



MIKRO-GEN A.T.C.

**TRAINING
MANUAL**

AIR TRAFFIC CONTROL SIMULATOR

LOAD " "

1 INTRODUCTION

This program is not a game, but sets out to realistically simulate air traffic control which is a subject touched on little in the everyday world. Whilst most people who have flown, whether for business or pleasure, appreciate that the aircraft in which they have travelled has been "controlled" in some way, few actually realise the complexity of the system which ensures their safety. And of those who do know what the initials ATC stand for, not many appreciate that most of the work involves controlling aeroplanes as they fly between airports, not just as they approach places such as Heathrow and Gatwick.

The main aim of Air Traffic Control is to ensure a safe and expeditious flow of air-traffic; safe in that all aircraft must be kept apart, and expeditious so as to avoid undue delay. To facilitate this, airways, so-called "motorways in the sky", have been established linking the major airports of the world. It is within these airways, and the Terminal Areas which surrounded the airports themselves, that most of the air traffic now flies, safely controlled by ATC.

It is the aim of this program then to simulate this Area Control of Air Traffic. The actual area used is the Hurn sector of the London Air Traffic Control Centre, centred roughly on the Bournemouth/Southampton area - encompassing most of the air traffic from the south and midlands of England going to and from Spain, Portugal, parts of France, Africa and the United States.

You must climb and descend the aircraft according to the rules set out in this booklet, guiding them through your airspace so that when they leave they are going in the right direction, at the correct height, and safely separated from each other.

The various types of traffic and how they are dealt with is detailed later, but first it is necessary to explain some of the many terms and abbreviations used in ATC.

2 GLOSSARY OF TERMS AND ABBREVIATIONS

- AGREED LEVEL** - A flight level to which an aircraft should be climbed or descended ready for the next sector.
- AID** - Aircraft Identification - the actual call-sign of an aircraft (eg BA123). Flight Plan field 2.
- AIRMISS** - The term used when two aircraft come too close to each other without actually colliding. The pilots file an Airmiss Report and the matter is investigated by the CAA.
- AIRSPACE** - Generally the air in which aircraft fly. It is divided into many different types - see CAS, TMA, Airway, UAS, FIR.
- AIRWAY** - A corridor of Controlled Airspace 10 miles wide along which aircraft fly between airports.
- ATC** - Air Traffic Control.
- ATCC** - Air Traffic Control Centre - the place from which all aircraft in an area are controlled, except when they are within 40 miles of their destination airport.
- CAA** - Civil Aviation Authority - the government body responsible for civil aviation in the UK.
- CAS** - Controlled Airspace - the airways and areas in which aircraft under Air Traffic Control must be kept.
- CID** - Computer Identification Number - the computer's reference number for an aircraft - Flight Plan field 1.
- ETA** - Estimated Time of Arrival - When a pilot expects to arrive either at an airport or fix along his route.
- FIELD** - A part of the flight plan of an aircraft stored in the computer.
- FIR** - Flight Information Region - the whole airspace which comes under the control of one Air Traffic Control Centre. Usually split up into smaller areas called Sectors.
- FIX** - A point along a flight's route, usually where there is a radio beacon or reporting point.
- FL** - Flight Level - the altitude of an aircraft in hundreds of feet (eg FL310 = 31,000 feet).
- FP** - Flight Plan - the details of each flight as stored in the computer. See section 5.

- FPS** - Flight Progress Strip - a strip of paper on which flight details are printed and a controller keeps a record of his instructions to the pilot.
- HEADING** - The direction along which an aircraft's nose points, in degrees from magnetic north.
- HOLDING PATTERN** - A racetrack shaped route which an aircraft flies around whilst awaiting its turn to land.
- KNOT** - A nautical mile per hour. All speeds in ATC are measured in knots.
- LABEL** - A block of data which gives information relating to a particular aircraft on the radar display.
- LATCC** - London Air Traffic Control Centre, based at West Drayton, near Heathrow.
- NM** - Nautical Mile - all distances in ATC are given in nautical miles.
- REPORTING POINT** - A point along an aircraft's route at which the pilot should report his position to ATC.
- TMA** - Terminal Area - a large area of controlled airspace where several airways meet around a major airport.
- UAS** - Upper Airspace - all airspace above FL245 (24,500 feet) is controlled airspace - thus an aircraft above FL245 does not need to stay within the boundaries of airways.

