Title: Counterweight Requirements for the WIYN 3.5 Meter Telescope

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.1 Section 3: Specify minimum time to operate is 90 seconds.
.2 Section 3: Revise mirror cover moment estimate.
.3 Section 3: Revise moment specification to account for .2.

1. Purpose and scope..... 1
2. Description..... 1
3. Mechanical Requirements..... 1
4. Physical Limitations..... 2
5. Seals and covers..... 2
6. Environmental..... 2

1. Purpose and scope

This document describes the requirements for the adjustable counterweight assembly(s) for the WIYN telescope. WIYN is fundamentally a Nasmyth configuration telescope. Despite this there will be several operational sources of imbalance which will require a balance adustment by moving a counterweight forward or aft along an axis parallel to the optical axis:

a) Mirror Cover. Opening the mirror cover will shift its center of gravity (CG) forward (ie towards the secondary).

b) Tertiary Fold-up. Moving the tertiary to its fold-up position shifts its CG forward.

c) Removing Dewars at the Modified Cassegrain position can cause a CG shift.

d) Secondary focus motion. This can move its CG fore or aft.

The counterweight is not intended to compensate for non-operational sources of imbalance such as optics removal or Modified Cassegrain instrument removal.

2. Description

Two counterweights will be made of lead and moved in the fore-aft direction with a motor driven threaded shaft. The counterweight assemblies will reside on the Optics Support Structure (OSS) fixed to the center section (ring beam). They will be located as close to the elevation axis as possible to reduce their contribution to the telescope moment of inertia. They will be remotely controlled and provided with an absolute encoder to remotely determine the counterweight location.

3. Mechanical Requirements

Moment:

The counterweight assemblies will be capable of changing the telescope balance by a minimum 110 kg-m (9510 in-lb).The magnitude of imbalance is estimated to be:

Mirror Cover 50 Kg-m

Tertiary fold 140 Kg x 0.15 m = 21

Modified Cass Dewars 20 Kg x 1.8 m = 36

Secondary Focus 300 Kg x .01 m = 3

Total 110 Kg-m (9510 in-lb)

Readout resolution:

One part in 500, equivalent to 0.2 Kg-m (16 in-lb).

Repeatability:

+/- One part in 500

Time to operate:

Less than 90 seconds for full range

Back driving:

The mechanism will be designed to prevent back driving.

Power dissipation:

Zero when not in operation.

4. Physical Limitations

The counterweight assembly must not interfere with the operation of the mirror cover.

To permit primary mirror removal no part of the counterweight assembly will protrude more than 1 cm below the center section (telescope zenith pointing).

It is desirable that the counterweight assemblies fit entirely inside the center section ring beam.

Two counterweight units may be used instead of one as long as all other specifications are met.

5. Seals and covers

Covers will be provided for maintenance of the leadscrew mechanism as needed.

Seals will be provided to prevent the migration of lubricants onto optics and other telescope sub-assemblies.

6. Environmental

The counterweight assemblies will meet specifications in any orientation of the OSS (zenith pointing to horizon pointing) and under the following operating conditions:

Temperature:	0° to 100° F
Humidity:	98% non-condensing
Altitude:	6838 ft.

Earthquake: UBC Zone 2