Active Mirror Support for 1 m Class Telescopes

Mike Connelley

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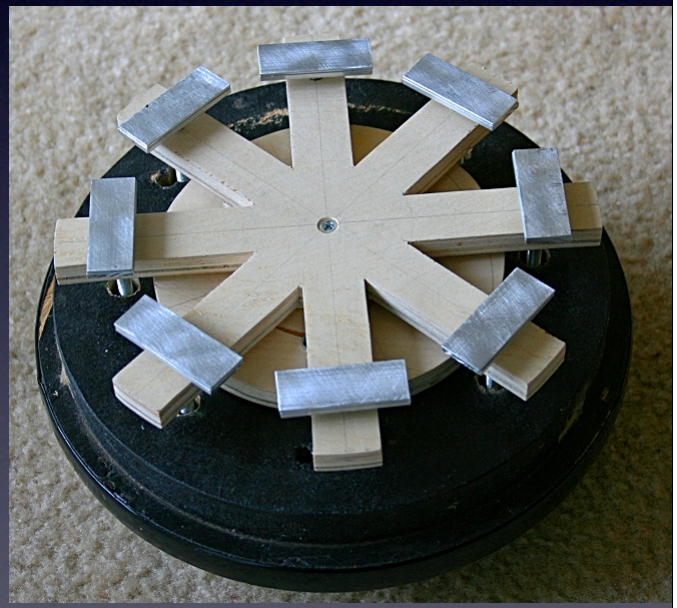
Problem: Mirrors Flex

- Stiffer mirrors
  - Thicker mirrors are heavier
  - Lightweighted blanks are expensive
- Active control
  - Adds complexity
  - Keeps weight low
- Segmentation
  - Small segments are individually stiff
  - Complex control for co-alignment/co-phasing

8” Experiment

- Made test rig w/ 8 adjustable fingers
  - Judged wavefront by eye
  - Made adjustments by hand
- Results
  - Could restore mirror figure by eyeball after randomly warping mirror
  - Could compensate for astigmatism
  - Figure stable after moving telescope



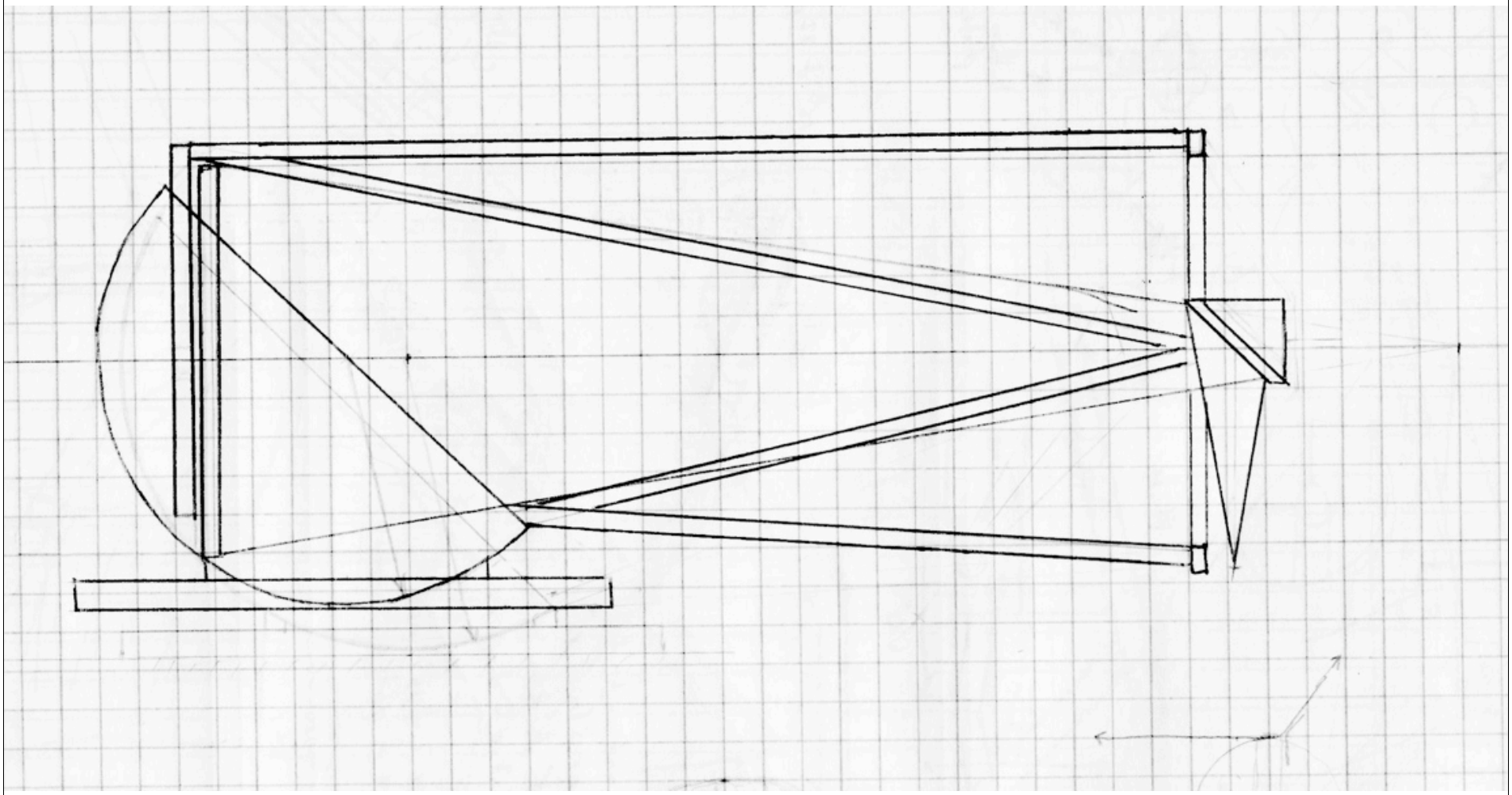
- A 1 m mirror needs careful support
- DC: Floatation support to carry mirror's weight, changes with cos(elevation)
- AC: Adjustment to compensate for flexure
- DC ~ 100 x AC

