did not have specific information about this possibility but that he was considering testing it.

Given the potential hazard, the Operations staff should probably follow up on these tests to learn their outcome.

4.1.6

(Sawyer)

Q: Are dome shutter limits sufficient?

- E-stop for dome vents/shutters.
- E-stop for equipment lifts.
- E-stop for high voltage equipment.

Response:

Needs review by Operations Staff, as lead by Site Manager, and NOAO Safety Officer.

4.2 Maintenance

4.2.1

(Percival)

Q. Do GWC clients (e.g. FSA, Hydra) get their data into the EDS archive log file? If not, how will long-term trending, accident replay, etc. be done?

Response: Jeff Lewis provides the following:

The mpgrouter and the wiyn archiver use an identical archive mechanism for saving EDS data. The new wiyn archiver program currently archives TCS EDS data and the mpgroute can archive instrument data, this is not used at this time.

The mpgrouter can archive TCS EDS data as well if need be. Archiving on the mpgrouter has not been tested as much as I would like.

My goal is to get the routers out of the job of archiving data. This is what the new archiver does. A simple GWC client can be written to archive instrument data.

4.2.2

(Mathieu)

Q: Operators/WIYN does not have a procedure for determining when to open after snow/ice. We need to develop access to the upper flat portion of roof. Dan noted that dome surface is aluminum pop-riveted into frame. Opening in ice-bonded conditions could damage dome.

(Bohannan)

Q: • Seals: garage door and shutter.

• Dome not going to open when it snows

Could break something when frozen (flatbeams freeze up)

Snow accumulates on top.

No procedures in place for testing, inspecting, and deciding to open.

• Condensation causes tires to spin.

• Dome crane inaccessible for easy servicing.

• Slower speed on jib crane for picking up optics. No working Hydroset on mountain.

A: Noted.

Response:

Mathieu and Bohannan raised several issues here which are being met in different ways:

We agree there is a need to establish a procedure for determining whether it is safe to open in the event of snow or ice accumulation.

The issue of snow and ice removal have been added to the improvement projects list. To this end, the building architects have been contacted and apprised of our concerns. We expect to receive recommendation from them soon.

Alternatives for access to the dome crane were discussed during the design phase. In the end we chose to erect scaffolding on the dome floor to provide service access. While admittedly not convenient, it is adequate for the infrequent servicing required.

The jib crane manufacturer has been asked to quote on modifications to slow both the hoist and traverse speeds.

We are looking into sharing the cost of refurbishing the Hydrasets between WIYN and NOAO.

4.2.3

(Daggert)

Q: Sand and grit in the computer area will fail the drives. Need to keep the area at a positive pressure.

(Oschmann)

Q: Grit build-up in computer alcove will be a reliability issue over time.

A:• Filter (including clean-room type filter) for inlets to room.

- Review exhaust/adjust to maintain some positive pressure.
- Trace down "leaks".
- Seals on doors.
- "Sticky" mats on entrances for dirt from foot traffic.

Response:

We are investigating the grit problem and have discussed possible solutions with the building architects.

4.2.4

(Gillespie)

Q: Not clear what operationally critical items and systems have easily configured backups, i.e. what components are possible/likely single-point failures?

A: Not discussed much.

Response:

Determination of critical components and single point failures is implicit in the ongoing preparation of a spares list and spares procurement.

4.2.5

(Gillespie)

Q: Telescope telemetry recording and archiving awkward, can be and has been disabled by operations staff.

A: This is acknowledged problem. Not easily addressed.

Response:

This problem has been identified and set as a low priority task since it is not directly detrimental to operations.

4.2.6

(Gillespie)

Q: Need a crisp definition of maintenance philosophy. For example, what is expectation for return to service for various failure modes?

Response:

NOAO is charged with the operations support for WIYN, and thus the maintenance and response to failure is of a similar or superior standard as for all KPNO facilities. This involves a regular preventive maintenance program supervised by the Site Manager, night time staff for immediate response to problems, and a list of key contacts on call for advice and response to more complicated problems.

4.2.7

(Johns)

Q: Engineering support for primary mirror system: Coordination problems have resulted in late implementation of upgrades, documentation, planning, etc.

A: Better coordination is needed between WIYN management and NOAO engineering.

Response: Noted and agreed.

4.2.8

(Bohannan)

• Even after a sealant is put in belloframs, a procedure is needed to check oil level in the makeup unit so that the operator does not have to do it based on an alarm.

• In addition TO's need procedures and training to fill make-up unit should it be needed at night.

• "Spyglass" in equipment room should be checked monthly. Who should be doing this? (i.e., on whose PM list?)

A: I didn't ask this specifically but these topics come up in discussion with mountain staff.

(Oschmann)

Q: PMS hydraulic leaks?

A:• Consider "scheduling" servicing of all actuators rather than wait for leaks.

