Training for remote queued service observing at CFHT

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ABSTRACT

The Canada-France-Hawaii Telescope moved to remote observing from its Waimea headquarters in February 2011. Before remote operations, Queue Scheduled Observations were performed from the summit of Maunakea by one Observing Assistant (OA) and one Service Observer (SO). The OA was in charge of the dome, telescope, associated systems, and weather monitoring, while the SO was in charge of executing appropriate observations based on scientific priorities and sky conditions. Under the new Remote Observing scheme, only one staff member, the Remote Observer, performs all necessary duties remotely, without any staff member present at the summit facility. The training program designed and implemented to achieve remote observing is presented here.

Keywords: classical observing, remote observing, merging positions, training program, observatory automation

1. INTRODUCTION

Since its first light in 1979, CFHT has been operating under the Classical observing mode. This mode is still used a few nights per year. In Classical observing from the summit of Maunakea, 2 people are working together, for safety reasons. A Telescope Operator and one or more visiting astronomers perform the observations.

A little over 10 years ago, on January 29, 2001, CFHT reached a milestone with its first Queued Service Observations[1,2,3]. Under that mode, the Observing Assistant (OA) performs the duties of a telescope operator while the Service Observer (SO), essentially replaces the visiting astronomer. The SOs are hired and trained by CFHT to operate instruments, decide which observation to carry out based on priorities and sky conditions, and perform the data acquisition and preliminary data quality assessment. By 2008, CFHT had its 3 main instruments operated under the QSO mode. On February 7, 2011, CFHT performed its first remote queued service observations, with no personnel at the summit and only one Remote Observer (RO) performing all the necessary duties from the CFHT headquarters in Waimea.

Table 1. Schematic comparison of the 3 operations modes at CFHT

Classical	**QSO**	**Remote QSO**
4 Telescope operators • Telescope operation • Dome and shutter operation • Guider operation • Weather assessment	4 Observing assistants • Telescope operation • Dome and shutter operation • Guider operation • Weather assessment	4 Remote observers • Telescope operation • Dome and shutter operation • Guider operation • Weather assessment • Instrument control • Data acquisition • Observation choice
Visiting astronomer(s) • Instrument control • Data acquisition • Guider operation • Target choice	4 Service observers • Instrument control • Data acquisition • Guider operation • Observation choice	

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In order to ensure an efficient and smooth transition from a 2-person operation to a single-person operation, a training program was carefully designed and is presented here.

2. FROM CLASSICAL OBSERVING TO REMOTE OBSERVING

2.1 The need for training

When the decision was made to move to remote operations and observing, it became immediately obvious that nobody at the observatory knew how to perform all the tasks that a RO would need to carry out. One option was to look outside the company for new employees who would have the appropriate experience, with the understanding that any new employee would require extensive training for the CFHT-specific systems. On the other hand, CFHT already had experienced staff members who were simply missing part of the knowledge required. It was therefore decided to train the available staff into becoming ROs, and offer the new position in-house first. The initial pool of potential RO candidates was double that of the final number of ROs needed (4). The training process would have to be a competitive one.

2.2 Observatory automation project

Remote observing would not have been possible without implementing the Observatory Automation Project[4] (OAP), which allowed the consolidation of status screens, information displays, and various controls, and now provides automated tools for warnings and alerts related to the facility or the weather.

3. DESIGN OF THE TRAINING

3.1 Job description

In order to train employees for the new position of a RO (or any new position), a clear job description is needed. A clear job description is essential to design a training program, as it helps potential candidates decide if they want to take the training or not, and helps at the end of the training to see if the goal was reached or not.

3.2 Goal definition

The goal of the training also needs to be defined in order to guide the whole process. The goal of the RO training at CFHT was to train candidates to become Remote Observers capable of operating all systems related to observing (dome, shutter, telescope, windscreen, instruments, guiders, etc.) and perform observations appropriate for the current sky conditions and the scientific priorities, under minimal supervision. A subtle point was to use the word “candidate”, which avoided associating trainees with their current employment at CFHT thus allowing a fresh approach.

3.3 Pool of candidates

The pool of candidates was examined and it was realized that the candidates had different backgrounds (BSc or MSc in astronomy or a related field), and different levels of experience and skills (from no or little familiarity with operating a telescope, up to years of experience; no or little experience with observing, or some experience, or years of experience). This diversity posed a challenge, and at the same time provided an opportunity to get creative.

