



**Radio
Navigation
Certificate
Course**



RADIO NAVIGATION CERTIFICATE COURSE

INTRODUCTION

The purpose of this document is to give guidance to Flight Training Organisations, Registered Facilities, ATOs, DTOs and Instructors who wish to give training to pilots for the AOPA Radio Navigation Certificate.

A copy of this Guide and Syllabus must be held by the pilot under training and should be used as a record to determine that all parts of the course have been completed prior to application for the Certificate. A signature block is incorporated against the relevant sections for the Instructor's signature when that item has been completed. Receipt of tuition is confirmed by the Student's signature at the bottom of the relevant pages.

AOPA may request to see the completed Syllabus and the candidate's logbook before issuing the Radio Navigation Certificate.

COURSE OBJECTIVES

AOPA has designed this Syllabus of Instruction in order to encourage pilots who hold either a EASA Part-FCL, UK PPL or a UK NPPL to obtain formal training in radio navigation procedures for use under Visual Flight Rules (VFR) in accordance with the privileges of their Licences.

Additionally, for holders of a JAR-FCL PPL issued by the UK CAA, the Course of training can be taken as a progressive step towards obtaining a UK IMC Rating. To this end a JAR-FCL PPL holder who has qualified for the AOPA Radio Navigation Certificate may be exempt from up to 5 hours instrument training of the Applied Stage of the IMC course (without time limit).

FLIGHT TRAINING

The Course will consist of a minimum of 5 hours flight training, of which 1 hour may be conducted in a Flight Navigation Procedures Trainer or a flight simulator approved by the authority. Flight training will be conducted by an instructor, authorised by the UK CAA, whose rating has had the Applied Instrument limitation removed.

GROUND TRAINING

Ground training will consist of a minimum of 10 hours as specified in the AOPA IMC Syllabus. Five hours of this training must be given by an Instructor competent to give radio navigation instruction and these five hours can be credited towards the ground training requirement of the UK IMC Rating Course (without time limit). The remaining five hours may be credited through self study under supervision.

NOTE: Due to the nature of the Course content and the limited number of flying hours required, it is particularly important that adequate ground training is given to the candidate prior to instruction in the air.

COURSE CONTENT

All candidates will undertake a Core Course of Ground Training which will cover:

- Basic Radio Principles
- Morse Code
- Basic principles of Radio Navigation Aids
- The use of Radar Services
- The use of GPS

All candidates will receive Core Course of Flight Training covering:

- The use of Radar Services
- The use of GPS as a supplemental navigation aid

In addition, each candidate will select three out of the four radio navigation aids below for ground and flight training.

VOR, DME, ADF, and VHF/DF

Training in the nav aids selected will be in conformity with the knowledge and competence in Radio Navigation required for those sections of the Syllabus for the UK IMC Rating.

At the commencement of the course the candidate and instructor should decide between themselves which three aids will be used commensurate with the aircraft equipment and the nav aids available in the geographic area where training is being conducted.

The minimum equipment requirements for the Flight Training are:

- VHF radio
 - GPS
 - VOR* }
 - DME } - according to the radio navigation aids selected for training
 - ADF }
- (*where RNAV is available this should be included in the flight training)

RADIO NAVIGATION CERTIFICATE SKILL TEST

Upon completing the course the candidate will be required to have his/her competence assessed in flight by a Flight Examiner who is authorised by the UK CAA, and has been approved by AOPA.

The Radio Navigation Certificate Skill Test will comprise:-

- (a) A VFR dead reckoning navigation leg of not less than 25 nm using any of VOR, DME, ADF or VDF for fixing backed up by map reading; GPS may be used to confirm fixes. Direct tracking to/from navigation beacons will not be allowed.
- (b) A diversion leg of at least 20 nm must then be flown using only radio aids for navigation except for visual identification of the final destination GPS may be used as the main aid but must be backed by at least one fix using other radio navigation aids.
- (c) In the course of the whole flight all other tasks listed on the Skill Test Form will be assessed.

