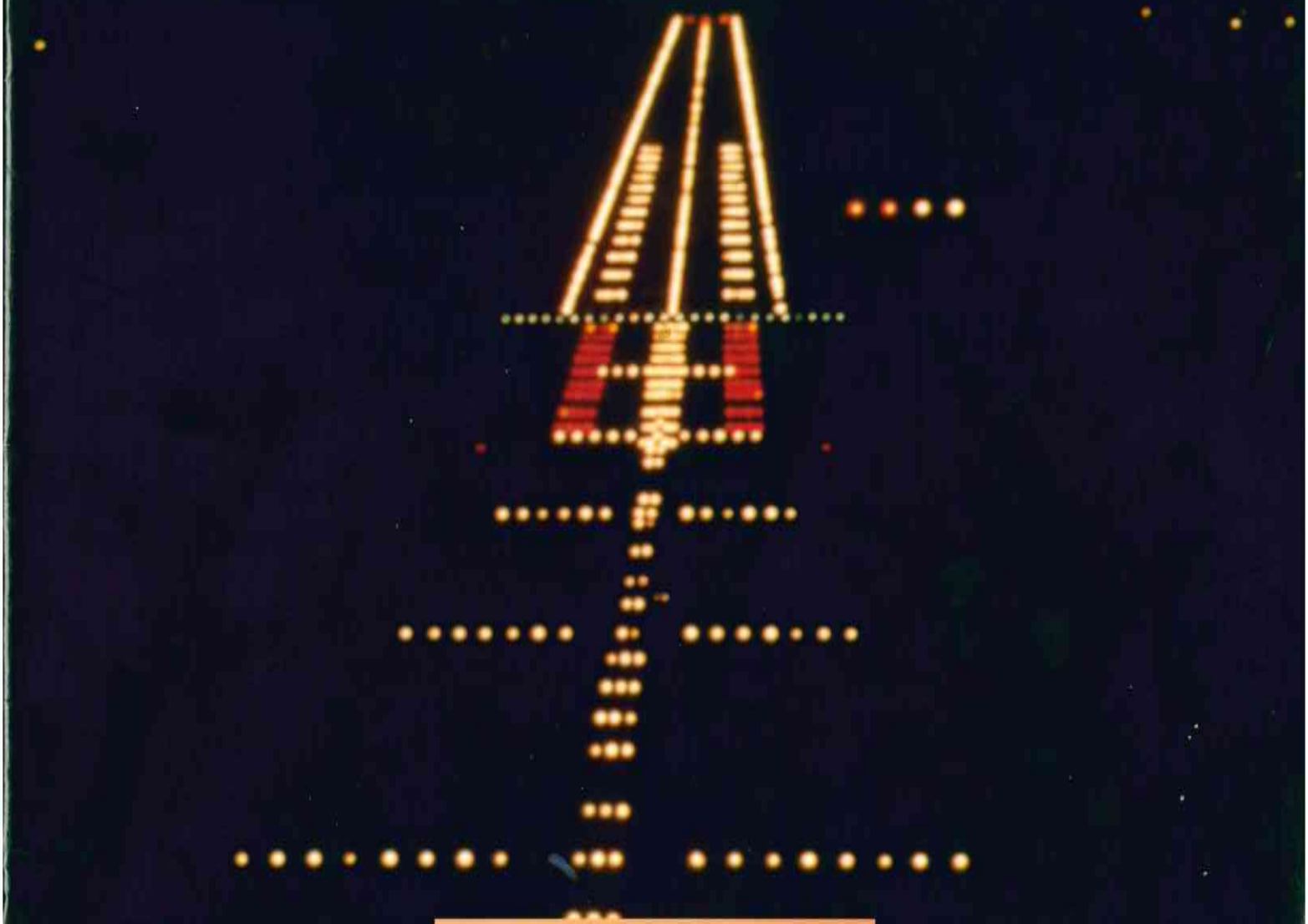
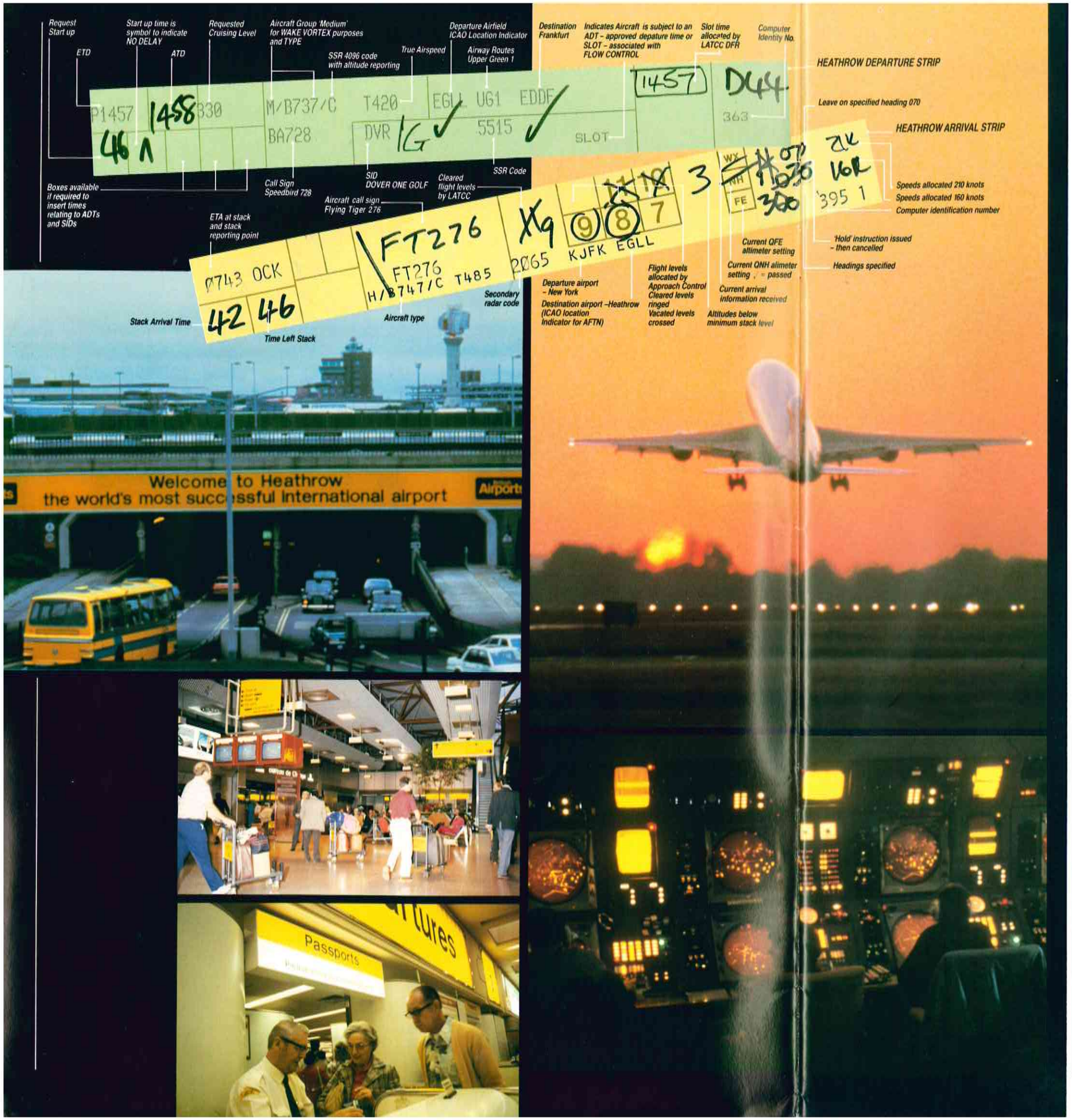
National Air Traffic Services