3.4 Requirements for the training

Given the defined goal and the available pool of candidates, a set of requirements was established. The training program had to:

- Be thorough, cover all possible topics
- Be fair to all candidates (e.g. provide equal access to all 3 instruments)
- Be flexible, adaptable, expandable
- Allow for progress tracking
- Define criteria for moving forward; provide evaluation and assessment tools
- Be put in context of a competition
- End with a certification deadline of end of 2010

3.5 Experts and trainers

Each observatory has a precious resource in its staff. For this reason, it was decided to involve as many CFHT staff members in the training and allow them to share their knowledge and expertise. The 8 potential candidates themselves (4 OAs and 4 SOs) were the primary trainers, as each group basically possessed one portion of the knowledge that had to be acquired. The observatory's instruments specialists, the QSO specialists (queue coordinators), the telescope/TCS and summit facility experts were approached to see how they could contribute to the training and transfer of knowledge.

3.6 Learning methods

The topics to cover were varied, and a mix of learning methods was used:

- Lectures or formal presentations (1-hour long presentations)
- Tours, "show-and-tell" (tour of the summit facility from the basement to the telescope floor)
- Self-study material with or without take-home exams (documentation, manuals, webpages)
- Quizzes, tests or questions sent by email
- Homework
- Coaching/mentoring with "experts"
- Individual sessions, group sessions
- Answering questions
- Practice, practice, and more practice!

3.7 Training general design

The design of the training program started mid-2008. The training was divided into 3 levels (Beginner, Intermediate, Advanced), each consisting of modules. The training started in early 2009 as soon as the details of the Beginner modules had been decided. The details of the Intermediate and Advanced modules were designed later, based on the experience gained while providing the Beginner level training, and based on how the training was progressing in general. Allowing the training to adapt to the candidates, the trainers, the timing, the progress, and work schedules, etc., was essential.

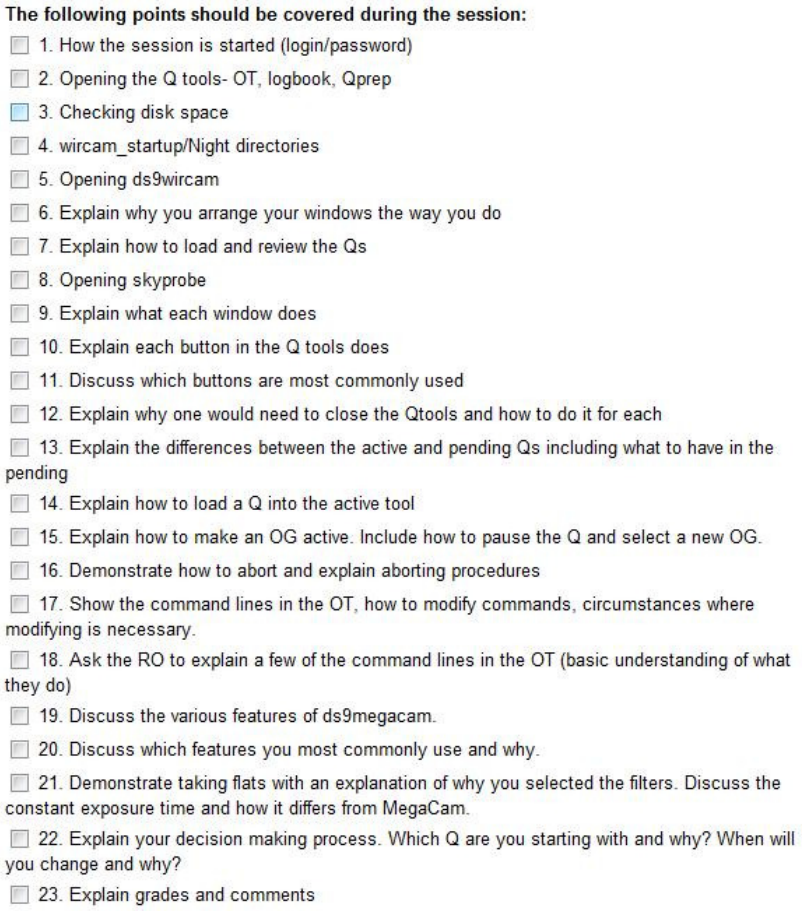
4. BEGINNER, INTERMEDIATE AND ADVANCED MODULES

4.1 Beginner modules

Beginner modules generally consisted in "passive" units with some transfer of knowledge from experts to the candidates:

- One module for each of the 3 instruments operated under QSO (basic design and capabilities, how they work)
- Modules helped trainees study of all the science programs for each semester (what information to look for and pay attention to, which details can impact decisions made at the telescope)
- Lectures on photometric (visible and IR) and polarimetry
- Basics of QSO as used at CFHT
- Summit tour
- Telescope start-up and shut-down procedures, basics of the Telescope Control System and telescope operations
- Safety module on cryogenics

For some modules, each trainee or candidate would receive information from a different trainer, so it was necessary to provide a tool to ensure consistency of the training. For some of the modules, trainers were provided with a detailed list of topics to cover.



The following points should be covered during the session:

- ☐ 1. How the session is started (login/password)
- ☐ 2. Opening the Q tools- OT, logbook, Qprep
- ☐ 3. Checking disk space
- ☐ 4. wircam_startup/Night directories
- ☐ 5. Opening ds9wircam
- ☐ 6. Explain why you arrange your windows the way you do
- ☐ 7. Explain how to load and review the Qs
- ☐ 8. Opening skyprobe
- ☐ 9. Explain what each window does
- ☐ 10. Explain each button in the Q tools does
- ☐ 11. Discuss which buttons are most commonly used
- ☐ 12. Explain why one would need to close the Qtools and how to do it for each
- ☐ 13. Explain the differences between the active and pending Qs including what to have in the pending
- ☐ 14. Explain how to load a Q into the active tool
- ☐ 15. Explain how to make an OG active. Include how to pause the Q and select a new OG.
- ☐ 16. Demonstrate how to abort and explain aborting procedures
- ☐ 17. Show the command lines in the OT, how to modify commands, circumstances where modifying is necessary.
- ☐ 18. Ask the RO to explain a few of the command lines in the OT (basic understanding of what they do)
- ☐ 19. Discuss the various features of ds9megacam.
- ☐ 20. Discuss which features you most commonly use and why.
- ☐ 21. Demonstrate taking flats with an explanation of why you selected the filters. Discuss the constant exposure time and how it differs from MegaCam.
- ☐ 22. Explain your decision making process. Which Q are you starting with and why? When will you change and why?
- ☐ 23. Explain grades and comments

Figure 1. Example of checklist provided to trainers to ensure all topics are covered during a session.

For some modules, the trainers also had a rubric to assess how the trainee performed during a specific session. The trainers were also asked to tell, if they could, what were the strengths and weaknesses of each trainee.

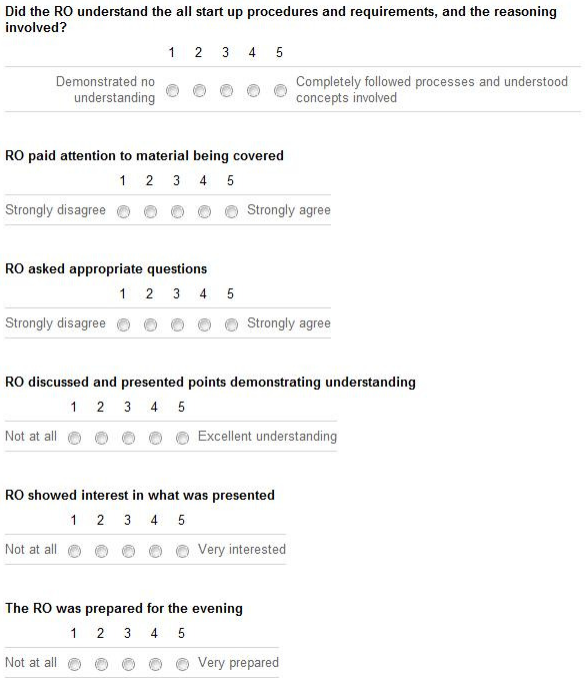


Figure 2. Example of rubric that trainers had to fill in.

