

# SIMPLE ANTENNA FOR OUR AIRCRAFT BAND CONVERTER

Our Project 721 has proved quite popular — for many more reasons than we anticipated when the project was conceived. Here is a simple groundplane type antenna that is easy to construct and uses commonly available parts.

THE BEST ANTENNA for monitoring purposes on VHF is one which receives signals equally well from every direction. Such an antenna is actually impossible to build, however, the nearest approach is an 'omnidirectional' antenna. That is, an antenna that responds to signals equally from all directions towards the horizon.

Most transmissions encountered in the 120 MHz band are vertically polarized; the simplest antenna one can construct to receive vertically polarized transmissions from almost any direction is the 'groundplane'.

In this antenna, a vertical, quarter-wavelength long whip (the 'active' part of the antenna) is situated at the centre of two crossed, half-wavelength long metal elements — the groundplane. The centre conductor of a coaxial cable feedline connects to the bottom of the vertical element while the outer conductor (braid) of the coax connects to the junction of the two groundplane elements.

In practice, this antenna will receive signals ranging from very low angles (towards the horizon) to quite high angles, with nearly equal sensitivity.

## Construction Comments

So that this antenna would be easy to build by a majority of interested constructors we have chosen parts which are readily obtainable.

The vertical element (A) is a standard low-band VHF whip sold for mobile applications. It consists of a length of tapered fibreglass covered in copper braid all protected by heatshrink tubing. A plated brass ferrule on the bottom has a tapped hole to mate with a standard mobile antenna mount. The whip as it comes is longer than required for the frequency of interest and is cut to the

length indicated (61 cm). This is easily accomplished with a pair of heavy sidecutters.

These whips are obtainable from a number of sources and we have listed them at the end of the article.

The mobile antenna mount is also a 'standard' item, readily available from a variety of sources. There are two choices here — you can either use a 27 MHz CB antenna mount or a special 'VHF/UHF' mobile antenna mount. They are quite similar in construction, however, the VHF/UHF type incorporates a different style of termination for the coaxial cable feedline which provides a better 'match' to the antenna.

Note though, that the VHF/UHF bases available provide a weatherproof

termination for the coax feedline. This is a decided advantage.

The groundplane elements are made from standard 9.5 mm (3/8") aluminium tube. This is available quite cheaply in two-metre lengths from hardware stores (such as Pauls in Sydney) or aluminium suppliers. These elements are bolted to a bracket bent up from a small sheet of aluminium, as shown in the assembly diagram.

The aluminium bracket should be drilled before bending. Exact details are not given as mechanical details will vary, depending on the size and spacing of the U-bolt, the mast and the particular antenna base used. The assembly diagram provides a guide. One groundplane element mounts inside the bend, take this into account when marking the bolt holes for drilling. Element bolt holes may be about 30 mm apart.

If you wish, the bracket may simply be screwed to a wooden mast, rather than bolted to a tubing mast as shown in the illustration. There is plenty of scope for different mounting methods, but the basic assembly as shown should be followed.

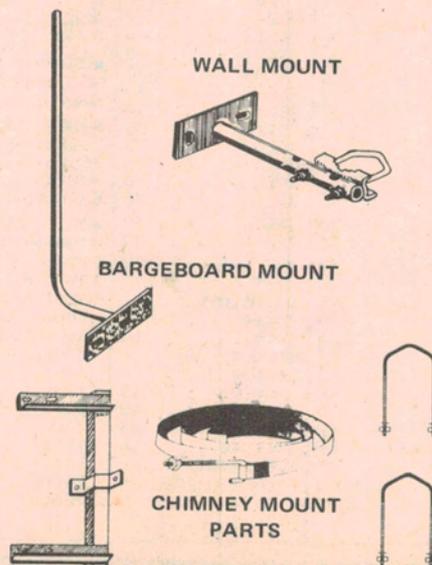
Cut the groundplane elements to length as shown in the illustration. Mark and drill them according to how you have drilled the bracket.

Do not cut the whip to length at this stage.