• My understanding is current fix is very good -- why wait for other units to fail -- incorporate fix on all units over time.

Response:

> We note and agree to the need to check oil levels as a part of regular monthly maintenance.
>
> Completing and improving documentation is an ongoing effort. Despite training, the real test of the documentation is having the TO's follow the procedures. As a result of the last make-up unit refill critical valves used in the procedure have been labeled and the procedure updated. This procedure is available on-line as part of the WIYN operations documentation. Additional TO training is planned.
>
> PMS hydraulic leaks are being monitored. The leaky units are being systematically rebuilt to eliminate leaks. One "loop" is being completed each T&E period. At this writing, 21/66 of the components have been successfully rebuilt.

4.2.9

(Oschmann)

Q: Spare parts database is on action list for primary mirror. This should be extended to tracking spares for rest of telescope/observatory.

A: System-wide spares tracking/database would be useful.

(Sawyer)

C: Develop access database for spares. All spares in general, observatory-wide.

Response:

Noted and agreed.

4.2.10

(Oschmann)

Q: Larry Goble's action list. It was not clear all were on WIYN's actions list.

A: All should be considered to be on WIYN action list. Review list and put plan to address.

Response:

Noted

4.2.11

(Bohannan)

Q: Did not get a chance to ask this. I heard Larry Goble say about the seals on the primary mirror, "what there is left." Do we have a problem here? I understand that these seals have been replaced "many" times -- do they need to be re-engineered? The air seals around the primary and secondary have deteriorated and gone. What to do?

Response:

The air seal around the edge of the primary mirror has been in use for several years since the mirror was first polished to a sphere. They were made of a neoprene rubber which has deteriorated. The exact cause of this deterioration is unknown; however, these seals have been exposed to severe solvents in the past. Silicon rubber parts on site have shown no signs of deterioration. The air seal was replaced with silicon rubber during the recent re-aluminzation exercise.

4.2.12

(Sawyer)

Q: Develop software to detect thermal system problem. Currently, rely on operator monitoring.

Response:

Noted.

4.2.13

(Gillespie)

Q: • LN_2 hold time for dewar? Pump frequency?

• Are dewar pumping and maintenance procedures in place?

• Any need or plan for routine monitoring of camera performance? (e.g. absolute photometric calibrations, or standard star photometry. routinely, etc.)

A: • ~12 hr., 6 months -- explore auto-fill and/or advances to thermal isolation being used on mosaic projects.

• Not discussed.

• Left for discussion in Panel.

(Mathieu)

Q: The dewar hold time on the Bench Spectrograph is not adequate to extend through a winter night. This is problematic for programs requiring all-night stability. Longer hold times are achieved at other observatories. Is there a plan for better dewar hold time at WIYN?

A: Refer to Armandroff for extended answer. Boroson - Mosaic dewar designed to hold 24 hours.

(Sawyer)

Q: Should we pursue auto-fill systems for the dewars at WIYN?

A: Should have electrical/thermal isolation. Should allow operator to override.

Response from Taft Armandroff:

> I talked to Rich Reed about the dewar comments below after the ORR. He thought that they should hold somewhat longer than what was specified if properly filled and at proper vacuum. There are no plans to redesign the KPNO dewars. This would be a big job. As you know, resources are very tight.

4.2.14

(Daggert)

Q: The HIC Controller spares? Harcon spares are on the mountain; what about HIC spares?

Response:

> The HIC Controller is not part of a facility instrument and is completely the responsibility of Indiana University. As such, WIYN has not acquired spares for it. However, it does have some common parts with the Harcon/Arcon controllers used on-site and it is possible that some of those spares could be used for the HIC Controller, should the Site Manager deem that appropriate.

4.2.15

(Gillespie)

Q: Re: spares, procedures, risk. Some thought needs to go into cost/benefit/risk analyses for critical systems and components. e.g. Can you live without a spare fiber harness bundle for Hydra? If you destroy a fiber harness, can you get it replaced 10 years from now?

(Daggert)

Q: Fiber life, repair?

4.2.16

(Gillespie)

Q: Are there any issues related to mirror cleaning, coating, or handling?

A: Possibly some open items on mirror handling procedures.

Response:

The procedures for handling all WIYN optics are reviewed and updated as necessary before and after the recent primary re-aluminzation exercise.

4.2.17

(Gillespie)

Q: Is there a commitment (and resources) of the consortium institutions to provide some reasonable level of continuing engineering support to the telescope?

A: No. Handled case-by-case.

4.2.18

(Sawyer)

Q: Would it be desirable to have "manual" control cables for FSA so that it could be run manually in case of problems.

Response:

Yes, hopefully, Indiana will provide this item in the future.

4.2.19

(Johns)

Q: Grease leaks in drive motors?

A: could these be run dry or with dichromate.

