

18" Newtonian Telescope

A DIY project inspired by
“Aperture Fever”

Keith Venables FRAS

www.astrokeith.com

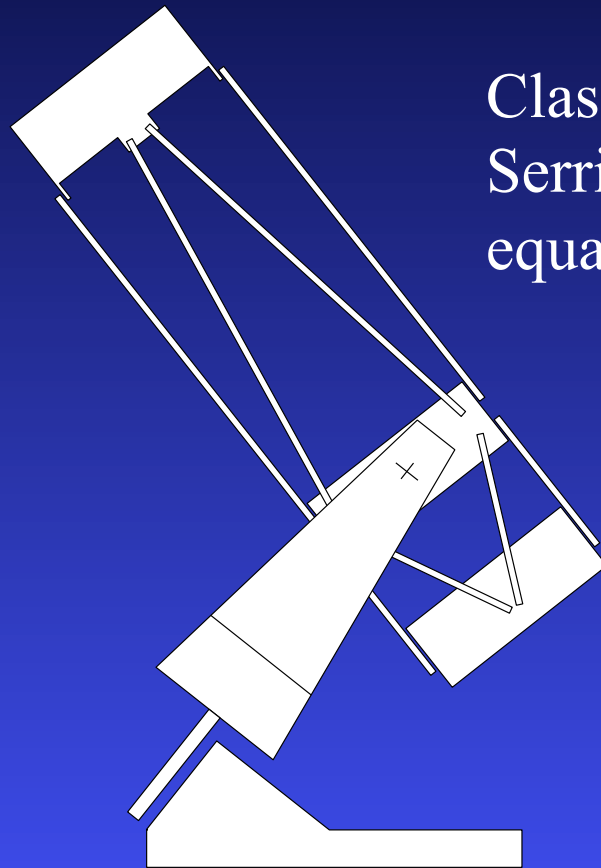
Presentation contents

- The Design Phase
- Photo walk through
- A few early results
- The Observatory Project

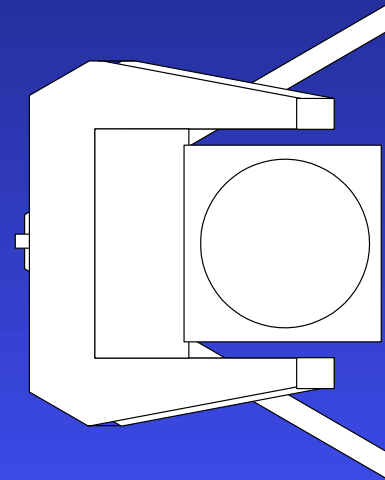
Design Goals

- Aperture
 - ◆ As big as practical & affordable
 - ◆ F number not to be less than 4
- Portability
 - ◆ Occasional visits to UK starparties
- Equatorial & stable mount
 - ◆ For astro photography
- Goto
 - ◆ Good enough to point a CCD camera automatically
- 80/20 target
 - ◆ 80% performance & functions for 20% cost

The Design



Classic Newtonian in a double Serrier Truss, mounted in an equatorial fork.



The Process

- design in stages
 - ◆ Keep the big picture in mind
 - ◆ Work out the detail as the work progresses
- Evolutionary
 - ◆ Build on what has been completed
 - ◆ Exploit opportunities
- problem solving
 - ◆ When things don't work out, take a break and think about it!
- workshop & tools
 - ◆ Work within capabilities of tools
 - ◆ Buy tools and blades etc as needed – they are as important as the telescope parts themselves
 - ◆ Use professionals for special items where necessary.







At last, it looks
like a telescope!

