RAGCHEW

FEBRUARY 2018

FROM THE EDITOR - G4CIB

The club has made a good start in the VHF/UHF UKAC events and as I write this editorial we are currently in 13th place in the Local Clubs results table. As I have said before, even if you are not a contest person, these events provide activity on what would probably otherwise be quiet bands so it's always a good opportunity to test new antennas or equipment. **Cliff G8CQZ** discovered by listening to a 144MHz UKAC event that his antenna was not working as it should (he was not hearing stations that other club members were in qso with). He set about building a new antenna which has proved to be very effective. So much so that he is now participating in the UKAC with good results. In the first of a series of three articles, Cliff gives us the details of his recent antenna projects.

In this issue, well known Cheltenham based operator **Graham G3VKV** has written an article entitled "Introduction to Amateur Satellites" and **Tony G4CMY** has submitted a piece describing his experiences of listening to one of the early Oscar satellites. **Tony G4HBV** continues his RF Notes series with the basics of how antennas work in terms of fields and currents. **Graeme G0EEA** writes about the time he listened in to the **International Space Station** and impressed his grandchildren.

On the shack front at **G4CIB,** I have recently purchased a little **Wolphi Link** interface box with a view to operating data modes from Lundy island later in the year. Initial tests using my IC703 running 5 watts resulted in a good haul of qsos around Europe on PSK31 and PSK63. Other projects are in the pipeline with a view to entering the Construction Contest which I understand is to be held some time in May or June.

Once again - the usual appeal - articles from members on any aspect of amateur radio are more than welcome! Email your article to me at **g4cib@outlook.com**

73 and good DX!

Brian G4CIB

SPECIAL EVENT STATION

GB4QBP (Quedgeley Brownie Pack)

THINKING DAY ON THE AIR

17th FEBRUARY 2018 1000-1600 UTC

JANUARY AFS 80m-40m

Entries from M0NQN, M0XAC & G4CIB

The CW leg was held on Sunday 7th January with one entry from GARES member **M0NQN.** Bob, running 100 watts from a Yaesu 950, clocked up a total of 111 qsos, 100 on 80m and 11 on 40m. This score put the club in 41st position out of 51 entrants in the Local Club table. In the 100 watt individual call sign table, Bob came 45th out of 103 entrants.

The SSB leg was held a week later on Saturday 13th January and the club was represented with entries from **M0XAC** and **G4CIB.** Gary, running 400 watts from a Kenwood TS590 clocked up a total of 58 qsos, 55 on 80m and 3 on 40m. Brian, running 10 watts from an IC703 clocked up a total of 82 qsos, 81 on 80m and 1 on 40m. This score put the club in 41st place out of 63 entrants in the Local Club table. Gary came in at 64th place out of 65 entrants and Brian 7th out of 19 entrants in the Individual Call Sign 400 watt and 10 watt tables respectively.

JANUARY UKAC

As reported in the January "Ragchew", six members submitted logs into the opening 2018 144MHz UKAC event. Two members submitted logs for the 432MHz event. In the 50MHz event, three logs were submitted and two logs on 70MHz

Many thanks to the following who submitted entries:

50MHz - **G0ULH, G8CQZ, M0XAC**

70MHz - **G0ULH, G4BCA**

144MHz - **2E0MFH, G0ULH, G4CIB. G4IZZ, G8CQZ, M0XAC**

432MHz - **G0ULH, M0XAC**

Can I reiterate - the more members we can encourage to submit entries (no matter how few qsos you have) will add to our total score. If you wish to find out more then any of the members listed above will be more than willing to give you the benefit of their experience.

As this issue goes to print (funny that as most "Ragchew"s are circulated electronically), GARES is in 13th place in the Local Clubs table.

