

# Getting Started-

*airband*

including

# RIAT 2004

## Pull-out Show Guide

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# Getting Started -



# airband

Welcome to your supplementary *Getting Started - Airband* Magazine presented free with *Short Wave Magazine* July 2004.

The purpose of this supplement is twofold, firstly to introduce the subject of airband listening to those readers, both old and new, who have perhaps not considered this side of the radio hobby. Secondly there's a 12 page RIAT 2004 Guide to either assist your visit to the world's biggest military airshow, or to entertain you in your armchair if you're not motivated to go.

In the *Getting Started* section, Peter Bond guides us through the subject in an easy start way. He provides a clear insight as to the operation of aircraft radio communications in the skies over the UK.

As Peter says, "The editor of *Short Wave Magazine*, Kevin asked me to prepare this supplement, as an introduction to airband listening. With a limit of a maximum of 16 pages it was difficult to decide what to include so in the end I decided to include a bit of everything. Apart from equipment, information sources, ATC operations, etc., I think it is important to understand the history of how aviation and Air Traffic Control evolved in the UK, so I have included a brief history and also a small bit of nostalgia to emphasise one important development".

Kevin Nice



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## History - Aviation, Airbands & Air Traffic

Since long before the Wright Brothers first took to the air in powered flight 101 years ago in 1903 there has always been a public fascination with the various forms of flight. As soon as aircraft started to become reliable the search for distance records was on and soon aircraft had crossed the Channel and the Atlantic. The first powered flight in the UK took place in 1908 and in 1909 the Aero Club was formed, (shortly becoming the Royal Aero Club) and in the same year the first UK airfield was opened at

the unlikely site of Shellbeach on the Isle of Sheppey in Kent. (Good quiz question?). There is little doubt that the First World War pushed forward research and development of aircraft and the associated equipment much further than would have been expected under a peacetime scenario. The first reported use of wireless was in 1914, this was used by the Royal Flying Corp. to direct artillery fire. The first use of radio telephony in an Air/Ground situation was in 1916 thus effectively becoming the first very basic Air Traffic Control.

With the cessation of hostilities in 1918 it was only a very short time before passenger air travel was introduced, (initially



● Belgian Air Force Mirage 5 BA in a special 70th Anniversary colour scheme.

# Getting Started-

# Airband Listening



for the wealthy), and soon the need for some form of Air Traffic Control was necessary. The first scheduled commercial International flight in 1919 was between London Hounslow to Paris by the company Aircraft Transport and Travel. In 1920, Croydon became London's official airport and the first Radio Telephony stations were set up at Croydon and Lympne in Kent. In 1922 the first mid-air collision between two airliners in France lead the way to the first regulated routes for aircraft and effectively the first airways and controlled airspace was introduced. By 1929, Mayday was adopted as a distress callsign, weather reporting systems were introduced, Wireless Traffic Control was introduced at Croydon and airliners had to carry specific equipment and had to be licensed. Regulation of the air had begun! This fascination

Sussex opens as Gatwick airport and in 1939 the Air Ministry formally adopts the title Air Traffic Control.

Aviation went forward in leaps and bounds and was once again aided by massive developments during the Second World War. From 1936, the 'Chain Home' Radar system was introduced on the east coast of the UK and this played a very significant part in our victory in the Battle of Britain. All sorts of other equipment was developed during the war including the Pathfinders using blind bombing aids. Radar units were reduced in size to fit onboard aircraft including the installation of the H2S radar guidance systems plus there was the introduction of the US designed LORAN navigation system. In the latter years of the war we were introduced into the jet age and to demonstrate how quickly air travel advanced in a

(GCA), was installed at both Heathrow and Prestwick, also in 1947 the first Flight Information Regions, (FIRs), were established within the UK. They were, Uxbridge (southeast), Gloucester (southwest), Preston (northern), Prestwick (central Scotland and Inverness (northern Scotland). By 1949 the first system of radio telephony transmitter sites was established within the Uxbridge FIR thus giving the first Area radio Coverage of a region. The transmitter sites were at Birdlip (Gloucestershire), Riddlesdown (Surrey), Lympne (Kent) and Pulham in Norfolk.

In 1950 the first UK Airway Green One was introduced between Woodley and Strumble, both of which are recognisable reporting points today. By the late 1970s, Woodley was to become one of the busiest Airway junctions in the UK. Within a year further airways were established across the country, including Amber One, Amber Two, Blue One, Red One and Red Two and so the airways structure as we know it today started to take shape. It is rather ironic that these airways still existed with almost the same titles until March 2004, (Green One became Gulf One, Amber One became Alpha One, etc.). During the 1950s much more progress was made, the IFF (Identification Friend or Foe) system was further developed, which would eventually be evolved into the modern day Secondary Surveillance Radar. This meant that radar would interrogate a transponder on the aircraft thus providing specific information rather than just painting the aircraft with a primary return shown on the radar screen. In 1951, the first proposals were made that computers could be used for processing flight data. In 1955, the Southern Air Traffic Control Centre moved from Uxbridge to Heathrow. In 1954 it was announced that Gatwick would be re-developed and would become London's second airport.

The new Gatwick Airport opened for operations in 1958, shortly after Croydon, once Britain's premier airport sadly closed for good in 1957.

In 1962, the National Air Traffic Control Service was formed, later to become the National Air Traffic Services and in 1966 the British Airports Authority was formed to manage the UK's state owned airports. Also in 1962, West Drayton was identified as the sight for the new Southern Air Traffic Control Centre and this became operational in 1967 when it moved from Heathrow. By 1971 this Centre was re-designed with new Civil Sector suites under the new Mediator system and became LATCC, the London Air Traffic Control Centre. By 1975 the Mediator system is completed and the Midlands Centre at Preston is closed, their duties are assumed by LATCC and the new Manchester sub Centre. The first fully computerised Flight Data Processing system becomes operational at LATCC using the IBM 9020D mainframe computer, this replaces the old Type 11 system. Also with the introduction of the 9020D, code callsign conversion is introduced, this allowed the computer to process the aircraft's SSR squawk code to present more detailed information on the radar screen, this would go on to include information such as callsign, SSR code, height, destination airfield, etc.

In Scotland the first of three Centre's opened at Gales on the Ayrshire coast in 1963, two further centres were later added at Prestwick and Renfrew. In 1972 the Scottish and Oceanic Centres were all amalgamated into one site at Prestwick. In 1978 the new Scottish Air Traffic Control Centre opens at Prestwick.

By 1980 the foundation of the current ATC system was in place and compared to the previous two decades there were less overall new developments but



● Search and Rescue variant of the CASA 21 from the Spanish Air Force.

with aircraft and aviation was even more evident when tens of thousands of people turned out in the twenties to watch the Hendon Air Pageants, although one suspects that some were there to see more than just good flying!

By the mid-1930s, aviation beacons had been introduced and the first Aerodrome Control Zone had been introduced at Croydon, thereby providing the first proper Air Traffic separation between aircraft. By 1935 there were 27 airports in the UK equipped with wireless, and basic approach landing equipment was in operation at Croydon. In 1936, a former Horse Racing course in

short time, it should be remembered that it was only 29 years between Spitfires fighting in the Battle of Britain and the first man landing on the Moon in 1969.

The post war era, especially from 1945 to 1950 saw massive progress made and the first foundations were laid towards the Air Traffic and Airways system we have today. In 1944 construction started on the new London Airport at Hounslow Heath, later of course to become Heathrow and by 1946 it was reported that Heathrow could now accommodate up to 50 flights per day! In 1947 the first Ground Controlled Approach

nevertheless still some very major ones. In 1982 a major radar replacement program was started and was completed in 1988. In 1985 the development of Stansted to become London's third airport was approved and in 1987, the London FIR handled in excess of one million movements for the first time. In 1989 a new military ATC operations room was became operational at the London Air Traffic Control Centre. In 1993 a new Terminal Control room was opened at West Drayton, and as part of this new Centralised Control Function (CCF), Approach Control at both Heathrow and Gatwick were moved to the new TC facility. Stansted Approach was moved to the CCF in 1995.

With a significant predicted increase in Air Traffic in the next 20 years the first plans were put forward in 1986 for a new Air Traffic Control Centre in southern England. Building work started at Swanwick in Hampshire in 1991 and in 1994 the building was completed and

in January 2002, some six years later than originally planned. London Terminal Control (TC), remained at West Drayton although it is expected to move to Swanwick within the next three or four years. In addition to the Civil ATC, London Military has also moved the London Joint Area Organisation, (LJAO), element of military air traffic to Swanwick. London Military East and West are scheduled to also make the move, possibly within the next three years.

### Equipment

Although there was much public interest in aviation before the Second World War, I think it would be fair to say that the modern hobby of aircraft spotting in the UK evolved from the highly important work of the Royal Observer Corps, (ROC), during the Second World War. Whilst early radar could identify the presence of aircraft it would need the ROC Observers or Spotters to positively identify the type and

career in aviation which has now spanned 32 years in one form or another.

Enthusiast v.h.f. airband radios did not really appear in the UK until the mid 1960s, then they were often add-ons to World Band radio's where the v.h.f. Broadcast band was extended from 108MHz up to 136MHz using f.m. The air bands are of course a.m., so this sort of signal

very difficult to select a precise frequency and breakthrough was common. My primary hand-held was a Signal 517 Sky Ace, this also had an analogue rotary tuning control but also had sockets for three fixed frequency plug in crystals. Extra crystals could be bought for different frequencies and so I had about a dozen different crystals which would allow for different set-ups

## As a child in the 1960s, my father would take me to watch the aircraft at Biggin Hill and Gatwick

reception was not ideal. As a lad of sixteen in 1970, I used to drool over a Sony wide band radio in a local shop which had a dedicated a.m. airband, sadly the model number eludes me but I do remember it being around £100 which was an awful lot of money in those days. For my first airband radio, I had to settle for a Bush VTR-178 which retailed for just under £20, which was still a fair bit of cash! Airband radios progressed slowly through the seventies but by early 1984, they were still fairly basic analogue units with the ability to receive v.h.f. signals only. Whilst h.f. receivers and amateur radio transceivers had progressed significantly, the days of digital readouts and multiple scanning channels were only just about to arrive in the airband world.

In early 1984, I used two hand-held airband radios, an ATC720, which was a small hand-held radio, which had a rotary thumb-wheel controls to select the frequency, I think it might have been called a 'Skyvoice' or something similar. The tuning dial would tune through the whole of the v.h.f. airband in about a third of a turn and consequently it was

depending on whether I was listening to the local airways from home or visiting one of my favourite airfields. When you look at the extensive facilities offered by modern radio's it is hard to believe that I was using such a basic receiver just 20 years ago!

### 1984 And All That

To set the scene. In early 1984 the Iron Curtain was still in place, the Berlin Wall was still a symbol of the barrier between east and west and security at UK military airfields was quite rightly, vigilant. For many years, aircraft enthusiasts had regularly visited bases around the country, and whilst photography was generally tolerated, it was not uncommon to get a visit from the military or local police who would politely check out what you were up to. (It's hard to believe that just 10 years later, military airfields would be providing viewing enclosures for the public). With security and other factors in mind, at that time most aviation enthusiasts would have been rather cautious about owning a radio that was capable of receiving u.h.f. airband transmissions. It was not an



● Another rare visitor to the UK, TAV-8S Matador of the Spanish navy.

handed over to the CAA. The work to equip the new building started but was plagued with a variety of problems over the next few years. The technical handover of the building eventually took place in December 2000 and training of ATC staff took place during most of 2001. The operational date was delayed on several occasions and the new London Area Control Centre (LACC), eventually started live operations

therefore the operator of that aircraft. After the war, many people who become interested in aviation and later on listening to the airbands often had family who were connected with civil or military aviation or have lived close to an airfield, in my case it was both. As a child in the 1960s, my father would take me to watch the aircraft at Biggin Hill and Gatwick, this promoted a great interest in aviation and the airbands which lead me to a

uncommon view that owning such a radio, (should one be available), might actually be illegal. Consequently, it was in March 1984 that the world of airband listening was turned on its head overnight.

To illustrate why in my opinion how momentous a day this was in the history of airband listening, let me tell you a short story which partially comes from an original article I wrote for *Short Wave Magazine* many years ago. "...It was a bright, sunny but cool early spring morning. I remember the date exactly it was 5 March 1984. Having finished a night shift at Heathrow, I decided to take advantage of the good weather and travel to RAF Mildenhall to take some photographs. It was an ideal morning for photography, not only was there glorious spring sunshine but there was a gentle breeze blowing from the Northeast. Whilst the North-easterly wind kept the temperature down, it did mean that Mildenhall was landing on Runway 11 and Lakenheath was on Runway 06. To me, this was ideal, as I could base myself in Pollards Lane, which was one of my favourite viewing points on the South side of the airfield. This location was excellent for photographs of aircraft landing at Mildenhall, plus it had the bonus that you could also view the inbound aircraft for Lakenheath, as they passed almost directly overhead. (This was in the days before the farmer opened his field to enthusiasts).