PROCEDURE TO OBTAIN THE CERTIFICATE

A candidate wishing to obtain the certificate can commence the course at any time after qualifying for a Private Pilot's Licence and a Flight Radio Telephony Operator's Licence. There are no minimum pre-entry hour or calendar time requirements nor is there a calendar time requirement to complete the course of training.

The course of training is reflected in the syllabus contents shown on the following pages.

Once the ground training and flight training has been completed and the Radio Navigation Certificate Skill Test passed, the application form for the issue of the certificate must be completed by the candidate and the instructor(s) giving the course, and the Examiner.

A fee of £15 will have to be paid to AOPA to cover the cost of administration and the issue of the Certificate. However, if the candidate is a Pilot Member of AOPA this fee will only be £10.

The completed application form should be sent to AOPA, 50a Cambridge Street, London SW1V 4QQ. Providing the necessary paperwork has been completed satisfactorily the candidate will be issued with the AOPA Radio Navigation Certificate.

SYLLABUS OF TRAINING

PRIMARY REFERENCE MATERIAL

The Air Navigation Order

The Rules of the Air and Air Traffic Control Regulations

Aeronautical Information Publication (AIP) and NOTAMS

The Flight Owner's Manual/Pilot's Operating Handbook/Operating Manuals for Radio Navigation Equipment

The AOPA Training Manual "Instrument Flying, Radio Navigation and Instrument Approach Procedures"

CAA Safety Sense Leaflet 25 "Use of GPS"

CAP804

**SYLLABUS OF TRAINING FOR THE
AOPA RADIO NAVIGATION CERTIFICATE COURSE**

Candidates Name	
Instructors Name	
Corporate Member Details	

CORE COURSE

The course of training must cover all the items listed below, but the student's aptitude and previous aviation experience must be taken into account when determining the amount of instructional time allotted to each particular item.

Although a number of items contained on the following pages are complementary to those contained in the PPL syllabus, the instructor must ensure that they have been covered during the candidate's pilot training and due allowance must be made for the time needed to revise these items as necessary.

All the following items must be covered during the ground training section of the Radio Navigation Certificate Course. This applies regardless of aircraft equipment fit or nav aids which have been selected for the flight training section of the course.

I confirm that I, _____ have received the tuition and completed the related briefings contained in this syllabus for the AOPA Radio Navigation Certificate Course.

Student's signature _____ *Date:* _____

SUBJECTS	Instructors Signature & Date
BASIC RADIO PRINCIPLES	
Radio frequencies Frequency bands Characteristics of radio waves Reception ranges <ul style="list-style-type: none"> Line of sight Skywave Groundwave Transmitter/receiver Antennae	Date:
MORSE CODE	
Morse code	Date:
BASIC PRINCIPLES OF RADIO NAVIGATION AIDS	
VHF Omni Range (VOR) <ul style="list-style-type: none"> Principles of operation/ Navigation information provided Ground and aircraft equipment Principles of RNAV aircraft equipment 	Date:
Distance Measuring Equipment (DME) <ul style="list-style-type: none"> Principles of operation/ Navigation information provided Ground and aircraft equipment 	
Non Directional Beacons – NDB/ADF <ul style="list-style-type: none"> Principles of operation/ Navigation information provided Ground and aircraft equipment 	
Very High Frequency Direction Finding (VHF/DF) <ul style="list-style-type: none"> Principles of operation/ Navigation information provided Ground and aircraft equipment 	
Radio Detection and Ranging (RADAR) <ul style="list-style-type: none"> Principles of operation/ Navigation information provided Ground equipment Primary radar Secondary Surveillance Radar (SSR) Aircraft equipment Transponders 	
Global Positioning System (GPS) <ul style="list-style-type: none"> Principles of system operation/ Navigation information provided Ground, satellite and aircraft equipment 	
Pre-flight serviceability checks Range, accuracy and limitations of Radio Navigation equipment	

