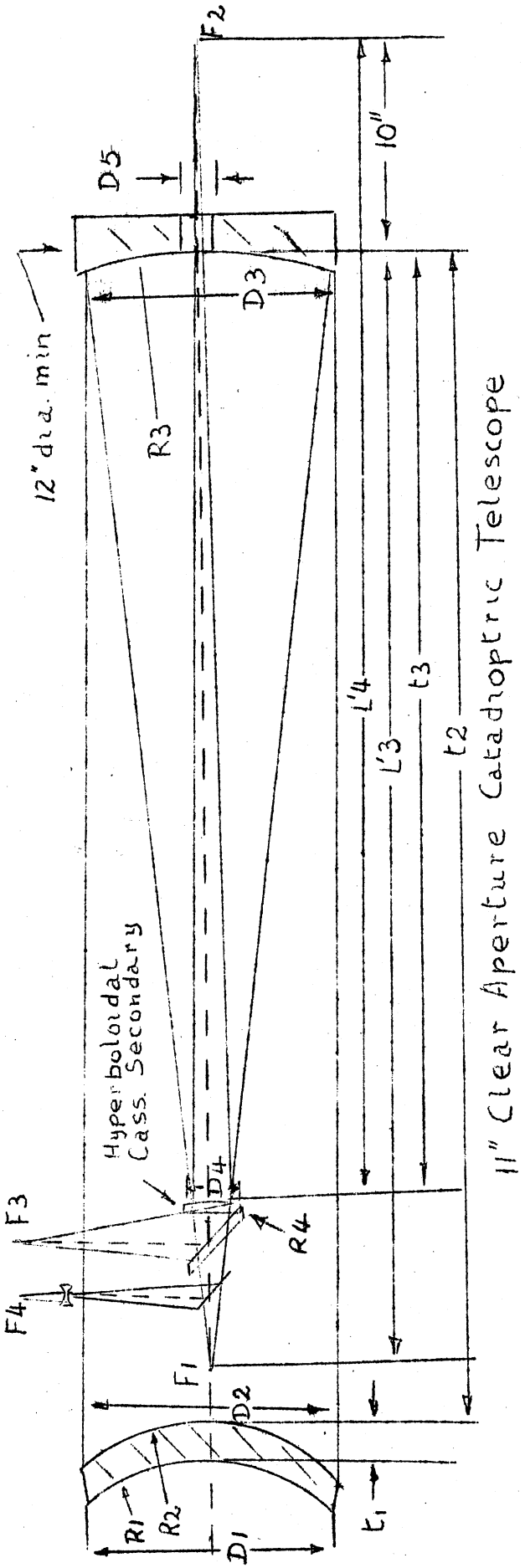

THE MAKSUTOV CLUB.

Circular No. 15.

Design for Maksutov - Cassegrain - Newtonian toloscope.

By B.A. Norman.

F_1	prime focus	Primary	f/4.2
F_2	Cassegrain focus	Cass. M factor	4.82
F_3	Newtonian focus	Cass.	f/20.244
F_4	Barlow focus	Primary e.f.l.	46.2"
		Cass. e.f.l.	226.684"

D_1	11"	R_1	17.094"
D_2	11.2533"	R_2	17.747"
D_3	11.4976"	R_3	94.525"
D_4	2.75"	R_4	25.232" (Cass secondary)
D_5	2.00"		

t_1	1.155"
t_2	50.233"
t_3	38.226"

L'3 48.226"
L'4 48.226" b.f.l.

Total rosidual LA' Primary 0".00242
(Permissiblo 0".0065")
Secondary 0".058
(permissiblo 0".150)

Glass BSC-2 Nd 1.517 V64.5

Franklin Contor
Quo.
Canada
1957

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Remarks by Mr. Norman.

11 inch f/4.2 f/20.24

A system which can be useful over a wide range of applications.

