

LONG FOCAL LENGTH
PHOTOGRAPHIC OBJECTIVES

OPTICS
RESEARCH
LABORATORY

UNIVERSITY OF TASMANIA

BROCHURE NO. 1

UT52/5

PHOTOGRAPHIC PERFORMANCE
OF
100 INCH TELEPHOTO OBJECTIVE

PRODUCED BY
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In recent years much attention has been given to the development of lenses of long focal length which are capable of producing acceptable photographs of distant objects. This development has been stimulated by the need to equip high flying aircraft with reconnaissance cameras fitted with telephoto objectives of focal lengths of 24 in., 36 in., and a few of 48 inches.

Also the large programmes of rocket research in current progress have created fresh demands for objectives of great focal length for use with high speed cine cameras for the general photography of missiles. For this purpose reflecting objectives have been used principally. These consist of two mirrors, one or both of which may be aspherical with the possible addition of a

corrector plate. Such objectives have the obvious advantages of lightness and compactness. Over against this however is the small size of the useful field of view and the difficulties of construction.

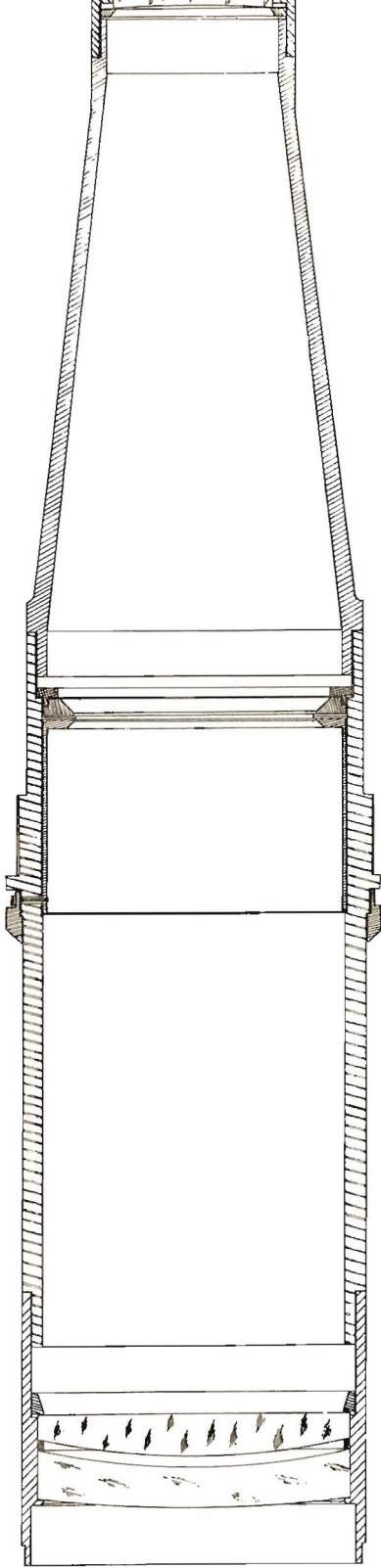
Lens systems of the telephoto type have not received the same attention for very long focal lengths on account of their greater size and weight. This comparatively neglected field of development is being investigated by the University of Tasmania at Hobart, the work being broadly an investigation into the possibility of extending the telephoto type lens system to very long focal lengths.

A lens of 100 inches focal length and relative aperture F/16 has been designed and the system has been constructed. A sectional drawing is shown

in Figure 1. A second model of this system in which the light path is folded by a system of four plane mirrors is nearing completion. This will give the lens system more favourable physical dimensions. Apparatus is being built whereby laboratory measurements may be made of the quality of the image produced by these lenses.

In the meantime some photographs have been taken of various subjects which serve to convey some idea of the performance of this lens. Some of these typical photographs are presented in this brochure for general interest. A full technical report on the design and performance of the 100 inch lens is being compiled now.

Funds for the support of this work have been made available by the Department of Defence Production.