Response:

We have asked the telescope manufacturer's recommendation for a "dry" lubricant. Given the loads and low speeds dry film lubricants are a reasonable choice. The main issue is removing the grease from the assembly without harming bearings or motor windings.

4.2.20

(Bohannan)

Q: What is the spare of "bone", the machine that the WIYN and mpg router runs on?

• Should we not have a configured spare rather than a generic one to cut down the replacement time? (Maybe this begs the question of computer sparing at WIYN?)

Response:

The WIYN workstations are being spared and upgraded per NOAO Central Computing Services' recommendations.

4.3 Performance

4.3.1

(Mathieu)

Q: Do we have images of rich fields during 0.5" seeing conditions to explore PSF variation across the field?

A: Silva - Chuck Claver has such images with 15mm pixel CCD. Some variations seen.

Oemler - Also has such frames with standard images.

Mathieu - If Chuck is willing, should incorporate in report as upper limit on optical performance.

Honeycutt - Included in Imager report.

4.3.2

(Honeycutt)

Q: Color - balanced flat-lamps not tested. Should not list flat as having met goal until tested. Might want to see if users would really use this (as opposed to median sky flats) when really pushing CCD performance, before putting a lot of effort into this.

Response: (von Hippel)

To the best of my knowledge no tests have been performed on the quality of the dome flats as a function of the color of the flat-lamps. The flat lamps have been tested in the following sense, however:

1) flatten broad-band data with dome flats, twilight sky flats, and dark sky flats,
2) check the degree to which dome flats and twilight flats flatten the data when compared to dark sky flats.

A partial answer to the above is contained in the WIYN Imager Commissioning Report:

"Phil Massey reports that the dome flats and bright sky flats disagree at the 2% level, and that dark sky frames demonstrate that the dome flats are better than the twilight flats. He also notes that in R the agreement between the dark sky and dome flats is 0.6%. The good agreement between dome and dark sky flats, as well as the poor agreement with twilight flats, is consistent with experience at the other telescopes on Kitt Peak: those telescopes with open tubes have a scattered light problem during bright twilight, while those with closed tubes produce good bright-sky flats."

My recollection is that the flats were of similar quality in B, V and I, and somewhat worse in U, between 1 and 2%.

Note that there are a number of reasons why dome flats and the actual observations should not agree perfectly, including the impossibility of exactly matching the sky illumination patters with a dome flat, and the fact that the Az-El design will cause the Imager to rotate behind the non-uniform illumination pattern of the telescope.

For pushing CCD performance, I would recommend a combination of dome flats and dark sky flats, if possible.

4.3.3

(Oschmann)

Q: DIQ looks good. Cannot assess telescope contribution without external monitor.

A: Do statistics versus elevation axis exist to, over time, get a plot of DIQ versus elevation (from Imager use for example)?

Response:

An external seeing monitor is not presently on the list of WIYN improvements, though such a device may be of general use as a KPNO facility.

Early attempts to correlate DIQ as a function of elevation angle failed due to variable seeing, tracking, and other perturbations. However, the headers of WIYN images are routinely and automatically stamped with elevation angle among other information. Thus we are accumulating a data base which may be examined for factors influencing DIQ.

4.3.4

(Honeycutt)

Q: Need warning to operator that this object will track through the zenith blind spot.

A: Agreed that this capability should be added.

Response:

Noted.

4.3.5

(Gillespie)

Q: Is it worth fixing breakaway problem?

A: Cost/benefit ratio needs to be looked at.

(Oschmann)

Q: Break-away in high wind? Should one operate into high wind?

A: Another consideration some telescopes on Mauna Kea have here is contamination of optics. More dust/dirt into enclosure and on optics when viewing into high wind. I have no idea if this is a consideration for WIYN/Kitt Peak.

Response:

We note and generally agree with these points. However, the telescope did not meet specification in this area, and is operationally hindered at wind speeds below 45 mph, the wind speed at which domes close on Kitt Peak. It does appear that a significant increase in torque is relatively simple to implement, however, fixing the breakaway problem has low priority at present.

4.3.6

(Gillespie)

Q: Has high frequency harmonic image motion been seen?

A: See servo system disc.

(Gillespie)

Q: Harmonic image motion?

A: Convene working group.

Response:

Noted.

4.3.7

(Honeycutt)

Q: 4' field for CIA: Too small to accommodate an aperture plate spectrometer or other instrument that might use much of the field at the WIYN port. Yet too large to push a lot of light down an on-axis aperture such as slit or fiber.

A: Blanco thinks impossible to go larger. Look into option of having smaller, brighter field for on-axis instruments.

Response:

The CIA was designed within the constraints of the IAS. The size of the box imposes an upper limit, while the clear field diameter places a lower limit on the size of the CIA. Larger or smaller fields are possible, however the simulated pupil geometry would differ from that of the telescope. In other words, the focal ratio of the beam would change. An easier alternative is to double or triple certain lamps to increase brightness while preserving the pupil geometry.