3 HURN SECTOR - DESCRIPTION

The map in the centre pages shows the layout of the Hurn Sector, together with the sector boundary and some of the adjacent airspace. The crosses represent the Fixes in the sector, those with five letter names are reporting points-there are no radio beacons located there. The rest are radio beacons, the three letter abbreviations for their full names are:

- | | | | |
|------------|------------|------------|-----------|
| FAW | - Fawley | OCK | - Ockham |
| IBY | - Ibsley | WOD | - Woodley |
| MID | - Midhurst | | |

There are five airports shown:

- | | | | |
|-------------|----------------------|-------------|------------|
| EGHD | - Plymouth | EGKK | - Gatwick |
| EGHH | - Bournemouth (Hurn) | EGLL | - Heathrow |
| EGHI | - Southampton | | |

Others you will come across are:

EGBB - Birmingham
 EGGW - Luton
 EGJJ - Jersey
 EGNX - East Midlands

The airway centre lines are shown by the lines joining the fixes. There are two types of airways - Lower Airways which go from just above ground level up to FL245, and Upper Airways which go from FL245 to FL460, (no civil aircraft flies higher than that except Concorde). Upper airways names are prefixed with the letter "U".

All airways are named with a colour, (Amber, Blue, Green, Red or White), and a number, (eg G1 = Green One, UG1 = Upper Green One). Sometimes the name is suffixed with a "W", which stands for West (eg A34W).

The airways which pass through Hurn Sector are given below, with their routings:

A34/UA34	WOD	- MID	- DRAKE		
A34W/UA34W	FAWBO	- KATHY	- ELDER	- SAMTN	
R1/UR1	ORTAC	- KATHY	- SELSI	- MID	- OCK
R1W/UR1W	ORTAC	- ELDER	- THORN	- HAZEL	- MID
UR8	DAWLY	- IBY	- SAMTN	- HAZEL	- MID
UR37	RIDGE	- IBY	- DOVER		
W17	ORTAC	- SAMTN	- HAZEL	- MID	
W38/UW38	ORTAC	- SAMTN	- NORRY		

The edges of the airways are also shown together with the London TMA boundary.

4 SIMULATOR OPERATION

At the start of each session you are asked two questions; first, Skill level? You must reply by pressing one of keys 1 to 9. The lower the number, the lower the skill level.

The main way in which the skill level takes effect is by the number of aircraft to be handled during the game. Each session lasts for one hour and during that hour you will handle between 15 and 60 aircraft (at levels 1 and 9 respectively). As you gain in experience you will be able to handle more flights per hour and progress through the skill levels. In addition there will be more unexpected events at the higher levels (see section 6).

The computer will then generate the required number of flight plans for the coming session. You may have to wait a few seconds while this is done.

Next you will be asked whether you want strips to be printed. If you have a printer connected to your computer you can have a Flight Progress Strip printed for each aircraft as it first appears on your radar. Subsequently you can request a strip on any flight using SR message. Further details are given in section 7.

5 FLIGHT PLANS

Each Flight Plan stored in the computer is divided into several sections (called Fields). They are not consecutively numbered because not all are accessible to the controller.

FIELDS

1	CID	Computer Identification Number (3 figures)
2	AID	Aircraft Identification (call sign) (5 figures)
3	TYPE	Aircraft Type (4 figures)
5	SPEED	Aircraft Speed in knots (at least 100 and less than 1000)
6	FIX	The first Fix on the aircraft's route
7	TIME	The time at which the Flight Plan will be activated - usually the ETA for the Field 6 Fix.
8	LEVEL	The Flight Level at which the aircraft will first appear.
9	REQUESTED LEVEL	The final Flight Level to which the aircraft wishes to climb.
10	ROUTE	The route that the aircraft will take through your sector. This is made up of the abbreviations for the various airways and airports.
11	ACTUAL LEVEL	The actual current Flight Level of the aircraft (begins the same as field 8).
12	CLEARED LEVEL	The Flight Level to which the aircraft is climbing or descending under your control. (Begins the same as field 8).

There are many more fields in each Flight Plan, but most are used only by the computer in its calculations and updating. Most fields can be changed using the various input messages detailed in section 7, and the data can be seen at any time with an FR message.

The Flight Plans themselves are randomly generated at the start of each session using data from the following tables to make a realistic simulation.

