HF bicycle and pedestrian mobile

Operating bicycle mobile by the sea with the QRO trailer.

BACKGROUND. HF bicycle mobile may seem like a strange mode of transport for HF amateur radio communication, but for many years I have been operating HF car mobile close to the sea and I have always had good results due to the enhanced ground-plane of the saltwater. However, I could never get really close to the waters edge with the car as I was restricted to access via roads and tracks. So, a few years ago I decided to put an old Yaesu FT-817 and short home-made centre loaded vertical for 14MHz on my bike. Running just 2.5W, I operated from the promenade in Blackpool, very close to the sea. I managed several contacts into the USA with good signal reports. Even at QRP, the performance when riding close to the sea was outstanding. I was now truly hooked on operating HF Bike Mobile close to the sea. What I needed to do now was to improve the system to get better results!

ONGOING IMPROVEMENTS. My bicycle mobile system has been developed over the last few years into a much more efficient full-blown radio station on two wheels. It is now fitted with more efficient (and bigger) home-made mono-band antennas for different HF bands, multiple 12V gel batteries, a tuned ground plane, computer logging, weather monitoring and digital voice recording equipment. It's now my 'shack on a bike' and, when operating close to the sea, competes well against much bigger home stations.

G4AKC/BIKE MOBILE. The bike itself is an inexpensive 16-speed mountain bike. It is now equipped to operate on all HF bands whilst on the move, mainly from locations very close to the sea in Blackpool, near to where I live.

The radio I use now is a handlebar-mounted Alinco DX-70TH in a zipped waterproof cover (in case of a downpour). The radio is powered by two pairs of 7AH 12V gel batteries. The Alinco DX70 has been modified to provide continually variable power from 10mW up to a maximum of 50W output. The batteries give a total of about four hours of use at the maximum output power. Two of the batteries are mounted on the rear pannier and the other two batteries mounted under the cross bar. Lots of RF toroid filters are used to eliminate RF feedback problems, because the antenna is only a short distance away from the transceiver.

The antennas for 15, 17, 20 and 40m are home-designed, home-made 'hi-Q' mono-band top-loaded verticals. They are all 3.5m long, and each has a dedicated 75mm diameter air-spaced coil, stored for transport in the red side bag on the bike.

HIGH POWER BICYCLE MOBILE. From time to time, when I'm feeling energetic, I also use a small trailer. This contains two 12V 40AH gel cells in parallel, which power a modified RM KL500 linear amplifier. This can run up to 300W output, although I generally run it at about 150W to conserve battery power. I get about four to five hours operational use at this level. A band-switchable, coiled-up quarter-wave coax line is used between the radio and the input to the amplifier to help achieve good RF stability. The downside is that the trailer weight – about 100kg – makes it very difficult to pedal up the hills! Fortunately, there are few hills in Blackpool.

GROUND TUNING UNIT. The limited size of the bicycle frame does not provide an ideal ground-plane for the vertical antenna to work against. As the bicycle is usually moving, it is impractical to attach a trailing wire to the bike. However, the sea provides a perfect ground-plane: all that is needed is a connection method. This is achieved by breaking the braid of the coax cable where it would normally connect to the frame of the bicycle. The braid is then connected via my 'ground tuning unit' (GTU, as opposed to ATU). This consists of a roller coaster inductor and switchable capacitor; the return side is connected back to the bike frame. The GTU has an RF current meter built and in use is adjusted manually for maximum ground current. This can be quite high when operating near to the sea (and especially so when using the amplifier). Tuning is dependent on high or low tide and different types of ground. The performance of the whole system is greatly improved when using the ground tuning, especially when operating close to the sea.

LOCATION, LOCATION, LOCATION. The operating location is perhaps the single most important factor in getting good results. Here in Blackpool, on the northwest coast of England, I am very lucky to have a truly fabulous location for the HF bands when out on the bike. I am lucky enough to have a perfect take-off over the sea to the north, south and west, but I am screened by sand hills to the east and hence I can only work long-path into VK, ZL, and the Pacific area. I have excellent short-path results into North and South America.

The sea provides the perfect ground plane for the vertical antenna to work against: it creates what we have nicknamed 'God's linear amplifier' on both transmit and receive!

PEDESTRIAN MOBILE. My pedestrian mobile system was constructed as an alternative system to get even closer to the sea and also to provide a more flexible system for practical use. I operate pedestrian mobile on 15, 17, 20 and 40m SSB and get really close to the sea using a small, lightweight, two-wheel trolley (or cart). The transceiver is another Alinco DX-70, whose RF power is again adjustable between 100mW and 50W. The radio can be quickly removed from the cart for those times when I can't pull the trolley on the beach; it is then carried in a dedicated backpack. Power is provided by a 24AH gel battery in the trolley, or a smaller (and lighter!) 7AH battery when in the backpack.

The Alinco DX-70 mounted in a weatherproof covering on the bike handlebars.

Pedestrian mobile trolley with DX-70 and amplifier at the front, batteries and ATU at the back.

