

NATIONAL RADIO ASTRONOMY OBSERVATORY
TUCSON, ARIZONA

October 22, 1979

To: 25-M Telescope Working Group

From: B. L. Ulich

Subject: Telescope Operations on Mauna Kea

*25 Meter Millimeter Wave Telescope
Memo #127*

After discussions with personnel at the University of Hawaii, IRTF, CFHT, and UKIRT concerning their work schedules and problems caused by the remoteness and altitude of Mauna Kea, I have reached some conclusions which I put forward for your consideration and comments.

1. People can and do travel from sea level (Hilo) to the summit and return each day five days a week. They work about six hours per day at the summit.
2. People can and do work longer shifts (up to a maximum of 12 hours) at the summit providing they sleep at the mid-level facility (Hale Pohaku). A maximum of five days' work is permitted in this mode. Longer periods apparently result in severe fatigue.
3. We should require that two persons be present at our site at all times. Because we will be the only telescope operating 24 hours/day, there will be times when no workers at other telescopes will be present at the summit. Experience has shown that in case of altitude sickness, illness, or injury, the victim should be promptly moved to lower altitude. In my opinion it will be risky and unsafe to allow anyone to operate the telescope alone. Someone else should be present nearby to render aid if necessary (this person could be the astronomer), and a vehicle should always be available.
4. We must increase the oxygen supply and humidify the air in order for people to sleep comfortably for several nights in a row at the summit. The French system of oxygen enrichment appears to me to be a more satisfactory solution than pressurization. We should also consider adding oxygen to the air in the control room, since the benefits to the comfort, safety, and efficiency of the operators and astronomers will be considerable. At present no one sleeps at the summit, but I believe the advantages of housing people next to our telescope will justify the expense. Of course, fewer rooms will be needed at Hale Pohaku if sleeping quarters are available in the control building at the summit.

5. Telescope operators should spend at least eight hours at the summit in an oxygen-enriched environment (or perhaps at Hale Pohaku) before they begin their 12 hour shift work. Astronomers should be required to do the same. Presently, operators and astronomers must spend 24 hours at Hale Pohaku before working a night at the summit.
6. Late-night service calls will probably have to be delayed until morning, unless a repair crew is constantly stationed at the telescope or at Hale Pohaku (which is probably unjustified). It is unreasonable to expect someone to get out of bed in the middle of the night, drive about two hours to 4100 meters altitude, and work effectively and safely.
7. Facilities for self-service food preparation should also be provided in the control building if people routinely sleep there.
8. We should make a considerable effort to avoid the necessity of strenuous physical exertion. This includes designing the mechanical equipment for reliability and ease of maintenance and repair, designing the control building and telescope for convenient access, and remotely controlling all telescope, astrodome, and receiver operations from the control room.
9. After working at the summit several days a week for a period ranging from a few weeks to six months, people become physically acclimated to the altitude. It appears, however, that people become "psychologically acclimated" in a much shorter time (several days). That is, they quickly learn which activities cause discomfort and avoid repeating them.