PRE-FLIGHT & AERODROME DEPARTURE PROCEDURES	
Determining the serviceability of the aircraft radio navigation equipment Obtaining the specific departure clearance Setting up of radio nav aids prior to take-off e.g. VOR frequencies, required radials etc. Aerodrome departure procedures, frequency changes Altitude and position reporting as required	Date:
AERONAUTICAL INFORMATION PUBLICATIONS	
The Aeronautical Information Service NOTAMS Aeronautical Information Circulars Information of an operational nature	Date:
The Rules of the Air and Air Traffic Services Visual Flight Rules and Instrument Flight Rules Flight plans and ATS messages Use of radar in Air Traffic Services Radio failure Special VFR Control Zones and Terminal Control Areas Control Areas Radar Advisory Service Airspace Restrictions and Hazards Royal Flights/ Temporary Restricted Areas	
Communications Types of service Extraction of data relating to radio aids	
Aeronautical Charts Charts available Amendments, corrections and revisions General descriptions of the series available Topographical charts Aeronautical symbols	
FLIGHT PLANNING	
The objectives of flight planning Selection of alternate(s)	Date:
Obtaining meteorological information Services available via telephone/ internet Met briefing Telephone communication direct with forecaster Met Office aviation briefing service forms 214/215 Actual weather reports, TAFs, METARs, SIGMET messages The route forecast The operational significance of the meteorological information obtained (including icing, turbulence and visibility)	

<p>Altimeter considerations</p> <p>Definitions of:-</p> <ul style="list-style-type: none"> Transition altitude Transition level Flight level QNH Standard pressure setting QFE Regional Pressure Setting 	
<p>Altimeter setting procedures:-</p> <ul style="list-style-type: none"> Pre-flight altimeter checks Take-off and climb En-route Approach and landing 	
<p>Terrain clearance</p> <ul style="list-style-type: none"> Selection of a minimum safe en-route altitude Instrument Flight Rules 	
<p>Preparation of charts</p> <p>Choice of routes and levels</p> <p>Compilation of flight plan log sheet</p> <p>Log sheet entries:-</p> <ul style="list-style-type: none"> Navigation ground aids to be used Frequencies – codings Radials and bearings Tracks and fixes Safety altitude(s) Fuel calculations ATC frequencies (VHF) <ul style="list-style-type: none"> Tower, approach, en-route, radar, FIS, Volmet Minimum safe sector altitudes en-route, and at destination alternate aerodromes 	<p>Date:</p>
<p>USE OF EN-ROUTE RADAR</p>	
<p>Availability of radar services</p> <p>Location, station frequencies, call signs and hours of operation</p> <ul style="list-style-type: none"> UK AIP and NOTAMS <p>Provision of service</p> <p>RTF, procedures and ATC liaison</p> <ul style="list-style-type: none"> Lower Airspace Radar Service (LARS) Emergency service <p>Use of SSR (transponder)</p> <p>Operation of transponders</p> <ul style="list-style-type: none"> Code selection procedure Emergency codes Precautions when using airborne equipment 	<p>Date:</p>
<p>USE OF GPS (Global Positioning System)</p>	
<p>Satellite availability/status</p> <p>Satellite signal anomalies</p> <p>NOTAMS</p> <p>Signal reception, effects of terrain, masking by aircraft structure</p> <p>Receiver Autonomous Integrity Monitor (RAIM)</p> <p>World Geodetic System 1984 (WGS 84)</p> <p>Pre-flight preparation and planning</p> <p>Specification of waypoints, user waypoints</p> <p>Data input/cross-checking data entry</p> <p>Database integrity</p>	<p>Date:</p>

Status of GPS in UK, use of GPS as a supplemental navigation aid Installation and limitations of system to be used for training Human error Use of system in flight Planned and unplanned diversions RTF procedures and ATC liaison System errors and malfunctions	
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SELECTED RADIO NAVIGATIONAL AIDS

Three nav aids to be selected from VOR, DME, ADF and VHF/DF for ground and flight training.