AIDs

Each AID is made up of a two letter airline code and a three figure number.
The airlines used are:

AE	Air Europe	KD	British Island Airways
AF	Air France	KG	Orion Airways
AO	Aviaco	KT	British Airtours
BA	British Airways	OM	Monarch
BD	British Midland Airways	PA	Pan-American Airways
BR	British Caledonian Airways	PM	Brymon Airways
BX	Spantax	RR	Royal Air Force
BY	Britannia Airways	SA	South African Airways
DA	Dan-Air	TP	Air Portugal
IB	Iberia	TW	Trans World Airlines
JM	Air Jamaica	UK	Air UK
JY	Jersey Airlines		

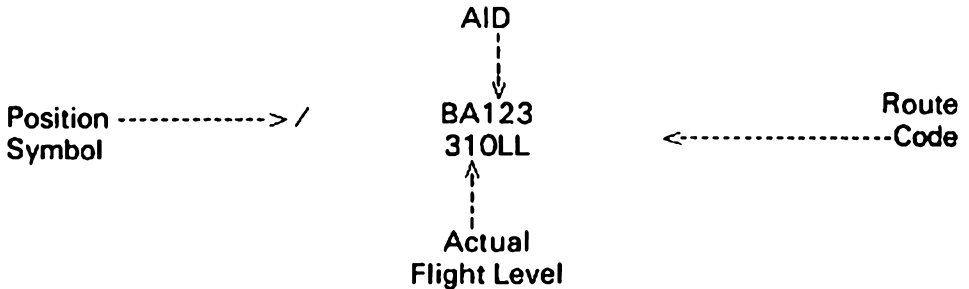
TYPES

BA11	BAe 111	2	jet	100 seats
BA46	BAe 146	4	jet	100 seats
B707	Boeing 707	4	jet	180 seats
B727	Boeing 727	3	jet	180 seats
B737	Boeing 737	2	jet	120 seats
B747	Boeing 747	4	jet	490 seats
B757	Boeing 757	2	jet	180 seats
B767	Boeing 767	2	jet	250 seats
CONC	Concorde	4	jet	100 seats
DC8	Douglas DC8	4	jet	200 seats
DC9	Douglas DC9	2	jet	150 seats
DC10	Douglas DC10	3	jet	350 seats
DH6	Twin Otter	2	prop	10 seats
DH7	Dash 7	4	prop	40 seats
EA30	Airbus A300	2	jet	300 seats
E110	Bandeirante	2	prop	20 seats
FK27	Fokker F27	2	prop	40 seats
HP7	Herald	2	prop	40 seats
HS74	HS 748	2	prop	40 seats
JAGR	Jaguar	2	jet	fighter
L101	TriStar	3	jet	340 seats
MRCA	Tornado	2	jet	fighter

6 CONTROLLING AIRCRAFT

When the program starts you will see the real time clock at the top left of the screen begin at 1200 hours. All simulation sessions start at this time. Shortly afterwards you will see the first aircraft Label appear.

Every aircraft under your control is shown with a Label to the following format:



AID - aircraft call-sign.

Position Symbol - the actual position of the aircraft is at the centre of the slash.

Route Code - a one or two letter code that tells you which way the aircraft is routing. If it is going to land at a UK airport then the last two letters of the airport's location code are used; e.g. LL = EGLL = Heathrow (see section 3).

The single letter codes are:

- A** - Atlantic (west bound along UR37 or UR8).
- D** - Dover (east bound along UR37 or UR8 but not landing in the UK).
- H** - Hurn (south bound along R1/W17/W38 etc).
- X** - Crossing (military aircraft not under your control crossing through your airspace).

The aircraft move realistically across the screen, following their Flight Plan routes (unless otherwise directed by you) and are updated every five seconds. The screen is to a scale of three pixels per nautical mile.

In real life a controller gives instructions to the pilot of an aircraft by radio. Obviously in this simulation we cannot do this so the instructions are input as messages to the computer. The aircraft under your control will respond accordingly.

HAZARDS AND EMERGENCIES

DANGER AREA - The danger area south of airway Red One must be avoided at all times. If one of the aircraft under your control enters the area you will be immediately suspended. Only RAF aircraft can fly through the danger area, but they are not under your control.

MILITARY CROSSERS - RAF aircraft (with the AID prefix of RR) will cross through the airways of Hurn Sector at regular intervals. You are not controlling these aircraft and therefore must keep your traffic away from them.

RADIO FAILURE - Occasionally an aircraft may experience a radio failure and lose contact with you. If this happens you will no longer be able to control the aircraft and, in the absence of any instructions from you, the pilot will continue to fly according to his own flight plan. This means that the aircraft may climb or descend unexpectedly and hence you must keep all your other traffic away from the radio failure aircraft.

PRESSURISATION FAILURE - If an aircraft experiences a pressurisation failure the pilot will descend immediately to FL100, the highest safe level. You must not climb the aircraft again, but give it priority over everything else. If it has just departed from a UK airfield you must turn it back on a course for that airfield. Remember the pilot will be very busy and so you must give him radar headings all the way back.

7 MESSAGE TYPES

The available message types and the rules governing their use are set out below. Messages can be entered at any time the computer is running, except when the Flight Data Display is being used (see section 9). The message being entered appears on the bottom line of the display, and any computer response on the line above (except with "FR").

