formed (somewhat in advance to the normal schedule), and the opportunity was taken to perform some of the work, in particular in the area of thermal and mechanical control of the telescope and of the image quality problem. This report summarises these actions:

3.1 Installation of Water Cooled Electronic Racks in the Cassegrain Cage

The heat produced by the racks inside the Cassegrain cage can be as high as 1KW and is dissipated below the primary mirror cell, resulting in an increase of the mirror temperature always above ambient temperature. Getting rid of this major heat source was essential to improve both, dome and mirror seeing. Water cooled racks have now been installed which house the electronics for the control of the adapter functions and auxiliary systems. All the cabling had to be refurbished and the control electronics re-assembled in the new racks. Obsolete items have been removed to obtain space and gain simplicity. Extensive testing was required thereafter and servicing of a couple of functions was necessary too. Additional refrigerated racks can be installed in the cage to accommodate the instrument control electronics.

3.2 Re-Arrangement of the Mirror Cover

This was probably one of the most impressive changes made at the 3.6-m. To reduce mirror seeing, it is essential that the mirror temperature matches the air temperature. This usually involves cooling during the day and, in some cases, ventilation when the outside temperature increases during the night. With the old configuration (the primary mirror was completely enclosed inside the centre piece) it would have never been possible to build an efficient cooling and ventilation system. For this reason, the mirror cover has been moved from its old position (a few centimetres above the mirror) to the top of the centre piece some 2 metres above the mirror. This change has several advantages:

- the space, where the cover was located, provides now for full access to the mirror surface (about 30 cm space), and could be used for forced mirror ventilation.
- there is now a direct access between the mirror and the declination axis hole, located in the centre piece. This 90-cm hole was part of the Coudé train of the telescope. It could now be used as an air duct to cool the mirror with air coming from the telescope base.

This operation required a lot of time due to the heavy work involved (grinding off welded parts, etc.) and cleaning of the complete telescope and its environment was necessary thereafter. Most of the hardware, like motor units, drive shafts, etc. have been "recycled" and are again in use.

3.3 Elimination of M3

This point is not directly related to the improvement of the image quality but it was necessary for the relocation of the mirror cover above the centre piece. However, the 2500 kg of metal and glass that have been removed can only help to reduce telescope flexure and will improve the dynamical behaviour of the telescope. Although some difficulties were expected for the balancing of the telescope after dismounting M3, the range of the polar counterweight could be extended by taking off the heavy cable cover (500 kg) on the delta twist of the other (West) side.

3.4 Installation of New Sensors for M1 and Mirror Cell

A study on the thermal behaviour of the dome is currently being developed by Philippe Sacre (ESO Garching) with the intention to build a simple thermal model that gives a prediction of the temperatures in the dome and on M1 as a function of external parameters. New temperature sensors have been installed on M1 and on the mirror cell together with the corresponding cabling. Displacement sensors have also been installed to measure possible movements of M1 inside the cell.

4. M1 Aluminisation and Status

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4.1 Aluminisation

The last aluminisation was performed in October 1994. After coating, a reflectivity of 89.5% and a micro-roughness of 60 Å was measured. These parameters were re-evaluated before the 1996 aluminisation, giving a reflectivity of 84.6% and a micro-roughness of 86 Å. These values are very good, when considering the 19 months of time between aluminisations, and these achievements have been obtained thanks to the CO_2 cleaning performed regularly during this period.

After mirror washing, the measurements were repeated, by using an Atomic Force Microscope. The reflectivity increased to 89% and the micro-roughness decreased to 65 Å. Then the standard procedure was applied: aluminium layer removal, alcohol cleaning and removal of dust particles. The coating plant was modified and improved last year; now a better vacuum pressure can be achieved than in the past, and the coating process runs in automatic mode. The aluminisation was very successful, resulting in a reflectivity of 90.5% and 59.5 Å micro-roughness.

One interesting conclusion from this set of measurements is the fact that the 3.6-m mirror coating interval may be more than 2 years, provided these figures can be confirmed in the future. This result is in agreement with the good photometric stability of EFOSC (Benetti, 1996, *The Messenger* No. 83). Also, they show the importance of a regular CO_2 mirror cleaning.

4.2 M1 Status

Although a more detailed report will be given elsewhere (Gilliotte, in preparation), some of the results can be anticipated:

1. The analysis of the mirror surface showed that no new "frosted zones" developed, when comparing the 1996 and the 1994 mirror defect maps.
2. The analysis of the mirror surface showed that the degradation of the mirror is produced by an increase of the micro-hole (digs) density. In these areas the glass looks to be more fragile and sensitive to scratches. The reflectivity in these zones is only 85% and the roughness increases to 120 Å.
3. For the first time it was possible to measure and compare the reflectivity with and without the specular reflection, with two different techniques.

The results show that: at 670 nm, the reflectivity of the "good" and "affected" regions is of 90% and 86%, the diffusion 1.1% and 8.1% respectively. At 400 nm, the diffusion increases to 1.6% in the good zones and to 17% in the frosted zones.

A roughness of 59 Å produces a diffusion within a 2π solid angle of 1.1% whereas a value of 120 Å produces 8.1% at 670 nm. The results on the frosted zones at 400 nm indicate that reflectivity measurements in the B-UV will be needed in the future.

The previous analysis (Gilliotte, 1995, *The Messenger* No. 82) can be confirmed at the moment: frosted zones still are limited to only 2% of the mirror surface, and their contribution to the diffusion is very limited, comparable to the effects due to dust.