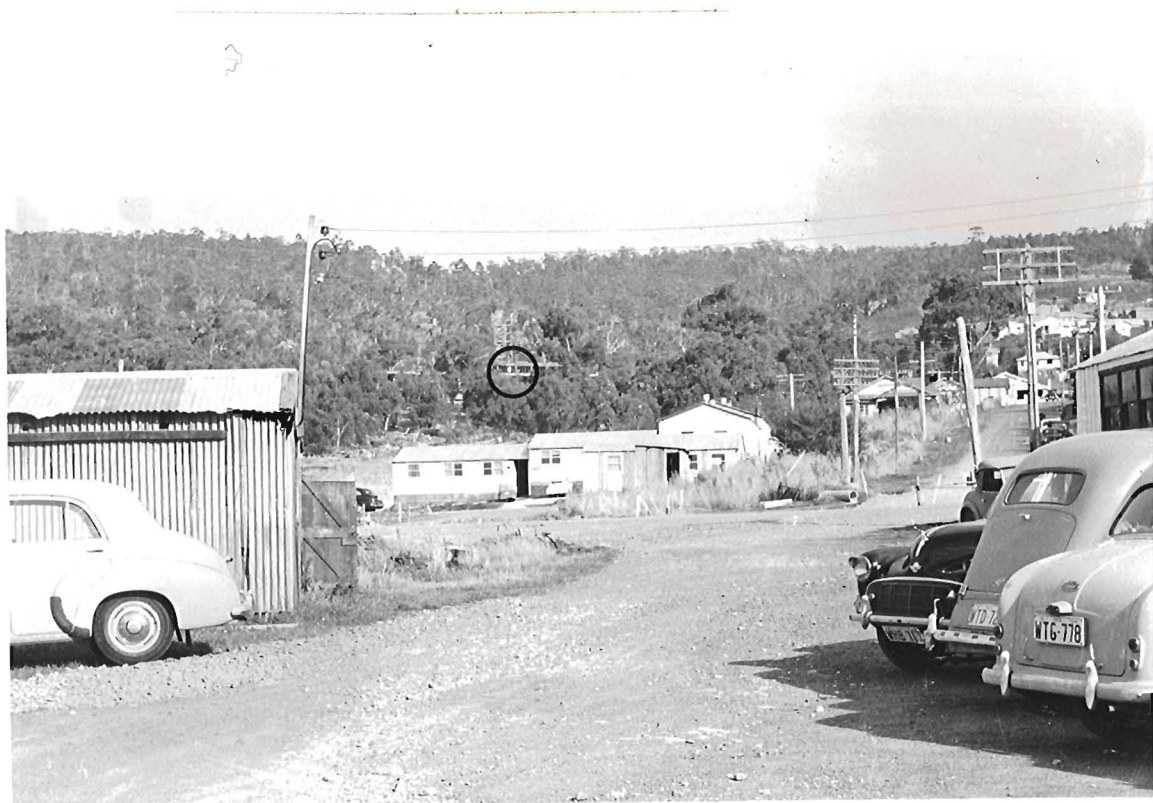


Section Drawing of Optical Assembly of 100 inch Telephoto Objective

The photographs on the following pages have all been taken on 35 mm. film and enlarged during printing to the same magnification (except the last). Those taken with the standard 50 mm. lens are included to give an idea of the relative distance of the target photographed.

The photographs on these two pages were taken from the same point, the position marked being distant 1700 feet (about one-third mile) from the camera.

The smallest Cobb elements on the chart are resolved, their central separation of 10.16 mm. subtending at the camera lens an angle of about 4 seconds of arc. In reciprocal radians this resolution corresponds to 51,000 per radian.





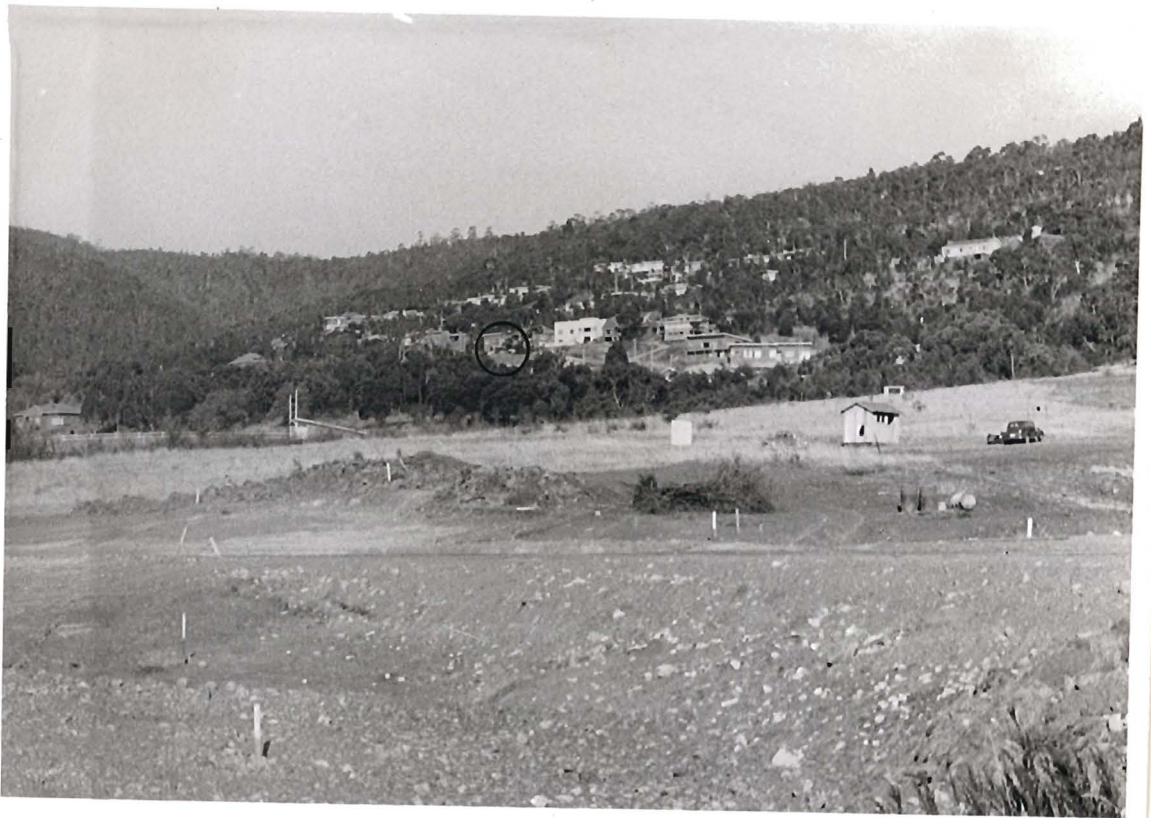
Two views of the same target area
taken with the 100 inch Telephoto Lens