When the entry line is blank the next key pressed will be taken as a "message type" entry and, if it is valid, the message abbreviation will appear followed by a space (note that all spaces are shown as apostrophes for clarity). After that the message itself may be entered via the normal keyboard. The message will be processed when "Enter" is pressed and the computer will reply accordingly.

Note that when AID is called for in the message entry, either AID (5 figures) or CID (3 figures) may be used. In addition by using capital shifted "5" to "8" you have control of a square cursor on the screen. When this is positioned over an aircraft's position symbol a message can be entered referring to that aircraft by using just "C" as the AID. Eg. HR'C or SD'C400.

If just the message type is pressed followed by ENTER then the computer will respond with the required message format as a reminder. The full

message can then be entered on the input line, referring as necessary to the prompt.

Below is a table of all message types, given with the abbreviation, corresponding key, required format and explanation respectively. Where part of the format is optional then that part is shown in brackets.

AM -key A - AM'AID'FIELD NUMBER'NEW DATA

AMENDMENT - used to change data fields in a Flight Plan which cannot always be changed otherwise. The fields which can be amended are:

- 2 - AID - must be 5 figures
- 3 - TYPE - must be 4 figures
- 5 - SPEED - must be between 100 and 999 knots
- 7 - TIME - must be 4 figures. If changed to present time then the flight will be activated immediately. If a future time then that will be the new activation time. A past time will prevent the flight from ever being activated.
- 8 - LEVEL - must be a Flight Level from 10 to 390. This is useful for changing the actual start level of a flight that is not yet active.

The field must be entered as a single number and any number of fields can be amended in one message and in any order.

eg. AM'BA123'2'BA124'3'B747

DM - key D - DM'AID' (TIME){(LEVEL)}

ACTIVATION - activates a pending Flight Plan. If no time is given then the flight is activated immediately, otherwise it has the same effect as amending fields 7 and 8 if the time and level are given.

eg DM'BA123'1220'110

DR - key E - DR'AID

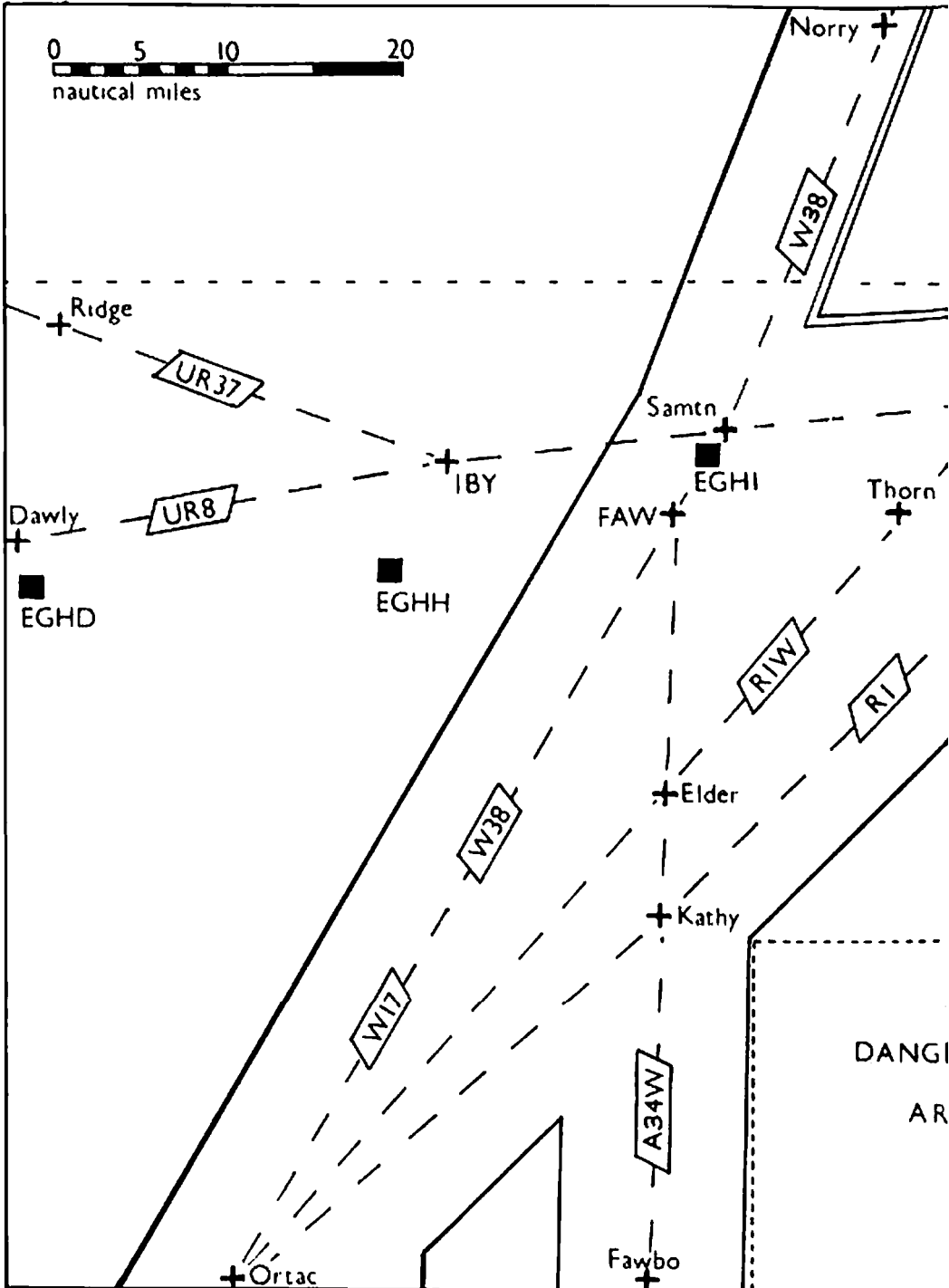
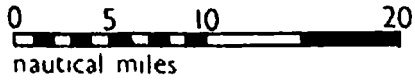
DIRECT ROUTE - This will set an aircraft on course for the last fix on its route through your sector. This is useful when there is little traffic and hence you can cut corners on a route, saving a pilot time and fuel.

