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CONTENTS

CHAPTER ONE

AIR INFORMATION PUBLICATIONS

Contents

INTRODUCTION

As part of basic preparation before any flight, pilots need to be able to brief themselves about:

- Air Traffic Control procedures regarding departure, en-route, destination and alternate airfields.
- Frequencies of communication and navigation aids (navaids) en-route and at airfields.
- Radio navigation and approach aids.
- Aerodrome Flight Information Service (AFIS), Automatic Terminal Information Service (ATIS) and in-flight weather services.
- Danger, Restricted and Prohibited Areas; Military training areas, Air Navigation Obstacles and Aerial Sporting and Recreational Activities.

In many operations offices and flight planning rooms a lot of this information is available on wall boards, often in the form of maps. Also, much of it will be available on printed maps and charts, such as those produced by Jeppesen and AERAD, amongst others.

However, these are secondary sources. Jeppesen and AERAD (and others) are not the authority on airspace, frequencies, and navigation aids. They merely print and reproduce, in an easily accessible form, information extracted from documents produced by the national aviation authority of that country (CAA, FAA, DGAC, etc). It is this national aviation authority which is the primary source.

These primary source documents are:

Air Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

The United Kingdom Air Information Publication is an example.

AIP Supplements. Temporary changes to the information contained in the AIP which are published by means of special pages.
In the UK these are printed on yellow paper and filed in the AIP SUPPLEMENT SECTION of the UK AIP, GENERAL (GEN) volume.

NOTAM. A notice distributed by means of telecommunications containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

A NOTAM is originated and issued promptly whenever information to be distributed is of a temporary nature and short duration or when operationally significant permanent changes of long duration are made at short notice. They are displayed in, or issued by, operations and flight planning centres.

FORMAT OF AN AIP

The format of an AIP produced by an ICAO contracting state conforms to a common standard in accordance with the Standards and Recommended Practices (SARP) of Annex 15 to the Convention on International Civil Aviation and with the Aeronautical Information services Manual (ICAO Doc 8126). Thus the Air Information Publication United Kingdom is a typical reference document. It is divided into:

- VOLUME I - AIP PART 1, GENERAL (GEN) and AIP SUPPLEMENTS (AIP SUP).
- VOLUME II - AIP PART 2, EN - ROUTE (ENR).
- VOLUME III - AIP PART 3, AERODROMES (AD).

AIP GEN-LOCATION INDICATORS

GEN 2.4 - LOCATION INDICATORS ENCODE					
Location	Indicator	Location	Indicator	Location	Indicator
Aberdeen	EGPD	Culdrose	EGDR	Hucknall	EGNA
Aberporth	EGUC	Cumbernauld	EGPG	Humberside	EGNJ
Alderney	EGJA				

Figure 1.1 Location Indicators

Location Indicators are allocated mainly to licensed aerodromes, Air Control Centres and Flight Information Centres. An indicator comprises four letters; the first two denote the country and the last two the airfield or centre. Thus:

EG	**UNITED KINGDOM**	
EGLL	"	**London/Heathrow**
EGTT	"	**London ATCC(ACC FIC)**
LF	**FRANCE**	
LFPG	"	**Paris/Charles De Gaulle**
ED	**FEDERAL REPUBLIC OF GERMANY**	**- civil airfields**
ET	"	**- military airfields**
EDD	"	**- international aerodromes**
EDDM	"	**Munich**
LI	**ITALY**	
LIRA	"	**Rome/Ciampino**
LE	**SPAIN**	
LEMD	"	**Madrid/Barajas**
KA to KZ	**UNITED STATES**	
CY and CZ	**CANADA**	

Agency Designator, three letters, and **Office Designator**, one letter**,** may be added after the **Location Indicator.** This allows messages to be directed to an **agency** and/or an **office** at a particular location**.**

For example the **Agency Designators** for an **Air Traffic Control Unit** and a **Flight Information Centre,** at any location, are **ZAZ** and **ZIZ**; the **Office Designators** at any location for **Freight and Cargo** and **Passenger Handling** are **F** and **P**.

Normally, for day to day operations, pilots need to be aware only of the significance of the Location Indicator, particularly when filing a Flight Plan (CA48), where the entries for departure, destination and diversion airfields, and FIR/UIR boundaries, are represented by a particular four letter code**.**

AIP GEN-NOTAMS (Notices to Airmen)

(Ref. UK AIP GEN 3.1)

All operationally significant information **not** covered by AIP amendment or AIP Supplement will be issued as a NOTAM.
All operationally significant changes issued as Aeronautical Regulation and Control (AIRAC) AIP Amendments, AIP Supplements or Aviation Information Circulars (AIC) will be additionally announced by "Trigger" NOTAMS, which remain valid for 15 days after a permanent change and for the complete duration of any temporary change or condition.
Three categories of NOTAMS are disseminated by the Aeronautical Fixed Service (AFS):

- **NOTAMN**, which contains **new** information.
- **NOTAMR**, which **replaces** a previous one.
- **NOTAMC**, which **cancels** a previous one. UK

NOTAMS are divided into two categories:

- Those containing information on UK International Airports and en-route information of interest to both International and Domestic recipients. (A to H, J and exceptionally X).
- Those containing information on domestic aerodromes and information to Domestic recipients only. (L to N, R and exceptionally X).

Edited example NOTAMS:

- **Series A**

  (A0012/99 NOTAMN)
  E) MIDHURST DVOR 'MID' 114.000MHZ U/S)

- **Series E**

  (E0011/99 NOTAMR)
  E) NO STOPWAY LIGHTS ON RWY 09 DUE WIP RESITING)

- **Series L**

  (L0018/99)
  E) NDB 'GST' NOT AVBL DUE MAINT.)

(A decode of the series lettering is at table 3.1.1, UK AIP GEN 3-1-5)

AIP GEN-AERODROME FLIGHT INFORMATION SERVICE (AFIS)
and
AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)
(Ref. UK AIP GEN 3.3.3)

OXFORD KIDLINGTON

Sevice Designation	Callsign	Frequency (MHz)	Hours of Operation	Remarks
AFIS	Oxford Information	118.875	Sat, Sun & PH 0830 -1700 (Winter) Sat, Sun & PH 0730-1600 (Summer)	
ATIS	Oxford Departure Information	121.750	Sat, Sun & PH 0830 -1700 (Winter) Sat, Sun & PH 0730-1600 (Summer)	

Fig. 1.2 Extract from AD 2 UK AIP

The **Flight Information Service (FIS)** (Fig.1.2) is provided at aerodromes to give information useful for the safe and efficient conduct of flights in the in the Aerodrome Traffic Zone (ATZ). From the information received pilots will be able to decide the appropriate course of action to be taken to ensure the safety of the flight.

FIS is available during the aerodrome's operation hours. The Flight Information Service officer is responsible for:

- Issuing information to aircraft in the ATZ to assist pilots in preventing collisions.
- Issuing information to aircraft on the manoeuvring area to assist pilots in preventing collisions between aircraft and vehicles/obstructions on the manoeuvring area, or between aircraft moving on the apron.
- Informing aircraft of essential aerodrome information (i.e. the state of the aerodrome and its facilities).
- Alerting the safety services.
- Initiating overdue action.

At busy airfields to alleviate Radio Telephony (RTF) loading on the operational channels, **Automatic terminal Information Service (ATIS)** (Fig.1.2) broadcast messages are used to pass routine arrival/departure information on a discrete RTF frequency or on an appropriate VOR. Pilots of aircraft inbound to these airports are required on first contact with the aerodrome ATS Unit to acknowledge receipt of current information by quoting the code letter of the broadcast. Pilots of outbound aircraft are not normally required to acknowledge receipt of departure ATIS but are requested to ensure that they are in possession of up-to-date information. (See ICAO Doc 7030 for further information on ATIS).

EXAMPLE OF A TYPICAL ATIS AT OXFORD/KIDLINGTON:

> **"ATIS B: Runway 02 right hand; Helicopter Area 1 Left; Surface W/ V 330/10; QNH1018, QFE 1008; Temperature -1°C, Dewpoint -3°C. Contact tower on 121.95MHz."**

AIP GEN-METEOROLOGICAL CHARTS

(Ref.UK AIP GEN 3.5)

National Meteorological Offices routinely issue written forecasts of selected areas at fixed times daily. For the UK, these are on Forms F214 and F215. The UK Met Office also issues European and North Atlantic forecasts. Details of areas of coverage and times of issue and the periods of validity are given in the UK AIP.

AIP GEN-METEOROLOGICAL INFORMATION

Aviation Routine Weather Reports-**METAR**/(Actuals), Aerodrome Forecasts-**TAF**, information concerning en-route weather phenomena which may effect the safety of aircraft operations-**SIGMET** (including volcanic activity), and selected special weather reports-**SPECI**, are broadcast by teleprinter and/or radio throughout the UK and internationally in text form.

The Meteorological Watch Offices (MWOs) are responsible for preparing and disseminating **SIGMETS** to the appropriate ACC/FIC within their own and agreed adjacent FIRs**.** Aircraft in flight should be warned of the occurrence or expected occurrence of a SIGMET phenomenon for the route ahead for up to 500nm or 2 hours flying time. SIGMET examples are:

- At subsonic levels-.
  - Freezing Rain
  - Severe Mountain Wave
  - Volcanic Ash Cloud

- At transonic and supersonic levels (FL250-600)-
  - Hail
  - Volcanic Ash Cloud
  - Moderate or Severe Turbulence

Information to aircraft in flight is usually supplied in accordance with area Meteorological Watch procedures, supplemented when necessary by an **En-route Forecast Service**. Information is also available from the appropriate ATS Unit at the commander's request, or from **meteorological broadcasts**.

Aircraft can obtain aerodrome weather information from any of the following:

- **VOLMET** broadcasts. (See Table Figure 1.5)
- **ATIS** broadcasts
- By request to an ATS Unit but whenever possible only if the information required is not available from a broadcast.

METEOROLOGICAL RADIO BROADCASTS (VOLMETS)

Call Sign/ ID	EM		Operating Hours	Stations	Contents	Remarks
1	2	3	4	5	6	7
London Volmet (Main)	A3E	135.375	H24 continuous	Amsterdam Brussels Dublin Glasgow London Gatwick London Heathrow London Stansted Manchester Paris/ CDG	1 Half hourly reports (METAR) 2 The elements of each report broadcast in the following order: (a) Surface wind (b) Visibility (or CAVOK) (c) RVR if applicable (d) Weather (e) Cloud (or CAVOK) (f) Temperature (g) Dewpoint (h) QNH (i) Recent weather if applicable (j) Windshear if applicable (k) Trend if applicable (l)Runway contamination warning if applicable 3 Non-essential words such as 'surface wind', 'visibility' etc are not spoken. 4 Except for 'SNOCLO' The Runway State Group is not broadcast 5 All broadcasts are in English.	The spoken word 'SNOCLO' will be added to the end of the aerodrome report when that aerodrome is unusable for take- offs and landings due to heavy snow on runways or runway snow clearance
	A3E	128.600	H24 continuous	Birmingham Bournemouth Bristol Cardiff Jersey London Luton Norwich Southampton Southend		
London Volmet (North) (Note 1)	A3E	126.600	H24 continuous	Blackpool East Midlands Isle of Man Leeds Bradford Liverpool London Gatwick Manchester Newcastle Teesside		
Scottish Volmet	A3E	125.725	H24 continuous	Aberdeen/Dyce Belfast/Aldergrove Edinburgh Glasgow Inverness London/ Heathrow Prestwick Stornoway Sumburgh		

Note 1: Broadcasting range extended to cover Southeast England and English Channel
Note 2: An HF VOLMET broadcast for North Atlantic flights (Shannon VOLMET) is operated by the Republic of Ireland

Figure 1.5 Volmet Broadcasts.

AIP ENR-NAVIGATION AIDS EN-ROUTE
(Ref. UK AIP ENR 4.1)

ENR 4.1 - RADIO NAVIGATION AIDS - EN ROUTE						
Name of Station (VOR set Variation)	IDENT	Frequency (Channel)	Hours of Operation (Winter/Summer)	Co-ordinates	DME Aerial	Remarks
1	2	3	4	5	6	7
Saint Abbs VOR/DME (5.5°W - 1995)	SAB	112.50 MHz (Ch 72X)	H24	555427N 0021223W	760 ft amsl	DOC 50nm/50000 ft (200nm/ 50000ft in Sector 054° - 144°M)
Scotstown Head NDB	SHD	383.0 KHz	H24	573333N 0014902W	-	Range 80 nm (25nm in Sector 180° to 335° MAG)
Seaford VOR/DME (5.5°W -1997)	SFD	117.0 MHz (Ch 117X)	H24	504538N 0000719E	300 ft amsl	DOC120 nm/50000ft 260°-290°M, 50nm/50000ft elsewhere

Figure 1.6 En-route Radio Navaids

Questions may be asked on the frequencies and callsigns of particular navigation aids. As an example, ENR4 of the UK AIP lists the en-route radio navigation aids alphabetically, together with their individual identifying morse callsigns, transmitting frequencies, operational hours, DME aerial elevation, where applicable, and any remarks. Thus:

- A **V**HF **O**mni **R**ange(VOR) and a **D**istance **M**easuring **E**quipment(DME) are situated at **Saint Abbs Head** where in 1995 the magnetic variation was 5.5°W; the VOR beacon is aligned with magnetic north.
- The morse callsign is **S**ierra **A**lpha **B**ravo.
- The VOR frequency to be selected by a civil operator is 112.50MHz which also activates the DME's interrogator/transponder UHF frequencies; military aircraft select channel 72X to obtain range from the DME.
- The station operates continuously 24 hours a day at,
- The published latitude and longitude in degrees minutes and seconds.
- The DME antenna is 760ft above mean sea level.
- Neither the VOR nor the DME should be used beyond 50nm and above 50000ft or 200nmn and 50000ft in the sector between 054°m and 144°M.

AIP ENR-CODENAMES FOR SIGNIFICANT POINTS
(Ref. UK AIP ENR 4.3)

ENR 4.3 - NAME -CODE DESIGNATORS FOR SIGNIFICANT POINTS			
‡ - See also AIP Ireland # - See also AIP Spain	† - See also AIP France § - See also AIP Norway		
Name Code	Co-ordinates	Purpose (ATS Route or Other Route)	Definition (°MAG/nm)
ABDAL	512646N 0015149W	Cotswold CTA - Arrivals to Bristol, Cardiff & Filton	CPT VOR/DME fix 268°/24 nm
ABSIL	543843N 0042000E	UM604 - IN866	VES VOR/DME fix 249°/148nm
ACORN	511456N 0001146E	London TMA - Gatwick SIDs	BIG VOR/DME fix 133°/8nm DET VOR/DME fix 261°/15nm LAM VOR/DME fix 179°/24nm
ADMIS	51594N 0001036E	B317 - R77 - UB317 - UR77	BKY VOR/DME fix 088°/4nm CLN VOR/DME fix 287°/37nm
ADSON	510338N 0021512W	R37	SAM VOR/DME fix 285°/35nm
AGANO	493956N 0020000W	Channel Islands CTR - Alderney Arrivals	JSY VOR/DME fix 008°/27 nm GUR VOR/DME fix 064°/67nm

Figure 1.7 Coded Designators

Navigation positions not marked by radio navigation aids are given a coded designator of up to five characters and are also defined by a radial and bearing from a co-located VOR/DME, as can be seen from fig. 1.7 above.

AIP ENR-NAVIGATION WARNINGS
(Ref. UK AIP ENR 5)

For safety reasons, when planning a VFR or IFR flight at low or high Flight Levels, the pilot must take into account the following:

- Prohibited, Restricted and Danger Areas (Fig.1.8).
- Military Exercise and Training Areas (Fig. 1.9).

- Other Activities of a Dangerous Nature, such as High Intensity Radio Transmissions (Fig. 1.10).
- Air Navigation Obstacles En-route, such as bridges and chimneys (Fig. 1.11).
- Aerial Sporting and recreational Activities (Fig. 1.12)

ENR 5.1 - PROHIBITED, RESTRICTED AND DANGER AREAS		
Identification and Name Lateral Limits	Upper Limit (ft) Lower Limit (ft)	Activity Details, Remarks and Byelaw Reference (One hour earlier during Summer period)
1	2	3
Danger Areas		
EG D001 Trevose Head 501918N 0053042W - 502400N 0053900W- 503200N 0053400W - 503930N 0052400W- 504300N 0051230W - 503830N 0050430W- 501918N 0053042W-	ALT 100 SFC	**Activity:** Helicopter Exercises including winching (Air Force Dept.) **Hours:** Mon to Thu 0800-2359, Fri 0800-1800. **Service:**DACS: St Mawgan APP on 126.500 MHz when open. Other times DAAIS: London Information on 124.750 MHz. **Remarks:** Nil.
‡ **EG D003 Plymouth** 501001N 0034740W - 500339N 0033430W- 494105N 0034912W - 493719N 0040938W- 501001N 0034740W-	Up to ALT 55000 SFC Subject to co-ordination procedures above ALT 22000	**Activity:** Ship Exercises / Target Towing/Firing/ Pilotless Target Aircraft (Navy Dept). **Hours:**Mon to Thu 0800-2359, Fri 0800 - 1600 and as notified **Service:** DACS: Plymouth Military on 121.250 MHz when open; other times London Mil via London Information on 124.750 MHz. **Remarks:** Pre-flight information may be obtained from Plymouth Operations, Tel: 01752-557550

Figure 1.8. Danger/Restricted/Prohibited Areas

ENR 5.2 - MILITARY EXERCISE AND TRAINING AREAS		
Name Lateral Limits	Systems/means of activation announcement/ information for Civil Flights	Remarks and Activity Times (One hour earlier during summer period)
1	**2**	**3**
Areas of Intense Air Activity (AIAA)		
Oxford (h) 515600N 0014900W - 520130N 0011745W 515745N 0011126W - 514328N 0010000W 513433N 0010000W - 513423N 0011138 W 513938N 0015510W - 515600N 0014900W	Radar services are available within this area from Brize Radar on 134.300MHz. The attention of pilots is also drawn to the Brize Norton Control Zone. (See ENR 2-2-2-1/2)	**Hours:** Permanently active. **Vertical Limits:** SFC to 5000 ft ALT. **Remarks:** There is intense air activity associated with closely woven civil and military climb out and approach procedures for the many airfields in this vicinity. Pilots flying in this area are advised to keep a constant vigilance particularly during weekdays when military activity is at its peak, and especially in the area 8.5nm/308°(T) and 6nm/145° (T) from Oxford/ Kidlington aerodrome where aircraft may be holding waiting clearance to join airways.

Figure 1.9. Military Training Areas.

ENR 5.3 - OTHER ACTIVITIES OF A DANGEROUS NATURE				
Name Lateral Limits	Vertical Limits	Advisory Measures	Authority Responsible for Information	Remarks Activity Times (One hour earlier during summer period)
1	**2**	**3**	**4**	**5**
High Intensity Radio Transmission Areas (HIRTA)				
Barford St John Radius 0.05 nm centred on 520001 N 0012105W	ALT 850 ft			
Boulmer Radius 0.9 nm centred on 552400N 0013706W	ALT 1600 ft			
Buchan Radiius 0.65 nm centred on 572759N 0014706W	ALT 4000 ft			

Figure 1.10. Other Dangerous Activities.

AIP AD-AERODROME CATEGORISATION
(Ref. UK AIP AD 1.4)

In the UK there are two types of civil aerodrome licence namely, PUBLIC USE LICENCE and ORDINARY LICENCE.

Aerodromes or Heliports operated in accordance with a PUBLIC USE LICENCE must have their hours of availability notified in the UK AIP and the aerodrome/heliport must be available to all operators on certain equal terms and conditions. However, this does not necessarily mean that the aerodrome is available to all flights without limitation. Aircraft operators must check and comply with the requirements and conditions of use indicated at AD 2 or 3.

Aerodromes or Heliports operated in accordance with an ORDINARY LICENCE may accept flights operated by the holder of the licence or by those specifically authorised by that licence holder. This normally means that prior permission is required for most flights but it does not exclude the possibility of scheduled or non-scheduled public transport flights being arranged after the formal agreement of the licence holder.

AERODROME COMMUNICATION FACILITIES
(Ref. UK AIP AD 2)

OXFORD/KIDLINGTON

EGTK AD 2.18 ATS COMMUNICATION FACILITIES				
Service Designation	Callsign	Frequency (MHz)	Hours of Operation	Remarks
1	2	3	4	5
APP	Oxford Approach	125.325	Mon-Fri 0830-1730 and by arrangement (Winter) Mon-Fri 0730-1630 and by arrangement (Summer)	
TWR	Oxford Tower Oxford Ground	118.75 121.950	Mon-Fri 0830-1730 and by arrangement (Winter) Mon-Fri 0730-1630 and by arrangement (Summer)	
AFIS	Oxford Information	118.875	Sat, Sun & PH0830-1700 (Winter) Sat, Sun & PH 0730-1600 (Summer)	
ATIS	Oxford departure Information	121.750	Sat, Sun & PH0830-1700 (Winter) Sat, Sun & PH 0730-1600 (Summer)	

Figure 1.13. Aerodrome Communication Facilities.

AERODROME RADIO NAVIGATION AND LANDING AIDS

BOURNEMOUTH

EGHH AD 2.19 RADIO NAVIGATION AND LANDING AIDS							
Type Category (Variation)	IDENT	Frequency	Hours of Operation Winter Summer # and by arrangement		Antenna Site co-ordinates	Elevation of DME transmitting antenna	Remarks
1	2	3	4		5	6	7
LLZ 08 ILS CAT 1	I BMH	110.5 MHZ	HO	HO	504700.26N 0014920.71W		
GP	IBMH	329.6 Mhz	HO	HO	504641.46N 0015050.18W		3° ILS Ref Datum Hgt 53ft. Localiser range is limited to 18nm+/- at 10° and 8nm at+- 35° of the localiser centre-line
L	BIA	339kHz	H24	H24	504639.62N 0015032.95W		On AD Range 20nm
LLZ 26 ILS CAT 1	I BH		HO	HO	504638.13N 0015133.70W		3° ILS Ref Datum Hgt 50 ft. The quality of guidance provided does not permit use of the facility for coupled approaches below 350 ft.
GP	I BH		HO	HO	504659.81N 0014952.58W		
DME	I BMH (RWY 08) I BH (RWY 26)		HO	HO	504643.75N 0015023.24W	44 ft amsl	On AD Freq. Paired with ILS I BH and I BMH. Zero range is indicated at the threshold of Runway 26 and 160m before crossing threshold of runway 08.

Figure 1.14. Radio Navigation and Landing Aids.

From the above table:

- Bournemouth has a **Category I Instrument Landing System (ILS)** for runways **08** (callsign **I BMH**) and **26** (callsign **I BH**). The **Localiser (LLZ)** frequency for either runway system is **110.50MHz**; the paired glidepath (**GP**) frequency for each is **329.60MHz**. The ILS hours of operation are denoted as **HO,** which means that the service is available to meet operational requirements. The antenna co-ordinates, published in the remarks column, are given in degrees, minutes, seconds and hundredths of latitude and longitude.

  The remarks column also states that the **glideslope** for each ILS is **3**°, and that the ILS
  Ref Datum Hgt (Reference Datum Height) for runway 08 and 26 is **53ft** and **50ft**.

  "The ILS reference datum point is a point at a specified height (around 50ft) located vertically above the intersection of the runway centre-line and threshold, through which the downward extended portion of the ILS glidepath extends."

  The remarks column for the ILS also publishes the localiser limitations for runway 08 and states, for the ILS on runway26, that "The quality of guidance provided does not permit use of the facility for coupled approaches below 350ft."

- **L** in the Type Column indicates that the airfield has a low powered Non-Directional Beacon (NDB), known as a **Locator,** sited on the aerodrome **(AD)** at the published latitude and longitude; its callsign is **BIA**, frequency **339kHz** and operational hours **H24** (continuous service). **Range 20nm** in the remarks column is the promulgated range or Designated Operational coverage (DOC):

  "The range promulgated for UK NDBs is based upon a daytime signal protection ratio between wanted and unwanted signals that limits bearing errors at that distance to +/- 5°. At ranges greater than those promulgated bearing errors will increase. Adverse propagation conditions particularly at night will also increase bearing errors. This protection takes into account average atmospheric noise but not nighttime skywaves."

  See the latest AIC on Radio Navigation Aids - Designated Operational Coverage.

- The **DME** (Distance Measuring Equipment) is frequency paired with ILS **I BMH** (RWY 08) and **I BH** (RWY 26). **Ch** (channel number) **42X** is the selection for military TACAN (TACtical Air Navigation) equipped aircraft. The operational hours are **HO** and the aerial elevation is **44ft amsl**. With reference to the Remarks column, **Zero range is indicated at the threshold of runway 26 and 160m before crossing the threshold of runway 08**.

OTHER SOURCES

Publications such as Aerad and Jeppesen Flight Guides, Low and High Level Airways Charts, Arrival and Departure Charts and Airfield Approach Charts all, variously, provide information on airfield opening hours, handling, Communication and Radio Navigation and Landing Aids etc.

SEARCH AND RESCUE

There may on occasions be a question relating to Search and Rescue (SAR). SAR is covered in Air Law. References for this topic are:

- School Training Notes, 010 Air Law.
- UK AIP Document GEN 3.6.
- ICAO Document Search and Rescue, Annex 12.

QUESTIONS

1. Where would you find information regarding Customs and Health facilities?

   a. ATCC broadcasts
   b. NOTAMs
   c. NAV/RAD supplements
   d. AIPs

2. Where would you find information regarding Search and Rescue procedures?

   a. ATCC broadcasts
   b. NOTAMs
   c. SIGMETs
   d. AIPs

3. In which document would you find information on known short-term unserviceability of VOR, TACAN, and NDB?

   a. NOTAM
   b. Aeronautical Information Publication (AIP)
   c. SIGMET
   d. ATCC

4. Where may details of temporary Danger and Restricted Airspace be found?

   a. SIGMETs
   b. Aeronautical Information Circulars (AIC)
   c. NOTAM and Aeronautical Information Publication (AIP)
   d. ATCC

5. Details of temporary danger areas are published:

   a. In AICs
   b. On the appropriate chart
   c. By VOLMET
   d. In NOTAMs

6. What are the types of NOTAM?

   a. Temporary, short-notice, permanent
   b. A, B, C
   c. NOTAMN, NOTAMR, NOTAMC
   d. A, E, L

ANSWERS

1	D
2	D
3	A
4	C
5	D
6	C

CHAPTER TWO

TOPOGRAPHICAL CHART

Contents

INTRODUCTION

The **Jeppesen VFR + GPS (Visual Flight Rules + Global Positioning System) Chart GERMANY ED - 6 EDITION 1999** is the reference for **JAR-FCL 033 01 00 00, FLIGHT PLANS FOR CROSS-COUNTRY VFR FLIGHTS.**

The chart is a **Lambert Conformal Conic Projection** with standard parallels of **N37°** and **N65°**; its **scale is 1/500 000** with **elevations in feet.** It is designed for VMC Flight in accordance with VFR. It is effective below FL125 in Austria, FL115 in France, FLl00 in Germany and FL150 in Switzerland. The Isogonic lines are valid for 1999; see top of the chart at E008° 55' and E012° 15'. **The Highest Spot Elevation** is **12028ft** at **N47 07.4 E012 20.8**. Identification of adjacent charts is provided at the diagram top left-hand corner of the chart.

WORLD GEODETIC SYSTEM of 1984 (WGS 84)

The co-ordinates of VFR REPORTING POINTS, AERODROMES and RADIO NAVIGATION AIDS use the **World Geodetic System of 1984 (WGS 84).** e.g.:

STUTTGART NDB = N48 42.7 E009 20.1

See the right-hand panels of the chart.

Example 1:

- What are the WGS84 co-ordinates of FOXTROTT 2 VFR Reporting Point in the Munchen Control Zone (CTR)?
- What are the WGS84 co-ordinates and ICAO designator for Innsbruck International aerodrome?
- State the Radio Navigation Aid, its frequency, callsign, co-ordinates and magnetic variation for MOOSBURG.

TRACK(COURSE) - MEASUREMENT OF DIRECTION AND DISTANCE

TRUE DIRECTION is measured by placing the centre of a protractor over the mid-point of the track, aligning its north/south axis parallel to the nearest meridian and reading off the track direction in °**(T)**. If the **MAGNETIC** direction is required the mean variation for the track is found by interpolation between the appropriate isogonals, up-dated as necessary for the mean annual change, and applying it to the true track direction as follows:

VARIATION WEST(+) - MAGNETIC BEST
VARIATION EAST (-) - MAGNETIC LEAST

DISTANCE in nautical miles is measured either by using the **NEAREST MERIDIAN SCALE** or the **NAUTICAL MILE SCALE** at the bottom of the chart; this latter scale has a Kilometre and Statute Mile Conversion. Thus:

60nm = 111km (60 x 1.8)

Example 2.

The magnetic track and distance, in nautical miles and kilometres, between aerodromes LAHR (EDTL) and STUTTGART (EDDS) are?

AERONAUTICAL INFORMATION

- **AIRPORTS** depicted on the chart are shown with their ICAO four letter code, location name, elevation in feet, longest runway available in metres and tower communication frequency; (v) indicates that VHF Direction Finding (VDF) is available.

- **WAYPOINT INFORMATION**. Compulsory and Non-compulsory Reporting Points are shown on the chart with their assigned name.

- **NAVAID INFORMATION** provides a navigational aid's frequency and identification; their co-ordinates are tabulated at the side of the chart.

- **TYPES OF AIRSPACE**
  When planning a flight the various types of airspace and their restrictions must be considered.

- **DANGER, RESTRICTED** and **PROHIBITED AREAS** on the chart are depicted as shown.

  - **RESTRICTED AREA** - Airspace of defined dimensions within which the flight of aircraft is restricted in accordance with certain specified conditions.

  - **DANGER AREA -** Airspace which has been notified as such within which activities dangerous to the flight of aircraft may take place or exist at such times as may be notified.

  - **PROHIBITED AREA -** An airspace of defined dimensions within which the flight of aircraft is prohibited.

TOPOGRAPHICAL INFORMATION

Note the symbols for natural high points, given in feet, and the Terrain Contour Tints, given in feet and metres. At the bottom right of the chart is a FEET METRE CONVERSION scale.

1m = 3.28ft

MINIMUM GRID AREA ALTITUDE (GRID MORA) figures are shown within each half degree of latitude and longitude; two noughts should be added:

47 = 4700ft

The resulting value provides a clearance of all terrain by 1000ft in areas where the highest point is 5000ft or lower and 2000ft where the highest point is 5001ft or more.

MISCELLANEOUS

- **FLIGHT INFORMATION AND METEOROLOGICAL SERVICES.** Frequencies for ATIS, Flight Information Service and Weather Information are provided within various Flight Information Regions (FIR) at nominated centres, at the inset chart bottom left of the main chart.

- **GENERAL AVIATION FORECAST AREAS** are shown in the adjacent chart. The numbers refer to telephone numbers

- Note the **AIRSPACE CLASSIFICATION GERMANY** diagram and table. Only class C, D, E, F and G are used in Germany.

- Note the **PHONETIC ALPHABET AND MORSE CODE**.

- Note the **SEMI-CIRCULAR CRUISING LEVELS ON VFR FLIGHTS** and those for France.

- VFR ROUTES WITHIN FRANCE. Bearings and tracks are magnetic and distances are in nautical miles.

- Note the table of AIRSPACE DESIGNATORS AND CONTROL FREQUENCIES.

Example 3.
Give a complete decode of the airfield information at Augsburg.

Example 4.
Decode the blue triangle to the east of Augsburg.

Example 5.
Decode the navaid information at N48 43.2 E011 31.3 and N48 44.3 E011 38.7.

Example 6.
What does the symbol at N48 22.9 E008 38.7 signify?

Example 7.
What type of airspace is Salzburg VOR/DME within? Give its dimensions.

Example 8.
What are the Salzburg ATIS and Weather Broadcast frequencies?

ESTABLISHMENT OF MINIMUM FLIGHT ALTITUDES

(Ref. JAR-OPS 1.250)
When selecting a Flight Altitude/Level which gives adequate clearance for a given sector the following should be considered:

- The accuracy with which an aircraft can determine its position.

- The inherent inaccuracies of altimeters and their indications plus corrections required to account for temperature and pressure variations in relation to ISA.

- The characteristics of the terrain.

- Rotor Turbulence and Standing Waves.
- The accuracy of the navigational chart.
- The vertical extensions of Danger, Restricted and Prohibited areas. (Avoid them if they cannot be overflown).
- The vertical extensions of the types of airspace.
- The highest ground or obstacle within the promulgated distances either side of the planned track.
- The ICAO Standard Semi-Circular Cruising Levels. (See Figure 2.1)

THE MINIMUM GRID AREA ALTITUDES (GRID MORA)

Printed on the chart have already been referred to. These could be used:

- As a rapid means of assessing the appropriate Flight Level/Altitude.
- As a means of cross checking terrain clearance values that have been obtained using the stated methods.
- As a rapid means of re-assessing safe clearance of terrain, eg. when a pilot becomes unsure of his exact position in relation to his intended track.

Students will be required to **find the highest obstacle within a given distance** either side of track.

CHOOSING CRUISING LEVELS

(See Figure 2.1 and bottom of the chart)

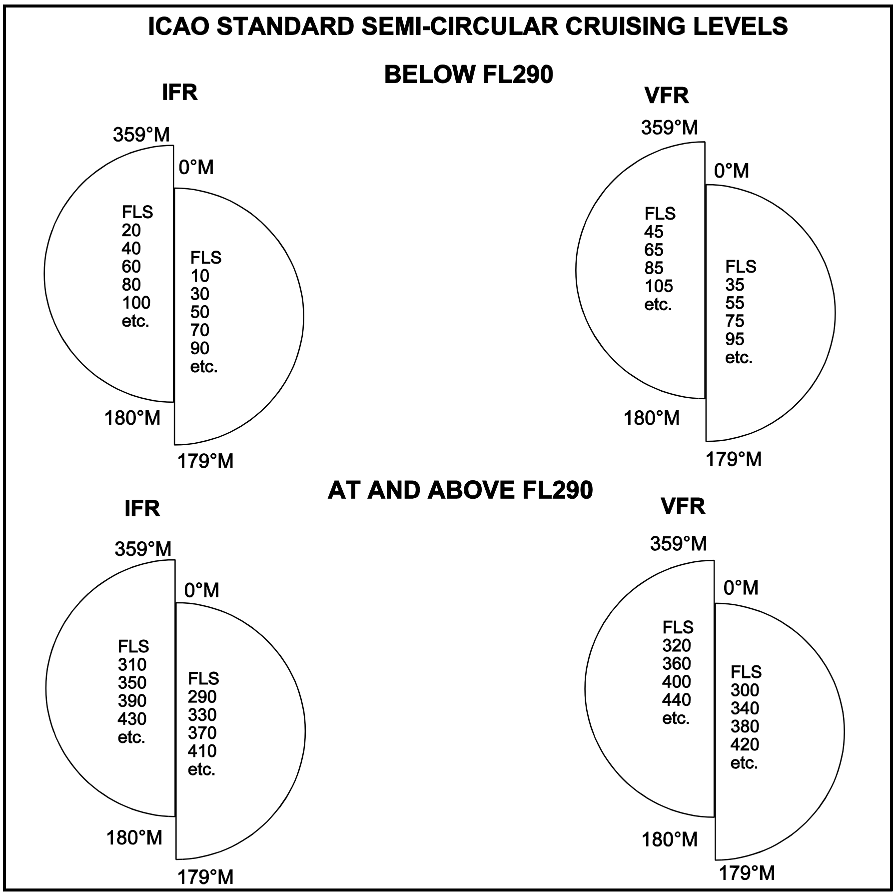

Figure 2.1. ICAO Semi-Circular Cruising levels

The choice of safe Flight Level is determined by the aircraft's planned **Magnetic track** (not heading), stated obstacle clearance allowance and regional forecast route QNH. For VFR flight for SEP and MEP aircraft the **BELOW FL290 VFR** diagram, top right of figure 2.1, is the reference. Flight Levels for a track between **0°M** and **179°M** are **odd levels plus 500ft**; for tracks between **180°M** and **359°M** they are **even levels plus 500ft**.

(When choosing levels for the Medium Range Jet Transport (MRJT) aircraft, the **IFR BELOW FL290** and **AT AND ABOVE FL290** will be the reference for **IFR** flight).

ALTIMETER ERRORS AND CORRECTIONS

An altimeter is calibrated in relation to the **International Standard Atmosphere (ISA).**

> A **mean sea level pressure and temperature** of **1013.25mb** and **+15°C,** and a mean temperature lapse rate of **2°C (1.98°C)/1000ft** up to **36090ft**, where it remains constant at -**56.5°C.**

Thus, when calculating the height increment/decrement in feet from an airfield to an aircraft's **Flight Level (pressure altitude)**, which is based upon the above standard conditions, the differences in pressure and temperature between the actual and ISA conditions must be accounted for.

Pressure Difference
The initial pressure setting for take-off will be **QNH**, which when set on the altimeter sub-scale causes it to indicate the aircraft's **altitude** (airfield elevation) above mean sea level at take-off**,** disregarding instrument error.

On passing the transition altitude the **standard pressure setting of 1013.25mb** is set on the altimeter sub-scale. The difference between **1013.25mb** and the airfield **QNH** will result in a **barometric error**, height loss or gain, in the order of **30ft /mb.**

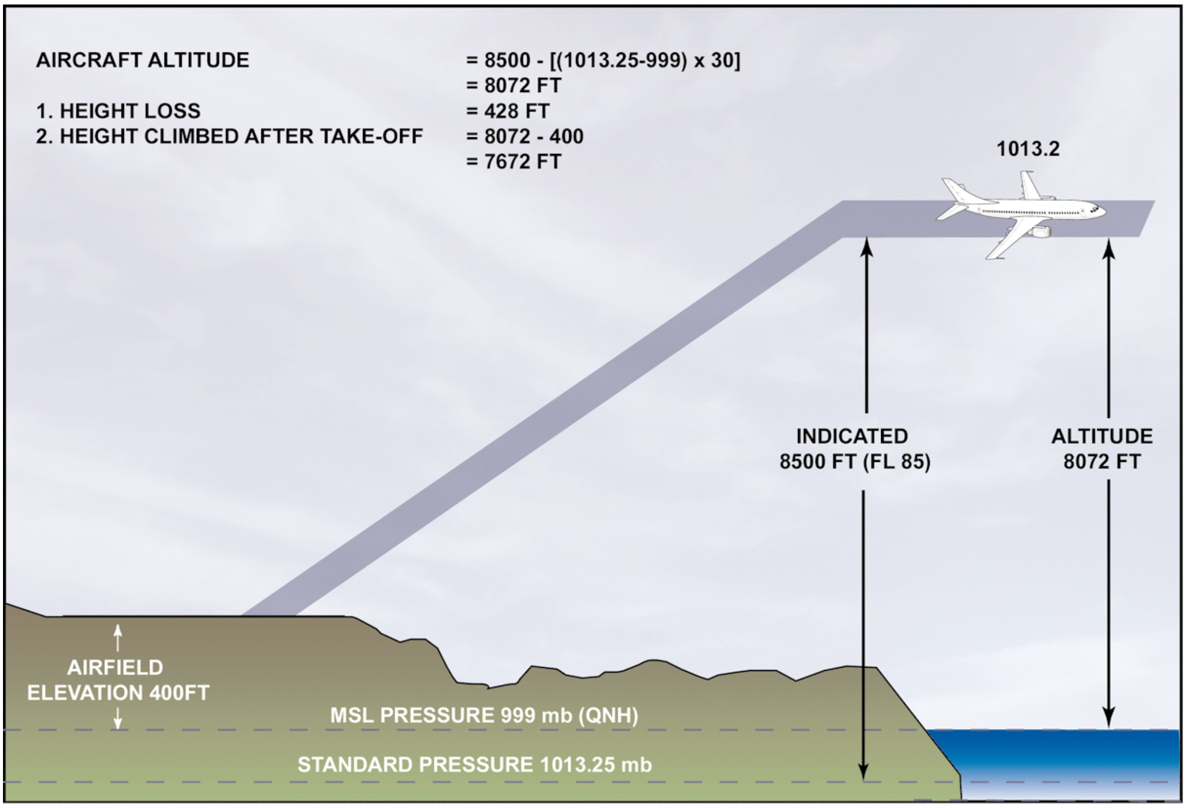

Figure 2.2 **1013.25mb > QNH - less height gained**

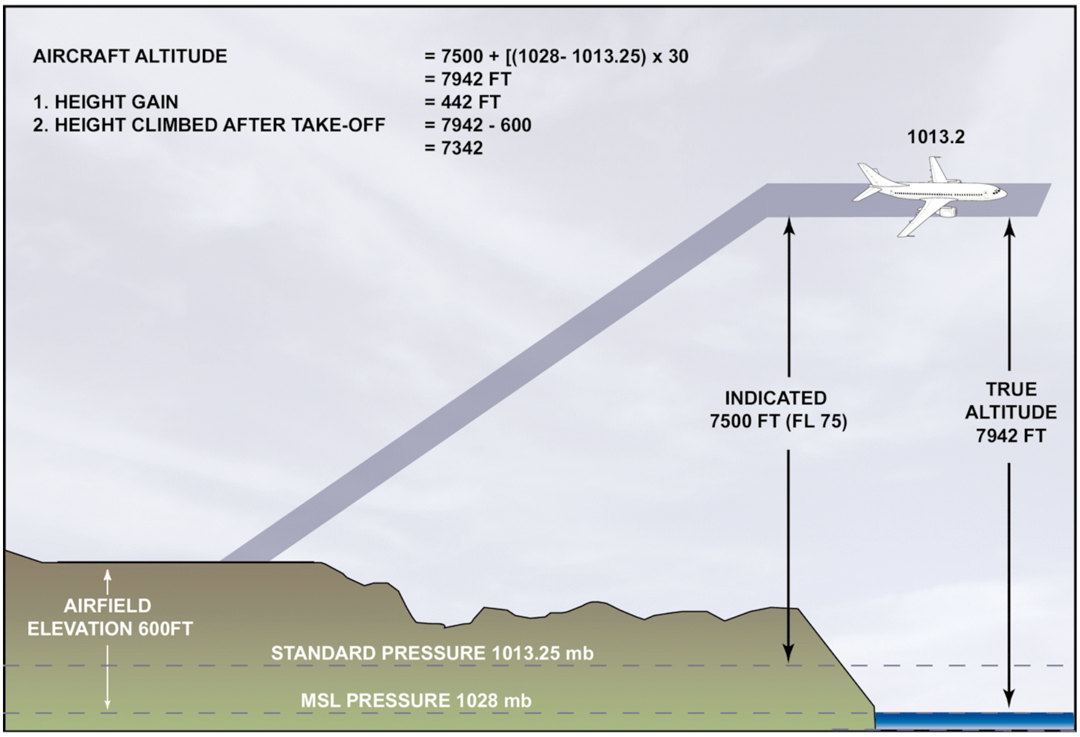

Figure 2.3 **1013.25mb < QNH - more height gained**

Temperature Difference from ISA at Cruising Pressure Level
The standard temperature for an aircraft flying at FL85, for example, is - 2°C. If the Corrected Outside Air Temperature (COAT) is -15°C the aircraft is flying in air colder and denser than standard; as pressure decreases more rapidly in a column of colder air the altimeter will over read. Conversely, when the COAT is warmer than standard the air is less dense and the altimeter will under read. Therefore when 1013.25mb is set:

LOWER COAT - altimeter OVER READS

HIGHER COAT - altimeter UNDER READS

The **"ALTITUDE"** window on the reverse of the CRP5 is used to correct for the difference in temperatures. Using the CRP5:

Set **FLIGHT LEVEL** (**85)** against **COAT (-15°C)** in the **"ALTITUDE"** window; read off **TRUE ALTITUDE (8100)** in feet on the **OUTER SCALE** against **FLIGHT LEVEL** (**85)** on the **INNER SCALE.** Thus the altimeter is **over reading by 400ft**.

If FL85 had been chosen to provide a 1000ft clearance above an obstacle at 7500ft amsl within the stated limits on the aircraft's planned sector, then the actual clearance would be 600ft. A safer level to accord with ICAO VFR Semi-circular Cruise Levels would thus be FL105.

Consider an aircraft is flying at FL75 (ISA 0°C), with a COAT of +16°C:

Set **FLIGHT LEVEL (75)** against **COAT (+16°C)** in the **"ALTITUDE"** window; read off **TRUE ALTITUDE (7925)** in feet on the **OUTER SCALE** against **FLIGHT LEVEL (75)** on the **INNER SCALE.** The altimeter will **under read by 425ft:**

In this instance FL75 was chosen to provide a clearance of 1000ft above an obstacle of 6500ft amsl. The actual clearance is thus 1425ft.

Hence remember the adage in relation to temperature (and pressure):

"High to low mind how you go"

Example 9.

An aircraft is airborne from an airfield, elevation 800', on a track of 090° (M); QNH 996mb.

- What VFR Flight Level must the aircraft maintain in order to clear an obstacle, 4400' amsl, by 1000'?
- What height is climbed to this Flight level?

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EXERCISE 1

With reference to the **VFR + GPS Chart GERMANY EDITION 1999 ED - 6** and VFR flight answer the following:

1. What type of airfield is at N4728 E00833.

2. Reference N4811 E01052. What is the significance of:
   a. ET in the Location Indicator ETSL?
   b. 141.25 and 2442m?

3. What type of airfield is at N4727 E00814?

4. What does the symbol at N4755 E01055 mean?

5. What does (v) after 125.700 at N4858 E00820 signify?

6. Flight from A, N4823 E00839 to B, N4803 E00922;

   a. What is the track direction (°T) and distance in nautical miles/kilometres?

   b. What is the highest terrain/obstacle within the area extending 5nm either side of the track and 5nm radii, centred on and beyond, A and B?

   c. What would be the correct flight level to clear this terrain/obstacle by a minimum of 1000ft?

   d. Fully describe the navigational facilities at A and B.

   e. What does the symbol 10.5nm, on track, from A signify?

   f. What is the highest Minimum Grid Area Altitude (Grid MORA) on this route?

   g. What are the STUTTGART INFORMATION (FIS) and ATIS frequencies?

7. What are the Airspace Designator and Control Frequency for Munchen?

8. Decode the three symbols in the vicinity of N47 33 E010 18.

EXERCISE 2 - FLIGHT LOG

EXERCISE 2

										Set Heading:		10:30
FROM	**TO**	**GRID MORA**	**FL**	**W/V**	**TRK (T)**	**VAR**	**HDG (M)**	**TAS**	**GS**	**DIST**	**TIME**	**ETA**
VILSHOFEN EDMV	REGENSBURG EDNR			090/20				100				
REGENSBURG EDNR	NORDLINGEN EDNO			120/30				110				
NORDLINGEN EDNO	MENGEN EDTM			270/30				120				
										0	**0**	

VFR EXERCISE 2

Complete the flight log on page 32 (opposite), then answer questions 1 to 12.

NB. If you have not yet done Heading and Groundspeed on the navigation computer then you cannot completely finish the log and answer questions 1 & 7.

An aircraft is due to depart Vilshofen at 10:30 then fly the following route:

Vilshofen to Regensburg
Regensburg to Nordlingen
Nordlingen to Mengen

Complete the VFR flight log then answer the questions below

1. What is your ETA at Mengen?

   a. 01:38
   b. 12:08
   c. 11:28
   d. 10:58

2. What type of airport is Vilshofen?

   a. Military airport with a hard runway
   b. Civil airport with a grass runway
   c. Civil airport with a hard runway
   d. Military airport with grass runway

3. What type of navaid is Roding? (N4902 E01232)

   a. An VOR on 114.70 Khz
   b. An NDB on 114.70 Khz
   c. A DME on 114.70 Mhz
   d. A VORTAC on 114.70 Mhz

4. What does the (V) indicate in the description of Straubing (Wallmuhle) airport? (N4854 E01231)

   a. VFR flights only permitted
   b. Very High Frequency (VDF) direction finding available
   c. Open 24 hours
   d. Very high landing fees charged for IFR flights

5. While flying at FL45 between Regensburg and Nordlingen does ED(R)-140 affect your route?

   a. No – its vertical limits are from FL60 to FL100
   b. No – its vertical limits are from 6000 ft AGL to FL100
   c. Yes – as the restricted area base can come down to the surface
   d. Yes – but a clearance through can be obtained from Neuburg airbase

6. What is the airport elevation and runway length of Nordlingen?

a.	500 metres	1384 feet
b.	1385 metres	500 feet
c.	13307 feet	500 metres
d.	1384 feet	500 metres

7. When flying between Nordlingen and Mengen; what is your drift?

a. 10° port
b. 7° port
c. 7° starboard
d. 10° starboard

8. You select Gerstetten (N4837 E01003) airfield as an en-route alternate; what type of airfield is it?

a. Civil with hard runway
b. Civil with grass runway
c. Glider side
d. Military with hard runway

9. What is the Augsburg ATIS frequency?

a. 126.95 Mhz
b. 124.97 Mhz
c. 115.90 Mhz
d. 124.57 Mhz

10. While flying towards Mengen and established on track; what is your QTE?

a. 223°(M)
b. 043°(M)
c. 043°(T)
d. It is not possible to receive a QTE

11. Name all the radio navigation aids you could use at Mengen?

a. VDF and an NDB on 401 Khz
b. VDF and an NDB on 401 Mhz
c. Only an NDB on 401 Khz
d. There are no radio navigation aids serving Mengen

12. With a surface wind of 300°/30 kts; which airfield would be a better destination alternate, assuming runway length is not restrictive.

a. Friedrichshafen
b. Pfullendorf
c. Saulgau
d. Albstadt

ANSWERS

Example 1.
a. N48 23.6 E011 48.8
b. N47 15.6 E011 20.6, LOWI.
c. VHF Omni-range (VOR)/Distance Measuring Equipment (DME), 117.15MHz, MBG; magnetic variation 1°E.

Example 2. 071°(M), 58.5nm, 108.5km.

Example 3. Civil airport with hard runway; ICAO designator EDMA; elevation1515ft; longest runway 1280m; Tower frequency 124.97MHz; VDF available.

Example 4. Compulsory VFR reporting point; N43 23. 6 E011 04.0; 312 radial 12nm from MAH VOR, frequency 108.4MHz.

Example 5. Ingolstadt TACAN (**Tac**tical **A**ir **N**avigation), VHF paired frequency 111.40MHz, callsign IGL. Ingolstadt NDB (Non-Directional Beacon), frequency 345kHz, callsign IGL.

Example 6. VO R (**V**HF **O**mni-Range) beacon, frequency 116.10MHz, callsign SUL.

Example 7. A Control Zone, Class D airspace. from ground level to 7000ft amsl.

Example 8. ATIS 125.72MHz; WX 113.80MHz from SBG VOR.

Example 9. a) FL75. b) 6184'.

EXERCISE 1

1. International Airport.

2. a. ET = German military airfield.
   b. 141.25MHz is the available communication frequency, VDF not available; 2442m is the longest runway available.

3. Civil Airport with hard runway.

4. Hang-glider site.

5. Means VDF available on that frequency.

6. a. 124°(T), 35nm/65km
   b. lit obstacle 3760ft amsl.
   c. FL55.
   d. At A: Very high Frequency Omni-range (VOR), 116.10MHz, callsign SUL. At B:Non-Directional Beacon(NDB), 401kHz, callsign MEG.
   e. Civil Heliport.
   f. 4800ft.
   g. 128.95 and 126.12MHz.

7. C; Radar 131.22MHz.

8. Glider site; cableway; man-made lit obstruction, 5866ft amsl.

EXERCISE 2

1	B
2	C
3	D
4	B
5	A
6	D
7	A
8	B
9	D
10	C
11	A
12	C

EXERCISE 2 ANSWERS

FROM	TO	GRID MORA	FL	W/V	TRK (T)	VAR	HDG (M)	TAS	GS	DIST	TIME	ETA
										Set Heading:		10:30
VILSHOFEN EDMV	REGENSBURG EDNR	7200	85	090/20	305	1 E	311	100	116	54	28	10:58
REGENSBURG EDNR	NORDLINGEN EDNO	3700	45	120/30	255	1 E	243	110	129	65	30	11:28
NORDLINGEN EDNO	MENGEN EDTM	4600	65	270/30	223	0 E	233	120	99	67	40	12:08
										186	**98**	

CHAPTER THREE

FUEL POLICY AND FUEL MONITORING

Contents

UNIVERSAL APPLICATION OF FUEL POLICY

You are shortly about to start practical planning examples on the Single Engine Piston, the Multi- Engine Piston and the Medium Range Jet Transport aircraft. As you will find out, we enter various tables and graphs for these aircraft types and, from these, we are able to work out how much fuel will be used for a particular length of flight under different conditions of aircraft weight, air temperature and wind component. In general, these predictions are quite accurate as long as the meteorological conditions experienced are close to the forecast values used to produce the plan. We call this the **Trip Fuel.**

On its own, however, this is not enough. If we had just the trip fuel on board at the moment of take-off, the engine would stop because of fuel starvation the moment we arrived at the destination, which is obviously not an acceptable way to operate. Clearly, we need some fuel other than the minimum to just do the trip. After all, we start using fuel before take-off. We have to consider start-up and taxi. We also need reserve fuel, firstly in case the trip does not go as planned, and secondly in order to taxi in and shut down.

The principles which establish how much fuel should be carried on an air transport flight have been internationally agreed and are laid down in CS-OPS 1. Whilst the actual amounts vary from aircraft type to type, because different aircraft have different fuel consumptions, the rules by which the minima for each flight are calculated are universal.
This is known as **EASA Fuel Policy**.

REALISTIC TRIP FUEL

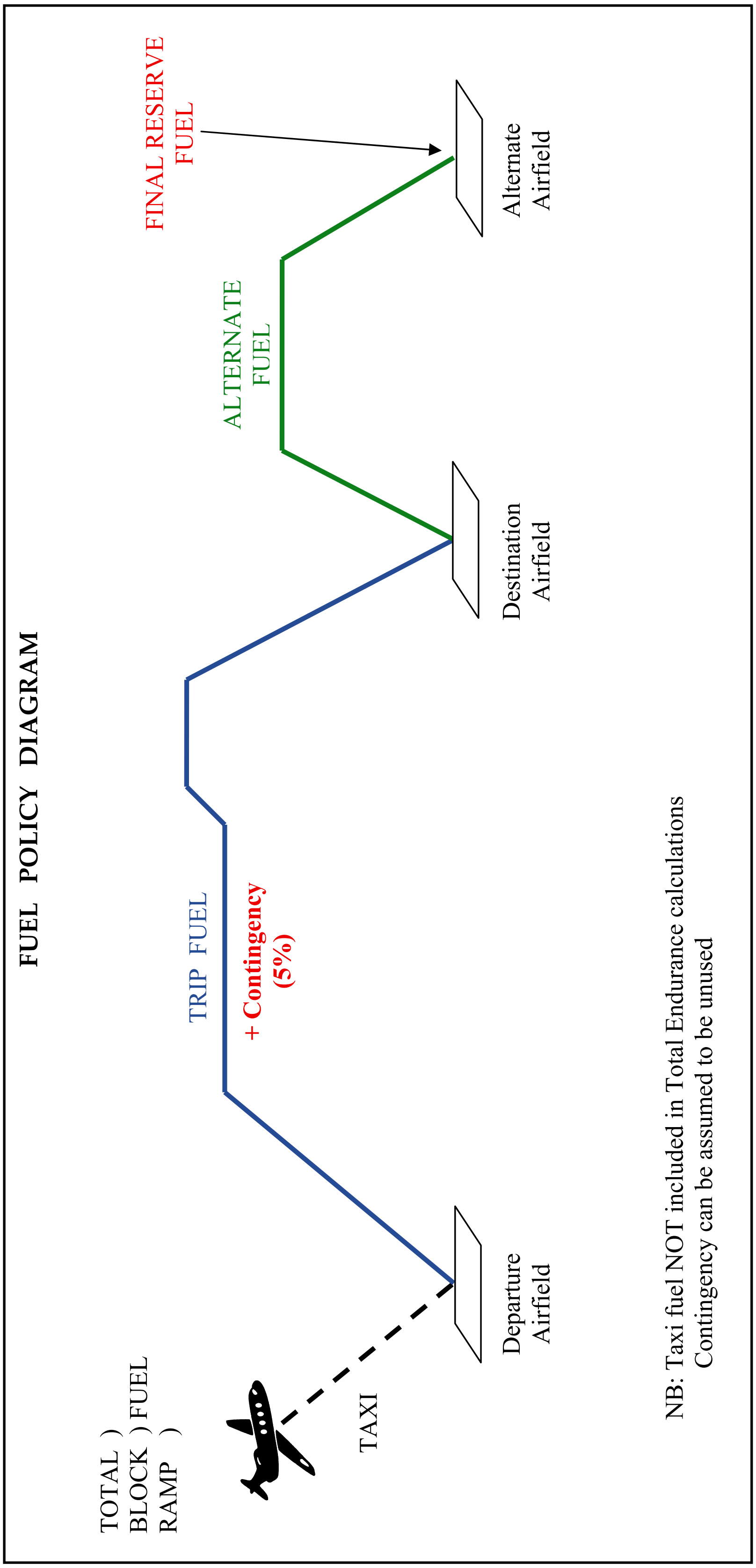
Whatever the commercial pressures to carry minimum fuel, there is no point in coming up with an unrealistically low figure for trip fuel. It has to be based on what you actually expect to happen. This means taking into account, for instance, the most likely routing, rather than a straight line route from departure to destination. If the departure airport insists on Standard Instrument Departures (SIDs) or the destination airport insists on Standard Instrument Arrivals (STARs), as is normal, then the SIDs and STARs may add tens of miles of track distance to the en route portion of the trip. These should be included in calculating the trip fuel. In particular, the following points should be noted:

The operator shall ensure that the planning of flights is based only upon:

- ➢ Procedures and data derived from the Operations Manual or current aeroplane specific data.

- ➢ The conditions under which the flight is to be conducted, including:

  - Realistic **fuel flows** expressed as **kg/h, lb/h or gal/h**;
  - The **aircraft's anticipated weights (masses)**
  - **Expected meteorological conditions**; and
  - **Air Traffic Service procedures and restrictions**


FUEL POLICY DIAGRAM
FINAL RESERVE FUEL
ALTERNATE FUEL
TRIP FUEL
+ Contingency (5%)
TOTAL)
BLOCK) FUEL
RAMP)
TAXI
Departure Airfield
Destination Airfield
Alternate Airfield
NB: Taxi fuel NOT included in Total Endurance calculations
Contingency can be assumed to be unused

JAR FUEL POLICY - BREAKDOWN OF FUEL

Under EASA fuel policy, fuel is considered under the following breakdown:

Taxi	
Trip	
Reserves which are further broken down into:	Contingency
	Alternate
	Final Reserve
	Additional
Extra	

Taxi Fuel. The amount required to start up, taxi, and hold (if necessary) before take-off. It will also include any fuel required to operate pre-flight services, such as cabin conditioning, and may include use of the APU. In the Boeing 737, for instance, 260 kg of taxi fuel is allowed. This is over a quarter of a tonne of fuel before take-off.

Trip Fuel. This should include fuel:

- For the take-off from the airfield elevation, the departure procedure (SID) and thence to the top of climb (TOC) at the initial cruising level/altitude.
- From the TOC to top of descent (TOD), including any step climbs or descents.
- From TOD to the point where the approach is initiated; account is taken of expected arrival procedures (STARs).
- For approach and landing.

Reserve Fuel. Reserve fuel is further sub-divided into:

- **Contingency Fuel**
- **Alternate Fuel**
- **Final Reserve**
- **Additional Fuel**

Each of these will be dealt with separately shortly.

Extra Fuel. Extra fuel is any fuel above the minima required by Taxi, Trip and Reserve Fuel. It can simply be because more has been uplifted than is required for the trip, so the surplus is defined as Extra Fuel or, more usually, it can be because, even when all the minima required by EASA fuel policy are carried, the aircraft commander decides that more is needed because of particular circumstances.

RESERVE FUEL

Contingency Fuel. An operator must ensure that every flight carries sufficient fuel for the planned operation, and reserves to cover any re-planning necessary for in-flight contingencies. **A contingency is a chance occurrence or unforseen event**. **Contingency Fuel** is carried to compensate for deviations:

- Of an individual aircraft from the expected fuel consumption data;
- From the forecast meteorological conditions; and
- From the planned routing and/or cruising levels/altitudes.

Alternate Fuel

Alternate fuel is simply the fuel required to fly from missed approach at the destination to the planned alternate. It should take into account probable routing and expected wind component, but it does not have its own allowance of contingency fuel. Contingency allowance is applied only to the trip fuel.

Final Reserve Fuel

If you fly from departure to destination, use the contingency fuel en route, and then have a missed approach at the destination and fly to the alternate, you will have no fuel left on arrival. We therefore have a minimum landing fuel, and you should normally never land with less than the Final Reserve Fuel. It consists of 30 minutes (for a jet or turbo-prop) or 45 minutes (for a piston) fuel consumption at endurance speed.

Additional Fuel

Contingency, Alternate and Final Reserve fuel cover most cases, and provided that suitable diversions are available en route and near the destination, this is all that is required for Reserve Fuel. There are two cases, however, where Additional Fuel may be needed:

No Alternate. This is also known as the "Island Holding" situation. If there is no alternate available at some isolated aerodrome, then you need to be able to cope with the aircraft landing two minutes ahead of you bursting a tyre on the runway, or possibly a short duration tropical squall going through.

No En Route Alternate and Inability to Hold Height. If you are a long way from an alternate and you suffer some malfunction which requires you to reduce to a lower altitude (engine failure or pressurisation failure or both), you may have to fly a long portion of the flight at a higher fuel consumption than planned. In this case you may need Additional Fuel.

On most flights Additional Fuel is not required but in either of the above cases, it may be necessary.

CALCULATION OF CONTINGENCY FUEL

Numerical calculation of taxi, trip, alternate and final reserve fuels is fairly straightforward. Taxi fuel is usually a standard allowance. Trip fuel and alternate fuel are extracted from graphs or tables from the appropriate Operational Flight Manual. We will practise this process in Chapters 4, 5 and 6. Final Reserve fuel is a simple calculation based on 30 (jet/turbo-prop) or 45 (piston) minutes hold at endurance speed. However, Contingency Fuel can vary depending on the type of operation.

