

Experiments in aircraft enhanced propagation - 2

Barry Miller VK3BJM

In November, I detailed the beginnings of my experiments in Aircraft Enhanced Propagation (AEP), on 144 and 432 MHz, from the far west of NSW. This month I'll explain how subsequent trips explored the question of how far west this mode of propagation can be relied upon.

Trip Number 3 – November 2003

In mid-November 2003 I headed up to a spot just south of White Cliffs, to continue exploring how far north and west the AEP would support communications. This trip would activate QF19ma, and challenge my portable VHF/UHF station. From the location just west of the Wilcannia-White Cliffs Road, my GPS told me it was 811km to Sydney, and 789km to Melbourne. This is getting right on the theoretical limit for this mode of propagation.

I spent nearly three days on the treeless ridge in 40°C heat, drinking lots of water and hiding in the shade. I failed – just – to work back into Melbourne. The beam heading was nearly at right angles to the Sydney-Adelaide aircraft track, which meant the aircraft provided propagation for a very brief period. The two near-contacts that I had suggested that it might just be possible to work into Melbourne, but the report exchange process would have to be perfect to be completed in time.

It was a different matter towards Sydney, though...

I had managed to park myself almost directly underneath the G222 flight path – it runs between Sydney and Jakarta. Not only did this mean I was woken up at about 0600 AEDT each morning by a 747-400 passing overhead towards Sydney, it also meant I had a reference from which to time my

calls to Sydney. There was also the A576 route visible a little to the north of me, running between Bali and Sydney via Alice Springs.

G222 was the key, though, as it was used by Boeing 747-400s at high altitude. The higher the aircraft, the further over the horizon your signal will be propagated. It also seems that the bigger the aircraft, the better

Gordon was 56, and he gave me a 53, peaking to 54.

I think it was around 2200z that I spoke with Guy, VK2KU, on 40m, and I agreed to leave my CW keyer running for half an hour for him to monitor with "Spectran" (a PC-based audio spectrum analysis program). At about 2235z we were discussing giving up as nothing much had been seen,



the propagation.

Through bad luck and bad timing, I didn't complete with any Sydney stations on the first two mornings. But on the third – Monday 17th – I concentrated on Sydney, and at 2118z I completed with Gordon VK2ZAB on 2m – a report of 51 given in return for a 52. Three minutes later, we completed on 70cm with the same reports. There was much whoopin' and a-hollerin', at my end at least... Twenty minutes later I repeated the contact on 2m with Gordon, except this time

when I heard something big and Boeing overhead. I suggested we give it another half hour!

Eventually my beacon signal started to become visible on "Spectran" and built in level until voice was viable. Finally, at 2313z, I worked Guy on 2m. I gave him a report of 51, and received a 41. Signal strength seemed to be still building as we 73'd.

Trip Number 4 – April 2004

On arriving home, I got out my maps, and flight charts, and

started calculating. I wanted to see if the 900km barrier could be broken. The best way to achieve this was to plot a beam heading from Sydney, getting it to intersect the G222 flight path at a distance of 450km or more (from Sydney). I came up with two initial possibilities: Mt Dering QF08tm, or near Nundooka Homestead QF09ud. A little more work suggested a spot 100km north of Broken Hill, near Fowlers Gap QF08uv, might be better. All three locations are along the Silver City Highway, north of Broken Hill.

While I wanted to get back on the road as soon as possible, I decided I'd wait until the ambient temperature level dropped to something a little saner than 40°C. This translated to mid-April 2004.

On Friday 2nd of April I left Kyneton for Fowlers Gap, arriving there just before midday the next day. With some much-appreciated assistance from David of the University of NSW (the UNSW own Fowlers Gap station), I set up adjacent to a trig marker on the highest part (283m ASL) of a nearby ridge. The view from the ridge alone was worth the drive from home!