Some Beginner modules ended with a take-home exam, which was graded. For most of those graded modules, all candidates did very well and in general, no one really stood out as either a very poor or an outstanding student. However, even at that early stage, work habits, skills, and personalities were discernable and some strengths and weaknesses were noticed. This knowledge was used later on and during the whole training to provide support and advice tailored to each individual. For example, when suggesting tools for time management, “pen and paper” individuals would receive different suggestions and ideas than the “computer and electronics” type of person.

4.2 Intermediate modules

Intermediate modules consisted of hands-on training, with the candidates practicing the basics skills required of an RO, at the summit and during a regular night of observing. At the very beginning, this required the presence of 3 staff members at the summit: one member performing his regular duties (one portion of the RO duties), then one trainer and one trainee both working on the second portion of the RO duties. Sending 3 staff members at the summit was difficult because of scheduling issues, and the additional workload proved unsustainable after a couple of months. To reduce the workload on trainers and trainees, the training continued with only 2 staff members at the summit, each practicing new duties, all the while providing support to each other for the areas where they were experts.

For the Intermediate I training, each trainee focused on the part of the job they were unfamiliar with. For the Intermediate II training, each trainee took charge of all duties to be performed during the whole night. The second staff member was there for safety reasons and to provide assistance as needed, at least initially. As more progress was made, the second person was instructed to only interfere and provide assistance if a significant loss of efficiency was expected.

The RO candidates were assessed using a detailed list of what is expected of an RO. For example:

- Was the RO candidate prepared for the whole shift? For each night?
- Was every exposure graded based on data quality? Correctly?

- Were there comments for each exposure? Enough? Correct?
- Were there weather log entries every 2hrs?
- Was the time accounting log accurate?
- Was the night started on time?
- Did the observations executed fit the sky conditions and scientific priorities?
- Were twilight flats taken? Enough? In the correct filters?
- Were phone calls to the technical or scientific staff appropriate and well managed?

Assessment was based on feedback from the technical staff (if they had to interact with the trainees at night to solve technical issues for example), from the staff member present at the summit at night, and from the Queue Coordinators who reviewed the RO candidate's work the next day (completeness and quality of the various logs filled at night, choice of program to execute, time lost, etc.).

4.3 Advanced modules

There were no formal Advanced modules. At the Advanced level, the candidates were simply required to accumulate experience. To be moved from the Intermediate level to the Advanced level, a candidate had to demonstrate proficiency and the capability to observe with minimal supervision.

4.4 Assessments and feedback, progress tracking

Feedback was provided to the candidates at various times during the training: after some shifts or as needed, and every few months. The feedback provided underlined the tasks and duties performed correctly, pointed out mistakes, listed strengths and weaknesses, underlined areas of progress, and provided tools and ideas for improvements. The main goal of the feedback was to identify the areas where each candidate had to focus his efforts and energy for the remainder of the training.

5. CERTIFICATION AND HIRING

To become a Certified RO, a candidate had to have moved to the Advanced level and demonstrated a reliable performance. The Certification was a necessary but not sufficient condition to be hired as Remote Observer. Other skills and general criteria (computer skills or other area of expertise, interest for the job, participation to other company duties or projects, etc.) were also taken into account, as is the case in most hiring processes.
At CFHT, some candidates declined the opportunity to train and be hired as a RO; they however remained dedicated to help train the others. The first ROs were certified mid-September 2010. The new position was opened (internally only) at end of September. All RO candidates that had taken the training had gained knowledge and experience, and they had all showed progress over the whole training period. In the end, only the 4 best candidates, who had been certified by then, were hired Jan 1st, 2011. Remote Observing started Feb 7 2011, and until the middle of 2011, CFHT still retains the services of the other candidates to allow for contingencies.

6. IMPACT ON EFFICIENCY OF OBSERVATIONS

As part of the design, engineering time has been set aside to allow for:

- Taking time to mentor while observing
- More idle time
- Slower execution while candidates learn and practice new skills
- Mistakes

Overall, little time was lost on the sky. Some non-optimal decisions were made, however most of the lost opportunities were recovered thanks to the excellent weather present during the last year of the training and the engineering time that had been set aside.

ACKNOWLEDGEMENTS

The success of the Remote Observers Training program is due in great part to the generosity of all the current and former CFHT staff members who have shared their knowledge and experience with the RO candidates. Their time and energy were an essential ingredient toward achieving another important CFHT milestone.

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