Contingency Fuel is the higher of **A** and **B** below:

A

One of these four, as agreed with the appropriate National Aviation Authority:

- 5% of the planned trip fuel, or, in the event of in-flight re-planning, 5% of the trip fuel for the remainder of the flight. No en route alternative is needed in this case.
- Provided that an en-route alternate is available, this figure may be reduced to 3% of the planned trip fuel, or, in the event of in-flight re-planning, 3% of the trip fuel for the remainder of the flight.
- If the operator has established a fuel consumption monitoring programme for individual aeroplanes, keeps appropriate records and uses valid data so determined, this can be reduced to 20 minutes flying time.
- If the operator has a fuel monitoring programme and agrees a particular method of statistical analysis which includes standard deviations (the details need not concern us for the purposes of the ATPL), this can be reduced yet further by agreement with the Authority.

B

An amount to fly for 5 minutes at holding speed at 1500 feet (450 m) above the destination aerodrome in standard conditions.

FUEL POLICY - WORKED EXAMPLES

Example 1

Jet aircraft. Taxi fuel is 60 kg. Cruise fuel flow is 5000 kg/hr. Hold fuel flow is 3000 kg/hr. Flight time is 2 hr 30. Contingency is 5% of trip fuel. Alternate fuel is 900 kg. What is the required ramp fuel?

Taxi			60
Trip		5,000 kg/hr x 2.5 hr	12,500
Reserve			
	Contingency		625
	Alternate		900
	Final Reserve	30/60 x 3,000	1,500
	Additional		Not required
Extra			Not required
Total ramp fuel			**15,585 kg**

Example 2

Jet aircraft. Taxi fuel is 100 kg. Trip fuel is 5,325 kg. Hold fuel is 6,000 kg/hr. Alternate fuel is 4,380 kg. Contingency is 5% of trip fuel.

What is minimum required take-off fuel?

a. 13,220 kg
b. 14,500 kg
c. 12,975 kg
d. 13,370 kg

Ans: c

Example 3

Piston aircraft. Taxi fuel 20 lb. Cruise fuel flow 150 lb/hr. Hold fuel flow 60 lb/hr. Flight time 1 hour 20 min. Alternate fuel 40 lb.

Assuming minimum fuel uplift, normal en-route diversions available and that contingency fuel is not used en route, what will be your fuel on arrival at the alternate?

a. 315lb
b. 95 lb
c. 55 lb
d. 295 lb

Ans: c

Example 4

Piston aircraft. Taxi fuel 20 lb. Cruise fuel flow 150 lb/hr. Hold fuel flow 60 lb/hr. Flight time 1 hour 20 min. Alternate fuel 40 lb.

Assuming minimum fuel uplift, normal en-route diversions available and that contingency fuel is not used en route, what will be your fuel on arrival at the destination after a 20 minute hold?

a. 85 lb
b. 95 lb
c. 55 lb
d. 75 lb

Ans: d

FUEL MONITORING

Having planned the expected fuel consumption, we now have to ensure that the aircraft is performing closely to the plan, and take appropriate action if it does not.

A commander must ensure that **fuel checks are carried out in flight at regular intervals.** The fuel remaining must be recorded and evaluated to:

- Compare actual consumption with planned consumption.
- Check that the remaining fuel is sufficient to complete the flight, and
- Determine the expected fuel remaining on arrival at the destination.

The relevant fuel data must be recorded.

If, as a result of an in-flight fuel check, the expected fuel remaining on arrival at the destination is less than the required alternate fuel plus final reserve fuel, **the commander must take into account the traffic and the operational conditions prevailing at the destination airfield, along the diversion route to an alternate aerodrome and at the destination alternate aerodrome,** when deciding to proceed to the destination aerodrome or to divert, so as **to land with not less than final reserve fuel.**

Modern major carriers use computer flight planning. Either they install their own dedicated ground flight planning computer, such as BA's CIRRUS system or Lufthansa's LIDO system, or they subscribe to a commercially available system such as JETPLAN. The computer output is usually in the form of large sheets of fanfold paper and a typical print-out is shown on the next page. Line 18 in this example is a list of the titles of each column and the last entry is "REM". This means "Fuel Remaining". Look down the columns and you will see that for each waypoint (KONAN, KOKSY, REMBA, etc) there is a REM value (0045, 0043, 0038, etc). This is the minimum fuel that should remain (in hundreds of kilogrammes) overhead the waypoint (i.e. 4,500 kg, 4,300 kg, 3,800 kg, etc). All that the pilot has to do is check as he passes over each waypoint that the fuel remaining is not less than the flight plan fuel and he then knows that he has sufficient to complete the trip and arrive with appropriate reserves.

```
Line

1 PLAN 6340                         EGKK TO EDDF 757B M80/F 09/30/92
2 NONSTOP COMPUTED 1145Z            FOR ETD 1830Z PROGS 30000Z                          KGS
3              FUEL    TIMEDIST  ARRIVE  TAKEOFF      LAND    AVPLD      OPNLWT
4 POA EDDF     003091  00/55 0362  1925Z   077390       074299  012500     058638
5 ALT  EDDL    001485  00/24 0101  1949Z   COMP M015
6 HLD          001521  00/30
7 CON          000155  00/03
8 REQ          006252  01/52
9 XTR          000000  00/00
10 TOT         006252  01/52
11 EGKK DVR6M DVR UG1 NTM NTM1A EDDF
12 WIND P029 MXSH 5/KOK TEMPO P01 NAM 0337
13 FL 370
14 LRC FL370 003091 00/56
15 LRC FL330 003180 00/57
16 LRC FL410 003111 00/55
17 EGKK ELEV 00202FT
18 AWY         WPT     MTR DFT ZD   ZT   ETA  ATA   CT      WIND   COMP  GRS  DSTR REM
19 MSA         FRQ
20 DVR6M       DVR     092  . .  068  0/11 . .   . .   0/11    ....   ....  .... 0294
21 023         114.95
22 UG1         TOC     097  . .  014  0/02                                       0289  0046
23 023
24 UG1         KONAN 097  L01  010  0/01 . .   . .   0/14    27045  P045  502  0270  0045
25 023
26 UG1         KOK     097  L01  025  0/03 . .   . .   0/17    26041  P040  497  0245  0043
27 023         114.5
28 UG1         REMBA   108  L02  090  0/11 . .   . .   0/28    27030  P028  488  0155  0038
29 026
30 UG1         NUVIL   109  L01   024  0/03 . .  . .   0/31    27025  P024  485  0131  0036
31 034
32 UG1         SPI     110  L01  004  0/01 . .   . .   0/32    27025  P024  485  0127  0036
33 034
34 UG1         LARED   131  L02  009  0/01 . .   . .   0/33    28025  P020  481  0118  0036
35 034
36 UG1         TOD     131  L03  007  0/01 . .   . .   0/34    28025  P021  481  0111  0035
37 043
38 UG1         NTM     131   . .  030  0/06 . .   . .   0/40     . . .  . . .  . . . 0081  . . .
39 043
40 NTM1A       EDDF    089   . .  081  0/16 . .   . .   0/55     . . .  . . .  . . . 0000  0032
41 043
42 ELEV        00364FT
43 EGKK        N51089W000113       DVR     N51097E001217       KONAN       N51078E002000
44 KOK         N51057E002392       REMBA   N50398E004549       NUVIL       N50322E005315
45 SPI         N50309E005375       LARED   N50252E005480       NTM         N50010E006320
46 EDDF        N50021E008343
47 FIRS        EBUR/0014   EDDU/0036
48 (FPL-JD105-IN)
49 -B757/M-SXI/C
50 -EGKK1830
51 -N0457F370  DVR6M   DVR UG1 NTM NTM1A
52 -EDDF0055 EDDL
53 -EET/EBUR0014   EDDU0036
54 REG/GBDKC  SEL/JDHC
55 E/0152   P/121   R/V   S/M   J/L   D/6   150C   YELLOW
56 A/WHITE BLUE
```

Figure 3.1 Computer Flight Plan - Gatwick to Frankfurt

For longer flights, it is also necessary to keep a track on the fuel consumption trend. We may have adequate reserves at the start of a trip but if the fuel consumption rate is higher than forecast we may go below the minimum requirement at a later stage of the flight. We need to have adequate early warning of the fuel flow as well as the total quantity.

On sophisticated modern aircraft this is accomplished by use of the Flight Management System. The fuel contents and the fuel flow-meter readings are passed directly into the FMC. The FMC also knows the route distance to go, the current groundspeed and the anticipated descent profile. From this it can work out the expected fuel on arrival. This is available for the pilots to check at any time. This expected arrival fuel is also compared with the sum of the alternate fuel and the final reserve fuel. If it goes below this sum, a warning to the pilots is displayed on the Control and Display Unit (CDU).

For aircraft without an FMS, the 'Howgozit' fuel graph is the usual method. A graph is drawn with 'Fuel Remaining' as the 'y' axis and 'Distance to Go' as the 'x' axis. See the example at Figure 3.2.

Note: *Questions on the 'Howgozit' are not set in the JAA exam. This is simply to help your understanding of fuel monitoring.*

In this example, we are assuming that we have a flight of 1,000 nautical ground miles. We have to land with 1,000 kg (our final reserve fuel) and the fuel required to fly to the alternate is 700 kg. Therefore our minimum on arrival at the destination is 1,700 kg.

(Just out of interest, note that the slope changes shortly after the start. This is because aircraft usually climb at a slower speed than cruise, but the engines are at or near max continuous power in the climb but at cruise power when level).

We are expecting to use 5,000 kg en route, so this is our trip fuel. Our contingency will be 5% of the remaining trip fuel, so this will be 250 kg at the start of the trip, reducing to zero at the end. Our minimum take-off fuel is therefore 6,950 kg.

Now, although we must have our contingency fuel on board, very often we do not use it. After all, the trip fuel is supposed to be based on a realistic figure. Therefore the contingency is only to cover unforeseen fuel consumption deviations, incorrect met forecasts and unexpected ATC re-routing. On the majority of trips, these should not occur. In these cases, the fuel will track down the 'probable fuel consumption' line and we will arrive with the contingency fuel unused.

During the flight we take fuel checks every half hour (or other interval, as specified in the company's Flight Operations Manual). From these we build up the history of the fuel consumption and establish a trend. Extrapolating the slope will indicate to us the expected arrival fuel if the trend continues. In Figure 3.3a, for instance, we are going to arrive with sufficient fuel. In Figure 3.3b, we are not. In this case, appropriate action would have to be considered, such as returning to the departure airfield or diverting to a suitable en-route airfield to up-lift fuel.

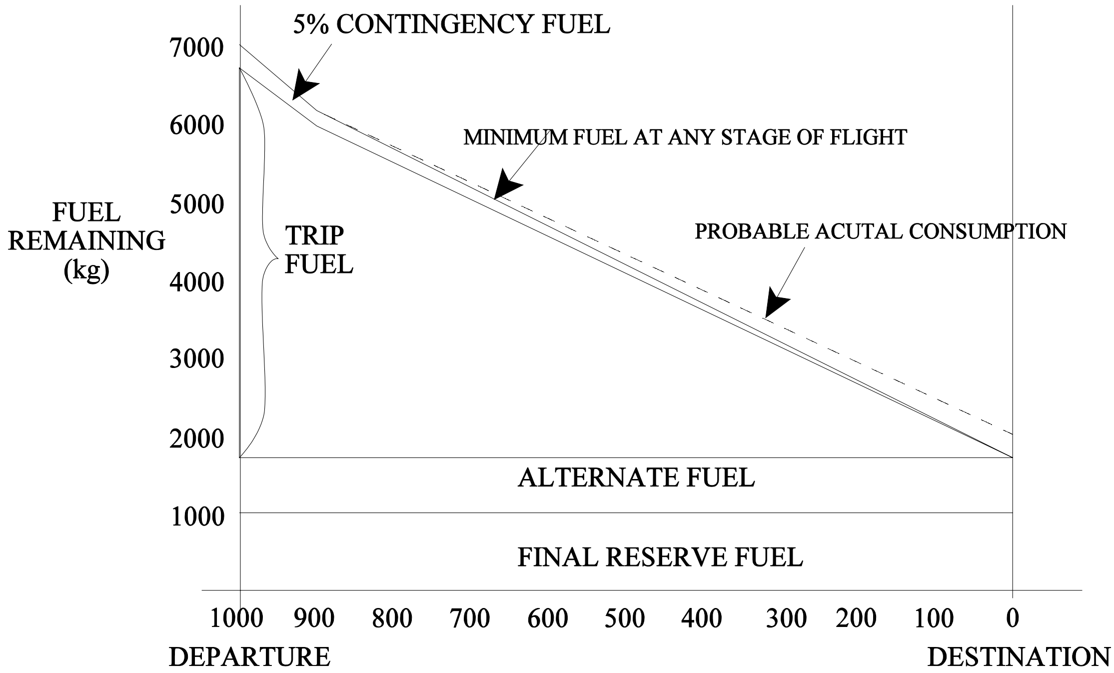


Figure 3.2 Fuel Graph

'HOWGOZIT' FUEL GRAPH

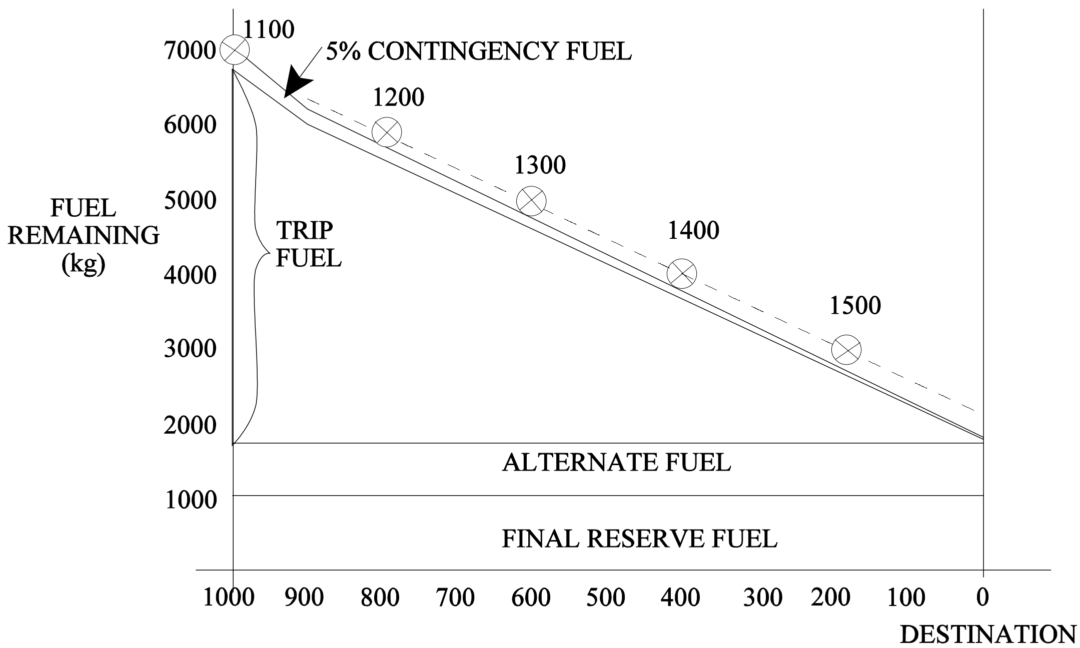


Figure 3.3a Sufficient Fuel

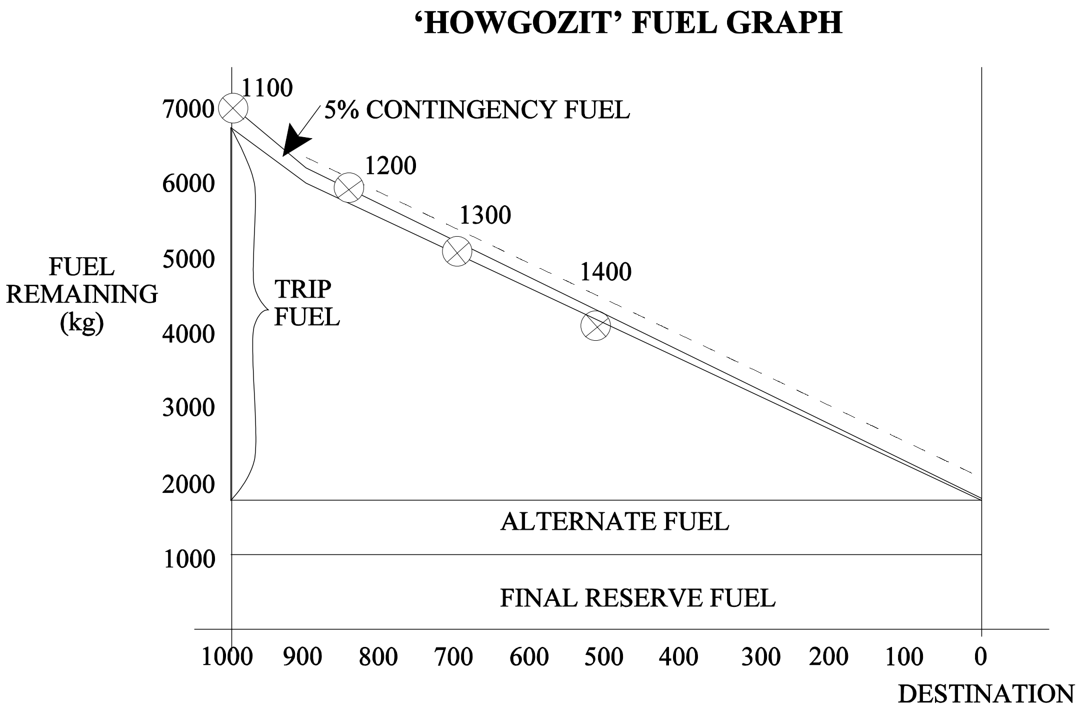


Figure 3.3b Insufficient Fuel

A check of the aircraft's fuel system may be required if it was thought that the excess consumption was caused by a fuel leak or a fuel-gauge fault. An error in computation at flight planning or in the actual fuel amount up-lifted at departure may have been the cause of the short- fall. Aircraft have run short of fuel. Very strong un-forecast headwinds have been encountered. Pounds to kilograms, kilograms to pounds, have been erroneously converted and specific gravities applied incorrectly!

SPECIAL CASES 1 – DECISION POINT PROCEDURE

There is a special case when we may get airborne without sufficient contingency fuel for the planned trip to the destination. This is called **decision point procedure.**

Decision Point Procedcure - A Typical Scenario

Consider the 'Howgozit' in Figure 3.5. A flight from Oxford to Faro, in southern Portugal, is planned. There are alternates near Faro - Seville or Jerez, for instance. The total of the Final Reserve Fuel and the Alternate Fuel is 3000 kg. The trip fuel is exactly 10,000 kg. There is a suitable en route diversion at Lisbon, so Contingency Fuel is 3%, which comes to 300 kg. This means that we need 13,300 kg at take-off.

Unfortunately, the maximum capacity of our fuel tanks means that we can get in only 13,150 kg at take-off. This is 150 kg short of the minimum requirement. Does this mean that we cannot do this flight? Not necessarily, if there is a suitable en route alternate.

We define the top of descent for going into Lisbon, our alternate, as the Decision Point. We have plenty of fuel to proceed to Lisbon, so this is legal. At this Decision Point, we carry out a fuel check. Unless unforeseen circumstances have arisen, we will probably not have used the Contingency Fuel and so will still have 150 kg above the expected consumption line for Faro.

The requirement for Contingency Fuel is 3% above the Trip Fuel required for the remainder of the flight, not the start trip fuel. At this stage of the trip, the required contingency fuel is only 55 kg. If the fuel remaining includes this 55 kg Contingency Fuel plus the remainder of the trip fuel for Faro (along with the usual Alternate Fuel and Final Reserve Fuel), we continue to Faro. If the fuel remaining comes to less than this figure, we divert to our alternate, Lisbon.

Figure 3.4 Oxford to Faro

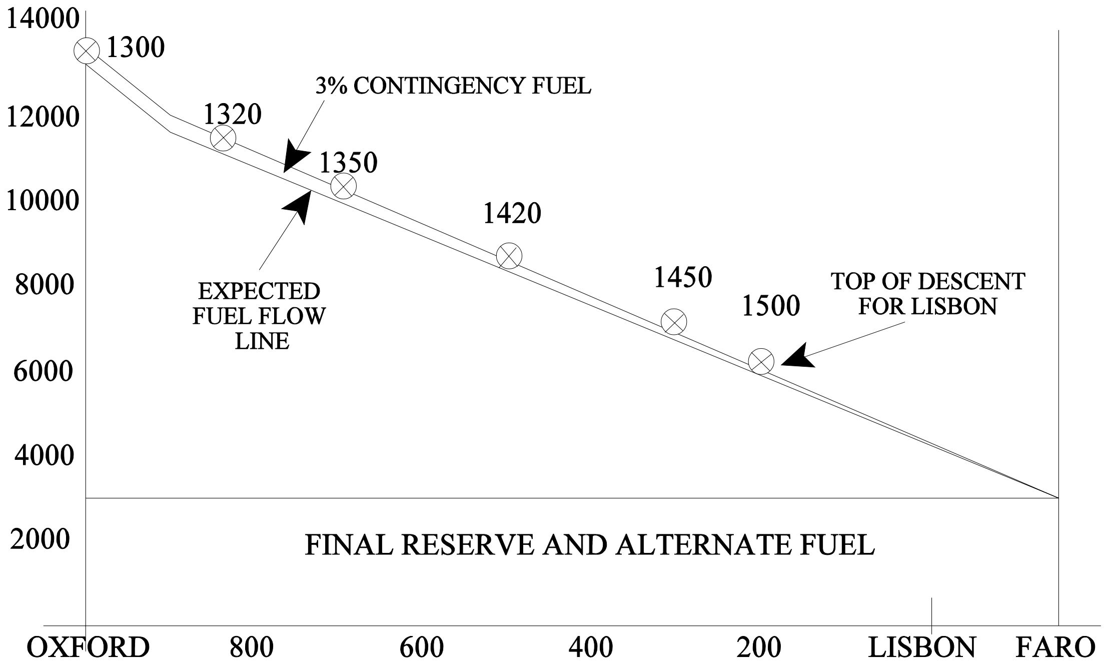


Figure 3.5 Oxford - Faro

Decision Point Procedure should not be attempted unless the departure fuel is sufficient to guarantee a reasonable expectation of there being enough fuel remaining at the Decision Point to permit continuation to the scheduled destination. The success of a Decision Point procedure will depend on whether unforeseen events, such as not being cleared to the optimum cruise level or avoidance of weather, have caused the contingency fuel allowance to be used. The normal non-consumption of contingency fuel, which can be a considerable amount (usually 3% at least of the fuel between departure and Decision Point), permits Decision Point Procedure to be feasible and safe.

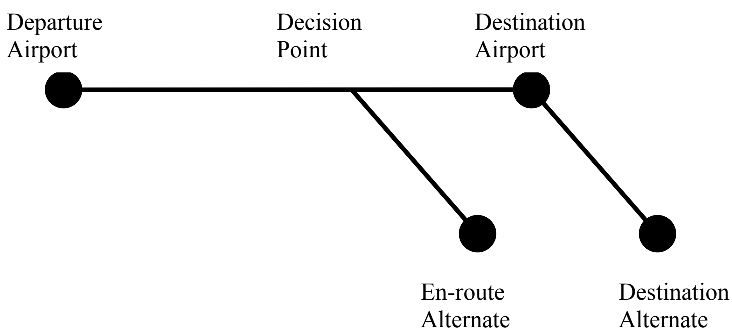


Figure 3.6 Decision Point Procedure

Comparing the Decision Point Procedure fuel requirement with the normal fuel requirements, **the maximum fuel reduction available is the contingency fuel (3% or 5% of trip fuel) between Departure and Decision Point**.

Alternatively, we can say that **contingency fuel can be reduced down to that required between Decision Point and Destination**.

SPECIAL CASES 2 – ISOLATED AERODROME PROCEDURE

An 'Isolated' Aerodrome is defined as an aerodrome for which there is no Destination Alternate. An island in an ocean is a good example, for instance, Easter Island in the South Pacific. In this case the aircraft might have to hold for longer than usual (ie, in the case of a blocked runway or a tropical storm passing through) with no option of diverting. Reserves normally consist of Contingency Fuel, Alternate Fuel and Final Reserve Fuel. In the case of an Isolated aerodrome there is no Alternate, so there is no Alternate Fuel. Instead, for a jet or turboprop aircraft, the combination of Final Reserve Fuel and Additional Fuel must comprise enough fuel to fly for two hours at normal cruise consumption after arriving at the destination aerodrome. CS-OPS 1 specifies that the fuel must include:

- Taxi fuel
- Trip Fuel
- Contingency Fuel
- Additional Fuel if required but not less than:
  - For aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15% of the flight time planned to be spent at cruising level, or two hours, whichever is less.
  - For aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption after arriving overhead the destination aerodrome, including the Final Reserve Fuel.

INTENTIONALLY BLANK

SELF-ASSESSMENT QUESTIONS

1. Given:

Dry Op Mass	= 33510 kg
Load	= 7600 kg
Final reserve fuel	= 983 kg
Alternate fuel	= 1100 kg
Contingency fuel	= 102 kg

The estimated landing mass at the alternate should be:

a. 42312 kg
b. 42093 kg
c. 42210 kg
d. 42195 kg

2. What is the purpose of Decision Point Procedure?

a. Carry minimum fuel to increase Traffic Load.
b. Increase safety of the flight.
c. Reduce landing mass to avoid stressing the aircraft.
d. Reduce contingency fuel to below that required from Decision Point to destination.

3. What is Decision Point Procedure?
It is a procedure to reduce the amount of fuel carried on a flight by:

a. Reducing contingency fuel from 10% to 5% of trip fuel.
b. Reducing contingency fuel to only that required from Decision Point to Destination.
c. Reducing trip fuel to only that required from Decision Aerodrome to Destination.
d. Reducing contingency fuel to below that required from Decision Point to destination.

4. Turbo-jet ac; taxi fuel 600 kg; fuel flow cruise 10,000 kg/hr; fuel flow hold 8,000 kg/hr; alternate fuel 10,200 kg; flight time 6 hours; visibility at destination 2000 m. What is the minimum ramp fuel?

a. 80,500 kg
b. 79,200 kg
c. 77,800 kg
d. 76,100 kg

5. Given: DOM 33,510 kg; Traffic load 7,600 kg. Trip fuel 2040 kg. Final reserve 983 kg. Alternate fuel 1100 kg. Contingency 5% of trip fuel.
Which of the following is correct?

a. Est. landing mass at destination 43,193 kg
b. Est. landing mass at destination 43,295 kg
c. Est. take-off mass 43,295 kg
d. Est. take-off mass 45,233 kg

6. Multi-engined ac on IFR flight. Given: trip fuel 65 US Gal; contingency 5% trip; Alternate fuel including final reserve 17 US Gal; Useable fuel at departure 93 US Gal. At a point halfway to destination, fuel consumed is 40 US Gal. Assuming fuel consumption is unchanged, which of the following is correct?

   a. At departure Reserve Fuel was 28 US Gal.
   b. At destination required reserves remain intact.
   c. Remaining fuel is insufficient to reach destination with reserves intact.
   d. At destination there will be 30 gal in tanks.

7. Minimum planned take-off fuel is 160 kg (30% total reserve is included). Assume the ground speed on this trip is constant. When half the distance has been flown, the remaining fuel is 70 kg. Is it necessary to divert to a nearby alternate?

   a. Diversion to a nearby alternate is necessary, because the remaining fuel is not sufficient.
   b. Diversion to a nearby alternate is not necessary, because the reserve fuel has not been used completely.
   c. Diversion to a nearby alternate is necessary, because it is allowed to calculate the fuel without reserve.
   d. Diversion to a nearby alternate is necessary, unless the captain decides to continue on his own responsibility.

ANSWERS

1	D
2	A
3	B
4	C
5	B
6	C
7	A

CHAPTER FOUR

NAUTICAL AIR MILES

Contents

NAUTICAL AIR MILES

Many of the graphs for the Single-Engine Piston (SEP), Multi-engine Piston (MEP) and, later, the Medium Range Jet Transport (MRJT) aircraft, refer to nautical air miles (NAM). They are a measure of the air distance flown by an aircraft. i.e. the distance flown at the True Air Speed (TAS). In still air (or when there is no wind component along the aircraft's heading vector) the NAM flown are equal to the Nautical Ground Distance (NGM) flown. NGM is the distance flown by the aircraft over the ground, as may be measured on a chart.

Usually the air is moving and an aircraft flying through this moving air will fly a different distance over the ground. If the air is moving in the opposite direction to the aircraft (a headwind, or minus wind component) then the aircraft will fly more NAM than NGM.
(See Figure 4.1a.)

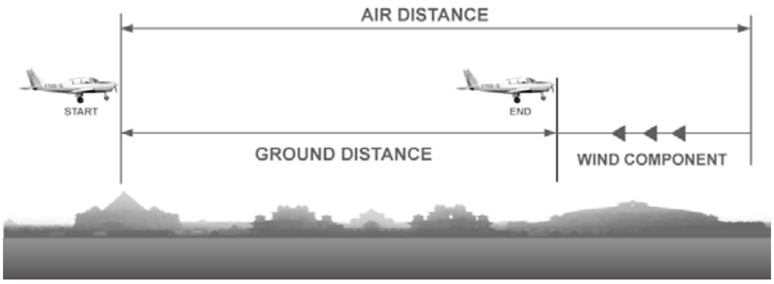


Figure 4.1a. NAM greater than NGM

Similarly, if the wind is blowing in the direction that the aircraft is flying, (a tailwind or plus wind component) the NAM will be less than NGM. (See Figure ure

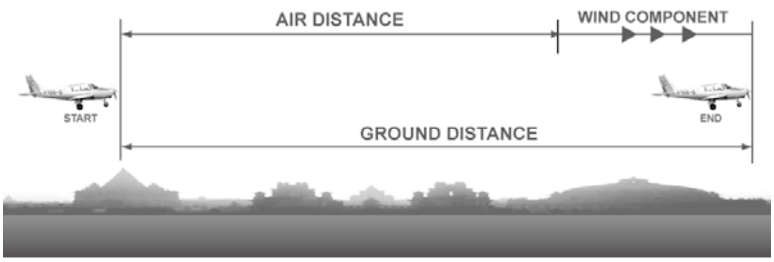


Figure 4.1b. NAM less than NGM

The relationship between NAM, NGM, TAS, GS (ground speed) and wind component (WC) is:

$$\frac{NAM}{NGM} = \frac{TAS}{GS}$$

Example

An aircraft flies at TAS 142 kt for 63 NAM. If the WC is -20kt, how many NGM does it fly?

$$\frac{NAM}{NGM} = \frac{TAS}{GS}$$

$$\frac{63}{X} = \frac{142}{122}$$

X = 122/142 * 63 = 54

OR on your Navigation Computer

Red cursor: 142 on the outer scale is set against 122 on the inner. Blue cursor: 63 is read on the outer scale against 54 on the inner.

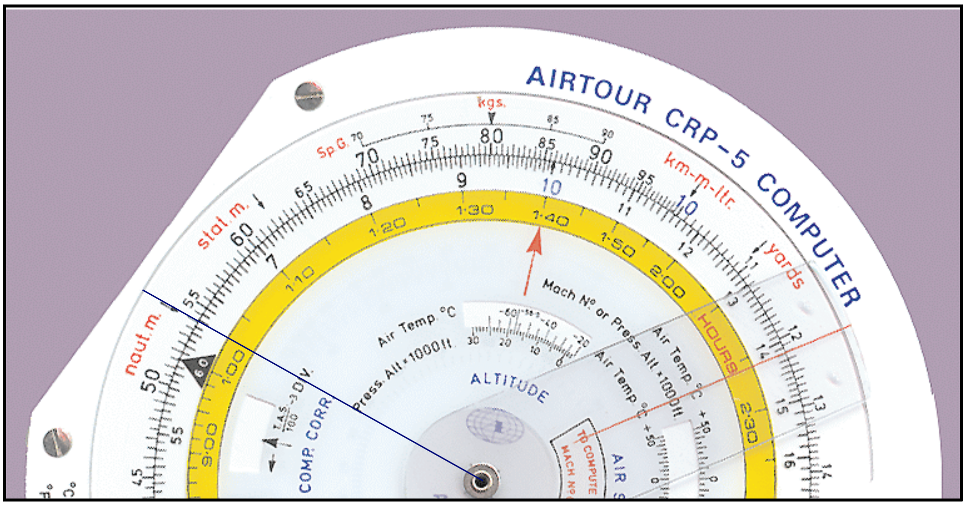


Figure 4.2. NAM to NGM using Navigation Computer

If the TAS (or GS) are not known, for example in a climb or descent, the conversion can still be carried out.

Consider an aircraft with a TAS of 100kt:

In one hour it would fly 100 NAM. But in that hour the air has been moved by the wind component. If the WC is -25 (25 head), then the air has moved 25 nm in the direction from which the aircraft came. So the ground distance flown is:

100 - 25 = 75 NGM.

Similarly, if the WC is +25 (25 tail) the ground distance is:

100 + 25 = 125 NGM.

We can see that the difference between air and ground distance is the +/- WC per minutes flown, or:

$$\frac{+/-\ WC}{60} \times \text{ minutes flown}$$

This gives the formula:

$$NGM = NAM \ +/- \left(\frac{WC}{60} \times \text{ sector time} \right)$$

Example

An aircraft climbs to cruising level in 11.5 minutes, covering 23.5 NAM. If the wind component is -30 kt, how many NGM are flown in the climb?

$$NGM = 23.5 - \left(\frac{30}{60} \times 11.5 \right)$$

$$= 23.5 – 5.75$$

$$= 17.75 \text{ (or18) NGM}$$

QUESTIONS

Take time to become very proficient doing these problems by completing the following exercises.

	TAS	W/C	GS	NAM	NGM
1	120	+20			250
2	120	-20			250
3	150	+30		330	
4	150	-30		330	
5	215	+15			755
6		+25	230	610	684
7		-20	95		185
8	550	-50			1235
9	135	+18			322
10	95	-10		310	277
11	550		520		215
12	140		160	425	
13			125	250	310
14	90			155	140
15	615	-65			2050
16	485	+55			215
17	375	+12		1500	
18	280	-20		715	
19	155	+35			785
20	405	-38		218	

	TIME	W/C	NAM	NGM
21	20	+30	105	
22	20	-30	105	
23	12	-25		88
24	30	+35	210	
25	8	-12	18	
26	15	+28		100
27	9	-35	50	
28	15	+50	85	
29	25	-40		125
30	18	+30	65	

ANSWERS

	TAS	W/C	GS	NAM	NGM
1	120	+20	140	214	250
2	120	-20	100	300	250
3	150	+30	180	330	395
4	150	-30	120	330	264
5	215	+15	230	706	755
6	205	+25	230	610	684
7	115	-20	95	224	185
8	550	-50	500	1358	1235
9	135	+18	153	284	322
10	95	-10	85	310	277
11	550	-30	520	227	215
12	140	+20	160	425	486
13	101	+24	125	250	310
14	90	-9	81	155	140
15	615	-65	550	2292	2050
16	485	+55	540	193	215
17	375	+12	387	1500	1548
18	280	-20	260	715	664
19	155	+35	190	640	785
20	405	-38	367	218	198

	TIME	W/C	NAM	NGM
21	20	+30	105	115
22	20	-30	105	95
23	12	-25	93	88
24	30	+35	210	227
25	8	-12	18	16
26	15	+28	93	100
27	9	-35	50	45
28	15	+50	85	98
29	25	-40	142	125
30	18	+30	65	74

CHAPTER FIVE

SINGLE ENGINE PISTON AEROPLANE (SEP)

Contents

INTRODUCTION

The tables for SEP refer to a more complex aircraft than the Warrior. The SEP is **a monoplane** with a **reciprocating engine.** It has a **constant speed propeller**, propeller RPM being controlled by the pilot via an RPM (or Pitch) lever. The fuel/ air mixture may be "rich" (more fuel) or "lean" (less fuel). Total fuel/ air mixture going into the engine is adjusted by varying the manifold pressure; the higher the manifold pressure, the more mixture being burnt.

The SEP manifold pressure is measured in inches of mercury; e.g. "25.0 in HG". As the aircraft climbs, the throttle lever must be advanced, manually, in order to maintain a desired pressure. Sometimes an engine device can add more fuel/ air mixture automatically, without the pilot moving the throttle lever. Eventually, in the climb, an altitude will be reached where manifold pressure can no longer be maintained. In this case, the throttle lever will remain at "maximum forward" and manifold pressure will start to reduce. **This altitude is called "full throttle height" and the power is said to be at "full throttle ".**

The SEP has a **retractable undercarriage**. The tables assume that the undercarriage is at the appropriate position for the stage of flight ie "down or extended" for landing and take off, "up or retracted" for climb, cruise and descent. There is no requirement to consider abnormal cases.

Details:

Maximum Take-off Mass (MTOM)	**3650 LB**
Maximum Landing Mass (MLM)	3650 LB
Maximum fuel load	**74 US GAL**
Fuel density	**6lbs/US GAL (unless advised otherwise)**

SINGLE ENGINE PISTON AEROPLANE (SEP) GRAPHS & TABLES

Please refer to CAP697 where all the graphs and tables for SEP will be found.

Each graph and table type within CAP697 has an example to explain how the particular graph or table is used. Therefore, the method is not repeated in these notes.

SEP - TIME, FUEL AND DISTANCE TO CLIMB DATA

(Ref. Fig. 4.4.)

The graph gives time, fuel and distance (NAM) to climb to any height (as pressure altitude and OAT) from MSL. If the airport is at MSL, the climb data can be read from the graph in one pass. If the airport is not at sea level then you have to extract the data for the top of climb (TOC) or initial cruising level, then extract data for the airport and take the airport data away from your cruising level to get the correct figures.

Climb Examples

1. Refer to CAP697 Figure 2.1
Given:

Airfield at	MSL	
OAT	+20°C	
Mass	3,650 lbs	
Climb to	FL100	OAT -10°C

What is the time, fuel and distance covered in the climb?

Time	Fuel	Distance

With a 30 kt tailwind; what is the ground distance covered in the climb?

2. Refer to CAP697 Figure 2.1
Given:

Airfield at	3000 ft	
OAT	+15°C	
Mass	3200 lbs	
Climb to	FL120	ISA

What are the time, fuel and distance covered in the climb?

	Time	Fuel	Distance
FL120			
3000 ft			
Difference			

With a 40 kt headwind; what is the ground distance covered in the climb?

Answers to Climb Examples

1.

Time	Fuel	Distance
13	**4.8**	**27**

33 ngm

2.

	Time	Fuel	Distance
FL120	**14**	**5**	**29**
3000 ft	**3**	**1**	**5**
Difference	***11***	***4***	***24***

17 ngm

CRUISE POWER SETTINGS TABLES

Each table in the Figure 2.2 series shows the performance data for a given power setting. For example, table 2.2.1 is for:

Manifold pressure of 25. 0 IN. HG (mercury) @ 2500 RPM.

The data is given for three different ISA temperature deviations: STANDARD DAY, ISA +20°C and ISA -20°C. Note that above a certain altitude (full throttle height), the stated manifold pressure cannot be produced by the engine and the tabulated values of manifold pressures (shaded areas) are approximately the maximum that can be expected.

The tables are used by turning to the page for the selected power setting and then choosing the nearest temperature deviation to that forecast. If the ISA temperature is either +10 or -10, then interpolation between tables is required.

Interpolation between pressure altitudes is required.

Cruise Example

3. Refer to CAP697 Figure 2.2 & 2.3 and extract the following data

			TAS	IAS	PPH	USG
Given: 25″ @ 2500 rpm	FL90	ISA +5°C				
Given: 21″ @ 2100 rpm	FL90	ISA -15°C				
Given: 23″ @ 2300 rpm	FL100	ISA +10°C				

Answers to cruise example

3. Refer to CAP697 Figure 2.2 & 2.3 and find the following data

			TAS	IAS	PPH	USG
Given: 25″ @ 2500 rpm	FL90	ISA +5°C	**168**	**148**	**76.3**	**12.7**
Given: 21″ @ 2100 rpm	FL90	ISA -15°C	**143**	**132**	**59.5**	**9.9**
Given: 23″ @ 2300 rpm	FL100	ISA +10°C	**157**	**134**	**65.10**	**10.85**

ISA	**ISA +20**
157	**156**
137	**132**
66.2	**64**
11	**10.7**

RANGE PROFILE FIGURE

This table gives an estimate of the maximum still-air range, for each of four power settings, for a selected pressure altitude.

The calculated range includes fuel for:

- Climb
- Cruise
- Taxi and run-up, plus
- A reserve fuel for 45 minutes at economy cruise power .

This table enables the pilot to rapidly select a suitable cruise level for a route distance and preferred power setting. It is also possible to select a power setting, given a preferred cruise altitude and route distance.

To use the table, enter on the left with **cruising pressure altitude** and move horizontally to the **selected power setting curve**. Move vertically downwards to read off the range in **Nautical Air Miles.**

Note. Range is effected by wind, therefore you will have to convert the NAM extracted from the graph into NGM, using the formula discussed in Chapter 3.

Range Examples

4. Refer to CAP697 Figure 2.4 — Extract Range (NAM)

   Given: Full Throttle @ 2500 rpm FL100

   Given: Full Throttle @ 2100 rpm FL100

   Given: Full Throttle @ 2300 rpm FL70

5. Given:
   Full Throttle @ 2500 rpm FL80
   30 kt tailwind component
   What is the ground range?

Answers to Range Examples

4.	Refer to CAP697 Figure 2.4		Extract Range (NAM)
	Given: Full Throttle @ 2500 rpm	FL100	**836**
	Given: Full Throttle @ 2100 rpm	FL100	**904**
	Given: Full Throttle @ 2300 rpm	FL70	**832**

5. Given:
Full Throttle @ 2500 rpm FL80
30 kt tailwind component
What is the ground range ?

789 nam from graph, also extract a TAS of **169** kt from the graph

$$\frac{TAS}{GS} = \frac{NAM}{NGM} \qquad \frac{169}{199} = \frac{789}{x} \qquad = \mathbf{929\ NGM}$$

ENDURANCE

The table gives endurance (how long the aircraft can remain airborne; not necessarily the time to achieve the maximum range). Use in a similar manner to Figure 2.4.
As this endurance includes a 45 minute reserve the endurance you extract is called a safe endurance.

Note. Endurance is NOT effected by wind.

Endurance example

5.	Refer to CAP697 Figure 2.5		Extract Endurance
	Given: FT @ 2500 rpm	FL100	
	Given: FT @ 2100 rpm	FL100	
	Given: FT or 23" @ 2300 rpm	FL70	

Answer to endurance example

5.	Refer to CAP697 Figure 2.5		Extract Endurance
	Given: FT @ 2500 rpm	FL100	**5.1 hrs 5 hrs 6 min**
	Given: FT @ 2100 rpm	FL100	**6.35 hrs 6 hrs 21 min**
	Given: FT or 23" @ 2300 rpm	FL70	**5.2 hrs 5 hrs 12 min**

SEP EXERCISE 1

Airfield "A" Data — Elevation: MSL; Temp: +20°c; Departure Mass: 3400 lbs

Aircraft plans to cruise to "D" at 23" 2300 rpm power

Using SEP Fig 2.1 and Fig 2.2 complete the fuel log

Calculate the Trip Fuel, Time En-route and ETA at "D"

Aircraft takes-off from "A" at 10:00

and climbs from "A" to FL80 (temperature at TOC is 0°c)

Wind Light & Variable

FROM	TO	FL	ISA DEV	W/V	TAS	NGM	TK	HDG	GS	TIME	FUEL FLOW	FUEL REQD	ETA
A	TOC	↗		L & V		100	120						
TOC	B	80	+5°c	230/30			120						
B	C	100	0	270/40		150	160						
C	D	60	-10°c	200/20		80	130						
TOTALS													

QUESTIONS

1. Refer to CAP 697 SEP1, fig 2.1

Given:	Aerodrome elevation	2500 ft,
	OAT	+10°C
	Initial weight	3500 lb
	Climb to	FL140 OAT -5°C

What is the climb time, fuel, NAM?

a.	22 min	6.5 g	46 nam
b.	24 min	7.5 g	50 nam
c.	2 min	1.0 g	4 nam
d.	26 min	8.5 g	54 nam

2. Refer to CAP697 SEP1, fig 2.2.3

Given FL75
OAT +10°C
Lean mixture
2300 RPM

Find fuel flow (GPH) gallons per hour and TAS.

a.	68.5 GPH	160 kts
b.	11.6 GPH	160 kts
c.	71.1 GPH	143 kts
d.	11.6 GPH	143 kts

3. Refer to CAP 697 SEP1 fig 2.4

Given:	Aeroplane mass at start up	3663 lbs
	Fuel load (density 6lbs/gal)	74 gal
	Take-off altitude	sea level
	Headwind	40 kt
	Cruise altitude	8000 ft
	Power setting,s	full throttle
		2300 RPM
		20°C lean of peak

Calculate the range

a.	548 nm
b.	844 nm
c.	730 nm
d.	633 nm

4. Refer to CAP697, SEP1, fig 2.5

Given		FL75
		Lean mixture
		Full throttle / 2300 RPM
	Take-off fuel	444 lbs
	Take-off from	MSL

Find endurance in hours

a.	5 hrs 20 mins
b.	4 hrs 42 mins
c.	5 hrs 12 mins
d.	5 hrs 23 mins

SEP EXERCISE 1 - ANSWERS

Airfield "A" Data	Elevation	MSL	Aircraft plans to cruise to "D" at 23" 2300 rpm power
	Temp	+20°c	Using SEP Fig 2.1 and Fig 2.2 complete the fuel log
	Departure Mass	3400 lbs	Calculate the Trip Fuel, Time En-route and ETA at "D"

Aircraft takes-off from "A" at 10:00

and climbs from "A" to FL80 (temperature at TOC is 0°c)

Wind Light & Variable

FROM	TO	FL	ISA DEV	W/V	TAS	NGM	TK	HDG	GS	TIME	FUEL FLOW	FUEL REQD	ETA
A	TOC	↗		L & V		18	120			8		3.4	10:08
TOC	B	80	+5°c	230/30	160	82	120	130	168	29	11.9	5.8	10:37
B	C	100	0	270/40	157	150	160	174	166	54	11	9.9	11:31
C	D	60	-10°c	200/20	158	80	130	137	150	32	12.2	6.5	12:03
TOTALS						330				123		25.6	

Worked Answers

Climb from A to FL80	**Cruise**	**TAS**	**FF**	(Table 2.2.3)
(Fig 2.1)	TOC to			
	B	160	11.9	Using the Standard Day Block
Time = 8 mins	B to C	157	11	Using the Standard Day Block
Fuel = 3.4 USG	C to D	158	12.2	Interpolating between Standard Day and ISA -20c

Distance = 18 NAM & NGM as no wind

Therefore TOC to B is 100 - 18 = 82 NM

ANSWERS

1. A
2. B
3. D
4. C

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CHAPTER SIX

MULTI-ENGINE PISTON AEROPLANE

Contents

INTRODUCTION

Data sheets are provided for a multi-engined aircraft (MEP1). This is a monoplane with two reciprocating engines, twin counter-rotating constant speed propellers and a retractable undercarriage; similar to a Piper Seneca.

Maximum Take-off Mass (MTOM)		**4750 LB**
Maximum Zero Fuel Mass (MZFM)		**4470 LB**
Maximum Landing Mass (MLM)		**4513 LB**
(Mass of aircraft = crew and payload but no fuel)		
Maximum fuel load		**123 US GAL**
Assumed fuel density	**(Unless otherwise advised)**	**6 LB/US GAL (SG.72)**
Maximum fuel mass		**123 X 6 = 738 LB**
		(123 X .72 X 8.3 = 735LB)

The Power Settings of 75%, 65% and 45% equate to High Speed Cruise, Economy Cruise and Long range Cruise.

The data sheets are used in a similar manner to those for SEP1. The following paragraphs explain the use of the data sheets.

MEP 1-FUEL, TIME AND DISTANCE TO CLIMB DATA

There are separate reference lines for **time, distance and fuel to climb**, but only one combined scale.

Climb examples

1. Refer to CAP697 Figure 3.1
   Given: Airfield at MSL OAT +20°C
   Climb to FL120 OAT -10°C

   What is the fuel, time and distance covered in the climb?

F	T	D

   With a 35 kt tailwind; what is the ground distance covered in the climb?

2. Refer to CAP697 Figure 3.1
   Given: Airfield at 4000 ft OAT +0°C
   Climb to FL140 OAT -20°C

   What is the fuel, time and distance covered in the climb?

	F	T	D
FL140			
4000 ft			
Difference			

   With a 40 kt headwind; what is the ground distance covered in the climb?

Answers to climb examples

1. Refer to CAP697 Figure 3.1
Given: Airfield at MSL OAT +20°C
Climb to FL120 OAT -10°C

What is the fuel, time and distance covered in the climb?

F	T	D
10	**19**	**34**

With a 35 kt tailwind; what is the ground distance covered in the climb?

45 ngm

2. Refer to CAP697 Figure 3.1
Given: Airfield at 4000 ft OAT +0°C
Climb to FL140 OAT -20°C

What is the fuel, time and distance covered in the climb?

	F	T	D
FL140	**12**	**22**	**39**
4000 ft	**4**	**6**	**11**
Difference	***8***	***16***	***28***

With a 40 kt headwind; what is the ground distance covered in the climb?

17 ngm

MEP 1-RANGE AT STANDARD TEMPERATURES

(CAP 697 Figure 3.2)

Two values of air range can be extracted, with either **45 MIN. RESERVE FUEL AT 45% POWER** (left hand side of graph) or **WITH NO RESERVE** (right hand side of graph).

NB. On the top right side of the graph is a power phrase to percentage translation. Eg. Economy power is 65%.

You also should correct the air range in accordance with the notes at the top left hand side of the graph.

Remember range is effected by wind so you might have to convert NAMs into NGMs.

Range examples

		Range with reserves	Range no reserve
3.	Refer to CAP697 Figure 3.2	Range with reserves	Range no reserve
	Given: Economy @ FL100 ISA		
	Given: LRC @ FL140 ISA		

Answers to range examples

3.	Refer to CAP697 Figure 3.2	Range with reserves	Range no reserve
	Given: Economy @ FL100 ISA	**760**	**850**
	Given: LRC @ FL140 ISA	**930**	**1040**

MEP 1-POWER SETTING AND FUEL FLOW

(CAP 697 Figure 3.3)

Power settings are expressed as **75% (HIGH SPEED), 65% (ECONOMY), 55% AND 45% (LONG RANGE)**. TAS is extracted from the SPEED POWER table, figure 3.4.

Enter the table with the required % power to obtain fuel flow in US GAL/hr

For example: Economy Power (65%) has a fuel flow of 23.3 USG/HR. Given a time let's say of 2hrs 30 minutes you can work out a trip fuel of 58.25 USG.

The manifold pressure is read off against pressure altitude and RPM in the correct % power column

Note that, for example, 75% power and a fuel flow of 29.0GPH should be achieved at FL60 at:

- **33.4 IN HG @ 2500RPM, or**
- **32.2 IN HG @ 2600RPM.**

Also, that the fuel flow decreases as power decreases, thus giving greater range and endurance.

To correct for temperatures different from ISA:

For each 6°C above ISA, add 1% to tabulated manifold pressure.

For each 6°C below ISA, subtract 1% from tabulated manifold pressure.

Make corrections to the nearest 1% only.

Unlike the SEP power graphs the TAS is NOT extracted here, so a separate graph is provided for you to get your TAS.

MEP 1-TRUE AIRSPEED

(CAP 697 Figure 3.4)

This graph is used to obtain the TAS for the various temperature, altitude and % power setting combinations in the cruise configuration.

Examples of extraction of TAS

4.	Refer to CAP697 Figure 3.4	TAS
	Given: High Speed@ FL120 ISA	
	Given: Economy @ FL120 ISA	
	Given: LRC @ FL120 ISA	
	Given: Economy @ FL80 OAT +20°C	
	Given: Economy @ FL80 OAT -20°C	

Answers to TAS extractions

4.	Refer to CAP697 Figure 3.4	TAS
	Given: High Speed @ FL120 ISA	**183**
	Given: Economy @ FL120 ISA	**178**
	Given: LRC @ FL120 ISA	**146**
	Given: Economy @ FL80 OAT +20°C	**176**
	Given: Economy @ FL80 OAT -20°C	**166**

MEP 1-ENDURANCE

(CAP 697 Figure 3.5)

The endurance in hours can be obtained either with the 45 MIN. RESERVE FUEL AT 45% POWER (left hand side of graph) or WITH NO RESERVE (right hand side of graph)

Endurance examples

5.	Refer to CAP697 Figure 3.5	Safe Endurance	Total Endurance
	Given: High speed @ FL100		
	Given: Economy @ FL100		
	Given: LRC @ FL100		

Answers to endurance examples

5.	Refer to CAP697 Figure 3.5	Safe Endurance	Total Endurance
	Given: High speed @ FL100	**3.6 hrs (3:36)**	**4.1 hrs (4:06)**
	Given: Economy @ FL100	**4.5 hrs (4:30)**	**5 hrs**
	Given: LRC @ FL100	**6.4 hrs (6:24)**	**7.2 hrs (7:12)**

MEP 1- DESCENT FUEL, TIME AND DISTANCE

(CAP 697 Figure 3.6)

This table works in the same way as the climb table in that one entry will give the fuel, time and distance to descend from a pressure altitude (FL) to MSL. If the destination airfield is not at MSL, then a second entry is needed to extract data for a hypothetical descent from airfield FL to MSL. This data is subtracted from the former to give the actual descent fuel, time, distance.

Descent example

6. Refer to CAP697 Figure 3.6
Given: Descend from FL120 OAT -20°C
To airfield at 4000 ft OAT +0°C

What is the fuel, time and distance covered in the descent?

	F	T	D
FL120			
4000 ft			
Difference			

With a 20 kt headwind; what is the ground distance covered in the descent?

Answers to descent examples

6. Refer to CAP697 Figure 3.6
Given: Descend from FL120 OAT -20°C
To airfield at 4000 ft OAT +0°C

What is the fuel, time and distance covered in the descent?

	F	T	D
FL120	**4**	**12**	**32**
4000 ft	**2**	**4**	**10**
Difference	**2**	*8*	**22**

With a 20 kt headwind; what is the ground distance covered in the descent?

19 ngm

MEP EXERCISE 1

Airfield "A" Data	Airfield "D" Data	Cruise Data
Elevation MSL	Elevation MSL	TOC to B - High Speed Cruise
Temp +15°c	Temp +15°c	B to C - Economy Cruise
Aircraft departs "A" at 11:30		C to TOD - Long Range Cruise
		Calculate the Trip Fuel, Time En-route and ETA "D"

FROM	TO	FL	OAT	W/V	TAS	NGM	TK	HDG	GS	TIME	FUEL FLOW	FUEL REQD	ETA
A	TOC		0°c	120/20		70	115						
TOC	B	FL100	- 4°c	150/30			115						
B	C	FL120	- 10°c	170/40		150	270						
C	TOD	FL100	- 6°c	140/30		80	305						
TOD	D		0°c	120/20			305						
TOTALS						300							

MEP EXERCISE 1 ANSWERS

Airfield "A" Data	Airfield "D" Data	Cruise Data
Elevation MSL	Elevation MSL	TOC to B - High Speed Cruise
Temp +15°c	Temp +15°c	B to C - Economy Cruise
Aircraft departs "A" at 11:30		C to TOD - Long Range Cruise
		Calculate the Trip Fuel, Time En-route and ETA "D"

FROM	TO	FL	OAT	W/V	TAS	NGM	TK	HDG	GS	TIME	FUEL FLOW	FUEL REQD	ETA
A	TOC		0°c	120/20		23	115			16		9	11:46
TOC	B	FL100	- 4°c	150/30	180	47	115	121	155	18	29	8.7	12:04
B	C	FL120	- 10°c	170/40	178	150	270	257	180	50	23.3	19.4	12:54
C	TOD	FL100	- 6°c	140/30	142	51	305	302	171	18	16	4.8	13:12
TOD	D		0°C	120/20		29	305			10		4	13:22
TOTALS						300				112		45.9	

QUESTIONS

1. Refer to CAP 697, MEP, Fig 3.1.
A flight is to be made from an airfield (elevation 3,000 ft) to another. The cruising level is FL 120, temp ISA. The OAT at the departure airfield is +10°C, the wind component in the climb is +30kts. Calculate the fuel used, time and distance flown in the climb.

a.	8 gals	13 mins	26 ngm
b.	8 gals	14 mins	33 ngm
c.	7 gals	14 mins	19 ngm
d.	11 gals	19 mins	34 ngm

2. Refer to CAP697 MEP Fig 3.6.
A flight is to be made to an airfield, pressure altitude 3,000 ft, in a MEP aircraft. The forecast OAT for the airfield is +1°C and the cruising level will be FL 110, OAT -10°C. Calculate the still air distance in the descent and the n.g.m. covered with a 20 kt headwind.

a. 29 nm/26nm
b. 21nm/23nm
c. 20nm/18nm
d. 20nm/20nm

3. Refer to CAP697 MEP1 Fig 3.2.
Given:

Cruising level	11000 ft
OAT in the cruise	-15°C
Usable fuel	123 US gallons

The power is set to economy cruise.

Find the range in NM with 45 min reserve fuel at 45% power.

a. 752 NM
b. 852 NM
c. 610 NM
d. 602 NM

ANSWERS

1. B
2. C
3. A

CHAPTER SEVEN

MEDIUM RANGE JET TRANSPORT (MRJT) SIMPLIFIED FLIGHT PLANNING

Contents

INTRODUCTION

The performance database for a modern jet aircraft is invariably contained in the operating company's flight planning computer set-up and the aircraft's Flight Management System (FMS). The company Operation's computers will produce flight plans for optimum routes and cruise modes, according to the instructions given.

- **Best direct track non-airways.**
- **Best direct airways track.**
- **Best North Atlantic track.**
- **Least fuel or time track.**
- **Extended Range Operations (EROPS) and Non Normal Operations, such as gear down flight.**

Crews use the FMS data base for in-flight fuel monitoring, and re-planning of the aircraft's performance when necessary, in order to obtain prompt accurate information and to reduce the need to refer to the relevant Operations Manual.

However, JAR Flight Crew Licensing, Flight Planning & Monitoring (Aeroplanes), require the student to be familiar with the reference material in the **CAP697 MRJT** , which is based upon extracts from the Boeing 737-400 Operations Manual, and to answer related examination questions.

AEROPLANE DATA AND CONSTANTS

The aeroplane is a monoplane with twin turbo-jet engines and a retractable undercarriage.

Structural Limits:	
Maximum Ramp (Taxi) Mass (MRM)	**63,060kg**
Maximum Take Off Mass (MTOM)	**62,800kg**
Maximum Landing Mass (MLM)	**54,900kg**
Maximum Zero Fuel Mass (MZFM)	**51,300kg**
Dry Operating Mass (DOM) (Average value, from source other than CAA Data Sheet)	**34,270kg**
Maximum Fuel Load	**5,311 US GAL** **16145kg @ 3.04kg/US GAL**
Constants:	
Fuel Density, unless otherwise stated:	**3.04kg/US Gal** **6.7lb/US Gal**

From the foregoing data note the following:

- **Maximum Take-off Mass (MTOM)** is the maximum permissible total aeroplane mass at the start of the take-off run.
- **Maximum Landing Mass (MLM)** is the maximum total permissible landing mass upon landing under normal circumstances.
- **Maximum Zero Fuel Mass (MZFM)** is the maximum permissible mass of the aeroplane with no **usable** fuel.

- **Dry Operating Mass (DOM)** is the total mass of the aeroplane ready for a specific type of operation, excluding all **usable** fuel and traffic load. This mass includes:

    - crew and their baggage.
    - catering and removable passenger service equipment.
    - potable water and lavatory chemicals.
    - food and beverages.

- **Traffic Load** is the total mass of passengers, baggage and cargo, including any non-revenue load.

- The amount of fuel allowed for running the Auxiliary Power Unit (APU), starting the engines, "push-back" and taxi to the take-off point is:

    Maximum Ramp Mass (MRM) - Maximum Take-off Mass (MTOM)

    63,060 - 62,800 = 260kg

    Taxi fuel is roughly 11kg/min. The APU burns 115kg/h

- The maximum traffic load is**:**

    MZFM - DOM
    51,300 - 34,270 = 17,030kg

OPTIMUM CRUISE ALTITUDE

(Refer to CAP697 Figure 4.1)

The optimum pressure altitude for best fuel mileage is presented for .78Mach cruise, and Long Range Cruise (LRC) or 74Mach. LRC is recommended for minimum trip fuel as it gives 99% of the maximum fuel mileage in zero wind. When cruising within 2000ft of the optimum altitude LRC approximates to a .74Mach cruise.

If the aircraft is flown above or below the optimum altitude for LRC or .74Mach the following table tabulates the fuel penalty incurred:

Example 1:

Enter the Optimum Cruise Altitude table with the Cruise Mass (Weight) 56,800kg, move vertically up to the selected cruise profile, LRC/.74Mach or .78Mach, and move horizontally to read the optimum cruise pressure altitude.

...............................?

...............................?

Example 2:

Cruise weight 62,000kg. Calculate the optimum pressure altitude for a .74Mach cruise and the fuel and mileage penalty if the aircraft is cleared to fly 4,000ft below.

..............................? (Answers Page 99)

SHORT DISTANCE CRUISE ALTITUDE

(Refer CAP697 Figure 4.2)

The cruise distance for sectors of 235 nm or less is limited by those required for the climb and descent**.** The Short Distance Cruise Pressure Altitude table shows the maximum pressure altitude at which it is possible to cruise for at least a minute.

Example 3:

Enter with the trip distance, 175nm, and move to the temperature line, ISA + 20°C; move horizontally to the Reference Line and follow the trade lines to intercept the vertical at the Brake Release Weight, 52,000kg; move horizontally to read the optimum cruise pressure altitude:

..............................?

Example 4:

Sector distance 150nm, temperature at MSL take-off of 30°C and brake release weight 42500kg. Calculate the maximum short distance cruise pressure altitude.