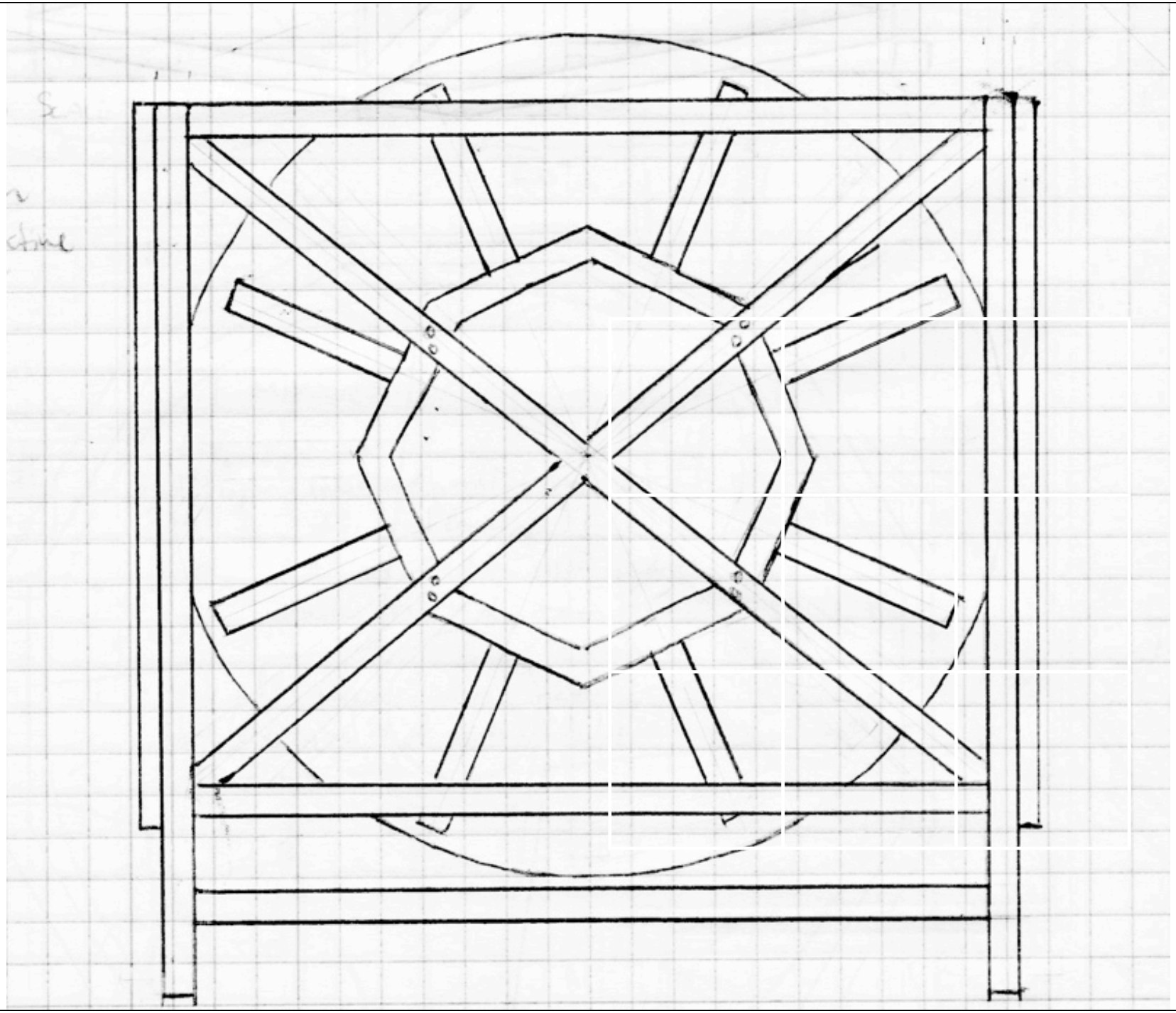
My Mirror

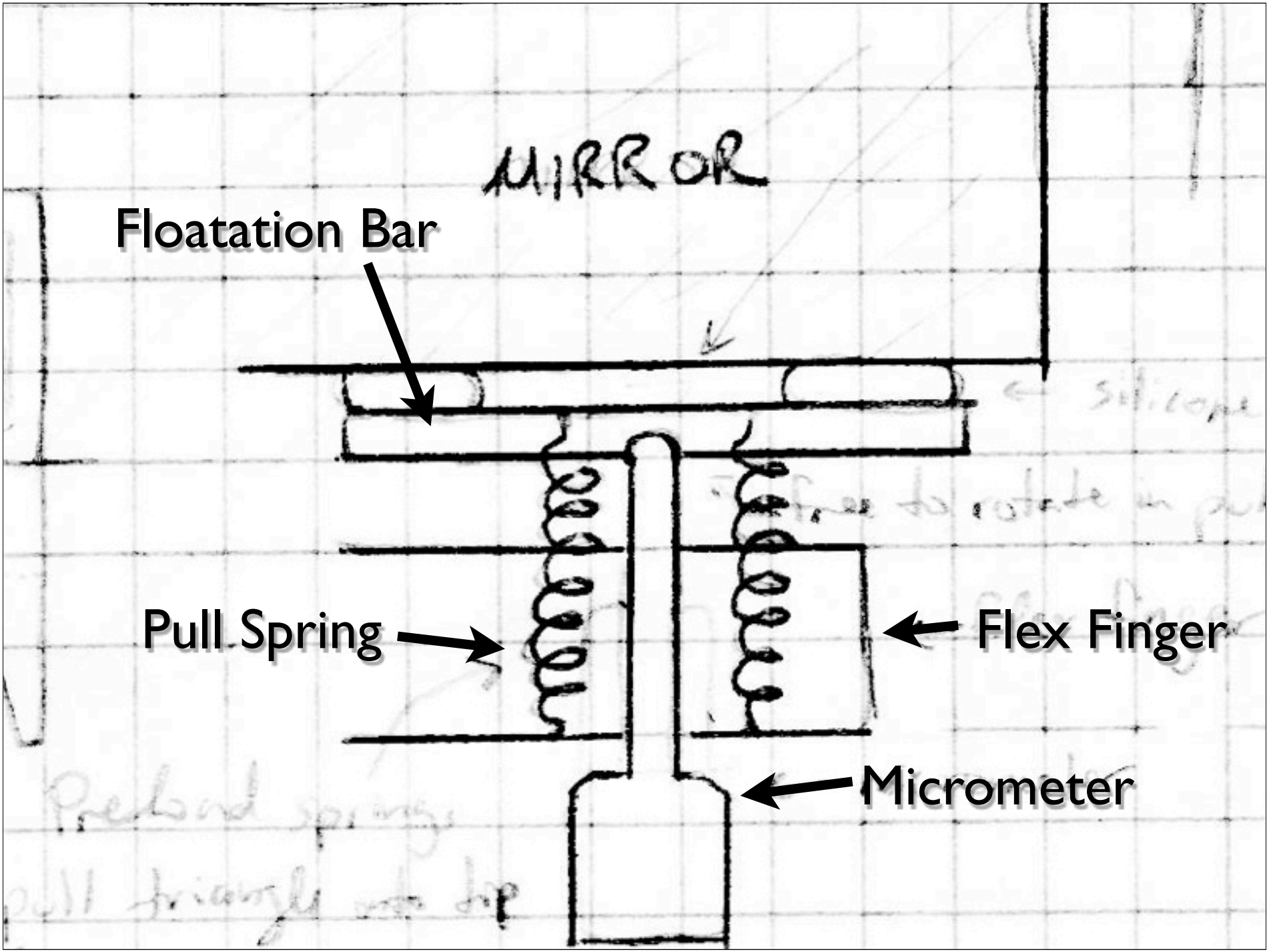
- Diameter = 1.0 m
- Focal length = 3.2 m
- Edge thickness = 1.5”
- Weight = 107 lbs.
- Known to show astigmatism