1. A camera at prime focus with film holder fixed at primary focal plane 2.016" in rear of correcting lens.

2. A Newtonian visual teloscope with diagonal mounted about 10½" to rear of correcting lens.

3. A sealed-in Barlow Newtonian where the diagonal is mounted somewhat nearer to the correcting lens so that approximately 1" of cone will extend through the tube. A good Barlow lens is used as an exit window.
This arrangement can be sealed-in using a dryer-indicator for exclusion and indication of atmospheric moisture as described by H.H.Selby in Sky & Teloscope, June & July 1956.

4. An f/20.24 Cassegrainian with secondary amplifying ratio of approximately 4.82 and e.f.l. of 226.684 inches.

Mechanical Notes.

It is suggested that the corrector lens be perforated so that the film-holder, diagonals and Cass. secondary can be attached as required, thus avoiding spiders and their accompanying diffraction.

These accessories could very well be supported by light aluminum tubing about 2" diameter, with a threaded bolt to go through the perforated corrector lens - the bolt can be fitted with a metal bushing. Such a support would be nearly 12" long for the Cass. secondary, hence the large tubing diameter to hold vibration to a minimum while acting as a cantilever support. Some flexure could be expected in the lens under worst conditions but I am led to believe that the system is quite tolerant of such deformation, and the support could be counterbalanced. The alternative, of course, is a spider mounting.

The Cassegrainian Secondary.

Since the primary system is fully corrected, this secondary mirror is, of necessity, a true hyperboloid. It is of 1.5232% eccentricity and 25".232 nominal radius of curvature.

The distance of the back focal plane 10" behind the primary mirror surface was made generous to minimize the body heat of the observer near the primary mirror, and also provides enough cone to utilize prism or diagonal or beam-splitter to enable viewing at 90° from the main optical axis, if desired.

The secondary mirror can be ground, polished, tested and figured by any of the well known methods of building and testing Cassegrainians.

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For those who wish to use the "Gaviola" method (reference for this is given in circular No. 13 - A.M.) the following zones and aberrations were used in the ray-trace and conform to the Gaviola formula:

$$Zt = e^2 r^2 / 2R$$

Radius of curvature R 25".232 Eccentricity $e = 1.5232$ $e^2 = 2.32014$

Zone r of secondary	r^2	Zt
1.191"	1.4196	0.065"
0.996"	0.993	0.046
0.715	0.511	0.024
0.4117	0.1696	0.008
0.00	-	0.00

As can be seen from the LA curves, the small aberrations of the primary have been reversed and magnified by the secondary, but still lie remarkably well within the Rayleigh limits. If, however, a suitable null method of testing the secondary directly in the system can be employed, the secondary can be figured to compensate the system and completely eliminate spherical aberration at the secondary focus. It could also compensate for errors of figure in the primary mirror.

This design may disappoint those who anticipated a Maksutov-Cass with spherical secondary made by aluminizing a spot on the rear surface of the correcting lens. Such a system is more suitable for smaller instruments and is not corrected at the primary focus, thus making it useless as a Newtonian. Nor is the overall correction capable of such control as is obtainable with the above system.

Many of you have read the article on Mars in March 1957 Sky & Telescope by Thomas R. Cave Jr. and admired the fine observational work and telescope described in that article. I suggest the Barlow-Newtonian version of the Maksutov, mentioned 3rd above, as a worthy challenger of the fine performance of Mr. Cave's instrument.

The reader is referred to the excellent articles on Maksutov telescopes by John Gregory in Sky & Telescope, Wright's article in A.T.M. III and the original Maksutov article in Journal of the Optical Society of America, May 1944, Vol. 34, No. 5, pp 270 - 284.

Photostats of articles from the Journal may be obtained from the New York Public Library at low cost.

The writer need hardly mention that if high quality optical and mechanical work be put into this project, an almost priceless instrument will result. A rolled and welded aluminum tube is suggested with ends machined to take machine-turned cells of corrector and primary mirror.

It is hoped that good designs and methods of construction, worked out by the various members, will be submitted to the Club for use by all.

B.A. Norman.