I parked up on the grass verge, set up my camera and tuned each of the hand-held radios to the v.h.f. tower frequency for the two airfields. I then sat back, tucked into my ham rolls and waited to see what the day would bring. I didn't know it then, but this was to be a day that in some ways would change my life! Airband listening at military airfields could be a frustrating experience. Whilst some transport aircraft did use v.h.f. for communications, much

of the radio-activity would be on u.h.f. Consequently, if the controllers v.h.f./u.h.f. slave link was switched off, the first indication you would get of a pending arrival would be the noise of the aircraft's engines on final approach! Even with the link on, hearing only one side of a two-way conversation could be a very frustrating experience.

After an hour or so a car pulled up in front of me. A man climbed out, nodded a greeting and then placed his camera in readiness on the roof of the car, his intentions were obviously the same as mine. From the muffled sounds in his car it was also apparent that he had an airband radio in operation. Having worked a night shift, I must admit that the warm sunshine had me nodding off in my chair and my attention to the job in hand was not 100%. By now Lakenheath was quite busy and F-111Fs were regularly making approaches over the top of us. They were mainly operating on u.h.f. and consequently my radios were more or less silent..."

### The Black Box

Even though I was dozing, I was still half listening to the radio but then something happened which had me awake in a flash. I suddenly realised that I could hear a two-way conversation between the radar controller and two aircraft. 'CASH 11 and 12' reported on a nine mile final to Runway 06 for a Ground Controlled Approach (GCA), at Lakenheath. The aircraft, which turned out to be a pair of Phantoms visiting from Ramstein, were in contact with radar down to two miles and were then told to call the tower. Once again, two-way contact was established on the tower frequency.

For a second I thought that my radios had miraculously developed u.h.f. capability, but then I realised that the transmissions were coming from the car behind me! He had plugged in an external speaker

and the previously muffled audio could now be heard quite clearly. I listened for about 10 minutes and became more and more astounded and not a little puzzled. All of the conversations for both airfields were two-way and this could possibly mean just one thing, he had a u.h.f. airband radio. It wasn't long before curiosity got the better of me and I wandered over to strike up a conversation. As I said before, people were rather cautious in those days and as I approached the car he surreptitiously placed a book over a small black box on the passenger seat.

After chatting for a few

memories, hyper scans, massive receiving ranges and all the various facilities a modern scanner can offer. The AR2001, was not just an enormous technological advance, it was the first wideband receiver of its type available in the UK, (on sale to the public). Not only did this radio open up the u.h.f. airband but it also gave access to other parts of the radio spectrum that people had only dreamed of before. This coupled with the fact that it had keyboard entry, digital readout and the various scanning facilities made it such a major step forward for the v.h.f./u.h.f. listener. If you ignored all the



● Very colourful SAR CC-115 Buffalo from the Canadian Armed Forces.

minutes and hopefully convincing him that I was not from a clandestine government department, I eventually posed the vital question, what type of radio was he using. He reluctantly moved the book and there in all its glory was the mysterious black box, an AOR AR2001. (Incidentally, AOR stands for Authority On Radio). The more questions I asked the more excited I became. Things like digital readout, memory channels, scanning and searching, were all more or less, unfamiliar to me. It was then that I noticed the frequency range on the front panel, an amazing 25-550MHz. Both of the airbands plus much, much more!

Perhaps to the present day enthusiast, my excitement may seem rather extreme but it must be put into context. We now take for granted 1000s of

other facilities, just the fact that you could punch in a frequency in a couple of seconds instead of constantly fiddling with an analogue dial, was a godsend in itself. It was a very short period of time, (that day in fact), before I became the proud owner of an AR2001!

Being primarily an aviation photographer the advent of u.h.f. capable radios was a big bonus. Just two weeks after I acquired my AR2001, I was sitting at Lakenheath watching some F-111s recovering from a mission. A Swedish Air Force C-130 on a test flight out of Cambridge called up Lakenheath Approach on u.h.f. asking for two overshoots at Mildenhall, this was approved and consequently after a swift eight kilometre dash down the back roads I arrived at the approach to Runway 29 just in time for some photos. The arrival of u.h.f.

airband radios had immediately widened my photographic horizons.

### The Floodgates Open

With the AOR AR2001 firmly implanted in radio history as the first digital v.h.f./u.h.f. scanning receiver, the situation was set for the floodgates to open. Yaesu soon followed with the FRG-9600, which had a wider receiving range and an increase to 100 memories. Apart from a.m. and f.m., the FRG-9600 could also select Single Side Band and so it was not long before a UK company fitted h.f. converters to give it an even wider frequency range. Although this was a conversion rather than part of manufacturing design, in a way it did signal a trend in wideband receivers over the next few years.

During the late nineteen eighties and early nineteen

selectivity are in my mind the most important aspects of a radio and in some cases this was being degraded by the attempts to cram an enormous amount into one little box. It's all very well producing a radio that has a range of 2-2500MHz if it is poor at 'pulling in' weak signals in the popular bands or suffers bad cross band interference. As a generalisation these comments apply to radios in the medium to lower part of the financial spectrum, you cannot expect hand-held units to perform like the AOR AR5000 and the Icom R8500, (although the gap has slowly closed over the years).

At the time I personally felt that by reducing the receiving range and concentrating on the signal quality was the way forward, one manufacturer who did go down this path of producing specialist radios was Yupiteru. Whilst producing wideband hand-helds such as the

money. Sadly, Signal was a small Japanese company and although a successor to the R-535 was considered it was deemed to not be economically viable and so the R-535 was to be their last radio.

### Memories

To my mind the next most important aspect of an airband radio after its general performance is the number of memories and the flexibility to use them. I have always felt that the best format for airband listening was a higher number of banks with fewer memories, the ability to link the banks is also a very useful facility. It was to be some while before this sort of flexibility was to become the norm. For example, AOR brought in two very good radios with the AR2002 and the AR3000A but with still only 20 memories on the AR2002 and four banks of 100 in the AR3000A, that flexibility was still not available. (It still didn't stop me owning an AR3000A for five years though). Some of the US makes such as Realistic started to reduce the size of memory banks but it was really only with the arrival of the Icom R7100 that we started to get real memory flexibility. Another item that I felt was always annoying on the airbands was the inability on many sets to alter the delay setting. On many radios this was set to two seconds after a transmission had stopped which was often too short a period. Many pilots, especially in the military can take longer than that to reply and consequently, the second part of the transmission could be missed - but not with modern radios! All those features I dreamed of 15 years ago are now with us and some of the current radios are an airband listeners dream.

### The Present Day

Compared with 20 years ago the modern era has a large number of airband radios to choose from.

The range of frequencies that they now cover and the current specifications would have been considered by some to be within the realms of science fiction just a quarter of a century ago. And so we come to the big question - in my opinion what radio would I suggest overall for airband listening? Ah - The \$64,000 question and one I don't really intend to answer, it is really down to the individual, how much they think they may listen to the airbands and of course how much you intend to spend. I have mentioned a few radios below that I have used in the past, but there are many more different makes of radio available. The answer is to arm yourself with information, read reviews in *Short Wave Magazine*, ask fellow enthusiasts about their radio, if you're lucky to be near a shop go along and ask to try two or three different sets.

Airband radios come in three basic types, micro hand-helds, hand-helds and base stations, although there are several that can be used both at home and mobile units. At the bottom end of the spectrum are basic units like Steepletone who still produce analogue tuning radios for under £30 or perhaps the Maycom AR-108 which is a micro hand-held for the civil airband only, for around £70. The micro hand-helds that have appeared in the past few years such as the Yaesu VR-120D and the Icom IC-R5 have a lot going for them. They are small, light and easy to slip into a pocket or a camera bag, they perform reasonably well and they are comparatively inexpensive in the £120 - £150 range. They don't have the convenience of a numeric keypad but the method of frequency entry is easily learned.

There is quite a large hand-held market with AOR, Icom and Yupiteru having produced a number of excellent hand-helds over the years. The current radios from AOR the AR8200 Mk3 and the new Icom IC-R20 are both admirable performers



● Superb Buccaneer S.2B from Royal Aircraft Establishment at Boscombe Down.

nineties, it was my firm belief that some manufacturers partially lost their way, one of the biggest problems being that radios were being asked to do too much, especially in the lower priced end of the market. The trend, particularly with hand-held scanners, was to dramatically increase the receiving range and the facilities, often at the expense of the general performance of the receiver. This has resulted in manufacturers producing some radios that were a 'Jack of all trades and master of none'. In the end, good sensitivity and

MVT-7000 and the excellent MVT-7100, they also produced specialist radios such as the VT-225 which was aimed at the v.h.f./u.h.f. airband market. Perhaps the classic example of a specialist radio was the Signal R-535, which was designed to operate on v.h.f. and the u.h.f. airband between 225 and 380MHz, (expandable to 400MHz. Although it was quite a basic unit with an unusual, but easily learnt method of frequency entry, it was very sensitive on the u.h.f. airband and even today can give my IC-R8500 a run for its

with amazing specifications and the ability to change all sorts of parameters, but you are now moving into the £450 - £500 range for a new hand-held. Perhaps one of the best hand-held radio's for airband listening which has stood the test of time is the Yupiteru MVT-7100. After the best part of a decade it is still available new for around £229 and can be seen regularly second-hand for about £140, so this would make a good starting radio for the airbands.

One radio to mention which can be used at home or mobile is the AOR AR8600 Mk2. This little radio was quite a revelation to me, the performance on both airbands is very good, there are plenty of memories and memory banks and like its big brother the AR5000A, a large number of operational parameters can be changed. Its compact size means that it can operate as a base station, go mobile in the car or go walk-about using the optional internal NiCad battery giving up to five hours use - price around the £600 mark.

Other radios which

which are more flexible to us. (Still banks of 100 memories but with a select facility allowing scan memory selection throughout all the banks).

Moving up to the £900 mark is the Fairhaven RD500VX. Once again this has a extensive list of specifications including a frequency range of 0-1750MHz, this set allows demodulation of single side band (s.s.b.), and so it can receive all of the airbands from h.f. to u.h.f. It also has the unusual attraction of having 2MB of on-board memory so it can store a database in excess of 50000 frequencies all of which can have alphanumeric name tags. If you are in the fortunate position of having a £1000 plus to spend, then either the Icom R8500 or the AOR AR5000A are your choice. These radios will do everything you could dream of on h.f., v.h.f. and u.h.f. Both are super performers on all the airbands and have tremendous specifications. I am biased as I have owned an IC-R8500 for almost 10 years and I think it just has the edge but others disagree. Don't forget the second-hand

and there are currently only a limited number of frequencies allocated in this additional band but the numbers are steadily growing. The military u.h.f. airband is from 225.025 to 399.975MHz, the lower part of the band from 225.0 to 230.0MHz is effectively not used for ATC voice communications. Also, a section of the upper part of the band from 380.0 to 399.975 is meant to set aside for future use by the Police with their new Tetra radio system, but at the time of writing there are still quite a number of military frequencies in use within this band. Both of the airbands

then split into sectors which are generally named after their geographical locations, Dover, Daventry, Montrose, Moray, etc. Some of the sectors are then split into smaller sub-sectors each of which will have a frequency allocated. See Fig. 3 on page 30 for a listing of the London Area Control Centre, Terminal Control, and Flight Information Region frequencies. I have listed them by Sector rather than by frequency so it is easier for the airband listener to locate them geographically to their own location.

The FIRs have Lower and Upper airspace, which is split at



- Probably the only visit to a UK airshow by a Kuwaiti Air Force F/A-18C Hornet!

## There is quite a large hand-held market with AOR, Icom and Yupiteru

occasionally appear on the second-hand market are the Signal R-535 which is still a great little performer on v.h.f./u.h.f. and remains popular with military enthusiasts but is now a dated design and lacks the facilities and specifications of modern receivers. The AOR AR3000A and the Icom IC-R7100 would grace any airband listening post, their performance on the airbands is good and is very similar for both radios. Perhaps an unfair comparison, but between the two I would give my vote to the IC-R7100 as it has a greater number of memories

market, I have seen examples of the IC-R8500 for sale as low as £650! There are a number of manufacturers who I have not mentioned which you may consider, but as I said earlier it is down to the individual to do some research before deciding which is the best airband radio for them.

### UK ATC - System

The civil v.h.f. airband is from 117.975 to 137.000MHz, the upper part of the band from 136.0 to 136.975 is a relatively new addition to the main band

transmit on a.m., (Amplitude Modulation). There is also an a.m. sub-band between 137.0 and 149.975MHz, this is used primarily by the military and in particular European NATO air-arms as well as the UK military.

### FIR & Sectors

It is beyond the scope of this guide to go into the detailed workings of UK Air Traffic Control, for that I suggest one of the books listed under information sources. Nevertheless, it is very important that the basics of the system are understood and so I will attempt to give an abbreviated overview.

