

A Light 17m /P mast design.

By G8MNY

(Updated Sep 13)

(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

Here is a VERY light weight mast system 18kg (40lbs) I designed & built years ago, & I have use it most of my for /P. It is much lighter than anything else of its size. It is very stringy so I called it "STRING WONDER MAST".

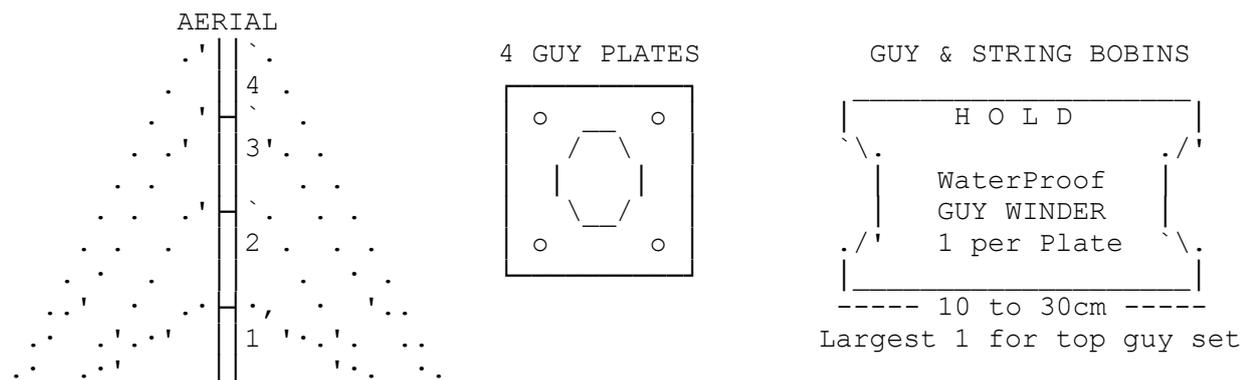
PURPOSE OF THE DESIGN

- 1/ To support an aerial @ 17m (54ft).
- 2/ Erection possible in cluttered sites.
- 3/ With modest aerial, One person could operate mast.
- 4/ Uses manual rotation or a bottom rotator.

POLES

It has 4 section of thin (2-3mm) aluminium tube starting with pole 1 a 3.6m 63m (12ft 2.5"), then 2 a 4.8m 50mm (16ft 2"), then 3 a 4.8m 43mm (16ft 1.75") & finally pole 4 a 4.8m 37mm (16ft 1.5"). Finding sources of suitable tube stockests can be difficult!

GUYING SYSTEM

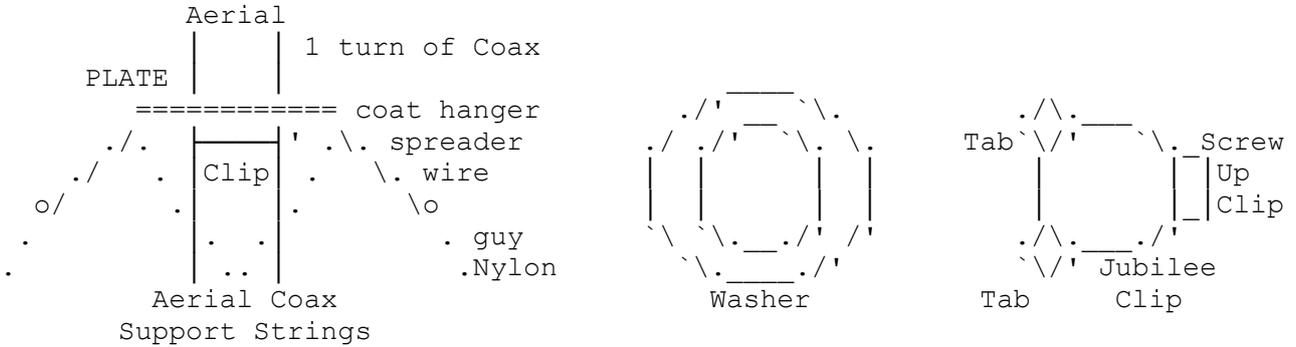


This uses 4x 10cm (4") square metal plates with central holes to closely match the poles as all by the top one sit on the larger lower pole. The corners are drilled to take the 3mm guy nylon strings & all metal smoothed off to not cut guys.