AIR TRAFFIC CONTROL AT HEATHROW AIRPORT



NATS

AIR TRAFFIC CONTROL AT HEATHROW AIRPORT



Introduction by General Manager
Air Traffic Services (ATS) CAA, Heathrow Airport

Aviation was introduced to Heathrow in 1929 when a small area became an aircraft manufacturers' flight test centre. It continued in this use until 1944 when the aerodrome was taken over for military purposes. Following the end of the war Heathrow was designated for civil use and commercial flights commenced in January 1946.

Constant development has produced the world's busiest international airport. In 1986 the National Air Traffic Services controlled over 315,000 aircraft movements (landings or take-offs) at Heathrow, and were also responsible for the control of more than 43,000 aircraft in the London Control Zone.

The Air Traffic and Telecommunications services are operated by the National Air Traffic Services on behalf of the Airport owners – Heathrow Airport Ltd. In 1986 nearly 32 million passengers passed through the terminals at Heathrow. The Airport also handled 600,000 tonnes of goods.

Currently some seventy five airlines use Heathrow, serving Europe, Asia, Australasia and the Americas, as well as destinations within the United Kingdom. Regularly over one thousand aircraft movements take place each day, and during summer traffic more than seventy movements are handled in each hour – more than one aircraft landing or taking-off every minute.

To most air travellers the dominant control tower and the nearby radar tower are visible reminders of Air Traffic Control, but few will be aware of the nationwide organisation needed to ensure the safety of aircraft arriving at or departing from Heathrow, twenty-four hours a day, and for every day in the year. This traffic has to be safely co-ordinated with the multiplicity of aircraft, both civil and military using adjacent aerodromes, and also with en route traffic flying along the airways.

This booklet aims to take you behind the scenes, to explain the need for the National Air Traffic Services and to provide more detailed information on some aspects of air traffic control.

HOW UK AIRSPACE IS ORGANISED

United Kingdom airspace extends not only over the land mass, but also over the surrounding seas and oceans, where it meets the airspace of adjacent countries.

It is divided into two Flight Information Regions (FIRs) – London and Scottish. Aircraft flying in these two regions are controlled from three air traffic control centres:

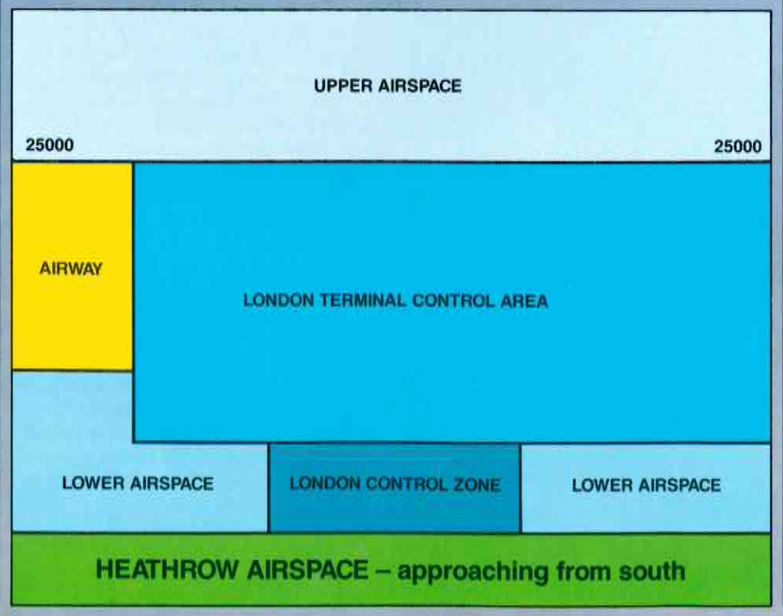
London Air Traffic Control Centre (LATCC) at West Drayton, Middlesex, which deals with traffic up to 55 degrees N. It has a sub-centre at Manchester International Airport.

Scottish ATCC at Prestwick, Ayrshire, handles traffic north of 55 degrees N.

Oceanic Area Control Centre looks after traffic over the eastern North Atlantic.

Within the FIRs are areas of controlled airspace, divided into five parts:

1. **Control Zones** surround and protect major airports.
2. **Control Areas** are airspace more than ten miles wide within which a number of airways run parallel or intersect.
3. **Terminal Control Areas (TMAs)** protect the intersections of busy airways and groups of large airports.
4. **The Airways,** which could be described as motorways in the sky, connect the TMAs. The airways are corridors of space ten miles wide up to a height of 24,500ft from a base which is usually between 5,000ft and 7,000ft. Above the airways Upper Air Routes cater for high flying aircraft, many of which are over-flying UK airspace.
5. **Special Rules Zones and Special Rules Areas** also provide protection around certain major airports. Heathrow Airport is protected by a Control Zone extending up to 2,500ft and controlled by ATC at Heathrow. Above this airspace lies the confluence of several major airways, which are controlled from the London Air Traffic Control Centre.