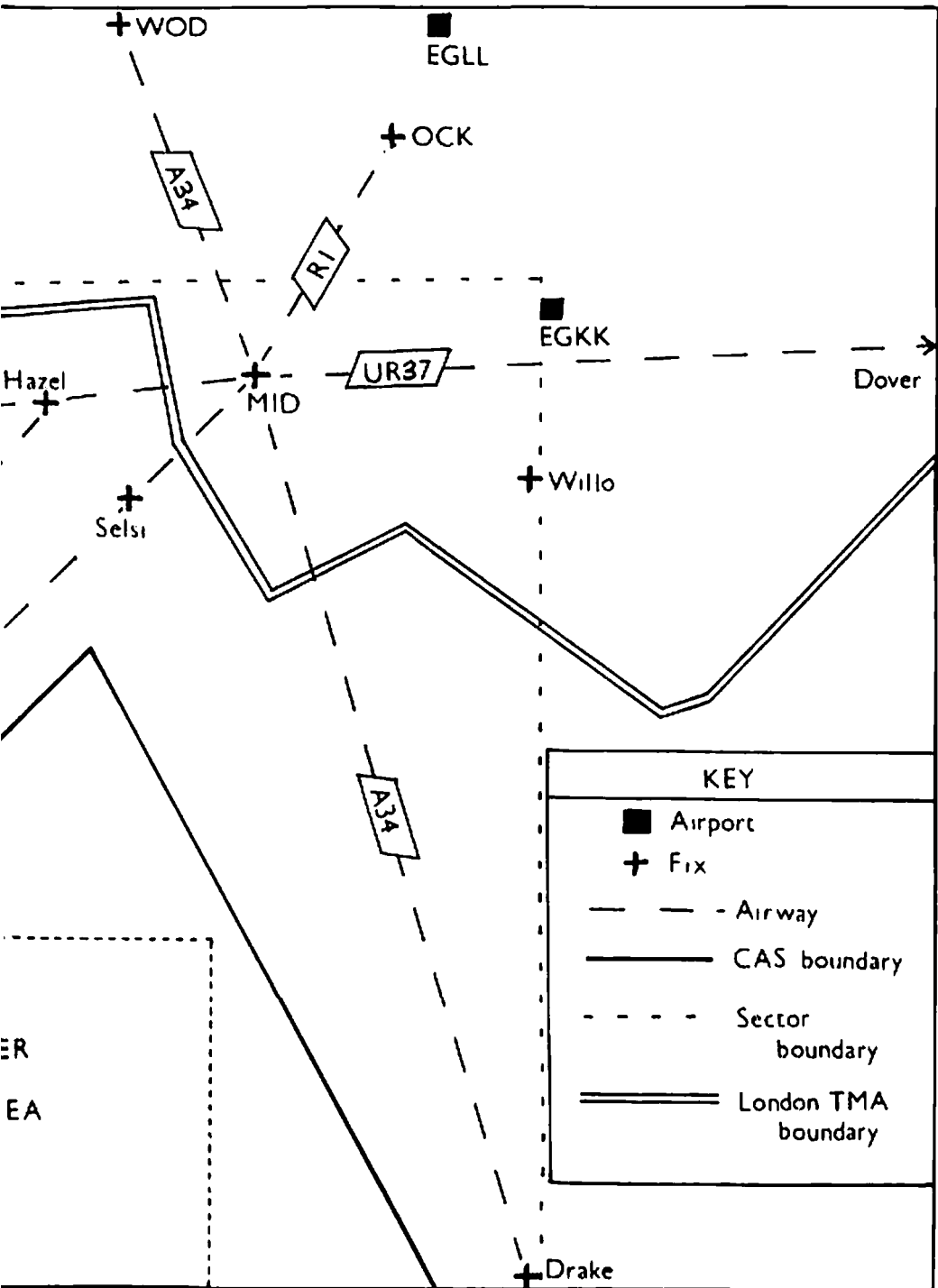
FR - key F - FR'AID

FLIGHT READOUT - prints the Flight Plan data to the bottom two lines of the screen in the following order:

CID-AID-TYPE-SPEED-FIRST FIX-TIME
LEVEL-REQUESTED LEVEL-CLEARED LEVEL-ROUTE

eg 001 BA123 B747 490 SAMTN 1220
110 350 110 EGLL UR8





KEY	
■	Airport
+	Fix
- - -	Airway
—	CAS boundary
- - -	Sector boundary
==	London TMA boundary

HD - key H - HD'AID'HEADING' (L) or (R)

HEADING CHANGE - change the heading of the aircraft, using degrees (0 to 359) clockwise from magnetic north. The L and R suffix denote left or right turn. If no suffix is given then a right turn is assumed. Note that all aircraft turn at a rate of one degree per second and that headings must be given with three digits.

eg. HD'BA123'230'L

HM - key K - HM'AID' (C) or (R) or (L)

HOLD MESSAGE - when suffixed with L or R this message will make the aircraft fly in a circular Holding Pattern, turning either left or right. The 'C' suffix cancels the hold and the aircraft will set course for the next fix on its route. If no suffix is given then a right turn will be assumed.

eg HM'BA123 or HM'BA123'L

or HM'BA123 'C

HO - key G - HO'AID

HAND-OFF - this message transfers control of the flight to the next sector on its route. This is done when the aircraft reaches the boundary of your sector. London inbounds would be handed-off to the London TMA controller, south-bound flights to the French Centre and Atlantic Traffic to the Cardiff sector at LATCC. Hand-offs are not required in level 1 simulations. After an HO message has been input you lose control of the aircraft and cannot input controlling messages for it.

eg HO'BA123

HR - key J - HR'AID