The 4 sets of guys are 1.6x longer than the height they are used on to ensure a safe shallow guying angle (45°) can be used to give the least added down force. I colour coded them with dye per level & each level is wound on flat winder with the "HOLD" side marked so that each twist of 4 guys is unwound next time. The top set needs the largest bobbin! The top 2 sets can be removed for transport.

IMPROVED TOP GUY SYSTEM

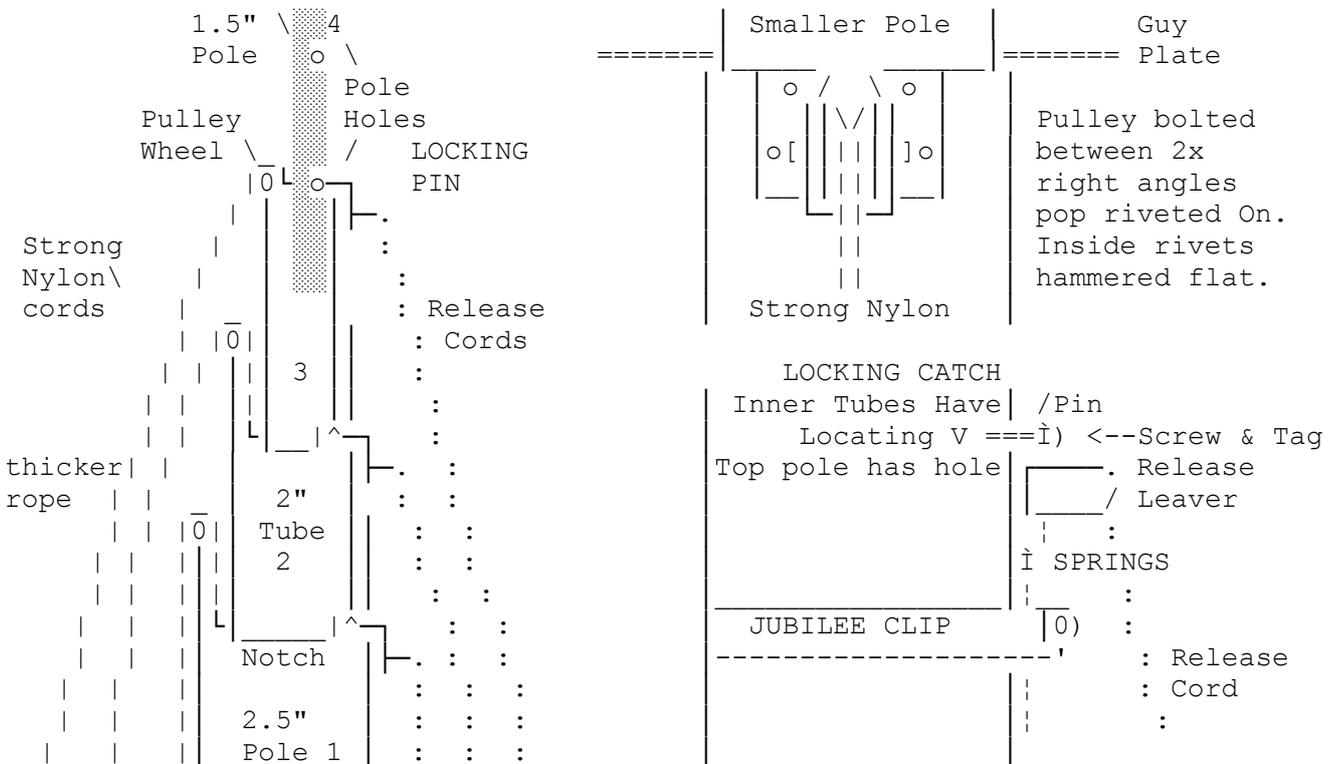
To stop the guys wrapping around the rotating pole that can happen with the top guys, the guy plate has 2 x 60cm (2ft) coat hanger wires threaded through the holes as well to make a large spreader, the wires have loops bent the end to capture the guys strings.



Hanging from this plate is also 2 strings (free ends of 2 of the guys) 60cm (2ft) long from opposite corners to take the hanging coax weight.

The top plate sits on a washer that sits on a Jubilee clip with 2 flat strip folded around it to provide a flat surface tabs for the washer to sit on. The clip is firmly tightened on the top pole below the aerial allowing room for 1 turn of coax.