USE OF VOR (VHF Omni Range) Availability of VOR stations en-route Station frequencies and identification coding Station maintenance periods/unserviceability UK AIP and NOTAMS Signal reception range Effect of altitude VOR radials Method of numbering Use of Omni Bearing Selector To/from indications Orientation Selecting radials Intercepting a pre-selected radial Assessment of distance to interception Effects of wind Maintaining a radial Tracking to/from a VOR station Station passage Use of two stations to obtain a fix Pre-selecting fixes along a track Assessment of groundspeed and ETA Use of RNAV Specification of waypoints Course deviation indicator RTF procedures and ATC liaison	Date:
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USE OF DME (Distance Measuring Equipment) Availability of DME facilities Location, frequencies and identification coding DME maintenance periods/unserviceability UK AIP and NOTAMS Use of DME to obtain – distance/groundspeed/time to run Use of DME to obtain a fix Signal reception range Slant range	Date:
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USE OF ADF (Automatic Direction Finding Equipment) Availability of NDB (Non Directional Beacons) facilities en-route Location, frequencies, tuning (as applicable) and identification codes Station maintenance periods/unserviceability UK AIP and NOTAMS Signal reception range Static interference Night effect Station interference Mountain effect Coastal refraction Orientation in relation to an NDB	Date:
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<ul style="list-style-type: none"> Homing Intercepting a pre-selected magnetic bearing and tracking inbound Station passage Tracking outbound Time/distance checks Use of two NDBs to obtain a fix (or alternatively use of one NDB and one other navaid) RTF procedures and ATC liaison 	
<p>USE OF VHF/DF (Very High Frequency/Direction Finding)</p> <ul style="list-style-type: none"> Availability of VHF/DF facilities en-route Location, frequencies, station call signs and hours of operation <ul style="list-style-type: none"> UK AIP and NOTAMS Signal reception range <ul style="list-style-type: none"> Effect of altitude RTF procedures and ATC liaison Obtaining and using types of bearing, e.g. QTE, QDM, QDR Homing to a station <ul style="list-style-type: none"> Effect of wind Use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid) Assessment of groundspeed and ETA 	<p>Date:</p>
<p>PRE-FLIGHT AND AERODROME DEPARTURE PROCEDURES</p>	
<p>SELECTED RADIO NAVIGATIONAL AIDS (Three out of four)</p>	
<ul style="list-style-type: none"> Radio equipment serviceability checks Departure clearance Navaid selection – frequencies, radials, etc. Aerodrome departure checks, frequency changes, altitude and position reports 	<p>Date:</p>
<p>USE OF EN-ROUTE RADAR</p> <ul style="list-style-type: none"> Establishing contact with an Air Traffic Service Radar Unit <ul style="list-style-type: none"> RTF procedures and ATC liaison Establishing the service required and position reporting Method of reporting conflicting traffic Aircraft separation standards Terrain clearance Method of handover to an adjacent radar facility Use of SSR (Transponder) <ul style="list-style-type: none"> Operation of aircraft equipment Code selection Interrogation and reply Precautions when selecting the required code 	<p>Date:</p>
<p>USE OF GPS (Global Positioning System)</p> <ul style="list-style-type: none"> Serviceability checks Inputting waypoint data Checking the validity of data input Checking satellite status Selection of map orientation and scale Use of course deviation indicator to intercept and maintain required track Recognition of waypoint passage Use of flight data to fix position and assess ETA Maintaining a position check on an aeronautical chart Obtaining information on the nearest facility for diversion Re-programming the GPS receiver in flight Flying to an alternate airfield or waypoint using direct-to navigation Dealing with loss of GPS signal 	<p>Date:</p>