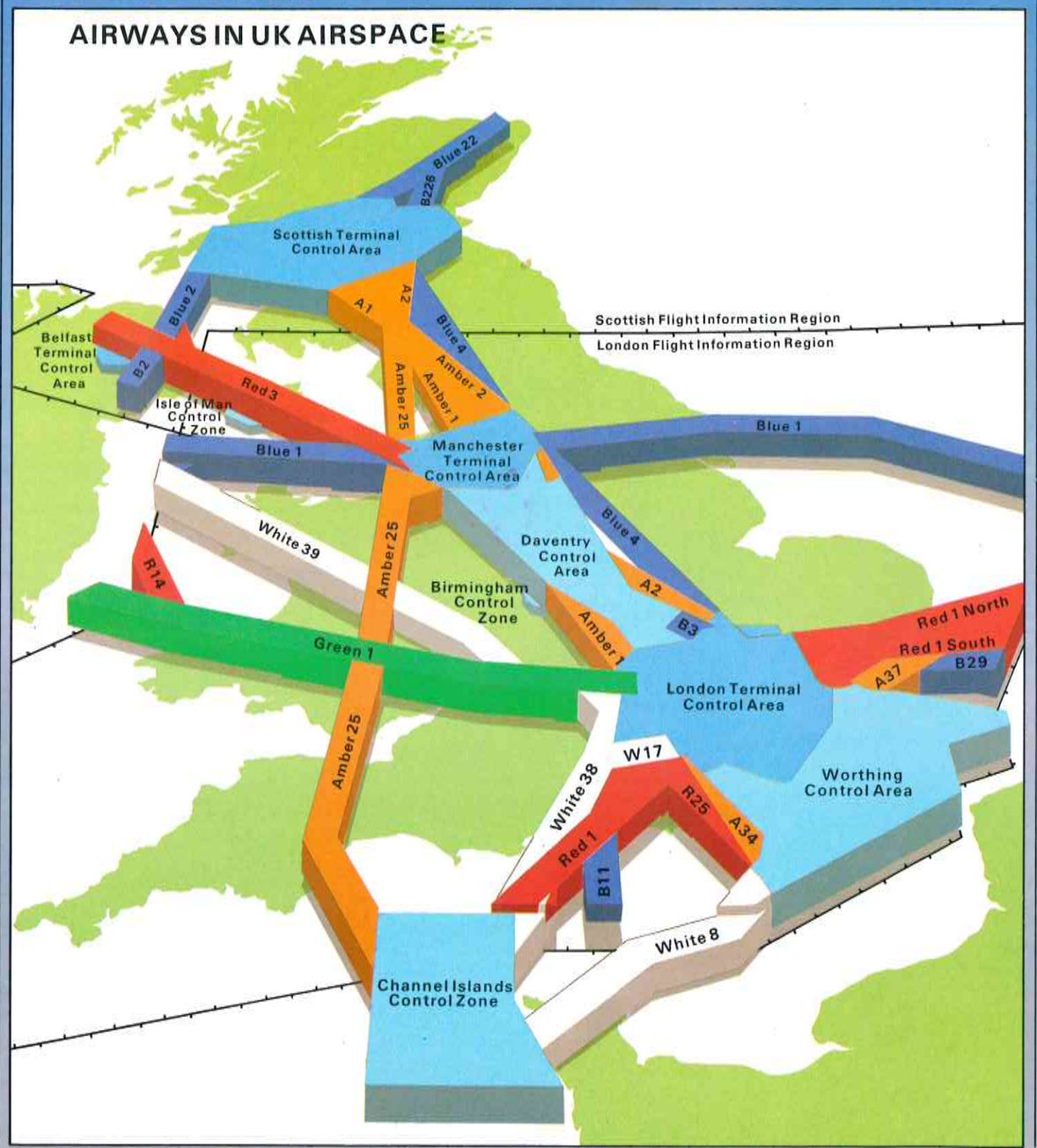


HEATHROW AIRSPACE – approaching from south

NATIONAL AIR TRAFFIC SERVICES

Air traffic control over the United Kingdom and at most of the major airports is provided by the National Air Traffic Services (NATS), an organisation responsible jointly to the Civil Aviation Authority (CAA) and the Ministry of Defence (MoD) for the guidance of both civil and military air traffic.

The prime objective of NATS is to ensure the safe, orderly and efficient flow of air traffic, but the system is also designed to minimise operational delay, fuel consumption and aircraft noise.



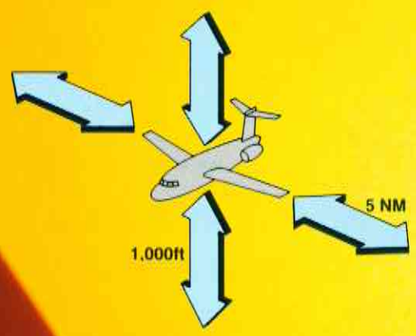
SERVICES PROVIDED BY NATS

Within controlled airspace the main function of air traffic control is to keep each aircraft safely separated from all others in accordance with internationally agreed standards. This is achieved by allocating different heights or by arranging certain minimum horizontal distances between aircraft. The separation distances vary according to the appropriate rules. For example, an aircraft flying in the Heathrow Control Zone under radar surveillance will be separated from other aircraft at the same height by at least three nautical miles. If two aircraft are less than three nautical miles apart horizontally, they are separated vertically by at least 1,000ft.

As well as ensuring that aircraft are adequately separated, ATC provides flight information and alerting services to aircraft flying under their control.

Flight information consists of all the data required for safe navigation of aircraft, such as radio frequencies for air/ground communications, the serviceability of navigation aids, the height, speed and direction of flight of other aircraft in the vicinity and the weather conditions prevailing en route and at the destination airport.

Should an emergency arise, the alerting service brings into action all organisations that can provide assistance – airfield and local fire services, the police, the Rescue Co-ordination Centre, HM Coastguard and the RNLI. Over the seas surrounding the UK the rescue services are supported by maritime reconnaisance aircraft and winch-equipped civil and military helicopters.



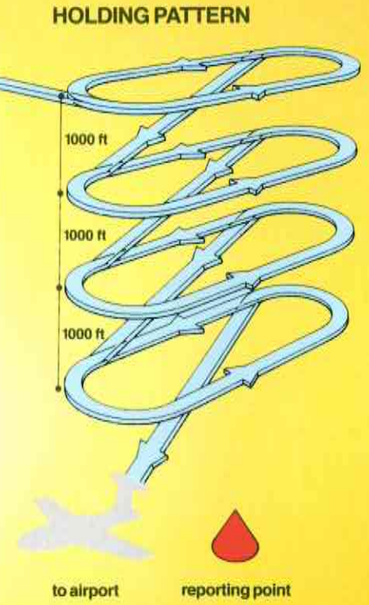
CONTROLLING INCOMING AIRCRAFT

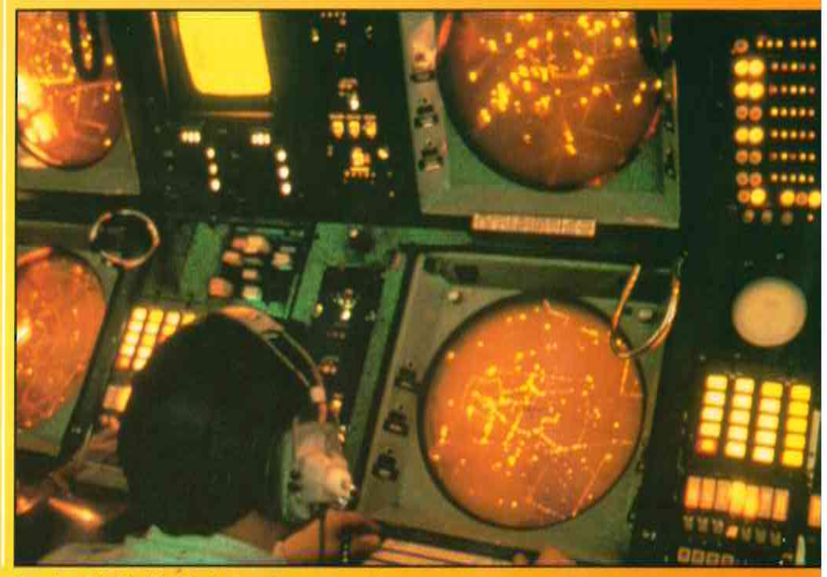
Aircraft approaching Heathrow are directed by the London Air Traffic Control Centre to one of four reporting points located by radio beacons at Bovingdon, Lambourne, Biggin Hill or Ockham. Before they land at the airport, pilots need to know the prevailing weather conditions, the runway in use and the navigational approach aids available. This information, known as the Automatic Terminal Information Service, is recorded and continuously transmitted on the radio frequencies of the radio beacons. Pilots receive this recorded information while their aircraft are approaching the beacons and before direct radio contact is established with the Heathrow tower. A similar service is operated for departing aircraft, by transmitting the information over one of the airport's local VHF frequencies. These messages are updated from the Approach Control Room every half an hour or whenever there is a significant change in the information.