4.3.8

(Gillespie)

Q:
- Pointing models, encoding, issues need working group discussion.
- Do pointing model with secondary. aO turned off.
- Make sure proper motion accounted for pointing model stars.

(Oschmann)

Q: Absolute pointing:

- encoding
- active optics

A: Need to differentiate two suspected sources of error. I agree that friction encoder is a suspect, but I'm not completely convinced that active optics/alignment effects on pointing has been thought through completely (along with rotator effects). Tertiary mis-alignment? Can alignment to elevation axis be verified? (This will affect rotation and hence pointing when using rotator.) Alignment of rotator to elevation axis? Consider adding fiducials every 10-15°! (to help encoding)

(Silva)

Q: Pointing: Proper motion inclusion in "FK5" stars. Why should FK4 stars be different? What about the calculation of the apparent place calculation? Rotation - precession,...

Offsetting: 0"2 spec.

Tertiary: Pointing models - does it include properly the pointing vector of the tertiary?

A: Offsetting: Identify some astrometric fields that would serve as standards. The GSC is probably not good enough for this purpose.

Pointing: Check algorithms for proper motions, precession, rotation, atmospheric refraction (as a function of star color also).

(Johns)

Q: Pointing problem.

A: Large shifts would be easily detectable with finder telescope on side of OSS. Installing finder would enable you to separate encoder errors from boresight shifts.

(Oemler)

Q: Short distance offsetting accuracy needs to be adequately characterized.

A: Need to identify good set of astrometric fields to do tests.

Response:

> Pointing maintenance/improvement is an ongoing effort at WIYN. Thanks for the suggestions, we will look into them.

See Johns comments in Section 6.

4.3.9

(Savage)

Q: We will need to look at the effects of tertiary flip repeatability on the WIYN pointing problem.

(van Altena)

Q: Tertiary Rotator. Slope of 10" -- change of optical axis on the order of 1 mm so the OFAD model center will no longer be correct and the OFAD model will not predict the MOS fiber positions adequately. Bore site error of ±10" is random if the TR is used numerous times.

A: Need to improve or check if this is important. Impact also on the pointing model.

(Gillespie)

Q: Rotating tertiary causes pointing problem. Bore sight not reliable to ~10 arcsec, messes up pointing model.

A: Need to fix if tertiary rotations to be used frequently.

(Oschmann)

Q: Repeatability of tertiary is large! How does this effect pointing?

A: Not sure of effect and what to do.

(Bohannan)

Q: Impact on pointing model on tertiary rotator repeatability certainly changes the boresight term and may have other effects if one is changing ports often.

A: Easily taken out by a "3" (some skepticism with this reply and looking at the errors in the pointing models.)

(Johns)

Q: Tertiary rotator repeatability - index position 10" vs 4" spec. What is effect on image quality and field distortion?

A: Ray trace effect of 10" non-repeatability.

(Mathieu)

Q: We need to understand better the impact of tertiary misalignment on pointing accuracy. 1) Does our pointing map have the ability to account for tertiary misalignment? Important, but apparently not reason for large runs since formal fits have RMS ~4" while immediately subsequent moves show rms ~15" with some tertiary position. Are we sure tertiary pointing is stable? 2) Is our actual pointing even worse than 15-20" given tertiary RMS of 10"? In actual operation tertiary is likely not at position appropriate for pointing map being used. How large is pointing area resulting from 10" error in tertiary position?

Response:

> Non-repeatable misalignment of the tertiary is to a major extent corrected with a simple zero point correction which is normally done on acquiring a star. For an on-axis object the correction is complete, however, for an off-axis object there is an error introduced into the calculation of the rotator position angle. The rotator angular error can be very large at high elevation and undoubtedly is a major source of the off-axis rotational error observed in Hydra.
>
> Since the effect vanishes for the on-axis object, tertiary non-repeatability does not appear in the pointing measurement.

See van Altena comment in Section 6.

4.3.10

(Sawyer)

Q: Should we evaluate instrument weight vs. flexure for instruments on FSA? Is structural design of FSA adequate for heavy instruments?

A: Was not considered in design of FSA, but have not noticed problems with coronagraph and Imager installed.

Response:

> Larger instruments should make use of the structurally rigid mounting points built into the IAS instead of attaching to the FSA.

4.3.11

(Sawyer)

Q: Do we need additional interference filters for the Bench Spectrograph?

A: Taft will review requirements. Will recommend needed filters. WIYN decide whether to purchase.

Response:

> Noted. Requests for additional filters are being reviewed by the Site Manager, with consultation by Armandroff and Barden, on a case-by-case basis.

4.3.12

(Gillespie)

Q: Does temperature affect plate scale to the point where Hydra needs to make compensation?

A: No.