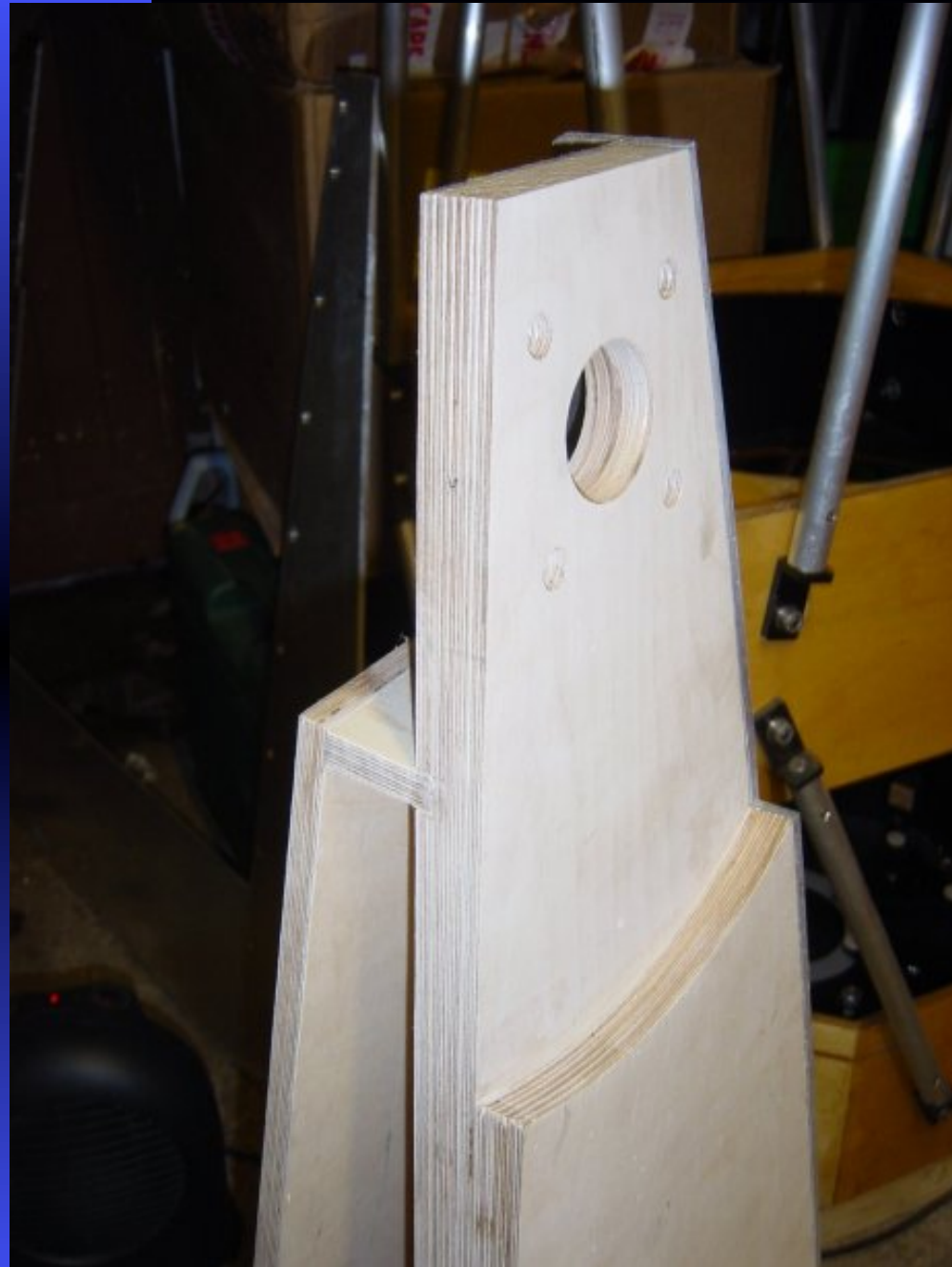
Time to check
balance, stiffness, &
weight





Baltic Birch ply

Weight for weight
stronger than
Aluminium. Easier
to cut & form



Reinforced box
gave enormous
stiffness.

All cuts made with a
router.

Bought as 12mm
sheet but layered up
where necessary.

Sheet aluminium used extensively,
from 1.6 to 25mm thick



RA Axis:

40mm stainless shaft in ball bearings
Aluminium “box” carries the shaft into the base of the fork assembly.



Now it really looks like a telescope!