At peak times there is a "rush hour" in the air just as on the ground and aircraft may arrive more quickly than the airport is able to land them. It is essential that the landing separation is maintained, so they are instructed to form a "stack" by circling at different heights around the reporting points.

To avoid wasting fuel and delaying passengers, a scheduling committee of all airlines using the airport reduces traffic peaks at the busiest hours as far as possible by agreeing staggered arrival and departure times.

HOLDING PATTERN





London Air Traffic Control centre

IN HEATHROW CONTROL TOWER

In the control tower at Heathrow there are two distinct air traffic control functions – approach control and aerodrome control. Although on different floors, the procedures used ensure these two provide a fully integrated service.

Approach control, located on the sixth floor of the tower, is responsible for aircraft arriving at Heathrow. It controls them from the moment LATCC hands them over until they have been lined up to land on one of the runways, when aerodrome control takes over.

Aerodrome control operates from the Visual Control Room at the top of the tower, some 120ft from the ground, giving a panoramic view of the airport. Aircraft are controlled from here on their final approach to land, when they are preparing for departure, when they are taxying and during actual take-off. Aircraft and vehicles moving on the runways and taxiways are also controlled from the Visual Control Room.

APPROACH CONTROL

In the Approach Control Room six controllers work as a team. They consist of two Approach Controllers, two No. 1 Radar Directors, a No. 2 Radar Director and a Special Visual Flight Rules Controller. The team work in semi-darkness so that they can see their radar displays as clearly as possible. Each Approach Controller, with his No. 1 Director, controls the traffic from either Bovingdon and Lambourne in the north, or from Ockham and Biggin Hill in the south.

When the aircraft is approaching the reporting point, LATCC informs the Approach Controller, who listens for the first call from the pilot when the aircraft's radio has been tuned into Heathrow's "approach" frequency. He instructs the pilot to enter the "stack" at the reporting point or, if there is no delay, the radar controller will pass instructions which will bring the aircraft into the sequence of landing traffic.

The Approach Controllers and the two No. 1 Directors work closely together, instructing pilots to adjust their height, speed and route so that two orderly streams of aircraft, one from the north, the other from the south form the approach pattern to the airport.

Aircraft in these two streams are handed over to the No. 2 Radar Director so that he can integrate them into a single stream of aircraft approaching the runway. At this stage, a correct landing interval must be established that ensures all aircraft are correctly separated, depending on the prevailing weather conditions and type of aircraft involved. Because of their great size and weight, wide-bodied aircraft, such as the Boeing 747, Tristar and DC10, and also Concorde, create more turbulence to the air through which they pass than smaller or slower aircraft. As this turbulence can upset the flying characteristics of lighter aircraft following behind, greater separation distances have to be provided.

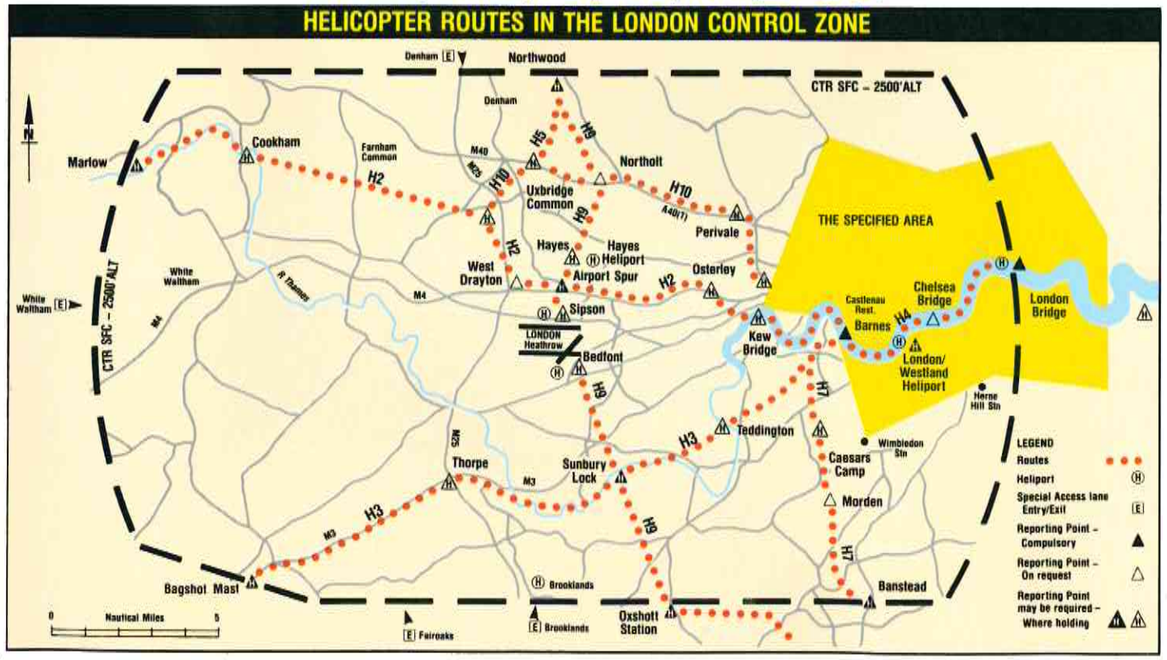
The Special Visual Flight Rules Controller (SVFR) in the Approach Control Room is responsible for helicopters, executive and light aircraft that want to land or are flying within the London control zone and do not join the main stream of traffic. These aircraft are fitted into the approach pattern to cause as little inconvenience as possible to the main commercial traffic.

In addition, the SVFR controller is responsible for the control of numerous "non standard" flights which take place within the London Control Zone. These flights require special handling because of the nature of their operations e.g.