...............................? (Answers Page 99)

SIMPLIFIED FLIGHT PLANNING - INTRODUCTION

(Refer to CAP697 Figures 4.3.1a to 4.4)

Simplified Flight Planning graphs are provided in the CAP697 MRJT1 for:

Three LONG RANGE CRUISE:	**100 - 600 200 -1200 and 1000 - 3000nm**
Three 0.74MACH CRUISE:	**100 - 600 200 -1200 and 1000 - 3000nm**
Three 0.78MACH CRUISE:	**100 - 600 200 -1200 and 1000 - 3000nm**
One 300KIAS CRUISE:	**0 - 1000nm.**
One STEPPED CLIMB:	**1000 - 4000nm.**
One ALTERNATE PLANNING - LRC:	**0 - 500nm.**
One HOLDING FUEL PLANNING	

The LRC, 0.74Mach, 0.78Mach and 300KIAS Cruise graphs have the same presentation.

The Simplified Flight Planning charts determine **trip fuel and time from brake release to touchdown**. APU usage, taxi, in flight flaps down manoeuvring (other than straight in approach), Cost Index Adjustments and reserve fuel should be added to the trip fuel from these charts to obtain the total fuel required. Additional fuel for holding is obtained from the Holding Fuel Planning table. (CAP 697 Figure 4.4)

SIMPLIFIED FLIGHT PLANNING - METHOD

Example 5:

LRC trip distance 1,000nm; cruise at FL290 with 50kt headwind, ISA -10°C. Estimated landing weight 40,000kg. Calculate the fuel required and flight time.

Enter with the trip distance and go vertically to the reference line. Follow the flow lines and correct for 50kt headwind.
Move vertically from this point to the first 29 intersection of the Pressure Altitude lines. Move horizontally across to the Landing Weight reference line and follow the flow lines to correct for Landing Weight.
Move horizontally across and extract the **Fuel Required...................kg**

Go back to the original vertical line and at the 29 intersection on the upper Pressure Altitude intersections move horizontally to the Trip Time reference line; follow the flow lines to ISA -10°C. Move horizontally and read off the **Trip Time..........h..........min**

If the given wind component exceeds that on a chart, convert the trip distance to nautical ground miles (ngm) to nautical air miles (nam) and ignore the Head and tail flow lines:

$$\textbf{NAM} = \frac{\textbf{NGM x Average TAS}}{\textbf{TAS +/- Wind Component}}$$

SIMPLIFIED FLIGHT PLANNING - ADDITIONAL ALLOWANCES

Cost Index Adjustment

The LRC Simplified Flight Planning charts are based upon climb, cruise and descent speeds which produce an approximate minimum trip fuel. If the flight is planned to operate with the Flight Management System (FMS) in the economy (ECON) mode adjustments to the trip fuel and time are necessary to account for the different flight profile; the table above itemises these adjustments.

Ground Operations

Fuel may be saved by minimising APU operation. **The average APU fuel flow for normal operations is 115kg/h (250 lb/h).**

The taxi fuel allowance is 11kg/min (25lb/min).

Cruise - Air Conditioning (AC) Packs and Engine/Wing Anti-ice

- **AC packs at high flow**: Increase the trip fuel by 1%.
- **Anti-ice:**
  - Engine only — Increase trip fuel by 70kg/hr.
  - Engine and Wing — Increase trip fuel by 180kg/hr.

Altitude Selection

The best fuel consumption for mileage at a given cruise profile is achieved at the optimum altitude. The fuel penalty for operations off the optimum altitudes is given by CAP 697 Table 4.1 of section 4 page 1.

Descent

The Simplified Flight Planning charts assume a descent at 0.74Mach/250KIAS and a straight in approach.

For every additional minute of flaps down operation add 75kg of fuel.

For Engine Anti-ice during the descent add 50kg.

Holding Fuel (JAA Final Reserve Fuel is extracted from this table)

The holding fuel is extracted from the HOLDING FUEL PLANNING table (Refer to CAP697 Figure 4.4). The chart is based upon a racetrack pattern at the minimum drag airspeed, with a minimum of 210KIAS. Interpolation for weight and pressure altitude is required.

Example: An aircraft holding at a pressure altitude of 1,500ft with a weight, at the start of a 30 minute hold, of 54,000kg has a planned fuel flow of 2,520k/hr. The expected fuel burn in the 30 minute hold is thus:

2,520 ÷ 2 = 1,260kg. The aircraft weight at the end of the hold is 54,000 - 1,260 = 5,2740kg.

ANSWERS TO SIMPLIFIED FLIGHT PLANNING

Example 1.

33,500ft at LRC/.74Mach.   32,600ft at .78Mach

Example 2.

31,500ft   fuel penalty +4%   mileage -4%

Example 3.

28,000ft

Example 4.

29,500ft (ISA +15°C)

Example 5.

6,700kg   3hrs.

QUESTIONS

1. Refer CAP697 Figure 4.1
   Given:
   Brake release mass of 55,000 kg
   Cruising at M0.74

   What is the optimum altitude?

2. Refer CAP697 Figure 4.1
   Given:
   Cruise mass of 50,000 kg
   Cruising at M0.78

   What is the optimum altitude?

3. Refer CAP697 Figure 4.2
   Given:
   Brake release mass of 60,000 kg
   Distance 150 nam
   ISA +10°C

   What is the short distance cruise altitude?

4. Refer CAP697 Figure 4.2
   Given:
   Brake release mass of 40,000 kg
   Distance 100 nam
   ISA +20°C

   What is the short distance cruise altitude?

5. Refer CAP697 Figure 4.3.1B
   Given:
   Landing mass of 45,000 kg
   Distance 600 ngm
   ISA +20°C
   Cruise using LRC @ FL370
   50 kt headwind

   What is the trip fuel and time?

6. Refer CAP697 Figure 4.3.1B
   Given:
   Landing mass of 55,000 kg
   Distance 600 ngm
   ISA -10°C
   Cruise using LRC @ FL370
   50 kt headwind

   What is the trip fuel and time?

7. Refer CAP697 Figure 4.3.1B
Given:
Landing mass of 35,000 kg
Distance 600 ngm
ISA
Cruise using LRC @ FL250
50 kt tailwind

What is the trip fuel and time?

8. Refer CAP697 Figure 4.3.1B
Given:
Landing mass of 37,000 kg
Fuel available 4,500 kg
ISA
Cruise using LRC @ FL370
75 kt headwind

How far could you fly?

9. Refer CAP697 Figure 4.1 and 4.3.3
Given:
Landing mass of 47,500 kg
Cruise mass of 58,000 kg
Distance 1,750 ngm
ISA +10°C
Cruise using M0.78
Wind light & variable

a. What is the optimum pressure altitude?

b. When cruising at FL330 what is your trip fuel and time?

10. Refer CAP697 Figure 4.1 and 4.3.1
Given:
Landing mass of 50,000 kg
Cruise mass of 54,000 kg
Distance 800 ngm
ISA +20°C
Cruise using LRC
50 kt tailwind

a. What is the optimum pressure altitude?
b. When cruising at FL350 what is your trip fuel and time?
c. With FMS in ECON mode with a cost index of 100; what are the fuel and time correction factors?

11. Refer CAP697 Figure 4.1, 4.3.1 and Table 4.1
Given:
    Landing mass of 45,000 kg
    Brake release mass of 60,000 kg
    Distance 2,000 ngm
    ISA -10°C
    Cruise using LRC
    100 kt headwind

    a. What is the optimum pressure altitude?
    b. When cruising at FL350 what is your trip fuel and time?
    c. If ATC restrict you to FL280; what is the fuel/mileage penalty factor?

12. Refer CAP697 Figure 4.3.2
Given:
    Landing mass of 35,000 kg
    Distance 2,000 ngm
    ISA
    Cruise using M0.74 @ FL290
    Nil wind

    What is the trip fuel and time?

13. Refer CAP697 300 KIAS cruise
Given:
    Landing mass of 55,000 kg
    Distance 500 ngm
    ISA +10°C
    Cruise @ FL240
    50 kt tailwind

    What is the trip fuel and time?

14. Refer CAP697 Figure 4.3.3
Given:
    Landing mass of 35,000 kg
    Fuel available 5,000 kg ISA
    Cruise using M0.78 @ FL350
    50 kt tailwind

    What is the estimated trip distance?

15. Refer CAP697 Figure 4.3.1
Given:
    Landing mass of 45,000 kg
    Distance 300 ngm
    ISA -10°C
    Cruise using LRC @ FL330
    120 kt tailwind
    TAS 423 kt

    What is the trip fuel and time?

16. Refer CAP697 Figure 4.3.5 Stepped Climb Cruise
Given:
Brake release mass of 62,500 kg
Distance 3,000 ngm
50 kt tailwind
ISA +20°C

What is the trip fuel and time?

17. Refer CAP697 Figure 4.3.6 Alternate Planning
Given:
Landing mass at the alternate of 47,500 kg
Distance 250 ngm
50 kt headwind

What is the alternate fuel and time?

18. Refer CAP697 Figure 4.3.3
Given:
Landing mass of 50,000 kg
Distance 700 ngm
ISA
Cruise using M0.78 at FL250
Wind light & variable

What is the trip fuel and time when engine anti-ice required for the whole flight?

ANSWERS

1.	34,600 ft		
2.	35,400 ft		
3.	25,000 ft		
4.	21,500 ft		
5.	4,000 kg		1.7 hrs (1 hr 42 min)
6.	4,550 kg		1.85 hrs (1 hr 51 min)
7.	3,100 kg		1.45 hrs (1 hr 27 min)
8.	700 ngm		
9.	a.	32,200 ft	
	b.	10,600 kg	3.95 hrs (3 hr 57 min)
10.	a.	34,600 ft	
	b.	4,400 kg	1.75 hrs (1 hr 45 min)
	c.	Fuel +7%	Time -4%
11.	a.	32,900 ft	
	b.	15,400 kg	6.75 hrs (6 hr 45 min)
c.	Off optimum by 5000 ft		5.5%
12.	10,900 kg		4.75 hrs (4 hr 45 min)
13.	3,450 kg		1.2 hrs (1 hr 12 min)
14.	1,035 ngm		
15.	1,700 kg		0.7 hrs (42 min)
16.	15,500 kg		6 hours
17.	2,000 kg		0.82 hrs (49 min)
18.	5,150 kg plus 1.65 hr @ 70 kg/hr (116) = 5266 kg		

CHAPTER EIGHT

MULTI ENGINE JET TRANSPORT

(MRJT) DETAILED FLIGHT PLANNING

EN-ROUTE CLIMB TABLE
CRUISE/INTEGRATED RANGE TABLES
DESCENT TABLES

Contents

DETAILED FUEL PLANNING - INTRODUCTION

(Refer CAP697 MRJT1 Figures 4.5.1 to 4.5.4b. Pages 19 to 70)

Four EN-ROUTE CLIMB TABLES, ISA -15 to 25°C
One WIND RANGE CORRECTION GRAPH
Eleven LONG RANGE CRUISE TABLES, FL270 - FL370
Seventeen Mach 0.74 CRUISE TABLES, FL210 - FL370
Six Mach 0.78 CRUISE TABLES, FL290 - FL390
Eight LOW LEVEL CRUISE 300 KIAS TABLES, FL140 TO FL210
Two DESCENT TABLES

EN-ROUTE CLIMB

Refer CAP697 MJRT1 Figure 4.5.1

The CAP697 provide climb tables for a **temperature range -15°C to 25°C.** Fuel, time, distance (nautical air miles) and TAS are extracted against the intersection of **Cruise Pressure Altitude** and **Brake Release Weight.** Interpolation for intermediate levels and weights is required.

The **fuel and time is from brake release** and the **distance from 1,500ft**; the scheduled **climb speed is 280 KIAS/.74 MACH**

The tabulated TAS is the climb average and is to be used to convert nautical air miles to ground nautical miles:

$$\text{NGM} = \frac{\text{NAM x AVERAGE TAS +/- WC}}{\text{AVERAGE TAS}}$$

Note. The minor Fuel Adjustment Table below the main table for departing from airfields not at mean sea level.

Example 1:
Given
Brake release weight 62,000kg
Airport elevation mean sea level
Zero wind
Cleared cruise pressure level 33,000ft
Calculate the en-route climb data.

......min; fuel burn............kg;..............ngm; average TAS............kt?

Example 2:

Calculate the en-route climb data from the following:
Airfield elevation 3,000ft
Mean wind component 30Head
Brake release weight 59,000kg
Cruise pressure level 35,000ft
OAT -62°C.

.........min; fuel burn...........kg;...........nam,..............ngm; TAS............kt?

CRUISE/INTEGRATED RANGE TABLES

Integrated range tables for Long Range Cruise, 0.74 and 0.78Mach Cruise and Low Level 300 KIAS Cruise are included in the CAP697 MRJT1, pages 25 to 68. **The same method of data extraction is used for all tables.**

The tables use the "difference" principle, **the difference in two weights being the fuel weight used for a sector**. The **corresponding difference in the tabulated distance equates to the still air distance for that weight of fuel**. Thus, all ground distances affected by a wind component must be first converted to still air distances.

For convenience gross weights are tabulated at 100kg intervals so that **table values may be extracted without interpolation.** For instance, using the table page 25 of CAP697 MRJT1, a gross weight of 51500kg equates to a cruise distance of 3093 nam; a cruise distance of 4420nam equates to a gross weight of 59600kg.

The TAS for the 0.74m and 0.78mm is tabulated at the top of each pressure altitude page; for LRC the TAS is found against the adjacent gross net weight figure.

Note the corrections to Fuel Flow and TAS, below each table, for Operation at Non- standard Temperatures

Quick guide to MRJT Integrated fuel tables

General guidelines and tips

- There are 3 main cruise methods :

Long Range Cruise	TAS is a function of aircraft mass
0.74 Mach	TAS is constant for flight level
0.78 Mach	TAS is constant for flight level

It is imperative that you pick the **correct page** for cruise method and flight level.They will NOT give you the page number in the exam, but will refer you to a figure number.
For example: Fig 4.5.3.1 then with the flight level **You** get the **correct page**.

- Tables using **NAM**: you are probably going to have to **convert** from/to NGM.

- Note there are corrections at the bottom of each page:
  - Not interested in "thrust limiting" weights
  - **SHOULD** have to adjust fuel calculated
  - **ALWAYS** adjust the initial TAS for temperature deviation

- Get TAS first, youu will need it anyway and in multi-choice might reduce number of options.

- It is the difference in the aircraft mass at the first point compared to the second point that gives the fuel required.

- A picture of what is going on might help.

- The examples on the following pages are the sort of questions and level that the JAA require.

- If you forget what to do, page 24 of CAP697 MRJT1 will remind you.

QUESTIONS

1. An aircraft is to fly from A to B a distance of 1500 nm (ngm) using
   Long Range Cruise (LRC) at FL330.
   Aircraft mass at "A" is 58,500 kg
   ISA +10°c
   50 kt tailwind

   What is the TAS and fuel required?

2. An aircraft is to fly from A to B a distance of 500 nm (ngm) at Mach 0.74 at FL290.
   Aircraft mass at "A" is 54,400 kg
   ISA -20°c
   50 kt headwind

   What is the TAS and fuel required?

3. Aircraft mass at "A" is 51,200 kg
   Aircraft mass at "B" is 48,500 kg
   Cruise at Mach 0.78 @ FL350
   ISA +20°c
   50 kt tailwind

   What is the TAS, Ground distance and Specific Fuel Consumption?

4. Aircraft mass at "A" is 55,500 kg
   OAT -59°C
   Wind light & variable
   Cruising using LRC @ FL310
   The aircraft is to fly for 35 minutes

   What is the fuel consumed from "A"?

ANSWERS

1. An aircraft is to fly from A to B a distance of 1,500 nm (ngm) using Long Range Cruise (LRC) at FL330
   Aircraft mass at "A" is 58,500 kg
   ISA +10°c
   50 kt tailwind

   What is the TAS and fuel required?

   Step 1 Find correct page - **31**

   Step 2 TAS = 433 + 10 = **443 kt**

   Step 3 Convert the 1,500 ngm into nam

   $$\frac{TAS}{GS} = \frac{NAM}{NGM} = \frac{443 \times 1500}{493} = \mathbf{1348\ nam}$$

   Step 4 Aircraft at "A" is 58,500 kg, enter the table with this mass and extract the cruise NAM of 4,704 nm.

   Step 5 4,704 - **1,348** nam gives a cruise NAM at "B" of **3,356.**

   Step 6 Enter table looking for a distance of 3,356 nam, you are unlikely to find exactly this figure but take the lower figure of 3,354 and this corresponds to an aircraft mass of **51,000 kg** when overhead "B"

   Step 7 The difference between 58,500 kg and 51,000 kg is **7,500 kg** and this is the fuel required. You should then increase the fuel required by 0.6% which is **45 kg** giving a total of **7,545kg**.

A	1,500 ngm	B
58,500 kg		
51,000 kg		
4,704 nam	1,348 nam	3,356 nam

Answer **TAS** **443 kt**
Fuel Required **7,545 kg**

2. An aircraft is to fly from A to B a distance of 500 nm (ngm) at Mach 0.74 at FL290.
Aircraft mass at "A" is 54,400 kg
ISA -20°c
50 kt headwind

What is the TAS and fuel required?

Step 1 Find correct page = **45**

Step 2 TAS = 438 - 20 = **418 kt**

Step 3 Convert the 500 ngm into nam

$$\frac{TAS}{GS} = \frac{NA}{NGM} \quad \text{so} \quad NAM = \frac{TAS \times NGM}{GS} = \frac{418 \times 500}{368} = \mathbf{568\ nam}$$

Step 4 Aircraft at "A" is 54,400 kg, enter the table with this mass and extract the cruise NAM of 3612 nm.

Step 5 3612 – **568** gives a cruise NAM at "B" of **3,044**.

Step 6 Enter table looking for a distance of 3.044 nam, you are unlikely to find exactly this figure but take the lower figure of 3036 and this corresponds to an to aircraft mass of **51,100kg** when overhead "B"

Step 7 The difference between 54,400kg and 51,100kg is **3,300kg** and this is the fuel required. You should then decrease the fuel required by 1.2% which is 40**kg** giving a total of **3,260kg**.

A 500 ngm B

54,400 kg
51,100 kg
3,612 nam 568 nam 3044 nam

Answer **TAS** **418 kt**
Fuel Required **3,260 kg**

3. Aircraft mass at "A" is 51,200 kg
Aircraft mass at "B" is 48,500 kg
Cruise at Mach 0.78 @ FL350
ISA +20°c
50 kt tailwind

What is the TAS, Ground distance and Specific Fuel Consumption?

Step 1 Find correct page = **59**

Step 2 TAS = 449 + 20 = **469 kt**

Step 3 Aircraft at "A" is 51,200 kg, enter table and extract the cruise NAM of 3,279 nm

Step 4 Aircraft at "B" is 48,500 kg, enter table and extract the cruise NAM of 2,788 nm

Step 5 3279 – 2788 = 491 NAM between "A" and "B"

Step 6 Convert the 491 nam into ngm

$$\frac{TAS}{GS} = \frac{NAM}{NGM} \quad \text{so} \quad NGM = \frac{NAM \times GS}{TAS} = \frac{519 \times 491}{469} = \mathbf{543\ ngm}$$

Step 7 Calculate the Specific Fuel Consumption.Strictly speaking though not as per the Performance definition, you need to remember that Specific Fuel Consumption or SFC is the fuel required divided by the ground distance flown.Specific Air Range is the fuel required divided by the air distance flown.

$$SFC = 51{,}200 - 48{,}500 = \frac{2{,}700}{543}\ kg = \mathbf{4.97\ kg/ngm}$$ (to 2 decimal places)

A	543 ngm	B
51,200 kg 48,500 kg 3,279 nam	491 nam	2,788 nam

Answer

TAS	**469 kt**
Distance	**543 ngm**
SFC	**4.97 kg/ngm**

4. Aircraft mass at "A" is 55,500 kg
OAT -59°C
Wind light & variable
Cruising using LRC @ FL310
The aircraft is to fly for 35 minutes

What is the fuel consumed from "A"?

Step 1 Find correct page = **29**

Step 2 Correct the OAT -59°C into an ISA deviation = ISA-12°C

Step 3 TAS = 437 - 12 = **425 kt**

Note: As wind is light and variable you can assume that TAS and GS are both 425 kt and NAM and NGM will also be equal.

Step 4 How far can you fly for 35 minutes at 425 kt = **248 nm**

Step 5 Aircraft at "A" is 55,500, enter the table with this mass and extract the cruise NAM of 4047 nm.

Step 6 4,047 – 248 nam gives a cruise NAM at "x" of 3,799.

Step 7 Enter table looking for a distance of 3,799 nam, you are unlikely to find exactly this figure but, 3,800 is close enough and this corresponds to an aircraft mass of **54,100 kg** 35 minutes after "A"

Step 8 The difference between 55,500 kg and 54,100 kg is 1,400 kg and this the fuel required. Strictly speaking you should then decrease the fuel required by 0.72% which is **10 kg** giving a total of **1,390 kg**.

A	35 min	x
55,500 kg		
54,100 kg		
4,047 nam	248 nam/ngm	3,799 nam

Answer **Fuel required 1390 kg**

EXAMPLE 4 - FLIGHT PLAN

INTEGRATED FLIGHT PLAN EXAMPLE 4

LINE	SECTOR		Temp °C	FL	Temp Devn	WIND		Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
	FROM	TO				Dirn	Speed											
1	A	B	-	330	0					-20		240			53500			
2	B	C	-	330	0					-30		370						
3	C	D	-	330	0					-40		410						
4																		
5	1. Extract cruise TAS .... kt. 2. Convert NGM to NAM																	
6	3. Enter 0.74M cruise table with Gross Weight 53500kg and extract Cruise Distance, ... Subtract ....NAM, = ...nam.																	
7	4. Enter table with ....nm and extract corresponding Gross Weight, ...kg. Fuel burn A to B is .... - .... = ...kg.																	
8	5. Copy Minus NAM from LINE 1 into Cruise Value LINE 2. Subtract .... NAM = ... nam.																	
9	6. Enter table with ....nm and extract corresponding Gross Weight, ...kg. Fuel burn B to C is .... - .... = ...kg.																	
10	7. Repeat the process.																	
11	Note: a) The percentage increase or decrease in Fuel Required for 10°C above or below ISA.																	
12	b) The increase or decrease in TAS by 1kt per 1°C above or below ISA.																	

ANSWER EXAMPLE 4 - FLIGHT PLAN

INTEGRATED FLIGHT PLAN - EXAMPLE 4 Answer

LINE	SECTOR		Temp °C	FL	Temp Devn	WIND		Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
	FROM	TO				Dirn	Speed											
1	A	B	-	330	0				430	-20	410	240	35	252	53500	3796	3544	1 4 0 0
2	B	C	-	330	0				430	-30	400	370	55.5	398	52100	3544	3146	2 1 0 0
3	C	D	-	330	0				430	-40	390	410	63	452	50000	3146	2694	2 3 0 0
4															47700			
5	1. Extract cruise TAS 430kt. 2. Convert NGM to NAM																	
6	3. Enter 0.74M cruise table with Gross Weight 53500kg and extract Cruise Distance, 3796nm. Subtract 252NAM, 3544nm.																	
7	4. Enter table with 3544nm and extract corresponding Gross Weight, 52100kg. Fuel burn A to B is 53500 - 52100 = 1400kg.																	
8	5. Copy Minus NAM from LINE 1 into Cruise Value Line 2. 3544. Subtract 398nam = 3146nm.																	
9	6. Enter table with 3146nm and extract corresponding Gross Weight, 50000kg. Fuel burn B to C is 52100 - 50000 = 2100kg.																	
10	7. Repeat the process.																	
11	Note: a) The percentage increase or decrease in Fuel Required for 10°C above or below ISA.																	
12	b) The increase or decrease in TAS by 1kt per 1°C above or below ISA.																	

DESCENT TABLE

(Refer CAP697 MRJT1 Figure 4.5.4a & 4.5.4b)

Time, fuel and distance(nam) for a flight idle thrust descent are tabulated for :

- 0.74M/250 KIAS, which approximates to an economy descent, and
- 0.70M/280 KIAS, turbulent air penetration descent.

Allowances are included for a straight-in approach with undercarriage down.

Increase fuel during the descent by 50kg for engine anti-ice.

Example 5.

Given a landing weight of 54,900kg and a mean descent wind component of 50kt head calculate the time, fuel and ground distance for a 0.74M descent from FL330.

Fuel...........kg; time............min; distance...........nam;...........ngm.

Example 6.

An aircraft with an estimated landing weight of 48,500kg descends from FL310 to fly a straight in approach, through turbulent air with the engine anti-ice on; the wind component is 45kt tail. Calculate the fuel burn, time and ground distance

Fuel..........kg; time............min; distance............nam;...........ngm.

EXERCISE 1 FLIGHT PLAN

INTEGRATED FLIGHT PLAN - EXERCISE 1

LINE	SECTOR FROM	SECTOR TO	Temp °C	FL	Temp Devn	WIND Dirn	WIND Speed	Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
1	A (3000')	TOC	-	↗	0					-30		250			56000	-	-	
2	TOC	B	-49	370						-50								
3	B	C	-49	370						-20		460						
4	C	D	-49	370						+10		390						
5	D	TOD	-49	370						+20		510						
6	TOD	E (MSL)	-	↘	-					+10						-	-	
7																ROUTE FUEL		
8																% INC/DEC		
9	E	ALT.(MSL)	-		-				-	0	-	150				DIVERSION FUEL		
10																5% CONTINGENCY		
11																APU/TAXI		260
12																AIR CONDITION		
13																ANTI-ICE		
14																HOLDING		
15																RAMP FUEL		

EXERCISE 1

Complete the Integrated Flight Plan from the following data:

Long Range Cruise flight at FL370 from A to E with a nominated alternate airfield.
Airfield elevation at A is 3,000ft;
Mean sea level at E and the Alternate.
The gross take-off weight(mass) at A is 56,000kg.
The estimated landing weights at E and the alternate are 46,000kg and 43,000kg.

Fuel:

Route:	Allow 5% contingency A to E.
Descent:	Straight in descent with gear down and no air turbulence.
Diversion:	Use Alternate Planning CAP697 MJRT1 Figure 4.3.6.
Taxi/APU:	Allow 260kg.
Air Conditioning:	1% for cruise A to E.
Engine and wing anti-ice:	180kg/h for cruise A to E.
Holding:	Compute 45′ holding fuel for straight and level flight at a pressure height of 1,500ft overhead E. (CAP697) Figure 4.4

Use 47,000kg as the start weight for the hold.

When the plan is completed answer the following:

a. Assuming that the contingency and holding fuel are unused, what is the estimated landing weight at the Alternate?
b. At a cruise weight of 56,000 kgs what is the optimum LRC/0.74M level?
c. The aircraft's track is 180°(T) and variation 10°E. The lowest optimum IFR cruise level is?
d. If the variation was 10°W what is the amended lowest optimum IFR level?
e. If the gross brake release weight is 46,000kg, trip distance 150nam and temperature ISA +10°C, what is the short distance cruise?

EXERCISE 2 FLIGHT PLAN

INTEGRATED FLIGHT PLAN - EXERCISE 2

LINE	SECTOR		Temp °C	FL	Temp Devn	WIND		Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
	FROM	TO				Dirn	Speed											
1	A	TOC	-	↗	-	200	35	245				236			61500	-	-	
2	TOC	B	-56			220	50	245										
3	B	C	-56			230	60	270				378						
4	C	D	-56			240	65	280				410						
5	D	TOD	-56			260	70	296				562						
6	TOD	E	-	↘	-	230	30	296								-	-	
7																ROUTE FUEL		
8																% INC/DEC		
9	E	Alternate	-			-	-	310	-	-60	-	185				DIVERSION FUEL		
10																5% CONTINGENCY		
11																APU/TAXI		
12																AIR CONDITION		
13																ANTI-ICE		
14																HOLDING		
15																RAMP FUEL		

EXERCISE 2

Complete the Integrated Flight Plan from the following data:

The aircraft's estimated cruise weight is 60,000kg; the ramp weight is 61,500. It is tasked to fly a route where the overall magnetic variation is 15°W. The trip is to be flown at the lowest ICAO IFR optimum pressure altitude for 0.78M. Details are provided in the attached Flight Plan and all the airfields are less than 100ft above mean sea level. The forecast QNH at the destination, E, is 1029mb.

Fuel:

Route:	Allow 5% contingency A to E.
Descent:	Straight in descent with gear down with turbulence forecast.
Diversion:	Use Alternate Planning CAP697 MJRT1 Figure 4.3.6. estimated landing weight 47,000kg.
Taxi/APU:	Allow 20′ APU and 20′ Taxi.
Air Conditioning:	1% extra to cruise fuel to destination.
Engine and wing anti-ice:	180kg/h for cruise A to E.
Holding at E:	Compute 45′ holding fuel, straight and level, at an altitude of 2,000ft overhead E. (CAP697 Figure 4.4)
Assume an initial weight of	50,000kg.

When complete, answer the following:

a. During the descent into E the pilot selected the flaps down 4 minutes before the ILS outer marker. What extra fuel was burnt

b. How much of the contingency fuel was used if the engine anti-ice was selected during the descent?

c. If the Anti-ice, Air Conditioning and half the Taxi/APU fuel have been burnt, what is the estimated landing weight at E?

d. If a LRC flight is planned to operate in the ECON mode what adjustments to fuel and time are needed if the Cost Index is 30?

ANSWERS TO INTEGRATED FLIGHT PLANNING

Example 1 19 min
1,550 kg
104 nam/ngm
374kt TAS.

Example 2 19.5 min
1,475 kg
109.5 nam / 101 ngm,
379kt TAS.

Example 4 See Flight plan over.

Example 5 21 min
285 kg
103 nam
85.5 ngm

Example 6 19min
270 + 50 = 320 kg,
88.5 nam
102 ngm.

EXERCISE 1

a. Estimated landing weight at Alternate is 44,766kg.
b. FL338.
c. FL330.
d. FL310.
e. 30,000ft

EXERCISE 2

a. 4 X 75 = 300kg.
b. 50kg
c. 49,971 - (642 + 129 + 98) = 49,102kg
d. Increase fuel by 1.5%; no time penalty.

ANSWER EXERCISE 1 FLIGHT PLAN

INTEGRATED FLIGHT PLAN - EXERCISE 1 Answer

LINE	SECTOR		Temp °C	FL	Temp Devn	WIND		Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
	FROM	TO				Dirn	Speed											
1	A (3000')	TOC	-	↗	0				392	-30	362	114 250	21	124	56000	-	-	1525
2	TOC	B	-49	370	+8				435	-50	385	136	21	154	54475	4195	4041	875
3	B	C	-49	370	+8				435	-20	415	460	66.5	482	53600	4041	3559	2500
4	C	D	-49	370	+8				435	+10	445	390	52.5	381	51100	3559	3178	2000
5	D	TOD	-49	370	+8				435	+20	455	397 510	52.5	379	49100	3178	2799	1800
6	TOD	E (MSL)	-	↘	-				-	+10	-	113	23	109	47300	-	-	295
7												1610	236.5		47005	ROUTE FUEL		8995
8																% INC/DEC		34
9	E	ALT.(MSL)	-		-				-	0	-	150	31	150	-	DIVERSION FUEL		1300
10																5% CONTINGENCY		450
11																APU/TAXI		260
12																AIR CONDITION		72
13																ANTI-ICE		577
14																HOLDING		1603
15																RAMP FUEL		13291

ANSWER EXERCISE 2 FLIGHT PLAN

INTEGRATED FLIGHT PLAN - EXERCISE 2 Answer

LINE	SECTOR		Temp °C	FL	Temp Devn	WIND		Track °T	TAS	Wind Comp	GS kt	NGM	EET	NAM	Gross Start WT	Cruise Value	Minus NAM	FUEL
	FROM	TO				Dirn	Speed											
1	A	TOC	-	↗	-	200	35	245	367	-	341	83 236	17	89	61500	-	-	1400
2	TOC	B	-56	310	-9	220	50	245	449	-	401	153	23	173	60100	4493	4320	1100
3	B	C	-56	310	-9	230	60	270	449	-	400	378	56.5	424	59000	4320	3896	2700
4	C	D	-56	310	-9	240	65	280	449	-	400	410	61.5	460	56300	3896	3436	2800
5	D	TOD	-56	310	-9	260	70	296	449	-	390	476 562	73	548	53500	3436	2888	3200
6	TOD	E	-	↘	-	230	30	296	284	-14	270	86	19	90	50300	-	-	270
7												1586	250		49930	ROUTE FUEL		11470
8															49781	% INC/DEC		-59
9	E	Alternate	-	-	-	-	-	310	-	-60	-	185	42			DIVERSION FUEL		1750
10																5% CONTINGENCY		574
11																APU/TAXI		258
12																AIR CONDITION		98
13																ANTI-ICE		642
14																HOLDING		1653
15																RAMP FUEL		16386

CHAPTER NINE

POINT OF EQUAL TIME (PET)

Contents

INTRODUCTION

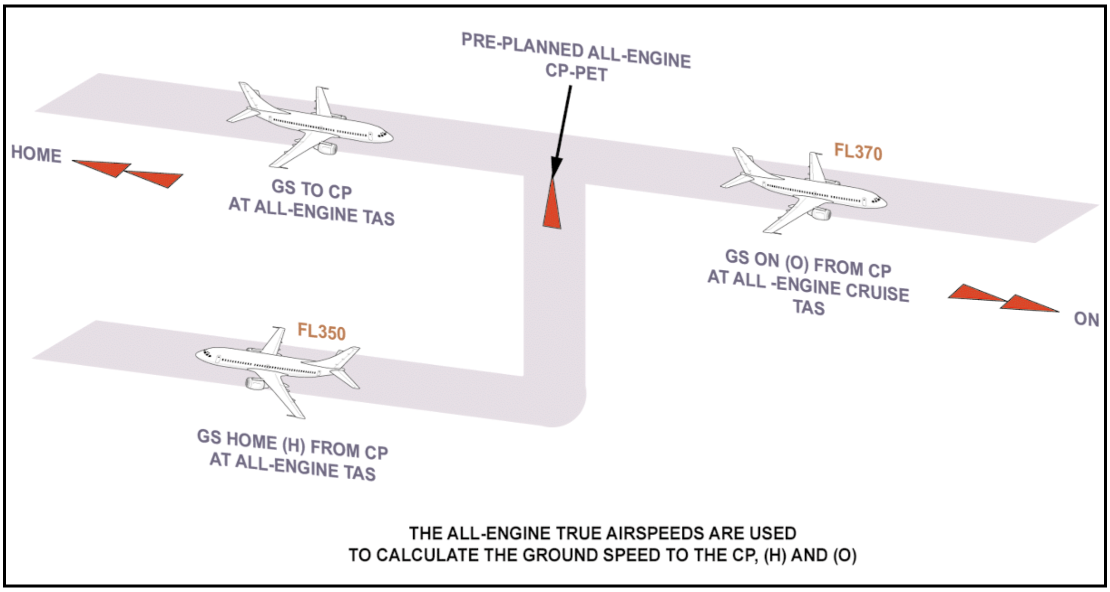


Figure 9.1 All -Engine Critical Point (Point of Equal Time)

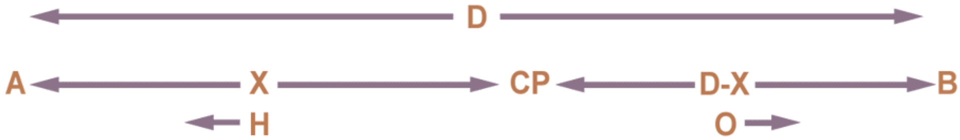
The Point of Equal Time(PET) or sometimes is referred to as Critical Point(CP), is that track position, in relation to two suitable airfields, from which it is **the same time** for an aircraft to fly to either. These two airfields could be the departure and destination airfields, or any two airfields situated suitably in relation to the aircraft's track.

The PET allows the pilot to decide quickly which of the two diversion airfields is the **closer in time** if there is a failure of an engine or a major system, or other event such as a serious illness on board. The fuel loaded for a flight (trip fuel, contingency allowance, holding and alternate fuel etc.) will be sufficient always for the aircraft to fly from the PET to either nominated airfield. **The PET is a time problem**. To make the time HOME from the PET equal to the time ON from the PET the two distances will be different, unless there is zero wind; in which case they are equal.

Routes over the oceans or remote parts of the world, where, in the event of an emergency, there is a scarcity of suitable en-route diversions within reasonable flying time from any point on the proposed track, may necessitate the calculation of a PET between departure and destination airfields and those en-route that are adequate.

For instance, a limit has been set on the distance a twin may be from an adequate airfield. This distance will be equal to one hour's flight time, in still air, at the normal one-engine in-operative cruise speed. Any operation planned beyond this distance from an adequate aerodrome is considered to be Extended Range Twin Operations (ETOPS: see CAP 513). Approved ETOPS requires the calculation of PETs between adequate airfields.

DERIVATION OF FORMULA



D	=	Total Distance
X	=	Distance to CP from A
D - X	=	Distance from CP to B
H	=	Groundspeed HOME from CP
O	=	Groundspeed ON from the CP

By definition TIME HOME = TIME ON and TIME = $\frac{\text{DISTANCE}}{\text{GROUNDSPEED}}$

$$\frac{X}{H} = \frac{D - X}{O}$$

$$XO = H(D - X)$$

$$XO = HD - HX$$

$$XO + XH = HD$$

$$X(O + H) = HD$$

$$X = \frac{DH}{O + H}$$

Figure 9.2 Derivation of CP Formula / Transposing Formula for Navigation Computer

THE EFFECT OF WIND ON THE POSITION OF THE PET:

Let A to B total distance D = 500nm and TAS = 300kt.

STILL AIR **X**

$$= \frac{500 \;\; x}{+}$$

$$= \frac{500 \;\; x \;\; 300}{300 \;\; + \;\; 300} = 250 \text{ nm}$$

= **HALFWAY**

60kt HEADWIND **X**

$$= \frac{500 \;\; x}{+}$$

$$= \frac{500 \;\; x \;\; 360}{240 \;\; + \;\; 360} = 300 \text{ nm}$$

= **Greater than HALFWAY**

60kt TAILWIND **X**

$$= \frac{500 \;\; x}{+}$$

$$= \frac{500 \;\; x \;\; 240}{360 \;\; + \;\; 240} = 200 \text{ nm}$$

= **Less than HALFWAY**

- **In Still air the PET is HALFWAY.**
- **If there is a wind then the PET moves INTO WIND.**
- **The stronger the wind the greater the movement INTO WIND.**

SINGLE SECTOR ALL-ENGINE PET

Fill in the groundspeed rectangles at Figure 10.3 and calculate the distance and time to the All-engine PET.

The all-engine TAS	475 kts
Engine failure TAS	380kts
The route distance	2,050 nm

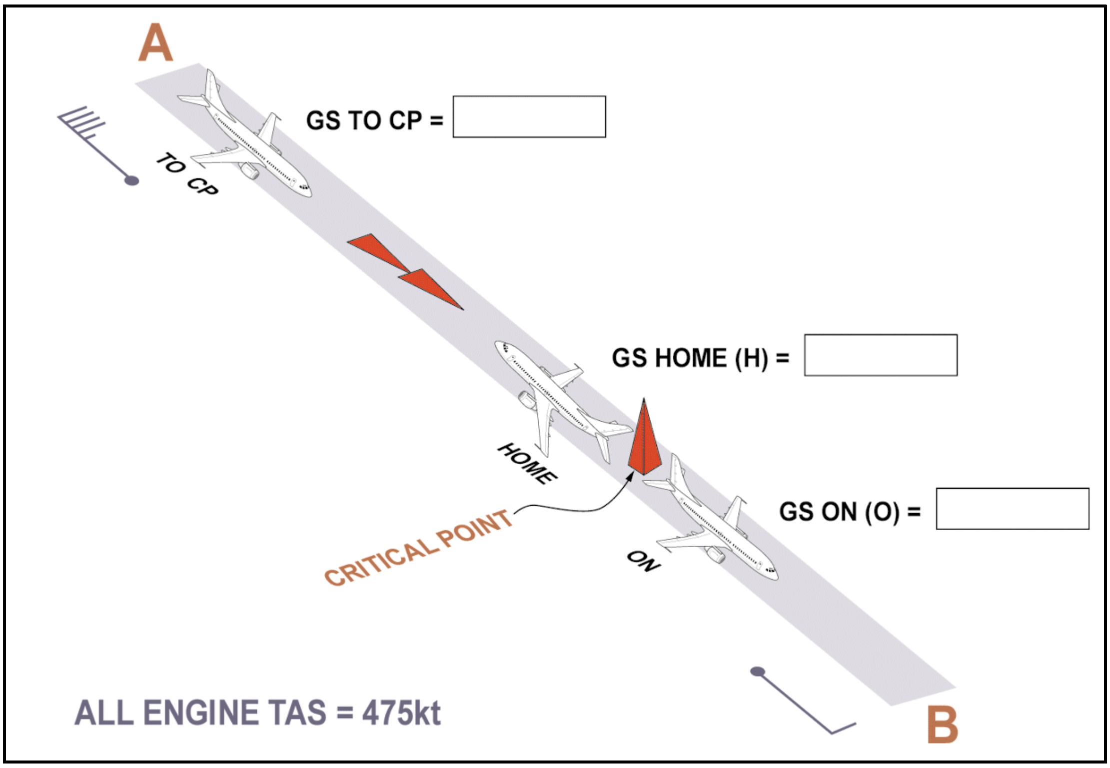


Figure 9.3 Example All Engine Single Leg PET

G/S H	475 - 45 = 430
G/S On	475 - 10 = 465
G/S out to PET	475 + 45 = 520

$$X = \frac{2050 \times 430}{465 + 430} = 985 \text{ nm}$$

985 nm @ G/S out 520 = 113.5 min

ENGINE FAILURE PET

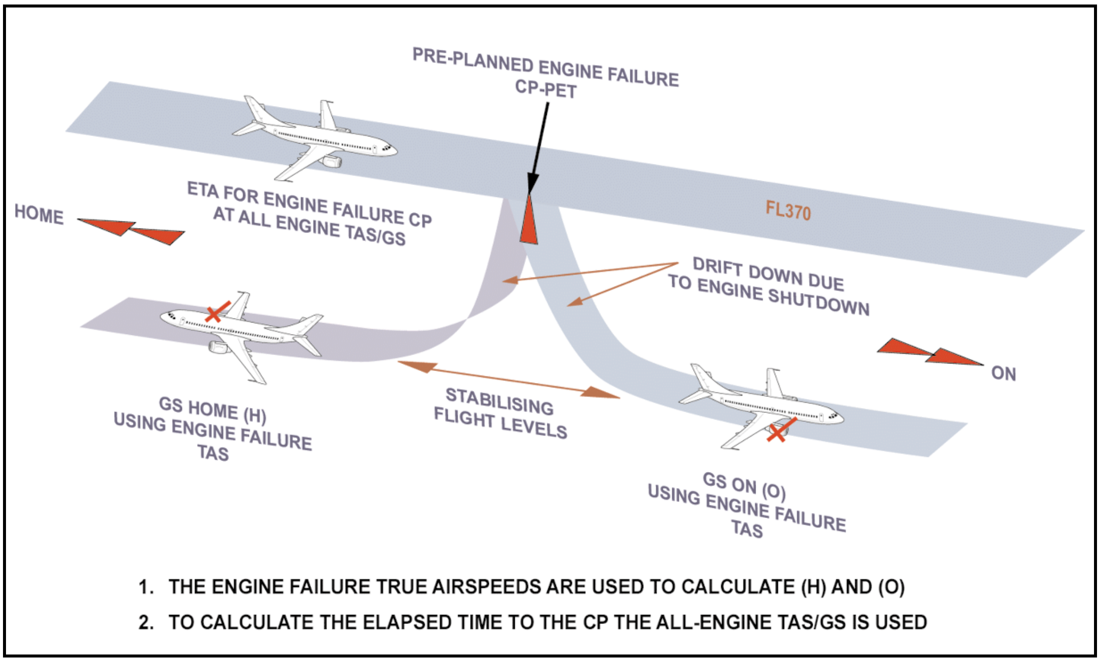


Figure 9.4 Engine Failure Critical Point

The loss of a power unit will necessitate invariably a "drift down" to a stabilising pressure altitude where the aircraft will either continue ON, or return HOME, at the reduced engine-failure TAS/GS, depending on whether the failure occurred before or after the ETA (computed at the All-engine TAS/GS) for the Engine-failure PET. If the engine failure happened at the PET then, in theory, the pilot could choose to fly to either airfield as the flight times are equal.

With reference to Figure 10.5 fill in the groundspeed rectangles and calculate the distance and time to the Engine-failure PET.

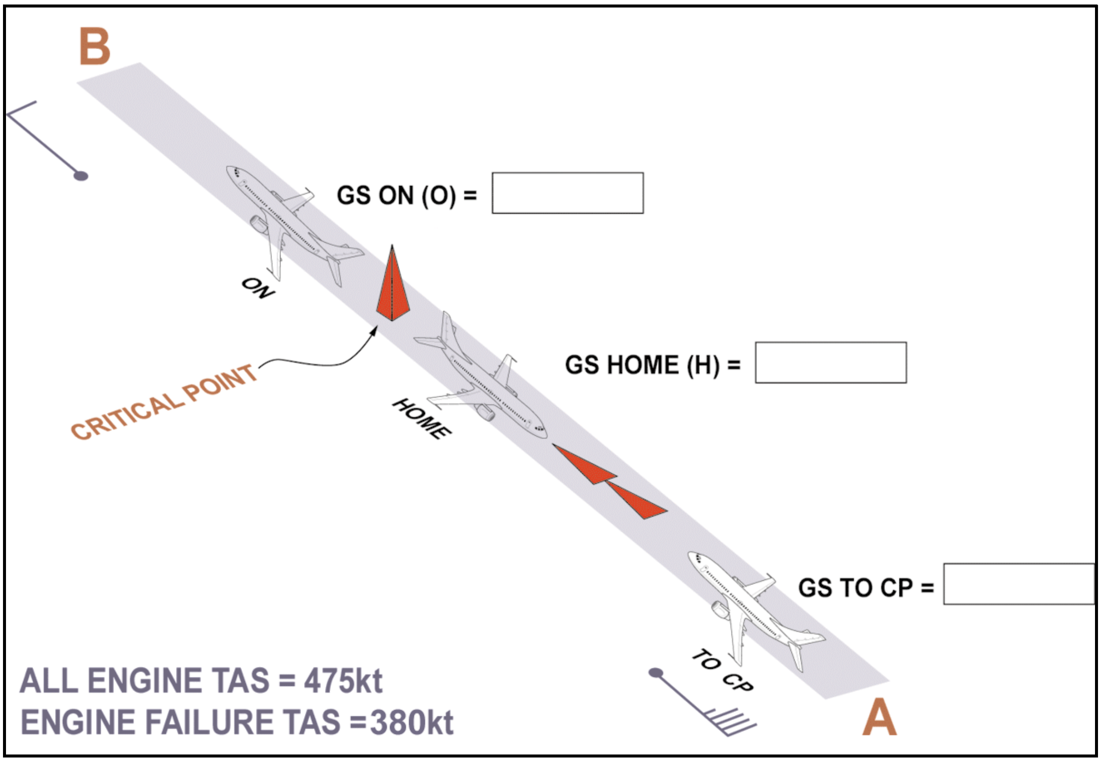


Figure 9.5 Example Engine Failure PET Single Leg

G/S H	380 - 45 = 335
G/S On	380 - 10 = 370
G/S out to PET	475 + 45 = 520

$$X = \frac{2050 \times 335}{370 + 335} = 974 \text{ nm}$$

974 nm @ G/S out 520 = 112.5 min

The difference in distance to an all-engine and engine failure PET can be seen to be very small, even though in these two examples there was a difference in all-engine and engine failure TAS of 95kt. Thus an engine failure PET is normally constructed, which may then be used for serious occurrences other than power unit failure.

To calculate the distance X to an engine-failure PET use the engine-failure TAS to calculate O and H in the formula.

To calculate the distance X to an all-engine PET use the all-engine TAS to calculate O and H in the formula.

To calculate the time to fly to an all-engine *or* an engine-failure PET use the all-engine TAS to calculate the groundspeed from the departure point to the PET.

QUESTIONS - 1

1. Given:

Distance from A to B	1200 nm
GS On	230 kt
GS Home	170 kt

What is the distance and time to the PET from "A"?

a.	600 nm	2 hr 37 min
b.	510 nm	2 hr 13 min
c.	690 nm	3 hr
d.	510 nm	3 hr

2. Given:

Distance from A to B	3200 nm
GS On	480 kt
GS Home	520 kt

What is the distance and time to the PET from "A"?

a.	1664 nm	3 hr 12 min
b.	1600 nm	3 hr 20 min
c.	1664 nm	3 hr 28 min
d.	1536 nm	3 hr 12 min

3. Given:

TAS	400 kt
Distance from A to B	2000 nm

A 40 kt headwind is forecast from A to B

What is the distance and time to the PET from "A"

a.	1100 nm	3 hr 03 min
b.	1100 nm	2 hr 30 min
c.	900 nm	2 hr 30 min
d.	1000 nm	2 hr 47 min

4. Given:

TAS	165 kt
W/V	090°/35
A to B	1620 nm
Course	035°

What is the distance and time to the PET from "A"

a.	903 nm	6 hr 04 min
b.	810 nm	5 hr 42 min
c.	708 nm	5 hr
d.	912 nm	6 hr 26 min

5. Given:

TAS	500 kt
W/V	330°/50
A to B	2600 nm
Course	090°

What is the distance and time to the PET from "A"

a. 1365 nm 2 hr 36 min
b. 1235 nm 2 hr 22 min
c. 1235 nm 2 hr 36 min
d. 2012 nm 3 hr 53 min

Engine Failure Case

6. Given: -

GS On	300 kt
GS Out	350 kt
GS Home	250 kt
Distance from A to B	1200 nm.

What is the distance and time to the PET from "A"

a. 545 nm 1 hr 34 min
b. 654 nm 1 hr 52 min
c. 500 nm 1 hr 40 min
d. 545 nm 1 hr 49 min

7. Given:

2 Engine TAS	450 kt
1 Engine TAS	350 kt
Distance from A to B	3000 nm with a 50 kt tailwind component.

What is the distance and time to the engine failure PET?

a. 1285 nm 3 hr 12 min
b. 1333 nm 2 hr 40 min
c. 1714 nm 3 hr 43 min
d. 1285 nm 2 hr 34 min

8. Given:

2 Engine TAS	480 kt
1 Engine TAS	400 kt
W/V	330°/80
A to B	3500 nm
Course	200°

What is the distance and time to the engine failure PET from "A"

a. 1515 nm 3 hr 23 min
b. 1558 nm 2 hr 56 min
c. 1515 nm 2 hr 51 min
d. 1985 nm 3 hr 44 min

Given the following data answer questions 9 &10

CAS	190 kt cruising
Pressure altitude	9000 ft
Temperature	ISA -10°C
W/V	320/40 kt
A to B is a distance	350 nm
Course	350°
Endurance	3 hours

9. What is the distance to the PET?

   a. 220 nm
   b. 311 nm
   c. 146 nm
   d. 204 nm

10. Given an actual time of departure (ATD) of 11:05, what is the ETA for the PET?

   a. 12:49
   b. 12:13
   c. 11:55
   d. 12:26

ANSWERS - 1

1 **510 nm** **2 hr 13 min**

$$x = \frac{1200 \times 170}{230 + 170}$$ = **510 nm** @ 230 kt = **2 hr 13 min**

2. **1664 nm** **3 hr 28 min**

$$x = \frac{3200 \times 520}{480 + 520}$$ = **1664 nm** @ 480 kt = **3 hr 28 min**

3. **1100 nm** **3 hr 03 min**

$$x = \frac{2000 \times 440}{360 + 440}$$ = **1100 nm** @ 360 kt = **3 hr 03 min**

4. **912 nm 6 hr 26 min**

Use your Navigation Computer to get ground speed on and home.
Remember to balance the drift for both outbound and the reciprocal home legs.
There are no short cuts!

$$x = \frac{1620 \times 183}{142 + 183}$$ = **912 nm** @ 142 kt = **6 hr 26 min**

5. **1235 nm** **2 hr 22 min**

Use your Navigation Computer to get ground speed on and home.
Remember to balance the drift for both outbound and the reciprocal home legs.

$$x = \frac{2600 \times 472}{522 + 472}$$ = **1235 nm** @ 522 kt = **2hr 22min**

Engine Failure Case

6. **545 nm 1 hr 34 min**

$$x = \frac{1200 \times 250}{300 + 250}$$ = **545 nm** @ 350 kt = **1 hr 34 min**

7. **1285 nm** **2 hr 34 min**

$$x = \frac{3000 \times 300}{400 + 300}$$ = **1285 nm** @ 500 kt = **2 hr 34 min**

8. What is the distance and time to the engine failure PET from "A"

1515 nm **2 hr 51 min**

Use your Navigation Computer to get ground speed on, out and home.
Remember to balance the drift for both outbound and the reciprocal home legs.
There are no short cuts!

$$x = \frac{3500 \times 342}{448 + 342}$$ = **1515 nm** @ **530** kt = **2 hr 51 min**

ISA at 9000 ft	-3
ISA deviation	-10
OAT	-13°C
Navigation Computer for TAS	214 kt

Use your Navigation Computer to get ground speed on and home.
Remember to balance the drift for both outbound and the reciprocal home legs.

Ground speed On & Out = 178 kt
Ground speed Home = 249 kt

9. **204 nm**

$$x = \frac{350 \times 249}{178 + 249} = \mathbf{204\ nm}$$

10. **12:13**

204 nm @ 178 kt = **1 hr 08 min + 11:05 = 12:13**

QUESTIONS - 2

1. Given:
Track 355°T
W/V 340°/30kt
TAS 140 kt
Total distance A to B 350 nm.

What are the time and distance to the point of equal time between A and B?

a.	75 mins	211 nm
b.	75 mins	140 nm
c.	50 mins	140 nm
d.	114 mins	211 nm

2. Given:
Course A to B 088°(T)
Distance 1250 nm
Mean TAS 330kt
W/V A to B 340°/60kt

The time from A to the Point of Equal Time between A and B is:

a. 1 hr 54 mins
b. 1 hr 44 mins
c. 1 hr 39 mins
d 2 hr 02 mins

3. Distance between airports = 340 nm
True track = 320°
W/V = 160°/40
TAS = 110 kt

Distance to PET is:

a. 121 nm
b. 219 nm
c. 112 nm
d. 228 nm

4. Flying from A to B, 270 nm
True track 030°
W/V 120°/35
TAS 125 kt.

What are the distance and time to the Point of Equal Time?

a.	141 nm	65 mins
b.	141 nm	68 mins
c.	135 nm	68 mins
d.	150 nm	65 mins

ANSWERS - 2

1	D
2	B
3	C
4	C

CHAPTER TEN

MRJT ADDITIONAL PROCEDURES

Contents

EXTENDED RANGE TWIN OPERATIONS (ETOPS) - INTRODUCTION

The loss of a power unit, or certain major systems, by twin-engined Performance Class A aircraft whilst flying over water or remote areas, causes greater problems than similar events on aircraft with three or four engines. It is, therefore, necessary to limit the distance all such twin-engined aircraft (including those powered by turbo-props and reciprocating engines) may be away from an **adequate airfield**. **This distance equals one hour's flight time, in still air and standard conditions, at the normal one-engine-inoperative cruise speed.**

Any operations planned to fly a twin-engined public transport aeroplane beyond this distance from an adequate aerodrome will be considered to be Extended Range Twin Operations (ETOPS).

An operator may be authorised to conduct ETOPS with a particular airframe/engine combination within a particular area (For example the North Atlantic) where the maximum diversion time, from any point along the proposed route of flight to an adequate aerodrome, is **up to 180 minutes or less (90, 120 or 138 minutes)** at the normal one-engine-inoperative cruise speed (under standard conditions and in still air). These areas will be specified on the permission issued by the Regulatory Authority for the purpose of approving ETOPS. **An operator shall not conduct operations beyond the threshold distance determined in accordance with JAR - OPS 1.245 unless approved to do so by the Authority and prior to an ETOPS flight an operator shall ensure that a suitable ETOPS en-route alternate is available within the appropriate diversion time.**

ETOPS - DEFINITIONS

Extended Range Twin Operations are those operations intended to be, or actually, conducted over a route that contains a point further than one hour's flying time (in still air) at the normal one-engine-inoperative cruise speed from an **adequate** aerodrome. When, alternatively a **Threshold Distance** has been agreed with the Authority, all non-ETOPS flights shall remain within the Threshold distance of an **adequate** aerodrome.

ETOPS Segment is the portion of an ETOPS flight that begins when the aeroplane is first more than the Threshold distance from any **adequate** aerodrome (ETOPS Entry Point) and ends when the aeroplane is last more than the Threshold distance from any **adequate** aerodrome (ETOPS Exit POINT).

Normal One-engine-inoperative Cruise Speed
An operator shall determine a speed for the calculation of the maximum distance to an adequate aerodrome for each two-engined aeroplane type or variant operated, not exceeding VMO, based upon the true airspeed that the aeroplane can maintain with one-engine-inoperative under certain conditions.
See JAR - OPS 1.245 (b) for determination of this speed, which is only intended **to be used to establish the maximum distance from an adequate aerodrome.**
Threshold Time is 60 minutes.

(Before granting an extension to the Threshold Time the Licensing Authority considers the following factors: propulsion system reliability record, modification and maintenance programme, flight dispatch requirements, training evaluation programme, operations limitation and specifications, operational validation flight and continuing surveillance and engine reliability monitoring.).

Threshold Distance is the distance travelled in still air in 60 minutes by an aircraft at the normal one-engine-inoperative cruise speed.

Rule Time is the maximum time that any point on the route may be from a suitable aerodrome for landing, as specified by the Authority and included in the operations Manual.

Rule Distance is the distance travelled in the Rule Time, at the normal one-engine-inoperative cruise speed.

Adequate Airfield. In general terms an ***operator*** may make an appraisal that an aerodrome has long enough runways, and is sufficiently equipped, to be considered **adequate** for his planned ETOPS routes. In particular it should be expected that at the anticipated time of use:

- The aerodrome will be available and equipped with the necessary ancillary services, such as ATC, sufficient lighting, communications, weather reporting, navaids and safety cover, and

- At least one letdown aid (ground radar would so qualify) will be available for an instrument approach.

Suitable Airfield. The ***commander*** must satisfy himself on the day**,** using criteria provided by the operator, that he has sufficient adequate aerodromes which, taking into account the weather and any equipment unserviceabilities, are suitable for his intended operation. An aerodrome shall not be selected as an ETOPS en-route alternate unless the appropriate weather reports or forecasts, or any combination thereof, indicate that, **during a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome,** the weather conditions will be at or above the planning minima prescribed.

ETOPS - MINIMUM EQUIPMENT LIST (MEL)

Primary system redundancy levels appropriate to ETOPS will be reflected in the MEL. For aeroplanes in operational service **the existing MEL will be re-evaluated and adjusted as necessary** to reflect the primary system redundancy levels required for ETOPS. **Primary airframe systems are those which have a fundamental influence on flight safety and could be adversely affected by the shutdown of a power unit**.

Examples are:

Electrical/battery, Hydraulic, Pneumatic, Flight Instrumentation, Fuel, Flight Control, Ice Protection, Engine Start and Ignition, Propulsion System Instruments, Navigation and Communications, APUs, Air Conditioning and Pressurisation, Cargo Fire Suppression, Emergency Equipment, Engine Fire Detection and Extinguishing Systems and any other equipment for ETOPS.

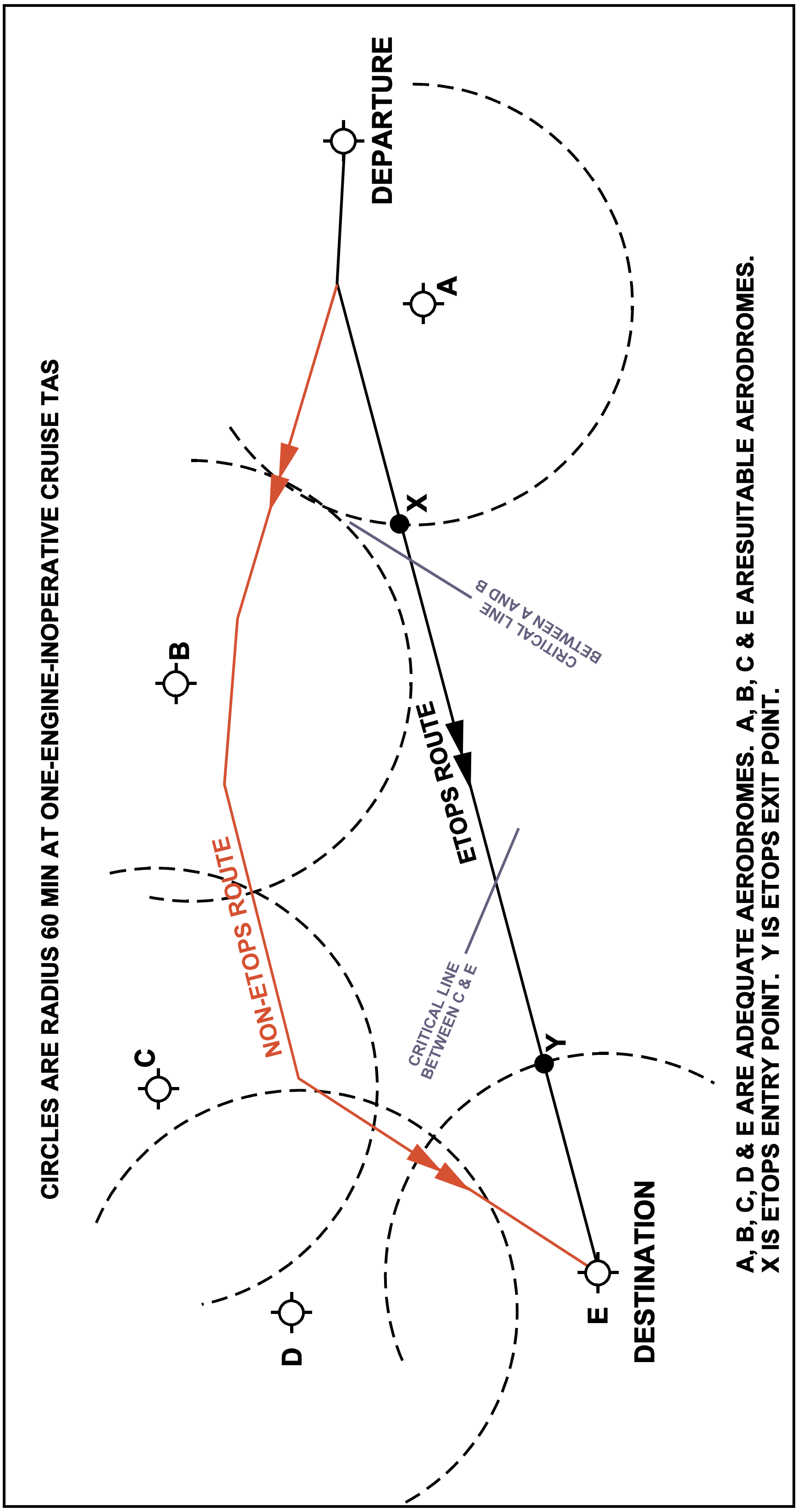


FIGURE 10.1 ETOPS CHART

ETOPS - COMMUNICATION and NAVIGATION FACILITIES

An aeroplane shall not be dispatched on ETOPS unless:

- **Communication facilities** are available to provide, under all expected conditions of propagation at the normal one-engine-inoperative cruise altitudes, reliable two-way voice communications between the aeroplane and the appropriate air traffic control unit over the planned route of flight and routes to any suitable alternate to be used in the event of diversion; and

- **Non-visual** ground navigation aids are available and located so as to provide, taking account of the navigation equipment installed in the aeroplane, the navigation accuracy required over the planned route and flight altitude, and the routes to any alternate and altitudes to be used in the event of diversion for whatever reason; and

- **Approved visual and non-visual aids** are available at the specified alternates for the authorised types of approaches and operating minima.