The UK is split into two Flight Information Regions, (FIRs), London and Scottish Control. These two Control Centres are

Flight Level 245 but in some areas there is also Middle Airspace so the distinct division between Middle and Lower has become more of a grey area in recent years. Many of the Terminal Control sectors have different upper and lower height limits on the area they control, so it would be impossible to list the many different permutations in this short document. For example, in the London area, TC Sectors such as Compton or Vatou go up to Flight Level 215 thereby incorporating middle airspace into their control area, whilst the re-designed Clacton Sector goes up to FL245. (Incidentally, the Terminal Control Areas - TC were for many years known as Terminal Manoeuvring Areas (TMAs). With the move of Heathrow, Gatwick and Stansted

Approach Control from the airfields to the Centralised Control Function at West Drayton in the mid 1990s to become part of TC. This effectively meant that TC now controls aircraft from just after they take off up to Flight level 245.

To give a simple example of an Instrument Flight Rules airways flight, (IFR), leaving Gatwick and then passing through the various sectors in Southwest England before entering the Ocean at OMOKO. Virgin 033 (VIR 033), departs Gatwick on the Tower frequency of 124.225, he is handed off to London Terminal Control South on 134.125 and climbed to Flight Level 70. A further climb to Flight Level 150 is instructed before he is handed off to the London Worthing West Sector on 129.425. They instruct him to go direct to GIBSO and to

and other points on the Airways are marked by Reporting Points such as Daventry (DTY), these used to be mainly named after geographical locations but a fair percentage are now being given random five letter names, such as DIKAS or BANEM. Others such as HALIF still represent an actual place, (Halifax). A large percentage of the Reporting Points do not actually have beacons but are theoretical positions, located by taking radials and bearings from adjacent VORs, these all have five letter identifiers such as EXMOR or FINDO.

The Reporting Point beacons are of two types, VORs and NDBs. VORs (v.h.f. Omni-Directional Range), which transmit a three letter identification code, (in the case of Daventry, 'DTY' is broadcast in Morse code on the v.h.f.

also have their own 'airways' system known as TACAN routes (Tactical Air Navigation aid). This is a much simpler system than the civil airways and runs in conjunction with them. There are less than ten routes which when linked together give a general basic coverage of most of the UK. The routes are identified by names such as TR1, TR3 or TB7. The TACAN beacons are located mainly at military airfields such as Marham (MAM) or Brize Norton (BZN).

8.33kHz spacing. It's currently expected that 8.33kHz spacing will be introduced into the UK before the end of 2004, but after many delays especially to the installation of the new radio equipment there is no guarantee that this latest deadline will be met. In the UK this new spacing will only affect the Area Radar of London and Scottish Control above FL245, other lower level radar units will remain unchanged. Whilst the military have re-equipped a fair

## Throughout the UK airspace is a quite complex series of 'roads in the sky'

climb to Flight Level 250. He is then handed off to the Berry Head Sector on 126.075 and told to climb and maintain Flight Level 260, further climb is then made to Flight Level 320 and 360 and he is told to route direct to OMOKO (the FIR boundary). The aircraft is then handed off to 134.625 the Shannon Oceanic Transition Area (SOTA), before reaching its Oceanic entry point at OMOKO.

### Airways & Reporting Points

Throughout the UK airspace is a quite complex series of 'roads in the sky' called Airways. They cover both Lower and Upper airspace and are the main routes for aircraft to enter, transit and leave our two Flight Information Regions. The various junctions

frequency 116.4MHz). If an aircraft locks onto a VOR signal it is travelling towards (TO), it can tell the bearing or radial it is on from the VOR. If it is travelling away from the VOR, (FROM), it can also use the reciprocal of the bearing for navigation. VORs will often have a Distance Measuring Equipment (DME), located with them, this as the title suggests allows for accurate distance measurement of the aircraft to the VOR. The other type of beacon is the much simpler NDB, (Non-Directional Beacon). This is not only used to mark a specific point on an airway where the transmission distance may be up to 192km, it can also be used as an airfield locator beacon where the transmission distance will be much less, usually about 25 - 35km.

The military within the UK



● Immaculate Russian Air Force Tu-95MS Bear-H lands on Runway 27.

It is not my intention to include a comprehensive frequency guide within this document but after perhaps the local airfield the first thing most airband listeners will tune into will be the civil and military airspace overhead. Consequently, I have included a listing of the London and Scottish Centre Civil and Military Area Control frequencies.

### 8.33kHz Spacing

Spacing within both airbands in the UK is currently 25kHz, but there is currently a much delayed proposal to introduce 8.33kHz spacing on Upper Airspace above Flight Level 245. The theory behind this new spacing is that it will make a lot more frequencies available within the civil airband. A number of European countries have already introduced this spacing on their Upper Airspace and consequently the radios on all civil air traffic and specific military air traffic, (mainly transport types), operating above Flight Level 245 have already been converted to utilise

percentage of their aircraft to fly in Civil Upper Airspace, from current evidence Belgian, French and Dutch Military Radar have not utilised this spacing, so it is unlikely that 8.33kHz spacing will be introduced to either London or Scottish Military.

For London and Scottish Control, the plan is to change en-route sectors so that they will utilise either 8.33 or 25kHz frequencies, once the change is established, frequencies of a different spacing will not be mixed on a sector. It can therefore be seen that the allocation of 8.33 and 25kHz frequencies on adjacent sectors will have to be very carefully planned.

This new spacing will in theory give access to three times the number of v.h.f. frequencies, but to maintain area coverage I am assuming that the 8.33kHz spacing would still be transmitted using offset frequencies, (see later). As a consequence, the quality of the filters would have to be very good to work with such a narrow bandwidth. To briefly explain how the system

# RIAT 2004



## Pull-out Show Guide

The RIAT 2004 Show Guide, brought to you by *Short Wave Magazine* presents you with a quick view of what's going on at the world's largest military airshow this year. If you're lucky enough to attend, then you can take the guide with you to assist with your enjoyment. Alternatively, you may be reading this guide having just purchased a copy at RIAT. However you came to be reading this guide - please enjoy it with our compliments!

### *A Brief History Of The Tattoo*

- The first "Air Tattoo" was organised by the late Paul Bowen and Tim Prince at North Weald airfield on 31 May 1971 to raise money for RAF Charities and is now the world's biggest military airshow. Under the umbrella of the Royal Air Force Benevolent Fund Enterprises, the Tattoo is staged annually in support of the Benevolent Fund and today attracts over 200,000 spectators.

- By 1975, when Air Marshal Sir Denis Crowley Milling took over as Controller of the RAF Benevolent Fund, the Air Tattoo was already becoming a major airshow. Sir Denis invited his war-time Battle of Britain leader Group Captain Sir Douglas Bader to be president of what was now to be called 'International Air Tattoo'.

Over the next six years until his death in October 1982, Sir Douglas worked to establish the Tattoo as the largest of its kind in the world. (Sir Denis, then Vice Patron of RIAT, died in December 1996 after a long illness).

- From 1973 to 1985 the International Air Tattoo was held at RAF Greenham Common near Newbury before moving to RAF Fairford. The Gloucestershire base has become the event's permanent home, apart from 2000 and 2001 when runway repairs were carried out. The Tattoo was awarded Royal Status in July 1996, the year of its Silver Jubilee airshow.

- In 1971 six overseas air forces took part in the Tattoo, with around 100 aircraft on display. By contrast, in 2003 more than 500 aircraft represented more than 40 British and international air arms.

# D-DAY 60<sup>th</sup> ANNIVERSARY



## D-Day Tribute

In an MoD-sponsored tribute to mark the 60th anniversary of this epic 'invasion', the sights and sounds of a D-Day airfield will be recreated featuring some of the aircraft that contributed to its success, including Dakotas, Mustangs, an Avenger, Lancaster and Spitfires. A series of stirring solo and formation flying displays will illustrate the wide variety of aerial roles conducted by Allied forces that proved vital to the success of Operation Overlord.

## Entente Cordiale Centenary

This year's Royal International Air Tattoo is one of a handful of national events selected by the UK Government to host official *Entente Cordiale* celebrations. A feast of Anglo-French entertainment - sponsored by the MoD - will be on the menu in the air and on the ground to highlight the many bonds that have united our two countries since the signing of this historic document 100 years ago.



## Hawk Reaches Milestone

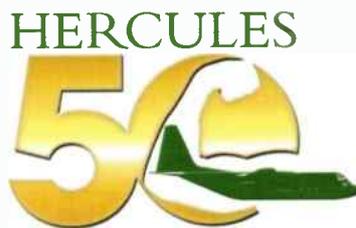
To mark its 30th birthday, RIAT 2004 welcomes the UK airshow debut of the Finnish Midnight Hawks display team plus the world famous Red Arrows - on their 40th display season - to highlight the appeal of this highly versatile jet.



Picture by Terry Hewlett

## Happy Birthday 'Herc'

Few aircraft during the past 50 years have done more to directly relieve the suffering of starving people around the world than the Lockheed Martin C-130 Hercules. From Ethiopia and Rwanda to Kosovo and Somalia, The Hercules has brought relief to many thousands of hungry people in some of the most inhospitable areas of the globe. But, far from simply being an international instrument of humanitarian goodwill, the 'Herc' has been used on a greater variety of missions than almost any other type of aircraft. To mark the 50th anniversary of this multi-talented 'workhorse', RIAT 2004 will spotlight the aircraft's versatility in search and rescue, famine relief, in-flight refuelling, fire fighting, Arctic operations support, 'paratroop' delivery and military support roles around the world.



## Operational Theme Fighter 04

The operational theme *Fighter 04* will feature one of the largest collections of fighter aircraft from around the world including the Eurofighter, F-15, F-16, F/A-18, Tornado, Sea Harrier and Mirage 2000 in an unforgettable display of their air defence and air superiority capabilities.





## D-Day

D-Day was arguably the most pivotal day of World War Two. In the early hours of 6 June, 1944, the largest ever amphibious assault took place on the beaches of Normandy in France - the start of a battle that would decide the fate of Europe. If the mission were a success then control of the continent would be possible; however, if it were lost, power would remain in the hands of the Axis armies.

Around 150,000 men landed on five Normandy beaches during D-Day. The Americans attacked two beaches that lay either side of the River Vire estuary; these were code named 'Utah' and 'Omaha'. The British and Canadians landed on the eastern beaches which stretched to the River Orne estuary; these were code named 'Sword', 'Juno' and 'Gold'.



To ensure that most of the German troops were nowhere near Normandy, fake radio signals, dummy vehicles parked at distant English ports and other scams fooled the Germans into thinking that the destination was Pas de Calais - the shortest and most obvious route.

While the Allies on four of the beaches encountered only moderate resistance, US soldiers of the 1st and 29th Infantry Divisions and the 2nd and 5th Ranger Battalions landing on Omaha came under heavy fire and for much of the morning it was unclear whether the landing would succeed.

Indeed, initial reports painted such a bleak portrait of beach head conditions that Lt. Gen. Omar Bradley, the United States' First Army commander considered pulling off the beach and landing troops elsewhere. As they struggled, one leader - Colonel George A Taylor -



told his men that there were two types of people who would stay on the beach - the dead and those going to die - so they had better get out of there - and they did. By the end of the day, the US soldiers were able to outflank the German positions and establish a tenuous toehold on the Normandy coast.

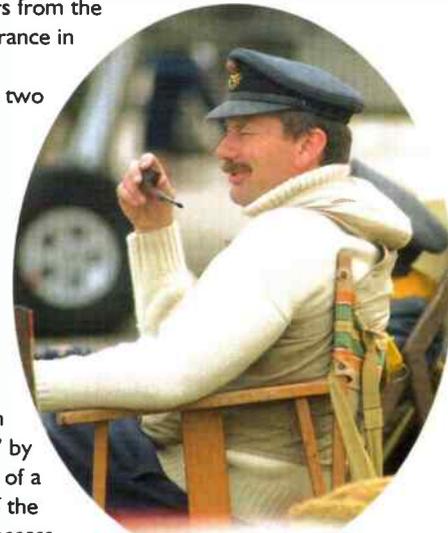
Within one week of D-Day, the Allies had landed, in the face of hostile obstacles, 326,000 men, 50,000 vehicles and more than 100,000 tons of supplies.

Inextricably linked to the history of D-Day is the history of RAF Fairford, home of The Royal International Air Tattoo (RIAT). Built to support the invasion, the Gloucestershire airfield opened on 18 January, 1944 and within two months, 620 Squadron had arrived from Leicester bringing with it 50 Short Stirling aircraft followed, a week later, by 190 Squadron with 100 Airspeed Horsa gliders.

On the night of 5 June, 45 Stirlings took off, each towing a glider, and dropped around 800 soldiers from the 5th Para Brigade over Caen in France in support of the D-day landings.

On the following evening the two squadrons each provided 18 aircraft from RAF Fairford to transport the main glider element of the 6th Airborne Division to their landing zone. Between them, the Horsas they towed carried 254 men, 33 jeeps, 29 trailers, 11 motorcycles and eight, 75mm Pack Howitzers.

RIAT 2004 will mark the 60th anniversary of this epic 'invasion' by recreating the sights and sounds of a D-Day airfield featuring some of the aircraft that contributed to its success, including Dakotas, Mustangs, and Spitfires.



