

Whipping Up Antennas Military Style

Ben Nock G4BXD, looks back at the days when Amateur Radio operating portable and mobile was mostly on h.f, and takes a unique, detailed look at how the whip antenna was developed by the military. You'll never look at the humble whip antenna in the same light after you've read this article!

With the advent of v.h.f. repeaters and cheap hand-held transceivers in the 1970s and onwards there seemed to be a decline in portable operating on the high frequency (h.f.) bands. I can recall the days when many a Radio Amateur met up in Hurst Street in Birmingham on a Saturday morning. There were many delightful

shops in that street those days, all selling electronic bits, junk, radio sets and the like.

As I've already suggested - there wasn't a hand-held rig in sight. Every car that parked up had a 12ft (4m) whip antenna, with big loading coil in the centre and a bit of 1.8 or 3.5MHz equipment screwed to the front dashboard. In other locations too there were Amateurs walking the fields

and hills with home-brewed h.f. rigs and long wavy whips above. There seemed no end of people out portable in those days, fresh air, exercise and the joy of radio, we didn't need gyms and weights and personal trainers in those days!

Then, and now, one big user of portable operations was the Military. Many a Soldier has lugged a very heavy radio (no military man-packs were ever designed to be lightweight) with whip antenna waving around madly. At the same time he'd be lugging his rifle and other vital bits of kit, all stowed away neatly in his webbing.

If anyone else has, like myself, tried carrying a Wireless Set 18 (WS18) around all day they will know just what backache is! How the poor trooper was supposed to fight in action, as well as drag the set around is amazing. The difficulties would account for the stories of many an airborne signaller who quickly ditched the set upon landing, so as to make a faster exit off the drop zone.

Happily though, we as Radio Amateurs can enjoy portable operation without the worry of being shot at, though irate farmers can be a worry at times when their land is being crossed! (Don't forget to ask first!).

And, while mobile installations can of course cater for a bigger and heavier mobile antenna array, the backpacker needs to consider weight. The military in particular have some interesting ideas on this subject, and this is my topic for this article.

Standard British Whip

The standard whip antenna as used on wartime sets consisted of a few tubular rods that pushed or screwed together. Standard lengths for each section were 4ft and 1ft, (approximately 1.2 metres and 300mm). A typical set-up could be three or four of the larger sections making a 12 or 16ft (3.5 and 4.8m) whip or eight or so of the smaller sections making an 8 to 12ft whip (2.4 to 3.5m).

The tuning of the whip was accomplished in the set, usually a roller coaster or a multi-tapped power amplifier (p.a.) coil that was adjusted for maximum current into the whip. The tuning section would not contribute to the radiated signal as it was contained within the screened case of the set.

Even later military sets used the plain whip sections, Fig. 1, that pushed or



Fig. 1: The standard British whip, a multi-sectional push together affair, very basic yet simple to use.



Fig. 2: The LSP-30 whip, tuning section with the insertable 4-section whip shown above (see text).



Fig. 3: The LSP-30 tuning section, rotating the tuning raises or lowers a plastic-connecting plunger (see text).

screwed together, but they had the benefit of being cheap and easy to replace if damaged. Later sectional whips are in fact fibreglass - the radiator is a multi-stranded wire running down the centre of each section. This not only holds them together in transit, but is also used as a pull -cord to erect the antenna when needed.

However, there have been though one or two quite interesting arrangements of military antennas for portable operation. This may give one or two new ideas and thoughts towards portable Amateur Radio operation.

Pye Labgear LSP-30

The Pye Labgear LSP-30 is compact h.f. multi-mode transceiver, and it has a quite ingenious arrangement for its whip antenna. The radio has a side-mounted bracket, which takes a sectional whip antenna, **Fig. 2**, with a clever built-in tuner.

Tuning of the whip is achieved by screwing a ferrite slug in or out of the antenna-loading coil. The overall length of the whip is 8ft 4in (2.52m).

The operator would monitor the antenna current meter and adjust the tuning for maximum reading. The tuning arrangement allows the whip to be tuned between 2 and about 8MHz. Incidentally, the tuning coil itself adding something to the radiated signal from the antenna system.

A rack and pinion gear system, **Fig. 3**, raises and lowers a plastic rod that cleverly engages with the tuning slug in the antenna section. This plastic rod has a pin and socket type arrangement so that the main whip can be removed from the

base section, which is left attached to the transceiver's case. This makes it easier to stow away when it's not in use.

The Pye Compak 8

Another Pye set, the Compak 8 h.f. transceiver has a very similar system, a loaded 8ft 4in (2.5m) whip antenna with an adjustable tuning slug. This time however, the operator manually tunes the whip by sliding the loading coils up or down the slug. A screw thread around the lower section, **Fig. 4**, allows the upper section with the whip to be adjusted quite smoothly. A quick release button disengages the thread and this allows quick tuning of the whip in times of need.