An introduction to using Amateur Satellites

By Graham G3VKV

Brief History

Since 1961 there have been Oscars (Orbiting Satellites Carrying Amateur Radio) up the sky. Oscar 3 in 1965 was the first with an actual voice transponder. In 40 years over 60 satellites have been launched with 20 now operational. These are mostly LEO's (Low Earth Orbit) between 100 and 1200 miles up and travelling at approximately 17,600 mph. The oldest amateur satellite still working is AO7 (Oscar 7) it was put into orbit in 1974.

How do they work

There are mainly two types, FM single channel, very similar to terrestrial repeaters, needing a CTCSS tone to access, also SSB/CW satellites with instead of one channel a section of band usually 20 or 100KHz repeated allowing multiple contacts to take place. The input (uplink) is on one band and the output (downlink) on another (usually 2m/70cms or 70cms/2m).

Equipment needed

For FM, 5W and a handheld to a small beam is adequate, either one which can transmit on one band and receive on another simultaneously or two hand helds. There are commercial antennas (Arrow etc.) which comprise a 2m 3 element and 7 element beam on one boom. These are easily made yourself if you are handy with metalwork. If you feel like spending a lot of money circular polarised antennas which will reduce fading and azimuth / elevation rotators are available but satellites can be a lot of fun without costing a fortune. For SSB satellites a dual band rig is needed or separates (2X FT817?) and 5 to 20W. Overhead passes can be easily accessed but when the whole of Europe is within range it gets a bit busy.

How to find the satellites

A satellite tracking programme is required to see the orbit data and position of the desired satellite. There are many available including Wxtrack – Sat32PC – Ham Radio Deluxe etc. I use Wxtrack which is free. Both stations have to be able to see the satellite (be within the footprint / circle) in order to communicate. These programmes can download the 2 line tracking data from celestrak.com and use it to show the satellite orbit position.

Operating satellites

Satellite frequencies and operational status can be found at the Amsat website or type 'Amateur satellite frequencies' into Google for a wealth of information. The two satellites I use are FO-29 for SSB and Fox 1B / AO-91 for FM. Before thinking of operating a period of listening is recommended and always make sure you can hear your own signal back from the satellite at all times and use the lowest power possible – if you can hear yourself then so can everyone else. On the single channel FM satellites do not call CQ just give your callsign a couple of times and keep QSO's very short as there may be others waiting for a contact during the short period of a pass.

Difficulties to be overcome

Transponders (repeaters) in satellites are usually inverting (LSB up produces USB down) - moving LF on the uplink results in your downlink signal moving HF which can be fun when trying to net on to another stations frequency. Also because the satellite is moving at 17,600mph the signals are moving across the dial all the time (Doppler shift). Higher coming towards you and lower going away, this can be as much as +-8KHz from the actual frequency. This occurs at a varying rate dependant on the relative movement of the satellite apparent at different observer locations.

Working satellite DX

To get long distances on satellites requires very low elevation angles (10 degrees or less at both ends) the ultimate DX is found below 2 degrees and by using satellites when they are at the highest point in their orbit (Apogee). This results in a very short time for a QSO, sometimes less than one minute. A good view to the horizon is required at these low angles, most records have been set with stations going out portable to high up locations. The world distance record of 7635km on FO-29 was achieved recently with 5W at both ends with hand held antennas between KG5CCI Arkansas USA and F4DXV in France. Using standard terrestrial antennas at my QTH in Cheltenham – 9 element Tonna for 70cms and 10 element Cushcraft for 2m on a 40ft tower I have worked 7498km to W5CBF in Dallas Texas and I have also had contacts to AL7RS in Teller Alaska and in total 32 US States and 4 Continents – Europe, Asia, Africa and North America. My system only works on low angle passes within the vertical beam width of the antennas but is excellent for DX.

More information

To see what others are doing on the satellites (Birds) go to Amsat on the web or see the QRZ.com pages of Jerome F4DXV, George MI6GTY and Dave KG5CCI who has made some interesting short films of his exploits. See KG5CCI on You tube.

See you on the satellites!