PULL UP MAST SYSTEM



PULL UP ROPES

These are thicker ropes where you hold them (e.g. 6-10mm) & for poles 3 & 4 are joined to strong thinner nylon cord (3mm 80kg) that can go over the 2cm dia pulley & between the poles. The top corners of the aluminium right angle supporting the pulley is bent over to capture the cord so it can't foul off the pulley.

On the outer pole I put a rope tie off cleat made from a bent flat strip of thick metal clamped with a large jubilee clip to the pole.

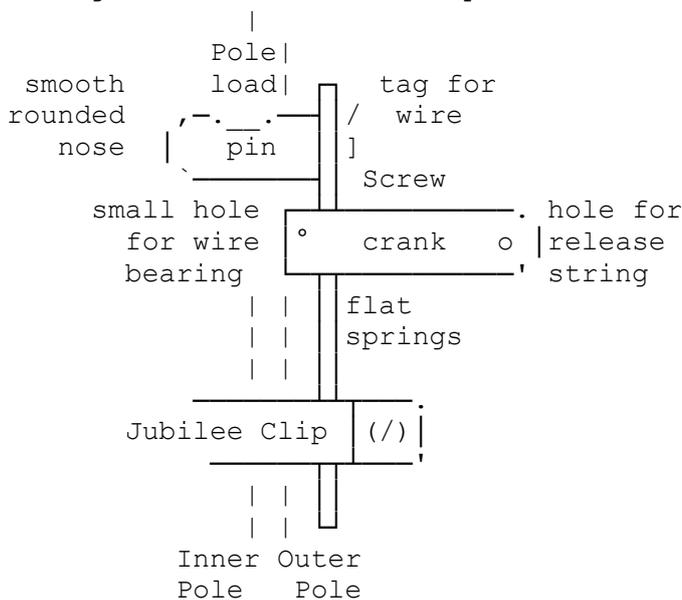
The ropes are attached to the bottom of the poles by a hole drill in the pole end. Like the guy plates, these holes are cleaned up to stop chaffing.

The top rope is attached to the bottom of thinnest pole through a diagonal hole made through it. This insures when the pull up rope is tight the pole is in the right location for the locking pin to engage.

LOCKING CATCHES

The location of these automatic locking pins determines the amount of pole overlap. I set the positions to give about 60cm (2ft) of overlap.

On the top pin system a hole is made in the inter tube. The locking system is mounted 2cm (1") down on the next tube, so that it clears the guy plate, & a slot just the width of the pin is cut in the 2nd bigger tube.



The catches uses a shaped steel locking pin (filed threaded pillars) to support each of the 3 inner sections. The shape has a curved top to ensure the pin can't release under load. These are attached with 4mm (2BA) steel screws with a tag to the flat springs which can be made from several old large hacksaw blades & other flat spring taped together.

The whole locking system is held to the pole with a suitable jubilee clip around the springs once the outer pole pin hole has been made.

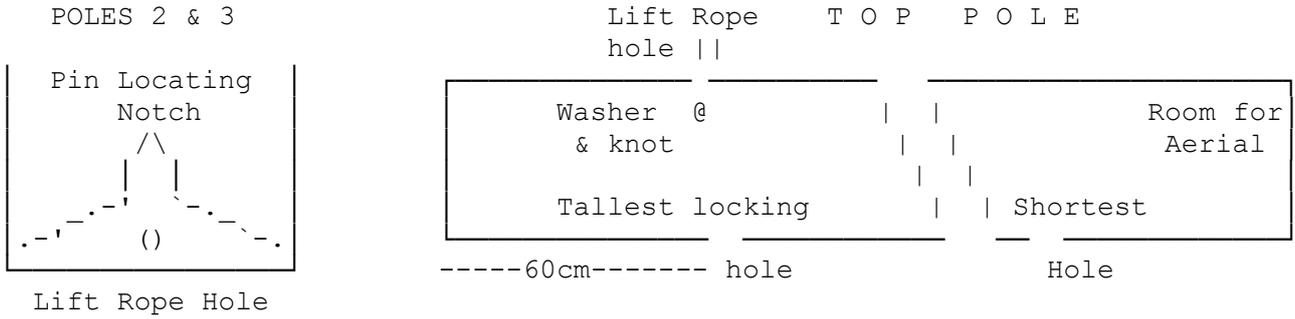
To facilitate unlocking a flat steel strip a bit wider than the pin inner pole "engagement length" is placed between the spring just under the pin. This is bent around the spring to form a square flat U with the top the U making the crank lever for the release string. A bearing for the crank is formed with 2 small holes through it just by the bends behind springs & nearest the pin. A sturdy wire is threaded though & attached to the tag completes this bearing.