ETOPS - FUEL POLICY PRE-FLIGHT

An operator shall ensure that the **pre-flight** calculation of usable fuel required for a flight includes:

- Taxy fuel.
- Trip fuel.
- Reserve fuel consisting of;
  - Contingency
  - Alternate fuel, if a destination alternate is required
  - Final reserve fuel (for aeroplanes with turbine power units, fuel to fly for 30 minutes at holding speed at 1500ft {450m}above aerodrome elevation in standard conditions), and
  - **Additional fuel, if required by the type of operation (e.g. ETOPS)**, and
- Extra fuel if required by the commander.

ETOPS - FUEL POLICY IN-FLIGHT

An operator shall ensure that **in-flight** replanning procedures for calculating usable fuel required when a flight has to proceed along a route, **or to a destination other than originally planned,** includes:

- Trip fuel for the remainder of the flight.
- Reserve fuel consisting of;
  - Contingency fuel.
  - Alternate fuel, if a destination alternate is required.
  - Final reserve fuel (for aeroplanes with turbine power units, fuel to fly for 30 minutes at holding speed at 1500ft {450m}above aerodrome elevation in standard conditions), and
  - **Additional fuel, if required by the type of operation (e.g. ETOPS)**, and
- Extra fuel if required by the commander.

ETOPS - CRITICAL FUEL

In general an aeroplane shall not be dispatched on an ETOPS flight unless it carries sufficient fuel and oil; and in addition, such additional fuel and oil as may be required to fly to a suitable aerodrome for landing in the event of the shut-down of a engine, or in the event of airframe system failure(s), which may require diversion to an alternate. **It should be assumed that this event occurs at the most critical point in terms of overall fuel and oil requiremets along the planned route of flight.** Thus for ETOPS operations the "Trip fuel for the remainder of the flight" will be the CRITICAL FUEL i.e the fuel from the **most** Critical Point (CP)/Equal Time Point (ETP) to the diversion aerodrome based upon a consideration of three possible events:

- **Simultaneous failure of an engine and the pressurisation** (this is the worst scenario) An emergency descent down to FL100 at VMO/MMO with the speed brakes extended and cruise to the diversion airfield at LRC speed

- **Total pressurisation failure** (but no engine failure). An emergency descent down to FL100 at VMO/MMO with the speed brakes extended and cruise to the diversion airfield at LRC speed.

- **Engine failure** (but no pressurisation failure). Descent and cruise will be initiated at the selected speeds and stabilising level.

The fuel required will be the greatest of the All-engine and two Single Engine cases. This amount is then compared to the fuel planned to be on the aircraft at the most critical CP/PET; **if it is greater than the planned amount then additional fuel must be uplifted.**

ETOPS - CHART CALCULATION OF THE MOST CRITICAL POINT

Figure 10.2 shows how the most critical point (CP/PET), i.e. the one based upon the two alternates furthest along track, is derived. It is based upon the Critical Line between airfields at C and E which is found by extending the bisector of the line between C and E to cut the ETOPS track.

Thus, the distances from this intersection to either C or E are equal, and, in still air conditions, the flight time at the one-engine-inoperative TAS will also be equal.

Assume:

One-engine-inoperative cruise TAS 400kt.

690nm, from C and E Critical Line intersection with the ETOPS track, to airfield C or E.

Mean forecast wind velocity 230/85, for flight to C or E at planned one-engine-out stabilising pressure level.

Therefore:

Still air time to C or E	=	690nm at 400kt
	=	104min
104min at a wind speed of 85kt	=	147nm

Back-plot a wind vector from the Critical Line intersection with the ETOPS track, in the direction 230°, for 147nm. At the end of this vector plot the Equal Line, parallel to the Critical Line.

The intersection of this Equal Line with the ETOPS track is the most limiting ETOPS PET/CP.

Thus:

- **At this position it is the same engine-out flight time to airfields at C or E,**

  and

- **The flight planned fuel from this point must be equal to or greater than the Critical Fuel to C or E. If it is not then the extra fuel required must be loaded.**

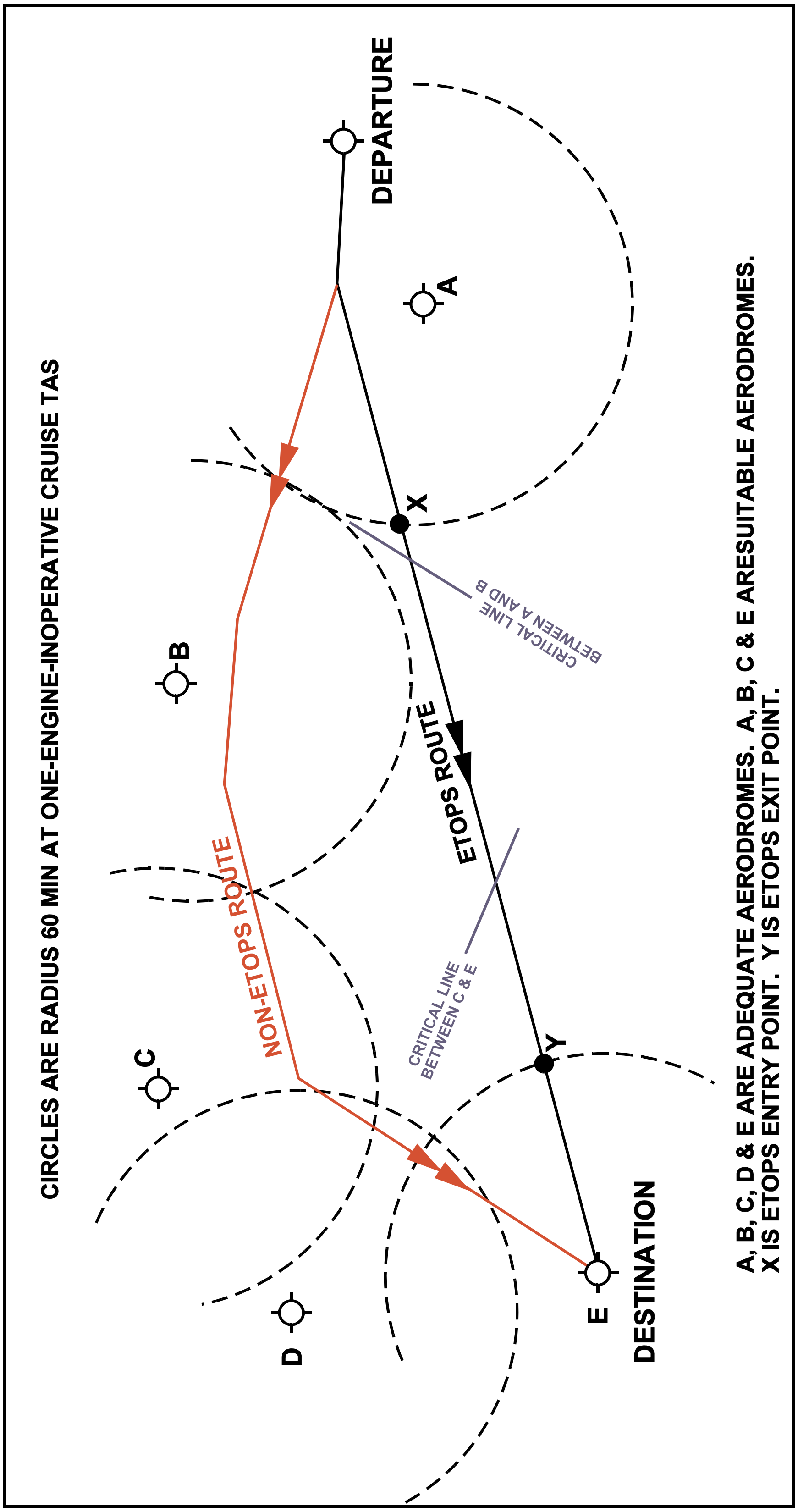


Figure 10.2 PET for ETOPS

ETOPS – CAP697 MRJT1

(CAP 697, Pages 72 to 75)

CAP697 Figures 4.7.1a & 1b provide the **CRITICAL FUEL RESERVE (LRC) for ONE ENGINE INOPERATIVE and ALL ENGINES OPERATIVE** at the Critical Point. If this fuel reserve is greater than the planned fuel at this point, the fuel load must be increased accordingly. Both graphs are based on the following **common** parameters:

- Pressurisation failure
- Emergency descent to 10000ft. Level cruise at 10000ft
- 250KIAS descent to 1500ft over the airfield
- 15 minutes hold at 1500ft. One missed approach, approach and land
- 5% allowance for wind errors

The One Engine Inoperative graph also includes Auxiliary Power Unit (APU) fuel burn. Thus, **this is the worst case scenario (engine and pressurisation failure)** which requires the APU to be started in flight in order to compensate, in part, for the loss of the power plant to provide essential electrics and pneumatics (e.g. air-conditioning).

Note the corrections, beneath each graph, for:

- Temperatures hotter than ISA.
- Icing conditions.

Example 1

An aircraft at a weight of 48000kg suffers an engine and pressurisation failure simultaneously. The forecast conditions at FL100 are +5°C and a 50kt headwind for the 850nm distance from the CP to the diversion airfield. Calculate the LRC Critical Fuel Reserve needed.

Ans....................kg

Example 2

Use the same details above, assuming pressurisation failure only.

Ans....................kg

Example 3

An aircraft at a weight of 50000kg has an engine and pressurisation failure simultaneously. The forecast is icing conditions at FL100, -15°C and a 60kt tailwind and for the 750nm distance from the CP to the diversion airfield. Calculate the LRC Critical Fuel Reserve needed.

Ans....................kg

Example 4

Use the same details above, assuming pressurisation failure only.

Ans....................kg

AREA of OPERATION - DIVERSION DISTANCE

CAP697 Figure 4.7.2

The area of operation is defined as the region within which the operator is authorised to conduct ETOPS. The distance to the diversion airfield from any point along the route must be flown within the approved time using the single engine cruise speed, assuming still air and ISA conditions.
The maximum diversion distance used to establish the area of operation may be obtained from this chart.

Method:

Enter the chart with the appropriate speed and weight at the point of diversion. Select the appropriate time.
Read off the maximum diversion distance.

Example 5

Fill in the Diversion Distances to a diversion airfield from any point on track, given the following table of speeds, weights and approved times:

SpeedM/ KIAS	Div. Wt. 1000kg	120min	135min	150min	180min
.70/280	45				
.74/290	55				
.74/310	70				
.74/330	38				
LRC	60				

IN FLIGHT DIVERSION (LRC) - ONE ENGINE INOPERATIVE

Refer to CAP697 Figure 4.7.3

This graph is a simple method of determining the fuel required and time for the flight from **a diversion point to a selected alternate**. It is based upon **one engine in-operative and NO pressurisation failure,** with the aircraft drifting down to **cruise at its selected level.**

Example 6

The One-engine-inoperative, LRC, diversion distance to the alternate is 940nm at a weight of 60000kg; wind component 50kt head, cruise FL260 and ISA Dev. +20°C. Determine the fuel required and diversion time.

Enter the graph with the diversion distance, move vertically to the WIND REF LINE and follow the curved flow lines to the value 50Head.

From this position go vertically to the PRESSURE ALTITUDE 1000ft slope of 26 and move horizontally to the WEIGHT AT POINT OF DIVERSION REF LINE

Follow the curved flow lines to intercept the 60000kg value and from here go horizontally to extract the FUEL REQUIRED....................kg.

Return to the intersection of the vertical distance/wind line with the PRESSURE ALTITUDE 1000ft slope of 26 and continue vertically to intercept the second PRESSURE ALTITUDE 1000ft slope of 26 and move horizontally to the ISA DEV (°C) REF LINE

Follow the temperature slope and read off the time...............hr..........hr.........min.
(Note: The solid line = 6000', the dashed line = 26000'; therefore, interpolation is required).

Example 7

The One-engine-inoperative, LRC diversion distance to the alternate is 400nm at a weight of 60000kg; wind component 100kt Tail, cruise FL60 and ISA Dev. +10°C. Determine the fuel required and diversion time.

...................kg ....hr..........hr..........

Example 8

Given:
Distance from CP to diversion 800nm, wind component 25head, weight at CP 55000kg.
Calculate:

- The fuel required for an engine and pressurisation failure diversion; outside air temperature at cruise level is +5°C with forecast icing...................kg
- The fuel required for a pressurisation failure diversion; temperature at cruise level is +5°C with forecast icing...................kg
- The fuel and time for a LRC engine failure diversion at FL220, OAT -19°C ....kg ....hr...............hr................min

NON NORMAL OPERATIONS

CAP697 MRJT1 Figure 4.6.1

The references are for **"Gear Down" Ferry Flight** with all engines operating at 220KIAS; climb and descent fuel and time are included.

Example 9.

Calculate the trip time and fuel required for a Gear Down Ferry Flight from the following:

Sector distance	850nm
wind component	75kt Tail
	FL 240
landing weight	40000kg,
OAT	-43°C.

Fuel..................kg **Time........h...........min**

Example 10.

Calculate the trip time and fuel required for a Gear Down Ferry Flight from the following**;**

Trip distance	550nm
wind component	100 Head
	FL 260
landing weight	53000k
OAT	-22°C.

Fuel..................kg **Time........h...........min**

FUEL TANKERING

CAP697 MJRT1 Figures 4.8.1 & 4.8.2

When the cost of fuel at the destination airfield is greater than that at the departure, the **LRC or .74Mach Fuel Tankering** graphs may be used to determine **if it is economical to carry fuel in excess of that required for the flight;** a large percentage of this extra fuel can then be used for the return flight or another sector. These charts should only be used if the cruise altitude capability is not adversely affected by tankering.

To obtain the smaller, but potentially significant, percentage of the surplus fuel that will be burnt, due to the increased gross weight of the aircraft resulting from the tankered fuel, the entering values for each graph are:

- Trip distance **NAUTICAL AIR MILES**
- Cruise pressure altitude
- Landing Weight **(WITHOUT TANKERING)**

The LRC example (Figure 6.13) shows that, for a trip of 1600nam at FL 330 and 42500kg Landing Weight (Without Tankered Fuel), if excess fuel is carried **13.2% of it will be consumed as a fuel penalty, due to the aircraft's higher gross weight.**

For fuel tankering to be economical the fuel price at the destination must be greater than the break even fuel price. The Fuel Price Differential Graph (Fig. 6.14) presents the Break Even Fuel Price Destination Airport for any Surplus Fuel Burn percentage and Fuel Price at Departure Airport; the fuel price is quoted as cents/US Gal.

Using the **13.2% Surplus Fuel Burn** in the example and a **Departure Airfield Fuel Price of 100 cents** the **Break Even Fuel Price Destination Airport is 115 cents.**

Example 11

An aircraft is planned to fly a LRC at FL350, ISA -10°C, at an average gross cruise weight of 55000kg and a Landing Weight(Without Tankered Fuel) of 47500kg; the wind component is -30kt and the trip distance 1600ngm. Calculate:

a. The % Surplus Fuel Burn. **..................%**

b. The Break Even Fuel Price Destination Airport if the Fuel Price at Departure Airport is 75cents/US Gal. **..................cents**

Example 12

An aircraft is to fly a .74Mach cruise at FL310, ISA +15°C with a Landing Weight(Without Tankered Fuel) of 40000kg. The sector distance is 1050ngm, wind component +35kt. Calculate

a. The % Surplus Fuel Burn. **....................%**

b. The Break Even Fuel Price at Destination if the Fuel price at Departure is 85 cents/US Gal.**....................cents**

ANSWERS

Example 1 8100 X 1.005 = 8140kg.

Example 2 8600 X 1.005 = 8643kg.

Example 3 5500 X 1.20 = 6600kg.

Example 4 5800 X 1.18 = 6844kg.

Example 5

SpeedM/ KIAS	Div. Wt. 1000kg	120min	135min	150min	180min
.70/280	45		878		1167
.74/290	55	766		952	
.74/310	70	744	834		1103
.74/330	38		908	1007	1205
LRC	60	744			1100

Example 6 7300kg 2.95hr / 2hr 57min.

Example 7 2800kg 1.05hr / 1hr 03min.

Example 8
a. 7600 x 1.005 X 1.2 = 9166kg.
b. 7900 x 1.005 X 1.18 = 9369kg.
c. 5400kg 2.4hr 2hr 24min

Example 9 7100kg 2h 24min

Example 10 10300kg 2h48min

Example 11 16.8% 90cents

Example 12 6.2% 92cents.

COMPUTER FLIGHT PLANS - INTRODUCTION

The majority of airlines use computer flight planning, either their own systems or those provided, for example, by SITA or Jeppesen. The following is representative of the type of information programmed into a computer database:

Co-ordinates and identification of all likely navigation beacons, waypoints and airfields. Meteorological data, which is automatically loaded from a main International Met. Office (e.g. Bracknell).

The airline's standard routes.

ATC routes, airways, SIDS and STARS, and the twice daily North Atlantic Tracks which are automatically loaded.

The operator's fuel management data and policy.

The structural limits and performance details of all the aircraft types operated.

Airfield dimensions and meteorological information in order that the regulated take-off and landing performance data can be calculated.

The operator's preferred alternate airfield data.

The operator's fuel costing policy.

The operator's preferred aircraft operating method. For example: Long Range Cruise, High Speed Cruise, Cruise Climb, Constant Mach No.

Most computer systems require the minimum basic information to provide a flight plan:

Examples of required information:

Aircraft type.	Block time.
Departure and	Destination.
Cruise mode	Traffic load required

However great care must be taken to ensure that the correct information is loaded. Remember- "garbage in, garbage out".

Figure 10.3 shows a print out of a trip from Gatwick (EGKK) to Frankfurt (EDDF).

Line

1 PLAN 6340 EGKK TO EDDF 757B M80/F 09/30/92
2 NONSTOP COMPUTED 1145Z FOR ETD 1830Z PROGS 30000Z KGS
3 FUEL TIME DIST ARRIVE TAKEOFF LAND AV PLD OPNLWT
4 POA EDDF 003091 00/55 0362 1925Z 077390 074299 012500 058638
5 ALT EDDL 001485 00/24 0101 1949Z COMP M015
6 HLD 001521 00/30
7 CON 000155 00/03
8 REQ 006252 01/52
9 XTR 000000 00/00
10 TOT 006252 01/52
11 EGKK DVR6M DVR UG1 NTM NTM1A EDDF
12 WIND P029 MXSH 5/KOK TEMPO P01 NAM 0337
13 FL 370
14 LRC FL370 003091 00/56
15 LRC FL330 003180 00/57
16 LRC FL410 003111 00/55
17 EGKK ELEV 00202FT
18 AWY WPT MTR DFT ZD ZT ETA ATA CT WIND COMP GRS DSTR REM
19 MSA FRQ
20 DVR6M DVR 092 .. 068 0/11 .. .. 0/11 0294
21 023 114.95
22 UG1 TOC 097 .. 014 0/02 02809 0046
23 023
24 UG1 KONAN 097 L01 010 0/01 .. .. 0/14 27045 P045 502 0270 0045
25 023
26 UG1 KOK 097 L01 025 0/03 .. .. 0/17 26041 P040 497 0245 0043
27 023 114.5
28 UG1 REMBA 108 L02 090 0/11 .. .. 0/28 27030 P028 488 0155 0038
29 026
30 UG1 NUVIL 109 L01 024 0/03 .. .. 0/31 27025 P024 485 0131 0036
31 034
32 UG1 SPI 110 L01 004 0/01 .. .. 0/32 27025 P024 485 0127 0036
33 034
34 UG1 LARED 131 L02 009 0/01 .. .. 0/33 28025 P020 481 0118 0036
35 034
36 UG1 TOD 131 L03 007 0/01 .. .. 0/34 28025 P021 481 0111 0035
37 043
38 UG1 NTM 131 .. 030 0/06 .. .. 0/40 ... . 0081 ...
39 043 ..
40 NTM1A EDDF 089 .. 081 0/16 .. .. 0/55 .... 000 0 0032
41 043
42 ELEV 00364FT
43 EGKK N51089W000113 DVR N51097E001217 KONAN N51078E002000
44 KOK N51057E002392 REMBA N50398E004549 NUVIL N50322E005315
45 SPI N50309E005375 LARED N50252E005480 NTM N50010E006320
46 EDDF N50021E008343
47 FIRS EBUR/0014 EDDU/0036
48 (FPL-JD105-IN)
49 -B757/M-SXI/C
50 -EGKK1830
51 -N0457F370 DVR6M DVR UG1 NTM NTM1A
52 -EDDF0055 EDDL
53 -EET/EBUR0014 EDDU0036
54 REG/GBDKC SEL/JDHC
55 E/0152 P/121 R/V S/M J/L D/6 150C YELLOW
56 A/WHITE BLUE

Figure 10.3 Computer flight plan - Gatwick to Frankfurt.

Line 1. Departure, Gatwick (EGKK) and Destination, Frankfurt (EDDF); aircraft type; cruise at Mach 0.8; IFR and date - month/day/year.

Line 2. Computation time; Expected Time of Departure; based upon meteorological forecast midnight 30th September; weights in kilograms.

Line 3. AV PLD = available payload; OPLN WT = operational weight.

Line 4. POA = point of arrival, EDDF/Frankfurt; 3091kg of route fuel; 55minutes flight time; 362nm route distance; expected arrival time 1925Z; take-off weight 77390kg; landing weight 74299kg; operational weight (weight less fuel and payload) 58638kg.

Line 5. ALT = alternate airfield EDDL/Dusseldorf; 1485kg diversion fuel; 24 =min diversion time; expected arrival time 1949Z; diversion wind component 15kt head(minus).

Lines 6 to 10. These state the fuel and time for: HLD = holding fuel, 1521kg.
CON = contingency fuel, 155kg (5% of 3091kg).
REQ = fuel required, less taxy and start up, for the route, 6252kg. XTR = extra fuel if required.
TOT = total fuel on board and equivalent time (time to empty tanks)

Line 11. Route summary: The Dover6M Standard Instrument Departure(SID) to Dover (DVR) VOR, routing UG1 to Nattenheim (NTM) VOR, the Nattenheim1A Standard Arrival Route (STAR) to EDDF.

Line 12. The average wind component for the route is 29kt tail(plus). MXSH = maximum windshear (increase in speed) of 5kt/1000ft at the KOK VOR. This strength of windshear indicates that clear air turbulence (TURB) is a possibility and a climb to a higher level could produce better fuel economy - a higher groundspeed **and** a lower fuel flow.The average temperature is -1°C. NAM = nautical air mile distance 337nm.

$$362\text{ngm} - \frac{29 \times 55}{60} = 335\text{nam}$$

Line 13. A Pressure Altitude of 37000ft, FL370,chosen for the flight.

Lines 14 to 16. An analysis of the long range cruise fuel and flight times for FL370, 330 and 410.

Line 17. Elevation of Gatwick (EGKK) airfield, 202ft.

Line 18. Column headings: AWY = airway designator; WPT = navigation waypoint and its identifier; MTR = magnetic track; DFT = drift; ZD = zone, leg or sector distance; ZT = zone, leg or sector elapsed time in hr/min.; ETA and ATA (estimated and actual time of arrival) logged when airborne; CT = the accumulative flight time; WIND = wind velocity as a five figure group 27 = 270°(T), 045 = 45kt.; COMP = wind component; GRS = groundspeed; DSTR = total distance remaining; REM = kg of fuel remaining.

Line 19. MSA = zone, leg or sector minimum safe altitude; FRQ = the radio frequency of the navigational beacon at the waypoint.

Line 22/36. TOC = top of climb; TOD = top of descent.

Line 42. Elevation, 364ft, of Frankfurt.

Lines 43 to 46. Waypoint co-ordinates for entry into Flight Management Computers, if required.

Line 47. Accumulative elapsed times, from take-off, to the Brussels and Rhein Flight Information Region (FIR) boundaries.

Lines 48 to 55. This is the computerised version of the ATC Flight Plan (CA48), which is usually acceptable to ATC:

Aircraft identification is JD105 for a Non-scheduled, **N**, IFR flight, **I.**
Type of aircraft is a Boeing 757, medium, **M**, wake turbulence and carrying Standard navigation and communication equipment, **S**, plus equipment, **X**, to fly in Minimum Navigation Performance Specification airspace and an Inertial Navigation System, **I. C** indicates a Secondary Surveillance Radar with an altitude transmitting capability. EGKK is the departure airfield with an off-blocks time of 1830UTC.
The first cruising level, **F**, is FL370 at a cruising speed, **N**, of 457kt TAS, routing via the Dover6M SID to DVR. From DVR to the NTM VOR along UG1 airway, thence via the Nattenheim1A STAR to EDDF.
The Total Estimated Elapsed flight time is 55 minutes with EDDL as the alternate airfield.
The Estimated Elapsed Times, from take-off, to the Brussels and Rhein FIRs are 14 and 36minutes.
The aircraft registration is GBDKC and its SELCAL code JDHC.

The following details are not transmitted unless the aircraft becomes overdue:

The total fuel endurance is 1hr 52min. The POB (Persons On Board) is 121. The aircraft is equipped with a separate emergency VHF radio and maritime, **M,** survival equipment. The life-jackets are fitted with a seawater activated light**.**
The aircraft carries six dinghies, **D**, with a total capacity of 150; 25 people per dinghy**.**
Each dinghy has a yellow cover, **C**.
The aircraft colour and markings are white and blue. (See Chapter11 for CA48)

CHAPTER ELEVEN

POINT OF SAFE RETURN (PSR)

Contents

INTRODUCTION

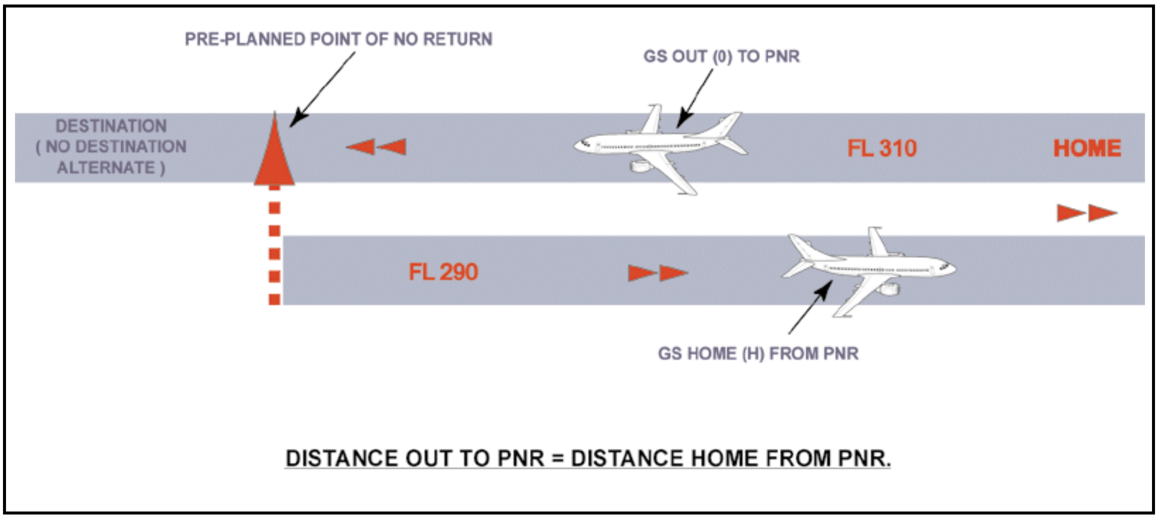


Figure 11.1 Point of No (Safe) Return

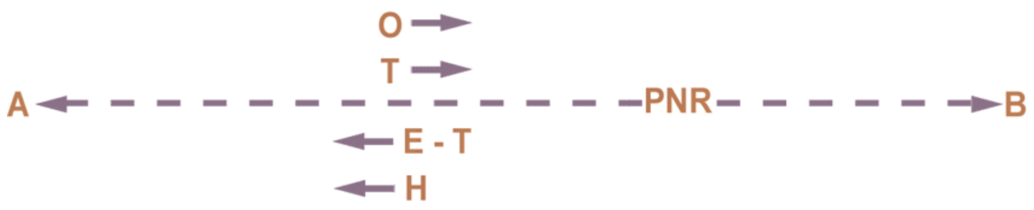
The **POINT OF SAFE RETURN (PSR)**, or sometimes referred to as the **POINT OF NO RETURN (PNR)**, is the furthest point along a planned route to which an aircraft can fly and return to the departure airfield, or departure alternate, within the **SAFE ENDURANCE** of the aircraft. **SAFE ENDURANCE** is the length of time an aircraft can fly without consuming the mandatory reserves of fuel that are required overhead its departure airfield, or departure alternate, in the event of the aircraft returning from the PSR. This SAFE ENDURANCE, quoted as a period of time (or an amount of fuel) is used to calculate the PSR. It must not be confused with the **TOTAL ENDURANCE**, the time an aircraft can remain airborne, at the end of which the tanks are empty.

If the state of the weather, runway, let-down aids or political situation at a destination airfield is likely to deteriorate and the only recourse would be to return back to the departure airfield, or departure alternate, it is prudent to calculate a PSR. Normally, the calculation of a PSR would only be necessary for flights to an "**isolated destination and no adequate destination alternate exists"**. Occasions on which a PSR may be required might include flights from mainland airfields to destinations such as Easter Island, Cocos Island, Tahiti, Ascension Island and the Azores.

In flight, at a reasonable time before the ETA for the PSR, the pilot checks that the destination airfield's weather, landing aids and runway state are acceptable for a period of usually one hour before to one hour after the destination ETA.

The **distance OUT** to the PSR **equals** the **distance Home** from the PSR. The **time OUT** to the PSR and **time HOME** from the PSR will be the **same in zero wind**; if there is an overall wind component the **time OUT** and **time HOME** will be unequal. But, in each case, the two values total the Safe Endurance time.

DERIVATION OF THE FORMULA



E = THE SAFE ENDURANCE

T = TIME OUT TO the PNR

E-T = Time HOME FROM the PNR

O = Groundspeed OUT to the PNR

H = Groundspeed HOME FROM the PNR

DISTANCE = TIME x SPEED

By definition DISTANCE OUT TO PNR = DISTANCE HOME FROM PNR

$$T \times O = (E - T)\,H$$

$$TO = EH - TH$$

$$TO + TH = EH$$

$$T(O + H) = EH$$

$$T = \frac{EH}{O + H}$$

Figure 11.2 Derivation PSR formula

TRANSPOSING THE FORMULA TO NAVIGATION COMPUTER

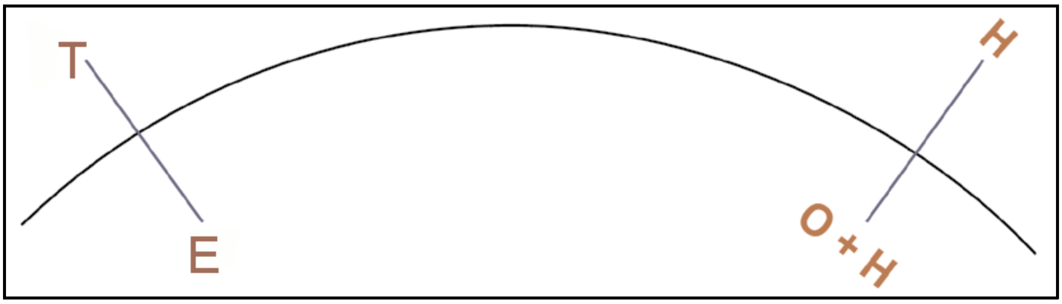


Figure 11.3 Transposing formula to Navigation Computer

THE EFFECT OF WIND ON THE LOCATION OF THE PSR:

Let E = 10h; TAS = 300kt.

STILL AIR	T	=	$\frac{\times}{+}$ =	min	
	D	=	min @ kt		
		=	nm		
				(Answer 1500nm)	
50kt HEADWIND OUT	T	=	$\frac{\times}{+}$ =	min	
	D	=	min @	kt	
		=	nm		(Answer 1458nm)
50kt TAILWIND OUT	T	=	$\frac{\times}{+}$ =	min	
	D	=	min @	kt	
		=	nm		(Answer 1458nm)

- In still air the distance to the PSR is the greatest.
- Any wind component reduces the distance to the PSR.
- This distance is the same for a HEAD or TAIL wind of the same value.
- The greater the wind component the greater the reduction in the distance to the PSR.

SINGLE LEG PSR

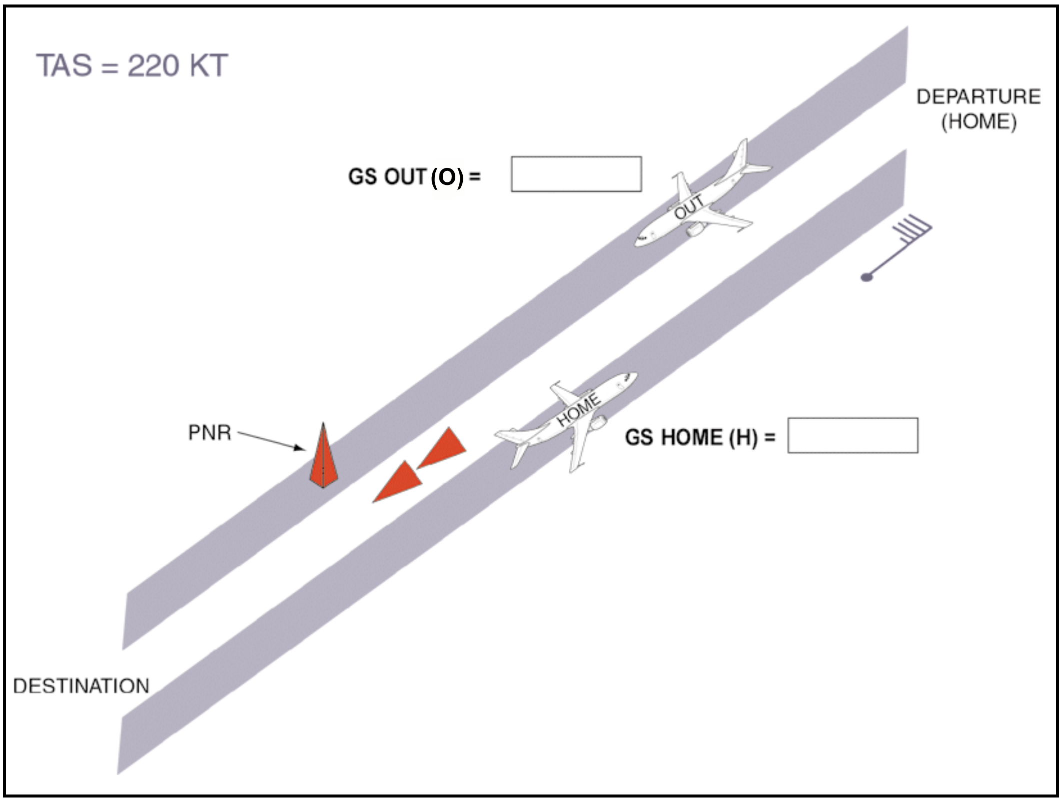


Figure 11.4 Example PSR

Study the Figure 11.4 and, using the formula, calculate the Time and Distance to the PSR. The aircraft is flying towards its destination at a TAS of 220kt with a wind component of +45kt. Its total Endurance is 7h 40min and the Safe Endurance is 6h; use TAS 220kt throughout.

Workings

$\frac{6 \times 175}{265 + 175}$ = 2 hr 23 mins @ 265 kts = 632 nm

(Answer: 2 hr 23 min, 632nm)

QUESTIONS - SINGLE LEG PSR

1. Given:

Total endurance	7 hr 40 min
Safe endurance	6 hr
GS Out	230 kt
GS Home	170 kt

What is the time and distance to the PSR from "A"?

a. 2 hr 33 min 587 nm
b. 3 hr 15 min 750 nm
c. 3 hr 27 min 794 nm
d. 2 hr 33 min 434 nm

2. Given:

Total endurance	5 hr
Reserves required	1 hr
GS On	250 kt
GS Out	280 kt
GS Home	320 kt

What is the time and distance to the PSR from "A"?

a. 2 hr 40 min 747 nm
b. 2 hr 15 min 629 nm
c. 2 hr 08 min 597 nm
d. 1 hr 52 min 523 nm

3. Given:

Total endurance	300 min
Required reserves	45 min
TAS	140 kt
Course	050°
W/V	270°/30

What is the time and distance to the PSR from "A"

a. 148 min 401 nm
b. 125 min 338 nm
c. 90 min 242 nm
d. 106 min 287 nm

4. Given:

TAS	160 kt
W/V	100°/30
A to B	1620 nm
Course	030°
Depart A at	09:30 UTC
Total endurance	4 hrs
Safe endurance	3 hrs 20 min

What are the distance, time and estimate to the PSR from "A"

a.	94min	231 nm	11:04
b.	106 min	261 nm	11:16
c.	128 min	315 nm	11:38
d.	106 min	296 nm	11:16

5. Given:

TAS	500 kt
W/V	330°/50
A to B	4600 nm
Course	090°
Total endurance	12 hrs
Safe endurance	10 hrs

What is the time and distance to the PSR from "A"

a.	4 hr 45 min	2480 nm
b.	2 hr 22 min	1235 nm
c.	5 hr 42 min	2974 nm
d.	4 hr 45 min	2242 nm

ANSWERS - SINGLE LEG PSR

1. **2 hr 33 min** **587 nm**

$$T = \frac{6 \times 170}{230 + 170}$$ = **2 hr 33 min** @ 230 kt = **587 nm**

2 **2 hr 08 min** **597 nm**

$$T = \frac{4 \times 320}{280 + 320}$$ = **2 hr 08 min** @ 280 kt = **597 nm**

3. **106 min** **287 nm**

Use your Navigation Computer to get ground speed out and home.
Remember to balance the drift for both outbound and the reciprocal home legs.
There are no short cuts!

$$T = \frac{255 \times 116}{162 + 116}$$ = **106 mins** @ 162 kt = **287 nm**

4. **106 min** **261 nm** **11:16**

Use your Navigation Computer to get ground speedout and home.
Remember to balance the drift for both outbound and the reciprocal home legs.

$$T = \frac{200 \times 168}{148 + 168}$$ = **106 min** @ 148 kt = **261 nm** **ETA 11:16**

5. **4 hr 45 min** **2480 nm**

Use your Navigation Computer to get ground speed out and home.
Remember to balance the drift for both outbound and the reciprocal home legs.

$$T = \frac{10 \times 472}{522 + 472}$$ = **4 hr 45 min** @ 522 kt = **2480 nm**

DERIVATION OF THE FORMULA FOR VARIABLE FUEL FLOWS

In the preceding examples Safe Endurance was quoted in hours and minutes. If it is given as an amount of fuel then the following formula, which takes into account individual sector fuel flows altitudes, temperatures, wind components and engine configurations, may be used:

LET	**d**	=	Distance to the PSR
	F	=	Fuel available (less reserves) for calculation of the PSR
	CO	=	The fuel consumption **OUT** to the PSR, **kg/nm**
	CH	=	The fuel consumption **HOME** from the PSR, **kg/nm**

Consumption in kg/nm is usually obtained by: $\dfrac{\text{FUEL/FLOW}}{\text{GROUND SPEED}}$

Or $\dfrac{\text{SECTOR FUEL}}{\text{SECTOR DISTANCE}}$

FUEL USED TO THE PSR + FUEL USED HOME FROM THE PSR = F

Therefore:

$$dCO + dCH = F$$
$$d(CO + CH) = F$$
$$d = \frac{F}{CO + CH}$$

EXAMPLE VARIABLE FUEL FLOWS PSR -SINGLE SECTOR

TAS 310kt; wind Component out to the PSR +30kt. Total fuel available less reserves 39500kg; fuel flow out to PSR at FL 270 is 6250kg/h; fuel flow home from the PSR at FL310 is 5300kg/h. Calculate the distance and time to the PSR.

$$CO = \frac{6250\text{ kg/hr}}{340\text{ kt gs}} = 18.38\text{ kg/nm}$$

$$CH = \frac{5300\text{ kg/hr}}{280\text{ kt gs}} = 18.93\text{ kg/nm}$$

$$D = \frac{395000\text{ kg}}{18.38 + 18.93} = 1059\text{ nm}$$

Time to PSR = 1059 @ 340 kt = 3 hrs 7 mins

Answer = 1059 nm 3 hrs 7 min

QUESTIONS - PSR WITH FUEL

6. Given:

GS Out	400 kt
Fuel flow out	2800 kg/hr
GS Home	450 kt
Fuel flow home	2500 kg/hr
Total endurance	15000 kg
Reserves required	3000 kg

What is the distance and time to the PSR from "A"

a.	1194 nm	3 hr
b.	872 nm	2 hr 11 min
c.	955 nm	2 hr 23 min
d.	1468 nm	3 hr 40 min

7. Given:

Total fuel available	16000 kg
Landing reserves required	1500 kg
P to Q distance	2050 nm
fuel required	11500 kg
Q to P distance	2050 nm
fuel required	10200 kg

What is the distance to the PSR from "P"?

a. 1369 nm
b. 1514 nm
c. 426 nm
d. 1656 nm

8. Given:

TAS	480 kt
W/V 330°/80	
A to B	3500 nm
Course	200°
Fuel flow out	2850 kg/hr
Fuel flow home	2680 kg/hr
Total fuel available	12000 kg
Landing reserves required	2000 kg

What is the distance and time to the PSR from "A"

a.	1558 nm	2 hr 57 min
b.	855 nm	2 hr
c.	1135 nm	2 hr 08 min
d.	855 nm	1 hr 37 min

ANSWERS - PSR WITH FUEL

6. **CO = 2800/400 = 7.00 kg/ngm**
   CH = 2500/450 = 5.56 kg/ngm

   955 nm **2 hr 23 min**

   $$D = \frac{12000}{7 + 5.56} = \textbf{955 nm} \text{ @ 400 kt} = \textbf{2 hr 23 min}$$

7. **CO = 11500/2050 = 5.61 kg/ngm**
   CH = 10200/2050 = 4.98 kg/ngm

   1369 nm

   $$D = \frac{14500}{5.61 + 4.98} = \textbf{1369 nm}$$

8. **CO = 2850/530 = 5.38 kg/ngm**
   CH = 2680/425 = 6.31 kg/ngm

   855 nm **1 hr 37 min**

   Use your Navigation Computer to get ground speed out and home.
   Remember to balance the drift for both outbound and the reciprocal home legs.
   There are no short cuts!

   $$D = \frac{10000}{5.38 + 6.31} = \textbf{855 nm} \text{ @ } \textbf{530} \text{ kt} = \textbf{1 hr 37 min}$$

QUESTIONS - ALL TYPES

1. Given:
15,000 kg total fuel,
Reserve 1,500 kg,
TAS 440 kt,
Wind component 45 head outbound,
Average fuel flow 2150 kg/hr.

What is the distance to the point of safe return?

a. 1520 nm
b. 1368 nm
c. 1702 nm
d. 1250 nm

2. Given:
Fuel flow 2150 kg/hr,
Total fuel in tanks 15,000 kg,
Fuel reserve required on arrival 3500 kg,
TAS outbound 420 kt, wind -30 kt,
TAS home bound 430 kt, wind +20 kt.

Find the time to Point of Safe Return.

a. 2 hr 06 min
b. 1 hr 26 min
c. 3 hr 33 min
d. 2 hr 52 min

3. Given:
Safe endurance = 5 hours
True track = 315
W/V = 100/20
TAS = 115

What is distance to PSR?

a. 205 nm
b. 100 nm
c. 282 nm
d. 141 nm

4. Given the following:
Departure to destination is 500 nm
Safe endurance is 4 hours
Groundspeed out is 150 kt
Groundspeed home is 130 kt

What is the distance and time to the point of safe return from departure point?

a.	232 nm	107 min
b.	221 nm	89 min
c.	139 nm	60 min
d.	279 nm	111 min

ANSWERS - ALL TYPES

1	B
2	D
3	C
4	D

CHAPTER TWELVE

AIRWAYS

CONTENTS

INTRODUCTION

To prepare for the examination students will need Jeppesen's "Student Pilot Route Manual for JAR-Flight Crew Licensing", or an equivalent approved publication; the selected Jeppesen charts are **NOT current** and are **NOT to be used for navigation**. The manual contains more charts than are usually required for the examinations.

For the examination students will, for example, be expected to:

- Select routes, and decode and explain the meaning of the symbols, from en-route, area, departure arrival and airfield charts.
- Extract, from the above charts, tracks, distances, heights/altitudes, magnetic variation, and frequencies/callsigns of navigation facilities etc.
- Compute heading, groundspeed and elapsed time.
- Select the correct flight level(s)for track direction(s) and obstacle clearance.
- Complete a part of a Navigation Plan/Navigation Log.
- Identify airspace classifications and restricted areas.
- Extract Instrument Approach Minima at destination and alternate aerodromes.

The CAA will provide the manual for the examinations; thus, during the examination the student may use the legend. However, because the allotted time for answering the questions is limited, **the student must be familiar with the ABBREVIATIONS, CHART GLOSSARY and the most commonly used symbols from the CHART LEGENDS, all of which are included in the INTRODUCTION to the manual.**

JEPPESEN MANUAL (JM) - CHART GLOSSARY

The glossary provides:

Unique **ICAO definitions** commonly used in Jeppesen publications; FAA (USA) terms are included when different from ICAO. It is recommended that these definitions, particularly the ICAO ones, are carefully studied and committed to memory. The following ICAO definitions should be noted:

AERODROME ELEVATION. The elevation of the highest point of the landing area. **ALTITUDE.** The vertical distance of a level, point or an object considered as a point, measured from mean sea level.

DECISION ALTITUDE (DA) or DECISION HEIGHT (DH). A specified altitude or height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. DA is referenced to means ea level; DH is referenced to the threshold elevation.

ELEVATION. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

FLIGHT LEVEL (FL). A surface of constant atmospheric pressure which is related to a specific pressure datum 1013.2mb (hPa), and is separated from other such surfaces by specific pressure levels.

HEIGHT. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

MINIMUM DESCENT ALTITUDE/HEIGHT. A specified altitude/height in a **non- precision approach or circling approach** below which descent may not be made without visual reference,

THRESHOLD. The beginning of that portion of the runway usable for landing
TRANSITION ALTITUDE. The altitude at or below which the vertical position of the aircraft is controlled by reference to altitudes.

TRANSITION LAYER.. The airspace between the transition altitude and the transition level.

TRANSITION LEVEL. The lowest flight level available for use above the transition altitude.

Abbreviations which relate to the information included in the manual's charts and aviation in general. Continuous reference to the abbreviations, in conjunction with the various charts and enclosed examples and exercises, will facilitate the retention of their meanings in the student's memory. Note the following ICAO abbreviations:

QFE. The atmospheric pressure at aerodrome elevation, or at runway threshold.

QNH. The altimeter sub-scale reading to obtain elevation when on the ground (Ref. ICAO Doc 8168-OPS/611 Vol. 1, 4th Edition 1993, Chapter 1)

QNE is the meteorological signal which requests, "What indication will my altimeter give on landing at .... at ....hrs, my sub-scale being set to 1013.2hPa?
(Ref. ICAO Doc8400/4. 4th Edition 1989. page9-59)

QNE is the height indicated on landing at an aerodrome when the altimeter sub-scale is set to 1013.2hPa.
(Ref. Handbook of Aviation Meteorology 3rd Edition, 1994, HMSO)

"When 1013.2mb is set on the subscale the height indicated on the pressure altimeter with the aircraft on the ground is known as the QNE value. This setting is used for some high level aerodromes where the QFE would be so low as to be outside the limits of the subscale setting. **(The setting of 1013.2mb is sometimes referred to, incorrectly, as the QNE)."**
(Ref. CAP 390 ATC Training Manual section 2-Meteorology).

The Jeppesen definition of **QNE** is: Altimeter setting 29.92"Hg or 1013.2mb.

JM - EN-ROUTE CHART LEGEND

The legend is for use in conjunction with the enclosed charts, the majority of which use the **Lambert Conformal Conic projection** and are designed primarily for airway instrument navigation using cockpit instruments, radio communications and ground based radio navigation aids. It should be noted that **not all symbols apply in all areas** and that symbols in green are printed in green on two-colour charts; all symbols are blue on single-colour charts. Detailed examples and exercises based upon the legend and various charts are provided later in this chapter. A general discussion follows on the legend which is divided into the following classifications

NAVAID SYMBOLS

Note the symbols for:
VOR (Very High Frequency Omni-directional Range).
Terminal VOR.

TACAN (Tactical Air Navigation) or **DME** (Distance Measuring Equipment).

VORTAC/VORDME.

NDB (Low and Medium Frequency Non-directional Beacon).

ILS (Instrument Landing System).**KRM course** is a Russian localiser equivalent.

MLS (Micro-wave Landing System).

Fan Markers.

Broadcast Stations.

NAVAID IDENTIFICATION

The shadow box is used when the navaid is associated with an airway or route. Off- airway navaids are un-boxed except that off-airway VORs are boxed on other than US and Canadian charts.

COMMUNICATIONS

Radio frequencies for communication are printed above the NAVAID name to indicate that voice communication is available through the Navaid. Radio frequencies in the 120MHz range are shown with the numbers "12" omitted. e.g. 122.2 and 122.35 are shown as 2.2 and 2.35**.**

NAVAID/COMMUNICATIONS DATA

This section shows how a navaid's operational status is depicted; the availability of a **TWEB** (Continuous weather broadcast); a **SABH** radio beacons' primary function is to transmit continuous automatic weather information; **R** = En-route radar available; **H + 04 & 15 (1)** means that a Marine NDB begins transmission at four minutes passed the hour and at 15 minute intervals thereafter and each transmission lasts for 1 minute.

RESTRICTED AIRSPACE/RESTRICTED AIRSPACE DESIGNATION

A knowledge of the symbols and abbreviations for the various types of restricted airspace is essential.

AIRPORTS

Memorise the symbols for civil and military airfields.

AIRWAY AND ROUTES AND CENTRE-LINES

A knowledge of the meaning of these symbols is required. In particular note the depiction of:

Airways.
Types of reporting points.
LF bearings (to the navaid) and radials (from the navaid).
Holding patterns.

AIRWAY INFORMATION

Note: in particular, the different designations of airways and routes and minimum clearance limits. For example:

V168. Victor (VOR airway) routes/airways are found on US and Canadian Low Level charts, which are effective up to, but not including, 18000′ msl.

J71. Jet routes/airways are for high performance aircraft. They are effective at and above 18,000′ msl to FL450 in the US and at and above 18,000′ msl to unlimited in Canada.

A1. European countries use the phonetic alphabet.

MINIMUM EN-ROUTE IFR ALTITUDE (MEA)

The lowest published altitude between radio fixes that meets obstacle clearance requirements between those fixes **and in many countries assures acceptable navigational signal coverage.** The MEA applies to the entire width of the airway, segment or route between the radio fixes defining the airway, segment or route.

MINIMUM OBSTRUCTION CLEARANCE ALTITUDE (MOCA)

The lowest published altitude in effect between radio fixes on VOR airways (i.e. below 18,000′msl), off-airway routes or route segments which meets obstacle clearance requirements for the entire route segment and in the USA assures acceptable navigational signal coverage only within 22nm of a VOR.

MINIMUM OFF-ROUTE ALTITUDE (MORA)

This is an altitude derived by Jeppesen. The MORA provides known obstacle clearance within 10nm of the route centre-line.

MAXIMUM AUTHORISED ALTITUDE (MAA)

A published altitude representing the maximum usable altitude or flight level for an airspace structure or route segment.

E means that **even altitudes/flight levels**, in thousands of feet, are used in the arrow's direction and **odd altitudes/flight levels** in the opposite; contrary to ICAO Semi-circular rules.

O means that **odd altitudes/flight levels**, in thousands of feet, are used in the arrow's direction. It is used only on one-way airways.

E and **O** indicates that all altitudes, even and odd, are available in the indicated direction.

PPR means that Prior Permission is Required from ATC for flight in the arrow's direction.

AIRWAY NAVAID/REPORTING POINT BY-PASS

The symbols depicting the by-passing of a navaid or reporting point should be noted.

BOUNDARIES

Students need to be familiar with the boundary symbols.

CONTROLLED AIRSPACE & ICAO AIRSPACE CLASSIFICATIONS Reference to the symbols in conjunction with the exercises in this chapter will enable the student to become familiar with the symbols for the above.

ICAO Airspace Classification is designated by the letters A to G:

Class A: IFR flights only are permitted; all flights are subject to ATC service and are separated from each other.

Class B: IFR and VFR flights are permitted; all flights are subject to ATC service and are separated from each other.

Class C: IFR and VFR flights are permitted and all flights are subject to ATC service and IFR flights are separated from other IFR flights and from VFR flights.

Class D: IFR and VFR flights are permitted and all flights are subject to ATC service; IFR flights are separated from other IFR flights and receive traffic information in respect of VFR flights; VFR flights receive traffic information in respect to all other flights.

Class E: IFR and VFR flights are permitted; IFR flights are subject to ATC service and are separated from other IFR flights. All flights receive traffic information as far as is practicable.

Class F: IFR and VFR flights are permitted; all participating IFR flights receive an air traffic advisory service and all flights receive flight information service if requested.

Class G: IFR and VFR flights are permitted and receive flight information service if requested.

Note the depiction, with airspace classification, of **Terminal Control Area (TMA), Control Area (CTA)** and **Control Zone** (**CTR**).

ORIENTATION/BORDER INFORMATION & MISCELLANEOUS

The location of airfields, navaids and reporting points, etcetera, on the charts can be readily plotted by reference to the latitude and longitude grid.

The isogonals are indicated at the edge of a chart or extended fully across the chart in a continuous dashed line.

Shorelines and large inland lakes are shown. The Border and Miscellaneous information should be noted.

The Grid Minimum Off-route Altitude (Grid MORA) values clear all terrain and manmade structures by 1000ft in areas where the highest elevations are 5000ft amsl or lower. MORA values clear all terrain and manmade structures by 2000ft in areas where the highest elevations are 5001ft amsl or higher. When a Grid MORA is shown as "Unsurveyed " it is due to incomplete or insufficient information. Grid MORA values followed by +/- denote doubtful accuracy, but are believed to provide sufficient reference point clearance.

HIGH ALTITUDE CHART LEGEND

This legend's symbols are additional and are applicable to the High Altitude Charts; preceding legend symbols also apply to the charts.

AREA CHARTS

This legend is applicable to Area Charts and is additional to the preceding legends. Students must familiarise themselves with the Area Chart symbols as questions will be posed on them in the examination. Note the symbols for:

Departure and arrival routes.
Speed Limit Point.
Man-made structures.
Depiction of communication frequencies.

AREA CHARTS-GENERALISED TERRAIN CONTOURS

Terrain information may be depicted on area charts when terrain within the area chart coverage rises more than 4000' above the main airport; see Madrid Area Chart. The absence of terrain contours does not imply the absence of terrain or structures. The contour information does not assure clearance above or around terrain or man-made structures. There may be higher uncharted terrain or man-made structures within the vicinity. Terrain information is useful for visual orientation and general visualisation of terrain. It does not replace the minimum altitudes dictated by the airway and air route structure.

JM - SID and STAR LEGEND

As the examination will include questions on selected Standard Instrument and Standard Terminal Arrival charts the student must have a thorough knowledge of this legend.

The charts provide a **graphical** (i.e. not to scale) **illustration of the governing authority's prescribed procedures**.

JM - APPROACH CHART LEGEND

As with the SIDs and STARs questions will be set in the examination on selected Approach Charts. Students are advised to become as conversant as possible with the layout and content of this comprehensive legend. The sub-divisions of this legend, which are a potential source of examination questions, are:

- **Landing Minimums.**
- **Airport Chart Format and Plan View**.
- **Additional Runway Information.**
- **Lighting Systems.**
- **Take-off and Alternate Minimums.**
- **GPS Approach Charts**
- **ICAO recommended airport signs and runway markings.**

AIR TRAFFIC SERVICES (ATS) ROUTES/STANDARD ROUTES

(Ref: Current UK AIP ENR 1 and ENR 3)

In the United Kingdom ATS Routes are based upon significant geographical points which may or may not coincide with the location of a radio navigation aid. These significant points can be found in column 1 of the table at ENR 3.
Unless stated otherwise **an airway is 5nm either side of a straight line** joining each two consecutive points shown in column 1 of the table. **Upper ATS routes** and **Advisory Routes** have no declared width but **for the purposes of ATS provision are deemed to be 5nm either side of a straight line** joining each two consecutive points. The vertical extent is shown in column 3 of the table.

ENR 3 is divided into:

- **LOWER ATS ROUTES** which have an upper limit of FL245.
  Ref. E(LO)1: See B1 ATS route, 279 and 085 radials from WAL VOR/DME at N53 23.5 W 003 08.0.

- **LOWER ATS ROUTES - (ATS ADVISORY ROUTES).** These have a maximum upper limit of FL240. The route designator for an Advisory Route always ends with **D**. e.g. **A1D, N562D**.
  Ref. E(LO)1: See W911D Advisory Route, 242 and 058 radials from IOM VOR/DME N54 04.0 w004 45.7

Note: *Advisory Routes, class F airspace, are thus not established within Controlled Airspace and are designated routes along which **Air Traffic Advisory Service** is available. An Air Traffic Advisory Service is a service provided within advisory airspace to ensure separation, in so far as is practical, between aircraft which are operating on IFR flight plans.*

Controlled Airspace is airspace of defined dimensions within which **Air Traffic Control Service** is provided to IFR and VFR flights in accordance with the airspace classification A, B, C, D and E. Thus an **Air Traffic Control Service** provides the much more complete service of:

- Preventing collisions between aircraft.
- Preventing collisions on the manoeuvring area between aircraft and obstructions.
- Expediting and maintaining an orderly flow of air traffic.

➢ **LOWER ATS ROUTES - (CONDITIONAL ROUTES (CDR))**.
These routes are usable only under specified conditions. (See ENR 1.1.1.1 para 1.5 and ENR 3.2.2.1)

➢ **UPPER ATS ROUTES** from FL245 to FL460. The route designator is always preceded by U. e.g. UA1, UB40.
Ref. E(HI)4: See UG1 Upper ATS route, 295 and 111 radials from STU VOR/DME N51 59.7 W005 02.3.

➢ **UPPER ATS ROUTES - (CONDITIONAL ROUTES (CDR))**

➢ **SUPERSONIC TRANSPORT ROUTES (SST)**

SST aircraft operating to or from London and Paris on transatlantic flights will be cleared by ATC to use as appropriate the Upper ATS Routes, which are for their use only. i.e SL1, SL2, SL3, SL4, SL5 and SL7.

➢ **STANDARD ROUTES**
(Ref. Figure 1)
Standard Routes are mandated in the UK AIP at ENR 3–5-2-9 (25 Mar 99):

- **UK Upper ATS Routes for N. Atlantic Traffic Flow (Westbound).**

- **UK Upper ATS Routes for N. Atlantic Traffic Flow (Eastbound).**

- **UK Upper ATS Routes for N. Atlantic Traffic Flow (Eastbound)** with destinations to exit points and Brussels (EBBR), Koln Bonn (EDDK), Munich (EDDM), London Heathrow (EGLL), Amsterdam/Schipol (EHAM), Paris Orly (LFPO), Milan (LIMC), Tel AVIV (LLBG) and Geneva (LSGG).

Questions may appear on Standard Routes.

