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Working 6m from Rotuma the 'Island Brew' Way

Antoine De Ramon N'Yeurt 3D2AG relates a tale of make do to allow him to operate on the 6m band while on a remote Pacific island.

Since 1988 I have been licensed as 3D2AG and usually operate from Suva, the capital of the Fiji Islands. These islands are quite in demand on the DX scene but there are actually three separate DXCC countries within the Fiji Group: Fiji proper, Conway Reef (Ceva-i-Ra) and Rotuma Island (IOTA OC-060), a small isolated island about 600km north of the main Fiji group. Rotuma has a population of about 3,000, mostly of Polynesian descent in contrast to the Melanesian inhabitants of mainland Fiji. From January to April 2001 I was in Fapufa Village, Rotuma, the main purpose of my visit being to operate amateur radio because the island is quite rare on the bands and is a separate DXCC entity from Fiji proper.

Usually I go to the island by boat, which takes about two days from Suva but on that particular trip, because of time constraints, I had to go by 12-seater twin propeller plane, which severely limited how much radio equipment I could take, especially beam antennas. I therefore concentrated my activities on the HF bands using an inverted-V wire antenna for the low bands and a tribander for 10-15-20m which had been left on the island by a previous DXpedition. Conditions were quite good on the HF bands, especially 10, 15 and 12m with good short-path openings to Europe and the USA. The March equinox propagation was particularly excellent, especially on 10m, with big openings to Japan, Europe and the USA. Over 25,000 QSOs were made in a three-month period, so much so that I had run out of logbooks and resorted to using a locally-purchased lecture pad to continue logging! As usual, for ecological and practical reasons (fuel was always scarce on the island) I always used solar power for the station, using a deep-cycle battery, 20A charge controller and 100W solar panels.

Fig. 1: The simple 3D2AG/P station consisting of IC-706, antenna tuner and a few ancillary items.

In early March 2001, propagation on 10m to all parts of the world was excellent and I was alerted on the ANZA DX net, which I usually frequented, that there were major openings happening on the 6m (50MHz) band around the Pacific and because of the high solar activity, also between the Pacific region and the USA and Japan via both trans-equatorial propagation (TEP) and F2 layer propagation. Many VK, ZL, JA and US stations were eager to work me from Rotuma on 6m. Of course, the possibility of sporadic-E propagation is always present depending on weather conditions as well. The 6m band is very interesting in that you never quite know when the band will open to which destination, and it can be very location-specific. For example, an opening from Fiji to Australia might be totally absent in nearby islands. The propagation also tends to shift around, a bit like a moving pipeline between two locations. It is no wonder that it is called the 'magic band' and requires much patience and 'being there at the right time' to make use of openings that may only last a few minutes. **Bob Gyde ZL3NE/1** spent many years studying 6m propagation and came up with some quite accurate weather-based tools to predict sporadic-E propagation as documented on the website below.

www.df5ai.net/ArticlesDL/ExternalRes/ZL3NEPropPredict.pdf

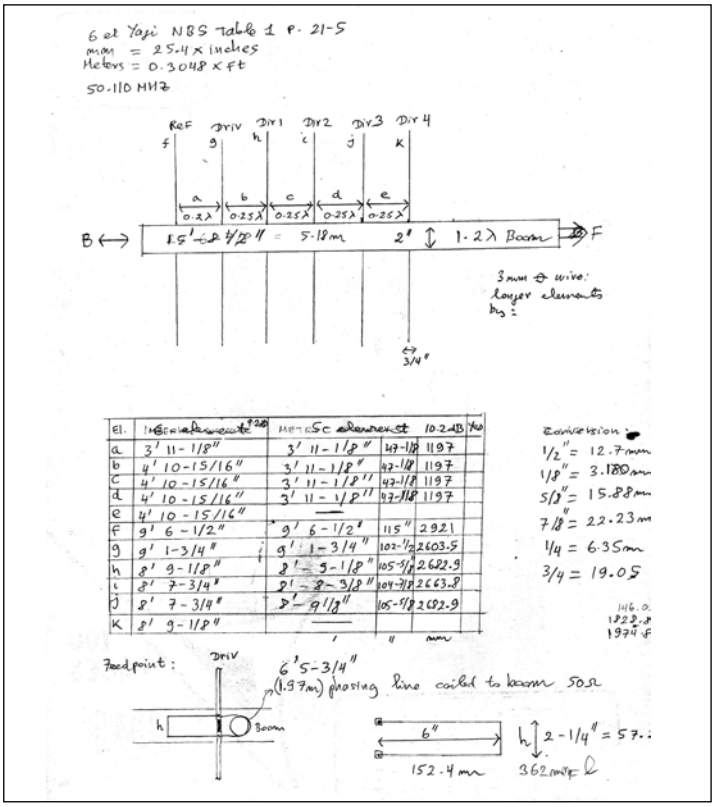

Fig. 2: The author's handwritten design notes, based on material from the ARRL Antenna Handbook.