A recent addition to the pedestrian mobile trolley is a KL500 linear amplifier, with power levels continually adjustable down to 100mW on low power to a maximum of 300W on high power. A separate 38AH gel battery mounted at the bottom of the trolley powers the amplifier. The battery life is quite limited at high power, so I usually run a maximum of 150W output. The antenna is a very lightweight home-made top-loaded vertical, similar to the ones for the bike. As with the bike, it is tuned against the frame

Operating backpack pedestrian mobile – note GTU on aerial mast.

of the backpack or trolley using a similar, but physically smaller, ground tuning system. I have also added digital voice recording to the pedestrian mobile trolley, which enables me to play back the contacts I make and manually enter them into my computer log when I get home.

WORLD RECORD. During November 2007 my good friend Keith Sharples, G7LPW, made a DXpedition with an HF backpack to Christchurch in New Zealand. The trip was made to try to set a new world record operating HF backpack to backpack and bicycle mobile on 20m SSB. Keith operated as G7LPW/ZL3/ pedestrian mobile.

After lots of development and forward planning we achieved this record at 0800UTC on 15 November 2007 over a long-path distance of about 21,000km. A two-way contact was also made at 5W each way, backpack mobile to backpack mobile. This was at the bottom of the sunspot cycle with zero sunspots and a solar flux index of 70. This record is confirmed by the "World Records Academy" in the USA.

TRY IT! HF bicycle mobile really is a lot of fun, especially when the weather is good. It works really well, too! I would encourage anyone who enjoys bike riding to give it a try: it's amateur radio and it helps to keep you fit and, to tell the truth, I don't think I've had as much fun playing radio since I first got licensed. Here's the best part: lots of stations say, "I've been a ham for 30 years or more and this is the first time I've talked to a guy on a bicycle."

There is more information about bicycle mobile, including some digital voice recordings, at www.qrz.com/db/g4akc.

TS-2200GX CTCSS

GIFT HORSE. I was recently given a defunct TRIO TR-2200GX that had a set of repeater crystals plus S20 and S22, but tone burst rather than CTCSS. After a few hours fixing its quite basic faults I got it working. My junk box yielded a Tone Encoder/Decoder type TS-32 by Communications Specialists Inc, which I decided to connect up.

ADDING CTCSS. The encoder tone must be fed in as close to the modulator as possible, avoiding any LF cutoff filtering in the mic path. A convenient point on the TR-2200GX is the Tone burst input terminal, NT, on the center of the PCB.

The TS-2200GX does not appear to have a low frequency filter on the Rx side, meaning that the set would 'growl' when receiving a sub-audible tone. Fortunately the TS-32 includes a suitable filter, so I removed the feed to the volume control and connected this to the Audio filter input on the TS-32 board. The Audio filter output then went back to the volume control. This mod cleans up the LF end of the audio and gives a more pleasing sound.

The next step is to fit the tone decode and override when no CTCSS is present. The feed to the TS-32 should be before any LF filtering, so a point next to the demodulator diodes is best. The top of R39 is an ideal place to connect the Decoder Input of the TR-32. The decoder will lift the clamp on the high pass filter and the repeaters signal will be passed. At this point, after setting the transmit deviation, the set will open a repeater if the correct tone is selected and will not growl when receiving a signal.

ENABLE/DISABLE. If the tone frequency is not set correctly or you are operating on a simplex channel, the decoder clamp has to be disabled. I found the best way was to short OUT-1 to 0V. This switch can be placed anywhere, but I fitted mine to the mic and re-purposed the second earth wire in the Mic to carry the signal.

I fitted the TS-32 unit with a bit of hot glue in the battery area of the TR-2200GX. The set makes a handy portable when out hilltopping, looking for repeaters. I find it works better from a 12V gel cell than it did on internal batteries; a Slim Jim completes the ensemble.

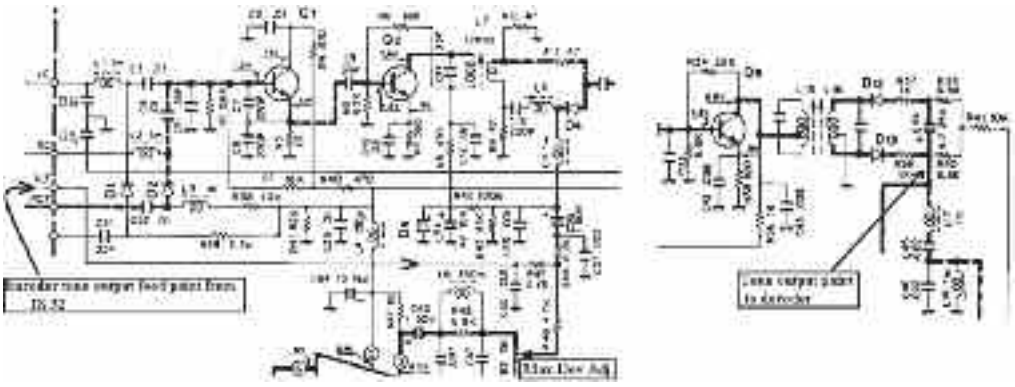

FIGURE 1: Extracts from the TR-2200GX circuit diagram showing the tone input, output and adjustment points.