STANDARD ROUTES					
Origin (AD or Entry Point/Route or Region)	Cruising Levels (FL)		Route	Destination (AD or Exit Point/Route or Region)	Remarks (Times 1 hour earlier for Summer)
	Min	Max			
1	2	3	4	5	6
UK Upper ATS Routes for North Atlantic Traffic Flow (Eastbound) - Destination: LFPO - Paris Orly					
61N 010W			BILLY - UN610 - STN-UN615-GOW - UA1 - MID - UA34	ETRAT	
60N 010W			STN - UN615 - GOW - UA1 - MID - UA34	ETRAT	
59N 010W			STN - UN615 - GOW - UA1- MID - UA34	ETRAT	
58N 010W			BEN - UN590 - GOW - UA1 - MID - UA34	ETRAT	
57N 010W			TIR - UN580 - GOW - UA1 - MID - UA34	ETRAT	
56N 010W			MAC-UA2-DCS - UA1 - MID - UA34	ETRAT	
DEVOL			BAKUR - UN456 - STU - UP2 - NIIGIT - UB39 - MID - UA34	ETRAT	
BABAN			BAKUR - UN546 - STU-UP2-NIGIT - UB39 - MID - UA34	ETRAT	
BURAK			NORLA - UR 37 - SAM - UR8 - MID - UA34	ETRAT	
DOLIP			NORLA - UR37 - SAM - UR8 - MID - UA34	ETRAT	
GIPER			TAKAS - French UIR	(TAKAS)	
KENUK			TAKAS - French UIR	(TAKAS)	
GUNSO			TULTA - French UIR	(TULTA)	
UK Upper Routes for North Atlantic Traffic Flow (Eastbound) - Destination : LGAT - Athens					
61N 010W			BILLY - UN610 - STN - PELOM - UL74	TOPPA	
61N 010W			BILLY - UN610 - STN - UN591 - AMIBA - UL7	LONAM	
60N 010W			STN - UN591 - PELOM - UL74	TOPPA	
60 N 010W			STN - UN591 - AMIBA - UL7	LONAM	
59N 010W			STN - UR38 -FINDO- UY806 - DODSI - UN591 - PELOM-UL74	TOPPA	
59N 010W			STN - UN591 - PELCOM- UL74	TOPPA	Use when UY806 is not available
59N 010W			STN - UR38 - FINDO - UY802	TOPPA	
58N 010W			BEN - UN585 - FINDO- UY802	TOPPA	
58N 010W			BEN - UN585 - FINDO - UR38 - NEW- UL602 - DOGGA - UB1	BLUFA	
58N 010W			BEN - UN581- ADN- UN591-AMIBA-UL7	LONAM	
57N 010W			TIR - UN580 - GOW - UL602 - NEW - UY800 - SOMIT - UY802	TOPPA	
57N 010W			TIR- UN580 - GOW - UA1	VEULE	
56N 010W			MAC- UA2 - DCS - UA1	VEULE	
55N 010W			TADEX - UN551-BEL - UB3-HON-UA1	VEULE	
DEVOL			TIVLI - UG4 - LND - UR168	CAVAL	Note 1
BABAN			TIVLI - UG 4- LND - UR168	CAVAL	Note 1
BURAK			TIVLI - UG4 - LND - UR168	CAVAL	Note 1
DOLIP			RATKA - French UIR	(RATKA)	
GIPER			TAKAS - French UIR	(TAKAS)	
KENUK			TAKAS - French UIR	(TAKAS)	
GUNSO			TAKAS - French UIR	(TAKAS)	

Note 1: Eastbound traffic via UR1668 - CAVAL may be tactically re-routed by ATC via UG$ - LIZAD if UR168 is not available in French Airspace

Figure 12.1 Example Standard Routes

➤ **PREFERRED ROUTES**
(Ref. Fig. 2)
Preferred Routes are published in the UK AIP at ENR 3-5-3-1 (15 Jul 99):

- **Daventry CTA Overflights. (Eastbound).**
- **Daventry CTA Overflights. (Westbound).**
- **Scottish Terminal Control Area (TMA) Transits (Westbound).**
- **Scottish Terminal Control Area (TMA) Transits (Eastbound).**

Questions may appear on Preferred Routes.

PREFERRED ROUTES					
Origin (AD or Entry Point/Route or Region)	Cruising Levels (FL)		Route	Destination (AD or Exit Point/Route or Region)	Remarks (Times 1 hour earlier for Summer)
	Min	Max			
1	2	3	4	5	6
Scottish Terminal Control Areas (TMA) Transits (Westbound)					
TLA	80	240	TLA- GRICE	GRICE	
PTH	80	240	GRICE-TRN	BLACA	
MARGO	100	240	TLA-FOYLE	RANOK	
DCS	80	80	TLA-FOYLE	RANOK	
MARGO	100	240	TLA	GOW	
DCS	80	80	TLA	GOW	
SAB	80	240	GOW	TRN	
Scottish Terminal Control Area (TMA) Transits (Eastbound)					
GRICE	Note 2	130	FENIK - DCS - A2	POL	
GRICE	150	240	FENIK - DCS- A1	CALDA	
RANOK	Note 2	130	GOW - DCS - A2	POL	
RANOK	150	240	GOW - DCS - A1	CALDA	
GOW	Note 2	130	DCS - A2	POL	
GOW	150	240	DCS - A1	CALDA	
MAC	Note 2	130	HERON - TRN - NGY - DCS - A1	POL	
MAC	150	240	HERON - TRN - NGY - DCS - A1	CALDA	
BLACA	90	240	TRN - GRICE	PTH	
TRN	90	240	GOW	SAB	

Note 1: Aircraft not intending to land at aerodromes within Edinburgh or Glasgow CTRs will be cleared by the most expeditious routes according to prevailing conditions.

Note 2: In general, such aircraft will be cleared to overfly the TMA not below Flight Level equivalent of 7000 ft and pilots are advised to flight plan accordingly (the actual cruising level will be allocated by ATC).

Figure 12.2 Example Preferred Routes

Example 1. (STAR).

Answer the following questions with reference to London Heathrow STAR 10-2E and the appropriate legend(s):

a. Decode *ATIS.

b. What is the Transition Level and Altitude? Define both terms and transition layer.

c. With reference to the **OCKHAM ONE DELTA (OCK 1D)** procedure: The descent planning clearance is?

d. Explain the significance of the symbol ❶

e. State the holding speeds in the London TMA.

f. The elevation of the airfield is?

g. Decode the triangular symbol at ***KENET.***

h. Define the geographical position of ***KENET*** in relation to the **LON** and **OCK VOR/DME** beacons

i. Decode ***SLP***.

j. Explain the symbols defined by the 275 radial (R275°) at 12nm from the **OCK** VOR.

k. State the speed limiting procedures for this STAR.

l. What is the planned possible descent clearance for the **OCK 1F** procedure?

m. At what distance would this planned descent start from the OCK VOR/DME?

n. With reference to the HONILEY VOR/DME:

  i. State its callsign.
  ii. State its frequency.
  iii. What does " **D** " mean?

o. Detail the meaning of, and the flight procedure for, the oval pattern located at the OCK VOR.

Example 2. (Approach Chart)

Answer the following with reference to the appropriate legend(s) and London Heathrow Approach Chart ILS DME Rwy 27L, 11-3.

PLANVIEW

a. With reference to the top left-hand box decode:

- "HEATHROW Director (APP) (R) 119.72".
- Alt Set: hPa. Rwy Elev: 3Hpa.
- Trans alt. 6000' (*5923')*.

b.
- Define MSA.
- What is the MSA to the East of the airfield?

c. Decode ❶

d. Decode *LOC* * 109.5 ILL.

e. Decode the information at BOVINGDON.

f. Describe the MISSED APPROACH HOLDING south of BNN VOR/DME.

g. State the difference between the **route** delineated by the 137 radial from the BNN VOR and its **arrowhead** at 19nm from the BNN DM,E and the **route** and **arrowhead** delineated by the 096 radial from LON VOR/DME.

h. What is the inbound track of the ILS localiser beam?

i. Where can the details of the danger area EG (D) - 133 be found? Decode the details.

PROFILE VIEW and LANDING MINIMUMS

j. What is the elevation of the threshold of runway 27L?

k. What are the recommended height and altitude at 4nm from the ILL ILS DME when the ILS glideslope is unserviceable?

l. Decode: OCA (H) RWY 27L. ILS D: 264' (*187'*).

m. Decode TCH 56'.

n. Explain the meaning of the propeller symbol.

o. Decode *GS* **1405'** *(1328')*.

p. What does **- - - - - M -** ↗ and ↗ signify?

q. Quote the DA/H for the ILS precision approach and the MDA/H for the localiser only (glideslope out) non-precision approach.

r. What is the missed approach procedure?

s. Define:

Non-precision approach and landing operations.

MDA/H.

Precision approach and landing operations.

DA/H.

Missed approach Point. Missed approach procedure. RVR.

t. Decode: ALS out; TDZ or CL out.

u. An aircraft has a groundspeed of150kt during the descent on the ILS glidepath. What is the glidepath angle and the required rate of descent?

v. Describe the Missed Approach Point (MAP).

w. What is the visibility and authorised UK RVR for a C Category aircraft when the touchdown lights are out of service?

x. Define visibility.

Example 3. (SID)

Answer the following with reference to the appropriate legend(s) and London Heathrow SID 10-3.

a. State the transition codes for runways 27R, 27L and 23.

b. What is the procedure after the 2 DME arc on the **BROOKMANS PARK SIX HOTEL DEPARTURE?**

c. With reference to the **BPK 6H** what does the symbol at N51 30.1 W000 37. 4 signify and what are the direct and curved path ground distances to it?

d. State the frequency of BUR NDB.

e. Quote the altitudes required:

   i. Crossing the 302 radial.
   ii. Crossing the 320 radial.
   iii. At the BPK VOR

f. An aircraft, cleared for the **BPK 6F** procedure, is airborne at 0613 UTC. What is its ETA at BPK if its average groundspeed is planned to be 240kt? (use mental arithmetic).

g. State the SPEED CONTROL PROCEDURE.

h. What is the routing at D6 LON?

i. What is the minimum crossing height at the appropriate Noise Monitoring Terminal?

j. State the climb procedures thereafter.

k. If an aircraft's groundspeed is 240kt what is its minimum rate of climb to comply with the noise abatement criteria?

l. What is the Minimum Sector Altitude for the BPK 6G departure to the CHT NDB, and what obstacle clearance does it provide?

m. What are the Transition Level and Transition Altitude?

n. State the departure control frequency.

o. What is the radius, and centre, of the Minimum Safe Altitude circle?

Example 4. Standard Routes

With reference to Fig. 12.1 and Chart E (HI) 3/4 choose the correct Standard Route from 57N 010W to LGAT (Athens) via VEULE and complete the following Flight Plan.

FROM	TO	TRACK (M)	VARN.	TRACK (T)	MET. W/V	HDG (T)	TAS	GS.	DIST.	AIR DIST.	TIME	ETA
57N 010W					250/40		490					
					250/50		490		89			
	DCS				240/60		490					
		162	6W		240/60		490					
HON	COWLY				230/70		490					

a. What is the latitude and longitude of VEULE?

b. What is the correct Flight Level (FL) to fly between FL300 and 360 as far as COWLY?

c. Calculate the Estimated Time of Arrival (ETA) at COWLY if an aircraft left 57N 010W at 0937Z.

d. What is total ground distance and total air distance?

Example 5 Preferred Routes

With reference to Fig. 12. 2 and E(LO)1 enter in the Flight Plan below the appropriate Preferred Route from MAC to CALDA (N534627 W0023838).

FROM	TO	AIRWAY	TRACK (M)	VARN.	TRACK (T)	MET.W/V	HDG (T)	TAS	GS.	DIST. GNM/ AM	TIME	ETA
MAC		N522D				240/40		470				
						240/40		470				
						250/60		470				
						250/60		470				
	CALDA					260/70		470				

a. What is the significance of the designator N522D?

b. What type of route is it between TRN and NGY?

c. What is the lowest eastbound FL?

d. What is thre ETA at CALDA? (ETA for MAC is 2359Z)?

e. What are the individual totals for ground and air nautical miles?

AREA, LOW and HIGH LEVEL CHARTS

Before attempting the exercises students should study the following example Jeppesen charts together with the relevant legends:

a. LONDON, UK and PARIS, FRANCE AREA.

b. E(LO)2.

c. E(HI)4

AIRWAYS EXERCISE 1 (LOG)

FROM	TO	AWY/ SID/STAR	FL	VRN.	W/V (MAG)	TR. (MAG)	TR. (TRUE)	HDG. (MAG)	TAS	WC	GS	DIST	EET	ETA
EGLL	D12 LON		↗									14	6	
	MID (TOC)		↗								340			
MID (TOC)			250											
			250											
	UIR BDY		250											
			250											
	SOKMA		ATC										6	
	MERUE(TOD)		ATC								300			
MERUE(TOD)	LFPG		ATC									40	12	
										TOTALS				

EXERCISE 1

Using the appropriate JM Legends, Jeppesen itemised charts and the following information complete the enclosed Airways Flight Plan.

Charts:

SID	London Heathrow MIDHURST DEPARTURES.
AREA	LONDON - UK and PARIS - FRANCE.
EN-ROUTE	E(HI)4
STAR	PARIS, FRANCE, Charles de Gaulle

Route:
LONDON HEATHROW (EGLL) N51 29 WOO 28 to PARIS CDG (LFPG) N4901 E02 33.

Depart EGLL using SID MID 3G to MID VOR/DME; aircraft is airborne at 0623UTC.

ATS route to BOGNA (N50 42.1 W000 15.0). N.B this position on the E(HI)4 chart is called WOR. From BOGNA to HARDY (N50 28.3 E000 29.5) and then to DPE (N49 55.6 E001 11.3).

Arrival via STAR DPE 1E, 1W to Paris CDG.

Met. Winds:

FL 250	MID to HARDY	300/85
	HARDY to DPE	300/60
TAS	FL250	390kt.

Refer to the relevant JM Charts/Legends and answer the following:

Reference LONDON, UK HEATHROW SID, MIDHURST DEPARTURES.

1. Itemise the speed control procedure.

2. State the noise abatement procedure.

3. If an aircraft's groundspeed is 175kt what rate of climb must it maintain to fulfill the noise abatement requirements?

4. State the altitude requirements at: D8 LON, D12 LON, D17 LON and MID VOR/DME.

5. When may these altitude requirements be exceeded?

Reference LONDON, UK AREA chart:

6. What is the significance of the green ➊ at N5135 W01 14?

7. State the name and dimensions of the above area.

8. What is the significance of the green ➌ which is 2nm to the SE of the symbol at f)?

9. For London Heathrow what are the communication frequencies for:
   i. Radar.
   ii. Tower.
   iii. Ground.
   iv. ATIS.

   What does **Cpt** mean? What does the * mean?

10 With reference to the green and blue symbols ➌ in the region N52 W01what:

   i. Are the navigation facilities available?

   i. Is the holding pattern at Daventry VOR for eastbound aircraft?

   iii. Is the alternate procedure when Daventry VOR is unserviceable?

11. What does the symbol at N51 07 W00 26 mean?

12 Describe the alternate holding pattern for BIG N51 19.8 E000 02.2.

13. Decode fully **CTR A** at N51 30 W00 30.

With Reference ATS route A37, 058 radial from DET VOR (N51 18.2 E000 35.9)

14. What is this airway used for normally?

15. Decode **FL90 1900a.**

16 Decode **19** to the south of DET VOR/DME.

17. What is the next reporting point ,eastbound, after TOBIX? State its lat/long.

Reference E(HI)4:

18. What is the chart's scale and above what flight level is the chart designed for?

19. What are the upper and lower limits of UK and French Upper Airspace?

20. What is the upper limit of UK and French high altitude airways?

21. If an aircraft is tracking 359°(M) with a heading of 010°(M), what is its lowest available FL in UK Upper Airspace?

22. Itemise the radio communication frequencies on UA47 from the UIR boundary to SOKMU at FL250, and the Upper Air Control Centre in which the aircraft is operating.

23. What is the magnetic variation WORTHING to HARDY?

24. Describe the symbols at N49 55.6 E001 10.3.

25. What does the blue symbol ❶ indicate at N50 13 W01 41?

Reference PARIS, FRANCE AREA CHART:

26. What is its scale?

27. What is the Approach Radar frequency for an aircraft descending from FL190 to FL110?

28. Overhead ABB VOR what is the decode for the SECTOR TNI box to the northeast?

29. What is the magnetic variation on this chart?

30. What is the distance and magnetic track between N49 01.9 E001 13.3 and N49 33.2 E002 29.4?

31. What is the highest Grid MORA?

32. Decode the blue symbol ❶.

Reference PARIS, FRANCE CHARLES DE GAULLE STAR:

33. State the ATIS frequency, Transition Altitude and Level.

34. Describe the ALTERNATE HIGH holding pattern at DPE.

35. List all the arrivals for propeller driven aircraft.

36. An aircraft is fitted with a twin-needle Radio Magnetic Indicator (RMI) and DME. How does it fix its position at MERUE?

37. Decode the symbology at SOKMU.

Reference PARIS CHARLES DE GAULLE VOR/DME RWY 27 page 23-1 JEPPESEN APPROACH CHARTS:

38. What are the descent instructions just prior to crossing CRL VOR/DME?

39. What are the instructions at the intersection of the CRL 119 radial at 18nm DME, and the CGN VOR 072 radial?

40. State the crossing heights at the RSY locator and the distance to the threshold.

41. In the event of an overshoot what are the height instructions to hold at MERUE?

42. State the MDA(H) for a straight in approach and define MDA(H).

Miscellaneous:

43. What are the INS co-ordinates for STAND No. A9?

44. What are the lengths in metres and feet of the two runways at Paris Charles de Gaulle?

45. Are Simultaneous Parallel Departure Procedures allowed at Paris CDG? If so what are the regulations?

AIRWAYS EXERCISE 2 (LOG)

FROM	TO	AWY/ SID/STAR	FL	VRN.	W/V (MAG)	TR. (MAG)	TR. (TRUE)	HDG. (MAG)	TAS	WC	GS	DIST	EET	ETA
LFPG	D18 BT	SID	↗								185	18.5		
	TOC		↗								360	36		
TOC	ABB	AWY	240											
	NASDA													
NASDA	CLIFF													
	TIGER(TOD)													
TIGER (TOD)	D12 BIG		↘									10	3	
	BIG		↘									12	4	
BIG	EGLL		↘									30.5	12	
										TOTALS				

EXERCISE 2

Refer to the appropriate JM legends, listed charts and the following information and complete the enclosed Airways Plan.

Charts:

SID	Paris, France, Charles de Gaulle ABBEVILLE DEPARTURES.
AREA	PARIS, FRANCE and LONDON, UK.
EN-ROUTE	E(LO)2.
STAR	LONDON,UK Heathrow.

Route:
PARIS CHARLES DE GAULLE (LFPG) N4901 E02 33 to LONDON HEATHROW (EGLL) N51 29 W00 28. The aircraft is airborne at 0823UTC

Depart LFPG using SID ABB 8A/D to ABB VOR/DME.

ATS route A20 from ABB to CLIFF

Arrival via BIGGIN STAR

Met winds:

FL240	TOC to TIGER	300/70.
TAS	FL240	450kt.

General questions charts E(LO)1 and 2:

1. What are their scales?

2. On a proposed flight Manchester to Naples which E(LO) charts are required?

3. State the limits and classifications of designated airspace for the UK and France.

4. In relation to UTC quote the normal Summertime hours for Belgium.

5. It is 2040 UTC 30/3/97. What is the LMT beyond E40?

6. In relation to COMMUNICATION decode the following:

G	*
X	**R**
C	**Cpt**

7. State the common emergency VHF frequency.

8. With reference to Brize Norton:

   a. What is: its ICAO location indicator?

   b. What is its panel location ("zigdex") for E(LO)1 and 2?

   c. Decode its communication facilities.

9. What do the shaded areas on the chart coverage panel signify?

10. SSB means?

11. An aircraft is overhead N51 05.2 W004 08.6 maintaining a track of 185°(M) with a heading of 180°(M). Should it be flying:

   a. An ODD level?
   b. An EVEN level?
   c. An ODD + 500′ level?
   d. An EVEN + 500′ level?

12. Where are details on E(LO)2 of:

   a. High Intensity Radio Transmissions to be found?

   b. Areas of Intense Air Activity to be found?

13. State the vertical limits for UK AERODROME TRAFFIC ZONES.

14. What are the UK ALTIMETER SETTING requirements?

15. In the UK what is the airspace classification of Airways and Advisory Routes?

16. Where are details of UK Military Air Traffic Zones (MATZ) published on E(LO)2?

17. Give the details for EG(D) - 014 at N50 30 W02 35.

18. Fully decode the symbols at N50 44 W03 25.

Reference Exercise 2 and chart E(LO)2:

19. At NASDA what IFR is the aircraft leaving and entering? (State their ICAO location indicators).

20. Decode all the airway symbols within a 7nm radius of N50 25 E01 26, including the blue thickly dashed line. (Ignore Le Touquet).

21. Decode the semi-circle around CLIFF.

22. What is the highest Grid MORA from ABB VOR onwards? Define Grid MORA.

Reference London, UK Heathrow STAR:

23. Decode the symbols at D12 BIG.

24. State the "SPEED LIMIT PROCEDURES/ATC REQUIREMENTS".

25. Quote the "DESCENT PLANNING/ATC REQUIREMENTS" for the BIG 2A STAR..

26. Decode ④.

27. Which three radials fix CLIFF?

Reference Paris, France Charles de Gaulle SID Abbeville Departures:

28. What does the symbol at 5nm on the BT VOR 331radial signify?

29. State the SPEED CONTROL PROCEDURES.

30. With reference to RWY 27 departures, if the take-offs and landings at ORLY are westerly, is an ABB 8A or ABB 8D filed?

31. What is the INITIAL CLIMB OUT procedure and minimum gradient for an ABBEVILLE departure RWY 27?

32. At a groundspeed of 230kt what rate of climb is required in ft/min?

Miscellaneous: (refer to London Heathrow charts)

33. Where are the Noise Abatement Procedures to be found, and what are the day and nighttime operational limits?

34. State the JAA MINIMUMS for LONDON HEATHROW for Runway 27L CAT2 ILS for an aircraft with an approach speed of 160 kt.IAS.

35. What are the Missed Approach Radio Failure Procedures for EGLL for RWY 27L/R via the EPSOM NDB?

36. With reference to a Surveillance Radar Approach LONDON HEATHROW, page 18-1 JM

a. What is Heathrow Director Approach frequency?

b. What is Heathrow Radar frequency?

c. What are the Missed Approach Holding points and heights?

d. What are the published Heights Above Aerodrome (HAA) at 3 and 2nm?

e. What is the minimum altitude/height at 4nm?

ANSWERS TO EXAMPLES/ EXERCISES

Example 1. (STAR)

a. * = Part-time operation; ATIS = Automatic Terminal Information Service.

b. The Transition Level is allocated by ATC; the Transition Altitude is 6000′.
Transition Level is the lowest level available for use above the transition altitude. **Transition Altitude** is the altitude at or below which the vertical position of the aircraft is controlled by reference to altitudes.
Transition layer is the airspace between the transition altitude and transition level.
(Ref. ICAO Doc 4444-RAC/501)

c. As directed by ATC.

d. For arrivals from the West and Northwest: When the OCK VOR or DME is unserviceable use EPSOM (EPM) 1A, 1D, 1F arrivals.

e. ❷ Holding speed in the London TMA up to and including FL140 is MAX IAS 220KT. At FL150 and above standard ICAO holding speeds apply. I.e.

Above FL140 to 200 inclusive: 240Kt in normal conditions; 280Kt or 0.8Mach, whichever is less, in turbulent conditions.
Above FL200 to 340 inclusive: 265Kt in normal conditions; 280Kt or 0.8Mach, whichever is less, in turbulent conditions.

Above FL340: 0.83Mach in all conditions.
(Ref. ICAO Doc 8168-OPS/611 Vol. 1, page 4-3)

f. 80′.

g. ***KENET*** is a non-compulsory airspace fix.

h. **LON**: VOR 277° radial; DME 37 nm. **OCK**: VOR 293° radial; DME 40nm.

i. ***SLP*** = Speed Limiting Point.

j. X = non-compulsory airspace fix; the shaded square = Speed Limiting Point.

k. "Maintain MAX IAS 250KT from position 3 Min before holding facility or position (SLP) shown on chart"

l). Pilots should plan for a possible descent clearance as follows:
OCK 1F: FL140 10nm before Nigit Int (intersection).

m. 37nm.

d. i. HON
ii. 113.65MHz.
iii. DME capability is indicated by a small "D" preceding the VOR frequency.

o. Holding Pattern or Racetrack Pattern. Inbound to the OCK VOR on the 332° radial. Outbound from overhead the VOR onto a track of 152°(M) to a maximum range of 9nm (D9) from the OCK DME. 7000 indicates the minimum holding altitude (MHA).

Example 2. (Approach Chart)

a. i) Heathrow Director, Approach Control Radar available, frequency 119.72MHz.

ii) The altimeter setting information is given in hectopascals (inches on request). The runway elevation of 3Hpa (3mb), which equals 90ft roughly,is the barometric pressure equivalent for the QFE altimeter setting. This value is subtracted from the reported QNH setting to obtain QFE. The height reference datum will be the runway threshold elevation (Rwy), airport elevation (Apt) or the runway touchdown zone elevation (TDZ), as applicable.

iii) The transition altitude 6000′ based on QNH and 5923′ based on QFE; the difference. 77′, equates to the elevation of the runway touchdown point.

b. i) The Instrument Approach Chart Minimum Safe Altitude (MSA), supplied by the controlling authority, is the minimum safe altitude which provides up to 1000′ obstacle clearance within a 25nm radius from the navigational facility upon which the MSA is predicted. If the radius is other than 25nm it is stated. This altitude is for **emergency use only** and does not necessarily guarantee NAVAID reception. When the MSA is divided into sectors, with each sector a different altitude, the altitudes in these sectors are referred to as "minimum sector altitudes"

ii) 2300′.

c. ➊: Advise ATC if unable to receive DME. Equivalent radar fix will be provided at 7.5nm and 4nm from the ILL ILS localiser.
LOC: Not available without the ILS DME.
Initial and intermediate approach valid up to 220kt IAS. ILS DME reads zero at threshold of runway 27.

d. The ILS localiser frequency is 109.5MHz; the ILS callsign is ILL and the * = part-time operation.

e. IAF = Initial Approach Fix based upon the BOVINGDON VOR/DME, frequency 113.75MHz, callsign BNN.. D = Distance Measuring Equipment available. When the BNN VOR/DME is unserviceable use the position at BOVVA which is defined by the 321radial at 32nm from the Biggin VOR/DME (see JM STAR 10-2A).

f. The Missed Approach Holding is based upon the CHILTERN Non-Directional Beacon (NDB)/Locator, callsign CHT, frequency 277kHz; race-track pattern inbound 293°(M) to the overhead then left turn outbound onto 113°(M).

g. The route from the BNN VOR/DME is an approach transition; the 096 radial and small arrowhead is a cross radial

h. 274°(M), its QDM.

i. Refer to the en-route chart E(LO)2. It extends from the ground to 1400′ and operates from 0800-2359 local time and 1400 to 2200 local time when notammed. j) 77′.

k.. 1410′ QNH; 1333′ QFE; (77′ difference).

l. **D** = AIRCRAFT APPROACH CATEGORY and speed of 141/165kt, which is 1.3 VSO. The **Obstacle Clearance Altitude /Height (OCA/H)** are 264', QNH and 187', QFE. **VSO**. = the stall speed or the minimum steady flight speed in the landing configuration.

OCA (H) is the lowest altitude or height above the elevation of the relevant runway threshold or aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria. For a precision approach procedure (i.e.ILS localiser and glideslope serviceable) **it is the lowest altitude or height** above the relevant runway threshold, **at which a missed approach must be initiated** to ensure compliance with the appropriate obstacle clearance criteria. (Ref. ICAO Doc 8168, 1993)

m. TCH 56' = ILS glideslope threshold crossing height.

n. Final Approach Fix (FAF) 7.5nm DME range from the runway threshold, 8.7nm DME range from LON VOR/DME; 2500' (2423') is the minimum glideslope intercept altitude or height.

o. Glideslope altitude (1405') and height (1328') at 4nm ILS ILL DME range from touchdown.

p. The **M** symbol and arrow signifies the **non-precision approach** (i.e. localiser only serviceable, no glideslope information) **Missed Approach Point (MAPt/MAP)**. The arrow without the dashes means the applicable **Decision Altitude or Height (DA/H)** for the **precision approach** ILS procedure (localiser and glideslope serviceable).

q. The DA/H is 277' (QNH)/200'(QFE); the MDA/H for the localiser only (glideslope out) approach is 490' (QNH)/413' (QFE).

r. The missed approach is: "Climb straight ahead to 3000' (2923') then as directed bt ATC (Max IAS 185kt). In the event of complete radio failure see 11-7."

s. **Non-precision Approach and landing operations.** An instrument approach and landing which does not utilize electronic glidepath guidance. i.e. localiser only ILS, VHF Omni-range (VOR), Non-Directional Beacon (NDB), VOR/DME, etc., approaches.

Minimum Descent Altitude/Height (MDA/H). A specified altitude/height in **a non-precision approach or a circling approach** below which descent may not be made without visual reference.

Precision Approach and landing operations. An instrument approach and landing using precision azimuth and glidepath guidance with minima as determined by the category of operation. i.e. ILS, MLS and Precision Approach Radar (PAR).

Decision Altitude/Height (DA/H) is a specified altitude or height in the **precision approach** at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.; DA is referenced to mean sea level (QNH) and DH to the threshold elevation (QFE). The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight-path.

Runway Visual Range (RVR) is the maximum distance a pilot 15ft above the runway in the touchdown area can see marker boards by day or night when looking in the direction of take-off or landing. (ref. School Met. notes).

Missed Approach Point (MAPt). That point in an instrument approach procedure at or before which the prescribed **missed approach procedure** must be initiated to ensure minimum obstacle clearance.

Missed approach procedure. The procedure to be followed if the approach cannot be continued. (Ref. ICAO Doc 9365-AN/910, 2nd Ed., 1991)

t. ALS out = approach lights out of service; TDZ or CL out = Touchdown lights or centre-line lights out of service.

u. 3°; 803ft/min

v. The MAP or MAPt is at .5nm from the ILL ILS DME, which is .5nm from the threshold.

w. 800m and 600m.

x. Visibility is the ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and night.
(ICAO Doc 4444-RAC 501 13th Ed., 1996).

Example 3. (SID)

a. **BPK 6F, BPK 6G** and **BPK 6H.**

b. After take-off from runway 23 fly straight ahead; at a range of 2nm from the LON Distance Measuring Equipment (DME) turn right and intercept the 122°(M) bearing **from** the BUR Non-directional Beacon (NDB), i.e. the bearing of 302°(M) **to** the NDB.

c. X = a non-compulsory airspace fix; 6nm direct from the LON DME. 7nm along the curved track.

d. 421kHz.

e. i) Above 3500ft but not above 6000ft.
ii) Above 4000ft but not above 6000ft.
iii) At 6000ft.

f. Ground distance = 32nm; at 4nm/min ETA = 0613 + 8min; **Ans. 0621UTC.**

g. Speed limit: 250kt IAS below FL100 unless otherwise cleared by ATC.

h. At 6nm from the LON DME turn right to intercept the 058°(M) track to the CHT NDB (i.e. 238°(M) bearing **from** the NDB). At CHT intercept the 248 radial from BPK VOR/DME to fly inbound to the beacon.

i. 1080ft (QNH), 1000ft (QFE).

j. Maintain a minimum climb gradient of 243ft/nm (4%) to 4000ft.

k. 972ft/min.

l. 2100ft; 1000ft.

m. Transition Level is given by ATC; Transition Altitude is 6000ft.

n. 118.82MHz.

o. 25nm radius, unless annotated otherwise, centred on the airport.

Example 4. Standard Route

FROM	TO	TRACK (M)	VARN.	TRACK (T)	MET. W/V	HDG (T)	TAS	GS.	DIST.	AIR DIST.	TIME	ETA
57N 010W	TIR	115	9W	106	250/40	109	490	520	107	101	12.5	0949.5
TIR	GOW	122	8W	114	250/50	118	490	522	89	83	10	0959.5
GOW	DCS	157	7W	150	240/60	157	490	486	79	79	10	1009.5
DCS	HON	162	6W	156	240/60	163	490	478	154	158	19.5	1029
HON		157	4W	153		160	490	470	49	51	6	1035

a) VEULE N49 51.4 E000 37.2

b) FL330.

c) ETA COWLY 1035 Z.

d) 478gnm; 472 anm.

Example 5. preferred Route

FROM	TO	AIR WAY	TRACK (M)	VARN.	TRACK (T)	MET. W/V	HDG .(T)	TAS	GS.	DIST. GNM/ AM	TIME	ETA
MAC	HERON	N522D	110	7W	103	240/40	107	470	498	23/22	3	0002
HERON	TRN	N522D	110	7W	103	240/40	107	470	498	8/7.5	1	0003
TRN	NGY	ATS	119	7W	112	250/60	117	470	512	23/21	2.5	0005.5
NGY	DCS	A1	140	7W	133	250/60	140	470	493	39/37	4.5	0010
DCS	CALDA	A1	162	6W	156	260/70	165	470	480	62/60.5	7.5	0017.5

a. N522D is an Advisory Route.

b. ATS signifies that an Air Traffic service is available between TRN and NGY.

c. FL150.

d. 0017.5Z.

e. 155gnm; 148anm.

ANSWER AIRWAYS EXERCISE 1 (LOG)

FROM	TO	AWY/ SID/STAR	FL	VRN.	W/V (MAG)	TR. (MAG)	TR. (TRUE)	HDG. (MAG)	TAS	WC	GS	DIST	EET	ETA
EGLL	D12 LON	MID 3G	↗	4W								14	6	0629
D12 LON	MID (TOC)	MID 3G	↗	4W		202	197				340	16	3	0632
MID (TOC)	BOGNA	A1	250	4W	305/85	150	146	155	390	+73	463	25	3	0635
BOGNA	HARDY	ATS	250	4W	305/85	120	116	119	390	+83	473	32	4	0639
HARDY	UIR BDY	UA47	250	4W	305/60	146	142	149	390	+55	445	9	1	0640
UIR	DPE	UA47	250	4W	305/60	146	142	149	390	+55	445	33	4.5	0644.5
DPE	SOKMU	STAR	ATC	3W		167	164				370	37	6	0650.5
SOKMU	MERUE(TOD	DPE	ATC	3W		100	097				300	17	3.5	0654
MERUE(TOD)	LFPG	1W	ATC	3W								40	12	0706
											TOTALS	223	43	

ANSWERS EXERCISE 1

1. Speed limit: 250 kt IAS below FL100 unless otherwise cleared by ATC.

2. Initial climb straight ahead to 580′ (500′ QFE). cross appropriate Noise Monitoring Terminal at a minimum of 1080′ (1000′ QFE), thereafter maintain a minimum climb gradient of 243′/nm (4%) to 4000′.

3. 709ft/min.

4. above 3000′, above 4000′, above 5000′, at 6000′.

5. Do not climb above the altitudes shown in the SIDs until specifically cleared by ATC to do so.

6. AREAS OF INTENSE AIR ACTIVITY (AIAA) not otherwise protected by regulated airspace, with an exceptionally high intensity of civil and/or military flights or where aircraft, singly or in combination with others, regularly participate in unusual manoeuvres. For pilots unable to avoid these areas Lower Airspace Radar Service (LARS) is available from the nearest units.

7. OXFORD AIAA from the ground to 5000′.

8. Benson Military Air Traffic Zone (MATZ). See top right hand corner of chart for dimensions and details.

9. i) 125.62MHz (By ATC).
ii) 118.7MHz, 118.5MHZ, 124.47MHz (By ATC).
iii) 121.9MHZ Delivery, 121.97 Pre-Taxi procedure clearance (Cpt).
iv) 113.75MHZ, 115.10MHz. 123.9MHz.
The * indicates part-time operation.

10. i) A VOR and associated DME and a non-compulsory reporting point at Daventry. A medium frequency NDB, 335kHz, and a non-compulsory reporting point at Westcott.
ii) Inbound on airway centre-line, left-hand pattern.
iii) When Daventry VOR is unserviceable the alternate procedure is inbound 190°(M) to the Westcott NDB, right hand pattern.

11. A Lower Airspace Radar Service is available at Dunsfold within unregulated airspace up to FL95 within 30nm of the airport and within limits of radar/radio coverage. Refer to E(LO) charts for frequencies.

12. The WEALD (N51 19.8 E000 02.2) ALTERNATE HOLDING, available when Biggin VOR unserviceable, is based upon BOV VOR/DME, inbound on the 141radial from 37nm to 32nm from the DME, right-hand pattern.

13. London Control Zone from ground level to 2000′ above airfield level (see note on Aerodrome Traffic Zones bottom right of chart).

14. Normally for Gatwick arrivals.

15. **FL90** = **Minimum En-route Altitude (MEA)** expressed as a Flight Level. AN MEA is the lowest published altitude between radio fixes that meets obstacle clearance requirements between those fixes **and in many countries assures acceptable navigational signal coverage**. The MEA applies to the entire width of the airway, segment or route between the radio fixes defining the airway, segment or route.

    1900a = the Jeppesen **Route Minimum Off -route Altitude (MORA)**. This altitude provides reference point clearance within 10nm of the route centre-line (regardless of route width) and end fixes. MORAs clear all reference points by 1000′ in areas where the highest reference points are 5001′ amsl or lower and 2000′ where reference points are 5001′ or higher.

16. **19** = **Grid Minimum Off-route Altitude (Grid MORA).** An altitude derived by Jeppesen or provided by State Authorities. The Grid MORA altitude provides terrain and man-made structure clearance within the section outlined by latitude and longitude lines. MORA does not provide for navaid signal, or communication, coverage. See page 6 JM Chart Glossary for terrain clearance criteria.

17. LOGAN; N5144.9 E 001 36.5.

18. 1inch = 20nm; FL200.

19. UK: FL245 to FL660. France: FL195 to FL660.

20. FL460.

21. FL260.

22. 129.35MHz, 131.25MHz; PARIS UAC.

23. 5°W.

24. A compulsory reporting point overhead the DIEPPE VOR (no DME) frequency 115.8MHZ; the flag is aligned with local magnetic north.

25. CRUISING LEVELS AVAILABLE ONLY: UR1 between Midhurst and ORTAC. Northbound FL250 etc ....see box N49 30 E/W00 00.

26. 1inch = 10nm.

27. 121.15/119.85MHZ.

28. Aircraft are controlled by PARIS CONTROL, with radar available, frequency 127.3MHz..

29. 3W.

30. 068°(M), 59.5nm.

31. 3000ft.

32. HOLDING PATTERNS. Refer to respective STAR/ARRIVAL charts for holding information. (see south of DIEPPE).

33. 128.0MHZ; TRANS. LEVEL by ATC; TRANS ALT 4000′.

34. FL 150 to 240 - inbound on the 151°(M) track, based upon the 331 radial from PON, right-hand turn at its intersection with the 250 radial from ABB. maximum 240IAS, 1.5min base legs.

35. DPE 1H, 1P; DVL 1W above FL195; DVL 1H above FL195; CAN 1H FL 130 maximum; LGL 1H; CHW 1H and 1W above FL195.

36. 334radial from PON VOR /280radial 26nm DME from CRL VOR/DME.

37. Non-compulsory airspace fix.

38. 3nm west of CRL cross at FL110 and descend to 4000′ on QNH.

39. Cross at and maintain 4000′ QNH.

40. 2260′ QNH/1873′ QFE; 5.7nm.

41. Minimum Holding Altitude (MHA) 3000′ .

42. 820′ QNH/433′ QFE. A specified altitude or height in a non-precision approach or circling approach below which descent may not be made without visual reference. (ICAO).

43. N49 00.0 E002 33.9.

44. 13829ft/4215m and 11811ft/3600m. (see Airport chart)

45. Ceiling and visibility 4000ft and 5000m or more; cross-wind less than 25kt. When in operation it will be transmitted on ATIS and RNAV systems shall be FMS or multi-sensor type. (see Airport chart).

ANSWER AIRWAYS EXERCISE 2 (LOG)

FROM	TO	AWY/	FL	VRN.	W/V	TR.	TR.	HDG.	TAS	WC	GS	DIST	EET	ETA
LFPG	D18 BT		↗	3W		331	328				185	18.5	6	0829
D18 BT	TOC	ABB 8A	↗	3W		349	346				360	36	6	0835
TOC	ABB	A20	240	3W	303/70	349	346	343	450	-50	400	20	3	0838
ABB	NASDA	A20	240	3W	303/70	321	318	318	450	-67	383	36	5.5	0843.5
NASDA	CLIFF	A20	240	3W	303/70	319	316	317	450	-68	382	26	4	0847.5
CLIFF	TIGER(TO	STAR	240	4W	304/70	319	315	317	450	-68	382	16	2.5	0850
TIGER	D12 BIG	BIG	↘	4w		319	315					10	3	0853
D12 BIG	BIG	2A	↘	4W		319	315					12	4	0857
BIG	EGLL	“	↘	4W								30.5	12	0909
											TOTALS	205	46	

ANSWER AIRWAYS EXERCISE 2

1. E(LO)1 1inch = 20nm; E(LO)2 1 inch = 15nm.

2. E(LO)1, 2, 7, 8, 9 and 10.

3. UK class (G)up to FL245; France class (G, D) up to FL195.

4. April to October, UTC + 2 hours.

5. 2040UTC + 0400 = 0040 31/3/97.

6. G = guard only. * = Part-time operation. X = On request.

R = radar capability. C = clearance delivery. Cpt =Clearance (pre-taxi procedure) .

7. 121.500MHz.

8. a. EGVN.
   b. Panel 3C E(LO)1 and panel 7A E(LO) 2.
   c. Brize Norton Airbase; Brize Approach 133.75MHz (part-time operation), 119.0MHz on request. Zone Radar Service (part-time operation) 134.3MHZ. Tower and Ground 126.5MHz, part-time operation and on request.

9. Coverage of appropriate Area Charts.

10. Single Sideband suppressed carrier wave HF (Short-wave) communications.
    11b.

12. a. E(LO)2; see N50 30 W07 30.
    b. E(LO)2; see N50 15 W07 30.

13. From the ground to 2000′ above aerodrome level (AAL). (see N5045 W 06 30).

14. See E(LO)2 N51 30 W06 15.

15. Airways within the UK are class A; Advisory Routes are class F. (see N51 25 W04 40).

16. See N49 45 W07 45.

17. Its vertical dimension is from the ground to 5000′. It is operative Monday - 0800LT to Friday 1800LT and when notified; controlled by Portland Approach.

18. Exeter civil airport, elevation 102′. Aerodrome Traffic Zone from the ground to 2000′ AAL; en-route radar service available. NDB(Locator) callsign Echo X-ray, frequency 337khz, part-time transmission. ILS available.

19. Paris LFFF; London EGTT.

20. The overall distance from ABB VOR to BIG VOR is **100**nm.
A20 is the ATS route designator within the **one-way arrow** symbol. The distance between ABB VOR and NASDA is **36**nm.

FL70 = The **Minimum En-Route IFR Altitude(MEA)**: The lowest published altitude between radio fixes that meets obstacle requirements between those fixes and in many countries assures acceptable navigational signal coverage. The MEA applies to the **width of the airway**, segment or route between the radio fixes defining the airway segment or route.

2100a = The **Minimum Off-Route Altitude**. This is an altitude derived by Jeppesen which provides known obstruction clearance **within 10nm** of the route centre-line.

➎ = A20 normally one-way westbound for airfields and FL listed. at N50 35 W06 15. The **blue thickly dashed line** = AREA CHART coverage for LONDON, UK EGLL AREA.

21. The semi-circle is a by-pass symbol. i.e CLIFF does not apply to G27, only to A20 and the ATS route to SFD VOR.

22. 2400′. See page 6 Jeppesen Chart Glossary.

23. SLP = Speed Limiting Point; its symbol is the shaded square. X = non-compulsory airspace fix.

24. Maintain maximum IAS of 250kt from a position 3 minutes before the holding facility, or the SLP position shown on the chart.

25. FL 150 by TIGER. ACTUAL DESCENT CLEARANCE WILL BE AS DIRECTED BY ATC.

26. Holding speed in the LONDON TMA up to and including FL140 is maximum IAS 220kt. At FL 150 and above standard ICAO holding speeds apply.

27. SFD VOR 076, LYD VOR 222, BIG VOR 139.

28. Noise monitoring point.

29. MAX IAS 250kt below FL100 unless otherwise instructed by ATC.

30. ABB 8A.

31. Minimum climb gradient 5.5% up to FL150. intercept the VOR CGN 268 radial; at 1.5nm from CGN DME turn right.

32. 1281ft/min.

33. See LONDON, UK NOISE HEATHROW.

    97dba 0700 - 2300LT; 89dba 2300 - 0700LT.

34. 160kt = CAT D aircraft (see page 1 Glossary)

    DH 100′ DA 177′. Radio Altitude (RA) 100′; RVR 350m. Touchdown Zone (TDZ) or Centre-line Lights (CL) out, the RVR = 550m , with Autoland = 300m.

35. In the event of complete radio failure climb STRAIGHT AHEAD (MAX IAS 185kt) to D10.0 LON VOR, then turn left to EPM NDB not above 3000’ (2920’) thence leave EPM NDB on a track ....etc.

36. a. 119.72MHz.

b. 119.2/119.9MHz.

c. CHT NDB Minimum Holding Altitude (MHA) 4000’ and EPM NDB 3000’ MHA.

d. 1030’ QNH, 950’ QFE; 730’ QNH, 650’ QFE. i.e. 300ft/nm.

e. 1180’ QNH, 1104’ QFE.

CHAPTER THIRTEEN

AIRWAYS MISCELLANEOUS CHARTS

Contents

ATLANTIC POLAR HIGH ALTITUDE EN-ROUTE CHART 5AT(HI) - INTRODUCTION

This chart is used primarily for planning routes and high altitude polar navigation between Europe and North America. All operations between Europe and the Canadian Arctic Control Area, between FL280 and FL390 inclusive, are strongly recommended to flight plan in accordance with the POLAR TRACK STRUCTURE (PTS) during:

- 1200 - 1800Z for traffic to Alaska.
- 0000 - 0600Z for traffic to Europe.

Reference: NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATION (MNPS) AIRSPACE MANUAL EIGHTH EDITION states that:

The PTS consists of 10 fixed tracks in the Reykjavik Control Area (CTA) and 5 fixed tracks through Bodo Oceanic Control Area (OCA), which are a continuation of the relevant PTS tracks in the Reykjavik CTA.

ATLANTIC POLAR HIGH ALTITUDE EN -ROUTE CHART 5AT(HI) - PROJECTION

Its projection is **POLAR STEREOGRAPHIC**:

- Bearings are correct.
- Great Circles are straight lines in Polar Regions.
- Scale is constant and correct in Polar Regions.

ATLANTIC POLAR HIGH ALTITUDE EN-ROUTE CHART 5AT(HI) - TRACK DIRECTION/MAGNETIC VARIATION/ DISTANCE

Track direction is given or measured as: **TRUE (T), MAGNETIC (M), GRID (G).** Grid navigation is covered later in the chapter.

The lines of equal **magnetic variation**, isogonals, are valid for 1995. On this chart the North Magnetic Pole is located approximately at N78 W100. There is a rapid change of magnetic variation in this area and the directive force, which aligns a compass needle with the magnetic meridian, reduces to zero as the magnetic pole is approached. Thus, in high latitudes magnetic reference for direction is impractical. Also, VOR beacons cannot be referenced to local magnetic north.

Example:
Resolute Bay VOR, 112.1 MHz, YRB (N74 43.7 W094 55.4) is aligned with local True North.

Distances are printed parallel to the track segments. Other distances can be measured using the nearest meridian scale, or the scale printed at the Top, Left and Right edges of the chart.
Note that 1inch = 100nm.

Example 1

STN(N58 12.4 W006 11.0) UN615, MATIK(N61 00.0 W008 04.0) PTS 1, N66 00.0 W012 30.0 [66PR].

a. The **Magnetic** track and distance STN to MATIK is........................

b. The **Magnetic** track MATIK to STN is................

c. The **True** track and distance MATIK to [66PR] are.........................

d. The **True** track [66PR] to MATIK is..................

e. The **Grid** track and mean magnetic variation MATIK to [66PR] are ....

f. The **Grid** track and distance [66PR] to MATIK are...........................

Example 2

a. The magnetic variation at KARLL(N70 00.0 W 151 00.0) is..............

b. The magnetic variation at EUREKA NDB, YEU, 205kHz (N79 59.5 W085 53.9) is...........

It can be seen that on the sector MATIK to [66PR] the return track 156°(T) is not a reciprocal of the outbound track 340°(T). However, the return track 169°(G) is almost the reciprocal of the outbound 348°(G). (The 1° difference is due to the fact that the track between the two points is not a straight line).

Therefore, to measure and fly a track that has an unchanging direction GRID NORTH must be used as the datum.

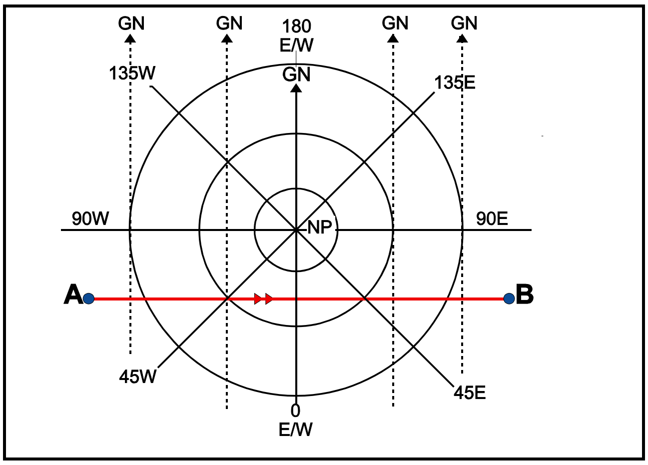


Figure 13.1 North Polar Stereographic Chart

ATLANTIC POLAR HIGH ALTITUDE
GRID NAVIGATION - EN-ROUTE CHART 5AT(HI)

The use of true and/or magnetic references for navigation in high latitudes is impractical due to:

- The rapid convergence of the meridians as latitude increases causing true track direction to change rapidly over short distances.
- The rapid change of magnetic variation over short distances.
- The degraded directional capability of magnetic compasses.

Therefore, to measure and maintain a track that has a constant direction **GRID NORTH** is used as a datum.
On this chart (and similar Polar Stereographic charts) the **Greenwich Meridian** is selected as the **Grid North Datum**; it is highlighted by a thick blue line and paralleled East and West at 300nm intervals.

Example 3
(Reference Jepppesen chart 5AT(HI))

Track from A (N85 00.0 E040 00.0) to B (N85 00.0 W040 00.0).

a. The true track direction at A is.................

b. The true track direction at N85 00 E/W00 00 is.............

c. The true track into B is................ *(Note the change of direction over 388nm)*

To obtain a constant track direction the grid north datum is used.

d. The grid track A to B is................

The angular difference between True and Grid direction at any point on a grid chart is known as **Convergence**:

TRUE NORTH - WEST OF GRID NORTH = WESTERLY CONVERGENCE.

TRUE NORTH - EAST OF GRID NORTH = EASTERLY CONVERGENCE.

Hence:

CONVERGENCE WEST, TRUE BEST (GRID LEAST)

CONVERGENCE EAST, TRUE LEAST (GRID BEST)

Conveniently, on a POLAR STEREOGRAPHIC chart:

CONVERGENCE = LONGITUDE WITH SIGN CHANGED

Thus with reference to Fig.12-1:

LONGITUDE at A = 40°E = 40°W CONVERGENCE
LONGITUDE at B = 40°W = 40°E CONVERGENCE

Therefore:

The Grid Track at A (Longitude 40°E) = 310°(T) - 40°W Convergence = 270°(G).

The Grid Track into B (Longitude 40°W) = 230°(T) + 40°E Convergence = 270°(G).

Where the track crosses the Greenwich Meridian Convergence = 0°.
True and Grid tracks are the same - 270°

The bottom right-hand corner of panel 9 of the chart provides a simplified method of calculating a GRID BEARING:

	+	**LONGITUDE WEST**
GRID BEARING = TRUE BEARING		
	-	**LONGITUDE EAST**

EXERCISE 1

1. The boundary surrounding the islands at N71 15 E/W180 is:

   a. An FIR boundary.
   b. A Time Zone boundary.
   c. An International Boundary.
   d. Part of the International Date Line.

Answer questions 2 to 7 using the Jeppessen chart 5AT(HI) and the following route:
A (N85 00.0 W160 00.0) to B (N80 00.0 W164 00.0) to C (N75 00.0 W164 50.0).

2. The total distance is:
   a. 302nm.
   b. 602km.
   c. 605nm.
   d. 602nm.

3. The highest Grid MORA for the route is:
   a. 1000ft.
   b. 1600ft.
   c. 160ft.
   d. 1600m.

4. The constant track direction from A to B is:
   a. 168°(G).
   b. 148°(M).
   c. 348°(G).
   d. 186°(T).

5. Which of the following is correct?

   a. The airspace below FL230 is uncontrolled.
   b. The airspace is uncontrolled inclusive of FL230 and below.
   c. The airspace is controlled from ground level up to FL230.
   d. The airspace is controlled from FL220 inclusive and above.

6. The boundary along latitude N75 indicates:

   a. An Upper Information Region.
   b. An Air Defence Identification Zone.
   c. An international boundary.
   d. A QNH boundary.

7. An aircraft is overhead B at 110520UTC. The Standard Time is:

   a. 111620.
   b. 111720.
   c. 101920.
   d. 101820.

8. The grid track from N70 00.0 W166 30.0 to N74 56.8 W141 00.0 is:
   a. 212°
   b. 032°
   c. 056°
   d. 043°

9. The (R) at N69 W158 means that:

   a. There is an en-route radar capability on 135.3MHz.
   b. Radar control is available on 135.3MHz.
   c. There is a VDF station at Barrow.
   d. There is a remote air/ground antenna at Barrow for direct communications with Anchorage Control Centre.

10. Given.
    Longitude W30 Variation 30°W True bearing 337°

    The Grid Bearing is:

    a. 307°
    b. 007°
    c. 037°
    d. 337°

ANSWERS - EXAMPLES

Example 1

a.	350°	177 nm
b.	170°	
c.	340°	322 nm
d.	156°	
e.	348°	13° W
f.	169°	322 nm

Example 2

a.	28°E
b.	92°W

Example 3

a.	310°
b.	270°
c.	230°
d.	270°

ANSWERS TO EXERCISE 1

1	B	6	B
2	D	7	D
3	B	8	A
4	C	9	D
5	A	10	B

PLOTTING CHARTS - INTRODUCTION

There are three charts:

- **NORTH CANADA (NCP)**.
- **NORTH ATLANTIC (NAP).**
- **MID ATLANTIC (MAP).**

Each chart is designed for plotting routes and positional information. In the final examination students should expect one simple plotting question, at least, based upon one of the charts.

PLOTTING CHARTS - PROJECTION

The chart is a **LAMBERT CONFORMAL CONIC PROJECTION**:

- Scale is considered to be constant.
- For practical purposes straight lines drawn on the chart are considered to be GREAT CIRCLES.
- Bearings are correct.
- 1inch = 120nm.

EXERCISE 2

(Use NCP chart)

"ACA865 is cleared to Toronto via North Atlantic Track Echo from 55N 010W to maintain FL320, Mach.82." The forecast wind velocity and COAT at FL320 are 020°/110kt and -60°C.

Plot the part-route:- London, N55 W010, N57 W020 and N57 W030, and answer the following: (Tolerances for distances within 1%)

1. The route distance London to N57 W030 is.................
2. The mean Great Circle track London to N57 W030 is.............(T)
3. The mean magnetic variation N55 W010 to N57 W020 is.........
4. The mean Great Circle track N57 W020 to N57 W030 is...........(T)
5. The initial heading from N55 W010 is............(M)
6. The aircraft's ATA at N55 W010 is 1038Z. The ETA at N57 W020 is..............
7. The aircraft's ATA at N57 W020 is 1126Z. The ETA at N57 W030 is..............
8. The aircraft is cleared to be at N57 W030 at 1211Z. Its revised Mach No. is...............

   The aircraft's ATA at N57 W030 is 1211Z. At 1201Z Gander Oceanic re-clears the aircraft from N57 W030 to N55 W040 at FL320, .82Mach. The forecast wind velocity and COAT are 350°/90kt and -64°C. Answer questions 9 and 10.

9. The mean Great Circle track and distance from N57 W030 to N55 W040 are.............(T) and..............
10. The ETA at N55 W040 is.............
11. At CARPE (N53 05.0 W054 05.0) the aircraft leaves the .... CTA /................. FIR and enters.................................CTA/....................FIR.
12. The distance from CARPE to REDBY(N52 15.0 W056 36.1) is...............nm.
13. RVSM means?
14. MNPS means?

ANSWERS - EXERCISE 2

EXERCISE 2.

1. 1087nm.
2. 288°(T).
3. 12°W.
4. 270°(T).
5. 318°(M).
6. 1126Z.
7. 1206Z.
8. .72Mach.
9. 250°(T); 358nm
10. 1256Z.
11. GANDER OCEANIC CTA/CZQX; GANDER DOMESTIC CTA/CZQX.
12. 103NM.
13. Reduced Vertical Separation Minima.

    (The equipment required is **two** fully serviceable **independent** altitude measurement systems; **one** automatic altitude-control system and **one** altitude alerting device. A functioning Mode C SSR Transponder is also required for flight through radar controlled RVSM transition airspace. When checking altimeters, pre-flight or in-flight, **at least two primary altimeters must agree at all times within plus or minus 200ft**.).

14. North Atlantic Minimum Navigation Performance Specification.

    (Aircraft must be equipped with the following:

    - **Two** fully serviceable Long Range Navigation Systems (LRNS). A LRNS may be one of the following:
        - One Inertial Navigation System (INS);
        - One Global Navigation Satellite System (GNSS); or
        - One navigation system using inputs from one or more IRS or any other sensor complying with the MNPS requirement.
    - Each LRNS must be capable of providing to the flight crew a continuous indication of the aircraft position relative to track.
    - It is highly desirable that the navigation system employed for the provision of steering guidance is capable of being coupled to the auto-pilot.).

NORTH ATLANTIC & CENTRAL NORTH ATLANTIC BLOW-UP PLOTTING CHART- INTRODUCTION

Both charts are Lambert Conical Conformal projections designed for:

- ETOPS. (This chart has been produced for an Airbus 330.)
- EQUAL TIME POINT(ETP)/CRITICAL POINT (CP) calculation and plotting.
- Position and route plotting.

The **NORTH ATLANTIC PLOTTING CHART** has a scale of 1inch = 200nm; its bottom right-hand corner contains an EQUAL TIME POINT (ETP)/CRITICAL POINT (CP) graph with instructions for its use.

On the obverse is the **CENTRAL NORTH ATLANTIC BLOW-UP AREA**
Scale 1 inch = 120nm.
The ETP graph and instructions apply to this chart also.

NORTH ATLANTIC & CENTRAL NORTH ATLANTIC BLOW-UP PLOTTING CHART- RANGE and TIME CIRCLES

Both charts show still air range/time circles of 820NM/120MIN (410kt TAS) and 1220NM/180MIN (406kt TAS) centred upon suitable diversion airfields such as Shannon (EINN), Lajes (LPLA), Gander (CYQX) and Keflavik (BIKF). These airfields are open 24 hours a day and can provide appropriate facilities for all types of aircraft.

Example 4
On the CENTRAL NORTH ATLANTIC BLOW-UP AREA chart:

a. Plot the route:-
Shannon (EINN) N52 42 W 008 55, to Gander (CYQX) N48 56 W054 34,
to Keflavik (BIKF) N63 59 W022 36, to Shannon.

b. Identify the 120MIN and 180MIN range circles from each airfield.

c. The Midpoint line cuts the Shannon/Gander track at position .... and is.............nm from each.

d. The Midpoint line cuts the Gander/Keflavik track at position......................................and is.............nm from each.

e. The Midpoint line cuts the Keflavik/Shannon track at position....................................and is.............nm from each.

It should be noted that any point on the extended MIDPOINT LINE, either side of the MIDPOINT, will be equi-distant from either airfield and will be the STILL-AIR ETP/CP.

At 90° to either side of each MIDPOINT LINE is a graticule which is used to adjust the STILL-AIR ETP/CP, either in the continuing (ON) or returning (HOME) direction, for the prevailing wind pattern.

Example 5
Use the CENTRAL NORTH ATLANTIC BLOW-UP AREA chart, and the ETP graph when required.

Given:
Route Shannon to Gander at Example 4.
Cruise FL 310; All-engine TAS 426kt
Engine-out stabilising height FL240; Engine-out TAS 370kt

Wind Components

	MIDPOINT to GANDER	MIDPOINT to SHANNON
FL310	-80kt	+50kt
FL240	-40kt	+20kt

Calculate the distance and time to the All-engine ETP/CP between Shannon and Gander.

a. The Equi-time number is......................
b. The number of miles from the Midpoint is...................nm.
c. The distance to the ETP/CP from Shannon is...............nm.
d. The time to the ETP/CP is...................min.

Cross-check using the formula:

e. The distance X to the ETP/CP from EINN = X

+

= ....nm.

f. The time to the ETP/CP = ...min.

Example 6.
Given:
Route Shannon to Gander at Example 4.
Cruise FL 310
All-engine TAS 426kt
Engine-out stabilising height FL240
Engine-out TAS 370kt

Wind Components

	MIDPOINT to GANDER	MIDPOINT to SHANNON
FL310	-80kt	+50kt
FL240	-40kt	+20kt

Using the same chart and route calculate the distance and time to the Engine-failure ETP/CP.

a. The Equi-time number is......................

b. The number of miles from the Midpoint is...................nm.

c. The distance to the ETP/CP from Shannon is...............nm.

d. The time to the ETP/CP is...................min.

Cross-check using the formula:

e. The distance from the ETP/CP, X = X / (+)

= ....nm.

f. The time to the ETP/CP = ...min.

ANSWERS

Example 4.

a.	Plotted on chart	
b.	N5310 W032 48;	857.5nm
c.	N57 26 W041 42;	683nm
d.	N58 32 W014 40;	399.5nm

Example 5.

a. +8
b. 137nm
c. 994.5nm
d. 158.5min
e. 993nm
f. 158.5min

Example 6.

a. +4
b. 68.5nm
c. 926nm
d. 148min
e. 929nm
f. 148min

ATLANTIC ORIENTATION CHARTS - AT(H/L) 1 & 2 - INTRODUCTION

These charts are used for route planning and en-route navigation between major transatlantic aerodromes. Both charts are Lambert Conformal Conic Projections. The scale of the AT(HL)1 is 1 inch = 132nm; AT(HL)2 is 1 inch = 136nm.

AT(HL) 1 & 2 - DISTANCE MEASUREMENT

Distance is obtained by:

- Extracting the values which are printed parallel to the published tracks and/or sectors thereof.
- Using the nautical mile scale at the left and right-hand margins.
- Using the adjacent meridian scale.

AT(HL) 1 & 2 INFORMATION

- The front panel shows:
  - The **coverage** of the chart pictorially .
  - **NAVAID LEGEND.**
  - **SELECTED VOLMET BROADCAST IN RADIO TELEPHONY (RTF).**
- **NAVAID** information, listed alphabetically, is provided at Panel 1 AT(HL)1 and panel 8 AT(HL)2.
- **NORTH ATLANTIC & CANADA MINIMUM NAVIGATION PERFORMANCE SPECIFICATION (MNPS)**.

  NAT ORGANISED TRACK SYSTEM (NAT OTS).

  NORTH ATLANTIC COMMUNICATION.

  COMMON PROCEDURES FOR RADIO COMMUNICATION FAILURES.
  Information on above is at panel 7 and 8 AT(HL)1.
- **NORTH ATLANTIC CROSSING CLEARANCE PROCEDURES & FREQUENCIES**
  information is published at panel 9 AT(HL)1.
- **POSITION REPORTING PROCEDURES**

  STANDARD AIR-GROUND MESSAGE TYPES & FORMATS.