Looking for a Solution

In any case, this exciting piece of news did not immediately mean much to me in Rotuma, since I did not have any 6m antenna available, although my faithful Icom IC-706MkII HF/VHF/UHF transceiver was capable of transmitting on that part of the spectrum, **Fig. 1**. However, so many 6m enthusiasts were extremely eager to work Rotuma on that band as an all-time new one and, as the sole radio-amateur station on that relatively rare DX entity, I felt it my duty to try to find a solution to come on the air on 50MHz as soon as possible. Shipping a beam antenna to the island was not an option because of the limited time I had left. Through a very fortunate coincidence, the brother of **Pita Aisake**, my host in Fapufa, was a radio amateur living in Fiji (**Aisea 3D2AA**, now deceased) and for the purpose of coaching his brother on the island in the hobby, had left behind a well-used copy of the 14th edition of the *ARRL Antenna Handbook* (1984). This was an invaluable asset because I was able to look up the construction of suitable antennas for 50MHz. I was particularly fascinated by the full-size 5-element 6m Yagi on page 11-8, **Fig. 2**. Of course, the biggest hurdle was finding the materials required to construct this antenna. All I had available was coaxial cable, some PL-259 male and female connectors, bits and pieces of wire, my portable toolbox and a 12V 25W soldering iron. The nearest hardware store was more than 600km away in Fiji, and even there, aluminium tubing suitable for antenna elements was not to be found!

Despite these apparent hurdles, the urge was there to get on the air as soon as possible on 6m with a good signal. On looking around the place I was staying, I noticed some old broken wooden lounge chairs, which could come in handy, **Fig. 3**. I asked my Rotuman host Pita if he knew of some suitable material for the boom and mast – PVC piping or wood came to mind. It turned out that the only solution was to go into the bush and cut some lengths of a native softwood tree that grew particularly straight and before long I had before me the backbone of the antenna. Now, the main problem was finding what to use for the directors, driven element and reflectors. With no metal tubing of any kind available on the island, I thought that a wire beam might be a solution.

A compromise was found with some lengths of steel clothesline that were lying about the house. Now this material is quite difficult to work with, being about 3mm in diameter, springy and not very rigid. I proceeded to straighten the lengths of wire as well as I could with a hammer and having measured them precisely as per the invaluable *Antenna Handbook* specifications for the 50.000 to 51.000MHz portion of the band, cut the director, reflector and driven element pieces with a pair of large pliers. The steel wire had been

Fig. 3: Starting to build the Yagi on the old lounge chairs.

Fig. 4: The U-shaped hairpin matching system, along with coaxial phasing line.

exposed for years to corrosive salty air and had to be cleaned with CRC-2.26 after thorough filing and removal of corrosion with sandpaper. This was particularly critical for good electrical connections and soldering of the driven element to the hairpin matching network and coaxial connector using the 12V solar-powered soldering iron (not an easy task because the steel material is not particularly solder-friendly). The U-shaped 'hairpin' matching system, **Fig. 4**, was fashioned out of a short piece of surplus copper wire and was soldered to a 180° phasing line made out of a few turns of 50Ω coaxial cable a half-wavelength long.

The whole contraption was fixed to the wooden 'boom' using nails by first attaching the two halves of the driven element to a rectangular piece of flat wood from the aforementioned broken lounge chairs (more precisely, the armrests!) using short U-nails. The directors and reflectors were similarly affixed to the boom using these wooden interfaces. Because of the hairpin matching system I was using, these were all longer than the driven element. Two flat wooden pieces were attached to the sides of the area near the driven element to support the U-matching network and to receive the coaxial connector. All this wood and steel was pretty heavy and lifting the boom of this full-size antenna with all the elements attached was no small effort, with the ends of the steel wires sagging noticeably. I used a more-or-less straight piece of tree trunk about 7m high as the 'mast' and attached to the boom using nails and vine cordage.

Rotation of this contraption inevitably meant using the 'Armstrong' method and a length of nylon fishing line was attached to the forward end of the antenna boom and terminated with a small piece of coral stone for easy turning towards the DX as required. Lifting up and erecting of this whole affair was a hair-raising exercise. I was particularly worried that the boom was too heavy and might break the mast because everything was wooden, precariously assembled, springy and sagging. However, we managed to get the antenna up in the air and fixed to the side of the native hut 'shack', **Fig. 5**. Now, as they say, the 'proof is in the pudding' and all that was left was to test this 'island-brew' hybrid 6m antenna on the air. And to be quite honest, the results were far above my expectations!