The first signal I looked for was the Ch5a vision carrier from Newcastle – it was immediately audible, and every now and then I heard the distinctive flutter of multi-path caused by an aircraft in the path. I ran the keyer towards Sydney, and it was heard by VK2ZAB almost continuously – but not at a level that would support voice. I could hear Gordon calling me most of the time, too, at RS of 41. This was the benefit of my low local noise floor, combined with his larger transmitter power. These signal levels appeared to be a result of inland tropospheric ducting (this view was strengthened by contacts with Leigh VK2KRR and Mark

VK2EMA – both had constant large signals from their QTH's in central NSW). We agreed that all we needed was an aircraft suitably placed to enable the contact to be made.

I'd believed that my position should have afforded me a view of aircraft passing on the G222 route, but I only saw one during my entire two days on the ridge. Based on my experience from the previous two trips, I asked Gordon to be available from 0500 AEST, to coincide with the morning flights I had observed. On this trip, it was dark at that time of the morning and I saw no aircraft.

Sunday morning we had two near contacts, but the enhancement was marginal – the first attempt had a report copied incorrectly, and the second fell through before confirmations were fully exchanged. Monday morning we succeeded twice (one contact showing marked aircraft flutter on Gordon's signal), with a third near contact. We tried 70cm, too; but I heard nothing from Gordon, though he thought he heard something from me. The path distance, according to my GPS, was 923km.

Contacts were also made into the Melbourne area (VK3AFW at a distance of 813km, and VK3II at 882km), Canberra (VK1DO at a distance of 860km) and with VK5's ZK and UBC, at Goolwa and Gawler respectively.

Station details

I'd class my portable station as modest – not QRP, but there is certainly room for improvement in most areas. All the contacts detailed in this article have been made with the following gear.

Transceiver: Icom IC-706MkIIg
2m: Mirage 160w PA, with inbuilt 21dB pre-amp (manufacturer claimed 0.6dB noise figure), and home-brew 10-

element DL6WU-style yagi at 5 metres above ground level.

70cm: RFC 100w PA, with inbuilt 12dB pre-amp (2 to 3dB noise figure) and home-brew 15-element DL6WU-style yagi at 4 metres above ground level.

I've variously used RG213, 9913 and LMR-400 coax on all trips except the Fowlers Gap expedition, where I used 6 metre lengths of LDF 4-50 heliax for both bands.

I feel that I can do much better on 70cm by building a bigger yagi (possibly 28 elements) and adding a better pre-amp (more gain and better noise figure). On 2m I need more grunt. I'm building a 14-element yagi for 2m, and looking at a design for a 19-element version. It would be nice to obtain a 300w solid state PA – but they're rare and cost kilo-bucks!

I use a CW keyer (the RAJE design kit) as a beacon, to save my voice. It automatically runs a simple sequence – “CQ de VK3BJM K” followed by 10 seconds of receive before repeating the call. During the receive break I listen intently for replies – if one is heard the keyer is disabled and I reply with voice. This also helps maximize the life of the battery, which in my car is an auxiliary 120 A/h deep cycle battery.

Conclusion

The western half of NSW has very few active amateurs on VHF and UHF, and this might add to the impression that VHF and UHF is a dead loss in this remote part of Australia. In fact, the type and altitude of the aircraft flying over NSW will provide some of the best long distance Aircraft Enhanced Propagation around. Time, patience, and a little research are all that is required to exploit this.

My choice now is this: attempt to exceed the 1,000km barrier for an AEP contact, by

going 80km west of Fowlers Gap, or settle for activating other locations in NSW within a 900km radius of Sydney. I want to try for the 1000km contact, but I won't attempt this till I have improved my portable station. Stay tuned – preferably on 144.100 MHz.

Finally, I'd like to thank the many stations whose support, encouragement and participation have made these contacts possible; but especially Chris Morley VK3KME and Peter Freeman VK3KAI for assistance in research, and Ron Cook VK3AFW and Gordon McDonald VK2ZAB for their support with both research and on-air availability.