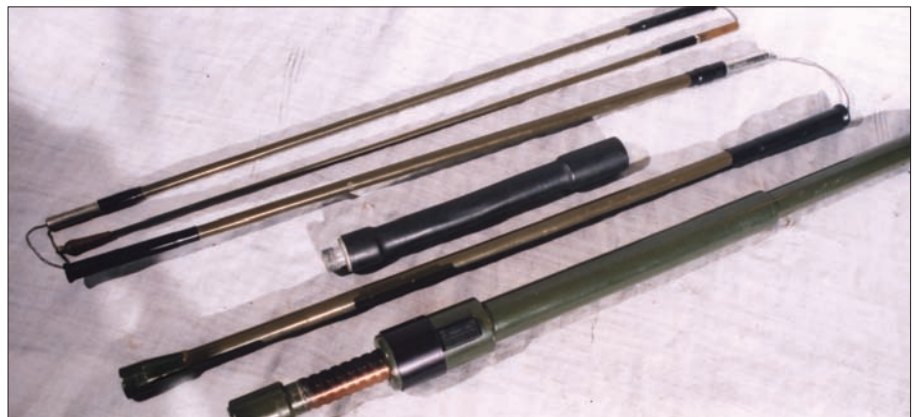


Fig. 4: The Compak 8 tuned whip, large screw adjusted lower section and 4-section whip plus flexible base section (see text).



Fig. 5: The Australian A510 tuner and whip sections (see text).

To quote from the Operator's Manual for this set: "The aerial forms an off-centre loaded quarter wave whip, capable of resonance over the frequency range 2 to 9MHz. The aerial tuning arrangements are of a novel design and construction; they consist of three main assemblies.

(1) A lower support section in the form of a coaxial connecting member having an outer metal tube carrying a 4 turn per inch Archimedean thread. (2) A tuning section - incorporating a load inductance and a fixed ferrite core, which screws into (1). (3) A slider assembly mounted coaxially with (1)

and (2), consisting of a plastic sleeve housing a number of spaced tuning rings". (Interesting eh?).

When in use there was also a flexible section that could fit between the set and the whip. This allowed the operator to adjust the angle of the whip to suit, where he was prone or upright.

Australian Whip

Another novel approach to tuning a whip antenna is found on the Australian A510 station. This is a man-carried receiver transmitter and has a miniature antenna tuning unit (a.t.u.) that connects between the set and the whip antenna.

The location of the antenna connector,

on the corner of the set furthest away from the body was to minimise de-tuning. The whip tuner, **Fig. 5**, has a large three lug bayonet type fitting which the operator presses down and rotates 60° to lock into position. The sectional whip, **Fig. 6**, is then inserted atop the tuner.

The tuner has a ball joint at the base to allow the whip to be swung to a convenient angle, for example vertical even if the operator is prone on the ground. To ensure efficient operation in the widely varying terrain, the set was to be used in jungle and heavily foliated areas, it was found



Fig. 6: The neat A510 whip tuner, marked 2-10MHz with a locking lever (see text).

critical to use an external antenna tuner when using the 8ft (2.4m) metal antenna rods. Though the A510 has an antenna matching circuit within the transmitter, the external unit may have been added after field trials showed that the internal antenna matching circuit was insufficient. The actual date of its adoption is a little unclear.

In service, the operator would rotate a tuning knob on the side of the unit, while watching the meter deflection on the transmitter. When the meter indicator needle was at its maximum, the operator could lock off the tuner with a small lever next to the knob.

The 8ft, (2.4m) sectional antenna rod comes in plug-together sections with a nylon cord inside to facilitate lining up the sections. A Counterpoise could be used with the rod antenna, this consisted of four black plastic covered wires joined together by the counterpoise stake and laid out to form a cross. The stake was driven into the ground and a green earth wire went from there to the earth terminal on the transmitter.

Note: There's a very interesting write up on the trial of the A510 when first produced, see: [http://www.shlrc.mq.edu.au/~robinson/Information/A510 Trials.html](http://www.shlrc.mq.edu.au/~robinson/Information/A510%20Trials.html)

Chinese Whip

Chinese whip: I'm now moving on to an interesting set, and it's the first with a slightly different approach to the whip issue. The sets I've mentioned before all

had a fully variable tuning system for their whip antennas. Now, there are systems using a tapped coil to load or partially tune the whip.

The Chinese Type 73 set, tuning 1.7 to 6MHz, came with a multi sectional whip, **Fig. 7**, incorporating a tapped loading coil. The length of whip is a very short 5ft 4in 6 (1.6m). The coil sits in a mid position on the whip, with elements below and above.

Note: It's well documented that top loading is the best method of loading a whip, but it does result in a very top heavy antenna.

Base loading is the easiest option but the poorest (performance wise), centre loading being the other option. However, it's neither the worst or best performer, but also neither the easiest or hardest to make!