## Factfile

- D-Day took place on 6 June, 1944 in Normandy, France. The operation was due to begin on the night of June 4-5 but bad weather delayed the assault.
- D-Day was the largest amphibious landing in history. 156,000 men took part in the initial D-Day landings. Of these, 10,000 were casualties on the first day.
- The first troops ashore were those of the 4th US Division who landed at 0630 on Utah beach.
- D-Day was under overall direction of Supreme Allied Commander Dwight D. Eisenhower
- The five beaches in Normandy used for the landings were code named Omaha, Utah, Sword, Juno and Gold.
- At least 30,000 Allied airmen were in action on D-Day
- At Sword Beach the 3rd British Division began landing at 0725 hours - Lord

Lovat led his commandos onto the beach as a piper played a Highland reel on the deck of his landing craft.

- The original code name for the 'invasion' of German-occupied Europe was Operation Roundup but this was eventually changed to Operation Overlord.
- On 25 August, 1944, less than three months after D-Day, Paris was liberated by the Allies.

The invasion of Europe involved huge resources. In the early months of 1944, Britain was a virtual army camp with 3.5 million troops, soldiers, sailors and airmen preparing for the task that lay ahead. British, American, Canadian, Australians and New Zealanders, French, Belgians, Norwegians, Poles, the Czechs and the Dutch assembled for the great assault.

Supporting them were 13,000 aircraft, 3,500 gliders, 1,200 fighting ships, 1,600 merchant ships and 4,000 assault craft. The historic importance of D-Day cannot be overstated. Not only did it pave the way for the liberation of Europe but it led to the ultimate destruction of the German armed forces.

# Red Arrows 40th Display Season

Organisers of the Royal International Air Tattoo are planning a fitting tribute to mark The Red Arrows' 40th display season.

The link between RAF Fairford and 'The Reds' stretches back to 1965, when the team was formed. Their predecessor team, the Yellowjacks, was formed in 1964 under the leadership of Flt Lt Lee Jones, an experienced fighter pilot who had recently begun instructing. Based at Flying Training School on the Isle of Anglesey, the team comprised five Hawker Siddeley Gnats, a good-looking, sophisticated jet aircraft that had only been in service with the RAF for about a year. The Yellowjacks were an instant success and were formally established under the immediate command of the Central Flying School. However, the yellow aircraft were difficult to see on anything other than a clear day and the team name was not popular. Instead the colour Red was chosen in recognition of The Red Pelicans, up until then, the RAF's premier aerobatic team and the word Arrows not only suited the Gnats' planned formation but also gave a nod to one of the most famous RAF aerobatic teams - The Black Arrows.

Initially, the team was based at RAF Fairford in Gloucestershire, which was then a satellite of the Central Flying School.

The Red Arrows' first public appearance was in May 1965 at the Biggin Hill International Air Fair. Success was immediate and 60 shows, including some in Europe, were flown in that first season. After the 1965 season, the Royal Aero Club (RaeC) awarded the team its Britannia Trophy 'for the British aviator or aviators accomplishing the most meritorious performance in aviation during the previous year'.

## Interesting Aircraft

The Royal Air Force of Oman will be sending its latest utility helicopter, an Agusta Westland Super Lynx 300, to RIAT.

This latest export version of the Lynx, 16 of which were ordered by the sultanate in 2002, has an improved airframe which should allow a service life of at least 25 years, and a new engine which will operate more effectively in hot and high conditions. It also features an integrated 'glass cockpit' and state-of-the-art sensors and avionics management.

The new aircraft is capable of carrying out offshore patrols, search and rescue missions and troop/transport operations. Furthermore, its unmatched ship-operating limit enables it to function in the worst conditions at sea.

The Omani Lynx 300 will fly to RAF Fairford from Westland Helicopters' factory in Yeovil prior to being delivered to the Middle East later this year and will be joined at the Tattoo by a Royal Air Force of Oman C-130H Hercules.

## Entente Cordiale Theme

The Royal International Air Tattoo at RAF Fairford, in Gloucestershire, on 17-18 July, has been chosen as one of the UK's official venues to host celebrations to mark the centenary of the signing of the historic Anglo-French *Entente Cordiale*. To mark the occasion, Tattoo organisers are planning a feast of Anglo-French entertainment - both in the air and on the ground - to highlight the many bonds that unite the two countries.

The MoD-sponsored celebrations will include a series of joint flypasts featuring aircraft from the two countries' armies, navies and air forces. It is hoped that a number of high-ranking dignitaries from across the Channel will be among the 160,000 visitors at the Tattoo.

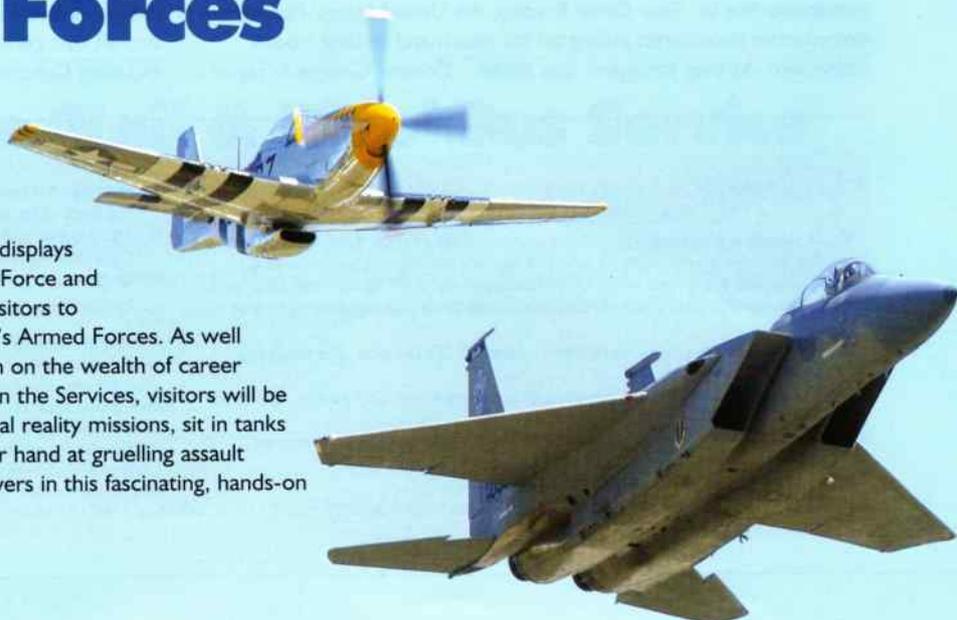
The *Entente Cordiale*, which was signed by the British Foreign Secretary, Lord Lansdowne and the French Ambassador, Paul Cambon, in London on 8 April 1904, not only sought to settle long-standing disputes but also paved the way for crucial diplomatic and military co-operation in the lead-up to World War One. Since then it has embodied the enduring relationship between the two nations.



## UK Armed Forces Today



An exciting series of interactive recruitment displays for the Army, Royal Air Force and Royal Navy will allow visitors to experience life in today's Armed Forces. As well as providing information on the wealth of career opportunities available in the Services, visitors will be able to embark on virtual reality missions, sit in tanks and aircraft and try their hand at gruelling assault courses or climbing towers in this fascinating, hands-on presentation.



## Display Teams



### The Red Arrows

The incomparable Royal Air Force Red Arrows, celebrating their 40th display season, head a star-studded cast of aerobatics teams at the Royal International Air Tattoo 2004. Former Harrier display pilot Squadron Leader Carl 'Spike' Jepson, 38, is 'Red 1' for the season. The Red Arrows, who have performed almost 4,000 displays in 50 countries, fly nine BAE SYSTEMS Hawk aircraft - and have made the 'Diamond Nine' formation famous across the world.

### Patrouille de France

Performing in eight sleek Alpha Jets, La Patrouille de France is set to bring French panache to RIAT 2004 as the Tattoo celebrates the 100th anniversary of the signing of the Anglo-French *Entente Cordiale*. The Patrouille is the first military aerobatics team, formed in 1953, and is renowned for breathtaking routines such as the 'Apollo bend' and perfectly executed solo splits. Then flying Fouga CM170 Magisters, *La Patrouille de France* appeared at the first Tattoo at North Weald in 1971, thrilling spectators with a slow roll in mirror formation.

### Patrouille Swiss

RIAT 2004 will be helping the *Patrouille Suisse* celebrate their 40th anniversary as the national aerobatic team of Switzerland, following their official formation with four Hawker Hunters for EXPO 1964. They will also mark their 10th year of display flying in the F-5E Tiger II after converting from Hunters in 1994.

The pilots - all volunteers from various front-line squadrons - are famed world-wide for performing precise formations at high speed.



### Royal Jordanian Falcons

The late King Hussein formed the Royal Jordanian Falcons as flying ambassadors for the Hashemite Kingdom and they have since become great supporters of the Royal International Air Tattoo. The team flies the Extra 300, an aircraft especially built for world-class aerobatics, allowing the Falcons to execute the most demanding of manoeuvres. Pilots are selected from the elite of the Jordanian Air Force.



### The Midnight Hawks

Finland's finest display team, The Midnight Hawks, will make their UK debut at The Royal International Air Tattoo at RAF Fairford, Gloucestershire on 17-18 July. The team, comprising four Hawk fighter trainers, will join the legendary Red Arrows and other Hawk operators from around the world for a special celebration to mark the 30th anniversary of the BAE SYSTEMS' Hawk.

Renowned around the world for their tight and beautiful formations, members of The Midnight Hawks display team are all flight instructors from the Finnish Air Force Academy in Kauhava. For many years, pilots at the academy performed formation flying as part of the annual Midnight Summer Airshow, held for their families and relatives as well as villagers in Kauhava. From small beginnings, the airshow has grown to attract many foreign aircraft and in excess of 20,000 spectators.

Because of the midnight sun, the airshow traditionally starts at around 1900 and lasts until midnight, when the last display is flown. The Midnight Hawks and its predecessors have always flown close to midnight - hence their name.



Picture by Parttu Karivalo

THE ROYAL INTERNATIONAL

# AIR TATTOO

16-18 July 2004 RAF Fairford

in partnership with

**BAE SYSTEMS**



- |  |                           |                           |                          |                           |                              |                                 |            |                           |                                  |   |
|--|---------------------------|---------------------------|--------------------------|---------------------------|------------------------------|---------------------------------|------------|---------------------------|----------------------------------|---|
| Coach Park and Swindon Shuttle Bus Stops | Green Gate and Car Parks  | Blue Gate and Car Parks   | Red Gate and Car Parks   | Free Showground Bus Route | Showground Bus Stop          | Disabled Bus Stop               | Mo Hir     |                           |                                  |   |
| Recommended Showground Route             | A Stirling Shopping Malls | A Concorde Shopping Malls | A Halifax Shopping Malls | Chalets                   | Patrons Pavilion Hospitality | Trenchard Breitting Owners Club | Enclosures | RIAT Guests Aviation Club | RAF Fairford RAF Benevolent Fund | Armed Forces Career Convention Overlord Aircrew |

# Flying Display Runway



- Disabled Enclosure
- Toilets
- Information
- Crèche and Lost & Found Children
- First Aid
- Charter Terminal
- Official RIAT Show Merchandise & Souvenirs
- RAF Benevolent Fund Exhibit
- Food Court
- Bar
- Fun and Games
- Radio City
- D-Day Spectacle Viewing Area
- BAE Systems Staff

Buy your Souvenir Programme for the Flying Display Programme and a full list of Exhibitors.

# Top Five Static And Flying Attractions

*There is always so much to see at Europe's largest Airshow that sometimes it is hard to know where to start. In order to help, here we present what, in our view, are the top five 'must see' aircraft on static display and the Top Five 'aircraft in the eight-hour flying display. If you see nothing else at this year's Royal International Air Tattoo, make sure you don't miss this lot!*



**LC-130H Hercules**  
(USAF Air National Guard)  
Operating from New York, this grey and orange coloured Hercules transports equipment and personnel to Antarctica - hence the skis! Expect to see one in the flying display and then one in the static park, which can be viewed up close. Rarely seen but always welcome at the Tattoo. *Picture by Dariusz Jezewski 'FotoDJ'*

## **The E-6B 'Mercury' (US Navy)**

Making a rare appearance at the Royal International Air Tattoo will be an E-6B 'Mercury' aerial command post from Tinker Air Force Base in Oklahoma. This high-tech US Navy 707 enables the US military on land to command, control and communicate with the nation's ballistic submarine fleet. Operating at heights up to 40,000ft, it trails up to seven miles of cable with an aerial attached. Its 22-strong crew can communicate with US submarines on ultra low frequencies using sophisticated electronic equipment. Whilst this equipment will be kept closely under wraps, Tattoo visitors will be able to talk to the crew.

## **Northrop Grumman RQ-8 Fire Scout (Northrop Grumman)**

This pilotless aircraft has been brought all the way from Patuxent River in Maryland to make its UK debut at The Royal International Air Tattoo in July. Instead of a pilot, this aircraft has its flight plan pre-programmed. The aircraft will be operated by the US Navy and will be used for precision targeting support by both the US Marine Corps and the US Navy.