  INCREASED WEATHER REPORTING.

  SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES IN MNPS/RSVM AIRSPACE.
- **TRANSPONDER OPERATION.**
- **IN-FLIGHT CONTINGENCY PROCEDURES FOR WAKE VORTEX etc.**
  Information on above is at Panel 1 AT(H/L)2.

EXERCISE 3

Given:

Chart	AT(H/L) 1 & 2.
Route	OMOKO (N48 50 W012 00), ATS route T16.
Destination	Porto Santo (LPPS) N33 04 W016 21.
Diversion	Santa Maria (LPAZ) N36 58 W025 10.

Answer questions 1 to 12.

1. The total distance from OMOKO to the intersection with the ATS route between N38 00 W020 00 to KOMUT is:

   a. 600nm.
   b. 643nm.
   c. 703nm.
   c. 853nm.

2. For this route the correct highest IFR ICAO level between FL280 and FL310 inclusive is:

   a. FL280.
   b. FL290.
   c. FL310.
   c. FL300.

3. With reference to Porto Santo's NAVAID the following is correct:

a.	VOR/DME	Ident SNT	frequency 114.9kHz
b.	VOR/DME	Ident SNT	frequency 114.7MHz
c.	VOR/DME	Ident SNT	frequency 114.9MHz
c.	VOR/DME/TACAN	Ident SNT	frequency 114.9MHz

4. The mean Great Circle track Porto Santo to Santa Maria is:

   a. 309°(M).
   b. 295°(T).
   c. 310°(T).
   c. 298°(T).

5. The mean magnetic variation Porto santo to Santa Maria is:

   a. 8°(W).
   b. 12°(W).
   c. 11°(W).
   c. 10°W.

6. The distance Porto Santo to N35 00 W020 00 is:

   a. 215nm.
   b. 494nm.
   c. 115nm.
   c. 220nm.

7. The night-time Weather FORECAST for Santa Maria is obtained from:

a. Shannon VOLMET on HF frequencies of 3.413MHz, 5.505MHz and 8.957MHz at H + 45 to 50min.
b. Shannon VOLMET on a VHF frequency of 341.3MHz at H + 45 to 50min.
c. Shannon VOLMET HF frequencies of 3.413kHz 5.505, kHz and 8.957kHz at H + 45 to 50min.
c. Shannon VOLMET on a long wave transmission, frequency of 3.413MHz at H + 45 to 50min.

8. The daytime MET Report for Santa Maria is obtained from:

a. Shannon VOLMET on a VHF frequency of 132.64MHz at H + 15 to 20min.
b. Shannon VOLMET on HF frequencies of 13.264MHz, 5.505MHz and 8.957MHz at H + 15 to 20min and H + 45 to 50min.
c. Shannon VOLMET on an HF frequency of 13.264kHz, 5.505kHz and 8.957kHz at H + 15 to 20min and H + 45 to 50min.
c. Shannon VOLMET on a short wave transmission of 132.64MHz 550.5MHz and 895.7MHz at H + 15 to 20min.

9. The route, if flown at FL290, is:

a. Not within MNPS airspace.
b. Within MNPS airspace.
c. Within MNPS/RVSM airspace.
c. Within RVSM airspace only.

10. Given:
Suitable airfields:
Santiago (N42 54 W008 25)
Porto Santo (N33 04 W016 20)
Santa Maria (N36 58 W025 10).
Twin turbo- jet passenger aircraft.
Normal one-engine in-operative Cruise TAS of 400kt.

a. The aircraft requires ETOPS authorisation
b. ETOPS authorisation is not required south of N45.
c. The aircraft does not require ETOPS authorisation.
c. The aircraft does not require ETOPS authorisation during daylight hours.

11. If an aircraft's ETA at Porto Santo is 1430UTC its Standard Time of arrival:

a. 1530.
b. 1330.
c. 1630.
c. 1230.

12. The North Atlantic Remote and Oceanic Areas Air to Air frequency is:

a. 131.80kHz.
b. 121.50Mhz.
c. 131.80MHz.
c. 127.90MHz SELCAL.

13. An aircraft in mid-Atlantic at 1400LMT on Midsummer's Day wishes to contact New York Area Control Centre. The listed frequencies are:

3016	13306
5598	17496
8906	

The frequency(s) *most likely* to be tried in order to obtain eventual two-way communication are:

a. 3.016kHz, 5.598khz or 8.906kHz.
b. 13.306MHz or 17.496MHz.
c. 13.306kHz or 17.946kHz.
c. 3.016MHz or 5.598MHz.

14. The MACH NUMBER TECHNIQUE for the North Atlantic Track System (NAT OTS) is based upon:

a. True Mach Number.
b. Indicated Mach Number.
c. MMO.
c. MNE.

15. Flights certified as complying with MNPS and RVSM should insert , after"S" in item 10 of their ICAO Flight Plan, the letter(s):

a. W.
b. X.
c. XR.
c. XW.

ANSWERS - EXERCISE 3

1	C	6	A	11	A
2	B	7	A	12	C
3	C	8	B	13	B
4	D	9	B	14	A
5	D	10	C	15	D

CHAPTER FOURTEEN

ATC FLIGHT PLAN (CA48)

Contents

INTRODUCTION

References: ICAO Doc 4444-RAC/501; UK AIP ENR 1.10-FLIGHT PLANNING (12 Mar 98)

What is an ATC Flight Plan?

It is simply advance notice of a pilot's intentions for a flight in terms of route (including departure and destination), cruising level and speed and information about the crew and passengers. It is in a set format (form CA48) to ensure completeness of information and compatibility with electronic data transfer between ATS and other units.

Students are required to understand, and answer questions on, all aspects of ATC Flight Plans, both individual (CA48) and Repetitive Flight Plans (RPL).

- Type of plan - individual or repetitive
- The format of an ICAO Flight Plan.
- The information required for the plan.
- How to complete, file, cancel or amend a flight plan.

DEFINITIONS

Flight Plan: Specified information provided to air traffic service units , relative to an intended flight or portion of a flight of an aircraft.

Repetitive Flight Plan (RPL): A flight plan related to a series of frequently recurring, regularly operated individual flights with identical basic features, submitted by an operator for retention and repetitive use by ATS units. These flights must be operated on the same day(s) of consecutive weeks and on at least 10 occasions, or every day over a period of at least 10 consecutive days. The elements of each flight shall have a high degree of stability.

Filed flight plan: The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes.

Current Flight Plan: The flight plan, including changes, if any, brought about by subsequent clearances.

Estimated elapsed time: The estimated time required to proceed from one significant point to another.

Estimated off-block time: The estimated time at which the aircraft will commence movement associated with departure.

Estimated time of arrival: For IFR flights, the time at which it is estimated that the aircraft will arrive over that designated point, defined by reference to navigational aids, from which it is intended that an instrument approach will be commenced, or, if no navigational aid is associated with the aerodrome, the time at which the aircraft will arrive over the aerodrome. For VFR flights, the time at which it is estimated the aircraft will arrive over the aerodrome.

(Extract from **ICAO DOC 4444** (PANS-RAC) Dated 7 Nov 1996)

ANNEXES TO THIS CHAPTER

- **Annex 1** to this Chapter is a copy of Part II, Chapter 8, Doc 4444, relating to the rules for ATC flight plans.
- **Annex 2** to this chapter, **INSTRUCTIONS FOR THE COMPLETION OF THE FLIGHT PLAN FORM**, is an extract of Appendix 2, Doc 4444.
- **Annex 3** to this chapter, **FLIGHT PLANNING-General Procedures,** is an extract from the UK AIP ENR 1-10 (12 Mar 98).

These annexes should be studied carefully as they may be a source of examination questions.

SPECIMEN CA48

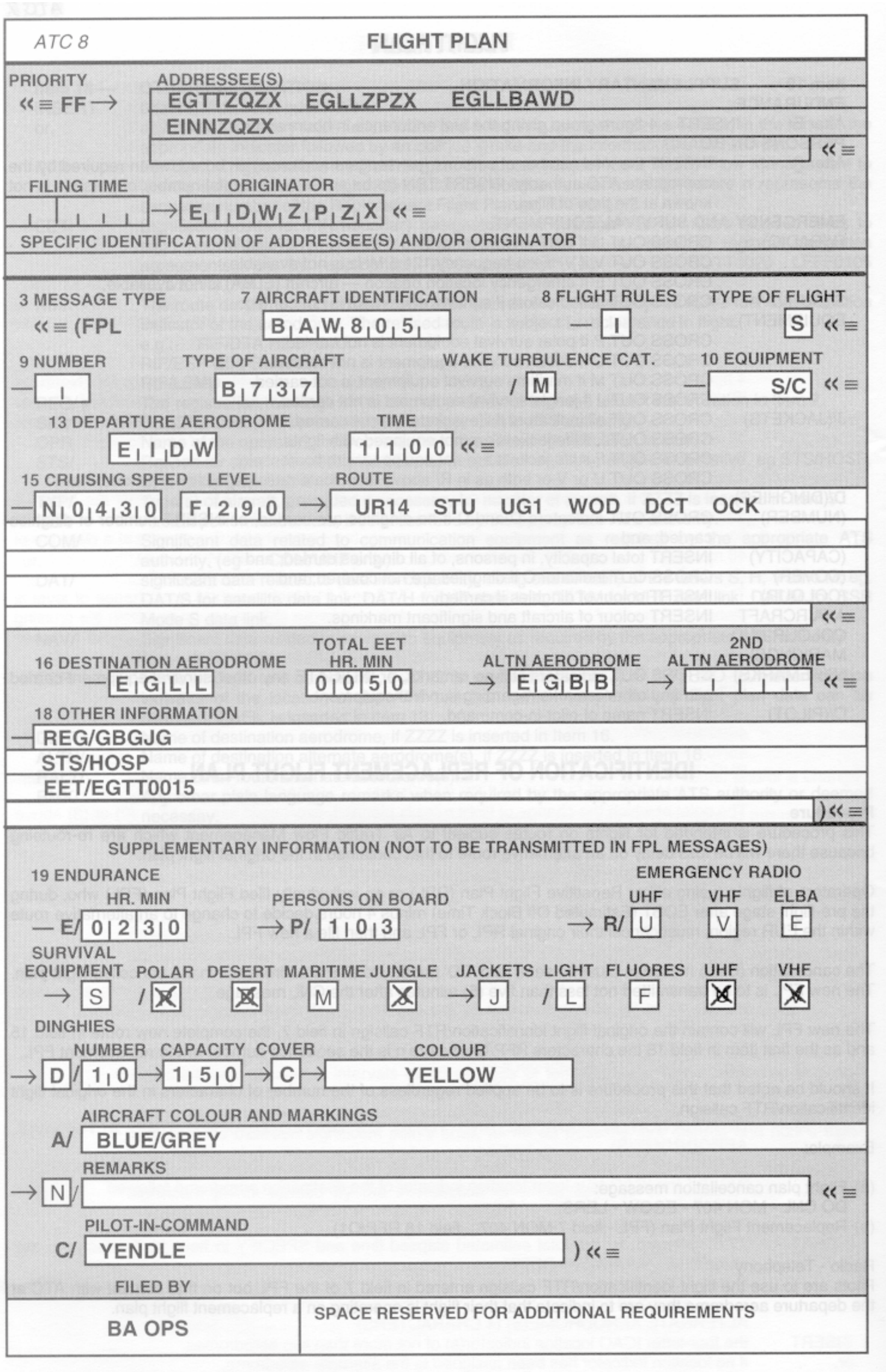
Reference Figure 14.1 and **Annex 2** to this chapter.
The numbered items at Figure 14.1 should be referred to in conjunction with the apposite instructions at Annex 2.

For example: Item **7 AIRCRAFT IDENTIFICATION** in Figure 14.1
Briefly, the instructions for **ITEM 7: AIRCRAFT IDENTIFICATION** at Annex 2, state that the aircraft identification should not exceed 7 characters and can be either the registration markings of the aircraft or the ICAO designator for the operating agency.

ITEMS 7, 8, 9, 10, 13, 16, 18, and **19** can be readily understood from the instructions.

ITEM 15: ROUTE is more complex and will be discussed later**.**

Decode of Specimen CA48
The aircraft identification is **BAW805**, (Speedbird 805 being the radiotelephony identification).
IFR **S**cheduled flight for a **B**oeing **737**, which creates a **M**edium wake turbulence**.**
The aircraft has a serviceable **S**tandard communication/navigation/approach aid equipment for the route and a serviceable SSR transponder with 4096 codes and Mode **C**.
The departure airfield is **EIDW**, (Dublin) with an estimated off-block time of **1100**UTC.
The first cruising speed is 430kt TAS, **N0430**, at Flight Level 290, **F290.**


ATC 8 FLIGHT PLAN

PRIORITY ADDRESSEE(S)
«≡ FF → EGTTZQZX EGLLZPZX EGLLBAWD
EINNZQZX
«≡

FILING TIME ORIGINATOR
→ EIDWZPZX «≡

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR

3 MESSAGE TYPE 7 AIRCRAFT IDENTIFICATION 8 FLIGHT RULES TYPE OF FLIGHT
«≡ (FPL — BAW805 — I S «≡

9 NUMBER TYPE OF AIRCRAFT WAKE TURBULENCE CAT. 10 EQUIPMENT
— B737 / M — S/C «≡

13 DEPARTURE AERODROME TIME
— EIDW 1100 «≡

15 CRUISING SPEED LEVEL ROUTE
— N0430 F290 → UR14 STU UG1 WOD DCT OCK
«≡

16 DESTINATION AERODROME TOTAL EET HR. MIN ALTN AERODROME 2ND ALTN AERODROME
— EGLL 0050 → EGBB → «≡

18 OTHER INFORMATION
— REG/GBGJG
STS/HOSP
EET/EGTT0015
) «≡

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)

19 ENDURANCE HR. MIN PERSONS ON BOARD EMERGENCY RADIO UHF VHF ELBA
— E/ 0230 → P/ 103 → R/ U V E

SURVIVAL EQUIPMENT POLAR DESERT MARITIME JUNGLE JACKETS LIGHT FLUORES UHF VHF
→ S / P D M J → J / L F U V

DINGHIES NUMBER CAPACITY COVER COLOUR
→ D / 10 → 150 → C → YELLOW

AIRCRAFT COLOUR AND MARKINGS
A/ BLUE/GREY

REMARKS
→ N / «≡

PILOT-IN-COMMAND
C/ YENDLE) «≡

FILED BY
BA OPS
SPACE RESERVED FOR ADDITIONAL REQUIREMENTS

Figure 14.1 Specimen ATC Flight Plan

The aircraft plans to join the airway **UR14** and fly along it to the Strumble VOR, callsign **STU,** where it changes to airway **UG1,** and thence to the navigation facility at Woodley, callsign **WOD**. From WOD it plans to fly direct, **DCT,** to Ockham VOR, callsign **OCK**.

The destination aerodrome is London Heathrow, **EGLL,** with a total planned flight time of 50minutes, **0050;** the alternate airfield is Birmingham, **EGBB.**

The aircraft registration is **GBGJG,** and it requires special handling as it is a Hospital, **HOSP,** aircraft. The estimated elapsed time, EET, to the London FIR boundary, **EGTT,** is 15 minutes, **0015,** after take-off.

ITEM 19: SUPPLEMENTARY INFORMATION

(NOT TO BE TRANSMITTED IN FPL MESSAGE). This information is only required when an aircraft is overdue and the emergency services have been alerted.

The total endurance of the aircraft is 2hr 30min, **0230,** and there are **103** persons on board.
The aircraft is fitted with separate emergency UHF, **U** and VHF, **V,** radio, together with a crash activated emergency locator beacon, **E.**
The aircraft is carrying maritime, **M,** survival equipment and life-jackets, **J,** fitted with a sea activated light, **L,** and fluorescent dye, **F**.
The aircraft also carries **10** inflatable dinghies, **D,** whose total capacity is **150** people; the colour of dinghies' covers, **C,** is yellow.
The aircraft has blue and grey markings and the pilot in command is Yendle.

ITEM 15

This is the most complex. Details are required of the aircraft's route, change of **route, speed, level and/or flight rules;** sub-items must be in capital letters and separated by a space. The following aide-memoir may be of use for filling in the ROUTE details which start after the arrow

- **ATS ROUTE** (2 to 7 characters)
  - Enter the coded designator assigned to the route or route segment e.g. UB37, R14.
  - Where appropriate enter the coded designator assigned to a standard instrument departure route (SID) or standard arrival route (STAR) e.g. OCK 1C, MAY 1J.
- **POINTS OF CHANGE** (2 TO 11 CHARACTERS)

  Enter:

  - The **coded designator** (2 to 5 characters) assigned to the point, e.g. EX, MAY, LOVEL, PORGY, SCROD.

  If there are no coded designators use:

  - **LATITUDE/LONGITUDE**

DEGREES (7 characters)	**DEGREES/MINUTES (11 characters)**
56N105W	4715N16005E
50N075E	6010N06206W or,

- **BEARING AND DISTANCE** from a navigation aid:
  For example SAM090035 indicates a point 35nm on a bearing of 090° (M) from Southampton VOR.

USE OF DCT (DIRECT)

- If a **departure airfield** is **located** or **connected** to the ATS route then the **coded designator** of that route will be the first entry. If it is **not on** or **connected to** the ATS route the first entry will be **DCT** followed by the **joining point**, followed by the **designator** of the ATS route. (Figure 14.2)

- If the **destination airfield** is **not on** or **connected to** an ATS route the last entry will be **DCT.** (Figure 14.3)

- Use DCT between coded designators not connected by ATS routes.

- Use DCT between a designated reporting point and a position, denoted by a latitude and longitude or a bearing or distance from a Navaid, which is outside the ATS route.

- Use DCT between a latitude and longitude, or a Navaid bearing and distance, and a designated reporting point on an ATS route.

- DCT is not required between successive points defined by latitude and longitude or a bearing and distance from a Navaid. (Figure 14.4)

➢ **Only points of change** are to be entered in item 15. Insert each point at which there is a change of;

- Route.

- Speed or level. A **change of speed is 5% of TAS or 0.01 Mach or more**. If there is a change of level or speed both must be entered even though only one has changed. (See Figures 14.5).

- Flight rules.

➢ Follow the point of change with the designator of the ATS route **even if it is the same as that before the change,** or by DCT if the next point is outside the ATS route.

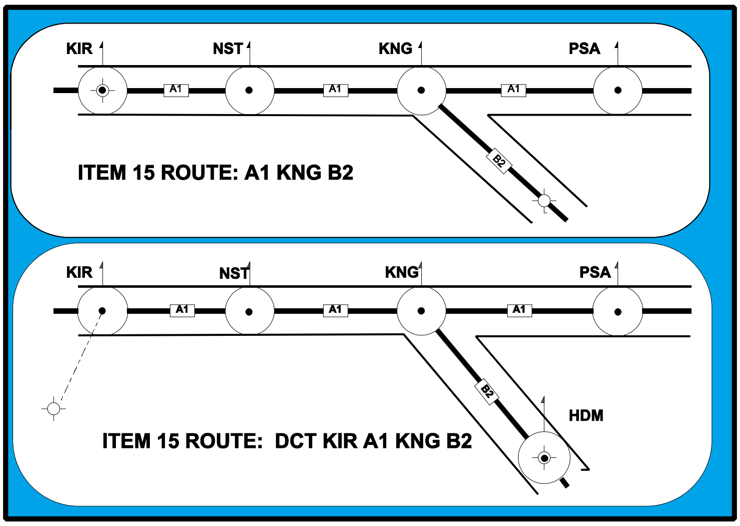


Figure 14.2 Use of DCT

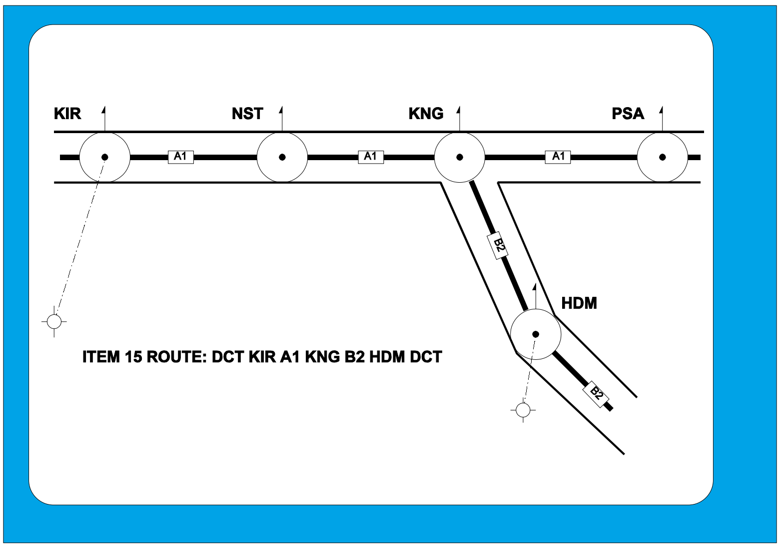


Figure 14.3 Use of DCT

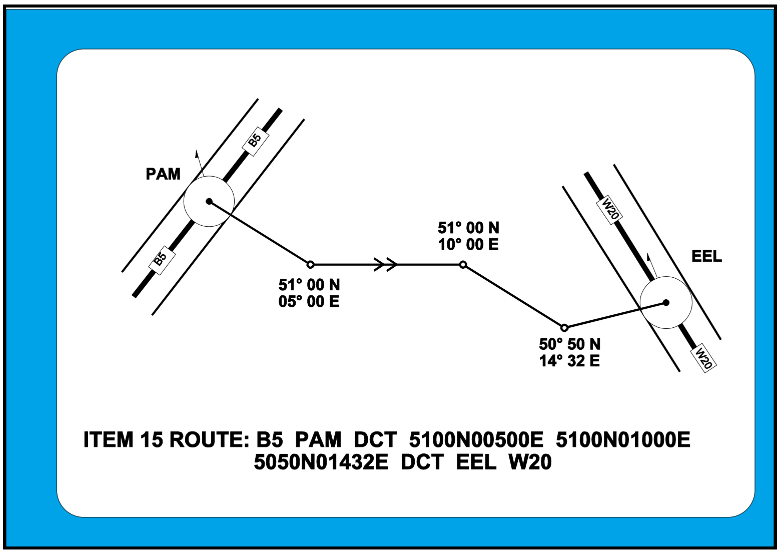


Figure 14.4 Use of DCT - Leaving and Re-joining Airways

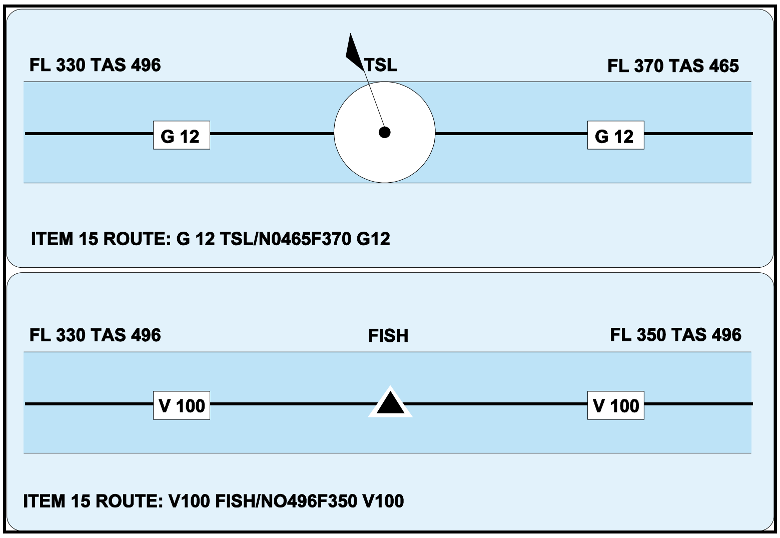
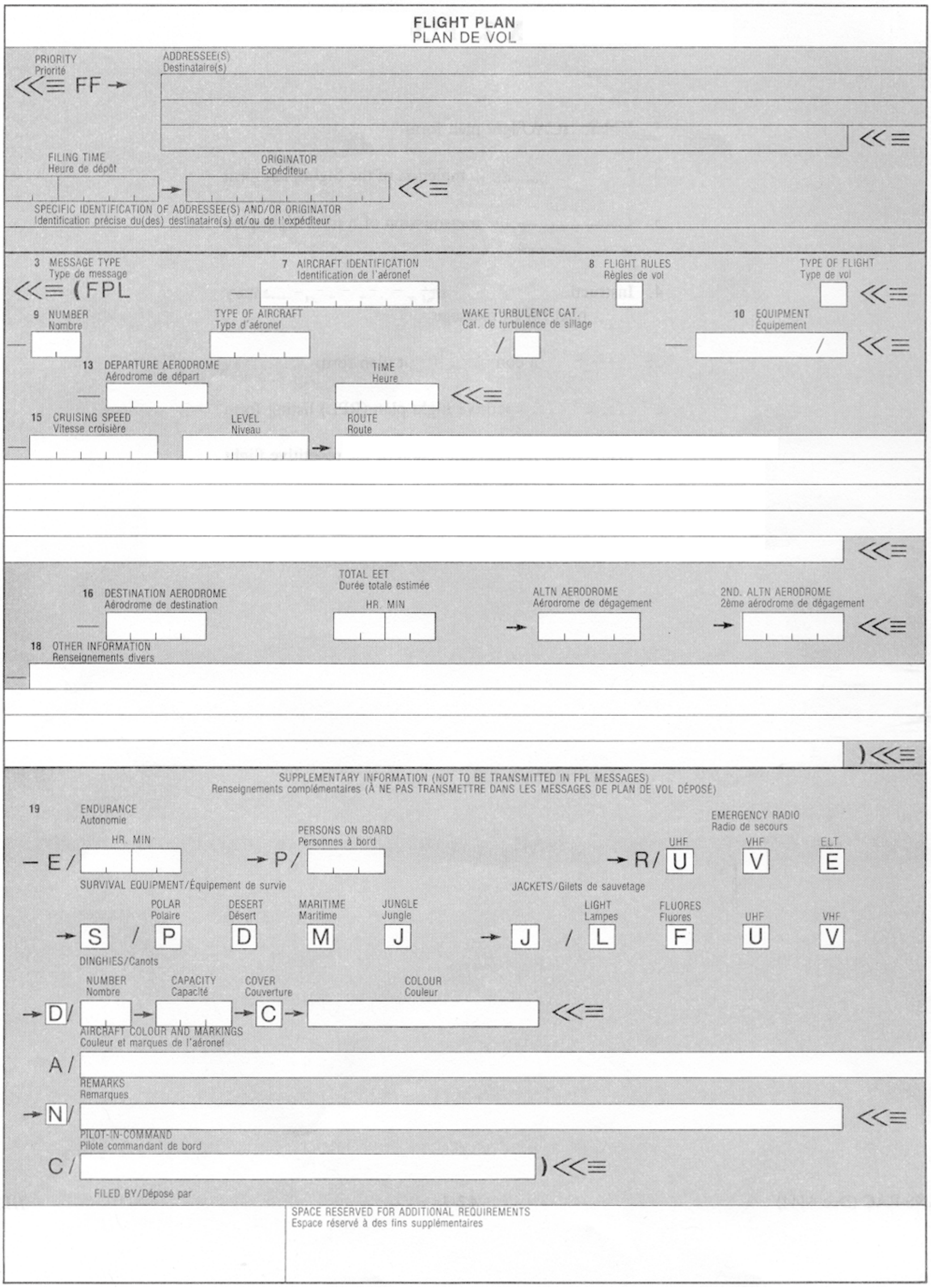


Figure 14.5 Change of Speed and/or Level

1. **ICAO model flight plan form**



FLIGHT PLAN
PLAN DE VOL

PRIORITY
Priorité
<<≡ FF →

ADDRESSEE(S)
Destinataire(s)

<<≡

FILING TIME
Heure de dépôt

ORIGINATOR
Expéditeur
→ <<≡

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR
Identification précise du(des) destinataire(s) et/ou de l'expéditeur

3 MESSAGE TYPE
Type de message
<<≡ (FPL

7 AIRCRAFT IDENTIFICATION
Identification de l'aéronef
—

8 FLIGHT RULES
Règles de vol
—

TYPE OF FLIGHT
Type de vol
<<≡

9 NUMBER
Nombre
—

TYPE OF AIRCRAFT
Type d'aéronef

WAKE TURBULENCE CAT.
Cat. de turbulence de sillage
/

10 EQUIPMENT
Équipement
— / <<≡

13 DEPARTURE AERODROME
Aérodrome de départ
—

TIME
Heure
<<≡

15 CRUISING SPEED
Vitesse croisière
—

LEVEL
Niveau
→

ROUTE
Route

<<≡

16 DESTINATION AERODROME
Aérodrome de destination
—

TOTAL EET
Durée totale estimée
HR. MIN

ALTN AERODROME
Aérodrome de dégagement
→

2ND. ALTN AERODROME
2ème aérodrome de dégagement
→ <<≡

18 OTHER INFORMATION
Renseignements divers
—

) <<≡

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)
Renseignements complémentaires (À NE PAS TRANSMETTRE DANS LES MESSAGES DE PLAN DE VOL DÉPOSÉ)

19 ENDURANCE
Autonomie
HR. MIN
— E /

PERSONS ON BOARD
Personnes à bord
→ P /

EMERGENCY RADIO
Radio de secours
UHF VHF ELT
→ R / U V E

SURVIVAL EQUIPMENT/Équipement de survie
POLAR Polaire | DESERT Désert | MARITIME Maritime | JUNGLE Jungle
→ S / P D M J

JACKETS/Gilets de sauvetage
LIGHT Lampes | FLUORES Fluores | UHF | VHF
→ J / L F U V

DINGHIES/Canots
NUMBER Nombre | CAPACITY Capacité | COVER Couverture | COLOUR Couleur
→ D / → → C → <<≡

AIRCRAFT COLOUR AND MARKINGS
Couleur et marques de l'aéronef
A /

REMARKS
Remarques
→ N / <<≡

PILOT-IN-COMMAND
Pilote commandant de bord
C /) <<≡

FILED BY/Déposé par

SPACE RESERVED FOR ADDITIONAL REQUIREMENTS
Espace réservé à des fins supplémentaires

Figure 14.6 Exercise 1

For the following exercises use Jeppesen High Altitude Chart E(HI) 4/5 CAA FOR CPL/ATPL

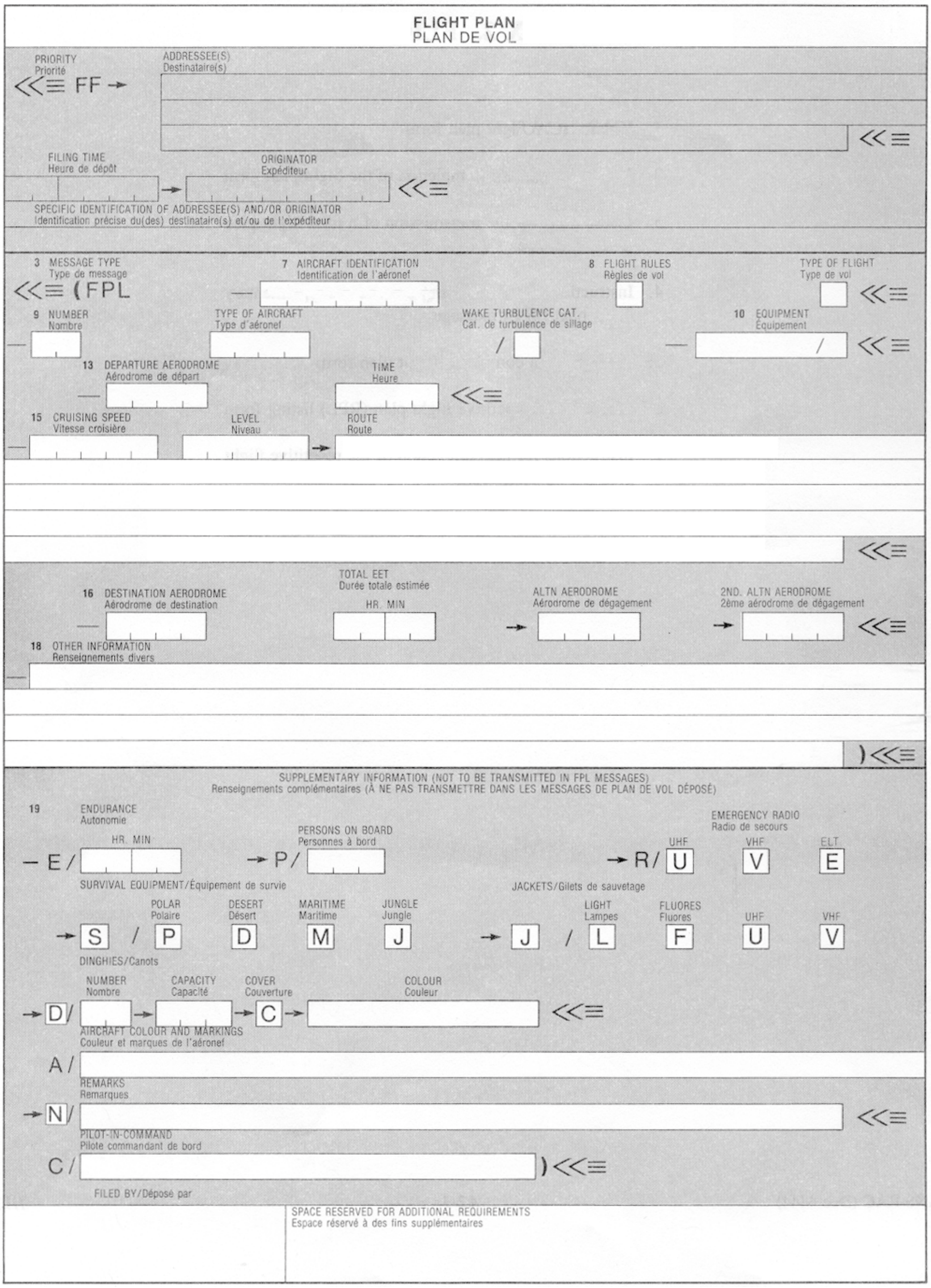
EXERCISE 1 - CA48

A non-scheduled flight is to be made from CAMBRIDGE (N5212 E000 13) EGSC to MUNICH (N48 08 E011 44) EDDM.

Route:	To join the upper airways system at LAMBOURNE (N51 39 E000 06) then airway UB3 - DOVER -UGI - NATTENHEIM - UB6 - MUNICH.
Flight Details:	Off blocks time 0920UTC Airborne time 0930UTC Allow 15 min from airborne to join airways at LAMBOURNE. LAMBOURNE to SPRIMONT: TAS 330 kt; wind component + 15 kt Cruise FL 250. SPRIMONT to MUNICH: TAS 350kt; wind component +20kt Cruise FL290
Aircraft Type:	Boeing 737 (B737)
Aircraft Weight:	45000 kg
Operator:	CAMMAIR
Identification:	G-GRAD
Radio & Navigation Equipment:	Standard + UHF R/T
SSR Equipment:	Transponder Mode 'A', 4096 codes + Mode 'C'
Flight Rules:	IFR
Type of Flight:	Non-scheduled air transport
Alternate:	STUTTGART (EDDS)
ATC	Require elapsed time to BRUSSELS FIR boundary.

Supplementary Information
Sufficient fuel for 2½ hours flight.
Passengers 119 + 5 crew.
ELBA (Emergency Location Beacon) is available.
Life jackets are available equipped with emergency lights and UHF capability.
Four covered life rafts (dinghies) are carried with an individual capacity of 32 persons.
The dinghies are coloured yellow.
The aircraft is coloured white with red markings.
No supplementary equipment is carried.

1. ICAO model flight plan form



FLIGHT PLAN
PLAN DE VOL

PRIORITY
Priorité
<<≡ FF →

ADDRESSEE(S)
Destinataire(s)

<<≡

FILING TIME
Heure de dépôt

ORIGINATOR
Expéditeur

<<≡

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR
Identification précise du(des) destinataire(s) et/ou de l'expéditeur

3 MESSAGE TYPE
Type de message
<<≡ (FPL

7 AIRCRAFT IDENTIFICATION
Identification de l'aéronef

8 FLIGHT RULES
Règles de vol

TYPE OF FLIGHT
Type de vol
<<≡

9 NUMBER
Nombre

TYPE OF AIRCRAFT
Type d'aéronef

WAKE TURBULENCE CAT.
Cat. de turbulence de sillage
/

10 EQUIPMENT
Équipement
/ <<≡

13 DEPARTURE AERODROME
Aérodrome de départ

TIME
Heure
<<≡

15 CRUISING SPEED
Vitesse croisière

LEVEL
Niveau

ROUTE
Route

<<≡

16 DESTINATION AERODROME
Aérodrome de destination

TOTAL EET
Durée totale estimée
HR. MIN

ALTN AERODROME
Aérodrome de dégagement

2ND. ALTN AERODROME
2ème aérodrome de dégagement
<<≡

18 OTHER INFORMATION
Renseignements divers

) <<≡

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)
Renseignements complémentaires (À NE PAS TRANSMETTRE DANS LES MESSAGES DE PLAN DE VOL DÉPOSÉ)

19 ENDURANCE
Autonomie
HR. MIN
– E /

PERSONS ON BOARD
Personnes à bord
→ P /

EMERGENCY RADIO
Radio de secours
UHF VHF ELT
→ R / U V E

SURVIVAL EQUIPMENT/Équipement de survie
POLAR Polaire, DESERT Désert, MARITIME Maritime, JUNGLE Jungle
→ S / P D M J

JACKETS/Gilets de sauvetage
LIGHT Lampes, FLUORES Fluores, UHF, VHF
→ J / L F U V

DINGHIES/Canots
NUMBER Nombre, CAPACITY Capacité, COVER Couverture, COLOUR Couleur
→ D / → → C → <<≡

AIRCRAFT COLOUR AND MARKINGS
Couleur et marques de l'aéronef
A /

REMARKS
Remarques
→ N / <<≡

PILOT-IN-COMMAND
Pilote commandant de bord
C /) <<≡

FILED BY/Déposé par

SPACE RESERVED FOR ADDITIONAL REQUIREMENTS
Espace réservé à des fins supplémentaires

Figure 14.7 Exercise 2

EXERCISE 2 - CA48

A non-scheduled flight is to be made from VENICE (N45 30 E012 21) LIPZ to TOULOUSE BLAGNAC (N43 37 E001 23) LFBO.

Route: To join upper airways' system at VICENZA (N4538 E011 41) then UB4 - ST PREX - UB28 - PASSIERY - UB16 - LA TOUR - UG5 - GAILLAC- TOULOUSE BLAGNAC.

Flight Details:

Off blocks 0630 UTC
Airborne 0645 UTC
Allow 10 minutes from airborne to joining airways at VICENZA, and 10 minutes GAILLAC to TOULOUSE

VICENZA to SPR:
TAS 450 kt; wind component -40
Flight level 310.

SPR to GAI
TAS 470 kt; wind component -15
Flight level 310.

Aircraft Type:	Airbus 310 (EA31)
Aircraft Weight:	Above 136000kg
Aircraft Registration:	G-BUSB
Operator:	British Airways
Identification:	BAW 780
Selcal Code:	HBSJ
Radio & Navigation Equipment:	Standard plus inertial navigation and RNP equipment.
SSR Equipment:	Transponder Mode 'A' - 4096 codes plus Mode 'C'.
Flight Rules:	IFR
Type of Flight	Non-schedule air transport
Alternate:	MARSEILLE (LFML)
ATC:	Require times to AOSTA and PASSEIRY.

Supplementary Information:

Enough fuel for 6½ hours flying Passengers TBN
Crew 12
ELBA (Emergency Locator Beacon) carried
Life jackets available equipped with emergency lights and VHF/UHF radio
Life-rafts: 15 with yellow covers; each life-raft capacity 20 people
Aircraft colour is blue and grey
No supplementary survival equipment is carried.

1. ICAO model flight plan form

FLIGHT PLAN
PLAN DE VOL

PRIORITY
Priorité
<<≡ FF →

ADDRESSEE(S)
Destinataire(s)
<<≡

FILING TIME
Heure de dépôt
→
ORIGINATOR
Expéditeur
<<≡

SPECIFIC IDENTIFICATION OF ADDRESSEE(S) AND/OR ORIGINATOR
Identification précise du(des) destinataire(s) et/ou de l'expéditeur

3 MESSAGE TYPE
Type de message
<<≡ (FPL

7 AIRCRAFT IDENTIFICATION
Identification de l'aéronef
—

8 FLIGHT RULES
Règles de vol
—

TYPE OF FLIGHT
Type de vol
<<≡

9 NUMBER
Nombre
—

TYPE OF AIRCRAFT
Type d'aéronef

WAKE TURBULENCE CAT.
Cat. de turbulence de sillage
/

10 EQUIPMENT
Équipement
— / <<≡

13 DEPARTURE AERODROME
Aérodrome de départ
—

TIME
Heure
<<≡

15 CRUISING SPEED
Vitesse croisière
—

LEVEL
Niveau
→

ROUTE
Route
<<≡

16 DESTINATION AERODROME
Aérodrome de destination
—

TOTAL EET
Durée totale estimée
HR. MIN

ALTN AERODROME
Aérodrome de dégagement
→

2ND. ALTN AERODROME
2ème aérodrome de dégagement
→ <<≡

18 OTHER INFORMATION
Renseignements divers
—
)<<≡

SUPPLEMENTARY INFORMATION (NOT TO BE TRANSMITTED IN FPL MESSAGES)
Renseignements complémentaires (À NE PAS TRANSMETTRE DANS LES MESSAGES DE PLAN DE VOL DÉPOSÉ)

19 ENDURANCE
Autonomie
HR. MIN
— E/

PERSONS ON BOARD
Personnes à bord
→ P/

EMERGENCY RADIO
Radio de secours
UHF VHF ELT
→ R/ U V E

SURVIVAL EQUIPMENT/Équipement de survie
POLAR DESERT MARITIME JUNGLE
Polaire Désert Maritime Jungle
→ S / P D M J

JACKETS/Gilets de sauvetage
LIGHT FLUORES UHF VHF
Lampes Fluores
→ J / L F U V

DINGHIES/Canots
NUMBER CAPACITY COVER COLOUR
Nombre Capacité Couverture Couleur
→ D/ → → C → <<≡

AIRCRAFT COLOUR AND MARKINGS
Couleur et marques de l'aéronef
A/

REMARKS
Remarques
→ N/ <<≡

PILOT-IN-COMMAND
Pilote commandant de bord
C/)<<≡

FILED BY/Déposé par

SPACE RESERVED FOR ADDITIONAL REQUIREMENTS
Espace réservé à des fins supplémentaires

Figure 14.8 Exercise 3

EXERCISE 3 - CA 48

LONDON/STANSTEAD TO BIARRITZ
A non-scheduled flight is to be made from STANSTEAD (EGSS, N51°53’ E000° 14’) to BIARRITZ (LFBZ, N43° 28 W001°32’)

Route:	Direct (DCT) to LAM, airways to BTZ and then as directed to land at BIARRITZ. **Airway UA34 is not available for this flight.**
Flight Details:	Off blocks 1515 UTC on a Tuesday Take-off 1525 UTC Allow 15 minutes flight time Stanstead to LAM and 20 minutes from ENSAC for descent and approach to BIARRITZ Lowest Flight Levels above FL250 to be used TAS 310 kt Forecast wind 200° (M)/45kt
Aircraft Type;	Boeing 737 (B737)
Aircraft Weight:	42000kg
Operator:	GROPEAIR
Registration:	G-WIZZ
Radio & Navigation Equipment:	Standard Mode C Transponder
Flight Rules:	IFR
Type of Flight:	Non-scheduled
Alternate:	LIMOGES (LFBL)

Using the above data identify the route and complete Items 7 and 18 of the CA48.

EXERCISE 4

1. Under what circumstances may an Aircraft Operator (AO) submit Repetitive Flight Plans (RPL) rather than individual flight plans?

   When.....flights are operated regularly on the same day(s) of consecutive weeks and on at least...... occasions or every day over a period of at least ..... consecutive days. The elements of each flight shall have a high degree of .....

   a. IFR, ten, ten, stability.
   a. VFR, seven, seven, familiarity.
   b. IFR, seven, seven, familiarity.
   c. VFR, ten, ten, stability.

2. What are the reasons for the format of the ICAO Flight Plan?

   a. The format is internationally agreed, is printed in two languages, usually English and the language of the State concerned, to help ensure correct completion which is essential for electronic data transfer.
   b. It is designed to fit into a standard pilot's bag, and have plenty of room for flight data.
   c. The format ensures that minimum writing is required, to reduce pilot workload in flight.
   d. The format is agreed between EC member states, for use in Europe only.

3. Which sections of a CA48 are not normally transmitted to other ATSUs?

   i Addressees
   ii Items 3 to 18 - the main body of the message.
   iii Supplementary information.

   a. i only.
   b. i and ii.
   c. iii only.
   d. None, all are always transmitted.

4. Normally, flight plans should be filed on the ground at least .... before clearance to start up is requested. Exceptionally, when it is not possible to meet this requirement, operators should .... and never ....

   a. 30 minutes, give as much notice as possible, less than 60 minutes.
   b. 60 minutes, give as much notice as possible, less than 30 minutes.
   c. 3 hours, cancel the flight, cause such trouble again.
   d. 3 hours, give as much notice as possible, 30 minutes.

5. Flight plans for flights affected by Air Traffic Flow Management (ATFM) rules, and in areas such as the North Atlantic, must be filed at least....... before EOBT.

   a. 3 hours.
   b. 1 hour.
   c. 30 minutes.
   d. Never less than 10 minutes.

6. In the event of a delay in excess of........ of .... for a controlled flight, or a delay of .... for an uncontrolled flight for which a flight plan has been submitted, the flight plan should be amended or a new flight plan submitted and the old plan cancelled, whichever is appropriate.

   a. 30 minutes, Estimated Off Blocks Time, 3 hours
   a. 30 minutes, planned take off time, 1 hour.
   b. 60 minutes, planned take off time, 3 hours.
   c. 30 minutes, EOBT, 1 hour.

7. If a pilot lands at an aerodrome other than the destination specified in the flight plan, he must:

   a. Ensure that all ATSUs which were addressees on the flight plan are notified of his landing.
   b. Ensure that the ATSU at the original destination is informed within 60 minutes.
   c. Ensure that the ATSU at the original destination is informed within 30 minutes.
   d. Report to ATC to apologise.

8. A current flight plan is

   a. The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes.
   b. The flight plan, including changes, if any, brought about by subsequent clearances.
   c. The flight plan, including changes, if any, cleared prior to take off.
   d. The flight plan, including changes, if any, cleared prior to the aircraft's present position.

9. A filed flight plan is?.......

   a. The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes.
   b. The flight plan, including changes, if any, brought about by subsequent clearances.
   c. The flight plan, including changes, if any, cleared prior to take off.
   d. The flight plan, including changes, if any, cleared prior to the aircraft's present position.

10. ATC must be informed of changes which occur to the flight plan speed and ETA. Many nations stipulate their own limits but PANS-RAC require changes of ..... in TAS and .... of ETA be notified. Which answer fills the blanks correctly?

   a. 3%, 5 minutes.
   b. 5 kts, 30 minutes.
   c. 5%, 3 minutes.
   d. 3 kts, 3 minutes.

11. A flight has filed a flight plan for a route starting on ATS routes and later leaving controlled airspace. It is "cleared via flight plan route". This means the flight is cleared to follow:

   a. The flight planned route until leaving ATS routes and must then obtain further clearance.
   b. The complete route without further ATC clearance.
   c. The flight planned route only until the next FIR boundary.
   d. The flight planned route only as far as the limit of control of the current ATS unit.

12. Who is responsible for processing a flight plan?

a. The ATS unit first receiving a flight plan.
b. The ATS unit in whose FIR the aircraft will fly first.
c. The ATS unit responsible for the aerodrome of departure.
d. The ATS unit responsible for takeoff clearance at the departure aerodrome.

A trip time of 150 minutes has been calculated for a flight with an EOBT of 1000 UTC and an expected take-off timeof 1020 UTC. The aircraft has a fuel reserve of 30%. Use this information to answer the following questions.

i 1000.
ii 1020.
iii 150.
iv 195
v 0230
vi 0315

13. What should be filled in at Item 13 of the CA48?

a. i
b. ii
c. v
d. vi

14. What should be filled in at Item 16 of the CA48?

a. iii
b. iv
c. v
d. vi

15. What should be filled in at Item 19 of the CA48?

a. iii
b. iv
c. v
d. vi

16. With reference to changes to RPLs. In the event that the destination airfield is changed the following action is taken:

a. The change is notified as early as possible and not later than 30minutes before departure to the ATS reporting office responsible for the departure aerodrome.
b. The change is notified as early as possible before departure to the ATS reporting office responsible for the departure aerodrome.
c. The RPL shall be cancelled for the day concerned and an individual flight plan shall be submitted.
d. The change may be notified by radio telephony on initial contact with the ATS unit.

ANSWERS

Exercise 1 - CA 48

Item 7: CGRAD
Item 8: I, N
Item 9: Blank, B737, M
Item 10: SU/C
Item 13: EGSC, 0920
Item 15: N0330F250 ➔DCT LAM UB3 DVR UG1 SPI/N0350F290 UGI NTM UB6 MUN
Item 16: EDDM, 0140, EDDS
Item 18: EET/EBUR0029 OPR/CAMMAIR
Item 19: E/0230 P/124 R/Cross out U and V
Survival Equipment: Cross out P,D, J ➔ Jackets: Cross out F and V
➔ D/04 ➔ 128, ➔YELLOW
A/WHITE RED
Cross out N using an X

Exercise 2 - CA 48

Item 7: BAW780 ITEM 8: I, N ITEM 9: BLANK, EA31, H
Item 10: SIR/C ITEM13: LIPZ, 0630
Item 15: N0450F310 ➔ DCT VIC UB4 SPR UB28 PAS UB16 TDP UG5 GAI DCT TOU
Item 16: LFBO,0128, LFML
Item 18: EET/AOSTA0037 PAS0048 REG/GBUSB SEL/HBSJ
Item 19: E/0630 P/TBN R/Cross out U and V
Survival Equipment: Cross out P, D and J ➔ Jackets: Cross out F
➔ D/15 ➔ 300 ➔ YELLOW
A/ BLUE GREY
Cross out N using an X

Exercise 3 - CA 48

Item 7: GWIZZ ITEM 8: I, N ITEM 9: BLANK, B737, M
Item 10: S/C ITEM 13: EGSS, 1515
Item 15: N0310F260 ➔ DCT LAM UR1 ORTAC/N0310F270 UR14 DIN UA25 CGC UB19 ENSAC DCT
Item 16: LFBZ,0225, LFBL
Item 18: OPR/GROPAIR
N.B. Initial FL260 acceptable.

Exercise 4

1	A	6	D	11	B
2	A	7	C	12	A
3	C	8	B	13	A
4	B	9	A	14	C
5	A	10	C	15	D
				16	C

ANNEX 1 - FLIGHT PLAN
EXTRACT FROM ICAO DOC 4444 (PANS - RAC) Dated 7 Nov 1996

Flight plan form

A flight plan form based on the model in Appendix 2* should be provided for and used by operators and air traffic services units for the purpose of completing flight plans. (* Appendix 2 in this instance is found at page *A2-1* PANS-RAC Doc 4444. Copies are also included in this chapter.) Note: A different form may be provided for use in completing repetitive flight plan listings.

The flight plan form should be printed and should include an English text in addition to the language(s) of the State concerned.Note: The Model Flight Plan Form in Appendix 2 is printed in English and one other of the languages of the Organisation for illustration purposes.

Operators and air traffic services units should comply with the instructions for completion of a flight plan form and a repetitive flight plan listing form given in Appendix 2. Note: The instructions for completing a flight plan form given in Appendix 2 may be conveniently printed on the inside cover of flight plan form pads, or posted in briefing rooms.

An operator unable to satisfy a prescribed route or area RNP* should, prior to departure, advise ATC of the RNP* types the aircraft is certified to meet.

(* *Required Navigation Performance (RNP) is a statement of the navigation performance accuracy necessary for operation within a defined airspace. RNP type is a containment value expressed as a distance in nm from the intended position within which flights would be for at least 95% of the total flying time. For example RNP 4 represents a navigation accuracy of +/- 4nm on a 95% containment basis*)

Submission of a flight plan.

Prior to departure.

Except when other arrangements have been made for submission of repetitive flight plans, a flight plan submitted prior to departure should be submitted in person or by telephone to the air traffic services reporting office at the departure aerodrome. If no such unit exists at the departure aerodrome, the flight plan should be submitted by telephone or typewriter, or if these means are not available, by radio to the unit serving or designated to serve the departure aerodrome.

In the event of a delay of thirty (30) minutes in excess of the estimated off-block time for a controlled flight or a delay of one hour for an uncontrolled flight for which a flight plan has been submitted, the flight plan should be amended or a new flight plan submitted and the old flight plan cancelled, whichever is applicable.

During flight.

A flight plan to be submitted during flight should normally be transmitted to the aeronautical telecommunication station serving the air traffic services unit in charge of the flight information region, control area, advisory area or advisory route in or on which the aircraft wishes to fly. When this is not practicable, it should be transmitted to another aeronautical telecommunication station for re- transmission as required to the appropriate air traffic services unit.

Note: If the flight plan is submitted for the purpose of obtaining air traffic control service, the aircraft is required to wait for an air traffic control clearance prior to proceeding under the conditions requiring compliance with air traffic control procedures. If the flight plan is submitted for the purpose if obtaining air traffic advisory service, the aircraft is required to wait for acknowledgement of receipt by the unit providing the service.

Acceptance of a flight plan.

The first air traffic services unit receiving a flight plan, or a change thereto, shall

- Check it for compliance with the format and data conventions;
- Check it for completeness and, to the extent possible, for accuracy;
- Take action, if necessary, to make it acceptable to the air traffic services; and
- Indicate acceptance of the flight plan or change thereto, to the originator.

General

RPLs (Repetitive Flight Plans) shall not be used for flights other than IFR flights operated regularly on the same day(s) of consecutive weeks and on at least ten consecutive occasions or every day over a period of at least ten consecutive days. The elements of each flight plan shall have a high degree of stability.

Note: For permissible incidental changes to RPL data affecting the operation for one particular day, and not intended to be a modification of the listed RPL.

RPLs shall cover the entire flight from the departure aerodrome to the destination aerodrome. RPL procedures shall be applied only when all ATS authorities concerned with the flights have agreed to accept RPLs.

The use by States of RPLs for international flight shall be subject to the provision that the affected adjacent States either already use RPLs or will use them at the same time. The procedures for use between States shall be the subject of bilateral, multilateral or regional air navigation agreement as appropriate."

Changes to RPL Listings

Changes of a permanent nature

Changes of a permanent nature involving the inclusion of new flights and the deletion or modification of currently listed flights shall be submitted in the form of amendment listings. These listings shall reach the air traffic services agency concerned at least seven days prior to the change becoming effective.

Changes of a temporary nature

Changes of a temporary, non-recurring nature relating to RPLs concerning aircraft type and wake turbulence category, speed and/or cruising level shall be notified for each individual flight as early as possible and not later than 30 minutes before departure to the ATS reporting office responsible for the departure aerodrome. A change of cruising level only may be notified by radio telephony on initial contact with the ATS unit.

In the case of an incidental change in the aircraft identification, the departure aerodrome, the route and/or the destination aerodrome, the RPL shall be cancelled for the day concerned and an individual flight plan shall be submitted.

Whenever it is expected by the operator that a specific flight, for which an RPL has been submitted, is likely to encounter a delay of 30 minutes or more in excess of the off-block time stated in that flight plan, the ATS unit responsible for the departure aerodrome shall be notified immediately.

Note: Because of the stringent requirements of flow control, failure by operators to comply with this procedure may result in the automatic cancellation of the RPL for that specific flight at one or more of the ATS units concerned.

Whenever it is known to the operator that any flight, for which an RPL has been submitted, is cancelled, the ATS unit responsible for the departure aerodrome shall be notified.

Operator/pilot liaison

The operator shall ensure that the latest flight plan information, including permanent an incidental changes, pertaining to a particular flight and duly notified to the appropriate agency, is made available to the pilot-in-command.

ANNEX 2
Extract from ICAO DOC 4444 (PANS - RAC) Appendix 2

FLIGHT PLAN

Instructions for the completion of the flight plan form

General

Adhere closely to the prescribed formats and manner of specifying data.

Commence inserting data in the first space provided. Where excess space is available leave unused spaces blank.

Insert all clock times in *4 figures UTC*.

Insert all estimated elapsed times in 4 figures (hours and minutes).

Shaded area preceding item 3 to be completed by ATS and COM services, unless the responsibility for originating flight plan messages has been delegated.

Note: The term"aerodrome" where used in the flight plan is intended to cover also sites other than aerodromes which may be used by certain types of aircraft; e.g., helicopters or balloons.

INSTRUCTIONS FOR INSERTION OF ATS DATA

Complete Items 7 to 18 as indicated hereunder.

Complete also Item 19 as indicated hereunder, when so required by the appropriate ATS authority or when otherwise deemed necessary.

Note: Item numbers on the form are not consecutive, as they correspond to Field Type numbers in ATS messages.

ITEM 7: AIRCRAFT IDENTIFICATION
(MAXIMUM 7 CHARACTERS)

INSERT one of the following aircraft identifications, not exceeding 7 characters:

- The registration marking of the aircraft (e.g., EIAKO 4XBCD N2567GA) when:
  - In radiotelephony the call sign to be used by the aircraft will consist of this identification alone (e.g. OOTEK), or preceded by the ICAO telephony designator for the aircraft operating agency (e.g. SABENA OOTEK);
  - The aircraft is not equipped with radio; OR
- The ICAO designator for the aircraft operating agency followed by the flight identification (e.g. KLM511, NGA213, JTR25) when in radiotelephony the call sign to be used by the aircraft will consist of the ICAO telephony designator for the operating agency followed by the flight identification (e.g. KLM511, NIGERIA 213, HERBIE 25).

Note: *Provisions for the use of radiotelephony call signs area contained in ICAO Annex 10. Volume II Chapter 5 (not published herein). Designators and telephony designators for aircraft operating agencies are contained in ICAO 8585 - Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (not published herein).*

ITEM 8: FLIGHT RULES AND TYPE OF FLIGHT
(ONE OR TWO CHARACTERS)

FLIGHT RULES

INSERT one of the following letters to denote the category of flight rules with which the pilot intends to comply:
I if IFR V if VFR
Y if IFR first) and specify in Item 15 the point
Z if VFR first) or points where a change of flight Rules is planned.

TYPE OF FLIGHT
INSERT one of the following letters to denote the type of flight when so required by the appropriate ATS authority:

S if scheduled air service
N if non-scheduled air transport operation
G if general aviation
M if military
X if other than any of the defined categories above.

ITEM 9: NUMBER AND TYPE OR AIRCRAFT AND WAKE TURBULENCE CATEGORY

NUMBER OF AIRCRAFT (1 OR 2 CHARACTERS)

INSERT the number of aircraft, if more than one.

TYPE OF AIRCRAFT (2 TO 4 CHARACTERS)
INSERT the appropriate designator as specified in ICAO Document 8643 - Aircraft Type Designators (not published herein); or if no such designator has been assigned, in case of formation flights comprising more than one type:

INSERT ZZZZ, and ***SPECIFY*** in Item 18, the (numbers and) type(s) of aircraft preceded by TYP/...

WAKE TURBULENCE CATEGORY (1 CHARACTER)

INSERT an oblique stroke followed by one of the following letters to indicate the wake turbulence category of the aircraft:

H - HEAVY, to indicate an aircraft type with a maximum certificated take-off mass of 136,000 kg or more;
M - MEDIUM, to indicate an aircraft type with a maximum certificated take-off mass of less than 136,000 kg but more than 7000 kg;
L - LIGHT, to indicate an aircraft type with a maximum certificate take-off mass of 7000 kg or less.

ITEM 10: EQUIPMENT

RADIOCOMMUNICATION, NAVIGATION AND APPROACH AID EQUIPMENT
INSERT one letter as follows:
N if no COM/NAV/approach aid equipment for the route to be flown is carried, or the equipment is unserviceable; or S if standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable *(see Note 1)*.

AND/OR

INSERT one or more of the following letters to indicate the COM/NAV approach aid equipment available and serviceable:

A (Not allocated)	M Omega
B (Not allocated)	O VOR
C LORAN C	P (Not allocated)
D DME	Q (Not allocated)
E (Not allocated)	R RNP type certification (Required Nav Performance)
F ADF	(see Note 5)
G (GNSS)	T TACAN
H HF RTF	U UHF RTF
I Inertial Navigation	V VHF RTF
J (Data Link)	W)
(See Note 3)	X) when prescribed by ATS
K (MLS)	Y)
L (ILS)	Z Other equipment carried (See Note 2)

NOTE:
1. *Standard equipment is considered to be VHF RTF, ADF, VOR, and ILS, unless another combination is prescribed by the appropriate ATS authority.*
2. *If the letter Z is used, specify in Item 18 the other equipment carried, preceded by COM/... and/or NAV ..., as appropriate.*
3. *If the letter J is used, specify in Item 18 the equipment carried, preceded by DAT/... followed by one or more letters as appropriate.*
4. *Information on navigation capability is provided to ATC for clearance and routing purposes.*
5. *Inclusion of R indicates that an aircraft meets the RNP type prescribed for the route segments), route(s) and/or area concerned.*

SURVEILLANCE EQUIPMENT

INSERT one or two of the following letters to describe the serviceable surveillance equipment carried:

SSR equipment: N Nil
A Transponder - Mode A (4 digits - 4096 codes)
C Transponder - Mode A (4 digits - 4096 codes and Mode C
X Transponder - Mode S without both aircraft identification and pressure-altitude transmission
P Transponder - Mode S, including pressure altitude transmission, but no aircraft identification transmission
I Transponder - Mode S, including aircraft identification transmission, but no pressure-altitude transmission
S Transponder - Mode S, including both pressure-altitude and aircraft identification transmission.
ADS equipment:
D ADS capability

ITEM 13: DEPARTURE AERODROME AND TIME (8 CHARACTERS)

INSERT the ICAO four - letter location indicator of the departure aerodrome, or if no location indicator has been assigned,

INSERT ZZZZ and ***SPECIFY***, in Item 18, the name of the aerodrome preceded by DEP/......