• Pipeline surveys • Parachute drops • Airships • Air displays • Sports events • Banner towing

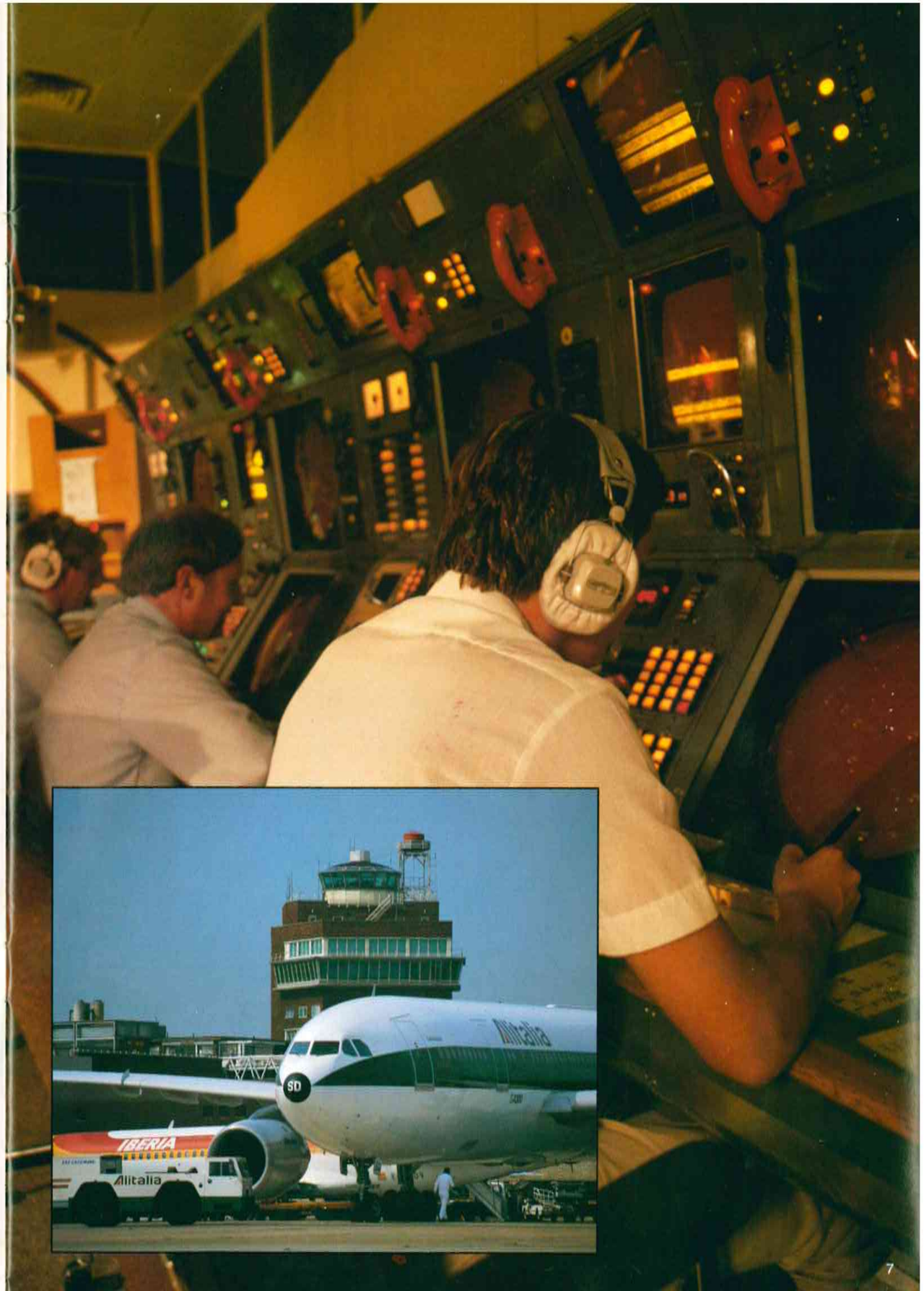
Helicopters are generally required to fly along special helicopter routes in the London area to keep them over thinly populated areas such as parks or rivers.

HELICOPTER ROUTES IN THE LONDON CONTROL ZONE



Approach control operates on the 6th floor ▶

The visual control room is located at the very top of the tower ▶



AERODROME CONTROL

When the two streams of approaching aircraft are satisfactorily merged into one stream and aligned with the runway at a distance of some six to eight miles from touchdown, communication is transferred to the Air Arrivals Controller who sits in the Visual Control Room at the top of the tower. It is his responsibility to make sure that runways are safely used to their maximum capacity.

When, from his commanding position overlooking the whole of the airfield, the Air Arrivals Controller can see that the runway itself is clear, he then issues the landing clearance to the first incoming pilot. He gives the current direction and strength of the surface wind, condition of the runway when necessary and, if for any reason it is not safe to land, he will issue instructions to "go around".

To monitor the spacing between aircraft the controller uses the Distance from Touchdown Indicator (DFTI) which shows part of the radar picture that is used in approach control displayed on a small tube so that the controllers can see the aircraft's distance from its touchdown point and its separation from the next aircraft.

▲ *Ground Movement Radar*
◀ *Distance from Touchdown Indicator*
▼ *Inside the visual control room*

GROUND MOVEMENT CONTROL

After the aircraft has landed, it should leave the runway as soon as possible to unload its passengers or freight and to keep the runway clear for the next arrival which may be fast approaching the runway threshold. When the aircraft is clear of the runway the Air Arrivals Controller instructs the pilot to contact the Ground Movement Controller who then directs the aircraft to its parking stand.

The Ground Movement Controller watches the inbound taxying aircraft's progress and integrates its movement with other aircraft and vehicles. He is responsible for separation between taxying aircraft, both arriving and departing, aircraft being towed and airport service vehicles. All this traffic is in radio communication with the Ground Movement Controller.

In the daytime, when there is good visibility, he controls aircraft and vehicles by direct observation which is why the Visual Control Room occupies such a commanding position in the airport complex. At night, or in poor visibility, a radar called the Aerodrome Surface Movement Indicator (ASMI) is used to monitor aircraft and vehicle movement. Its scanner is mounted above the roof of the Visual Control Room at the top of the tower. It is a downward-looking primary radar with a scanner rotating at very high speed. Runways and taxiways show up clearly on the display as well as the aircraft and vehicles which need to be tracked. The ASMI display in the Heathrow Visual Control Room, like television, is bright enough for daytime viewing.

At night, the aircraft are assisted by green centreline and red stop bar lights embedded in the taxiways. These lights can be illuminated in sections to allow a discrete route to be signalled to ensure that no two aircraft are in or crossing the same section at any one time. The lighting system is operated by an Air Traffic Control Assistant in the Visual Control Room who acts on instructions from the Ground Movement Controller. The lighting control panel is designed in the form of an airport map, with press switches which directly operate the lighting system on the airfield.

The Lighting Control Panel

On the ground aircraft movements have to be integrated with a variety of other traffic.