Graham G3VKV

How to Become a Cool Grandad

By Graeme G0EEA

Tim Peake's Question and Answer sessions, between the ISS and schools in the UK, were well publicised and, using the internet, it was easy to find out when, and where (on the radio spectrum), they would take place. I told my grandchildren what they probably already knew, that these were live sessions on the internet, which was the best place to listen as there would be video and it would be available after the event. I also said that we could probably hear Tim simply and direct, on my walkie talky, albeit you would not hear the schoolchildren. I took the necessary kit -walkie talky with ¼ wave aerial, external loudspeaker, mains PSU, power extension cable to their place and set it up outdoors on the garden table. We did indeed hear Tim Peake on the walkie talky, 145.800MHz as I recall. I myself was surprised that we did not need to do anything about Doppler shift, and with benefit of hindsight I suspect we missed a few minutes at the beginning and at the end due to this effect. The grandchildren were sufficiently impressed, the oldest commenting, "That's cool, Grandad".

Just a CQ call is all it takes!

A few evenings ago I wandered into the shack to sort a few things out and turned on the rig. I tuned to 144.430MHz - the GB3VHF beacon frequency - and there it was burbling away but not any stronger than usual. So nothing likely to be on the band tonight. I decided, however, to put out a CQ on 144.300MHz and was aware of a weak signal but not really sure it was calling me. I called QRZ but nothing was heard. But just occasionally there appeared to someone there. I left the rig tuned to the calling frequency and a few minutes later was surprised to hear 2E0OOM calling. The call sign seemed familiar and sure enough I had worked Mike in Gravesend, Kent (JO01EK) several times last year during some vhf "lifts". Despite heavy QSB we managed to exchange all the relevant details and signed off after ten minutes or so. Not bad for 50 watts into a loft mounted 5 element ZL Special. Moral of the story? Even when the bands appear dead, it's always worth putting out a CQ call. So let's have more members monitoring 144.300MHz.

Listening Through Oscar 6 in 1972

By Tony G4CMY

In response to your plea for comments on satellite operating, I have attached a QSL card I received from AMSAT in November 1972 in return for a log of stations heard through OSCAR 6 that I sent to them. This was before I was licensed so my RSGB Associate Number A7813 is shown on the card, AMSAT asked for reception reports at the time and I must have sent a couple more because I have two further OSCAR 6 QSL cards.

OSCAR 6 had an uplink on 2m and a downlink on 10m. I was using an RII55N receiver with a modified RF24 unit as a 10m convertor. The antenna was a 10m dipole about 8 feet of the ground.

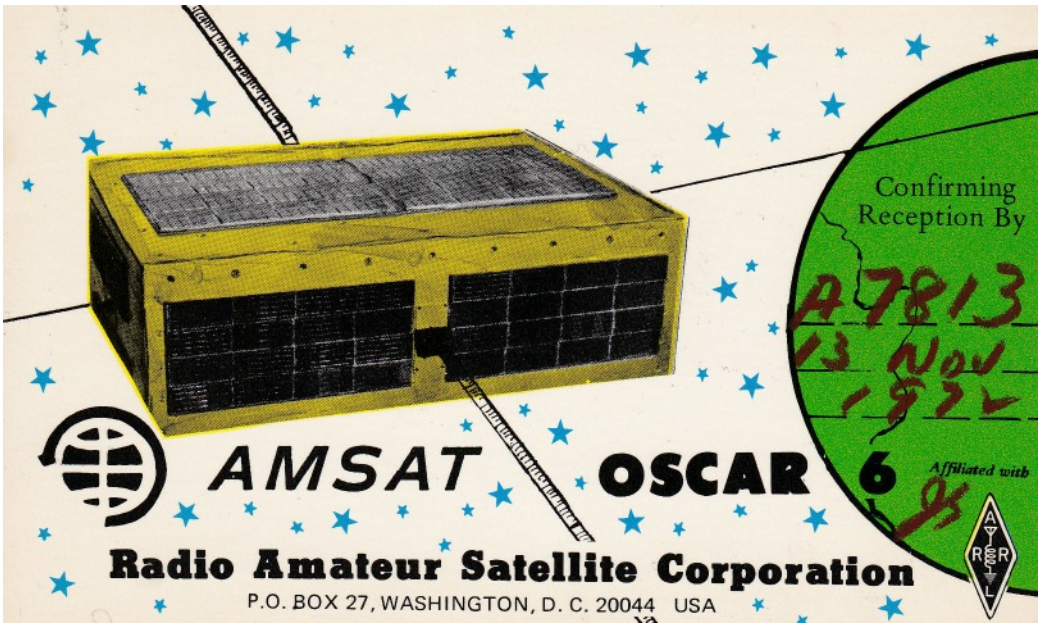
I was inspired to listen for satellite signals after a GCHQ Amateur Radio Club open night where they were demonstrating reception of signals from the then newly launched OSCAR 6. They were of course using a very nice Racal receiver and a serious antenna but I thought it was worth a try with my humble equipment. From late October 1972 to June 1973 I was a regular listener to OSCAR 6 and never ceased to be amazed when, listening at the predicted signal acquisition time, a host of CW and SSB signals would appear out of the background noise, rise to a good signal strength and then gradually fade back down to nothing as the satellite dropped below the horizon. The satellite was usually audible for a maximum of about 15 minutes but occasionally longer if there was some ionospheric propogation bending the signals over the horizon. I could usually hear stations all over Europe and often on the East Coast of the USA and Canada.