4.3.13

(Gillespie)

Q: Flats quality and possibility of stray light problem.

A: Use pinhole scattered light test to see if baffling works. Test described in paper by Nordic Optical Telescope staff, or ask ARC because we're having these tests done.

Response:

> A pinhole camera was installed on the telescope in early March. The resulting pictures were very useful in diagnosing the effectiveness of the telescope baffles. In particular, it is clear that additional flocking should be added to the interior of the tertiary baffle to reduce scattered light. Thanks to Gillespie for the suggestion.

4.3.14

(Gillespie)

Q: TDI drift-scan mode?

A: Hooks and capability exist, not excluded by design.

Response:

> Driftscan mode has not been implemented due to low interest. We have, however, been careful not to preclude its implementation by any design decision in other parts of the system.

4.3.15

(Honeycutt)

Q: Would be very useful to preserve the capability and procedures for acquiring wavefronts using the Imager or other camera in user instrument, so that the wavefront to be converted goes through the optics of the instrument (such as the coronagraph).

A: Silva agrees is desirable. Perhaps an instrument could supply their own wavefront analysis (Claver product?).

Response:

> We intend to preserve the present general wavefront reduction capabilities while developing a more specific GUI driven version for optimum speed and efficiency.

4.3.16

(van Altena)

Q: Temperature difference between air and mirror surface.

A: It would be useful to have the ΔT recorded with the observations in order to compare with the seeing estimates. In the GUI?

Response:

> Temperature data is presently archived into the engineering data stream (EDS), though recovering data is difficult (as has been noted). We presently record several data in the observation header that should make it possible to access the engineering archive to recover a wealth of data about the telescope conditions. The bottleneck is in the data recovery.

4.3.17

(Percival)

Q: XTCS uses “epoch” where I think that “equinox” is meant.

1. Is epoch or equinox actually sent to TCS?
2. Are proper motions allowed to be input?
3. Is epoch treated correctly?

A: I'll be glad to work this out with Dave Mills.

Response/update:

Thanks to Jeff Percival for pursuing this. Subsequent to this comment Jeff has identified and helped to squash a subtle bug that resulted in incorrect calculation of proper motion and certainly contributes to pointing errors. A fix is in the works.

4.3.18

(Percival)

Q: As XTCS is upgraded to do more coordinate transformations, it should use the same pointing code as the TCS to eliminate subtle inconsistencies (e.g. galactic coordinates map into FK4 equatorial, not FK5). (Also, e.g. refraction effects.) This will be very easy with the upcoming TCS code update.

A: Dave Mills agrees with this.

Response:

Noted.

4.4 Observing Efficiency

4.4.1

(Oschmann)

Q: Operational efficiency, time to set-up guide problem.

A: Look at automation at an operational system level. For example, time to move probes may not be so critical if much of the set up can occur concurrently with the telescope slewing to the next object. Use GUI as much as possible for “point and click” operation.

(Johns)

Q: Set-up times for IAS guide probes is not acceptable.

A: First step is to speed up software but hardware upgrades to probe stages may also be required. Resources?

Response:

A hardware improvement project is currently underway to increase the speed and reliability of focus and guide probe motions. Additional software changes to improved operation efficiency of guide star acquisition and closed-loop guiding activation have been implemented. This should cease to be a significant source of operational inefficiency in the very near future.

4.4.2

(Oemler)

Q: Field acquisition camera readout must be made fast and convenient.

(Mathieu)

Q: How long will it take to acquire an image for acquisition of objects with V ≥ 16?

A: Honeycutt -> several minutes procedure will significantly limit faint-object slit spectroscopy, etc.

Blanco, Silva - Still under development, depends on Lewis' image processing software which hasn't been implemented yet.

New electronics will be needed for motor to hit 10 sec positioning spec.

Johns - If easily (automatically) done during slew, could substantially soften specs.

Mathieu - ORR panel needs to redefine goal.

(Oschmann)

Q: Use of acquisition camera sounds very inefficient. ~2 minutes was stated. Key operational efficiency item!

A: Try to automate system to speed up. Readout should be seconds (I'm sure camera can support this.)

Response:

Noted. Software project to improve efficiency and ease-of-use underway. Probe controller hardware being updated to improve speed and reliability to original specs (see response to item 4.4.1).

4.4.3

(Gillespie)

Q: How about "observing efficiency"?

- Measured, how?
- Tall poles?
- Rotator is sometimes tall pole?

A:

- "Save the bits" has data.
- Number not computed (B. Bohannan)
- Yes.

(Gillespie)

Q: Operational efficiency (i.e., shutter open time) needs to be measured now (through "Save the Bits") over some reasonable baseline. Use this metric as a driver and means of monitoring improvements over time. Set realistic goals for improvement, and review progress.

Response:

We presently determine operational downtime by recording the amount of time lost to technical problems, wavefront analysis, divided total amount of clear time that could be used for observation. The compliment is defined as operational efficiency.