specification

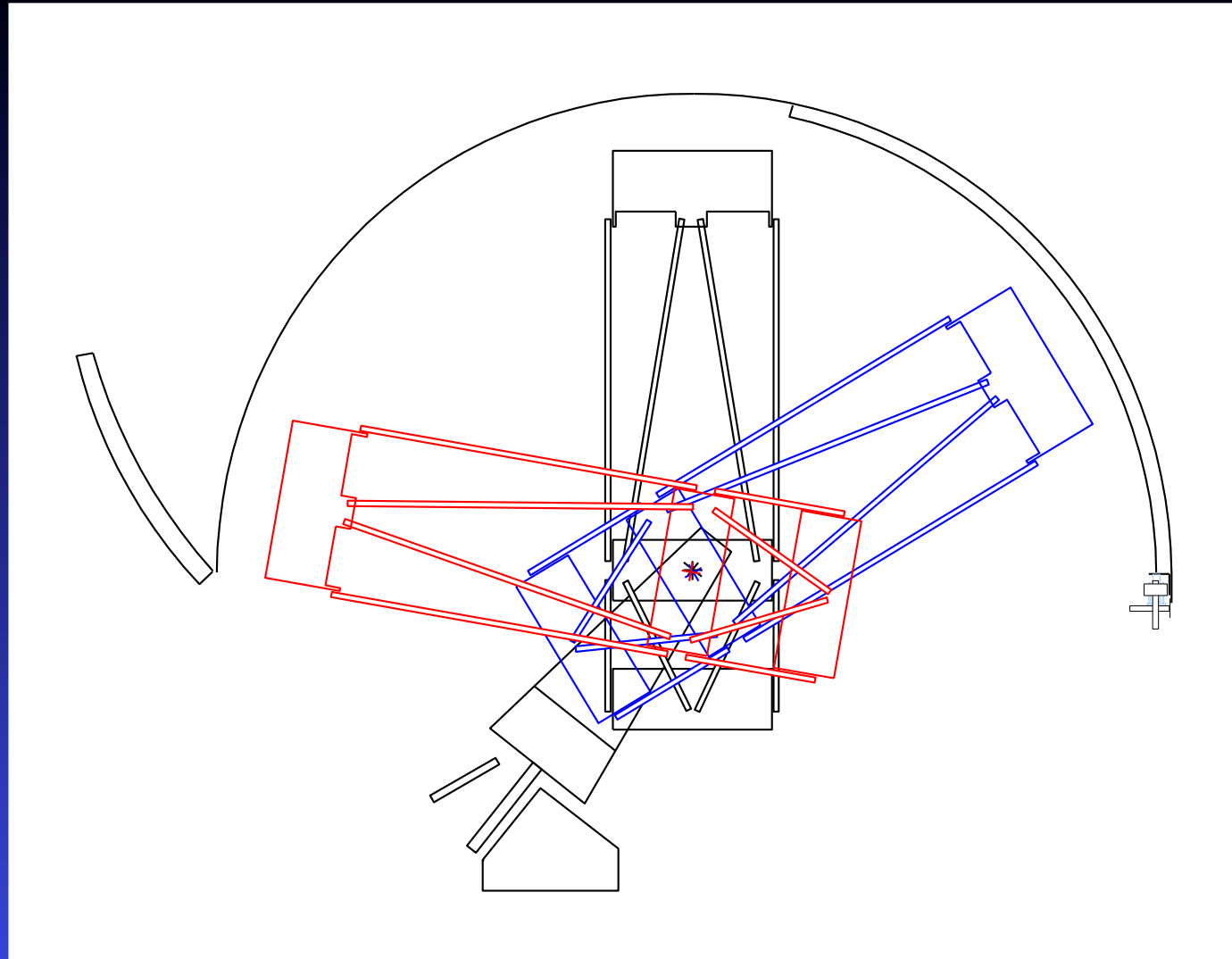
- 18" F4.5 mirror manufactured by Oldham Optics in Suprex© glass,
- 2" crayford type focuser with slow motion feature
- Integral secondary heater & Primary mirror cooling fan

- Equatorially mounted fork
- 14" worm & gear sets supplied by Beacon Hill Telescopes
- AWR Technologies Intelligent Drive System
 - ◆ Twin dc stepper motors
 - ◆ Intelligent & Simple handsets
 - ◆ PC and autoguider ccd interface connectors
 - ◆ Periodic Error Correction
 - ◆ 5°/sec slew speed
 - ◆ Goto/pointing accuracy 20 arcsec

- 30x70 finder scope
- 120mm guide scope
- Kendrick dew heaters on all optics
- Observatory pc, running
 - ◆ SkyMap Pro9 – Planetarium & telescope control
 - ◆ AstroArt 3 – CCD control & image processing
 - ◆ Sky2000 – CCD autotrack
 - ◆ On-line email & explorer
 - ◆ Remote pc server

next problem!

- The original idea of a roll-off shed seemed inadequate.
 - ◆ Requires too much space
 - ◆ Insufficient protection when observing
 - ◆ Out of character with the telescope
- A domed observatory would be as valuable an investment as the telescope itself.