In addition to the loading coil the Chinese system even supplies a fold out fan-like assemble. This is attached to the top of the whip to increase the top loading capacity of the antenna.

As with any system having its loading coil above the base, the weight of the whip and its nature to swing around when on the move must have made this a bit of a handful for the operator! I would imagine that a stationary operating position was probably adopted; the coil removed for any on-the-move operating that was needed.

American Whip

Something of a quality item now! The USA made transmitter-receiver AN/PRC-74 was designed for Special Forces, covering 2-12MHz and delivering 15W peak envelope power (p.e.p.) of single sideband (s.s.b.). This set comes with a very nicely constructed multi tapped loaded whip, **Fig. 8**, designated the AS-1887 Antenna. This is the longest whip at 9ft 4in, or around 2.8m.

The tuned whip has several plug-selected positions on the base of the coil, **Fig. 9**, allowing it to be tuned between 2 and 18MHz. The operator pulls out a spring-loaded plug, rotates it to the nearest frequency required marked around the base, and re-inserts the plug.

Extracts from the operator's manual read: "(4) Attach the whip antenna to the antenna support base and screw the antenna support base into the whip mounting bracket. (5) Connect the lead from the antenna base to the ANT (red) terminal of the radio set. (6) Set the frequency range selector switch, located at the bottom of the antenna-loading coil, to correspond to the operating frequency. (7) Tune the radio set as outlined in para 3-2 and 3-3. Note. If time and conditions permit, a counterpoise be connected to the radio set ground terminal as indicated in



Fig. 7: The Chinese whip with tapped loading coil, flexible section and 4-leaf 'petal' type capacity hat (see text).



Fig. 8: The PRC-74 whip, with AS-1887A loading coil.

(8) and (9) below. (8) Attach one of the antenna reels to the GRD (black) terminal of the radio set. (9) Unwind the antenna wire to approximately twice the length of the whip antenna and lay wire on the ground in a convenient direction away from the radio set. This wire acts as the counterpoise”.

The quality of this whip, the push together fittings for the sections, **Fig. 10**, and the clever spring-loaded frequency selector make this a quality item. The finish is extremely neat and professional

French Whip

The French made Thomson THC-471B h.f. transceiver has one of the shortest whips I've seen for high frequency use. The manual states the normal selection of antennas as a wire doublet, a 3m whip and a really short 1.5m whip. The 1.5m whip, **Fig. 11**, does however appear to have a centre mounted loading coil.

Unfortunately, although I have the radio set and various other accessories, this doesn't include the short whip antenna so I do not know if the coil is fixed or tapped. The photograph in the manual seems to show a fixed coil. As the radio set can operate between 3 to 15MHz it must be assumed (I think) that operation with the small whip would be confined to the higher frequencies.

Novel Ideas

It certainly seems the Military are always keen to try novel ideas. True, today the main communication links are via satellite and v.h.f. sets but, it's still interesting to see just what they've used over the years.

For individual Amateur Radio use the various ideas might bring a few operators to thoughts of operators portable themselves. Just think of the fresh air and all that sunshine you can soak up while still talking to another Amateur in far away places.

As I mentioned stated earlier, top loading is the best option but it's the hardest to make readily and practically usable. Base loading a whip is the easiest option (**Fig. 12**), but raising the coil up the whip somewhat does help and it's not too hard construction ally. Certainly, there's food for thought from the above, so get out this summer (between the showers!) and give it a try. I look forward to working you portable.



Fig. 9: The PRC-74 loading coil and 5-section whip antenna.



Fig. 10: The PRC-74 whip warning notice.



Fig. 11: The French THC-471 loaded whip (see text for comments).

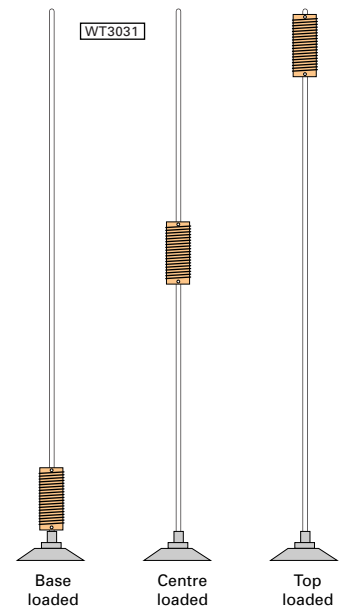


Fig. 12: Base loading a whip is the easiest option.

Virtual Museum

Ben Nock G4BXD operates his own extensive website <http://www.qsl.net/g4bxd/> where you can see a small fraction of his large collection. When you visit the site you get a very good idea of what's available because the ever popular ex RAF R1155 receiver greets you! Ben's 'Kidderminster Kollection' is truly extensive, and has been used by ITV for the *Doctor Finlay* drama series to provide a 1950s 'period' Amateur Radio background. A visit to the site is highly recommended. **Editor.**