Some time later I managed a two way QSO through a later satellite. I can't remember if it was OSCAR 7 or OSCAR 8 but it had, amongst others, an uplink on 10m and a downlink on 15m. I worked a station in Tewkesbury. I was using a TS120V with a trapped vertical as transmitter and your old HW7 with a 15m dipole as receiver.

Strangely, it doesn't seem that long ago!

73

Tony G4CMY



RF NOTES BY TONY – G4HBV

Over the next few “Notes” I shall be covering the operation of antennas, trying to explain how they work in terms of fields and currents. Antennas can be divided up into two main types: standing wave and travelling wave antennas. Most of the antennas we use are standing wave antennas, where the radiating elements are either open-circuit or form a closed loop. In travelling wave versions the radiating element is connected to a conductive load. However, by the end of the articles you will see, I hope, that this distinction is not a really accurate one.

Imagine a half-wave dipole erected in free-space (an imaginary place where there is no earth or obstruction to interfere with the uniform expansion of the radiation fields). This dipole is fed by ribbon feeder of 75 ohm characteristic impedance that exactly matches the impedance at the dipole centre and the transmitter's output impedance (which is balanced). Therefore for the moment we needn't bother about SWR meters or ATUs.

We commence by considering the start of the positive half-cycle of RF current from the TX passing up the right-hand side of the feeder and into the right-hand half of the dipole. Because this positive current in the feeder is balanced by a returning current in the left-hand feeder, there will be little radiation from the feeder.

As the current progresses along the dipole arm it causes fields to form around the antenna – this is a natural process that we needn't go into here.

One field is an induction field, a local field that returns its energy to the antenna in the form of a return current, flowing in the opposite arm of the dipole and eventually back, via the left-hand feeder to the TX. The other field is the radiation field, which moves away from the antenna and whose energy is lost from the antenna. As this positive half-cycle continues, the forward current in the right-hand arm of the dipole reaches the open-circuit at its far end and with nowhere to go it becomes a return (reflected) current flowing back along the right-hand arm. This reflected current enables the current to be zero at the open-circuit of the far end. This happens to the current throughout the whole positive half-cycle of RF from the TX. Along the arm of the dipole the reflected current and the forward current form a “so-called” standing wave on the dipole arm. This pattern of current exists for the whole of the positive half-cycle; with the length of the dipole arm (a quarter wavelength) meaning that reflected current has reached its zero value at the feeder connection point on the dipole arm. At any point on the right-hand arm of the dipole the current will be determined by the time instant within the positive half-cycle AND the position of the point with regard to the forward/reflected current's pattern.