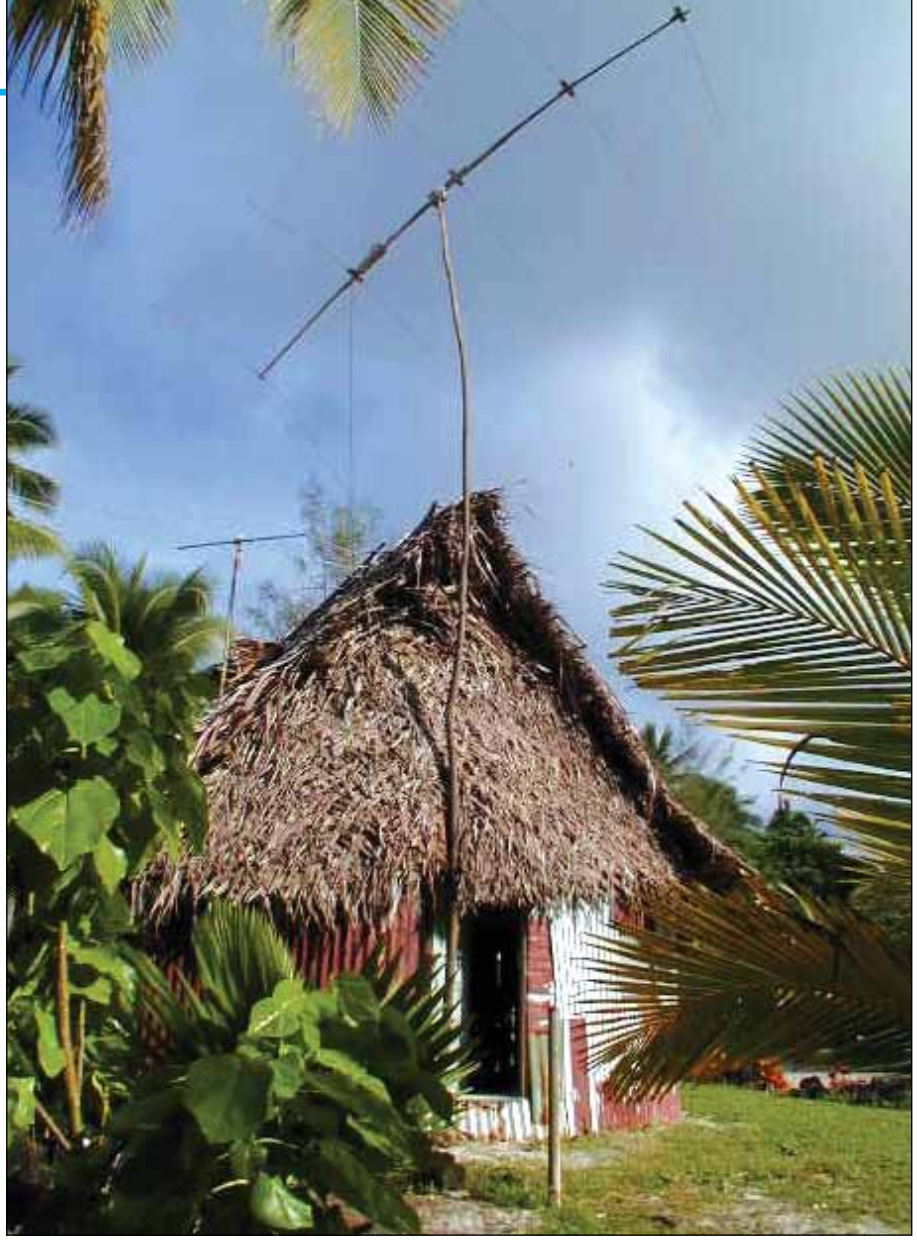

Fig. 5: Not exactly the neatest looking antenna system but the homebrew Yagi and mast (seen here by the 'shack') brought some remarkable contacts. The 10m beam can also be seen behind the shack.

Testing and Operation

Initial testing of the resonance showed a very acceptable SWR better than 1.3:1 on 50.110MHz, which meant that I could call CQ using 100W without any worry, all thanks to the improvised hairpin matching network. My very first 6m QSO was on March 11th at 0310UTC, with Rick P29KFS (Papua New Guinea) on SSB. The next big opening took place on March 15th between 0830 and 1000UTC where some 200 JA (Japanese) and HL (Korean) stations were worked with very good signals (59 to 59+) via TEP. Regular openings to Japan, Korea Hawaii and Hong Kong continued until April 3rd, when central America (Costa Rica, Mexico and Chile) started to come in via F2 propagation around 2030 to 0600UTC and then on April 8th, 12th and 13th there were major openings to Australia with VK1s to VK8s being worked between 2200 and 0400UTC. At this time, the west coast of the USA and Texas also started to come in with stations in Brazil being heard too. This was all in the background of major short-path openings to Europe on 10m in the local evenings. Just before I had to go QRT on April 19th because my return boat to Fiji had arrived, the 6m band was still wide open to Australia, the west coast of the USA and Central America. It is admittedly with some reluctance that I finally had to take this 6m beam down (the entire boom broke into pieces at this stage due to termite infestation). Little did the other stations realise on what type of antenna the precious QSOs were made! Over 1,000 QSOs were made on 50MHz from Rotuma by the time I left. The antenna performed amazingly well under the circumstances, the only worry being turning the 'boom' because every time I went outside to spin the all-wooden 'lumberman's delight' contraption I was afraid the whole thing might come crashing down because of the weight and sagging! But the antenna held out for over a month, resisting the winds and attacks by wood ants. This very interesting experience shows just how exciting amateur radio can be in a remote location isolated from the rest of civilisation, where under the force of circumstances the real ham spirit and ingenuity come into play to provide a local and sustainable solution to a DX need on the VHF bands!