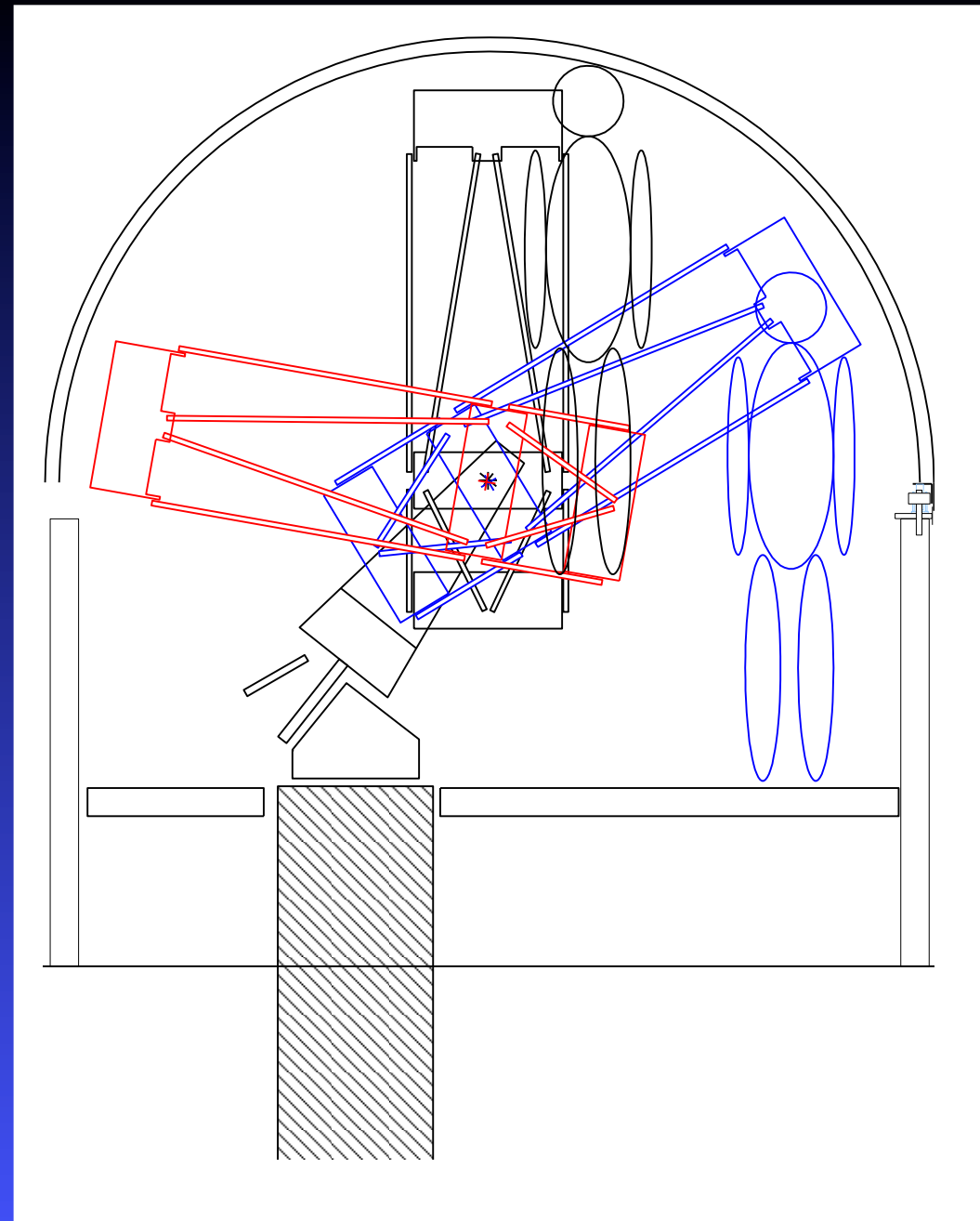
A 3.2m (11ft) dome would be required, mounted at least 1m above the telescope base.

Raise dome & telescope so as to allow easy entry

Raise floor for convenient observing

Sink concrete pillar into ground to support mount.

Raised telescope & floor will be drier.



Octagonal base looks nice & occupies minimum space

Raised floor does not touch the mount

A fit 18 year old son mixed 1.5 tonnes of concrete for the base.

Designed for disassembly for moving house





1/12 hemisphere
made in solid
wood &
smoothed to
shape.

“The Plug”

The “mould” - 4 layers of fibreglass



Phew! A nice fit





Work in progress

A 75x75mm steel angle was rolled into a circle to form the dome base.

This runs on 8 x 8 casters









Ready for
business

Shutter made of
Aluminium.

Top section running
in curved Al tracks

Lower section
hinges out.

Telescope installed in Observatory



Single high performance pc controls everything





Costs

■ Telescope

◆ Mirror set	£1800
◆ AWR Drive	£1300
◆ Gears	£400
◆ Materials	<u>£1500</u>
	£5000

valued at £12,000

■ Observatory

◆ Dome	£1000
◆ Base	<u>£500</u>
	£1500

valued at £10,000

to do!

■ scope

- ◆ Stronger machined centre box?
- ◆ Off axis adjustment for guide scope

■ observatory

- ◆ Motorize dome & shutter
- ◆ Summer cooling extractor fan
- ◆ Move to a dark site!

■ Short term programme

- ◆ Commission
- ◆ Planets, asteroids etc,
- ◆ Explore methods to beat light pollution.