Lightweight Antenna Masts – a few thoughts

The ready availability of lightweight antenna masts has made many forms of portable operating possible. In locations where natural supports such as trees are not available, a lightweight mast will allow the operator to lift their antenna clear of the ground.

Why do we elevate antennas?

The earth is a rather lossy dielectric and if an antenna is placed on the ground it will radiate less efficiently compared to an antenna in the air. It will also be de-tuned and thus an antenna that has been resonated on a mast will be way "off tune" when placed on the ground.

The ends of antennas also need to be clear of the ground for best performance. One study has suggested that losses rise rapidly when parts of an antenna are closer than about 1/40th of a wavelength from the ground. While this is a rule-of-thumb, it does seem to have some basis in fact.

That being said, snow and ice are not lossy and Antarctic field parties working on ice shelves can just lay their antenna on the ice. For the rest of us, an elevated antenna will be most effective.

Materials

Lightweight masts can be made of various materials. In this article I will be looking at composite masts, not metal masts. The two composites that are commonly used are fibre-glass (F-G) and carbon-fibre (C-F). Carbon-fibre composite has an excellent strength to weight ratio and a fairly low cost. From a radio perspective it's important to note that C-F is a conductor. This has some implications for its use in radio systems:

> carbon fibre masts are not generally suitable for supporting vertical antennas where the radiating element of the antenna runs alongside the mast.
>
> helical antennas or loading coils wound around a C-F mast will show increased losses which may be excessive. If used with high power transmitters, these losses may be manifested as charring or burning of the mast.

Fibre-glass is relatively cheap. It is strong enough for most antenna applications. It does not conduct.

Mast types

The masts most commonly used for portable operating are "re-purposed" fishing poles. These have many different names: roach-poles, squid-poles, crappie-rods, whips etc. They were not designed for supporting antennas and the quality of this type of pole varies widely.

There are two types of fishing pole with differing utility.

Telescopics

Telescopic poles are extended by pulling and twisting the sections. Friction holds the sections out. This type of pole is the most popular for antenna use. It is quick and easy to erect. Because there is overlap on the sections, it is strong. Points to be aware of are:

- the length of these poles is often a few percent less than advertised due to manufacturing tolerances.
- when used in windy conditions or for extended periods, the "friction lock" may work loose causing the pole to collapse.
- the base caps for these poles are often slightly brittle – treat with care.
- the rubber bungs used in the tops are easy to lose. They can sometimes be replaced with bungs used in home-wine making.

Put-over poles

Every so often I read about a radio amateur that has discovered a new type of lightweight pole that wont collapse. Invariably they are what fishing shops here in the UK call "put over poles". These poles are not telescopic but consist of sections that slot into each other. They won't collapse but they have some big disadvantages:

- due to the machining required to make the joints between the sections work, the poles are thinner here. This means that unlike telescopic poles, the joints are weaker than the sections themselves.
- they are less convenient to use as all the sections have to be removed and laid out to allow the pole to be put up
- they make adjusting antennas harder as you cant just telescope them down
- as you need to lay out the sections on the ground, the potential for dust and dirt getting into the joints is greater.

People who experiment with this type of pole don't tend to use them for long before the convenience of telescopic poles becomes obvious.

Ups and downs

Everyone who has used one of these poles will have had it collapse occasionally. To reduce or eliminate the problems, here are a few tips:

- pull and twist the sections firmly for maximum friction

when a long period of use is required, tape the joints with insulating tape

minimise any downward force on the poles by keeping guys and antennas fairly slack

insert a piece of closed-cell foam rubber inside the bottom of the largest section of the pole to reduce the chance of damage if the pole does collapse.

Conversely it's sometimes hard to get the sections of these poles to collapse when you have finished operating. Rubber gloves (of the type used for washing up pots and pans) can be used to get a better grip on the pole. The most difficult problems occur in freezing rain or freezing mist. This can make collapsing the pole very difficult indeed. In extremis male radio amateurs may wish to use a fluid at body temperature in attempts to free the pole joints…

Broken poles

Eventually you will break your pole. The first thing to note is that shards of C-G or F-G are razor sharp. Be very careful when handling a broken pole. Because the overlapped joints are stronger than the pole sections, poles often break towards the middle of a section. The good news it that a field repair is easy.

Remove the broken section and slide the top of the section into the bottom of the section. Because of the taper it will lock in place making a usable, but shorter, pole section. This will get you through the day.

Using poles on windy days

Lightweight poles will bend in the wind. Resist the temptation to tighten your antenna or guying system. Instead, move the base of the pole back so that the top of the pole is angled into the wind. This should reduce the curvature on the pole and will lessen the chance of it breaking. Over the years I have used poles in winds that have been hard to stand up in. The margin between success and failure in such situations is small. Don't forget that you can reduce the height of the pole and re-adjust the antenna/guying system too.

Do you need a mast?

Trees can be used to support a portable antenna but masts are often easier to use – even where there are trees. In areas where space is restricted, a telescopic mast can be extended straight up, rather than extended horizontally. Carrying a mast makes your portable operation much more "self-sufficient".

SOTABEAMS

We specialise in portable operating. We stock a huge variety of tried-and-tested products to make your operating more fun!