Warning:- A failure in the release mechanism @ 3m, 7.2m, 11.4m above you, MAY mean the loss of the mast when it comes to take it down! So make sure you are happy with it's operation when you make it AND CHECK IT EACH TIME YOU USE IT".

LOCKING LOCATIONS

The bottom of poles 2 & 3 are cut at an angle & a V notch to take the locking pin. This is opposite the pull up rope tie off hole point. The angle & notch ensure the pole do not rotate when locked, & easily find the home position when

engaging. As there is quite bit of room between pole 1 & pole 2 spacers are pope riveted on either side of the thick pull up rope on pole 2 to reduce the play & keep the bottom of the pole firmly against the catch.



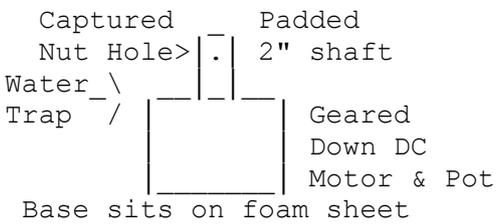
The top pole has a locating hole for the locking catch pin to find. This must be located accurately so that under pull up load it will locate OK. Other holes can be also be made higher up that pole to enable lower mast height to be used if it is too windy to do the final lift. In that case the upper guys can be tied off shorter to improve stability.

LUBRICATION

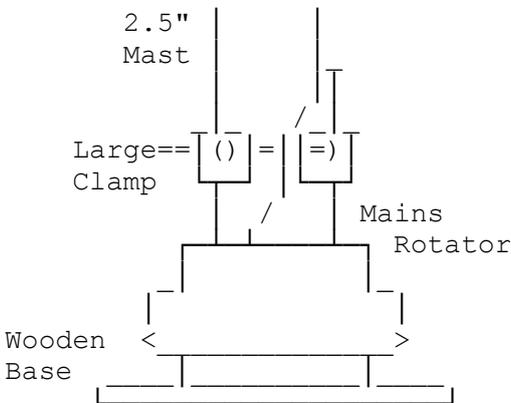
As aluminium to aluminium mechanics is not hard warring or low friction, suitable lubrication is need. For the underside of the guy plates & top washer I use a heavy grease that will not wash away. For the tubes & pulleys, I use new engine oil, it is easy to apply with each tube pulled out one at a time.

ROTATOR

I use a 12V rotator with a padded out shaft that the mast sit on & a bolt hole. It is only low torque & easily stalled rotator, so if anything fouls up it does no damage & keeps it's direction meter in sync! Its made from scrap army kit.



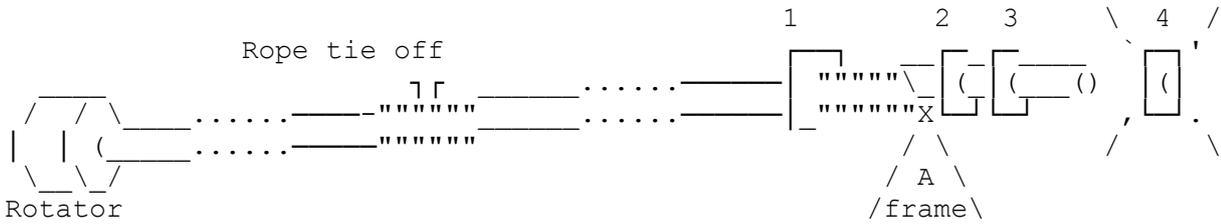
I also use a mains one with over sized clamps that go outside the pole & rotator, again clamp is done just enough to allow normal levels of torque only.



