



THE MARCH MEETING

This month we welcome the return of Richard Eassom of GEC-Marconi Communications who will provide a presentation entitled "Automated HF".

Since its discovery in 1924, military forces have relied on the High Frequency (HF) radio band for long-haul communications and suffered the associated problems of low bandwidth, noise, interference and propagation.

The skilled HF radio operator became an important asset. With the availability of satellite communications in the 1960s, HF was thought to be redundant, although it still featured in most forces.

However, the ever-increasing processing power of today's computers has allowed the skilled operator to be replaced by software, restoring HF communications as a relatively inexpensive, reliable and flexible medium for long-haul communications. This talk will discuss the techniques that are currently being employed to achieve fully automated HF communications.

The meeting opens at 7.30pm on Tuesday 3rd March in the Board Room of the Marconi Social Club, Beehive Lane, Chelmsford. (Please sign-in on arrival and place your order for refreshment if required).

DATES FOR YOUR DIARY

- 28 Feb. RAINHAM RADIO RALLY - Rainham Kent.
- 3 Mar. CLUB MEETING - Automated HF - R. Eassom.
- 7/8 Mar. LONDON AR & C SHOW - Picketts Lock.
- 7 Apr. CLUB MEETING - Members new rigs.

MEETINGS FOR MAY

Due to a block booking of the whole of the Marconi Social Club complex throughout the first week of May, our Club meeting will be held on the second Tuesday, May 12th. However, an extra outside visit has been arranged on Tuesday May 5th to the Borough Council Emergency Centre in Chelmsford. Colin, G0TRM is co-ordinating this event and will be taking a list of names at the March meeting.

C.A.R.S AT CANVEY RALLY - by Christopher, G0IPU

After the success of the last club stall at the Canny rally, Jan and myself thought it would be right for the club to have another go this year. Jan, unfortunately could not make this rally due to parental duties. The junk sale leftovers were stored by Jan in his garage (thanks Jan) and some new gear was collected a day or so before the rally by Colin G0TRM, Geoff G7KLV and myself. Geoff was the first to arrive and got things under way by finding the tables in the hall that were allocated to us. When I arrived some 30 minutes later, Geoff had most of the junk sale gear in the hall ready to set out. I unloaded my car and set about displaying the goods that were for sale. This was done in good time so Geoff and I went to the canteen to get a cup of tea. Colin turned up with fresh toot soon after, along with the banner, this was put up as well. There had been a small amount of trading the day before the Rally and some money had been made by Geoff and Colin in a mutual exchange of bits. I paid for the table (in fact it turned out to be two tables just as you came into the hall) out of my own money, and was reimbursed at the end of the day. As it turned out the tables were paid for in no time at all, thanks to Geoff and Colin's earlier trading (Hi). The doors opened at 10:30 and we were in the thick of it, and doing well too. We had a good response from the "punters" and much humour was evident in the light banter in the hope of a sale. At around 14:00 trade started to drop off and we remained at the stall till around 14:30 when we started to pack up. There is still much surplus equipment left, but we did manage to make the club £75.90 in the end. I enjoyed the rally, and so did my two sons who came along later. If you were there, I hope you enjoyed it as well.

LAST MONTHS MEETING - Report by Colin, G0TRM

Steve Emmitt gave us a very interesting and enthusiastic presentation of this rather complex topic demonstrating a thorough and complete understanding of the subject.

He is currently employed by Cable and Wireless, formerly Mercury Communications at one of their main Earth Stations situated on the Isle of Dogs in London. He has been with the Company for some four years after a 15 year career in the Royal Air Force, the latter part of which was spent at the RAF satellite station. He told of early experiments using silvered balloons as reflectors and of RAF attempts using moon-bounce techniques to send signals to Hawaii.

It all began some 50 years ago with Arthur C. Clarke and what was then regarded as Science Fiction. He worked out that if a satellite was positioned 22,000 miles out in space it would see 1/3 of the worlds surface and by having just 3 of them the whole world could be covered. His original idea entailed having crew members on each satellite with the ability to patch radio circuits between each other and the ground.

Today's satellites are naturally very very complex machines operating at frequencies between 4-8GHz and 10.5-18GHz and even up to 175GHz.