**Flying Display**

60th Anniversary D-Day Tribute  
Sponsored by the MoD, this explosive hour-long tribute to Allied aircrew will feature a number of historic aircraft including Mustangs, gliders, Dakotas, Spitfires, a Miles Messenger, Douglas Invader, Grumman Wildcat, Avenger and a Piper Grasshopper. With the use of pyrotechnics, organisers aim to highlight the vital operational roles performed by aircrew before, during and after D-Day, ending with a mass 'must-see' flypast of these legendary aircraft.

**LET 410 (Estonian Border Guard)**  
Simply has to be seen for its rarity value. The Estonians, new members of the EC, have chosen to make their UK debut at RIAT. They will be bringing their LET 410 turbo prop aircraft, used to enforce internal security along the borders of this former Russian republic. Will be particularly popular among aircraft enthusiasts. *Picture by Lars Wahlstrom*



**Boeing F-15C 'Eagle'**

(USAF Air Combat Command)

**North American P-51D Mustang (Civilian)**

This Heritage Flight joint flypast will bring together the greatest fighter aircraft of World War II with arguably the greatest fighter of the modern era - the F-15.

The all-weather F-15 will be flown by the US Air Combat Command East Coast Demo pilot, while the vintage Mustang will be flown by legendary US heritage flight pilot Ed Shipley Jr.

The Mustang is one of the fighters that escorted 'Mighty Eighth' heavy bombers on perilous sorties over mainland Europe during World War Two. Several Heritage Flights were formed in 1997 to commemorate 50 years of the US Air Force. These 'past and present' displays are now a popular attraction in North America. This is only the second time a US Heritage Flight has performed at RIAT. *Boeing F-15C 'Eagle' picture by US Air Force*



**F-117A Nighthawks (USAF Air Combat Command) pic of low level F-117A**

Not one but two F-117A Nighthawks stealth bombers will be at this year's Tattoo, one in the air and one on static display. The aircraft is a regular favourite and never disappoints. Its low-level, twisting flypasts give visitors a perfect view of its state-of-the-art angular bodywork (which gives it its stealth qualities). Last year, the F-117A flew in formation with The Red Arrows creating a unique and breathtaking spectacle for spectators.

**The Midnight Hawks (Finnish Air Force)**

Be the first in the UK to see the Finnish Air Force display team The Midnight Hawks when they make their British debut at The Royal International Air Tattoo.

The team, who have only once performed outside of their native country, will join the Red

Arrows and other Hawk operators from around the world for a special celebration to mark the 30th anniversary of the BAE SYSTEMS' Hawk.

Comprising four Hawk fighter trainers, the team - all flight instructors from the Finnish Air Force Academy in Kauhava - are renowned around the world for their tight and beautiful formations. *Picture by Perttu Karivalo*



**Sea Harrier (Royal Navy)**

**F-4F Phantom II (German Air Force)**

Impossible to choose between the two - both are legendary aircraft and both are soon to disappear from our skies (the Sea Harrier pilots converting to GR7s until the JSF comes into service and the German Phantom being replaced by the Eurofighter Typhoon). The Sea Harrier's unique hovering quality almost defies gravity and is best experienced close up. The Phantom, meanwhile, is an 'old school' fighter that is both big and fast. Hailing from the same family as the F-15, the Phantom is its older, badder cousin...sheer brute force and an awesome sight in the sky.

**The F-104S Starfighter (Italian Air Force)**

Not one but four Italian F-104S Starfighters will be on static display, courtesy of the Italian Air Force (IAF) - which has been a staunch supporter of the Tattoo for many years. Tattoo organisers are hoping the IAF will send their four brightly coloured versions (pictured) as part of the Fighter 04 operational theme. The 'Starfighter', which was the first aircraft to hold simultaneous official world records for speed, altitude and time-to-climb, was the winner of the All-Weather Interceptor design competition held by the IAF in 1965 beating, among others, the Mirage III and the F-4 Phantom. RIAT 2004 represents the last chance to see these high-performance, supersonic interceptors in the UK before they are retired from service later this year. *Picture by Thomas Urbild*



# Getting there

This year the RIAT organisers are continuing to work together with our Traffic Management Consultant and the local Police to build on the broad success of the new Traffic Plan of last year. All car parking will be again located in off-site fields and the specialist car park contractor has been re-appointed to manage the parking operation. A large number of Police pointsmen will be deployed at all key junctions from early in the morning on the Public Days and the whole traffic operation will be managed from a Joint Control Centre set up at RAF Fairford.

## Traffic Routes

The main public routes for use on Saturday 17 and Sunday 18 July, are:

**Green Route** - Traffic on the A417 dual carriageway will exit near Cirencester at the Burford Road roundabout briefly onto the A429 before rejoining the A417 after the Cherry Tree Lane crossroads. Vehicles will be directed through Meysey Hampton to the 'Green' Car Parks on the edge of Marston Meysey.

### Blue Route -

Bringing traffic from the M4 Junction 15 and the South along the A419(T), exiting at the Cricklade slip road and along the C124 towards Kempford. Vehicles will be directed to the 'Blue' Car Parks along Top Road.



### Red Route -

Bringing traffic from the North-East via the A40/A361 through Lechlade-on-Thames, along the A417 and through Whelford to the 'Red' Car Parks. During the entry phase a one-way flow will be in force on the Whelford Road from the Shell Garage on the A417 to the junction with Horcott Hill.

**Brown Route** - As a 'pressure relief' for the A419(T) east of Swindon, traffic from the West, South-West and Bristol direction can be directed off the M4 at Junction 17, north towards Malmesbury and then north-east through the Cotswold Water Park and the Spine Road junction before turning south again to rejoin the Blue route at the C124.

## Exiting Traffic

During the exit phase traffic will travel the inbound routes in reverse. The one-way tidal flow on the Whelford Road will reverse and move to run from the junction with Washpool Lane to the junction with Horcott Hill.

## Coaches And The 'Rail & Ride' Bus Service

Thamesdown Buses will operate a dedicated bus service from Swindon Bus Station/Railway Station to RAF Fairford on the two Public Days using the Purple Route - leaving Swindon on the A361, via Highworth, the Freke Arms, Hannington, Hannington Wick and Kempford. Returning buses will depart along the C124 and A419 to Swindon. All coaches will be encouraged to travel to RIAT on the Purple Route and park inside the base. The Purple Route will remain open for two-way local traffic but access between Hannington and Kempford will be restricted to residents and Tattoo pass holders. The bus circuit will be reversed during the exit phase. The Police will only change this arrangement if major traffic problems occur. The last shuttle bus is planned to depart RIAT at 2000 on both Saturday and Sunday.

## Park and Ride

A fare-paying Park & Ride bus service will also operate on the two Public Days from a site on the South Marston Business Park, Swindon. Buses will be routed on the same route as the Coach and Shuttle Buses. The cost will be £4 adults, £1.50 children aged 15 and under (in advance) £5 adults, £2 children aged 15 and under on the day.

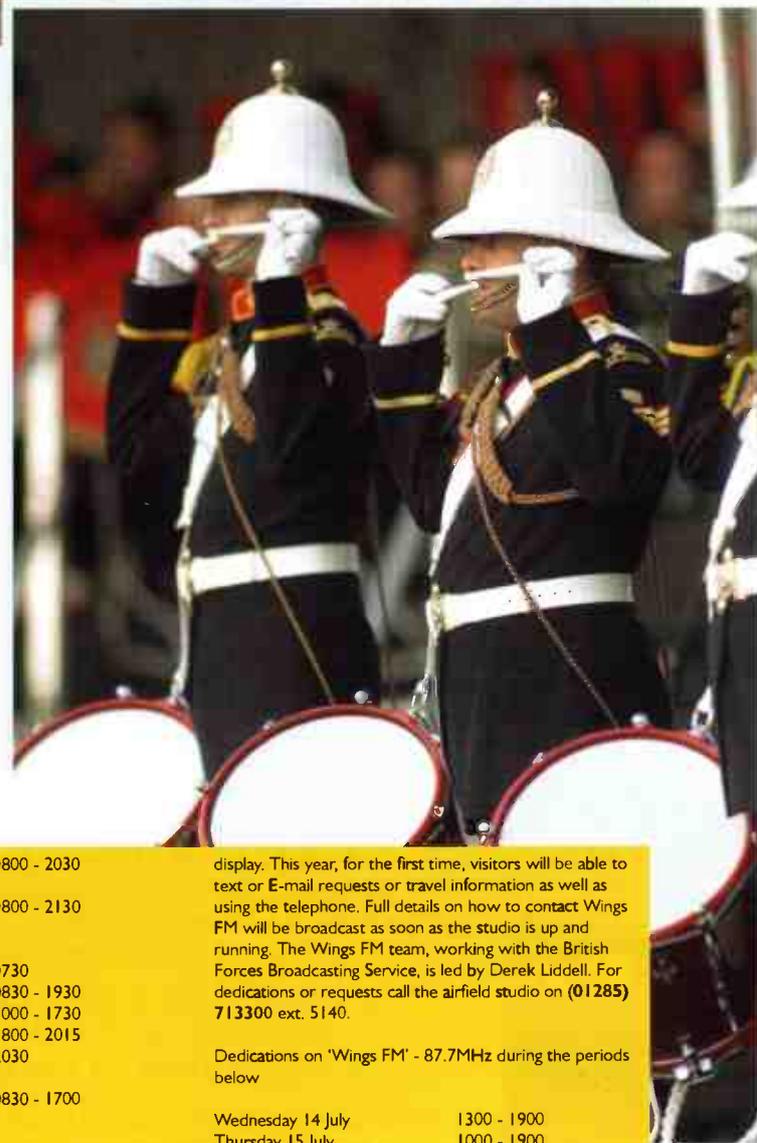
THE ROYAL INTERNATIONAL  
**AIR TATTOO**  
 17-18 July **2004** RAF Fairford  
 in partnership with  
**BAE SYSTEMS**



Picture by Donna Weissenborn



Picture by B.Franklin

**Friends Of The Royal International Air Tattoo (FRIAT)**

From Wednesday, 14 July to Friday 16 July, aviation enthusiasts belonging to FRIAT will have access to the special Park & View enclosures at the eastern and western ends of the runway at RAF Fairford. On Thursday, 15 July and Friday, 16 July, FRIAT members will park in the Blue Car Park before being escorted on foot to the enclosure. The same arrangement will be in place on Monday, 19 July. For more information about joining the Friends of The Royal International Air Tattoo, together with details of the six-day aviation package, call **(01285) 713456**.

**On-The-Day**

Pay booths at each entry point will be manned **all day** on Saturday 17 July and Sunday 18 July. Visitors will not be permitted to enter RIAT 2004 at any time unless an admission ticket is produced or purchased, and there will be no entry/re-entry after 1700 on public days.

**Airfield Operating Times**

Wednesday 14 July  
 Aircraft arrivals/rehearsals 0900 - 2000  
 Thursday 15 July

Aircraft arrivals/rehearsals 0800 - 2030  
 Friday 16 July  
 Aircraft arrivals/rehearsals 0800 - 2130

Saturday/Sunday 17-18 July  
 Gates open 0730  
 Flying Operations 0830 - 1930  
 Flying Display 1000 - 1730  
 Open Air Evening Concert 1800 - 2015  
 Gates close 2030  
 Monday 19 July  
 Aircraft departures 0830 - 1700

**Park & View Enclosure**

Wednesday 14 July 0730 - 2000  
 Thursday 15 July 0700 - 2030  
 Friday 16 July 0700 - 2030  
 Monday 19 July 0730 - 1800

**Wings FM**

You can tune into Wings FM (87.7MHz - frequency to be confirmed) from Wednesday 14th July at 1300hrs to Monday 19th July at 1600hrs for Airshow and traffic news, interviews and, on Saturday and Sunday, for live commentary of the world's most spectacular flying

display. This year, for the first time, visitors will be able to text or E-mail requests or travel information as well as using the telephone. Full details on how to contact Wings FM will be broadcast as soon as the studio is up and running. The Wings FM team, working with the British Forces Broadcasting Service, is led by Derek Liddell. For dedications or requests call the airfield studio on **(01285) 713300** ext. 5140.

Dedications on 'Wings FM' - 87.7MHz during the periods below

Wednesday 14 July 1300 - 1900  
 Thursday 15 July 1000 - 1900  
 Friday 16 July 0800 - 2000  
 Saturday & Sunday 17/18 July 0600 - 2200  
 Monday 19 July 0800 - 1600

Wings FM recorded programming will continue on a 24-hour basis outside these live broadcast times

**Royal Air Force Benevolent Fund Enterprises**

To request a free copy of the Air Tattoo Gift Collection catalogue, covering all RAFBFE activities for 2004, please telephone 0870 758 1940 or visit [www.airtattooshop.com](http://www.airtattooshop.com)

Some of the information contained in the RIAT 2004 Guide is subject to change. All information was correct at time of going to press. For the very latest information please check [www.airtattoo.com](http://www.airtattoo.com)

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The BEST needle tuned air-band radio available!!!  
Air-band has full AM reception, that is why it out performs  
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Modes AM / FM / WFM

Step Sizes 5, 6.25, 8.33, 9, 10, 12.5, 15, 20, 25, 30, 50  
and 100kHz

Features: Headphone socket, 1250 memories. Auto  
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Alpha numeric display, Built-in ferrite bar for AM  
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## SKY SCAN

747



Digital civil air-band receiver.  
Marine band in channel numbers.  
Also receives FM radio stations.