OR, If the flight plan is received from an aircraft in flight,

INSERT AFIL, and ***SPECIFY***, in Item 18, the ICAO four-letter location indicator of the location of the ATS unit from which supplementary flight plan data can be obtained, preceded by DEP/...

THEN WITHOUT A SPACE

INSERT for a flight plan submitted before departure, the estimated off-block time,

OR, for a flight plan received from an aircraft in flight, the actual or estimated time over the first point of the route to which the flight plan applies.

ITEM 15: ROUTE

INSERT the *first cruising speed* as in A and the *first cruising level* as in B, without a space between them.

THEN, following the arrow,

INSERT the route description as in C.

- **CRUISING SPEED** (MAXIMUM 5 CHARACTERS)

INSERT the True Air Speed for the first or the whole of the cruising portion of the flight, in terms of:
Kilometers per hour, expressed as K followed by 4 figures (e.g. K0830);or

Knots, expressed as N followed by 4 figures (e.g.,N0485); or

Mach Number, when so prescribed by the appropriate ATS authority, to the nearest hundredth of unit Mach, expressed as M followed by 3 figures (eg., M082)

- **CRUISING LEVEL** (MAXIMUM 5 CHARACTERS)

INSERT the planned cruising level for the first or the whole portion of the route to be flown, in terms of:

Flight Level, expressed as F followed by 3 figures (e.g., F085, F330); or

Standard Metric Level in tens of meters, when so prescribed by the appropriate ATS authorities, expressed as S followed by 4 figures (e.g. S1130); or

Altitude in hundreds of feet, expressed as A followed in by 3 figures (e.g., A045 A100); or

Altitude in tens of meters, expressed as M followed by 4 figures (eg.,M0840); or

For uncontrolled VFR flights, the letters VFR.

- **ROUTE (INCLUDING CHANGES OF SPEED, LEVEL AND/OR FLIGHT RULES)**

Flights Along Designated ATS Routes

INSERT, if the departure aerodrome is located on, or connected to the ATS route, the designator of the first ATS route;

OR, if the departure aerodrome is not on, or connected to the ATS route, the letters DCT followed by the point of joining the first ATS route, followed by the designator of the ATS route.

THEN
INSERT each point at which either a change of speed or level, a change of ATS route, and/or a change of flight rules is planned.

Note: When a transition is planned between a lower and upper ATS route and the routes are oriented in the same direction, the point of transition need not be inserted.

FOLLOWED IN EACH CASE

By the designator of the next ATS route segment, even if the same as the previous one;

OR, by DCT, if the flight to the next point will be outside a designated route, unless both points are defined by geographical co-ordinates.

Flights Outside Designated ATS Routes

INSERT points normally not more than 30 minutes flying time or 370 km (200NM) apart, including each point at which a change of speed or level, a change of track, or a change of flight rules is planned;

OR, when required by appropriate ATS authority(ies).

DEFINE the track of flights operating predominantly in an east-west direction between 70°N and 70°S by reference to significant points formed by the intersections of half or whole degrees of latitude with meridians spaced at intervals of 10 degrees of longitude. For flights operating in areas outside those latitudes the tracks shall be defined by significant points formed by the intersection of parallels of latitude with meridians normally spaced at 20 degrees of longitude. The distance between significant points shall, as far as possible, not exceed one hour's flight time. Additional significant points shall be established as deemed necessary.

For flights operating predominantly in a north-south direction, define tracks by reference to significant points formed by the intersection of whole degrees of longitude with specified parallels of latitude which are spaced at 5 degrees.

INSERT DCT between successive points unless both points are defined by geographical co- ordinates or by bearing and distance.

USE ONLY the conventions in (1) to (5) below and *SEPARATE* each sub-item by a space.

- **ATS ROUTE** (2 to 7 CHARACTERS)

The coded designator assigned to the route or route segment including, where appropriate, the coded designator assigned to the standard departure or arrival route (eg., BCN1, B1, R14, UB10, KODAP2A).

Note: Provisions for the application of route designators are contained in Annex 11, Appendix 1 (not published herein), whilst guidance material on the application of an RNP type to a specific route segment (s), route(s) or area, is contained on the Manual on Required Navigation Performance (RNP), Doc 9613 (not published herein).

- **SIGNIFICANT POINT** (2 to 11 CHARACTERS)

The coded designator (2 to 5 characters) assigned to the point (eg., LN, MAY, HADDY); or if no coded designator has been assigned, one of the following ways:

Degrees only (7 characters);
2 figures describing latitude in degrees, followed by "N" (North) or "S" (South), followed by 3 figures describing longitude in degrees, followed by "E" (East) or "W" (West). Make up the correct number of figures where necessary, by insertion of zeros; eg., 46N078W.

Degrees and minutes (11 Characters)
4 figures describing latitude in degrees and minutes followed by"N" (North) or "S" (South, followed by 5 figures describing longitude in degrees and tens and units of minutes, followed by "E" (East) or "W" (West). Make up the correct number of figures, where necessary, by insertion of zeroes; e.g. 4620N07805W.

Bearing and distance from a navigation aid:
The identification of the navigation aid (normally a VOR), in the form of 2 or 3 characters,
THEN
the bearing from the aid in the form on 3 figures giving degrees magnetic,
THEN
the distance from the aid in the form of 3 figures expressing nautical miles. Make up the correct number of figures, where necessary, by insertion of zeros; eg., a point 180° magnetic at a distance of 40 nautical miles from VOR "DUB" should be expressed as DUB180040.

- **CHANGE OF SPEED OR LEVEL (MAXIMUM 21 CHARACTERS)**

The point at which a change of speed (5% TAS or 0.01 Mach or more) or a change of level is planned, expressed exactly as in (2) above, followed by *an oblique stroke and both the cruising speed and the cruising level,* expressed exactly as in A and B above, without a space between them, *even when only one of these quantities will be changed*.

Examples: LN/N0284A045
MAY/N0305F180
HADDY/N0420F330
4602N07805W/N0500F350
46N078W/M082F330
DUB180040/N0350M0840

- **CHANGE OF FLIGHT RULES** (MAXIMUM 3 CHARACTERS)

  The point at which the change of flight rules is planned, expressed exactly as in (2) or (3) above as appropriate, *followed by a space and one of the following*:
  VFR if from IFR to VFR IFR if from VFR to IFR

  Examples: LN VFR
  LN/N0284A050 IFR

- **CRUISE CLIMB** (MAXIMUM 28 CHARACTERS)

  The letter "C" followed by an oblique stroke;

  THEN
  the point at which cruise climb is planned to start; expressed exactly as in (2) above, followed by an oblique stroke;

  THEN
  the speed to be maintained during cruise climb , expressed exactly as in a. above, followed by the two levels defining the layer to be occupied during cruise climb, each level expressed exactly as in B. above, or on the level above which cruise climb is planned followed by the letters
  "PLUS", without a space between them.

  Examples:
  C/48N050W/M082F290F350
  C/48N050W/M082F290PLUS
  C/52N050W/M220F580F620

ITEM 16: DESTINATION AERODROME AND TOTAL ESTIMATED ELAPSED TIME, ALTERNATE AERODROME(S)

DESTINATION AERODROME AND TOTAL ESTIMATED ELAPSED TIME (8 CHARACTERS)

INSERT the ICAO four-letter location indicator of the destination aerodrome followed, without a space, by the total established time; or

If no location indicator has been assigned,

INSERT ZZZZ followed, without a space, by the total estimated elapsed time, and ***SPECIFY*** in Item 18 the name of the aerodrome, preceded by DEST/...

Note: For a flight plan received from an aircraft in fight, the total estimated elapsed time is the estimated time from the first point of the route to which the flight plan applies.

ALTERNATE AERODROME(S)
(4 CHARACTERS)

INSERT the ICAO four-letter location indicator(s) of not more then two alternate aerodromes, separated by a space; or

if no location indicator has been assigned to the alternate aerodrome,

INSERT ZZZZ and ***SPECIFY*** in item 18 the name of the aerodrome, preceded by ALTN/....

ITEM 18: OTHER INFORMATION

INSERT 0 (zero) if no other information, or any other necessary information in the preferred sequence shown hereunder, in the form of the appropriate indicator followed by an oblique stroke and the information to be recorded:

EET/ Significant points or FIR boundary designators and accumulated estimated elapsed times to such points or FIR boundaries, when so prescribed on the basis of air navigation agreements, or by the appropriate ATS authority.

Examples:
EET/CAP0745 XYZ0830
EET/EINN0204

RIF/ The route details to the revised destination aerodrome, followed by the ICAO four letter location indicator of the aerodrome. The revised route is subject to re-clearance in flight.

Examples:
RIF/DTA HEC KLAX
RIF/ESP G94 CLA APPH
RIF/LEMD

REG/ The registration markings of the aircraft, if different from the aircraft identification in Item 7.

SEL/ SELCAL Code, if so prescribed buy the appropriate ATS authority.

OPR/ Name of the operator, if not obvious from the aircraft identification in Item 7.

STS/ Reason for special handling by ATS; e.g., hospital aircraft, one engine inoperative; e.g., STS/HOSP, STS/ONE Eng INOP.

TYP/ Type(s) of aircraft, preceded if necessary by number(s) of aircraft if ZZZZ is inserted in Item 9.

PER/ Aircraft performance data, if so prescribed by the appropriate ATS authority.

COM Significant data related to link capability, using one or more of the letters S, H, V and M; e.g. DAT/S for satellite data link, DAT/H for HF data link; DAT/V for VHF data link; DAT/M for SSR Mode S data link.

DAT/ Significant data related to navigation equipment as required by the appropriate ATS authority.

NAV/ Significant data related to navigation equipment as required by the appropriate ATS authority.

DEP/ Name of departure aerodrome, if ZZZZ is inserted in Item 13, or the ICAO four letter location indicator of the location of the ATS unit from which supplementary flight plan data can be obtained, if AFIL is inserted in Item 13.

DEST/ Name of destination aerodrome, if ZZZZ is inserted in Item 16. **ALTN/**Name of destination aerodrome(s), if ZZZZ is inserted in Item 16. **RALT/**Name of en-route alternate aerodrome(s).

RMK/ Any other plain language remarks when required by the appropriate ATS authority or deemed necessary.

ITEM19: SUPPLEMENTARY INFORMATION

ENDURANCE
After **E/** ***INSERT*** a 4-figure group giving the fuel endurance in hours and minutes.

PERSONS ON BOARD
After **P/** ***INSERT*** the total number of persons (passengers and crew) on board, when required by the appropriate ATS authority. ***INSERT*** TBN (to be notified) if the total number of persons in not known at the time of filing.

EMERGENCY AND SURVIVAL EQUIPMENT

R/ (RADIO)
CROSS OUT U if UHF on frequency 243.0 MHz is not available.
CROSS OUT V if VHF on frequency 121.5 MHz is not available
CROSS OUT E if emergency locator transmitter (ELT) is not available.

S/ (SURVIVAL EQUIPMENT)
CROSS OUT all indicators if survival equipment is not carried.
CROSS OUT P if polar survival equipment is not carried.
CROSS OUT D if desert survival equipment is not carried.
CROSS OUT M if maritime survival equipment is not carried.
CROSS OUT J if jungle survival equipment is not carried.

J/ (JACKETS)

CROSS OUT all indicators if life jackets are not carried.
CROSS OUT L if life jackets are not equipped with lights.
CROSS OUT F if life jackets are not equipped with fluorescein.
CROSS OUT U or V or both as in R/ above to indicate radio capability of jackets, if any.

D/ (DINGHIES) (NUMBER

CROSS OUT indicators D and C if no dinghies are carried, or
INSERT number of dinghies carried; and (CAPACITY)
INSERT total capacity, in persons, of all dinghies carried; and (COVER)
CROSS OUT indicator C if dinghies are not covered; and (COLOUR)
INSERT colour of dinghies if carried.
A/(AIRCRAFT COLOUR AND MARKINGS)
INSERT colour of aircraft and significant markings.

N/ (REMARKS)
CROSS OUT indicator N if no remarks, or ***INDICATE*** any other remarks regarding survival equipment.
C/ (PILOT)
INSERT name of pilot in command.

FILED BY

INSERT the name of the unit, agency or person filing the flight plan.

Instructions for the completion of a repetitive flight plan (RPL) listing form

General
List only flight plans that will operate in accordance with IFR. (Flight rules I in FPL format). It is assumed that all aircraft are operating as scheduled flights (Type of flight S in FPL format). otherwise *notify* in Q (Remarks).
It is assumed that all aircraft operating on RPLs are equipped with 4096-code transponders with modes A and C. Otherwise, *notify* in Q (Remarks).

List flight plans in *alphabetical order of location indicator of the departure aerodrome.*
List flight plans for each departure aerodrome in chronological order of estimated off-block times

adhere closely to the data conventions as per the Flight Plan form.

Insert all clock times in 4 figures UTC.

Insert all estimated elapsed times in 4 figures (hours and minutes).

Insert data on a separate line for each segment of operations with one or more stops; i.e. from any departure aerodrome to the next destination aerodrome even though call sign or flight number is the same for multiple segments.

Clearly identify additions and deletions in accordance with Item H, (Fig. 13.9). Subsequent listings shall list the corrected and added data, and deleted flight plans shall be omitted.

Number pages by indicating number of page and total number of pages in submission.

Utilise more than one line for any RPL where the space provided for items O and Q on one line is not sufficient.

A flight shall be cancelled as follows:

- Indicate a minus sign in item H followed by all other items of the cancelled flight
- Insert a subsequent entry denoted by a plus sign in item H and the date of the last flight in item J, with all other items of the cancelled flight unchanged.

Modifications of the flight shall be made as follows:

- Carry out the cancellation as detailed above
  and
- Insert a third entry giving the new flight plan(s) with the appropriate items modified as necessary, including the new validity dates in items I and J.

Instructions for insertion of RPL data

Item A: OPERATOR

Insert name of operator.

Item B: ADDRESSEE(S)

Insert name of agency(ies) designated by the States to administer RPLs for areas of responsibility concerned with the route of flight.

Item C: DEPARTURE AERODROME(S)

Insert location indicator(s) of departure aerodromes.

Item D: DATE

Insert on each page of submission the date (year, month, day) in a six figure group that the listing was submitted .

Item E: SERIAL NUMBER

Insert serial number of submission (2 numerics) indicating last two digits of year, a dash, and the sequential no. of the submission for the year indicated (start with numeral 1 each new year).

Item F: PAGE OF

Insert page number and total number of pages submitted.

Item G: SUPPLEMENTARY DATA AT

Insert name of contact where information normally provided under Item 19 of the FPL is kept readily available and can be supplied without delay.

Item H: ENTRY TYPE

Insert a minus sign (-) for each flight plan that is to be deleted from the listing.

Insert a plus sign (+) for each initial listing and , in the case of subsequent submissions, for each flight plan not listed in the previous submission.

Note: No information is required under this item for any flight plan which is unchanged from the previous submission.

Item I: VALID FROM

Insert first date (year, month, day) upon which the flight is scheduled to operate.

Item J: VALID UNTIL

Insert last date (year, month, day) upon which the flight is scheduled to operate as listed, or UFN if duration is unknown.

Item K: DAYS OF OPERATION

Insert Number corresponding to the day of the week in the appropriate column; Monday = 1.

Insert 0 for each day of non-operation in the appropriate column.

Item L: AIRCRAFT IDENTIFICATION (Item 7 ICAO flight plan)

Insert aircraft identification to be used for the flight.

Item M: TYPE OF AIRCRAFT AND WAKE TURBULENCE CATEGORY (Item 9 ICAO flight plan)

Insert appropriate ICAO designator as specified in ICAO Doc 8643 - Aircraft Type Designators.

Insert H, M or L indicator as appropriate:

H - HEAVY to indicate an aircraft type with a maximum certificated take-off mass of 136000kg or more.

M - MEDIUM to indicate an aircraft type with a maximum certificated take-off mass of less than
136000kg but more than 7000kg.

L - LIGHT to indicate an aircraft type with a maximum certificated take-off mass of 7000kg or less.

Item N: DEPARTURE AERODROME AND TIME (Item 13 ICAO flight plan)

Insert location indicator of the departure aerodrome.

Insert the off-block time, i.e. the estimated time that the aircraft will commence movement associated with departure.

Item O: ROUTE (Item 15 ICAO flight plan)

Insert:

- Cruising speed; the true airspeed for the first part of the whole cruising portion of the flight in accordance with Item 15 (a) of the ICAO flight plan.
- Cruising level; the planned cruising level for the first or whole portion of the route in accordance with Item 15 (b) of the ICAO flight plan.
- Route; the entire route in accordance with Item 15 (c) of the ICAO flight plan.

Item P: DESTINATION AERODROME AND TOTAL ESTIMATED ELAPSED TIME (Item 16 of the ICAO flight plan)

Insert location indicator of the destination aerodrome.

Insert the total elapsed time.

Item Q: REMARKS

Insert items of information as required by the appropriate ATS authority, normally notified in Item 18 of the ICAO flight plan and any other information pertinent to the flight of concern to ATS.

UK AIP ENR 1-10-1 EXTRACT

ENR 1.10 — FLIGHT PLANNING

1 General Procedures

1.1 Reference Documents

1.1.1 -ICAO Annex 2, Chapter 3.
-ICAO Doc 4444 Air Traffic Management - PANS ATM/501/14, Chapter 4, Chapter 10 and Appendices 2 and 3.
-ICAO Doc 7030/4 Regional Supplementary Procedures, Part EUR.
-Central Flow Management Unit (CFMU) Handbook.
-Integrated Initial Flight Plan Processing System (IFPS) Users Manual.
-CAP 694 The UK Flight Plan Guide.

1.2 Types and Categories of Flight Plan

1.2.1 There are two types of flight plan:

(a) Visual Flight Rules (VFR) flight plan;

(b) Instrument Flight Rules (IFR) flight plan.

1.2.2 Flight plans fall into three categories:

(a) Full flight plans: the information filed on Form CA48/RAF 2919;

(b) Repetitive Flight Plans (see paragraph 5);

(c) Abbreviated Flight Plans: the limited information required to obtain a clearance for a portion of flight (eg: flying in a Control Zone, crossing an Airway) filed either by telephone prior to take-off or by RTF when airborne. The destination aerodrome will be advised of the flight only if the flight plan information covers the whole route of the flight.

1.2.3 Full and Abbreviated flight plans may be filed by RTF with the appropriate controlling Air Traffic Service Unit (ATSU).

1.3 A guide to filing a flight plan is shown at page ENR 1-10-3.

1.4 When to file a Flight Plan

1.4.1 A flight plan **may** be filed for any flight.

1.4.2 A flight plan **must** be filed for the following:

(a) for all flights within Class A Airspace;

(b) for all flights within any Controlled Airspace in IMC or at night, except for those operating under SVFR;

(c) for all flights within any Controlled Airspace in VMC if the flight is to be conducted in accordance with IFR;

(d) for all flights within Class B, C and D Controlled Airspace irrespective of weather conditions;

(e) for any flight from an aerodrome in the United Kingdom, being a flight whose destination is more than 40 km from the aerodrome of departure and the aircraft Maximum Total Weight Authorised exceeds 5700 kg;

(f) for all flights to or from the United Kingdom which will cross the United Kingdom FIR Boundary;

(g) for any flight in Class F Airspace wishing to participate in the Air Traffic Advisory Service.

1.4.3 The occasions on which a VFR flight plan must be filed are specified at paragraph 1.4.2, sub-paras (d), (e), (f) and (g) (further details on VFR flight plans are at paragraph 3).

1.4.4 It is **advisable** to file a flight plan if the flight involves flying over the sea, more than 10 nm from the UK coastline, or over sparsely populated areas where Search and Rescue operations would be difficult.

1.5 Booking Out

1.5.1 Rule 20 of the Rules of the Air Regulations 1996 requires that a pilot intending to make a flight shall inform the Air Traffic Service Unit (ATSU) at the aerodrome of departure; the filing of a flight plan constitutes compliance with this Rule. In the absence of an ATSU at the departure aerodrome, the pilot may submit his flight plan through the Parent Unit (see paragraph 2). However, the requirements of Rule 20 must be complied with irrespective of whether or not a flight plan has been filed. Therefore, on those occasions when there is no necessity to submit a flight plan, the pilot remains responsible for notifying the ATSU at the departure aerodrome of his intention to fly. This action is known as 'Booking Out' but unlike the normal flight plan procedure, the information will not be transmitted to any other ATSU.

1.6 Submission Time Parameters

1.6.1 Normally, flight plans should be filed on the ground at least 60 minutes before clearance to start up or taxi is requested; however, for North Atlantic and flights subject to Air Traffic Flow Management (ATFM) measures a minimum of 3 hours is required. (When completing the flight plan the departure time entered in Field 13 must be the Estimated Off Block Time (EOBT) not the planned airborne time). Exceptionally, in cases where it is impossible to meet this requirement, operators should give as much notice as possible and never less than thirty minutes. Otherwise, if this is not possible, a flight plan can be filed when airborne with any ATSU, but normally with the FIR Controller responsible for the area in which the aircraft is flying. If the airborne flight plan contains an intention to enter Controlled Airspace or certain Control Zones/Control Areas, at least 10 minutes prior warning of entry must be given. In all cases, the message should start with the words 'I wish to file an airborne flight plan'. It should be noted that passing an airborne flight plan over the RT may, due to the controller's workload, result in a delay in the message being filed.

1.7 Submitting a Flight Plan Through the Departure Aerodrome ATSU

1.7.1 A written flight plan, which is filed through the ATSU at the departure aerodrome, must be submitted on Form CA 48/RAF 2919. The local ATSU may assist in compiling the flight plan details and checking them; however, the ultimate responsibility for filing an accurate flight plan rests with the pilot or the operator. If the departure aerodrome is not connected to the AFTN, the pilot is responsible for arranging for the details of the flight plan to be passed to the appropriate Parent Unit.

1.8 Persons On Board

1.8.1 The number of persons on board a flight for which a plan has been filed must be available to ATSUs for SAR purposes for the period up to the ETA at the destination plus one hour. If this information has been sent to the Operators handling agency at destination, no further action is required. Otherwise, this information is to be made available as follows:

(a) Where the operator or departure handling agency closes down before the ETA of a flight at destination plus one hour, the operator or departure handling agency will lodge the number of persons on board with the ATSU serving the aerodrome of departure;

(b) where the aerodrome ATSU closes down before the ETA plus one hour, the ATSU will lodge the number of persons on board directly with the appropriate ACC;

(c) at aerodromes without an ATSU, where the aerodrome closes down before ETA destination plus one hour, the aerodrome operator or departure handling agency will lodge the name and address of officials who have access to flight departure records with the appropriate ACC, so that they can be contacted as necessary, either direct, or through the local police.

1.9 Action in the Event of Diversion

1.9.1 If a pilot lands at an aerodrome other than the destination specified in the flight plan, he must ensure that the ATSU at the original destination is informed within 30 minutes of his flight planned ETA, to avoid unnecessary action being taken by the Alerting Services.

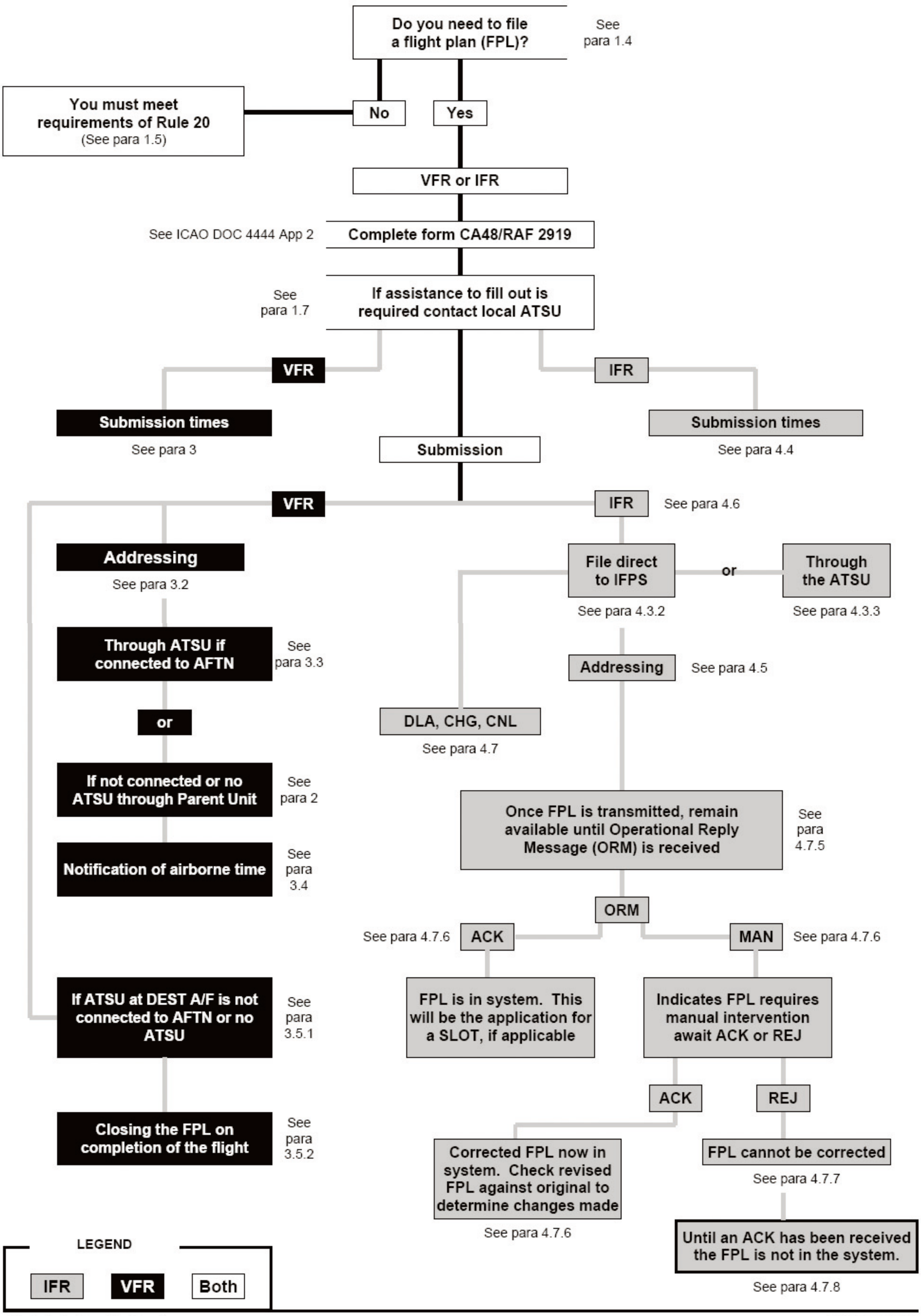
1.10 Cancelling an IFR Flight Plan in Flight

1.10.1 If a pilot has begun a flight in Controlled Airspace under an IFR flight plan, he may decide, on entering VMC, that he will cancel his IFR flight plan and VFR (Rule 31(3) of the Rules of the Air Regulations 1996). However, it must be stressed that a pilot cannot exercise this choice in Controlled Airspace which is notified as Class A Airspace and, therefore, in which all flights in all weather conditions are subject to IFR procedures. In Controlled Airspace where the exercise of the pilots choice is possible, pilots may request the cancellation of IFR flight plans by notifying the ACC, provided that they are operating in VMC. An IFR flight plan may be cancelled by transmitting the following message: '.......(identification) - Cancel IFR flight plan'. ATC cannot approve or disapprove cancellation of an IFR flight plan but, when in possession of information that IMC is likely to be encountered along the intended route of flight, will advise the pilot accordingly as follows:

'IMC reported (or forecast) in the vicinity of ....'

The fact that a pilot reports that he is flying in VMC does not in itself constitute cancellation of an IFR flight plan. Unless cancellation action is taken, the flight will continue to be regulated in relation to other IFR traffic.

GUIDE TO FILING A FLIGHT PLAN



2 UK Parent Unit System

2.1 Facilities exist within the UK for the interchange of messages for aerodromes not connected to the AFTN, and also for aerodromes without an ATSU, through the use of nominated ATSUs which have the capabilities to act as Parent ATSUs (Parent Units).

2.2 Areas of Responsibility

2.2.1 The map at ENR 6-1-10-1 shows the associated area of responsibility for each Parent Unit which provides the services specified in the above paragraphs. Any operator, at an aerodrome which does not have an ATSU, or is not on the AFTN, wishing to file a flight plan should pass details of the flight plan to the Parent Unit within whose area of responsibility the aerodrome lies. The staff at the Parent Unit will assist in the completion of the flight plan and will address it appropriately for processing through the AFTN. When specific addresses are required by the pilot or the operator, in addition to those normally inserted by the ATSU for the flight being planned, it should be ensured that such requirements are notified at the time of filing the flight plan. Operators and pilots are reminded that paragraph 1.6 (time requirement for filing a flight plan) is most important when filing with the Parent Unit.

2.3 Departure Time

2.3.1 The FIR Controller will accept departure times from pilots who have departed from aerodromes where there is no ATSU, or it is outside the ATSUs hours of operation. The pilot is to advise the FIR Controller to pass the departure time to the ATSU to which the flight plan was submitted.

2.3.2 When it is known by a pilot that the ATSU at the departure aerodrome is going to be closed at the time of departure, the flight plan is to be filed with the Parent Unit and the airborne time passed as described in paragraph 2.3.1.

2.4 Changes, Delays or Cancellation of a Flight Plan

2.4.1 It is essential that ATC is advised of cancellations, delays over 30 minutes and changes to flight plan details. A second flight plan cannot be used to amend the first. The original flight plan must first be cancelled and then a revised flight plan filed.

2.5 Contact Numbers for Parent Units

Parent Unit	Telephone Number	Fax Number
London Heathrow	020–8745 3111 / 3163	020–8745 3491 / 3492
Manchester	0161–499 5502 & 5500	0161–499 5504
Scottish ACC	01292–692679 & 692663	01292–671048

3 VFR Flight Plans

3.1 When to File a VFR Flight Plan

3.1.1 A VFR flight plan may be filed for any flight.

3.1.2 A VFR flight plan must be filed for the following:

(a) For all flights to or from the United Kingdom which will cross the United Kingdom FIR Boundary;

(b) for all flights within Class B - D Controlled Airspace (this requirement may be satisfied by passing flight details on RTF);

(c) for any flight in Class F Airspace wishing to participate in the Air Traffic Advisory Service;

(d) for any flight from an aerodrome in the United Kingdom, being a flight whose destination is more than 40 km from the aerodrome of departure and the aircraft Maximum Total Weight Authorised exceeds 5700 kg.

3.1.3 It is advisable to file a VFR flight plan if the flight involves flying over the sea, more than 10 nm from the UK coastline, or over sparsely populated areas where Search and Rescue operations would be difficult.

3.2 Addressing of VFR Flight Plans

3.2.1 In addition to addressing a VFR flight plan to the Destination Aerodrome, and when applicable the appropriate adjacent foreign FIR(s), it must also be addressed to the appropriate UK FIR(s) as listed below:

EGZYVFRP Scottish and Oceanic FIRs;
EGZYVFRT London FIR.

3.2.2 VFR Flight Plans with portion(s) of flight operated as IFR

3.2.2.1 IFPS is the only source for the distribution of IFR/General Air Traffic (GAT) flight plans and associated messages to ATSUs within the participating European States - the IFPS Zone. Although IFPS handles IFR flight plans, it **will not** process the VFR portions of any mixed VFR/IFR flight plan. Therefore, in order to ensure that all relevant ATSUs are included in the flight plan message distribution, pilots or Aircraft Operators should make certain that whenever a flight plan contains portions of the flight operated under VFR, in addition to IFR, the FPL must be addressed to:

IFPS (EGZYIFPS)
Aerodrome of departure
Aerodrome of destination
all FIRs that the flight will route through as VFR (in UK address to EGZYVFRP for Scottish/Oceanic FIRs and/or EGZYVFRT
Any additional addressees specifically required by State or Aerodrome Authorities

3.3 Submission Time Parameters

3.3.1 VFR flight plans should be submitted to the ATSU at the departure aerodrome on Form CA 48/RAF 2919 at least 60 minutes before clearance to start up or taxi is requested. The local ATSU, if required, will assist in compiling the flight plan. If the departure aerodrome is not connected to the AFTN, the pilot is responsible for arranging for the ATSU to despatch the completed flight plan via the Parent Unit (see paragraph 2). If the departure aerodrome has no ATSU, the pilot will arrange for the flight plan to be passed to the aerodromes Parent Unit for onward transmission.

3.4 Airborne Time

3.4.1 The pilot is responsible for ensuring that the airborne time of the flight is passed to the ATSU with whom the flight plan has been filed. The ATSU will ensure that the departure message, if required, is sent to the appropriate addressees. The pilot should try to arrange for a 'responsible person' on the ground to telephone the airborne time to the ATSU, as passing it over the RTF may, due to controller workload, lead to a delay in sending a departure message. Failure to pass the airborne time will result in the flight plan remaining inactive; consequently, this could result in the destination aerodrome not being aware that alerting action should be taken.

3.5 Action When the Destination Aerodrome has no ATSU or AFTN Link

3.5.1 If a pilot has filed a VFR flight plan to a destination which does not have an active ATSU and is not connected to the AFTN, he is required to pass the ETA, prior to departure, to a 'responsible person' at the destination aerodrome. In the event of the aircraft failing to arrive at the destination aerodrome within 30 minutes of the notified ETA, the 'responsible person' must **immediately** advise the Parent Unit. This action is the trigger by which the Parent Unit will commence alerting action.

3.5.2 Exceptionally, where a pilot is unable to find someone to act as a 'responsible person' at the destination aerodrome, he must contact the appropriate Parent Unit prior to departure and request that it acts in this capacity. Should a pilot need to take this course of action, he will be required to contact the Parent Unit within 30 minutes of landing at the destination to confirm his arrival. Failure to complete this action will automatically result in the Parent Unit initiating alerting action.

4 IFR Flight Plans

4.1 Introduction

4.1.1 The UK is a participating State in the Integrated Initial Flight Plan Processing System (IFPS), which is an integral part of the Eurocontrol centralised Air Traffic Flow Management initiative. The IFPS is the **sole** source for distribution of **IFR/General Air Traffic** (GAT) flight plan information to ATSUs within the participating European States, which collectively comprise the IFPS Zone (see map at ENR 6-1-10-2). Additionally, IFPS provides accurate flight data to the Air Traffic Flow Management (ATFM) elements of the Central Flow Management Unit (CFMU), located at Haren, Brussels.

4.1.2 IFPS will **not** handle VFR flight plans or Operational Air Traffic (OAT) flights; however, it will process the GAT portion(s) of a mixed OAT/GAT flight plan and, similarly, the IFR portion(s) of a VFR/IFR flight plan.

4.1.3 Full details of the procedures relating to IFPS and ATFM are contained within the relevant sections of 'IFPS Users Manual' and 'The CFMU Handbook' which are available, **free of charge,** from:

Eurocontrol Library,
Rue de la Fusee,
96, B - 1130 Brussels,
Belgium.
Tel No: +32-2-729 36 39
Fax No: +32-2-729 91 09

4.2 General Description of IFPS

4.2.1 IFPS comprises 2 IFPS Units (IFPU) sited within the Eurocontrol facilities at Haren, Brussels and at Bretigny, Paris. The IFPS Zone is divided into 2 separate geographical areas, each IFPU having a primary responsibility for one area and a secondary role, for contingency purposes, for the other. All IFR/GAT flight plans and associated messages **must** be addressed to both IFPUs. The primary IFPU will process the flight plan, or associated message, whilst the other will hold both the raw and processed data, to be used in the event of failure of the primary Unit. Following successful processing the flight plan will be delivered, at the appropriate time, to all the ATSU addressees on the flight profiled route within the IFPS Zone.

4.3 Filing of Flight Plans and Associated Messages

4.3.1 Aircraft Operators (AO) are **ultimately** responsible for the complete filing of their IFR/GAT flight plans and associated messages. This encompasses compilation (including addressing), accuracy and submission of flight plans **and also** for the reception of an Acknowledgement (ACK) message from IFPS (see paragraph 4.7.5).

4.3.2 AOs who have the facilities and are prepared to file their own flight plans and associated messages directly with IFPS and any other non - IFPS States affected by the flight (see paragraph 4.5.4) may do so. This is the standard IFPS IFR/GAT flight plan filing procedure and is termed **'direct filing'**.

4.3.3 AOs who, for whatever reason, are unable to conform to the direct filing procedure should make local arrangements to file their IFR/GAT flight plans using one of the following methods:

(a) Through the ATSU at the aerodrome of departure; or

(b) for operators at aerodromes where the ATSU is not connected to the AFTN, or alternatively where there is no ATSU, through the designated Parent Unit.

4.3.4 The occasions on which an Arrival (ARR) message must be issued are minimal (ie, when an aircraft has diverted or when a controlled flight has experienced loss of radio communication). In each instance the responsibility for issuing an ARR message will rest with the ATSU at the landing aerodrome.

4.3.5 Within the UK ATSUs at the aerodrome of departure will continue, when appropriate, to assist in the compilation of flight plans. However, the responsibility, as specified at paragraph 4.3.1, continues to rest with the AO.

4.4 Submission of Flight Plans

4.4.1 Flight Plans should be filed a minimum of **3 hours** before Estimated Off Block Time (EOBT) for North Atlantic flights and those flights subject to ATFM measures, and a minimum of **60 minutes** before EOBT for other flights. (The CFMU has made it known that there is limited flexibility within the system to allow for the handling of special or late notice flights).

4.5 **Addressing of IFR Flight Plans**

4.5.1 **Flights Wholly Within the IFPS Zone.** For IFR/GAT flight plans and associated messages, for flights conducted **wholly** within the IFPS Zone, it will be necessary to address these messages only to the two IFPUs. To further simplify **AFTN** addressing a **single** collective address, **EGZYIFPS**, which covers both IFPUs, has been established. The individual IFPU addresses are:

	AFTN	SITA
Haren	EBBDZMFP	BRUEP7X
Bretigny	LFPYZMFP	PAREP7X

All flight plans and associated messages must be addressed to both IFPUs; this can be achieved by using either the AFTN collective or individual addresses or, alternatively, by using the individual SITA addresses.

4.5.2 **Flights Entering or Overflying the IFPS Zone** For that portion of the flight within the IFPS Zone, only the two IFPUs need to be addressed as in paragraph 4.5.1.

CHAPTER FIFTEEN

REVISION QUESTIONS

Contents

REVISION QUESTIONS

1 A turbine - engined aircraft burns fuel at 200 gals per hour (gph) with a Fuel Density of 0.8. What is the fuel flow if Fuel Density is 0.75?

a. 213 gph
b. 208 gph
c. 200 gph
d. 188 gph

2 AC flying at 7500ft, is cleared to descend to be level at 1000ft, 6nm before reaching a beacon. If ground speed is 156kt and Rate of Descent is 800fpm, how many miles before the beacon should descent begin?

a. 15.0
b. 30.2
c. 27.1
d. 11.1

3 After flying for 16 minutes at 100 kt TAS with a 20 kt tail wind, you have to return to the airfield of departure.
You will arrive after:

a. 10 min 40 sec
b. 20 min
c. 24 min
d. 16 min

4 An aircraft is in cruising flight at FL095, IAS 155 kt.
The pilot intends to descend at 500 ft/min to arrive overhead the MAN VOR at 2000 ft (QNH 1030 hPa).
The TAS remains constant in the descent, wind is negligible, temperature standard. At which distance from MAN should the pilot commence the descent?

a. 42 nm
b. 40 nm
c. 45 nm
d. 48 nm

5 At a fuel check you have 60 US gallons (USG) of useable fuel remaining. Alternative fuel required is 12 USG. The flight time remaining is 1 hour 35 mins. What is the highest consumption rate acceptable?

a. 33.0 USG/Hr
b. 37.9 USG/Hr
c. 30.3 USG/Hr
d. 21.3 USG/Hr

6 ATC require a descent from FL270 to FL160 to be level 6 nm before a VOR.
If rate of descent is 800 feet per minute, mean groundspeed is 256 kt, how far out from the VOR must descent be started?

a 59 nm
b. 65 nm
c. 144 nm
d. 150 nm

7 Given:
Track 355 T, wind velocity 340/30kt, TAS 140kt, total distance A to B 350 nm. What are the time and distance to the point of equal time between A and B?

a. 75 mins,211 nm.
b. 75 mins, 140 nm.
c. 50 mins, 140 nm.
d. 114 mins, 211 nm.

8 The fuel burn - off is 200 kg/hr with a relative fuel density of 0.8. If the relative fuel density is 0.75, the fuel burn will be:

a 267 kg/hr
b. 213 kg/hr
c. 200 kg/hr
d. 188 kg/hr

9 You are flying at FL330, M0.84, OAT -48C, headwind 52 kt. The time is 1338 UTC. ATC clear you to be at 30W (570 nm away) at 1500 UTC. To what Mno do you have to adhere?

a 0.72
b. 0.76
c. 0.80
d. 0.84

10 Where would you find information regarding Customs and Health facilities?

a ATCC broadcasts
b. NOTAMs
c. NAV/RAD supplememnts
d. AIPs

11 Where would you find information regarding Search and Rescue procedures?

a ATCC broadcasts
b. NOTAMs
c. SIGMETs
d. AIPs

12 An aircraft climbs from an airfield, elevation 1500 ft, QNH 1023mb, to FL75. What height does the aircraft have to climb?
(Assume 1mb = 30ft.)

a 6600 ft
b. 7800 ft
c. 6300 ft
d. 6000 ft

13 Given by a met station elevation at 4000ft where QNH is 1003hpa. The minimum obstruction clearance altitude(MOCA) is 8500ft. Assume 30ft per HPa
What is the minimum pressure altitude?

a 1280ft
b. 8500ft
c. 8200ft
d. 8800ft

14 Given:
True track 215; mountain elevation 11,600 ft; local airfield gives QNH as 1035 mb;
Required terrain clearance 1500 ft; temperature ISA - 15C.

Which of the following is the minimum flight level considering the temperature?

a FL150
b. FL140
c. FL120
d. FL110

15 Multi-engined ac on IFR flight.
Given:
trip fuel 65 US Gal;
contingency 5% trip;
Alternate fuel including final reserve 17 US Gal; Useable fuel at departure 93 US Gal. At a point halfway to destination, fuel consumed is 40 US Gal.

Assuming fuel consumption is unchanged, which of the following is correct?

a. At departure Reserve Fuel was 28 US Gal.
b. At destination required reserves remain intact.
c. Remaining fuel is insufficient to reach destination with reserves intact.
d. Remaining fuel is insufficient to reach the destination.

16 Refer to ED-6. You are at position N47 59 E 010 15. Which Flight Information Service should you contact?

a. MEMMINGEN 117.20 MHZ
b. MEMMINGEM 135.60 MHZ
c. MUNCHEN 126.95 MHZ
d. MUNCHEN 131.22 MHZ

17 Refer to Jeppesen Manual ED-6.
An aeroplane is flying VFR and approaching position TANGO (N4837 E00916) at FL55 and on a magnetic track of 090.
The distance from TANGO is 20 nm.
The navigation aid and frequency at TANGO is

a. VORTAC 112.50 kHz
b. DME 112.50 Mhz
c. VOR 112.50 with no DME
d. VORTAC 112.50 Mhz

18 Refer to Jeppesen Manual ED-6.
Flying from position ERBACH (N 4821 E00955) to POLTRINGEN airport (N 4833 E00857).
Find the magnetic course and distance.

a 108/60 nm
b. 252/41 nm
c. 287/41 nm
d. 287/60 nm

19 Refer to Jeppesen Manual ED-6.
Flying from position SIGMARINGEN (N 4805 E00913) to BIBERACH airport (N 4807 E00946).
Find the magnetic course and distance.

a 093/41 nm
b. 086/22 nm
c. 267/22 nm
d. 086/32 nm

20 Refer to Jeppesen Manual ED-6.
Flying VFR from PEITING (47 48N 010 55.5E) to IMMENSTADT (47 33.5N 010 13.0 E) determine the magnetic course.

a 077
b. 243
c. 257
d. 063

21 Refer to Jeppesen Manual ED-6.
Flying VFR from VILLINGEN (N4758 E00831) to FREUDENSTADT (N4828 E00824), determine the distance.

a 54 nm
b. 29 km
c. 29 nm
d. 33 nm

22 Refer to Jeppesen Manual ED-6.
Give the frequency of the GRENCHEN VOR at N4711 E00725.

a 108.65 MHz
b. 326 kHz
c. channel 23
d. 120.1 MHz

23 Refer to Jeppesen Manual ED-6.
Give the frequency of ZURICH Volmet.

a 127.2 Mhz
b. 127.2 Khz
c. 128.525 Mhz
d. 118.1 Mhz

24 Refer to Jeppesen Manual ED-6.
The GRENCHEN LSZG aerodrome (N 4711 E 00725) has a tower frequency of 120.10 Mhz. The "(V)" after the frequency indicates?

a Available on request
b. Only to be used during daylight
c. Available for VFR flight only
d. VDF available

25 Refer to Jeppesen Manual ED-6.
The magnetic track from VILLINGEN (N4803.5 E00827.0) to FREUDENSTADT (N4828.0 E00824.0) is?

a 176
b. 004
c. 185
d. 356

26 Refer to Jeppesen Manual ED-6.
What is the frequency for Stuttgart ATIS?

a 126.12 MHz
b. 128.95 MHz
c. 118.60 MHz
d. 115.45 MHZ

27 Refer to Jeppesen Manual ED-6.
What is the navaid at 48 30N 007 34E?

a VORTAC/NDB
b. NDB
c. TACAN
d. VOR/DME

28 Refer to Jeppesen Manual ED-6.
What navigation or communications facilities are at N 4855 E 00920?

a NDB
b. TACAN
c. VOR/DME
d. VORTAC

29 Refer to Jeppesen Manual ED-6.
What navigation or communications facilities are at N 4822.9 E 00838.7?

a NDB
b. VOR
c. VOR/DME
d. VORTAC

30 The quantity of fuel which is calculated to be necessary for a jet aeroplane to fly IFR from departure to destination aerodrome is 5,325 kg.
Fuel consumption in holding mode is 6 000 kg/hr. Alternate fuel is 4 380 kg. Contingency should be 5% of trip fuel.

What is the minimum required quantity of fuel which should be on board at take-off?

a 13 220kg
b. 14 500kg
c. 13 000kg
d. 13 370kg

31 Turbo-jet ac, flying to an isolated airfield, with no destination alternative. On top of: taxi, trip and contingency fuel, what fuel is required?

a. Greater of 45 mins + 15% of trip or 2 hours
b. 30 mins holding @ 450m AMSL
c. 30 mins holding @ 450m AAL
d. 2 hours at normal cruise consumption

32 CAP697 SEP1 fig 2.5.
For a flight departing from MSL at 3663lb, cruising at FL80 @2300 RPM, 20C lean of peak EGT, in 40kt headwind, calculate endurance.

a 4.75hr
b. 5.3hr
c. 6.1hr
d. 6.55hr

33 Minimum planned take-off fuel is 160 kg (30% total reserve is included). Assume the ground speed on this trip is constant.
When half the distance has been flow, the remaining fuel is 70 kg.

Is it necessary to divert to a nearby alternate?

a. diversion to a nearby alternate is necessary, because the remaining fuel is not sufficient.
b. diversion to a nearby alternate is not necessary, because the reserve fuel has not been used completely.
c. diversion to a nearby alternate is necessary, because it is allowed to calculate the fuel without the reserve
d. diversion to a nearby alternate is necessary, unless the captain decides to continue on his own responsibility.

34 Refer to CAP 697 MRJT Fig 4.4
Given:
DOM - 35,000 kg
Expected Load - 12,000 kg
Contingency, approach and hold fuel - 2,500 kg
Departure aerodrome elevation - 500 feet
Alternate aerodrome elevation - 30 feet

Find (i) Final Reserve Fuel (Jet aircraft) and (ii) Relevant elevation

a. 2360 Alternate elevation
b. 1180 Destination elevation
c. 1180 Alternate elevation
d. 2360 Destination elevation

35 Refer to CAP 697 SEP1, fig 2.1.
Aerodrome elevation 2500 ft, OAT +10C.
Initial weight 3500 lb.
Climb to FL140, OAT -5C.

What are the climb time, fuel, NAM?

a. 22 min, 6.5 g, 46 nam
b. 24 min, 7.5g, 50 nam
c. 2 min, 1.0g, 4 nam
d. 26 min, 8.5g, 54 nam.

36 Refer to CAP 697 SEP1, fig 2.1.
Given:
FL75, OAT +5C,
during climb, average headwind component 20kt,
take-off from MSL with initial mass of 3,650 lbs.

Find time and fuel to climb.

a. 11 min, 3.6 USG
b. 7 min, 2.6 USG
c. 9 min, 2.7 USG
d. 9 min, 3.3 USG

37 Refer to CAP 697 SEP1, fig 2.2.3.
Given:
FL75, OAT +10C,
Lean mixture, 2300 RPM.

Find fuel flow (GPH) gallons per hour and TAS.

a. 11.6 GPH 160 kt
b. 68.5 GPH 160 kt
c. 71.1 GPH 143 kt
d. 11.6 GPH 143 kt

38 Refer to CAP 697 SEP1 fig 2.4
Given:
Aeroplane mass at start up 3663 lbs
fuel load (density 6lbs/gal) 74 gal
Take-off altitude sea level
Headwind 40 kt
Cruise altitude 8000 ft
Power setting full throttle 2300 RPM
20°C lean of peak

Calculate the range

a 633 nm
b. 844 nm
c. 730 nm
d. 547.5 nm

39 Refer to CAP697, SEP1, fig 2.5.
Given: FL75;
Lean mixture; Full throttle/2300 RPM;
Take-off fuel 444 lbs;
Take-off from MSL.

Find endurance in hours.

a. 5 hrs 12 mins
b. 5 hrs 20 mins
c. 4 hrs 42 mins
d. 5 hrs 23 mins

40 The still air distance in the climb is 189 Nautical Air Miles and time 30 minutes. What ground distance would be covered in a 30 kt headwind?

a 189 nm
b. 203 nm
c. 174 nm
d. 193 nm

41 Turbo-jet ac;
taxi fuel 600kg; fuel flow cruise 10,000kg/hr;
fuel flow hold 8,000kg/hr; alternate fuel 10,200kg;
flight time 6 hours; visibility at destination 2000m.

What is the minimum ramp fuel?

a 80,500 kg
b. 79,200 kg
c. 77,800 kg
d. 76,100 kg

42 What is Decision Point Procedures?
It is a procedure to reduce the amount of fuel carried on a flight by:

a. Reducing contingency fuel from 10% to 5% of trip fuel.
b. Reducing contingency fuel to only that required from Decision Point to Destination
c. Reducing trip fuel to only that required from Decision Aerodrome to Destination.
d. Reducing trip distance

43 What is the purpose of Decision Point Procedure?

a. Carry minimum fuel to increase Traffic Load.
b. Increase safety of the flight.
c. Reduce landing mass to avoid stressing the aircraft.
d. To assist in decision making at refuelling

44 When calculating the fuel required to carry out a given flight, one must take into account:

1. the wind
2. foreseeable airborne delays
3. other weather forecasts
4. any foreseeable conditions which may delay landing

The combination which provides the correct statement is:
a 1-3
b. 2-4
c. 1-2-3-4
d. 1-2-3

45 Refer to CAP697 MEP1 fig 3.2.
A flight is to be made in a multi-engine piston aeroplane.
Given:
Cruising level 11000 ft
OAT in the cruise -15C
Usable fuel 123 US gallons
The power is set to economy cruise.

Find the range in NM with 45 min reserve fuel at 45% power.

a 752 nm
b. 852 nm
c. 610 nm
d. 602 nm.

46 CAP697 MRJT1 fig 4.5.2 & 4.5.3.2
For a flight from B to C at FL310. M0.74, ISA - 12C,
957ngm, 40kt tailwind;
weight 50,100kg.

How much fuel is required to fly to C?

a 4,600kg
b. 4,500kg
c. 5,000kg
d. 4,100kg

47 CAP697 MRJT1 fig 4.7.2.
ETOPS - ac can not travel more than 120 minutes from a suitable (sic, should read "Adequate") airfield. Assume LRC and diversion weight of 40,000kg.

What is the still air diversion distance?

a 735
b. 794
c. 810
d. 875

48 Ref CAP697 MRJT1 Fig 4.2 & 4.5.3.2
Estimated take-off mass 57,000 kg. Ground distance 150nm. Temperature ISA-10C. Cruise at M0.74.

What is the optimum cruise altitude and TAS?

a. 25 000ft & 445 kt
b. 33 000 ft & 420 kt
c. 25 000 ft & 435 kt
d. 33 000 ft & 430 kt

49 Ref CAP697 MRJT1, fig 4.5.3.1. Aircraft mass at top of climb 61,500kg. Distance 385 nm. FL350, OAT -54.3.C. Tailwind of 40kt.

Using Long Range Cruise, how much fuel is required?

a 2150kg
b. 2250kg
c. 2350kg
d. 2050kg

50 Refer CAP697 MRJT Fig 4.3.5
Tail wind componet 10kt
Temp ISA -10°C Break release 63,000kg
Trip fuel overall 20,000kg

What is the maximum possible trip distance?

a 3640
b. 3740
c. 3500
d. 3250

51 Refer CAP697 MRJT Fig 4.4
Given:-
Mean gross mass 47000kg
The fuel required for a 45 min holding at race track pattern at 5000ft is..

a 1090
b. 1690
c. 1635
d. 1125

52 Refer to CAP 697 fig 4.1
Given:
Cruise weight 53 000 kg; LRC/ M0.74; cruise at FL310. What is the fuel penalty

a 0%
b. 1%
c. 4%
d. 10%

53 Refer to CAP 697 fig 4.5.1.
Given:
aerodrome at MSL; cruise at FL280; ISA-10C; Brake release mass 57 500 kg. What is the climb fuel required?

a 1100 kg
b. 1150 kg
c. 1138 kg
d. 2200 kg

54 Refer to CAP 697 fig 4.5.1.
Given:
Track 340T; W/V 280/40kt; aerodrome elevation 387 ft; ISA -10C; Brake release mass 52000 kg; cruise at FL280.
What are the climb fuel and time?

a. 15 min, 1100 kg
b. 12 min, 1100 kg
c. 10 min, 1000 kg
d. 11 min, 1000 kg

55 Refer to CAP 697 MRJT fig 4.3.1.
Trip distance 1900 nm, fuel on board 15 000kg, landing weight 50 000kg. What is the minimum pressure altitude for this flight?

a. 17 000 ft
b. 10 000 ft
c. FL370
d. FL250

56 Refer to CAP 697 MRJT1 fig 4.2 and 4.5.3.2.
Given:
Brake release weight 45,000 kg, trip distance 120 nm, temperature ISA-10C, cruise at M0.74.
Find optimum pressure altitude and TAS.

a. FL370 / 424 kt
b. FL250 / 435 kt
c. FL370 / 414 kt
d. FL250 / 445 kt

57 Refer to CAP 697, MRJT1 fig 4.1.
Find the OPTIMUM ALTITUDE for the twin - jet aeroplane. Given: Cruise mass = 54 000 kg,
Long Range Cruise or 0.74 Mach.

a. 35 300 ft
b. 34 500 ft
c. maximum operating altitude
d. 33 800 ft

58 Refer to CAP 697 MRJT1, fig 4.2.
Find the SHORT DISTANCE CRUISE ALTITUDE for the twin - jet aeroplane.
Given: Brake release mass = 45 000 kt, Temperature = ISA + 20C,
Trip distance = 50 Nautical Air Miles (NAM).

a. 11 000 ft
b. 12 500 ft
c. 10 000 ft
d. 7 500 ft

59 Refer to CAP 697 MRJT1 fig 4.3.1.
Given: Tail wind component 45kt
Temperature ISA -10C Cruise altitiude 29,000 ft Landing mass 55,000 kg

For a flight of 2800 ground nautical miles, the (i) trip fuel and (ii) trip time respectively are:

a. (i) 16,000 kg (ii) 6hr 25min
b. (i) 18,000 kg (ii) 5hr 50min
c. (i) 20,000 kg (ii) 6hr 40min
d. (i) 17,100 kg (ii) 6hr 07min

60 Refer to CAP 697, MRJT1 fig 4.3.1C.
For a flight of 2400 ground nautical miles the following apply: Temperature ISA -10C Cruise altitude 29 000 ft Landing mass 45 000 kg
Trip fuel available 16 000 kg

What is the maximum headwind component which may be accepted?

a 35 kt
b. 15 kt
c. 0
d. 70 kt

61 Refer to CAP 697 MRJT1 fig 4.3.3A
Given:
Cruise M0.78, FL 280, 50,000 kg, 200 nms, wind component 30 kt Head. Find the fuel required.

a 1700 kg
b. 1740 kg
c. 1620 kg
d. 1970 kg

62 Refer to CAP 697 MRJT1, fig 4.3.6.
In order to find ALTERNATE FUEL and TIME TO ALTERNATE, the AEROPLANE OPERATING MANUAL shall be entered with:

a. distance in nm, wind component, zero fuel mass
b. distance in nm, wind component, dry operating mass plus holding fuel
c. distance in nm, wind component, landing mass at alternate
d. distance in nm (NAM), wind component, landing mass at alternate.

63 Refer to CAP 697, MRJT1, fig 4.5.1. Given:
Brake release mass = 58 000 kg, Temperature = ISA + 15C.

The fuel required to climb from an airfield at elevation 4 000 ft to FL300 is:

a 1350 kg
b. 1400 kg
c. 1450 kg
d. 1250 kg

64 Refer to CAP 697 MRJT1 fig 4.5.2 & 4.5.3.1.
Given:
Long range cruise at FL340
Distance C-D 3200 nm Temperature deviation from ISA +12C Tailwind component 50 kt
Gross mass at C 55,000 kg

The fuel required C-D is:

a. 17 500 kg
b. 14 200 kg
c. 17 800 kg
d. 14 400 kg

65 Refer to CAP 697 MRJT1, fig 4.5.2 and 4.5.3.4.
Given:
Distance C - D 540 nm
Cruise 300 KIAS at FL210,
Temperature Deviation from ISA = +20C Headwind component = 50 kt
Gross mass at C = 60 000 kg

The fuel required from C to D is:

a. 4 200 kg
b. 4 620 kg
c. 3 680 kg
d. 3 350 kg

66 Refer to CAP 697 MRJT1, fig 4.5.3.1.
Given :
flight time from top of climb to the en route point in FL280 is 48 min. Cruise procedure is long range cruise (LRC), Temperature is ISA - 5C. Take - offf mass = 56 000 kg,
Climb fuel = 1 100 kg.

Find distance in NAM for this leg and fuel consumption.

a. 437 nam, 2100 kg
b. 350 nam, 2000 kg
c. 345 nam, 2000 kg
d. 345 nam, 2100 kg

67 Refer to CAP697, MRJT1, fig 4.1.
Given:
cruise mass 54000 kg; LRC/0.74M. Find Optimum Altitude.

a. 33 800 ft
b. 34 500 ft
c. 35 300 ft
d. maximum operating altitude

68 Refer to CAP697 MRJT1, fig 4.3.1.
Given:
estimated zero fuel mass 50t; estimated landing mass at destination 52 t ; final reserve fuel 2t; alternate fuel 1t; flight to destination, distance 720 nm, true course 030, W/V 340/30; cruise: LRC, at FL330 outside air temperature -30C.
Find estimated trip fuel and time.

a. 4 800 kg / 01hr 45 min
b. 4 400 kg / 02 hr 05 min
c. 4 750 kg / 02 hr 00 min
d. 4 600 kg / 02 hr 05 min

69 Refer to CAP697 MRJT1 fig 4.3.1c.
Within the limits of the data given, a mean temperature increase of 30C will affect the trip time by approximately:

a -5%
b. +5%
c. +8%
d. -7%

70 Refer to CAP697 MRJT1 Fig 4.3.2 A.
Planning a flight from Paris (Charles de Gaulle) to London (Heathrow) for a twin-jet aeroplane. Power setting: M0.74; FL 280; Landing Mass 50,000 kg; Distance to use 200 nm; W/V from Paris to London is 280/40, Mean track 340T.
Find the estimated trip fuel

a 1,550 kg
b. 1,740 kg
c. 1,900 kg
d. 1,450 kg

71 Refer to CAP697 MRJT1 Fig 4.3.3 C
Given:
Twin-jet aeroplane, ground distance to destination 1600 nm, headwind component 50 kt, FL330, cruise 0.78Mach, ISA Deviation +20C and landing mass 55,000 kg. Find fuel required and trip time with simplified flight planning.

a. 12,250 kg, 04 hr 00 min
b. 11,400 kg, 04 hr 12 min
c. 11,600 kg, 04 hr 15 min
d. 12,000 kg, 03 hr 51 min.

72 Refer to CAP697 MRJT1 fig 4.3.5.
Given:
Headwind 50kt; Temperature ISA+10C; Brake release mass 65,000kg; Trip fuel 18,000kg. What is the maximum possible trip distance?

a 3480 ngm
b. 2540 ngm
c. 3100 ngm
d. 2740 ngm

73 Refer to CAP697 MRJT1 fig 4.3.6. Given:
Distance to alternate 400nm Landing mass at alternate 50 000kg
Headwind component 25kt

The alternate fuel required is:

a 2550kg
b. 2800kg
c. 2900kg
d. 2650kg

74 Refer to CAP697 MRJT1, fig 4.3.6.
Given:
DOM 35 500 kg, estimated load 14 500 kg, final reserve fuel 1200 kg,
distance to alternate 95 nm, average true track 219, head wind component 10 kt.

Find fuel and time to alternate.

a. 800 kg / 24 min
b. 1100 kg / 44 min
c. 1100 kg / 25 min
d. 800 kg / 40 min

75 Refer to CAP697 MRJT1 fig 4.4.
Given:
Mean gross mass 47 000kg
The fuel required for 45 minutes holding in a racetrack pattern at 5000ft is:

a 1690kg
b. 1090kg
c. 1635kg
d. 1125kg

76 Refer to CAP697 MRJT1, fig 4.4.
The final reserve fuel taken from the HOLDING PLANNING table for the twin-jet aeroplane is based on the following parameters:

a. pressure altitude, aeroplane mass and flaps up with minimum drag airspeed.
b. pressure altitude, aeroplane mass and flaps down with maximum range speed.
c. pressure altitude, aeroplane mass and flaps up with maximum range speed.
d. pressure altitude, aeroplane mass and flaps down with minimum drag airspeed.