Three different orbits are used, spy satellites have a so called 'circular polar' orbit, resulting in a similar area of Earth being scanned on each pass. A second type, known as 'circular equatorial' has a rotation time of 23 hours 56 minutes resulting in the familiar geostationary operation. The third and special type of orbit is used by the Russians, it has an elliptical offset orbit known as active tracking, taking 18 hours for the upper part and 6 hours for the lower part of the pass.

Geostationary satellites need to be re-positioned every 30 days or so and this has to be done with extreme care by the programmers and controllers as each move uses precious fuel and satellites cannot be restocked. Even a 1 bit error in control signals can cause disastrous results. Positional information is sent to four places of decimals. From 22,000 miles range the earth is covered by a 17 ° arc and even 0.3° of error will cause problems. Ground antennas are controlled by tracking a beacon on the satellite and can move up to 0.1° in 0.01° steps.

INTELSATS are stabilised by spinning round and as the antennas must be facing earth at all times the satellite is in two parts. Very complex and sophisticated slip ring contacts are required between the stationary antenna section and the rotating lower part containing most of the electronics.

Solar power requirements are of the utmost importance and stringent steps are taken to ensure the panels face the right way at all times. A problem can occur however during an eclipse which can last in total up to 72 minutes during which time batteries are brought into use. Very careful management is required to ensure that the two sets of batteries are always in top condition. Charge and discharge figures are carefully recorded and the appropriate steps taken to ensure memory and other problems do not develop. If power consumption becomes a problem non-essential units can be switched off in a set sequence to conserve vital resources.

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LAST MONTHS MEETING - continued.

Different satellites require different launch techniques and hence somewhat different methods of construction are required. European and American approaches differ and a varying number of orbits are required after the launch before the final operating position is reached.

Steve spoke about some of the failures that have occurred, such as the piece of cleaning rag left inside a fuel tank of a rocket which blocked a turbo, causing one of the three engines to fail and the whole thing to go out of control and it being destroyed by the launch controller. On another occasion two wires from the solar panels were crossed over resulting in no power, but this was not discovered until the satellite was being tested in orbit. Another satellite was lost when a single error in a 16 bit word of control caused the satellite to turn through 180°, resulting in all the antennas facing the wrong way with the total inability to receive any more signals to correct the orientation. All the traffic received and sent from the Docklands site is digital be it via satellite or cable. A large percentage of the cables being fibre optic, and could be destined for local use, Europe or the USA. Data rates of 16Mbit, 140Mbit and up 40Gbit are used. QPSK (quadrature phase shift keying) is used for the data, together with FEC (forward error correction).

A typical TX chain might be in at 70MHz up-converted to 1200MHz then up-converted again to 14.5GHz. A typical HPA could be a travelling wave tube having a 100MHz bandwidth of ±1dB at 750 watts, or a Klystron type HPA producing 2kW with an HT of 8.5kV. All powers are quoted reference to 1dBW. For some paths 2MW IERP are in use. Antenna gains of 60dB are common with a 0.1° beam width from a 13 metre diameter dish. An LNA on the dish would be kept at a constant -50°C. ensuring low noise. Path losses are very very significant, some 200dB in each direction are quite normal, (inverse square law applies) so the power arriving at the ground receiving antenna would be in the region of 10 to the minus 16 watts, (a bit less than the average amateur signal strengths). To compensate an earth station would radiate 10 to the power of 8 watts.

Dual redundancy is used wherever possible because down time is very expensive and bad for business. A reliability of 97.7% sounds good but it still means an outage of 36 hours a year. There are four dishes on the Cable and Wireless site, known as Thames 1,2,3 & 4. 1 is 3.7m, 2 is 8.0m, 3 is 13m and 4 is 9m in diameter. Number 2 is for UTELSAT for North Sea traffic, whilst 3 is for S.America and Africa. 4 is also used for the North Sea traffic via Brazil.

INTELSAT covers some 140 countries, UTELSAT is used mainly for Europe, while INMARSAT is used as it's name implies mostly for shipping using L band (1.2GHz). Mobile satellite phones using three satellites with current coverage from the Antarctic to the Sahara with a cost of some £5 per minute for voice or fax.