In this context, the term “standing wave” is misleading and I am sure diagrams of current distribution along such a dipole have misled many people. Yes, it you were to probe along the dipole arm a measuring instrument would show this current distribution – BUT in reality there is no standing wave – it is a mathematical illusion – there are only forward and reflected currents.

For the whole of this positive half-cycle the forward and reflected currents in the right-hand arm are exactly mirrored by currents in the left-hand arm caused by the induction field, returning energy back to the TX via the left-hand feeder. These currents contribute to the total radiation field produced by the dipole.

As the positive half-cycle of power from the TX ceases and the negative half-cycle begins, current now flows into the left-hand feeder, with the return current, caused by the local induction field, returning to the TX via the right-hand feeder. The value of current taken from the TX is determined by the power lost in the radiation field as it moves away from the dipole**.** I have explained before that an imaginary resistance, the radiation resistance of the dipole is used to account for this and in this special case we are considering it forms the input impedance at the dipole centre.

You will have noticed that on the dipole arm, the whole of the current is reflected, this means that the SWR on the antenna is enormous; this is the condition necessary for effective radiation. So when you see adverts stating that such and such an antenna has a low SWR you will realise this is nonsense. What they are referring to is the SWR on the feeder.

Another thing to be aware of is that some books (especially older ones) try to explain radiation as the fields “breaking away” - this is incorrect – fields are NOT the cause – they are the effect by which we observe the radiation.

New Aerials for 6 thru 70 by Cliff G8CQZ

Old ZL Special (& Colinear)

I had often listened to the 2m UKAC contest but rarely participated and had never actually put in an entry. This was because I rarely worked more than three or four fairly local stations and could only hear three or four more. I knew that the main reason for this was my 5 element ZL special but it was only in October 2017 that I realised just how bad it was. You see I had accidentally started listening to the contest with my vertical colinear connected but, when I switched over to the ZL special, I could only hear the same few stations at the same strength. Something had to be done.

I don't know what it was about my ZL special. Brian (G4CIB) also has one and his seems to work well but the front to back ratio on mine was about one "S" point and even off the side it was only another point lower.

Then salvation happened. I had been looking at alternatives, without success, when the November RadCom arrived and the "Antennas" column featured a "Dual Band Yagi Beam". Not only could I get on 2m but I could also get on 70cm with essentially the same aerial. The only 70cm aerial that I had was the vertical colinear, hardly the thing for a UKAC entry. I have always been of the school that says "why buy when you can build" so I was hooked. Then I remembered an earlier design that I had also been interested in: adding 4m to a 6m dipole. That had been in RadCom back in April 2016. If I was going to take the mast down to install one aerial, I might as well install two. So it was decided: I was going to build both.

An order went off (to www.aerial-parts.co.uk, as mentioned in Ragchew May 2017) for the aluminium and connectors, I borrowed the club's MFJ antenna analyser and six weeks later I installed two new aerials. I wouldn't say that it was easy but it wasn't hard if you took it steadily and didn't try to rush anything. A lot of the construction details weren't in the RadCom articles so it had to be worked out. If it was "measure twice before cutting once" it was definitely "think three times" before deciding what to do. I don't think that I saved any money by building it myself but I got exactly what I wanted, not one of the limited range of options commercially available.

When I switched on, GB3VHF (144.430MHz) was definitely a lot stronger. I also had much better directionality. Tuning up the band slightly, I realised that there was a beacon that I had never heard before: GB3MCB in St Austell on 144.470MHz. Sure enough, switching to the vertical and it disappeared. I could also hear both GB3UHF and GB3MCB on 70cm with the new aerial.

The New Aerials

So, in December 2017 I entered the 2m UKAC and had 16 contacts. Not bad for 10 watts and a very nervous operator. I also heard, but didn't work, a lot more including a PA station and a couple of F's.

All I needed was a better rig.