CONTROLLING DEPARTING AIRCRAFT

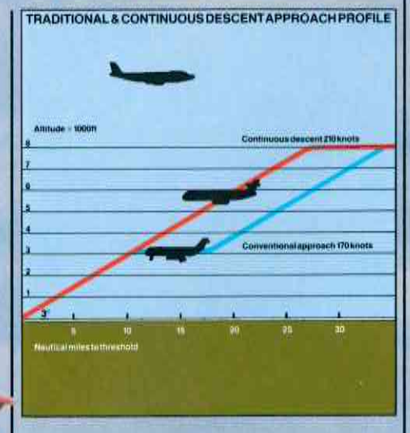
When an aircraft has loaded its fuel, catering supplies, baggage and passengers, the doors are closed and seat belts fastened, and the pilot makes a radio call to the Ground Movement Planner in the Visual Control Room for permission to start engines. The Ground Movement Planner advises the pilot when to start so that he will not be unduly delayed either in the air or on the ground, thus saving fuel. He has to consider how many other aircraft have started up, whether there is any congestion along the outbound air routes, both in the UK or abroad, and the availability of time and height "slots" made necessary by the congestion. The Ground Movement Planner gives the pilot "start-up" clearance and when he is ready to move, the Ground Movement Controller takes over. He allows the aircraft to be pushed from its stand by tractor, advises the pilot of the runway in use and guides him to the runway holding point, making sure that there is sufficient separation between the aircraft and vehicles moving in the operational areas of the airport.

DEPARTURE

As an aeroplane approaches the holding point on the taxiway, responsibility is transferred to the Air Departure Controller, who lines up the aircraft in departure sequence to obtain the maximum use of the runway concerned. For example, when two aircraft of a similar type are departing in rapid succession, one for a north-bound destination followed by one for a south-bound destination, they may be allowed to leave one minute apart, but, depending on the aircraft type and specific departure route, this time interval may be increased. With the aircraft lined up in a take-off sequence the Air Departure Controller issues individual take-off clearances. When each aircraft is safely airborne it is handed over to the London Air Traffic Control Centre, which continues the process of seeing it safely on its way through the London Region, before it is handed over to a controller in an adjacent Region.

NOISE ABATEMENT

Aircraft noise is a nuisance for most people who live near the airport or under one of the flight paths. Wind, temperature and humidity changes can make a great deal of difference to the amount of noise heard at any particular time. However, a number of measures are taken to minimize the problem. Over built-up areas, minimum noise routes have been defined which carefully route aircraft over the less densely populated areas. Engine climb power is also reduced for the period when aircraft must fly over built-up areas. Different runways are used for take-off and landing and these are regularly alternated so that noise is spread equally over the areas lying beneath the landing and take-off routes, and flights are severely restricted at night. "Continuous descent approach" techniques from the stack to touchdown are regularly used in a further attempt to reduce the amount of noise reaching the ground.



TELECOMMUNICATIONS

Heathrow Air Traffic Engineering Services are essential in ensuring the safe and expeditious flow of aircraft into and out of Heathrow Airport. Air traffic controllers at Heathrow rely on high integrity electronic systems for radar, communications and navigational aids for control of aircraft on approach and landing. These services may be sub-divided into four main areas:

1. Telecommunications
2. Telegraphic communications
3. Navigational aids
4. Radar

Top: CACC Message editing terminal
Above: VHF receiver station

Good communications are essential if air traffic control is to operate safely and efficiently in the busy airspace around Heathrow Airport. For direct communications between Air Traffic Control and aircraft, 14 VHF Radio Telephony channels are provided. Each frequency has a standby and in some cases a third transmitter and receiver.

This level of service recognises the need for continued communication between the controller and the aircraft in all circumstances.

Eleven channels of UHF ground communications are also provided for a variety of users; for example, Ground Movement Control, Emergency Services, and Airport Operations. Some UHF channels are linked to VHF channels, so that Air Traffic Controllers can hear and speak to both aircraft and vehicles as if they were on the same channel.

The VHF and UHF channels are fed through a distribution and control system (RDCE) to the air traffic control positions, allowing controllers to select from a variety of radio channels at the desk positions. Intercom facilities enable communication between controllers without removing their headsets.

In addition, all operational telephone lines are fed through another control and distribution system, (TDCE). This enables any controller to select from a variety of operational telephone lines. The controller is able to carry out a telephone conversation whilst monitoring the R/T channel, using his headset facilities.

All radio and telephone conversations are recorded on 32-channel tape recorders, in accordance with the standard laid down by the International Civil Aviation Organisation (ICAO). The tapes are then stored for 30 days before erasure and re-use. In the event of an incident these tapes may be used for investigation purposes.

A facility available to aircraft is the Airport Terminal Information Service (ATIS). This consists of recorders providing arrivals and departure information. The messages containing meteorological and other information, are replayed continuously. This obviates the need for controllers continually to repeat information to outbound and inbound aircraft.

TELEGRAPH COMMUNICATIONS

Civil Aviation Communications Centre (CACC) International airline operations are supported by a world-wide point-to-point communications system, called the Aeronautical Fixed Telecommunications Network (AFTN), which is used for air traffic purposes. Its task is to pass messages containing flight plan, NOTAM, and meteorological information in a format laid down by ICAO. Most developed countries have one main switching or relay centre feeding a national network of sub-centres and terminals. The UK centre is in the Control Tower at Heathrow, where the international AFTN circuits from neighbouring countries terminate. These circuits are connected to seven other similar centres in Europe and North America.

In the CACC at Heathrow all routeing is fully automatic. The maximum capacity is one-quarter of a million messages per day and an average day's throughput is 100,000 messages. Messages may also be transmitted automatically to addresses by telex either as normal routeing or as a diversion from a direct line connection.

Central Bulletin System

To provide airline operators with information on air navigation facilities and services, and the procedures associated with them, all countries must provide an Aeronautical Information Service (AIS).

The safety and efficiency of air navigation depends on this information, which needs regular and rapid updating and is issued as a "NOTAM" (Notice to Airmen) – usually of a temporary nature.

The UK Aeronautical Information Service has a central office at Pinner and a number of outstations at major UK Airports.

The Central Bulletin Service Section collates and edits the NOTAM material and provides daily bulletins to AIS users, with the aid of a computer based system.

Five 1200 modem lines connect with outstations at Prestwick, Glasgow, Manchester, Birmingham and Gatwick. Selected bulletins are transmitted from the system to these AIS centres on a daily basis.

Volmet

The Automatic Volmet system, in the computer centre, receives regular weather reports from the message switching computer, giving actual reports for all major UK and nearby continental airports.

Top: Monitoring the VOLMET audio output
Above: CACC message switching equipment
Right: Global OPMET self-briefing facility

The Automatic Volmet computer compiles three Area Bulletins, which are then converted into synthesised speech and passed to West Drayton for transmission on the Area Coverage system.

The Volmet channel gives aircraft pilots instant up-to-date weather reports for their destination airport.

Global Opmet

In the AIS briefing area two computer terminals available to aircrew or airline despatchers, provide a "self-briefing" facility. Users can select specific geographical areas and order an instant printout of weather forecasts and trends.

The self-briefing computers are fed with information from the CACC computer system. Each weather station world-wide supplies current weather reports and forecasts every half-hour.