New techniques are being tested such as Multiple Wave Division, a 40Gbits/sec transfer medium, and SDH Synchronous Digital Hierarchy, a high speed fibre optic dual ring circuit.

It was generally agreed that the presentation was very good indeed and very enlightening and much enjoyed by all. Our warmest thanks to Steve for a fine evening.

If anyone would like their own Earth Station about £1.5 million from your next lottery win will just about cover it.

ROY and ELA.....SORRY!

For those members who were not able to attend the February meeting I will repeat here the announcement I made on our behalf.

At the last AGM, Roy and Ela expressed the wish to retire from the Committee at the next AGM and become ordinary members.

The Committee have responded with plans to gradually take over their tasks in a smooth transition. Unfortunately fate decided to step in with a serious health problem for Roy which places him in long term care with the medical profession.

So Roy and Ela would like to apologise for the abrupt halt in their contribution to the Society's activities while keeping their fingers crossed for an improvement in Roys health to enable them to join in some of the club meetings.

MEMBERS NEWS

This month we are pleased to welcome another new member, Clive Humphris, a S.W.L.

Robert Tavener is now the proud owner of the Callsign M1CMY.

This interesting article has been "in stock" for some time, the reason being that it is rather long, however, I feel sure it will not lose its impact if serialized over three issues, Ed.

GAS MANTLES AND AMATEUR RADIO - Harry, G5HF

As far as I can remember, I started life as a small boy. We lived near Wimbledon Common, which has numerous ponds where, in Winter, we skated and when warm enough I sailed my model boats with friends - sailing boats, electric boats and Toc-Toc boats (remember them?).

It was the mid 1920s and I was reading several books about the sea battles of the Great War, the Battle of Jutland, the Battle of the Falklands and two or three more. Looking back at those battles now, I feel that they must have been horrendous, as many thousands were killed and injured in terrible conditions. But to a small boy they looked very exciting and great fun! I was 8 or 9 at the time. I used to day-dream of being able in some magical way to control my model boats so that we could have model sea battles on Wimbledon Common, with guns, smoke, torpedoes and great sinkings.

Then about 1928 I saw an article in *Boys Own Paper* entitled "How to build a wireless controlled model boat." Eureka!! This was it! I assumed that the article described the state of the art on wireless, but I now see that the circuits were the same as Marconi used thirty years earlier, but the advantage was you could make almost all the components needed. The transmitter was spark, using a Ford ignition coil, and the receiver used a coherer, which they said could be purchased from Gamages for five shillings.

The coils were made from the inside of toilet rolls dipped in paraffin wax and the condensers (capacitors to the young) were made from 2lb jamjars lined inside and out with tinfoil. This was REAL tinfoil stripped from the insides of tea chests and beautiful material to handle and solder. No araldite then, so we used Secotone, a glue made from animal bones, very smelly, but a good sticker.

The Ford coil was a wonderful construction, being mounted in a wooden box with dovetailed corners and filled with paraffin wax. Almost bomb-proof and fitted with a trembler on one end, so all you needed was a 6volt battery. I used a 12volt battery and got sparks up to 2 inches long with needle spark gaps.

The next problem was how to make a coherer. I couldn't afford 5 shillings to buy one as my pocket money was only about 2 pence per week, and it all went on sweets. So I said to my Dad, "How do I get a coherer and one or two other bits, like relays?" He was manager of a gas mantle factory in Wandsworth and he took me there to get help from the chief engineer and the chief chemist, who were friends of mine as I used to spend time there during school holidays ("We must be nice to him. He's the boss's son"). The engineer machined up a piece of ebonite to make a cup-shaped coherer and fitted it onto an old bell for a tapper.

(continued in the April issue Newsletter)

COMMITTEE MEETING

The next Committee meeting will be held at 7.30pm on Wednesday 11th March at the QTH of Andrew and Daphne, you are welcome to join us.

MEMBERS ADVERTISEMENT

Colin Page, G0TRM says, CAN ANYONE HELP PLEASE ?

1. How can I use a COMMODORE MPS 1230 PRINTER on an IBM PC
2. Does anyone have circuit information on a DENON AM/FM TUNER TYPE 550L.

Colin is QTHR or by ☎ (01245)223835

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Deadline for the next NewsLetter is Saturday 28th March