#### Frequency Range

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156-162.50 Marine Band

88-108 FM Radio

552-1629Khz AM Radio

Memory Channels

Carry Strap

**£49.95 + £5 p&p**



## MAYCOM AR-108

### Full Civil Air-band

VHF scanning receiver.

Range: 108- 136.975 MHz (AM) and 136- 180  
MHz (FM)

Power: 2 x AA cells or DC adaptor

Features: 99 memories, Earphone socket, Belt  
clip, Wrist strap, Detachable antenna.

**£69.95 + £5 p&p**

## SKY SCAN

MR318A



Civil Air-Band Receiver

MW/LW Radio

Memories

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Full Civil Coverage

Includes  
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## ALINCO DJX3

Full Civil + Military Aircraft Receiver

100kHz - 1300MHz

AM/FM/WFM

700 Memory Channels

Stereo FM (with headphones)

Steps: 5/6.25/8.33/10/12.5/15/20/25/30/50/100kHz

Size: 56w x 102h x 23d mm

Supplied : 3AA dry cell battery case, carrying  
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Civil Air-Band Scanning Receiver

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Modes: AM, FM. Step Sizes: 5, 12.5, or 25 kHz

(range dependant). **NEW 8.33 KHZ**

Power: 6AA size cells or 9V DC @ 160mA;

Features: Headphone socket

**£89.95 + £5 p&p**



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● Fig. 2: London and Scottish Centre Civil and Military Area Control Frequencies.

London Area Control Centre - Swanwick	130.925 TC North Primary	293.475 ATC Primary
126.075 Berry Head	128.475 TC North Secondary	299.975 Eastern UK ICF
132.95 Berry Head/Lands End	121.025 TC Redfa/Logan	313.0 Discrete/Standby
134.75 Bristol	121.225 TC Redfa/Logan	London Military West
133.6 Bristol/Brecon	129.075 TC South	128.25 South Standby
129.375 Bristol/Strumble	133.975 TC South/North Standby	128.7 North/ATC Primary
133.45 Clacton East	134.125 TC South/Ockham./Sam.	133.3 South/ATC Primary
127.825 Clacton West 1	120.475 TC Southeast S/B	133.9 South/Daventry Pri
118.475 Clacton West 2	133.175 Willo/Midhurst Out	135.15 South/ICF
127.1 Daventry Northbound 1	LACC - Swanwick - FIS	244.375 South/STC Berry Head
127.875 Daventry Northbound 2	124.6 Flight Information/East	245.0 South/Rare Standby
131.125 Daventry Southbound 1	124.75 Flight Information/West	245.1 Practice Emergency Test Freq
129.2 Daventry Southbound 2	125.475 Flight Information/North	245.175 Southwest/ATC Primary
134.45 Dover High	Scottish Area Control & TC	245.25 North/West STC
134.9 Dover Low	123.775 Antrim Sector	247.275 South/Gci/Standby
128.425 Dover South	132.725 Central Sector	255.925 South/ATC
129.1 Lakes North	135.85 Dean Cross North	257.275 South/ATC
131.05 Lakes South	129.225 Dean Cross South	261.025 STC/Standby
132.6 London Middle East	119.875 FIS & Standby	262.975 South/ATC Primary
132.45 London Middle West	133.675 Hebrides Sector	268.975 South/STC
127.425 London Upper East	121.325 Humber Sector	270.0 South/Daventry Standby
135.425 London Upper West	126.925 Montrose Sector	275.475 South/ICF Allocator
126.775 North Sea South	133.875 Moray Sector	278.025 South/West
128.125 North Sea West	125.675 Southwest Sector	278.075 South/West ATC Primary
135.575 Wirral Sector 7	126.25 Spare	283.525 South/West ATC Primary
135.325 Worthing East	124.5 Tay Sector	290.575 South/STC Standby
129.425 Worthing West	124.825 TCA/Galloway Sector	340.25 North/Warton STC
135.05 Worthing West	126.3 TCA/Talla Sector	London Military - LJAO
132.3 Worthing West Low	134.775 Tyne Sector	127.45 Northwest/ICF
120.025 Standby/Central	127.275 West Coast Sector	233.8 Southeast
133.525 Standby/East	London Military East	251.225 Southeast
126.875 Standby/North	131.225 ATC Secondary	254.275 Northwest/ICF
136.6 Standby/South	133.325 ATC Secondary	264.825 North/STC
127.7 Standby/West	135.075 ATC North Primary	275.35 Central ICF
129.05 Spare	135.275 Eastern UK ICF	291.075 Southeast
134.25 Spare	135.625 ATC Primary/Standby	299.8 Southeast
135.25 Spare	135.925 ATC Primary/Standby	Scottish Military
136.2 Spare	232.025 ATC Primary	124.05 STC/Exercises
136.275 Spare	248.775 ATC/ACMI Primary	134.3 Scottish Military ICF
136.55 Spare	254.825 ATC Primary	134.475 Central/Southwest
129.025 Spare TC Gatwick	263.075 ATC/Cac Standby	231.625 North/STC
London Terminal Control - West Drayton	275.675 ATC Primary	249.475 Scottish Military ICF
120.525 Biggin/Detling Out	276.775 ATC/ACMI Primary	252.475 ATC East/South Discrete
121.275 Bovingdon Inbounds	277.775 ATC Primary	258.0 North STC
129.275 Bovingdon Inbounds	279.3 ATC Primary	259.175 ATC East
119.775 Bovingdon Outbounds	280.575 Discrete/STC	259.725 ATC West/Standby
118.825 Brookmans Park Out	284.3 Discrete/Standby	259.775 ATC East/South
123.9 Lambourne In/Out	290.6 Discrete/Standby	268.575 ATC West
120.175 Lumba/Timba Inbounds	290.7 ATC/ACMI Standby	268.925 ATC East
135.8 TC Capital/Compton	291.775 ATC/ACMI Standby	292.675 ATC Central/South
127.95 TC Capital/Vaton	292.6 Discrete/Standby	358.875 Central STC
124.925 TC East/Dagga Sector		
129.6 TC East/Sabre Sector		
133.075 TC North		

will work - The 25kHz ATC sectors will continue to pass frequencies with two decimal places as per the current system. Consequently, an aircraft being transferred to 132.025MHz on a 25kHz sector will be told to 'contact frequency 132.02'. (One

As far as airband enthusiasts radio's are concerned the initial rush by manufacturers to bring out radios with 8.33kHz spacing was a bit premature, because as long as your radio can resolve down to 5kHz spacing, (which most radio's can), you will be

offset frequencies and this hopefully will help explain some of the difficulties of introducing 8.33kHz spacing. The basic principal of offset frequencies is to allow the same frequency to be broadcast from more than one transmitter site giving a greater area of radio coverage for a single frequency. The usual occurrences of this being within Area Radar, (en-route), such as London Control or London Military. It is always essential to have a guard area around each frequency so that it does not bleed into adjacent channels, consequently, modern 25kHz frequencies are effectively cut into three segments.

Airfield frequencies such as Heathrow tower on 118.5 are centred and do not use offsets, consequently they have a natural guard area either side, (see Fig. 1). Area frequencies such as London Control on 129.1 (Lakes Sector), is broadcast from the transmitters at Preston with a plus 5kHz offset and from Cleve Hill with a minus 5kHz offset, (offsets are usually plus or minus 5 or 7.5kHz). This means that as long as the filters in the transmitter are set accordingly then the same frequency can be broadcast simultaneously from the two transmitters without them interfering with each other. The receiver bandwidth in the aircraft, (or your radio), will be a wider setting and consequently will allow reception of either transmission without differentiating between either offset. If you have the facility on your radio to alter the filtering you could tune in to a local en-route transmitter site, (if available), and switch between filters and tune up and down to see the effect of the offset frequencies.

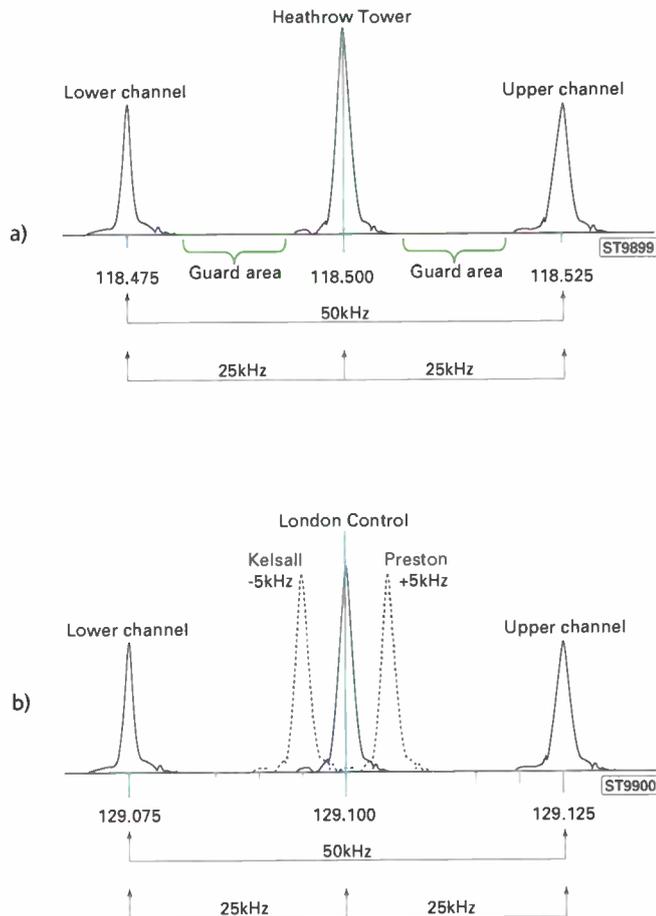
You will see from the diagrams that the system works fine as long as frequency allocation is carefully planned. In the perfect world each frequency allocation will alternate between airfield and en-route frequencies, the centred airfield frequency providing

automatic guarding between the two. Two airfield frequencies next to each other is also not a problem with a bigger guarded area, but you cannot allocate two en-route frequencies next to each other. If this were to happen the lower and upper offset of each frequency would cause interference. I think this highlights the potential problems of introducing 8.33kHz spacing with the reduced bandwidth.

## Information Sources

There are essentially three main sources of airband information and that is Books, Magazines and the Internet. Three books that give an in depth look into the workings of UK Air Traffic Control are, *Airband Radio Handbook* by David J Smith (Haynes 2002 - £12.99), *Airband Radio Guide* (ABC 2001 - £8.99) and *Air Traffic Control* (ABC 2001 - £9.99). All three in their own ways are very informative but due to the extensive UK airspace changes of the past two years are a little out-of-date. If I were to choose one to read it would be *AIR Band Radio Handbook*, all the books can be bought from the SWM Book Store.

The number of airband frequency books has declined recently, with several titles appearing and disappearing in the past three or four years, (most of which were aimed purely at the military enthusiast). Some of the books mentioned above do have limited frequency listings but in my opinion the one book that stands out from all the others is published by Photavia Press and that is *Airwaves 2004*. Now in its 11th annual edition it gives the civil and military airband enthusiast a comprehensive insight into the aviation frequencies used for v.h.f., u.h.f. and also h.f. listening. Apart from the frequency listings it also contains a lot of other information relevant to monitoring the airbands. (For further information go to the Photavia Press website



● Fig 1: Offsets in practise

Three Two decimal Zero Two). To identify 8.33kHz airspace all frequencies are to be referred to as 'channels', with the channel being passed with three decimal places. For example, on an 8.33kHz sector an aircraft would have been told to 'contact channel 127.860', (One Two Seven decimal Eight Six Zero). As you can see, the 8.33kHz channels are not literally a third of 25kHz which in theory would produce a frequency such as 132.0083 but rounded to 5kHz, so this frequency would become 132.010MHz.

able to receive the new 8.33kHz frequencies without a problem. Problems will only occur if they allocate 8.33kHz frequencies close together and you are not able to select a smaller filter size on your radio. Breakthrough may well then be experienced but theoretically, because of the inherent problems allocating 8.33kHz frequencies close together will not happen.

### Offsets

That leads on to the current 25kHz spacing and the use of

[www.photav.demon.co.uk](http://www.photav.demon.co.uk) *Airwaves 2004* can be bought direct from Photavia Press or from the *Short Wave Magazine* Book Store for details see the main magazine page 66. A further publication of use which also comes from Photavia Press is *Callsign 2004*. This gives an in-depth look at the ATC callsigns used in both civil and military aviation and is very useful guide to the airband listener by providing the means to help identify who is being heard.

### Magazines

Magazines are perhaps not one of the most prolific sources of airband information but still make an important contribution. Aviation titles such as *Aircraft Illustrated* have airband columns but they tend to give a general overview rather than going into detail, (especially for the military

enthusiast). The specialist radio monthly *Short Wave Magazine* has a two page dedicated monthly airband column, 'Sky High'. This column goes into detail on a wide variety of subjects related to airband listening including the latest news of changes to civil and military airspace and frequencies.