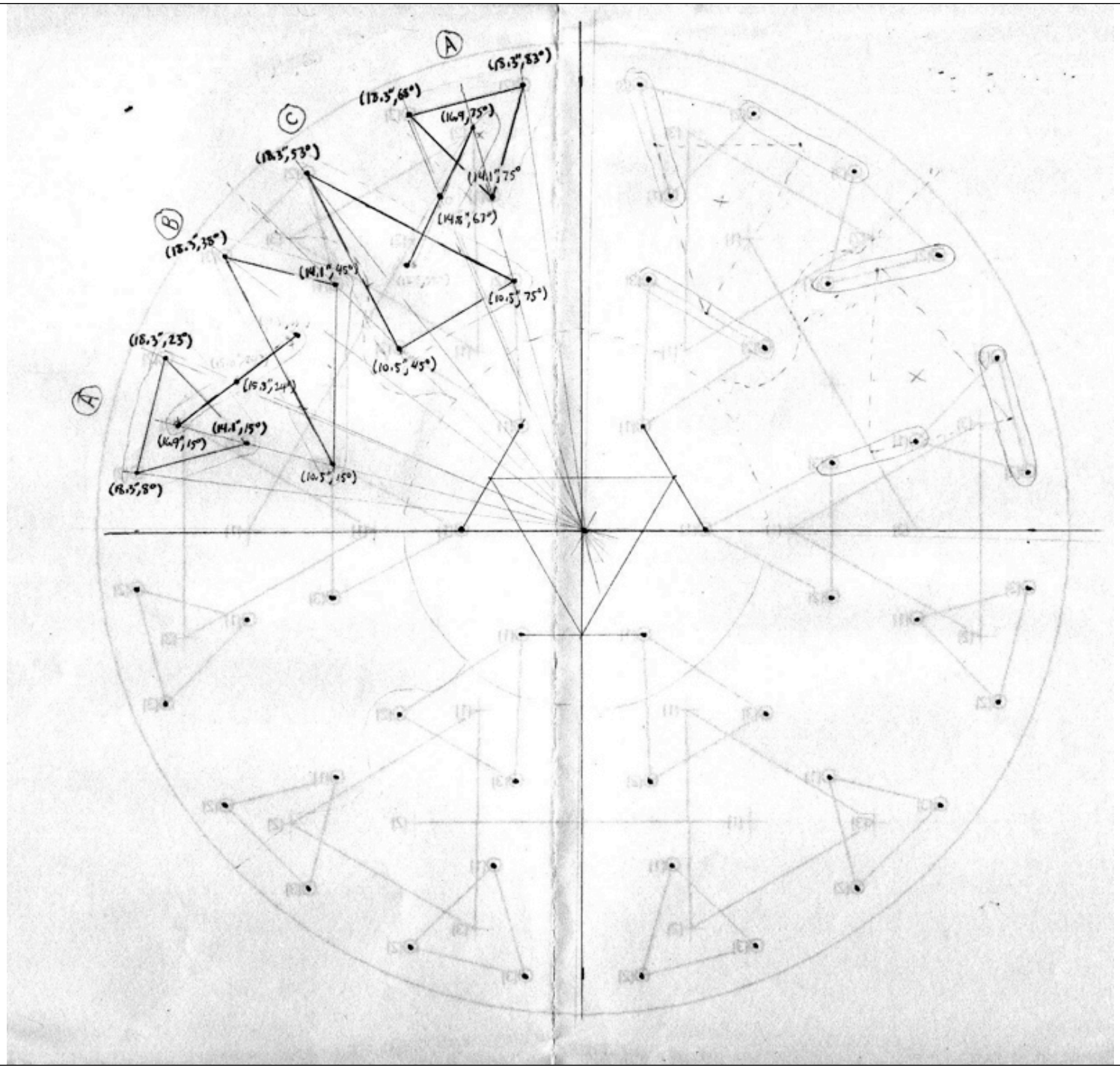
Mirror Cell Design

- Radial support with a sling
- 54 points collected into 9 groups
  - 8 groups around edge, one in center
  - Each group controlled separately
  - Floatation bars/triangles within a group
  - Mirror may be glued to floatation points






MIRROR
Floatation Bar
Pull Spring
Flex Finger
Micrometer


A
(15.3", 83°)
(13.5", 68°)
(16.9", 75°)
C
(18.3", 53°)
(14.1", 75°
(14.8", 67°)
B
(18.5", 38°)
(14.1", 45°)
(10.5", 75°)
(18.3", 23°)
(10.5", 45°)
A
(15.3", 24°)
(14.1", 15°)
(16.9", 15°)
(10.5", 15°)
(18.5", 8°)