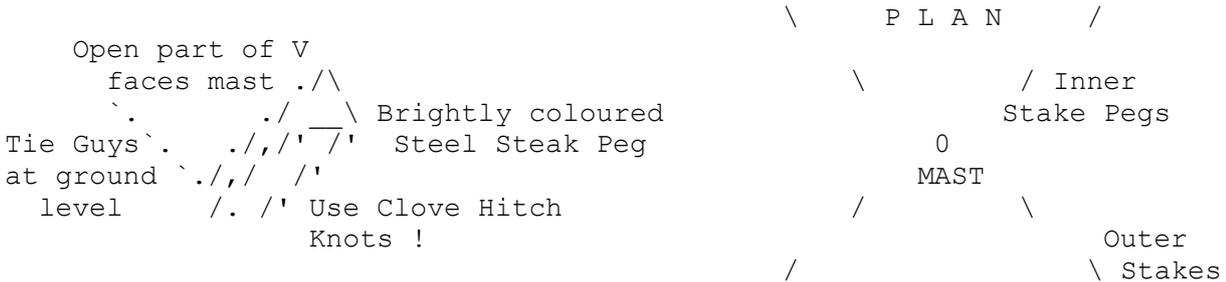
Corners Pegged down if needed.

SETTING UP

A wooden A frame supports the mast while the guys, ropes & release cords are sorted & laid out before the mast is erected.



Steel stakes or pegs (8 off painted anything but GREEN) are slightly larger than large tent pegs are used (e.g. 30cm x 2cm x 2cm) with sharpened points. Use with the open V side towards the mast & hammed right in @ 45° angle, to tie off the guys in 2 concentric squares.



ERECTING

Always start with no aerial or coax load, but allow enough mast space for it & the coax loop before clamping up the top guy clip.

If the centre location is not to important you can erect the mast singlehanded. Put 2 pegs in @ 90° for the lower guys & tie them off (I always use the safe & quick clove hitch for ties) swing the mast vertical & lean it almost vertical into the 2 guys. Then put out & loosely tie off the next lower 2 guys. Put the mast vertical & adjust ties & pegs for a proper square. If not single handed get 1-4 slaves with different names to put in the 4 pegs.

Then pull the 2nd pole out until it's catch locks. Then put out the 4 guys for that level to the same pegs. Repeat for guy levels 3 & 4 with a bigger peg square.

When all is well & vertical, lower the mast leaving all guys in place. This MUST BE DONE IN REVERSE ORDER so that the mast is supported as comes down. Pull on the heighest pull up ropes to take the load of the catch before attempting to release the catch. When all telescoping is done just lift & move the base away keeping the top about were it was. Put mast back on A frame. Run out all the spare guy strings towards their respective pegs to keep the tangle around the mast to a minium. Attatch aerial & coax, coax weight to be carried on the top guy plate.

Re-erect the mast, you may find minor guy adjustment is needed to keep the mast vertical (straight is more important) now it is under load.

IN USE

Because this is a light weight mast, erection & de-erection is ONLY POSSABLE IN NO TO LIGHT WINDS, wait for lulls (evening or morning). However once up, the mast has survived strong winds (>50MPH) if the relevant guys are adjusted to keep the mast straight. Vertical is not so important!

In public demos etc. I do not let the public in the guying area, which is bigger than the drop zone. But one advantage of it is that it can be put in between marquees etc. where other masts would need a huge erection area. If tying guys to ladder racks on cars vans etc. make sure owners do not drive

away!!!

If the mast should collapse in a storm etc, in my experience it will fold & kink one of the middle tubes lowering the aerials VERY slowly (work hardening absorbing most of the energy) without the aerials or anything of the ground being damaged.

Aerial used on it (one at a time) are:-

Length	Weight	Type
6.6M (22ft)	5.0kg	17el 2M by Tonna, (but often stripped down to 11 element)
3.0M (7ft)	2.0kg	8el 2M Quad Homemade 2 thin boom type,
6.2M (20ft)	4.0kg	27el 70cm QLY by G3JVL,
4.0M (13ft)	4.7kg	88el 70cms Multibeam by JBeam,
2.1M (7ft)	1.5kg	24el 70cms beam,
5.0M (18ft)	2.0kg	55el 23cms by Tonna.

And with some of the above plus a /M Colinear whip & a halyard for HF wires.
Coax used is the lightweight low loss POPE H100.

Why Don't U send an interesting bul?

73 de John G8MNY @ GB7CIP