Taken with a standard
50 mm. lens

Comparative photographs of a target
distant half a mile (2600 feet)

Taken with the 100 inch
telephoto lens.

Note the figures inside the
window. The letters on
the notice are $3 \frac{1}{2}$ inches
high.



Taken with a standard
50 mm. lens

Comparative photographs of a target
distant three quarters of a mile (4000 ft.)

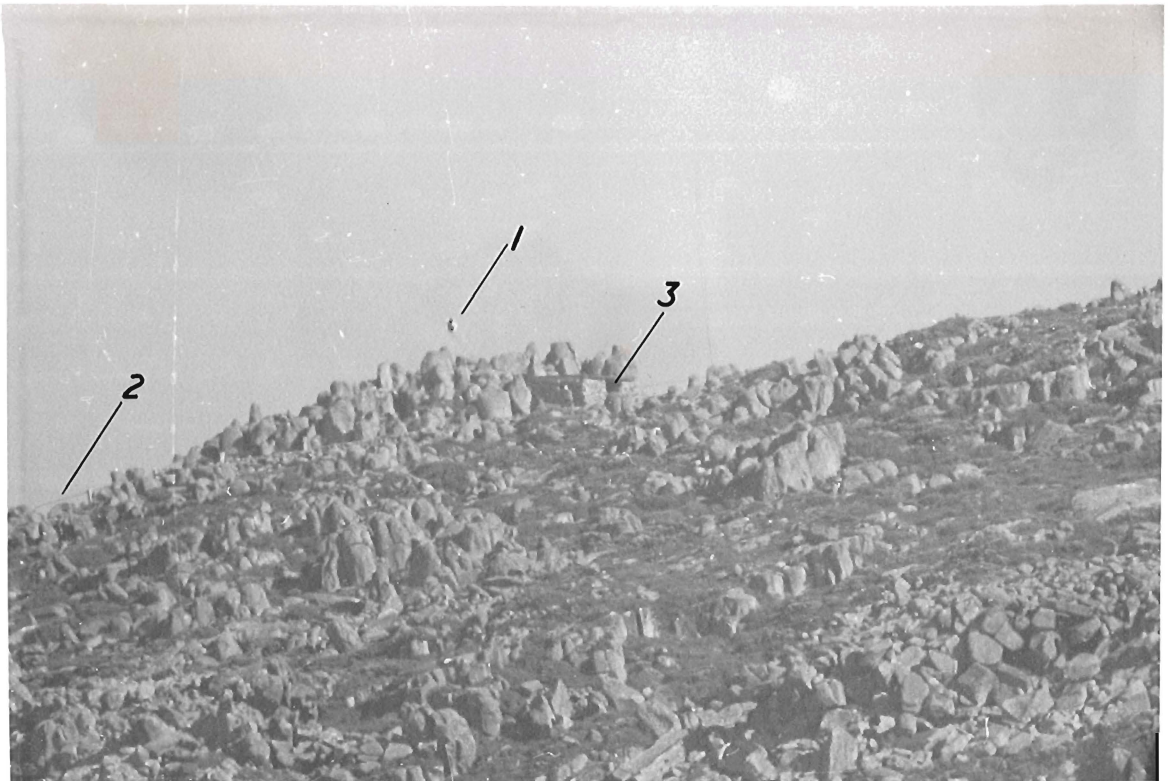
Taken with the 100 inch
telephoto lens



Taken with a standard
50 mm. lens

Comparative photographs of the Pinnacle,
Mt. Wellington, distant from the camera
about 4 $\frac{3}{4}$ miles.

Taken with the 100 inch
telephoto lens.
Note the items marked;
1. Survey Trig. Point,
2. Wire rope around the road,
3. Entrance to rock cabin.



This photograph is a print from a 35 mm. film strip placed in the image plane. It shows the high resolution obtained with the lens across a relatively considerable field of view. The resolution target and the figures are distant 2900 feet from the camera. The resolution figure read from the film is 58,000 per radian.