4.4.4

(Oschmann)

Q: Time to measure wavefront and apply correction is too long.

A: Effort to completely automate process is to be encouraged. I believe the stated goal of 5 minutes is achievable. Should look at optical analysis to see if secondary collimation and primary mirror figure could be done in one iteration. Gemini has a preliminary analysis of this (for Gemini) which may be of interest. Come ask me for this (it may take some explanation) done by Earl, Mike Burns, and me!

(Honeycutt)

Q: Look into predicting the effect of tilting the secondary on the astigmatism term to be corrected by the primary, with the aim of evaluating both secondary and primary mirror correction from a single wavefront exposure.

A: Nick Roddier thinks this might be possible.

(Johns)

Q: Currently, two wavefront measurements are required to close active optics loop because of cross coupling between coma term and other aberrations.

A: See if effect is predictable to enable single measurement.

(Bohannan)

Q: •Why is it necessary to do a wavefront (or two) each night when the telescope is turned on?

•Why some nights no correction is needed at the start of a night and others require large corrections?

A: •Two needed -- one to take out coma with secondary and one to take out astigmatism in primary. Thermal effects on truss, focus terms -- which are being address. Is it just thermal noise, flexing (I'm still not convinced why this has to be done each night. No control over zero-point.) What causes the variations? Get the overhead on doing wavefront to such a small amount of time that people would want to do it during the night to get the best out of the optics.

•IAS focus sensor guider output FWHM as a measure of performance (could be either atmosphere or telescope).

(Oschmann)

Q:

1) Active correction takes too long.

2) Variability from night-to-night.

3) Is it important for night's observing?

4) Is there an <u>external</u> seeing monitor to help distinguish telescope <u>total</u> cont. from what atmosphere is providing at the time?

A. • Automate process! (big gains here.) More important than current reliability issues.

• Decouple coma and higher order level to correct secondary and primary in one action.

• External seeing monitor for diagnosis? Any general Kitt Peak.

Response:

The effort to reduce the overhead for wavefront analysis is ongoing on several fronts. We have installed absolute position references on the secondary mirror to enhance night-to-night repeatability. We are implementing temperature feedback to help stabilize focus. In addition, there is an effort to automate the wavefront sensing, analysis, and feedback as much as possible. This effort should be completed by 15 September 1996.

There are no WIYN plans for an external seeing monitor. KPNO has plans for such a monitor but it is proceeding at low priority.

4.4.5

(Savage)

Q: Efficient procedures must be developed for telescope alignment and focus. WIYN should develop a recommended strategy for updating the alignment during the night.

Response:

Noted. This will be incorporated into the WIYN operator's handbook.

4.4.6

(Bohannan)

Q: What sort of a review process is in place for optimizing the GUI for the operators?

A: Silva explained the process... Periodic meetings -- sit down with operators, Silva, Sawyer, Blanco, Bob Marshall. What is cumbersome, not intuitive, etc.? Arbitration of differing views.

4.4.7

(Mathieu)

Q: What is a ballpark estimate for a WIYN retrofit of the CTIO Hydra development?

A: Barden - 50-100K. CTIO development is being done with WIYN retrofit in mind.

Armandroff - Presuming no inclusion of development costs.

4.4.8

(Gillespie)

Q: A lot of set-up overhead tasks seem to be related to data communication I/O bottlenecks that appear systemic to WIYN control system architecture (?). Can these problems be easily addressed?

Response:

While is it certainly true that early science operations efficiency was hampered by interprocess communications problems, a dedicated attack on this situation has reduced this problem to the level where it is no longer a significant source of operational inefficiency.

4.4.9

(Gillespie)

Q: 3 min readout of chip an unacceptable overhead (X3 longer than spec)?

A: No. Worth it for low noise, and relatively. small overhead relative to exposure times -- also, other work in parallel during readout (e.g. more fibers).

4.4.10

(Bohannan)

Q: If the slew settling time is limited by the active optics, what is the next threshold, limiting factor? (Note: Viewgraph says "major" upgrades required to improve - but discussion indicated that hardware upgrade had been done and that there were software delays which could easily be done.)

A: Unknown.

Response:

> Dave Sawyer writes:
>
> It turned out the measured 80 second settling time was with the software delays removed. This amount of time was needed for the active system to iterate through the rigid body position and the force matrix. Nick Roddier decided that the rigid body motion was the important parameter to correct first to minimize time and image motion. He and Jeff Lewis modified the active code to correct rigid body position first and then correct the force matrix. The rigid body correction now takes 25 seconds. However, to prevent force updates from introducing rigid body errors Nick had to slow the force updates way down (they now take on the order of 5 minutes). Nick feels that the force errors would not affect the image quality and that we are safe to start observing as soon as the rigid body motion is complete (25 secs). Some tests were conducted to evaluate the effect of the active optics force errors on image quality and it was found that image quality was not degraded by force errors during seeing conditions of 0.8".
>
> There are two things that can be done to further improve the settling time. We could rebuild all the makeup units for high speed operation (as was done with the lateral makeup unit), and we should mechanically adjust the cross-coupling actuators to minimize the force errors (some of them apply forces in the wrong direction).