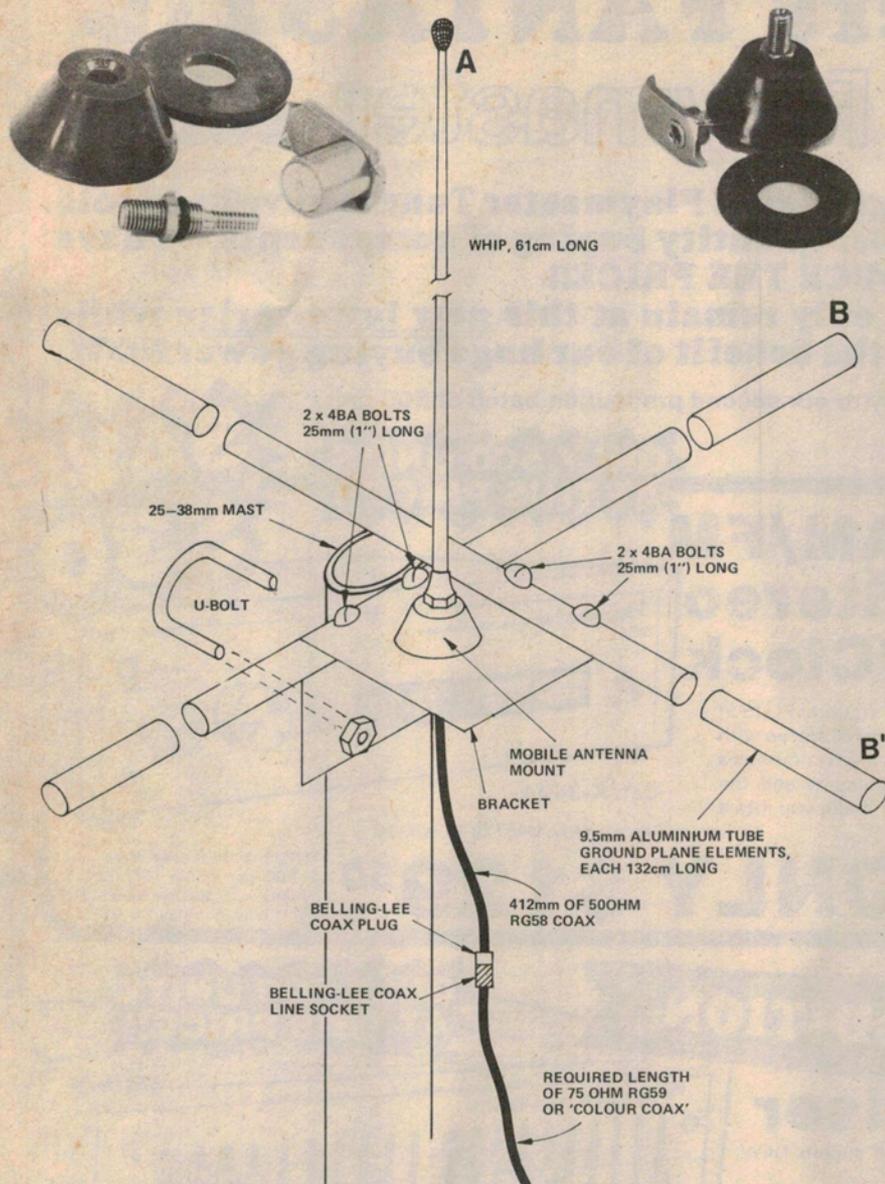
## Assembly

All drilling should be done first. Do an individual trial assembly of the antenna mount and the elements just to see that everything fits without coming afoul of the other parts.

Bend up the bracket and assemble the antenna base, connecting the coax at the same time. Attach the two groundplane elements. Note that one is



Commonly available TV antenna mounting components are inexpensive and provide a range of mounting options for the antenna described here.



## PARTS LIST ETI-722

- Whip** . . . . . Fibreglass quarterwave mobile whip. Obtainable from Mobile One or Scalar (Cat. No: M11).
- Base** . . . . . Mobile antenna base. Obtainable from Mobile One (HF base A), Scalar (type MB or OB) or IFTA (Jackson, model 2-226). The latter is a solderless type.
- Bracket** . . . . . 16 or 18 gauge aluminium 75 x 150 mm min size.
- Elements** . . . . . 9.5 mm (3/8") dia aluminium tube.
- Coax** . . . . . RG58 (52 ohms) cut to 415mm; RG59 (75ohms) or similar, length to suit installation.
- Connectors** . . . . . Belling-Lee type, coax plug (e.g.: Dick Smith Cat. No: P-2020) and coax line socket (e.g. DS (e.g. DS Cat No: P-2030).
- Miscellaneous** . . . . . 4 BA bolts and nuts, U-bolt to suit mast diameter

RG58 52 ohm coax, cut to an 'electrical' quarter wavelength (to account for the velocity factor of the cable — a wavelength is shorter in coax due to the effect of the cable's dielectric). This is inserted between the antenna and the main feedline as illustrated in the assembly diagram.

The bandwidth of this system, and the whole antenna, is quite adequate for the application.

A standard Belling-Lee coax line plug is attached to the end of the RG58 matching section and a Belling-Lee coax line socket is attached to the end of the 75 ohm feedline. This join should be securely taped with insulation tape, or even covered with heatshrink tubing, to protect the connectors from the effects of the weather.

### Addresses

- IFTA** 1 Greville St, Randwick 2031 (PO Box 21, Bondi Beach 2026), phone: (02) 665-8211.
- Mobile One** 17 Sloane St, Marrickville 2204, phone: (02) 516-4500.
- Scalar** 20 Shelley Ave, Kilsyth 3137, phone: (03) 725-9677.  
20 The Strand, Penhurst 2222, phone: (02) 570-1392.  
969 Ann St, Fortitude Valley 4006, phone: (07) 52-2594.

These firms should be able to assist with whips and bases to suit the antenna and addresses of nearest suppliers.

Assembly diagram for the antenna. Inset above left shows the solderless Jackson 2-226 antenna mount, inset above right shows Scalar's OB base.

mounted beneath the bracket, in the bend. The other is mounted on top. The bolts go right through bracket and element.

Finally, screw the whip to the mounting base, measure 61 cm up from the bracket and cut the whip at that point.

### Mounting Tips

The antenna may be mounted using TV antenna mounting components. These are relatively inexpensive and widely available. Standard wallmounts, barge-board or chimney mounts and mast sections are ideal.

Mount the antenna as high as practicable and away from other objects for best results.

### Coaxial Feedline

Standard 75 ohm coaxial cable is used

for the feedline. This is commonly used for colour TV installations.

The impedance of a groundplane antenna of this sort of construction is generally around 35 to 40 ohms. To obtain best performance from the antenna it is necessary to 'match' the feedline impedance to the antenna impedance. Fortunately, there's a very simple way to do this.

A length of coax, one quarterwavelength long, having an impedance equal to the geometric mean of the two different impedances (that is: the square root of the product of the two impedances) will 'transform' between the two impedances. This technique is called the "Q-match transformer" method.

Conveniently for us, the square root of 35 ohms by 75 ohms is very close to 52 ohms. Thus, we can use a piece of