### Internet

Whilst the Internet can be a very good source of information, I have to admit that I have mixed feelings about airband information via this medium. The Internet information primarily comes from two sources Newsgroups and individual websites. Newsgroups are a good source of up-to-date information and there are numerous aviation and airband related groups on the following three sites: [www.egroups.co.uk](http://www.egroups.co.uk) [www.groups.yahoo.com](http://www.groups.yahoo.com)

and [www.smartgroups.com](http://www.smartgroups.com)

All aspects of aviation are covered including general aviation, spotting, the airbands, ACARS and Selcalls. If you join one or all of these three groups you can search through the newsgroup information and decide which of them may be right for you. If it is not what you hoped for you can always unsubscribe if you don't like them. A word of caution, if you choose to join an enthusiasts group such as the mil-spotters forum or the civil equivalent, they are very well supported so be prepared to receive a large number of messages every day. The mil-spotters-forum for example generates well over a 1000 messages per month!

The other aspect of the Internet is individual websites, which in some cases I personally find very annoying. Unfortunately, with regards to overall frequency

lists there is a lot out-of-date information available on some sites. Some lists include airfields such as Upper Heyford which has been closed for ten over years, try a search on Google UK for '+airband' and '+frequencies' to see what I mean. I frankly do not understand people who spend a lot of time creating a website with airband frequencies on it, only then to leave it for years with no updates? As a consequence I could find only a few websites with up-to-date listings of UK airband frequencies. Having said that, there are some very good airband sites which are specific to local areas or individual airfields. Have a look at milairman's Lakenheath monitoring site to see what can be done by a real airband enthusiast

[www.milairman.co.uk](http://www.milairman.co.uk) It is worthwhile therefore doing a search for your local airfield or



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### Air Band

- HF
- VHF
- UHF

### Marine Band

- VHF
- UHF

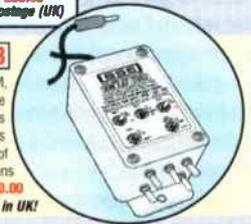
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area as someone may have created a site for it, (and hopefully kept it up-to-date).

## Information Sources

### Antennas

One of the questions I am most regularly asked is what type of base station antennas I currently use or which antenna would I recommend for airband listening. Also, is there any benefit to be gained from antennas designed specifically for the airband? Over the past 20 years I have tried a wide variety of antennas,

located in the loft, although a loft installation will still work well. Also, using an antenna with the low loss N-type connector does seem to improve performance slightly.

I currently use a mix of antennas. A wideband discone for general listening, I have found that the 'double discone' design works well over a wide range of frequencies, including good results on both the air bands. If possible buy one made of stainless steel rather than aluminium as I have found that they survive long term exposure to the elements much more



● Looking very smart in a typical all metal scheme Mig-21 MF Fishbed of the Czech Air Force.

sometimes out of personal interest and others as a result of the weather. The increasing number of winter storms over the last decade has meant that the antenna manufacturers have been kept very much in business by myself and I am sure by many others. It has even got to the point where I now keep an old discone operational in the loft during the winter as I get fed up with being off air each time another big storm wrecks the rooftop arrays.

Firstly, it is important to use a good quality low-loss coaxial cable, with the antenna placed as high as is reasonably possible. Even if they are of a similar height above the ground, there is a distinct advantage having a roof mounted antenna over one

effectively. Antennas constructed from aluminium oxidise, become brittle after a period of time and therefore become more likely to snap in strong winds. I also use a dedicated airband antenna with the various discone antenna cut to a length suitable for both the civil and military airbands. My experience shows that the results over a good quality wideband discone are not as dramatic as some people might expect but if your main interest is aviation then the expenditure is well worthwhile to help pull in those weak signals. (My guess is that there is at least a 5dB gain by using this type of dedicated antenna). I have also used a single whip type antenna, but in my view they are not as effective as a good discone.

Hand-held radios usually come with an antenna supplied whether it is a telescopic, helical or a whip type. Just because a radio is supplied with an antenna don't automatically presume that it is the best one for the frequencies you wish to monitor. If the opportunity arises try out different types of antenna on your hand-held whilst listening to a regular transmission such as an ATIS Weather frequency. You may well be surprised at the improvement in performance by changing the antenna!

### Power On The Move

As with all portable electronic devices, the power source for use with a hand-held airband radio is critical for maximum use away from a power source. It is important to consider the type of rechargeable batteries that you will use.

The older type of AA size Nickel Cadmium batteries (Ni-Cads), would have a capacity of typically about 600-750mAh, (milliampere hours), with the more modern variants of Ni-Cads having been extended to 1000mAh (1AH) capacity. The first thing I would suggest is to move on to the more expensive Nickel Metal Hydride batteries, (Ni-MH), which will instantly extend the time you can use your hand-held. I have three sets of Ni-MH rechargeable cells the older set has a capacity of 1300mAh, my most recent acquisition is a 2000mAh set which is almost three times the capacity of the older Ni-Cads. With a hand-held such as my MVT-7100 having a rated consumption of typically 140mA you can see the capacity advantage that Ni-MH batteries give, extending the life of the radio from 5 - 6 hours up to 14 - 15 hours. The times I have quoted are approximate and will vary as your hand-held will consume more power whilst scanning than if you were listening to a single frequency.

Another advantage of Ni-MH

batteries is that they do not suffer from the memory effect that plagues NiCads and consequently, they can be topped up at any state of charge. A quick check in my catalogue shows that a set of four 2000mAh Ni-MH would be between £9 and £10. So it is up to you to decide whether the extra expense is worth the extra capacity. In my opinion, it most definitely is!

## Where And How To Listen

### Home Or Local Airfield

Unlike many hobbies, the great thing about airband listening is that you can do it anywhere. You can listen at home, at work, (boss permitting!), in the car, on holiday, etc. Basically airband listening is a UK, and in fact you could say a Global hobby. (Subject to local legislation, see the section on the law later).

The v.h.f. and u.h.f. airbands both work on the principle of 'line of sight', in other words if a signal is not blocked by anything solid between the transmitter and your radio, in good conditions you should be able to pick up an aircraft at 33000ft up to approximately 400km away. Beyond this distance the curvature of the earth is significant and the signal will be degraded and reception is very difficult. Occasionally, the line-of-sight rule is superseded by unusual atmospheric and propagation conditions which cause the signal to 'skip' and sometimes ground stations can be heard many hundreds of miles away. These conditions are not common and only occur a few times a year. The 400km limit I have cited is purely an arbitrary figure, as in many cases it can be more and sometimes less. For example, I live in South Devon at 75m above sea level with a reasonably open view to the North, using a rooftop discone I can hear aircraft on the London Control Lakes and North Sea Sectors quite clearly which must

be almost 480km away.

Consequently, the location of your radio will affect the reception of airband signals dramatically, if you live close to the top of a hill your reception will be much better than if you live in a valley or in a built up city. Basically anything solid that can get in the way of your signal will cause it to degrade, (hills,



● In Tiger scheme marks, Mil Mi-24D of the Czech Air Force.

buildings, trees, etc.). If your listening location is not ideal then you may find that the same aircraft at 33000ft can only be heard clearly up to 100 or 160km away but even so there is still plenty to listen to. Transmissions from airborne aircraft to your radio are one thing, but Ground stations such as the local airport are a different matter. Signal reception is once again affected by the terrain between yourself and the local airport. Whilst picking up the aircraft in the air is no problem, the Tower Controller for example is a different matter. In good local conditions I would expect you to pick up transmissions from the ground station up to 45km away, but if the local terrain is poor then this can drop dramatically to even below 10km.

### Airshows

Airband listening can mean something different to everyone, whether you want to tune in to the local airfield or identify aircraft on the Airways above you. But airshows, whether it is your local fly in or the Royal International Air Tattoo can often provide some interesting airband

listening. Apart from listening in to the airfield ATC it gives the opportunity to listen in to the display aircraft and aerobatic teams many of which have dedicated frequencies allocated to them. Once again an airband frequency directory will prove a good source of this type of information. A good starting point to listen to is the Red Arrows

who use 243.45 as their primary air-to-air frequency.

### Searching & Exercises

Searching for and finding new active frequencies is always one of the more interesting and rewarding areas of airband listening. If you look at it logically, there will always be a differential of information between the two disciplines of airband listening. Within the civil airband a large percentage of the frequency information is available in the public domain with just a few subjects such as discrete Company frequencies being available for the listener to search for. There are only around 900 Civil v.h.f. airband allocations in the UK compared with about 2500 (currently identified), u.h.f. Military allocations, so in theory there will always be a larger percentage of new military information to search for.

Exercises and deployments such as the B-52s at Fairford last year always provides great opportunities for discovering new information.

Most modern radios have the facility to set-up a number of search bands and during busy

military activity I generally keep one radio scanning London Military with the other searching different sections, (or all of), the military airband. With military airband listening, searching the u.h.f. band especially for example during an exercise, provides the thrill of the chase and there is a particular satisfaction to be gained by finding a new frequency whilst searching the 225-400MHz band, (identifying who is using the new frequency can be another matter). With such a high percentage of discrete frequencies within the military airbands there is always something out there new to discover.

### ACARS

The idea for Aircraft Communications Addressing and Reporting System (ACARS) was introduced by Aeronautical Radio Inc, (ARINC), in the USA. The original concept was to replace the time intensive system of voice situation reports from the aircraft to the Airline Flight Operations team on the ground. These reports would include such information as serial, flight number, pushback times, departure times, fuel flow figures, position reports, etc. All these reports would have to be read-back to confirm the information

Although the system was around for some years, it was not really until the reduction in size and cost of computer systems in the mid-late eighties that the system really came into its own and started to be fitted to a significant number of aircraft. The ACARS system, consists of a group of sensors on board an aircraft which can monitor varying parameters, the information is then fed into an on-board computer which formulates the data and then automatically transmits it to a ground station via a v.h.f. radio link. As an example, these sensors can monitor such things as when the undercarriage retraction lever is operated and also when the undercarriage is fully retracted, thus generating a departure time element as part of the ACARS message, this is known as Event Recording. Safeguards are built into the system so that a false event cannot be transmitted. The raw data is then sent to a central processing computer where the data is translated into readable messages for the individual Airline Flight Operations Departments, this is achieved via the ARINC Electronic Switching System (ESS).

To monitor ACARS you will need a radio capable of receiving the Civil Airband 118.000-



● Another real rarity, Tornado IDS of the Royal Saudi Air Force.

and that coupled with the progressive withdrawal of Flight Engineers on aircraft meant that this reporting workload was passed on to the Pilot and First Officer - Consequently, ACARS was born in about 1976.

136.975MHz, an audio output lead, plus suitable software and, or a decoder. The lead connected to the 'rec out' or headphone socket of the radio to the 'line-in' socket of your computer soundcard or to an ACARS

decoder. Using an external antenna will also improve reception and will improve the accuracy of the decoded message. By tuning the radio, (squench off), to the ACARS frequencies, 131.525, 131.725, (UK Primary), 136.9 and 136.925MHz, you will hear raw data bursts as information is transmitted. (136.925 is only broadcast from one transmitter near Glasgow). The computer software then converts the raw data into readable messages. You should also be aware that after decoding, the resulting message still contains some information that needs to be translated, but perhaps most importantly for the enthusiast the Serial and Flight Number are always included.

If you are looking for a software solution try using a search engine such as Alta Vista or Google on the Internet and search for "+ACARS" "+Software", (using the plus signs). This will lead you to much more detailed explanations of

using a decoder and software is the *Lowe Air Master*, this is available for *Windows 95* and *Windows 98* but not for *Windows2000* or *Windows XP*. In my experience this seems to have a much more successful decoding rate than some of software only systems, (it can be found second hand). Go to the web page [www.acarsonline.co.uk/aclink/aleqdec.htm](http://www.acarsonline.co.uk/aclink/aleqdec.htm) for further information on ACARS and software reviews.

## HF Airband & Selcalls

Whilst this guide is primarily aimed at the v.h.f. and u.h.f. airband enthusiast, it would be most remiss of me not to comment on another interesting side of the airbands - h.f. listening, (short wave). The fourteen main civil and military h.f. airbands are between 2.850 and 23.350MHz. Unlike aircraft transmission on v.h.f. and u.h.f., signals on h.f. bands use single side band (s.s.b.)



● Rare visit from an Air Guard fighter, a Pennsylvania Air National Guard A-7D.

ACARS, plus also free to download ACARS software such as WACARS and KRACARS. There are also commercial products such as SKYSPY version 2.55 which is about £25. The success rate of data conversion does appear to be variable by all accounts but at least with shareware, if it is not suitable to your requirements, then it has only cost you the price of the download. Possibly one of the best systems that is available

the transmissions all utilise the upper side band (u.s.b.). Unlike v.h.f. and u.h.f., signals which are on the whole limited in range to 'line of sight', h.f. signals can travel much further, as put very simply, they bounce off layers of the earth's ionosphere (a radio reflective mechanism encircling the planet). This means that aircraft crossing the Atlantic ocean and much further afield can be heard, especially if propagation conditions are good.