HEADING READOUT - the computer responds with two figures - the actual present heading of the aircraft and the heading to which you have cleared it. If it is not actually turning then both figures will be the same.

ID - key I - ID'AID

IDENTIFY - this is useful when two aircraft are close together. The position symbol of the selected aircraft will flash for a few seconds.

LB - key O - LB'AID

LABEL DELETE - the aircraft's label will be deleted from the radar display leaving only the position symbol. If the label has already been removed then the second LB input will replace it on the screen. This facility is useful when two aircraft are close to each other causing the labels to overlap.

LT - key Z - LT'AID'HEADING

LEFT TURN - another way of changing heading. Works in the same way as the HD message but always a left turn. No suffix is necessary.

LV - key L - LV'AID'FLIGHT'LEVEL

LEVEL CHANGE - changes the cleared level field of the Flight Plan (12). The aircraft concerned will then climb or descend to that level as appropriate. The level must be in the range 10 to 390.

eg LV'BA123'310

RN - Key T - RN'AID

RESUME OWN NAVIGATION - this sets the aircraft on course for the next fix on its route. This is useful if you have turned the aircraft from its own course and now wish it to continue by itself. Note however that if you have let the aircraft pass that next fix then the RN message will turn the aircraft back to that fix. See also DR above.

RS - key R - RS'AID

REMOVE PLAN - if a plan is not yet active this message will prevent it from being activated. If it is active and displayed then the flight will be immediately removed from the display.

RT - key X - RT'AID'HEADING

RIGHT TURN - as with LT but always turning right.