Civil Aviation Packet Switching Integrated Network (CAPSIN). Based on modern "packet switching" principles CAPSIN is intended to meet most of the CAA's requirements for both operational and administrative data transfer with connections to other European centres and to North America.

Telephone Exchange

The computer-based exchange serves the control tower and various airfield and ancilliary sites. It also provides the Southern Switching centre for the Administrative Telephone Network (ATN). Along with its sister exchanges at Manchester and Prestwick the ATN provides telephone communication between all the major CAA stations.

NAVIGATIONAL AIDS

INSTRUMENT LANDING SYSTEM

When the Radar Director in Approach Control has positioned the aircraft on to the extended centreline of the runway, the pilot completes the approach by using the Instrument Landing System (ILS).

The ILS is a radio system which transmits two beams, one – the localiser – operating on VHF, the other – the glidepath – operating on UHF. The localiser beam defines the centreline of the runway and extends along the approach path for twenty-five miles. The glidepath beam defines the angle or glidescope which the aircraft should fly while following the localiser course to approach the runway, safely clearing all obstacles. This system, coupled to an aircraft's automatic flight control system facilitates automatic landings in very poor visibility. The ILS equipment is tested to a 10-million-to-one failure factor. It employs duplicate electronic systems, uninterruptable power supplies and continuous monitoring of signal accuracy and integrity.

ILS localiser array

There are three internationally recognised categories of ILS performance:

Category I
For operations with a minimum cloud base of 60 metres and forward visibility down to 600 metres runway visual range (RVR).

Category II
For operations with a minimum cloud base of 30 metres and forward visibility down to 400 metres RVR.

Category III
For guidance down to and along the runway with no minimum cloud base. This enables aircraft to land and take-off in fog conditions if they are equipped with a suitable flight control system. The four main approaches at Heathrow can operate in Category III.

The operational integrity of the instrument landing systems is checked every four months by the Civil Aviation Authority's Flying Unit, which uses aircraft equipped as flying laboratories to measure and check the accuracy of the systems.

▲ *ILS glidepath array*

▼ *On the ground aircraft movements have to be integrated with a variety of other traffic*

IRVR displays

RUNWAY VISUAL RANGE

Landing or taking off in low visibility requires accurate measurements of the visibility along the intended runway. A system called the Instrumented Runway Visual Range (IRVR) automatically measures and provides this information. Three measurements are taken on each runway – at each end and in the centre.

IRVR equipment involves using an instrument called a transmissometer which measures the loss of light from a source projected over a standard distance. The measurements are fed into a computer together with other data, such as runway lighting intensities, giving a computed runway visual range of each area of the runway. This is then displayed in all the operational control rooms of the Control Tower. The information is transmitted to pilots by air traffic control when the visibility falls below 1,500 metres.

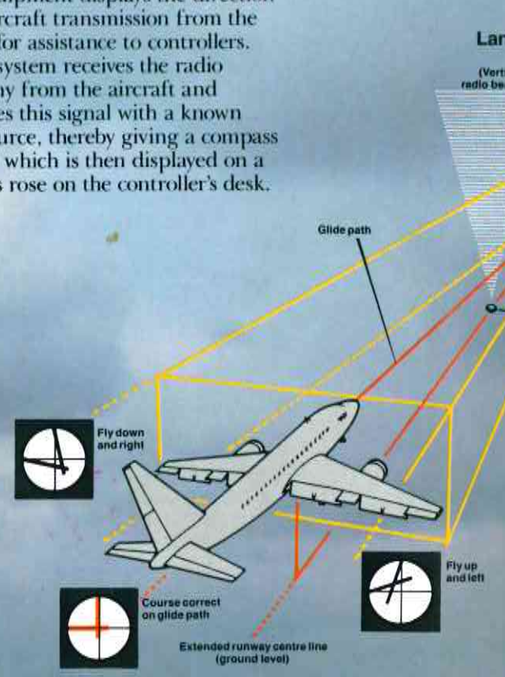
Distance Measuring Equipment
The Distance Measuring Equipment (DME) is situated at mid-point along the runway. This equipment gives a continuous distance from threshold readout to the approaching pilot.

This is achieved by the aircraft "interrogating" the ground equipment which, after a fixed delay, replies to the aircraft. Knowing the delay between its transmissions and the reply, the equipment in the aircraft calculates the distance and displays it in the flight deck.

DRDF display

Digital Resolution Direction Finder (DRDF)
This equipment displays the direction of an aircraft transmission from the airport for assistance to controllers.

The system receives the radio telephony from the aircraft and compares this signal with a known fixed source, thereby giving a compass bearing which is then displayed on a compass rose on the controller's desk.



RADAR

23cm Primary Radar with on-mounted secondary radar ▶

10cm Primary Radar ▼

Approach and Aerodrome Control employ radar systems as an aid to location and identification of all aircraft in their airspace.

Information from various radar sensors is presented on a radar display unit which provides the controller with a continuously updated plan of aircraft movements. This planned presentation readily enables the progress of aircraft to be monitored, both in relation to other traffic and to fixed ground reference points electronically mapped on the radar display. The use of radar to ensure the correct sequence and spacing between landing aircraft, enables Heathrow Air Traffic Control to safely handle up to 34 landings per hour. Without it no more than eight landings could be safely managed per hour. Note – with the inclusion of aircraft departures, Heathrow is capable of handling a peak rate of 71 movements per hour.

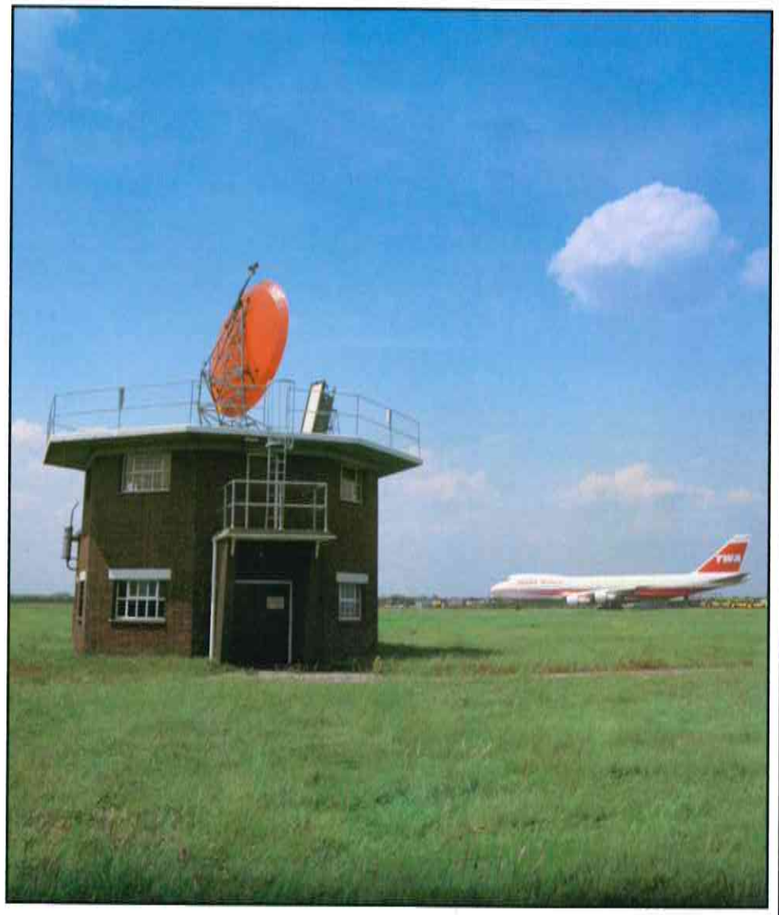
There are two kinds of radar systems used at Heathrow, these are "primary surveillance radar" and "secondary surveillance radar" (SSR).