4.4.11

(Honeycutt)

Q: Software should tell operator, when start Imager exposure, max. exp. till get rotator unwrap.

(Bohannan)

Q: There needs to be an indicator available both to the operator and observer for the amount of time until "un-wrap."

A: Agreed.

Response:

> Noted and in the works.

4.4.12

(Gillespie)

Q: • What is current measure of down time due to failures/maintenance items?

• How measured?

• How much T & E steady-state?

A: • Not measured (~10%).

• Defined as lost time vs. (total time-weather).

• 2 nights/mo., down from ~25% now.

(Oschmann)

Q: When considering "down time," need clear definitions. Also 2% down time should be viewed against observing efficiency.

A: Is effort better spent to reduce downtime versus improvements in observing efficiency? Of course, both should be good, but keep in mind where most gains can be made. Improving optics calibration for example. Automate more versus planned maintenance for various items.

Response:

> Our method for calculating operational efficiency was described in the response to section 1.4.3. We have not recorded the actual integration time because this is more dependent on the type of observation, and the experience of the observer, rather than the efficiency of telescope operations per se.

4.4.13

(Oschmann)

Q: Lack of on-line diagnostics:

- Seeing monitor
- Logging of various engineering data
- DIQ logging from any source possible, including Imager.

I know a fair amount is there, putting it together in a usable manner.

A: These would be useful in understanding and diagnosing problems quickly. Also, may be useful in scheduling maintenance as things grow worse, but not limiting performance, i.e., "trend" analysis.

Response:

> Noted and agreed. The engineering data archive has already accumulated over a year's worth of very relevant data for determining trends and correlation's. Unfortunately cumbersome access has made it difficult to use. We intend to develop tools to enhance the usefulness of the archives, however this must necessarily take a low priority compared to other projects.

4.4.14

(Savage)

Q: The real time focus correction device should also include a measure of <u>image quality</u> (FWHM) in <u>real time</u>. Most observers would find this addition to the focus correction device extremely valuable.

(van Altena)

Q: Focus monitor/seeing monitor?

A: It would seem that the guider could deliver some kind of measure that could be calibrated to yield focus/seeing.

Response:

> Added to WIYN software improvement project list for conceptual development.

4.4.15

(Gillespie)

Q: • Plan and strategy for operator training is not well-defined.

• .7 X 3 - 2.1 FTE operators are not sufficient. Need ≥2.5 FTEs if telescope to be manned a 12^h/day by operator.

(anonymous)

Q: OT training/operations are adversely effected by rapid turnover of OT's. NOAO needs to pay attention to OT's job satisfaction to encourage longevity and loyalty.

Response:

> WIYN is in discussions with NOAO to consider alternative arrangements.

4.4.16

(Honeycutt)

Q: Processes communicating with one another should have mechanisms to detect when other processes it is communicating with has stalled or died, so the process can take appropriate action (e.g. adopt defaults, notify operator). Apparently, GWC already does this. when a process dies, the operator should be notified.

Response:

> As control system continues to evolve, failure notification mechanisms continue to be improved.

4.5 Documentation

4.5.1

(Gillespie)

Q: Is there a telescope users manual?

A: Yes. Good.

4.5.2

(Gillespie)

Q: How are deficiencies in h/w documentation being addressed? Need audit of as-built documentation.

A: Acknowledged problems, site manager working problem "single-handed."

Response:

> Site Manager continues to update documentation as necessary.

4.5.3

(Oemler)

Q: Observers need information on GUI tools available to him. More generally, need easily accessible guide to observing at WIYN (not just man pages).

Response:

> Noted. This is being addressed in several ways including more on-line and WEB accessible information. Ultimately, however, there is no substitute for experience.

4.5.4

(Sawyer)

Q: Should we develop a "start-up manual" that details general availability of tools for:

- Observing
- Imager operation
- Hydra operation

Brief description of tools -- available on Web.

4.5.5

(Bohannan)

Q: Where are the drawings (and manuals) located? Are they in the NOAO microfilm system?

A: Not 100%.

Response:

> All WIYN drawings have been microfilmed and a set is in permanent storage. Many newer handbooks manuals are on-line for easy access and conformity of style.

4.5.6

(Oemler)

Q: Need to deal with missing control system documentation through Wisconsin SAC representatives. Doesn't make sense to try and recreate them.

Response:

> Noted. Subsequent to the ORR, the University of Wisconsin Controls Group provided most of the desired, missing CS documentation.