SD - key S - SD'AID'SPEED

SPEED CHANGE - changes the aircraft speed (Flight Plan field 5), which must be in the range 100 to 990 knots.

eg SD'BA123'420

SR - Key Q - SR'AID

STRIP REQUEST - if the ZX printer is fitted to your computer then this message will produce a printed flight progress strip on the aircraft concerned. The strips take the following format:

Time Fix CID	Cleared Level	AID Type Speed	Requested Level Route
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For example:

1220 SAMTN 001	110	BA123 B747 490	R350 EGLL UR8
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VT - key V - VT'AID

VECTOR LINE - this message generates a dotted line in front of the aircraft concerned which shows the next ten positions at which it will appear if it maintains its present heading. Obviously if it is turning to another heading then it may never actually reach those positions. The line does however give a useful estimation of where a particular heading will take an aircraft and gives some idea of relative speeds.

8 OTHER KEY USES

The top row of keys on the computer keyboard (1 to 0) all have specific functions when pressed with Caps Shift. They can be used at any time, even when you are inputting a message.

- 1 - HOME CURSOR - moves the square cursor back to the bottom left corner of the screen.
 - 2 - PAUSE - pauses the program until the same key is pressed again. When the session is halted in this way the time in the top left of the screen will flash.
 - 3 - QUIT - the game will be immediately ended - see section 11 of this book.
 - 4 - FLIGHT DATA DISPLAY - replaces the radar display with the Flight Data Display - see section 9.
 - 5, 6, 7, 8 - CURSOR CONTROLS - move the square cursor in the direction of the arrows. Each key press will move the cursor one pixel, but there is a fast auto-repeat if the key is held down. In this way the cursor can be accurately positioned over an aircraft's position symbol and a message be entered for that flight (see section 7).
 - 9 - ERASE - this completely clears both the input and computer response lines at the bottom of the screen and enables you to enter the next message.
 - 0 - DELETE - this will delete the last character typed. If 'ENTER' was the last key pressed the Delete will remove the computer's response only - thus the same message could be input again just by pressing ENTER once more.
- SYMBOL SHIFT - MAP** - if both shift keys are pressed together the radar will be replaced by a map indicating the various parts of the Hurn Sector.

9 FLIGHT DATA DISPLAY

This display mode is reached by pressing Capital Shift and '4' keys at the same time. The radar display will disappear and be replaced by a Flight Progress Strip representation of each active flight. If there are more flights than can be accommodated in one screen then subsequent screens can be seen by pressing any key other than Caps shift 4, which returns you to the radar picture. Whilst you are in this mode the real time clock will stop and upon returning to the normal display everything will be as it was before. The purpose of this Flight Data mode is to enable you to study the new details of all flights under your control without having printed strips. In any case the Data Display strips are more detailed than the printed ones and are always up to date.

The strips take the following format:

Time Fix CID	Cleared Level Level	AID Type Speed	Heading Requested Level Route
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- TIME - the activation time of the Flight Plan (field 7).
- FIX - the first fix on route (field 6).
- CID - Computer Identification Number (field 1) in RED.
- CLEARED LEVEL - the level to which you have cleared the aircraft (field 12) in RED.
- LEVEL - the first level of the aircraft (field 8).
- AID - the aircraft's call-sign (field 2). This is shown in RED if east-bound or BLUE if west-bound, to differentiate between traffic flows.
- TYPE - aircraft type (field 3).
- SPEED - in knots (field 5) in MAGENTA.
- HEADING - the aircraft's cleared heading. This is suffixed with an "H" if the aircraft is holding (ie an HM message has been input).
- REQUESTED LEVEL - the final Flight Level that the aircraft is requesting (field 9).
- ROUTE - through your sector (field 10).

When a strip has been displayed for every live aircraft, the next key press (except Capital shifted "4") will start a listing of all those Flight Plans that have not yet been activated. This listing will continue into subsequent pages as necessary, each one being produced with the next key press.

Each entry in the Pending Plan list takes the following format:

CID-AID-TYPE-TIME-FIRST FIX-ROUTE CODE

These details are basically as stored in the Flight Plan, except that the TIME is prefixed with "P" to show that the plan is pending and the ROUTE CODE is the one or two letter code for the flight's destination or exit point (see section 6).

eg 001 BA123 B747 P1220 SAMTN A

When this listing is finished you will be presented with a blank screen until Capital shifted "4" is pressed again, whereupon you will be returned to the radar picture.

10 HURN SECTOR PROCEDURES

The basic aim of this simulator is to guide the aircraft under your control safely through the sector. To do this all aircraft must be 'separated' using the separation standards set out below. In addition it will be necessary for most aircraft to be either climbed or descended through your airspace and details of what should be done are given under the heading LEVELS.

SEPARATION

All aircraft under your control must be separated vertically by at least 1000 feet up to 29,000 feet, and by 2000 feet above 29,000 feet. To this end a system of Flight Level allocations has been devised whereby west-bound aircraft fly at even numbered Flight Levels up to 280 (i.e. 40,60,80,...260,280) and also at FL310,350,390 and 430. East-bound flights use odd levels up to 290 (ie 30,50,...270,290) and also FL330,370,410, and 450. In this way two aircraft in level flight, going in opposite directions are guaranteed to be separated.