Primary Surveillance Radar

Primary radar operates by radiating electromagnetic energy and detecting the presence and character of the echo returned from reflecting objects. Electronic processing of these echoes can distinguish the characteristics of an aircraft return and reject unwanted reflections from hills, buildings, trees and rain clouds, etc. Heathrow's primary radar facilities "independently" provide positional and velocity information on all aircraft out to a range of 50 nautical miles.

Secondary Surveillance Radar

Secondary surveillance radar requires the active participation of aircraft. Aircraft engaged in the public transport of freight and passengers are fitted with a transponder which receives a signal from a ground transmitter and sends a reply on a different frequency. The reply is in the form of alphanumeric data and usually includes flight information, route and height. The SSR input to Heathrow is fed via the London Air Traffic Control Centre into a computer for processing and is then overlaid onto the Approach Control primary radar displays. Within the computer the identification code is converted to the aircraft callsign. On the controller's radar picture, each aircraft blip is labelled with its callsign, height and route information.

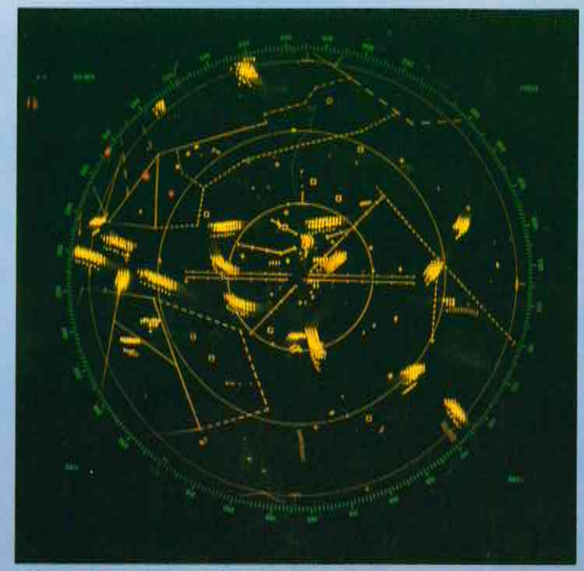


Heathrow uses the following radar sensors:

1. 23cm Primary Radar.
2. 10cm Primary Radar.
3. Heathrow Monopulse Secondary Radar.
4. Debden Monopulse Secondary Radar.

Radar displays

Signals from the various primary and secondary radar sensors are brought together in radar data processing and distribution equipment in the Control Tower. This equipment allows the controller in Approach Control to select his choice of a primary radar service on his radar display along with electronically generated video maps and range marks. These maps provide an accurate indication of the extended centre lines of the airport runways, reporting points and other geographical data.



Heathrow radar display with primary and secondary information

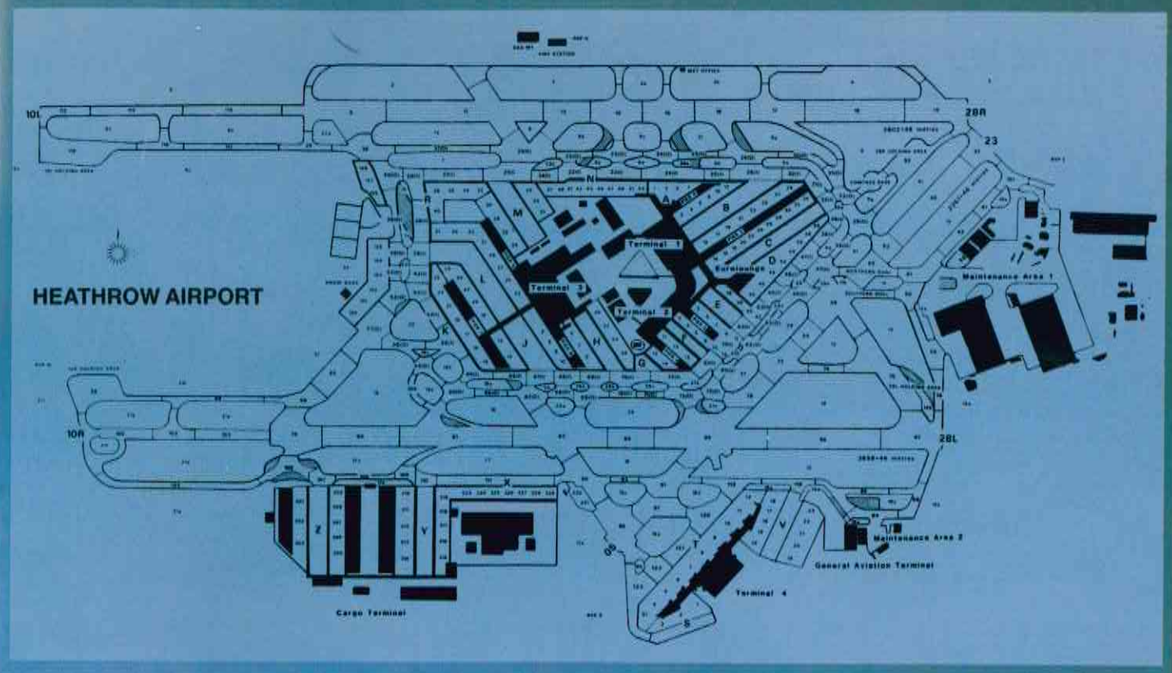
CLOSED CIRCUIT TELEVISION

Closed Circuit Television systems are used to transmit and display information to and from the Approach Control Room. Two systems are used at Heathrow:

DRDF Aerial Array

1. The Stack CCTV system
This system presents a picture of the flight progress strips held for traffic at each of Heathrow's four arrival stacks at Bovingdon and Lambourne in the north, and Ockham and Biggin Hill in the south. This information is transmitted to the London Air Traffic Control Centre so that vacated stack levels can be reallocated to newly arriving aircraft. It also allows information from the northern stacks to be displayed to the sector controlling the southern stacks and vice-versa.

2. Met CCTV system
This system presents meteorological data called "weather actuals" to Approach Control, Aerodrome Control, LATCC, the Meteorological Forecaster, the Meteorological Briefing Office and various other users at Heathrow.



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