<p>USE OF VOR (VHF Omni Range) Station selection and identification Orientation Intercepting a pre-selected radial RTF procedures and ATC liaison Maintaining a radial inbound Recognition of station passage Maintaining a radial outbound Use of two stations to obtain a fix along the track Assessment of groundspeed and ETA *Use of RNAV (*Where available in the training aircraft) Inputting waypoint data Use of course deviation indicator to intercept and maintain required track Recognition of waypoint passage</p>	<p>Date:</p>
<p>USE OF DME (Distance Measuring Equipment) Station selection and identification Use of DME to obtain distance/groundspeed/time to run Use of DME to obtain a fix</p>	<p>Date:</p>
<p>USE OF ADF (Automatic Direction Finding Equipment) Selection, tuning and identifying an NDB ADF orientation RTF procedures and ATC liaison Homing Tracking inbound Station passage Tracking outbound Time/distance checks Intercepting a pre-selected magnetic bearing Determining the aircraft's position from two NDBs (or alternatively from one NDB and one other navaid)</p>	<p>Date:</p>
<p>USE OF VHF/DF (Very High Frequency Direction Finding) Establishing contact with a VHF/DF station RTF procedures and ATC liaison Obtaining and using a QDR and QTE Obtaining and using a QDM Homing to a station Effect of wind Use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid) Assessment of groundspeed and ETA</p>	<p>Date:</p>

FLIGHT TRAINING SYLLABUS - CORE COURSE	
PRE-FLIGHT AND AERODROME DEPARTURE PROCEDURES Radio equipment serviceability checks Departure clearance Navaid selection – frequencies, radials, etc. Aerodrome departure checks, frequency changes, altitude and position reports	Date:
USE OF EN-ROUTE RADAR Establishing contact with an Air Traffic Service Radar Unit RTF procedures and ATC liaison Establishing the service required and position reporting Method of reporting conflicting traffic Aircraft separation standards Terrain clearance Method of handover to an adjacent radar facility Use of SSR (Transponder) Operation of aircraft equipment Code selection Interrogation and reply Precautions when selecting the required code	Date:
USE OF GPS (Global Positioning System) Serviceability checks Inputting waypoint data Checking the validity of data input Checking satellite status Selection of map orientation and scale Use of course deviation indicator to intercept and maintain required track Recognition of waypoint passage Use of flight data to fix position and assess ETA Maintaining a position check on an aeronautical chart Obtaining information on the nearest facility for diversion Re-programming the GPS receiver in flight Flying to an alternate airfield or waypoint using direct-to navigation Dealing with loss of GPS signal	Date:
USE OF VOR (VHF Omni Range) Station selection and identification Orientation Intercepting a pre-selected radial RTF procedures and ATC liaison Maintaining a radial inbound Recognition of station passage Maintaining a radial outbound Use of two stations to obtain a fix along the track Assessment of groundspeed and ETA *Use of RNAV (*Where available in the training aircraft) Inputting waypoint data Use of course deviation indicator to intercept and maintain required Track Recognition of waypoint passage	Date:
USE OF DME (Distance Measuring Equipment) Station selection and identification Use of DME to obtain distance/groundspeed/time to run Use of DME to obtain a fix	Date:

<p>USE OF ADF (Automatic Direction Finding Equipment) Selection, tuning and identifying an NDB ADF orientation RTF procedures and ATC liaison Homing Tracking inbound Station passage Tracking outbound Time/distance checks Intercepting a pre-selected magnetic bearing Determining the aircraft's position from two NDBs (or alternatively from one NDB and one other navaid)</p>	<p>Date:</p>
<p>USE OF VHF/DF (Very High Frequency Direction Finding) Establishing contact with a VHF/DF station RTF procedures and ATC liaison Obtaining and using a QDR and QTE Obtaining and using a QDM Homing to a station Effect of wind Use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid) Assessment of groundspeed and ETA</p>	<p>Date:</p>