Obviously when aircraft are climbing or descending they will cross through the levels of other aircraft. In these circumstances, and also if two flights are cruising at the same level, then there must be at least FIVE nautical miles between them horizontally. Although it may be difficult to judge 5 miles on the radar at first, remember that it is half the width of an airway (eg from FAWBO to the edge of A34W) or 15 pixels on the Spectrum display.

To maintain the 5 mile horizontal separation it may sometimes be necessary to turn aircraft from their intended routes. This is where the HD, LT and RT messages are used. At times it may be necessary to 'vector' an aircraft in this way the whole time it is under your control.

LEVELS

There are many standard levels used in ATC. East and west-bound cruising levels have already been mentioned. On Hurn sector this means that outbound traffic going through ORTAC (ie with route code "H") should only be climbed to west-bound levels.

In addition, other flights also need to be climbed or descended, ready to be handed off to the next LATCC sector. These are called Agreed Levels and are set out below.

LONDON TMA INBOUNDS	(Route Code LL, KK, GW or SS)	FL120
BIRMINGHAM INBOUNDS	(Route Code BB)	FL230
PLYMOUTH/HURN/ SOUTHAMPTON INBOUNDS	(Route Code HH, HI or HD)	FL30
ATLANTIC OUTBOUNDS	(Route Code A)	FL240

Some flights coming into your sector will arrive at an Agreed Level:

HEATHROW & LUTON OUTBOUNDS	FL130
GATWICK OUTBOUNDS	FL110
PLYMOUTH/HURN/SOUTHAMPTON OUTBOUNDS	FL20

Outbound flights should be climbed either to the Agreed Level on their route, or to the nearest appropriate level to their requested one.

Inbounds should be descended to the appropriate Agreed Level. Note that it is not necessary for the aircraft to actually reach the agreed level, but they must be cleared to it (using the LV message).

Overflights (eg New York to Frankfurt) should whenever possible be left at their cruising levels.

STANDARD ARRIVAL ROUTES

Aircraft inbound to the London TMA airports fly along standard routes. These are:

HEATHROW (LL) via MID to OCK

GATWICK (KK) via THORN & SELSI to WILLO

LUTON/STANSTED (GW/SS) via SAMTN to WOD

However, if traffic conditions permit, there is no reason why aircraft cannot be deviated from these routes under your control.

ERRATA

The LUTON/STANSTED Standard Arrival Route is via HAZEL to WOD, not as shown above.

11 END OF SESSION REPORT

The simulation session ends after one hour, or when you press the 'Quit' key. The radar picture will be cleared and you are given a report of your performance. You are told how many aircraft you handled, how many were not cleared to the required Agreed Level, how many Airmiss Reports were filed against you by pilots, and how many were not handed off to the next sector (remembering that hand-offs are not required in level 1 games).

Finally you are given a percentage rating of your overall performance and asked whether you want another go.

12 HINTS AND TIPS

The job of an air traffic controller is very skilled and demanding; they each undergo about three years basic training. It is not surprising then that this simulator gives a very simplified representation of the problems involved in ATC. Even so, it may take a lot of practice to be able to master the many tasks involved. Simulators similar to this one are widely used in the training of controllers.

At first it may be helpful to select a mid-range skill level (say 5) and just watch the aircraft as they move about the sector. This will give you an idea of the various routings, aircraft speeds and what to expect generally. Of course nothing will climb or descend.

When you start controlling begin with a low skill level and work upwards. Level 9 is virtually impossible to handle, and would be for even the best real-life controller. Level 1 would represent a quiet winter's day whilst level 7 would be a very busy summer's day at LATCC.

There are a few points, some of which may seem obvious, that will help you to control your sector.

- 1 Two aircraft at least 5 miles apart on parallel headings will never meet.**
- 2 Two aircraft on diverging headings will never meet.**
- 3 A slower aircraft behind a faster one will never catch it up.**
- 4 If two aircraft are approaching head on, one climbing, the other descending, then climb one to a certain level and descend the other to a level at least a thousand feet above it. When they have passed each other it is safe to continue to their final levels.**
- 5 Never hand-off an aircraft until it is nearing its agreed level, is near your sector boundary and is clear of all other traffic.**
- 6 Remember that once handed off you lose control of that aircraft and cannot alter its course again.**
- 7 The only computer messages that are really necessary for controlling are LV, HD (or RT and LT) and HO (except for level 1). All the others are purely for convenience.**

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