4.6 Future Development

4.6.1

(Gillespie)

Q: Initiative to implement remote observing needs to be defined.

A: Another workshop, including Gemini and ARC reps.

Response:

> Noted. However, remote observing has not been ranked as high priority for the WIYN operations staff. It would appear that one or more of the constituent universities should take the initiative in developing remote observing.

4.6.2

(Mathieu)

Q: Remote observing capability - technical.

As an operating mode - safety.

This was not a spec (I believe, but is a necessary "action Item" as a future operating mode).

4.6.3

(Percival)

Q: MPG router should not impose bandwidth hit (increase) over that of WIYN router for clients that want all data.

(Mathieu)

Q: Need to understand the implications of remote observing for the mpg router and, more generally, for information transfer within WIYN.

Response:

Noted.

4.6.4

(Bohannan)

Q: Enough room in cable wrap-up for future needs and extras?

A: Meets specifications. Filled up faster than expected.

5. Material Presented During Review

All the material handed out during each of the presentations listed in Section 2.4 have been collected and bound into a separate document (WODC 02-42-01). Copies may be requested from the WIYN Project Manager or the WIYN Site Manager.

6. Panel Review of ORR Report

A preliminary version (DRAFT Ver. 0.5) was distributed to the ORR panel, as well as Dan Blanco, the Project Engineer, for review and comment. That version did not include responses by the Project to the issues raised in Section 4. Comments on DRAFT Ver. 0.5 were received from all panel members except De Young and Bohannan. In general, the panel members who responded concluded that this draft accurately portrayed the outcome of the review and offered relatively minor comments (e.g. typographical errors, etc.). The following more detailed comments have been included in their entirety.

6.1 van Altena comments

Re: Issues 4.3.9:

The 10 arcsec repeatability slop in the tertiary mirror does not seem to produce a significant error in the calculated fiber positions in the Hydra. The error of 10 arcsec incurred in the OFAD center produces an error of 0.2 arcsec at the edge of the field of view in Hydra according to X. Guo, who checked his reductions in this matter. It does however still screw up the pointing of the WIYN.

6.2 Johns comments

Re: Issue 4.3.8, etc.:

While the pointing and tracking performance received a fair amount of discussion this item did not make it into the list of high priority items that needed to be addressed. Nevertheless, I believe that the problems with pointing will need to be solved in order not to be a constant tax on operational efficiency. There is also a matter of pride: an rms pointing performance of 10-20" is not world class and the peak-to-peak variations will be even worse.

I know the team has been under a lot of pressure to get up and running, particularly after the secondary mirror episode. Still I didn't get the message that the pointing has been carefully analyzed to determine if the problem is: (i) non-repeatability with one or more encoder; (ii) bore sight various due to active optics; (iii) tertiary mirror repeatability; (iv) thermal variations in the structure; (v) software bugs; (vi) all of the above; or (vii) none of the above.

The number of possible failure modes is large and unless the Observatory gets lucky, a concerted and probably lengthy effort will be required to sort things out. Given the number of other items that need addressing having, perhaps, more apparent solutions, it is hard to argue that pointing should have priority. Pointing is, however, such a fundamental parameter of telescope performance that I believe it can't be ignored for long.

6.3 Blanco comments

General comment about priorities:

Now that the Observatory has reduced to an operations level of staffing we are critically shorthanded for major improvement projects. This makes it very important to establish globally prioritized goals. Realistically, given the present staffing, we can expect completion of only the few tasks deemed most important. I think the ORR Panel has done an excellent job of preparing such a globally prioritized list.

Once we have targeted a short list of highest priority goals it is of utmost importance not to waver in our aim until at least some of these goals have been met. I invite the SAC to endorse the Panel's list recognizing that these tasks will necessarily occupy the operations resources to the exclusion all other major projects.

7. Material Submitted After Review

This section documents ORR related material submitted after the ORR was completed. Thus, this material was not presented to nor reviewed by the ORR panel.

7.1 WIYN Re-imager Status Report

Per Action Item 3, Section 3.2.3 (Maintenance), Art Code (UW) submitted a "Status Report on the WIYN Reimager and Spectropolarimeter". This report is dated 28 Feb 1996. It was delivered to the Project by Bob Mathieu (UW) and filed as WODC 02-43-01.

8. Acknowledgments

I would like to thank Pat Patterson for her tireless support and assistance before, during, and after the review. She is one of the "behind the scenes" people who have made WIYN the success it is today.

I would also like to gratefully acknowledge the endless contributions of Dave Sawyer and Dan Blanco to the success of this review (and to the success of the entire Project as well!) and apologize for my usual brinkmanship approach to any deadline situation.

Finally, my love and appreciation to my wife, Paula, and my children, Sean and Alison, who have tried to keep me balanced and sane over the last two years, despite numerous obstacles along the way.