With the right equipment and antenna it is not uncommon to hear aircraft routing across the Pacific between the United States, the Far East and Australia. Nevertheless, you are very much at the mercy of the current propagation conditions and this can be affected by several parameters such as, sunspots, electrical storms and the like. One day you will struggle to get a good signal from traffic crossing the Atlantic and a couple of days later you might pick up Honolulu

range so it is really up to the listener how seriously they may wish to take their h.f. interests.

## Selcalls

First introduced on the North Atlantic in 1956, Selcalls hold a major interest for some h.f. airband listeners. Basically, Selcalls are a means of communication. They are used by a ground controller to alert the flight crew that they wish to communicate with them, thus avoiding the



● Very colourful pair of Hawks from 19 (R) Squadron of the Royal Air Force.

or Sydney quite clearly. All-in-all, it makes for some interesting airband listening.

Some scanners, or more correctly I should say, wideband receivers have the facility to receive h.f. s.s.b. signals. Whilst some work reasonably well, in many cases this is a makeshift arrangement which makes the radio a 'jack of all trades' and consequently will not give the best h.f. performance. You may be able to listen to signals across the Atlantic but to resolve weak signals from distant stations it is best to buy a dedicated h.f. radio. Prices for new portable h.f. radios from manufacturers such as Sangean or Sony start at around £130 with second-hand sets being available from around £80, but like v.h.f. and u.h.f. radios the sky is the limit on price, with several hobby h.f. sets being well over the £1000 mark. However, some very good second-hand h.f. radios from the leading manufacturers such as AOR, Icom, Yaesu, Kenwood and the Japan Radio Company (JRC), can be bought in the £250 to £500

crew having to continuously listen to background un-squelched h.f. noise. Aircraft that are Selcall equipped are usually those that are expected to travel over large expanses of barren land or more usually over the Oceans of the world, where long distance h.f. communications are used.

A four letter code is entered into the controller's Selcall Encoder and this is then transmitted via a specific h.f. frequency, this code will be received by all the aircraft on the frequency but only the one with that specific code selected will have their Selcall two tone chime alert activated. The transmission of the Selcall chime is denoted by the familiar ping-bong sound heard on the frequency, once alerted the crew will turn up the volume and listen out for a voice communication.

The Selcall code database is managed by ARINC on behalf of the International Civil Aviation Organisation (ICAO). There are currently around 15000 Selcalls allocated to over 1600 various operators. The four letter code is

made up of two elements or pairs of tones, letters one and two and letters three and four, each form a tone, both pairs of letters must be arranged alphabetically. Consequently, you can have a Selcall such as GJFS, (British Airways Boeing 777), but you cannot have GJSE. Duplicate letters are not permitted in each pair or tone, for example AACC, as this would not be recognised by the aircraft's Selcall decoder, as a further restriction the same tone cannot be used in both the first and second pair, in other words you cannot have a code of ABAB or EFEF.

Each of the many pairs of letters makes a different tone the first tone is transmitted for one

M, the letter (I) was not used. With air traffic on the increase this number of codes soon became woefully inadequate and so in 1985 a further four letters or tones were made available and the letters P, Q, R and S were added. The letter I along the letter O was not used. This increased the number of available Selcall code permutations to 10920, thereby allowing much more flexibility of the system. Nevertheless, it is still less than the current total allocation and to solve this problem for many years duplicate Selcalls have been issued.

In theory, when duplicate Selcalls were issued they were allocated to aircraft that operated

on the same frequency and will both respond to the same Selcall code. It used to be a rare occurrence but the odds of it happening are on the increase, especially as the USAF have for some years been allocating duplicate blocks of Selcalls to their transport aircraft. With the increased amount of USAF traffic across the Atlantic due to the situation in the Gulf and elsewhere, Selcall conflicts are now heard much more regularly.

For h.f. listeners who are interested in identifying aircraft from their Selcalls there are currently two books on the market which will help with this. The first is the *Directory of Aircraft Selcalls*, (£13.95), published by Seldec in September 2002, it contains almost 10000 aircraft

Selcalls, see [www.seldec.com](http://www.seldec.com) for more information. The second book is a more recent publication from Photavia Press, this is *Airwaves Selcal*, (£11.95) published in December 2003 and contains over 13,000 aircraft Selcalls. The latter book is currently available from the SWM Book Store. Both books include cross-references of the Selcall information.

## Airband & The Law

Finally, one item I should comment on is regarding the legal aspect of using airband or wideband receivers in the UK. As I mentioned earlier, when the AOR AR2001 first appeared in 1984, some people were originally of the opinion that to



● A spectacular scheme, Sukhoi SU-27A Flanker of the Ukrainian Air Force.



● Another impressive Tiger scheme, an F-5A of the Norwegian Air Force.

second, there is then a delay of a fifth of a second before the second pair of letters are transmitted for one second also. Up until 1985, there were 12 letters or tone codes available making up a total of 2970 code permutations. The letters were A, B, C, D, E, F, G, H, J, K, L and

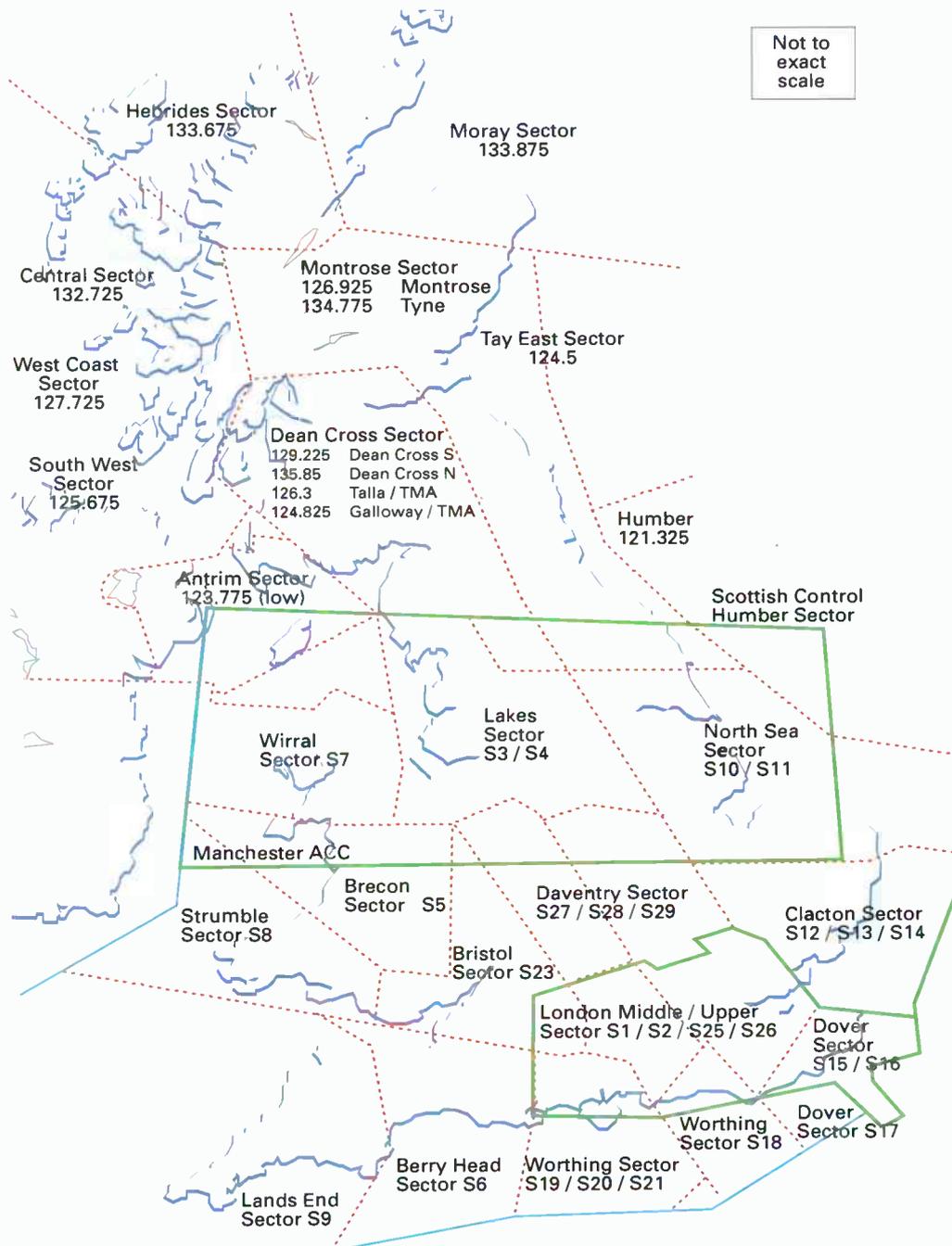
in different parts of the world and were therefore unlikely to both appear on the same h.f. MWARA Network. As aircraft are sold on to new operators and therefore may operate in different areas, there inevitably will be the odd occurrence where two aircraft with the same code will appear

## Abbreviations

ACARS	Aircraft Communications Addressing And Reporting System
a.m.	Amplitude Modulation
ATC	Air Traffic Control
CCF	Centralised Control Function
FIR	Flight Information Region
FIS	Flight Information Service
f.m.	Frequency Modulation
GCA	Ground Controlled Approach
h.f.	High Frequency (short wave)
ICAO	International Civil Aviation Organisation
ICF	Initial Contact Frequency
LJAO	London Joint Area Organisation (Swanwick Mil)
MHz	Megahertz
MWARA	Major World Air Routes (h.f.)
LACC	London Area Control Centre
LATCC	London Air Traffic Control Centre
NDB	Non Directional Beacon
SOTA	Shannon Oceanic Transition Area
STC	Special Tasks Cell (Frequency)
TACAN	Tactical Air Navigation Aid
TC	Terminal Control (Area)
TMA	Terminal Manoeuvring Areas (Now TC)
v.h.f.	Very High Frequency
VOR	v.h.f. Omni Directional Range (Beacon)
u.h.f.	Ultra High Frequency

## Credits

I am grateful to the NATS library website for some of the historical information - thanks also go to **Photavia Press, Colin W, Nick L, Ron, Jim M, John L, Kevin G** and **Keith T.**



<b>Wirral Sector</b>	135.575	Wirral
<b>Lakes Sector</b>	129.1	Lakes North
	131.05	Lakes South
<b>Daventry Sector</b>	129.2	Southbound 2
	131.125	Southbound 1
	127.1	Northbound 1
	127.875	Northbound 2
<b>London Control Standby</b>	120.025	Central
	126.875	North
	127.7	West
	133.525	East
	136.6	South
<b>Bristol Sector</b>	129.375	Strumble
	133.6	Brecon
	134.75	Bristol
<b>Berry Head Sector</b>	126.075	Berry Head
	132.95	Lands End
<b>Worthing Sector</b>	129.425	West
	132.3	West Low
	135.05	West
	135.325	East
<b>London Upper Sector (LUS)</b>	127.425	LUS East
	135.425	LUS West
<b>London Middle Sector (LMS)</b>	132.45	LMS West
	132.6	LMS East
<b>Dover Sector</b>	128.425	South
	134.9	Dover Low
	134.45	Dover High
<b>North Sea Sector</b>	126.775	South
	128.125	West
<b>Clacton Sector</b>	118.475	West 2
	127.825	West 1
	133.45	East

own such a set was in fact against the law. This wasn't the case then and nor is it now. It is not illegal to buy or own a wideband radio, but it is illegal to listen to any transmissions for which you are not licensed or authorised. As a consequence, if you use your radio to listen to anything other than Broadcast radio, Amateur radio or weather and navigational information at sea, you are in breach of the *Wireless Telegraphy Act 1949/1967* and also the *Interception of Communications Act 1985*. With this in mind it was perhaps fortunate that the government took no action back in 1984 to ban the ownership of radios capable of receiving such

things as the u.h.f. airband, Police, Fire, Government Agencies, etc. In the modern era, if you visit the average airshow you will see literally hundreds of scanners in regular use. The operation of wideband radios has now been tolerated for many years and few prosecutions have taken place regarding their operation. It was therefore regrettable that in the past a few ill-advised people have chosen to breach the *Status Quo* by attempting to sell conversations illegally monitored on their scanners to the media. Fortunately, these events were relatively short lived and thank goodness, did not give way to a knee-jerk reaction from the

government by rushing through disabling legislation. The advent of the digital mobile 'phone has meant that this type of monitoring has now been made impossible with the average scanner. My comments obviously only apply to the law in the UK, remember if you do take your scanner abroad you are subject to the laws of another country who may take a very different and a lot less tolerant view to that at home. As a consequence you may not be bringing your radio back with you, or worse still you may be making an unplanned extension to your stay abroad! Please take care. **SWM**

The large blue box across the Midlands shows the area of the Manchester ACC up to Flight Level 285.

The area within this solid line in Southeast England is the London and Upper Sectors, which control the airspace above FL215.

This map is a guide only, boundaries positions are only approximate and are potential subject to change.



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