77 Refer to CAP697 MRJT1, fig 4.5.1.
Given:
brake release mass 57 500 kg, temperature ISA - 10C, headwind component 16 kt
initial FL280,

Find: still air distance (NAM) and ground distance for the climb.

a. 67 NAM / 71 nm
b. 59 NAM / 62 nm
c. 62 NAM / 59 nm
d. 71 NAM / 67 nm

78 Refer to CAP697 MRJT1, fig 4.5.1.
Planning an IFR flight from Paris (Charles de Gaulle) to London (Heathrow) for the twin-jet aeroplane.
Given:
Estimated take-off mass 52000 kg, Airport elevation 387 ft, FL280,
W/V 280 / 40 kt, ISA deviation -10C, average true course 340.

Find the time to top of climb.

a 3 min
b. 11 min
c. 12 min
d. 15 min

79 Refer to CAP697 MRJT1 fig 4.5.3.1.
Given:
FL330; COAT -63C; Weight 50500kg, What is TAS?

a 411 kt
b. 433 kt
c. 421 kt
d. 423 kt

80 Refer to CAP697 MRJT1 fig 4.5.3.1.
Given:
Long Range Cruise at FL350
OAT -45C
Gross mass at the beginning of the leg 40,000kg
Gross mass at the end of the leg 39,000kg

Find:True airspeed (TAS) and cruise distance (NAM) for a twin jet aeroplane

a. TAS 433 KT, 227 NAM
b. TAS 423 KT, 227 NAM
c. TAS 433 KT, 1163 NAM
d. TAS 423 KT, 936 NAM

81 Refer to CAP697 MRJT1 fig 4.5.3.1.
LRC FL330 Temp -63C Mass 54100kg time 29 mins
Find the fuel consumed.

a 1207 kg
b. 1191 kg
c. 1100 kg
d. 1000 kg

82 Refer to CAP697 MRJT1 fig 4.5.4.
A descent is planned at 0.74M/250KIAS from 35,000 ft to 5,000 ft.

How much fuel will be consumed during this descent?

a 278kg
b. 290kg
c. 150kg
d. 140kg

83 Refer to CAP697 MRJT1 fig 4.5.4 and Jeppesen Manual LONDON Heathrow 10-2 STAR
Aircraft mass 49,700 kg, FL 280.

Plan a descent to Heathrow elevation. What is the descent time?
a 8 mins
b. 10 mins
c. 17 mins
d. 19 mins

84 Refer to CAP697 MRJT1 simplified flight planning.

Planning a flight from Paris (CDG) to London Heathrow for a twin-jet aeroplane.
The wind from London to Manchester is 250/30 kt; mean track 350; distance 160 nm.
Assume the landing mass at alternate is about 50,000 kg.

Find the alternate fuel and time.

a. 1,200 kg, 20 mins
b. 1,300 kg, 28 mins
c. 1,600 kg, 36 mins
d. 1,450 kg, 32 mins

85

DOM	2800kg
Trip	300
Payload	400
MTOM	4200
MLM	3700

What is maximum fuel load?

a 700 kg
b. 1000 kg
c. 800 kg
d. 500 kg

86 Given:
DOM 33,510kg; Traffic load 7,600kg. Trip fuel 2040kg. Final reserve 983kg.
Alternative fuel 1100kg. Contingency 5% of trip fuel.

Which of the following is correct?

a. est landing mass at destination 43,193kg
b. est landing mass at destination 43,295kg
c. est take-off mass 43,295kg
d. est take-off mass 45,233kg

87 Given:
Dry Op Mass = 33510 kg
Load = 7600kg
Final reserve fuel = 983 kg Alternate fuel = 1100 kg Contingency fuel = 102 kg.

The estimated landing mass at the alternate should be:

a 42312 kg
b. 42093 kg
c. 42210 kg
d. 42195 kg

88 MTOM 64 400 kg MLM 56 200 kg MZFM 53 000 kg DOM 35 500 kg Load 14 500 kg Trip fuel 4 900 kg T/O fuel 7 400 kg

Maximum additional load is?

a. 3 000 kg
b. 4 000 kg
c. 5 600 kg
d. 7 000 kg

89 MTOM 64400kg MLM 56200kg MZFM 53300kg DOM 35500kg
Traffic load 14500kg Trip fuel 4900kg Minimum takeoff fuel 7400kg

What is the maximum allowable takeoff fuel?

a 11400 kg
b. 14400 kg
c. 8600 kg
d. 11100 kg

90 Planning a flight from Paris (Charles-de-Gaulle) to London (Heathrow) for a twin-jet aeroplane.

Preplanning:
Maximum take-off mass = 62 800 kg Maximum Zero Fuel Mass = 51 250 kg
Maximum Landing Mass = 54 900 kg Maximum Taxi Mass = 63 050 kg
Assume the following preplanning results: Trip fuel = 1 800 kg
Alternate fuel = 1 400 kg
Holding fuel (final reserve) = 1 225 kg Dry Operating Mass = 34 000 kg
Traffic Load = 13 000 kg Catering = 750 kg
Baggage = 3 500 kg

Find the Take-off Mass.

a. 55 765 kg
b. 51 425 kg
c. 52 265 kg
d. 51 515 kg

91 Reference computer flight plans. Are they able to account for bad weather in calculating fuel required?

a. can automatically allow extra consumption for anti-icing use
b. can automatically divert route around forecast thunderstorms
c. no
d. can automatically allow for poorly maintained engines

92 Which statements are correct about computer flight plans?

1). They can file the flight plan for you.
2). In the event of an in-flight re-routing computer automatically generates a new flight plan.

a 1 only
b. 2 only
c. Neither
d. Both

93 A METAR reads:SA 1430 35002KT 7000 SKC 21/03 Q1024. Which of the following information is contained in this report?

a Day, month
b. Runway in use
c. Temperature, dewpoint
d. period of validity

94 BIRMINGHAM EGBB/BHX
SA0850 280850 18014kt 9999 SCT024 BKN030 BKN045 12/08 Q1011=
FC0600 280600Z 280816 190015G27kt 9999 BKN025 TEMPO 0812 5000 - DZ BKN012
BECMG 1214 19022G37=
FT0400 280434Z 281212 19022G37 9999 BKN025 TEMPO 1902 5000 RA BKN010
BECMG 2201 25007kt

Refer to weather information for Birmingham, above. What is the total time for which the weather is forecast?

a 9 hours
b. 18 hours
c. 24 hours
d. 28 hours

95 BIRMINGHAM EGBB/BHX
SA0850 280850 18014kt 9999 SCT024 BKN030 BKN045 12/08 Q1011= FC0600 280600Z
280816 190015G27kt 9999 BKN025 TEMPO 0812 5000 - DZ BKN012 BECMG 1214
19022G37=
FT0400 280434Z 281212 19022G37 9999 BKN025 TEMPO 1902 5000 RA BKN010
BECMG 2201 25007kt

Refer to weather information for Birmingham, above. What is the lowest visibility forecast at 280800Z?

a 50 km
b. 5000m
c. 10 km or more
d. 2500m

96 Given the following TAF / METAR:

Bordeaux / Merignac
LFBD / BOD
SA1330 121330Z 21005KT 9000 FEW030TCU FEW 033CB SCT040 BKN100 09/08
Q1005 TEMPO 25015G25KT 3000 TSRA SCT005 BKN015CB=
FC1100r 121100Z 121221 28010KT 9999 -RA SCT020 FEW025CB SCT040 TEMPO
1218 25015G25KT 6000 SHRA SCT008 SCT020CB BKN033 PROB30 TEMPO 1218
28020G30KT 3000 TSRA SCT005 BKN015CB BECMG 1821 22004KT 8000 NSW FEW006 BKN030=
FT1000 121000Z 121812 30010KT 9999 SCT020 FEW025CB BKN040 BECMG 1822
22004KT 8000 FEW006 BKN030 BECMG 0306 24005KT 6000 SCT007 SCT015 BKN090
BECMG 1012 -RA=

What maximum windspeed (kt) is forecast for BORDEAUX / MERIGNAC AT 1600 UTC?

a 10
b. 5
c. 30
d. 25

97 Given the following TAF / METAR:
JOHANNESBURG/JAN SMUTS FAJS/JNB
FT0900 120900Z 121212 36010KT 9999 FEW030CB FEW035 PROB40 TEMPO 1318
VRB15KT 3000 TSRA SCT030CB BKN080 FM2000 03005KT CAVOK BECMG 0204
SCT008 SCT100 PROB30 0305 3000 BCFG BKN004 FM0800 34012KT 9999 SCT025
T25/12Z T15/03Z T27/12Z=

What are the lowest cloud conditions (oktas/feet) forecast for JOHANNESBURG/JAN SMUTS at 0300 UTC?

a. 5 to 7 at 800
b. 3 to 4 at 800
c. 5 to 7 at 400
d. 3 to 4 at 400

98 Given the following TAF / METAR:

LYONS/SATOLAS LFLL/LYS
SA1330 121330Z 14007KT 9000 -TSRA FEW020CB SCT033TCU BKN046 09/07 Q1003
NOSIG=
FC1100r 121100Z 121221 VRB03KT 9999 FEW010 SCT020 BKN040 BECMG 1821
33006KT TEMPO 1221 VRB15G20KT 4000 SHRA SCT008 BKN015=
FT1000 121000Z 121812 33004KT 9999 SCT025 BKN060 BECMG 2224 VRB02KT 8000
SCT010 SCT020 BECMG 0204 1500 BR BKN003 TEMPO 0407 0800 FG OVC002
BECMG 0810 33006KT 9999 SCT015 BKN030=

Which best describes the weather, if any, at Lyon / Satolas at 1330 UTC?

a. nil
b. Frequent rain showers
c. Fog
d. Light rain associated with thunderstorms

99 Refer to Appendix A.
At position 37.7N 15.0E what is the worst hazard which could be expected?

a. Engine flame-out and windscreen damage
b. turbulence
c. reduced visibilty
d. nil

100 Refer to Appendix A
In the vicinity of Paris (N49 E003), the tropopause is at about

a. FL340
b. FL400
c. FL350
d. FL380

101 Refer to Appendix A.
In the vicinity of WARSAW (52N 020E) the tropopause is at about FL

a. 400
b. 370
c. 350
d. 330

102 Refer to Appendix A.
Over PRAGUE (50N 014E) the lowest FL listed which is unaffected by CAT is:

a. 350
b. 300
c. 270
d. 400

103 Refer to Appendix A
The surface system over London (51N 000E) is a/ an

a. cold front moving west
b. warm front moving north
c. stationary occluded front
d. occluded front moving east

104 Refer to Appendix A.
What CAT is forecast overhead Benghazi (32N 020E)?

a. slight
b. moderate
c. light
d. severe

105 Refer to Appendix A
What is the maximum wind speed over Italy?

a. 100 kt at FL380
b. 110 kts at FL380 but the maximum not shown on the chart
c. 110 kts at FL380
d. 130 kts at FL340

106 Refer to Appendix A.
What is the most likely icing to be found at FL180 overhead Casablanca (33N 008W)?

a slight
b. moderate
c. severe
d. light

107 Refer to Appendix A.
What is the wind associated with Munich?

a. Maximum wind of 160 kt from 360T
b. Maximum wind of 120 kt from 360T
c. Maximum wind of 100 kt from 360T
d. Maximum wind of 140 kt from 290T

108 Refer to Appendix A
Which describes the maximum intensity of icing, if any, at FL180 in the vicinity of Casablanca (N33 W008)

a Severe
b. Moderate
c. Light
d. Nil

109 Refer to Appendix A .
Which of the following flight levels, if any, is forecast to be clear of significant cloud, icing and CAT along the marked route from SHANNON (53N 10W) to BERLIN (53N 13E)?

a None
b. FL290
c. FL210
d. FL250

110 Refer to Appendix B
The approximate mean wind component at Mach 0.78 along the true course 270 at N50 from 000 to 010W is

a. 25 kt tailwind component
b. 55 kt headwind component
c. 35 kt tailwind component
d. 40 kt headwind component

111 Refer to Appendix B.
The approximate mean wind component (kt) along the true course 180 from 50N to 40N at 020E is:

a. 55 kt tailwind
b. 40 kt tailwind
c. 70 kt tailwind
d. 55 kt headwind

112 Refer to Appendix B.
The W/V (degrees/ knots) at 60N 040E is:

a 085/60
b. 050/60
c. 230/60
d. 265/60

113 Refer to Appendix B.
What is the temperature deviation (degrees C) from ISA over 60N 000E?

a -9
b. -55
c. +2
d. +9

114 Refer to Appendix B
What mean temperature (C) is likely on a course360 (T) from N40 to N50 at E040

a -47
b. -46
c. -49
d. -50

115 TAF EDDH ISSUED AT 042200
EDDH 0624 21010KT CAVOK BECMG 0810 9999 SCT025 SCT040
PROB30 TEMPO 1218 7000 -RADZ BKN012 BECMG 1620 7000 BKN020
TEMPO 1824 4000 RADZ BKN005

Refer to the TAF above.
What are the lowest cloud conditions forecast for 1900 UTC at HAMBURG (EDDH)?

a. 5 to 7 at 1200 ft
b. 3 to 4 at 500 ft
c. 5 to 7 at 500 ft
d. 5 to 7 at 2000 ft

116 A flight is planned from L to M, distance 850 nm. Wind component out is 35 kt(TWC) ,
TAS 450 kt. Mean fuel flow out is 2500 kg/hr,
mean fuel flow inbound is 1900 kg/hr and the fuel available is 6000 kg.

The time and distance to PSR is :

a. 1 hr 30 min, 660 nm
b. 1hr 30 min, 616 nm
c. 1 hr 16 min, 606 nm
d. 1 hr 16 min, 616 nm

117 Find the distance to the POINT OF SAFE RETURN (PSR).
Given:
Maximum useable fuel = 15 000 kg, minimum reserve fuel = 3 500 kg,
Outbound: TAS 425 kt, head wind component = 30 kt, fuel flow = 2150 kg/hr.
Return: TAS 430kt, tailwind component = 20 kt, fuel flow = 2150 kg/hr.

a 1491 nm
b. 1125 nm
c. 1143 nm
d. 1463 nmb

118 Given:
15,000 kg total fuel, reserve 1,500 kg, TAS 440 kt,
wind component 45 head outbound, average fuel flow 2150 kg/hr.

What is the distance to the point of safe return?

a 1520 nm
b. 1368 nm
c. 1702 nm
d. 1250 nm

119 Given:
fuel flow 2150 kg/hr,
total fuel in tanks 15,000 kg,
fuel reserve required on arrival 3500 kg, TAS outbound 420 kt, wind -30 kt,
TAS home bound 430 kt, wind +20 kt.

Find the time to Point of Safe Return.

a. 2 hr 06 min
b. 1 hr 26 min
c. 3 hr 33 min
d. 2 hr 52 min

120 Given:
Safe endurance = 5 hours
True track = 315
W/V = 100/20
TAS = 115

What is distance to PSR?

a 205 nm
b. 100 nm
c. 282 nm
d. 141 nm

121 Distance between airports = 340 nm
True track = 320
W/V = 160/40
TAS = 110

Distance to PET is:

a 121 nm
b. 219 nm
c. 112 nm
d. 228 nm

122 Flying from A to B, 270 nm, true track 030, wind velocity 120/35, TAS 125 kt.

What are the distance and time to the Point of Equal Time?

a. 141 nm, 65 min
b. 141 nm, 68 min
c. 135 nm, 68 min
d. 150 nm, 65 min.

123 Given:
Course A to B 088(T) Distance 1250 nm Mean TAS 330kt
Mean W/V A to B 340/ 60kt

The time from A to the Point of Equal Time between A and B is:

a. 1 Hour 54 minutes
b. 1 Hour 44 minutes
c. 1 hour 39 minutes
d. 2 hours 02 minutes

124 Given:
distance A to B = 2050 nm. Mean groundspeed "on" = 440 kt
Mean groundspeed "back" = 540 kt

The distance to the point of equal time (PET) between A and B is:

a 1153 nm
b. 1025 nm
c. 920 nm
d. 1130 nm

125 If CAS is 190 kt, altitude 9000 ft, temperature ISA -10C True course 350, W/V 320/40,
distance from departure to destination is 350 nm endurance 3 hrs,
actual time of departure is 1105 UTC.

The PET is reached at:

a 1233 UTC
b. 1221 UTC
c. 1214 UTC
d. 1203 UTC

126 If CAS is 190 kt, altitude 9000 ft, temperature ISA - 10C
true course 350, W/V 320/40 distance from departure is 350 nm, endurance 3 hours.

The distance to PET is?

a 203 nm
b. 170 nm
c. 211 nm
d. 330 nm

127 An appropriate flight level for IFR flight in accordance with semi-circular height rules on a course of 180 degrees magnetic is:

a FL105
b. FL90
c. FL95
d. FL100

128 For an IFR flight using ICAO semi-circular cruising levels on a magnetic track of 200, which is a suitable level?

a FL290
b. FL300
c. FL310
d. FL320

129 Refer to Appendix C and Jeppesen E(HI)4 SID Paris (Charles de Gaulle) 20-3.
Planning an IFR flight from Paris to London (Heathrow) for the MRJT. Departure SID ABB 8A. Assume variation 3 W
Determine the magnetic course, ground speed and wind correction angle from TOC to ABB 116.6

a. MC 349, GS 416 kt, WCA -5
b. MC 169, GS 416 kt, WCA +5
c. MC 349, GS 416 kt, WCA +5
d. MC 169, GS 450 kt, WCA +4

130 Refer to Jeppesen E(LO)1
What is the NBD serving Belfast City airport?

a. BEL 117.2 MHz
b. OY 332 KHz
c. HB 420 KHz
d. BEL 117.2 KHz

131 Refer to Jeppesen E(LO)6
Airways routing between CHEB (OKG - N5003.3 E01224.4) to RODING (RDG - N4902.4 E01231.6).
Which is the lowest usable Flight Level?

a FL 40
b. FL 70
c. FL 80
d. FL 50

132 Refer to Jeppesen Manual AMSTERDAM SCHIPOL 11-6. ILS DME RWY 22.
Complete the blanks for the missed approach:
"Turn .... on track......climbing to..... (.....)"

a. left, 005, 2000' 2012'
b. left, 266, 2000' 2102'
c. right, 240, 2000' 2011'
d. left, 160, 2000' 2014

133 Refer to Jeppesen Manual, any SID chart for London Heathrow.
Which of the following is the correct Minimum Safe Altitude (MSA) for the airport?

a. East sector 2300 ft within 50 nm
b. West sector 2300 ft within 25 nm
c. East sector 2100 ft within 50 nm
d. West sector 2100 ft within 25 nm

134 Refer to Jeppesen Manual chart E(HI) 4 FOR EXAMS.
An aeroplane has to fly from about 10 nm south east of Salzburg (N4800 E01254) to Klagenfurt (N4636 E01434).
Which statement is correct?

a. The minimum obstacle clearance altitude (MOCA) on this route is 10800 ft AMSL
b. The minimum Enroute Altitude (MEA) is 13400 ft
c. The minimum sector altitude (MSA) is 13400 ft
d. The minimum grid safe altitude is 13400 AMSL.

135 Refer to Jeppesen Manual chart E(HI)4 For exams.
An appropriate flight level for flight on airway UG1 from ERLANGEN ERL 114.9 (4939N 01109E) to FRANKFURT FFM 114.2 (5003N 00838E) is:

a FL300
b. FL290
c. FL310
d. FL320

136 Refer to Jeppesen Manual chart E(HI)4 FOR EXAMS.
The magnetic course and distance from ST PREX SPR 113.9 (N4628 E00627) to FRIBOURG FRI 115.1 (N4647 E00714) on airway UG60.

a. 048 / 46 nm
b. 061 / 37 nm
c. 061 / 28 nm
d. 041 / 78 nm

137 Refer to Jeppesen Manual chart E(HI)4 FOR EXAMS.
The radio aid at STAD (N5145 E00415) is:

a. a NDB , frequency 386 kHz
b. a VOR frequency 386 Mhz
c. a VOR/DME on channel 386
d. a TACAN on channel 386.

138 Refer to Jeppesen Manual chart E(HI)4 FOR EXAMS.
The radio aid at ZURICH (N4737 E00849) is:

a. a NDB , frequency 115.0 kHz
b. a VOR , frequency 115.0 MHz
c. a VOR/DME, frequency 115.0 MHz
d. a TACAN on channel 11

139 Refer to Jeppesen Manual chart E(HI)5 FOR EXAMS.
An appropriate FL for flight along airway UG5 from MENDE-NASBINALS MEN 115.3 (N4436 E00310) to GAILLAC GAI 115.8 (N4357 E00150) is:

a FL280
b. FL290
c. FL300
d. FL310

140 Refer to Jeppesen Manual chart E (HI) 5.
The magnetic course and distance from LIMOGES LMG 114.5 (N45.49 E001.02) to CLERMONT FERRAND CMF 117.5 (N45.47 E003.11) on airway UG22 are:

a. 046 / 70 nm
b. 067 / 122 nm
c. 113 / 142 nm
d. 094 / 90 nm

141 Refer to Jeppesen Manual chart E(LO)1.
The magnetic course / distance from WALLASEY WAL 114.1 (N5324 W00308) to LIFFY (N5329 W00530) on airway B1 are:

a. 279 / 114 nm
b. 279 / 85 nm
c. 311 / 114 nm
d. 311 / 85 nm

142 Refer to Jeppesen Manual chart E(LO)5.
The airway intersection at RONNEBY (N5618 E01516) is marked by:

a. a fan marker callsign LP
b. a TACAN callsign RON
c. a NDB callsign N
d. a NDB callsign LF

143 Refer to Jeppesen Manual chart E (LO) 5.
The magnetic course/ distance from EELDE EEL 112.4 (N5310 E00640) to WELGO (N5418 E00725) on airway A7 are:

a. 024 / 023 / 73 nm
b. 024 / 023 / 47 nm
c. 024 / 023 / 67 nm
d. 037/ 038/ 50 nm

144 Refer to Jeppesen Manual E(HI)3.
Are the VOR and TACAN navaids at OSNABRUCH (N52 12 E008 17) co-located?

a Yes
b. VOR/DME only
c. VOR/NDB only
d. No

145 Refer to Jeppesen Manual E(HI)4 for exams.
An aeroplane has to fly from Abbeville (50 08.1N 001 51.3E) to Biggin (51 19.8 0000.2E).
At Biggin you can find 141. This is:

a. The average true course of the great circle from Biggin to Abbeville
b. The magnetic course to fly inbound to Biggin
c. The magnetic great circle course from Biggin to Abbeville
d. The radial, referenced to true north, of Biggin to fly inbound.

146 Refer to Jeppesen Manual E(HI)4 for Exams.
Flying from ABBEVILLE (N5008.1 E00151.3) by UA20 to BIGGIN (N5119.8 E00002.2).
What is the first suitable IFR FL above FL295

a 300
b. 310
c. 320
d. 330

147 Refer to Jeppesen Manual E(HI)4 for exams.
For a flight from Paris Charles de Gaulle to London Heathrow, what is the average true course?

a 320
b. 300
c. 120
d. 140

148 Refer to Jeppesen Manual E(HI)4 for exams.
Of the following, the preferred airways routing from FRANKFURT FFM 114.2 (50 03N 00838E) to KOKSY (51 06N 002 39E) above FL245, on a Wednesday is :

a. UR10 NTM UB6 BUB ATS
b. UG108 SPI UG1
c. UB69 DINKI UB6 BUB ATS
d. UG1

149 Refer to Jeppesen Manual E(HI)4 for exams.
The magnetic course/ distance from DINKESBUHL DKB 117.8 (49 09N 010 14E) to ERLANGEN ERL 114.9 (49 39N 011 09E) on airway UR11 are:

a. 052/ 97 nm
b. 050/47nm
c. 133/85nm
d. 230/97nm

150 Refer to Jeppesen Manual E(HI)4 for exams.
The magnetic course and distance from SALZBURG SBG 113.8 (N48 00 E012 54) to STAUB (N48 44 E 012 38) on airway UB5 is:

a. 346/ 43 nm
b. 166/ 64 nm
c. 346/ 64 nm
d. 346/ 45 nm

151 Refer to Jeppesen Manual E(HI)4 for exams.
What is the best route from CLACTON CLN (N51 50.9 E001 09.0) to MIDHURST MID (N51 03.2 W000 37.4)?

a UR12
b. TRIPO UR1 LAM UR1
c. UR123
d. UB29 LAM UR1

152 Refer to Jeppesen Manual E(HI)4 for exams.
What is the lowest continuous MEA from WALLASEY (N53 23.5 W003 08.0) to MIDHURST (N51 03.2 W000 37.4) on UA34?

a FL245
b. FL290
c. 5 300 ft
d. 16 800 ft

153 Refer to Jeppesen Manual E(HI)5 for exams.
Given Leg MOULINS (N46 42 E003 38.0)/ DIJON (N47 16.3 E005 05.9).
Find route designator and distance.

a. UG12, 69nm
b. D, 44 nm
c. UG21, 26nm
d. Direct route, 69 nm

154 Refer to Jeppesen Manual E(HI)5 for Exams.
On a flight from AMBOISE (N4725.7 E00103.9) to AGEN (N4353.3 E00052.4)
What is the best airway route above FL200?

a. UB19 POI UB195
b. UH40 FOUCO UH20 PERIG UA34
c. UA34
d. UB19 CGC UA25

155 Refer to Jeppesen Manual E(HI)5 for Exams.
The minimum en route altitude available on airway UR160 from NICE NIZ 112.4 (43 46N 007 15E) to BASTIA BTA 116.2 (42 32N 009 29E) is

a FL250
b. FL260
c. FL210
d. FL200

156 Refer to Jeppesen Manual E(HI)5 for exams.
What radio navaids are shown at CHIOGGIA (45 04N E012 16)?

a. VOR/DME freq 114.1, NDB freq 408
b. VOR freq 114.1, TACAN freq 408
c. VOR freq 114.1, TACAN channel 408
d. VOR/DME 114.1, DME freq 408

157 Refer to Jeppesen Manual E(LO)1.
From SHANNON (N5243.3 W00853.1) by W13 to KORAK. What is meant by "5000" by the route centreline ?

a. MORA 5000 FT
b. MAA 5000 FT
c. MOCA 5000 ft
d. MEA 5000 ft

158 Refer to Jeppesen Manual E(LO)1.
The minimum en-route altitude that can be maintained continuously on airway G1 from STUMBLE 113.1 (5200N 00502W) to BRECON 117.45 (5143N 00316W) is:

a FL80
b. FL110
c. 4100 ft AMSL
d. 2900 ft AMSL

159 Refer to Jeppesen Manual E(LO)1.
What navaids are shown at TOPCLIFFE (N5412.2 W00122.4)?

a. TACAN only, channel 84, TOP
b. TACAN and VOR, channel 84, 113.7, TOP
c. NDB 92 KHz, AB
d. VOR, 113.7 MHz, TOP

160 Refer to Jeppesen Manual E(LO)1.
What radio navigation aid is at SHANNON (52 43N 008 53W)?

a. VOR SHA 113.3 MHz only
b. VOR DME SHA 113.3 MHz
c. NDB frequency 353 kHz
d. TACAN frequency 113.3 kHz

161 Refer to Jeppesen Manual E(LO)2.
What is the lowest MEA that can be flown continuously between Jersey (N4913.3W00202.7) and LIZAD (N4935.4 W00420.3)?

a FL140
b. 1000 ft
c. FL60
d. 2800 ft

162 Refer to Jeppesen Manual E(LO)5.
Fly by G9 from SUBI (N5222.8 E01435.3) to CZEMPIN (N5207.9 E01643.7).
What is a suitable FL?

a FL050
b. FL060
c. FL070
d. FL080

163 Refer to Jeppesen Manual E(LO)5
OSNABRUCH VOR and TACAN (52 12N 008 17E).
What can be said about the VOR and TACAN?

a. They are frequency paired
b. They are not frequency paired
c. They are frequency paired and have the same ident
d. They are not frequency paired and have different idents.

164 Refer to Jeppesen Manual
E(LO)5. See DENKO (N52 49 E015 50)
What does "440 DRE" mean?

a. 440 kHz plus ident
b. 440 kHz plus ident only when BFO switched on
c. 440 kHz plus ident only when BFO switched off
d. 440 MHz plus ADF only when BFO off

165 Refer to Jeppesen Manual E(LO)5.
What is the lowest MEA that can be flown continuously between RONNE (5504.0 E01445.7) and DOXON (N5526.9 E01810.0)?

a FL100
b. 1000 ft
c. FL60
d. 2500 ft

166 Refer to Jeppesen Manual instrument approach chart:
LONDON HEATHROW ILS DME Rwy 09R (11-1).
The Minimum Descent Altitude (MDA) for an ILS approach, glide slope out, is:

a 405 ft
b. 480 ft
c. 275 ft
d. 200 ft

167 Refer to Jeppesen Manual instrument approach chart ZURICH ILS Rwy 16 (11-2).
The lowest published authorised RVR for an ILS approach, glide slope out, all other aids serviceable, aeroplane category A, is:

a 800m
b. 600m
c. 720m
d. 1500m

168 Refer to Jeppesen Manual LONDON HEATHROW ILS DME Rwy 09L (11-2).
The decision altitude for an ILS straight-in landing is:

a 480 ft
b. 280 ft
c. 200 ft
d. 400 ft

169 Refer to Jeppesen Manual, London page 10-2D, Ockham STARs.
At Ockham what are the lowest holding level and maximum speed?

a. 7000 ft, IAS 250kt
b. 7000 ft, IAS 220 kt
c. FL140, IAS 220 kt
d. FL140, IAS 250 kt

170 Refer to Jeppesen Manual MADRID BARAJAS 10-2B STAR.
Approaching the airfield from the South using UR10.
What is the Initial Approach Fix for ILS RWY 33 ?

a VTB VOR
b. CJN VOR
c. CENTA
d. MOTIL

171 Refer to Jeppesen Manual MADRID, BARAJAS page 11-1. ILS DME Rwy 33.
What is the minimum altitude for glideslope interception?

a 3500 ft
b. 4000 ft
c. 2067 ft
d. 1567 ft

172 Refer to Jeppesen Manual MUNICH ILS Rwy 26R (11-4).
The ILS frequency and identifier are:

a 108.7 IMNW
b. 108.7 IMSW
c. 108.3 IMNW
d. 108.3 IMSW

173 Refer to Jeppesen Manual MUNICH NDB DME Rwy 26L approach (16-3)
The frequency and identifier of the NDB for the published approaches are:

a 112.3 MUN
b. 108.6 DMS
c. 338 MNW
d. 400 MSW

174 Refer to Jeppesen Manual Munich SID (10-3D).
Which is the correct departure via KEMPTEN from runway 26L?

a KEMPTEN THREE ECHO
b. KEMPTEN FIVE SIERRA
c. KEMPTEN THREE QUEBEC
d. KEMPTEN THREE NOVEMBER

175 Refer to Jeppesen Manual Munich STAR plates.
With an easterly surface wind, approaching from the west, to Munich via the TANGO VOR. Which is the best STAR and its associated IAF (Initial Approach Fix)?

a. Kempten 2T / BETOS
b. NDG 1T / ROKIL
c. RODING 1R / MOOSBURG
d. AALEN 1T / ROKIL

176 Refer to Jeppesen Manual Paris Charles-de- Gaulle, (21-7), ILS rwy 10.
What is the ILS course?

a 088
b. 100
c. 118
d. 268

177 Refer to Jeppesen Manual SID chart for AMSTERDAM ARNEM (10-3B).
The route distance from DER 27 to ARNEM is:

a 67 nm
b. 35 nm
c. 59 nm
d. 52 nm

178 Refer to Jeppesen Manual SID chart for AMSTERDAM SCHIPOL (10-3).
Which statement is correct for ANDIK departures from runway 19L?

a. Maximum IAS 250kt turning left at SPL 3.1 DME
b. Cross ANDIK below FL60
c. Contact SCHIPOL DEPARTURE 119.05 passing 2000 ft and report altitude
d. The distance to ANDIK is 25 nm.

179 Refer to Jeppesen Manual, SID charts for Paris Charles-de- Gaulle.
What is the distance to Abbeville on SID ABB 8 A?

a 72 nm
b. 74 nm
c. 72.5 nm
d. 74.5 nm

180 Refer to Jeppesen Manual STAR 10-2 and instrument approach chart 11-4 ILS/DME Rwy 27R for London Heathrow.
Planning an IFR flight from Paris to London (Heathrow).
Name the identifier and frequency of the initial approach fix (IAF) of the BIG2A arrival route.

a. EPM 316 kHz
b. BIG 115.1 kHz
c. BIG 115.1 MHz
d. OCK 115.3 MHz

181 Refer to Jeppesen Manual STAR charts PARIS (Charles-de-Gaulle) (20-2).
The route distance from CHIEVRES (CIV) to BOURSONNE (BSN) is:

a 73nm
b. 83 nm
c. 88 nm
d. 96nm

182 Refer to Jeppesen SPM, Paris, France plate 21-8 (ILS Rwy 10) What is the localiser course?

a 278
b. 088
c. 108.7
d. 178

183 Refer to the Zurich 10 - 2 STAR plate
On the BLM 2Z STAR, what is the routing to EKRON?

a. From Denel Int, proceed to Sopim Int, intercept BLM 111 radial to Golke Int, intercept TRA 247 radial inbound (HOC 067 radial) to Ekro
b. Leave HOC VORDME on 067 radial (TRA 067 radial inbound) to Ekron
c. Leave WIL VORDME on 018 radial to Ekron
d. Leave BLM VORDME on 111 radial toGolke Int, intercept TRA 247 radial inbound (HOC 067 radial) to Ekron

184 Unless otherwise stated on charts for standard instrument departures the routes shown are given with:

a magnetic headings
b. True course
c. magnetic course
d. true headings

185 Refer to Jeppesen Manual 5AT(HI)
Flying from 80N 170E to 75N 11E. Initial track is 177 grid.
What is the initial true track?

a 177
b. 357
c. 347
d. 167

186 Refer to Jeppesen Manual chart 5 AT(HI).
The initial true course from A (65N 006E) to C (62N 020W) is:

a 272
b. 266
c. 256
d. 246

187 Refer to Jeppesen Manual chart 5 AT(HI).
What is the initial grid track from Stornoway (N5812.4 W00611.0) to Keflavik (N6400 W02240)?

a 320
b. 140
c. 313
d. 133

188 Refer to Jeppesen Manual chart 5AT(HI)
Route PTS P from VIGRA (N6233.2 E00602.2) to ADOBI (N6830.0 E00300.0).
What is the grid track?

a 353
b. 344
c. 173
d. 349

189 Refer to Jeppesen Manual chart NAP.
The initial magnetic course from A (64N 006E) to C (62N 020W) is:

a 275
b. 267
c. 271
d. 262

190 Refer to Jeppesen Manual North Atlantic Plotting chart.
Flying from A (N58 E004) to B (N62 W020).
What is the great circle distance?

a 775 nm
b. 755 nm
c. 740 nm
d. 720 nm

191 A "current flight plan" is:

a. flight plan in the course of which radio communication should be practised between aeroplane and ATC
b filed flight plan
c. flight plan with the correct time of departure
d. filed flight plan with amendments and clearances included.

192 A repetitive flight plan (RPL) is filed for a scheduled flight: Paris-Orly to Angouleme, Paris-Orly as alternate.
Following heavy snow falls, Angouleme airport will be closed at the expected time of arrival.The airline decides before departure to plan a re-routing of that flight to Limoges.

a. It is not possible to plan another destination and that flight has to be simply cancelled that day (scheduled flight and not chartered)
b. The airline's Operations department has to transmit a change to the RPL to the ATC office, at least half an hour before the planned time of departure.
c. The pilot-in-command must advise ATC of his intention to divert to Limoges at least 15 minutes before the planned time of arrival.
d. The RPL must be cancelled for that day and an individual flight plan must be filed.

193 An aircraft in the cruise has a calibrated airspeed of 150 kt, a true airspeed of 180 kt and an average ground speed of 210 kt.
The speed box of the flight plan must be filled as follows:

a K0210
b. N0150
c. N0180
d. K0180

194 For a flight plan filed before flight, the indicated time of departure is:

a. the time overhead the first reporting point after take-off
b. the time at which the flight plan is filed.
c. The estimated off-block time.
d. The time of take-off.

195 For a radio equipped aircraft, the identifier in the ATS flight plan item 7 must always:

a. be the RTF callsign to be used
b. include the aircraft registration
c. include the operating agency designator
d. include an indication of the aircraft type

196 For which flights are Flight Plans required?

i). IFR flights.
ii). IFR and VFR flights.
iii). Flights crossing national boundaries. iv). Flights over water.
v). Public transport flights.

a. ii, iii and iv
b. i, iii and v
c. i and iii
d. ii, iii, i and v

197 Given:
Maximum Certificated take-off mass 137 000 kg
Actual take-off mass 135 000 kg

For item 9 of the ATS flight plan the wake turbulence category is:

a. medium plus “M+”
b. heavy/medium “H/M”
c. medium “M”
d. Heavy “H”

198 Given the following flight plan information,
Trip fuel 136 kg
Flight time 2.75 hrs Reserve fuel 30% of trip
Fuel in tanks Minimum Taxi fuel 3 kg,

state how “endurance” should be completed on the ICAO flight plan:

a 0338
b. 0334
c. 0245
d. 0249

199 How many hours in advance of departure time should a flight plan be filed in the case of flights into areas subject to air traffic flow management (ATFM)?

a 3.00 hrs
b. 0.30 hrs
c. 1.00 hr
d. 0.10 hr

200 If a pilot lands at an aerodrome other than the destination aerodrome specified in the ICAO flight plan, she must ensure that the ATS unit at the destination is informed within a specified time of her planned ETA at destination.
The time is:

a 45 mins
b. 30 mins
c. 15 mins
d. 10 mins

201 If equipment listed in item 19 is not carried:

a. Circle boxes of equipment not carried
b. Tick the boxes of equipment carried
c. Cross out the boxes for equipment not carried
d. List equipment carried in box 18 (other information)

202 If the destination airport has no ICAO indicator, in box 16 of your ATS flight plan, you write:

a ////
b. AAAA
c. XXXX
d. ZZZZ

203 In an ATS flight plan an aircraft will be classified as “L” if its MTOM is?

a. 27 000 kg
b. 10 000 kg
c. 57 000 kg
d. 7 000 kg

204 In an ATS flight plan item 15 where either a route for which standard departure (SID) and a standard arrival (STAR) are provided

a. SID should be entered but not STAR
b. Both should be entered
c. STAR should be entered but not SID
d. SID nor STAR should be entered

205 In flight, it is possible to:

i. File an IFR flight plan
ii. Modify an active flight plan
iii. Cancel aVFR flight plan
iv. Close a VFR flight plan
(rules of the air ann2 3.3.5)

a. i and iii
b. i , ii, iii and iv
c. ii, iii and iv
d. i and iv

206 In order to comply with PANS-RAC, during an IFR flight, deviations from flight plan particulars should be reported to ATC.
Concerning TAS and time, the minimum deviations which must be reported are:

a. TAS 3% and time 3 minutes
b. TAS 5% and time 3 minutes
c. TAS 5 kt and time 5 minutes
d. TAS 10 kt and time 2 minutes.

207 In the ATS flight plan Item 15, for a flight along a designated route, where the departure aerodrome is not on or connected to that route:

a. It is not necessary to indicate the point of joining that route as it will be obvious to the ATS unit.
b. It is necessary only to give the first reporting point on that route
c. The letters “DCT” should be entered, followed by the point of joining the ATS route.
d. The words “as cleared” should be entered.

208 In the ATS flight plan item 15, it is necessary to enter any point at which a change of cruising speed takes place.
For this purpose a “change of speed” is defined as:

a. 10% TAS or 0.05 Mach or more
b. 20 knots or 0.05 Mach or more.
c. 5% TAS or 0.01 Mach or more
d. 20km per hour or 0.1 Mach or more

209 In the event that SELCAL is prescribed by an appropriate authority, in which section of the ATS flight plan will the SELCAL code be entered?

a equipment
b. route
c. aircraft identification
d. other information

210 Item 7 of the flight plan in accordance with PANS-RAC (DOC 4444) should always include, for an aircraft equipped with a radio:

a Aircraft initialisation
b. Aircraft type
c. aircraft callsign
d. aircraft operator

211 Prior to an IFR flight, when filling in the ICAO flight plan, the time information which should be entered in box 16 "total elapsed time" is the time elapsed from

a. take-off until reaching the IAF (initial approach fix) of the destination aerodrome
b. taxi out prior to take-off until the IAF
c. take-off until landing
d. taxi-out prior to take-off until completion off taxi-ing after landing.

212 Reference CA48.
What is the maximum estimated elapsed time or distance between points on track mentioned in Item15 of the flight plan, for flights outside designated ATS routes?

a. 30 min / 200 nm
b. 60 min / 370 nm
c. 90 min / 370 km
d. 120 min / 370 nm

213 Reference item 19 of the ICAO flight plan, Endurance is?

a. Maximum flight time plus 45 minutes holding fuel
b. Maximum flight time plus 30 minutes holding fuel
c. Fuel endurance of the aircraft
d. Total usable fuel required for the flight

214 Reference the ICAO flight plan, in item 15 (speed) this speed refers to :

a Indicated airspeed
b. Equivalent airspeed
c. Initial cruising true airspeed
d. Calculated groundspeed

215 Standard equipment in item 10 is considered to be:

a. VHF, RTF, ADF, VOR, ILS
b. HF, RTF, VOR, DME
c. VHF, VOR, ADF
d. VHF, RTF, ILS, VOR

216 The navigation plan reads:

Trip fuel	100 kg
Flight time	1 hr 35 min
Taxi fuel	3 kg
Block fuel	181 kg

How should "endurance" be shown on the flight plan?

a 0204
b. 0240
c. 0249
d. 0252

217 The planned departure time from the parking area is 1815UTC. The estimated take-off time is 1825UTC.
The IFR flight plan must be filed with ATC at the latest at:

a 1725 UTC
b. 1715 UTC
c. 1745 UTC
d. 1755 UTC

218 "Total Elapsed Time" for an IFR flight, when filling in the ICAO flight plan at box 16, is the time elapsed from :

a take-off until landing
b. take-off until reaching the IAF (Initial Approach Fix) of the destination aerodrome
c. taxi-out prior to take-off until taxiing after landing
d. taxiing until the IAF (Initial Approach Fix) of the destination aerodrome.

219 What is Total Elapsed Time on a VFR flight plan?

a. From take-off to overhead destination
b. From take-off to overhead destination + 15 mins
c. From take-off to landing
d. From taxi to arrival on the gate.

220 When filling in a flight plan, wake turbulence category is a function of?

a. Max certificated landing mass.
b. Max certificated take-off mass
c. Estimated landing mass
d. Estimated take-off mass

221 When filling in item 9 of the flight plan and there is no aircraft designator listed, what should the entry be?

a none
b. ZZZZ followed by an entry at item 18
c. XXXX followed by an entry at item 18
d. a descriptive abbreviation of the aircraft type.

222 When submitting a flight plan before flight, departure time is?

a. Overhead the first reporting point
b. At which the aircraft leaves the parking area
c. Of take-off
d. At which flight plan is filed

223 You have a flight plan, IFR, from Amsterdam to London.
In the flight plan it is noted that you will deviate from the ATS route on passing the FIR boundary Amsterdam/London.
The airway clearance reads " Cleared to London via flight plan route".

Which of these statements is correct?

a. The filed deviation is not accepted
b. The route according to the flight plan is accepted
c. It is not allowed to file such a flight plan
d. You will get a separate clearance for the deviation

224 You have a mode A transponder (4 digits, 4096 codes) and mode c. Item 10 of the flight plan should show

a C
b. A
c. P
d. S

225 You have filed a flight plan for an uncontrolled flight and suffer a delay prior to departure. After how long a delay must you restate your OBT?

a 30 mins
b. 40 mins
c. 60 mins
d. 90 mins

226 You make a diversion from the route given in the flight plan and land at an uncontrolled airfield.
Within what time after landing should you inform ATC?

a 10 mins
b. 20 mins
c. 30 mins
d. 45 mins

227 Refer to Jeppesen Manual - VFR Section Athinai Hellinikon 29-1
What is the variation?

a. 3° east
b. 3° west
c. not shown on chart
d. 6° east

228 Refer to Jeppesen Manual - VFR Section De Kooy 19-1
What is the minimum altitude over the quiet sector?

a. 32800 ft
b. 1500 ft
c. 3500 ft
d. 6500 ft

229 Refer to Jeppesen Manual - VFR Section De Kooy 19-1
What is the frequency and QDM of the ILS for runway 22?

a. 109.70 MHz 216° (M)
b. 109.70 kHz 220° (M)
c. 119.10 MHz 216° (T)
d. 109.70 MHz 216° (T)

230 Refer to Jeppesen Manual - VFR Section Esbjerg 19-2
What are the dimensions of runway 08/26?

a. 2600 ft by 45 ft
b. 8530 ft by 45 ft
c. 8530 metres by 45 metres
d. 2600 metres by 45 metres

231 Refer to Jeppesen Manual - VFR Section Sabadell 19-1
What is the frequency of the Barcelona ATIS?

a. 119.10 MHz
b. 120.80 MHz
c. 118.65 MHz
d. 738 kHz

232 Refer to Jeppesen Manual - VFR Section Aberdeen 10-IV
What frequency is the Aberdeen ATSU on?

a. 114.30 MHz
b. 126.25 MHz
c. 119.87 MHz
d. 135.17 MHz

323 Refer to Jeppesen Manual - VFR Section Aberdeen 10-IV
What is the max ground elevation within the CTR?

a. 1733 ft
b. 1733 m
c. 2105 ft
d. 1245 ft

234 Refer to Jeppesen Manual - VFR Section Aberdeen 19-1
What frequencies could you receive ATIS when on the ground?

a. 114.30 MHz only
b. 121.85 MHz only
c. 114.30 MHz or 121.85 MHZ
d. 121.70 MHz

235 Refer to Jeppesen Manual - VFR Section Aberdeen
What is the maximum wing span of an aircraft using the eastern apron and taxiway?

a. 20 ft
b. 20 m
c. 23 m
d. 10 m

236 Refer to Jeppesen Manual - VFR Section Athinai 29-1
What call sign and frequency for start-up?

a. ATIS 123.40 MHz
b. Approach 119.10 MHz
c. Ground 121.70 MHz
d. Tower 118.10 MHz

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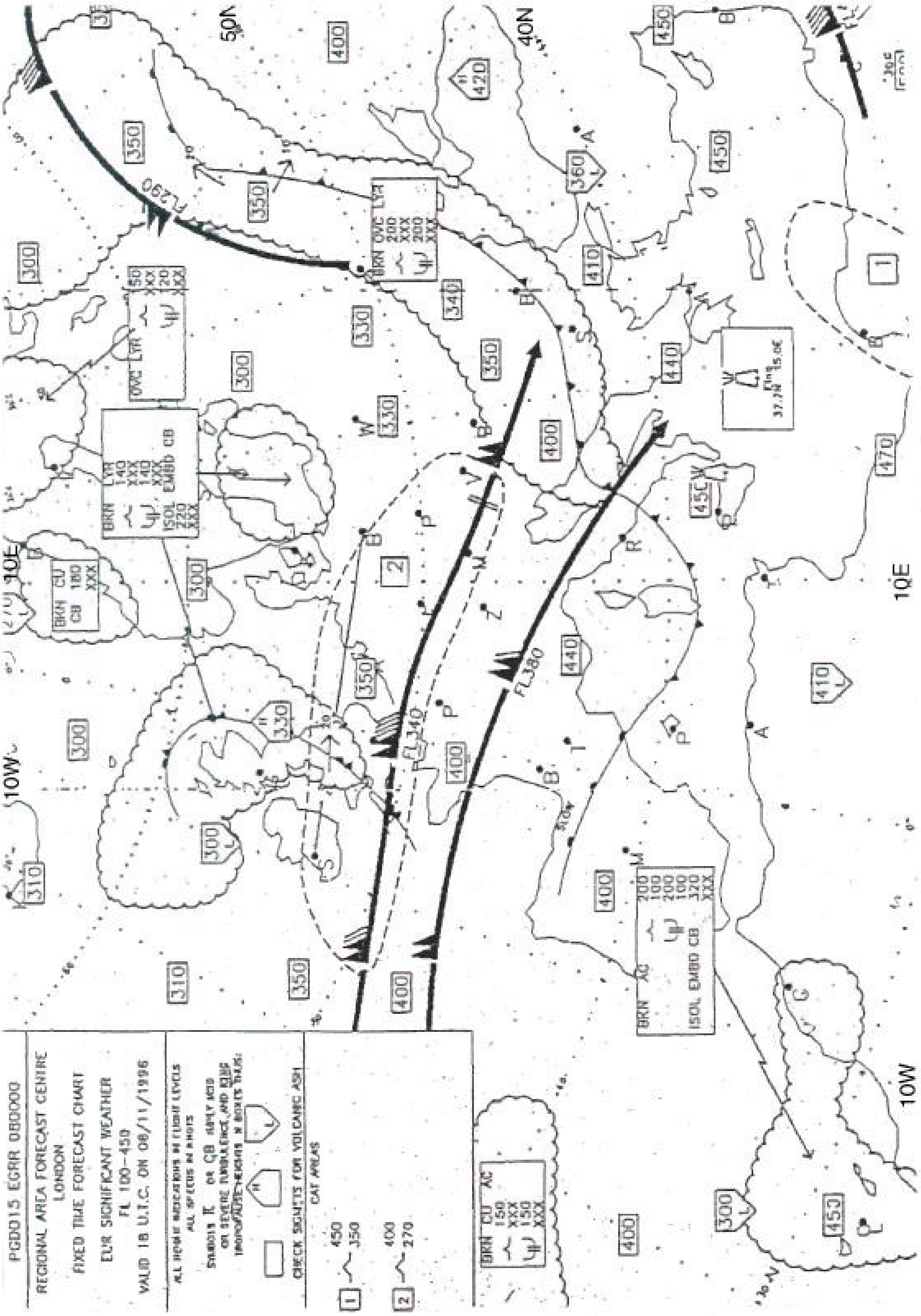
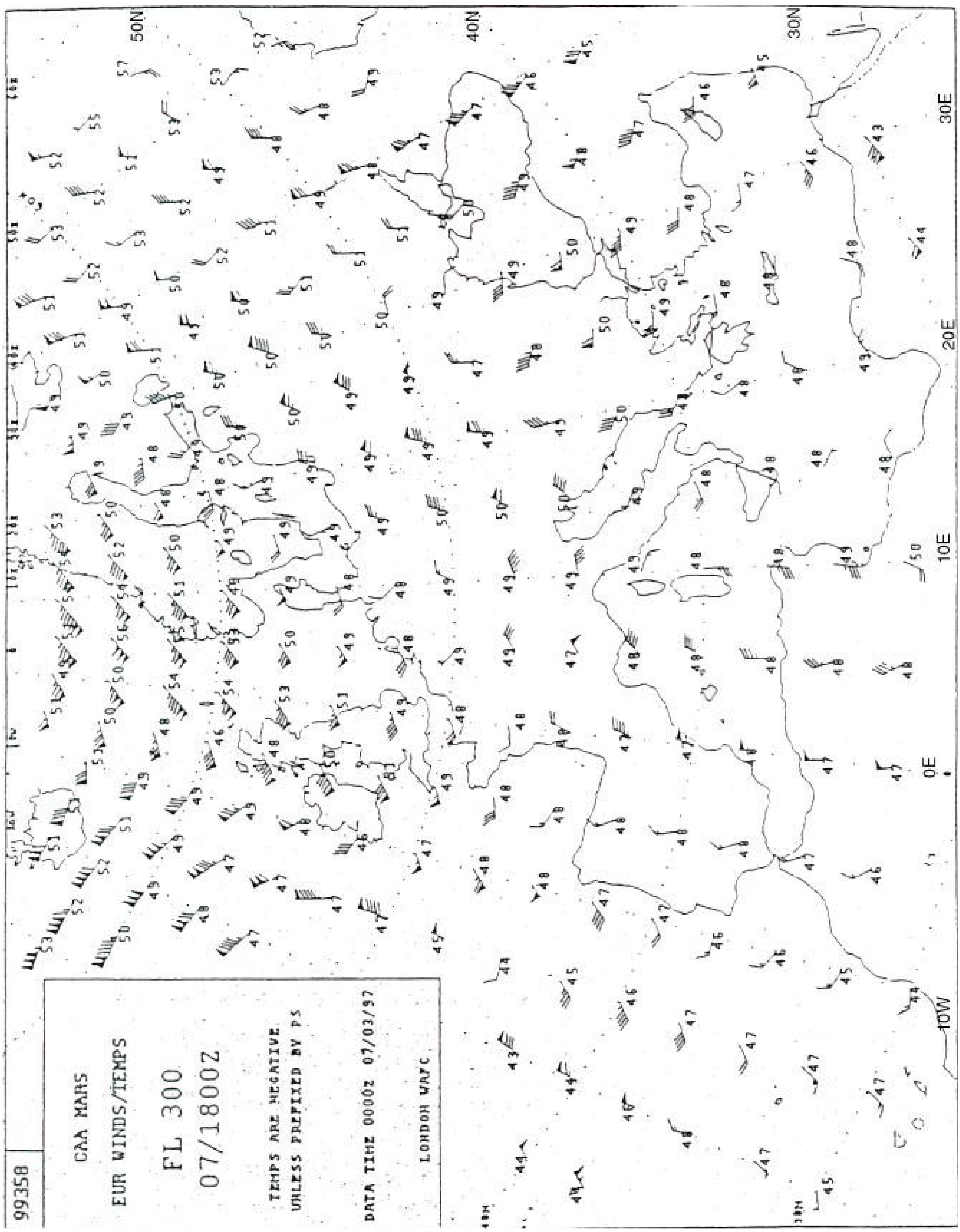
ANNEX A


PGDD15 EGRR 080000
REGIONAL AREA FORECAST CENTRE
LONDON
FIXED TIME FORECAST CHART
EUR SIGNIFICANT WEATHER
FL 100-450
VALID 18 U.T.C. ON 08/11/1996
CHECK SIGMETS FOR VOLCANIC ASH
CAT AREAS
FL290
FL340
FL380
10W
10E
50N
40N

ANNEX B


99358
CAA MARS
EUR WINDS/TEMPS
FL 300
07/1800Z
TEMPS ARE NEGATIVE
UNLESS PREFIXED BY PS
DATA TIME 0000Z 07/03/97
LONDON WAFC

ANNEX C

OPERATIONAL FLIGHT PLAN	FLT NR	ACFT REG	ACFT TYPE	FROM-TO	RWY			W/V
				LFPG - EGLL	T			QNH

SKED TD		Remarks: FOR TRAINING AND EXAMINATION PURPOSES ONLY	AVG WC:________	MAX LM			MALTOM (Met)
SKED TA				TRIP FUEL			COR
SKED BLOCK TM			AVG FF:________	MALTOM			MALTOM
				EST ZFM			
FLT PLAN TIME			TOC:________	EST ALTOF			(MAX ZFM)

PLN TO	G + L -	CMB ADDN *	TIME ACC	POSITION	TC GC	W/V	WCA	T CMB ISA	FL	CRZ PROC	TAS	GS	DIST INT	DIST ACC	NAM FLT	TAS 80
				LFPG												
				TOC	*340*	*280/40*	**X**	*ISA-10°C*	*280*	*0.74*	**X**	**X**	*50*	*50*		
				ABB 116.5		*280/40*		*ISA-10°C*	*280*	*0.74*	*430*					
				TOD		*280/40*		*ISA-10°C*	*280*	*0.74*						
			00:41	*EGLL*	*320*	*280/40*	**X**	*ISA-10°C*	*280*	*0.74*	**X**	**X**				

SEG	TOM	CALC NAM	ACC FUEL
	acc+CA* **X**		
1	M		
1	INT FUEL	**X**	
1	M		
1	STEP CL		
2	M		
2	INT FUEL	assumed 80	
2	M		
2	STEP CL		
3	M		
3	INT FUEL		
3	M		
3	STEP CL		
4	M		
4	INT FUEL		
4	M		
4	STEP CL		
5	M		
5	INT FUEL		
5	M		
5	STEP CL		
LAST	M		
LAST	INT FUEL		
LAST	M		
LAST	ADD DES **X**		
LAST	*LM49,700KG*		
RECL	M		
RECL	INT FUEL		
RECL	M		
RECL	ADD DES		
RECL	LM		

ALTN	FL	AVG TC	W/V	TAS	GS	DIST	TIME	FUEL
EGCC		*330*	*250/30*					

BASED ON TAFS:	DATE:	TKOF ALTN

FO____________ PIC____________

APPENDIX C TO FP FEEDBACK

TRIP FUEL	*assumed 1750kg*	
CONT FUEL		
ALTN FUEL		
FINAL RES	*1300kg*	*00:30*
PLNTOF		
EXTRA FUEL		
TKOF FUEL		
TAXI FUEL		
BLOCK FUEL		

ANSWERS TO REVISION QUESTIONS

1	A	31	D	61	B	91	C	121	C	151	D	181	D	211	A
2	C	32	B	62	C	92	A	122	C	152	B	182	B	212	A
3	C	33	A	63	D	93	C	123	B	153	D	183	D	213	C
4	D	34	C	64	D	94	D	124	D	154	C	184	C	214	C
5	C	35	A	65	A	95	B	125	C	155	A	185	C	215	A
6	B	36	D	66	C	96	C	126	A	156	A	186	B	216	C
7	D	37	A	67	B	97	C	127	D	157	D	187	A	217	B
8	C	38	A	68	A	98	D	128	C	158	B	188	B	218	B
9	C	39	A	69	A	99	A	129	A	159	A	189	A	219	A
10	D	40	C	70	B	100	B	130	C	160	B	190	B	220	B
11	D	41	C	71	A	101	D	131	C	161	A	191	D	221	B
12	C	42	B	72	D	102	C	132	D	162	C	192	D	222	B
13	D	43	A	73	B	103	D	133	D	163	D	193	C	223	B
14	B	44	C	74	C	104	B	134	D	164	B	194	C	224	A
15	C	45	A	75	C	105	C	135	C	165	A	195	A	225	C
16	C	46	A	76	A	106	C	136	B	166	B	196	C	226	C
17	D	47	A	77	C	107	D	137	A	167	C	197	D	227	A
18	C	48	C	78	B	108	A	138	B	168	B	198	B	228	B
19	B	49	A	79	C	109	D	139	B	169	B	199	A	***229***	***A***
20	B	50	B	80	A	110	D	140	D	170	A	200	B	230	D
21	C	51	C	81	C	111	A	141	B	171	B	201	C	231	C
22	A	52	C	82	C	112	B	142	C	172	A	202	D	232	D
23	A	53	C	83	D	113	A	143	A	173	D	203	D	233	A
24	D	54	D	84	D	114	A	144	D	174	B	204	B	234	C
25	D	55	A	85	C	115	C	145	C	175	D	205	B	235	B
26	A	56	B	86	B	116	D	146	B	176	A	206	B	236	C
27	D	57	B	87	D	117	B	147	A	177	A	207	C		
28	C	58	C	88	A	118	B	148	A	178	C	208	C		
29	B	59	D	89	D	119	D	149	B	179	D	209	D		
30	C	60	A	90	D	120	C	150	D	180	C	210	C		

SPECIMEN EXAMINATION PAPER

56 Questions Time Allowed 3 hours Total Marks 61

All questions worth one mark unless stated.

1. Information on Search and Rescue (SAR) procedures may be obtained:

   a. from NOTAMs.
   b. from the latest AIC.
   c. from the Aeronautical Information Publication.
   d. by RT communication with the FIR within which the aircraft is operating.

2. Refer to ED- 6.
   The track and distance between Friedrichschafen (EDNY) and Stuttgart (EDDS) are:

   a. 350°(M) 62.5 km
   b. 345°(M) 65 nm
   c. 349°(M) 62.5 nm
   d. 351°(M) 116 km

3. Refer to ED-6.
   The radio navigation aid at N48 54.8 E009 20.4 is:

   a. a VOR/DME call sign LBU frequency 109.20 kHz
   b. a Tacan call sign LBU channel number 109.20.
   c. a VOR/TAC call sign LBU frequency 109.20 MHz
   d. a VOR/DME call sign LBU frequency 109.20 MHz

4. Refer to CAP697 SEP Figure 2.1.
   Given : Airfield elevation 6000ft OAT 15°C Initial Weight 3525lb
   Cruise altitude 14000ft OAT -13°C Wind component 60kt tail
   The time, fuel and ground nautical miles to TOC are:

   a. 16 min 5 gall 31 ngm
   b. 15 min 6 gall 18 ngm
   c. 17 min 7 gall 46 ngm
   d. 16 min 5 gall 52 ngm

5. Refer to CAP697 SEP Figure 2.2.
   Given:
   Pressure Altitude 10000ft OAT -15°C Power 23IN HG @ 2300RPM
   The fuel flow and KIAS are:

   a. 67.3 PPH 140 kt
   b. 67.3 GPH 157 kt
   c. 11.4 GPH 139 kt
   d. 66.2 GPH 137 kt

6. Refer to CAP697 MEP Figure 3.4.
An aircraft is flying at a High Speed Cruise at a pressure altitude of 12000ft, temperature ISA +15°C. The TAS is:

a. 189 kt
b. 186 kt
c. 183 kt
d. 182 kt

7. Refer to CAP697 MEP Figure 3.5
The endurance "With 45 Min. Reserve at 45% Power" for an Economy Cruise at 13000ft is:

a. 4 hr 25 min
b. 4 hr 04 min
c. 4 hr 57 min
d. 6 hr 18 min

8. The air distance and time to climb is 197 nam and 33 min respectively. What is the required ground distance with a 40 kt headwind component ?

a. 222 ngm
b. 184 ngm
c. 157 ngm
d. 175 ngm

9 Given:
Trip time 3hr 06min Block fuel 118kg Taxi fuel 8kg
If the aircraft is required at any time during its flight to have a minimum reserve fuel of 30% of trip fuel remaining, the minimum fuel amount after 2hr is:

a. 39 kg
b. 55 kg
c. 42 kg
d. 45 kg

10. An aircraft is airborne from an airfield, elevation1560ft amsl, on a QNH of 986mb/hPa.
On its track of 269°(M) there is a mountain 12090ft amsl. To clear this obstacle by a minimum of 2000ft its correct ICAO VFR Flight level is: (1mb/hPa = 30ft).

a. FL145
b. FL155
c. FL160
d. FL165

11. On a Jeppesen chart the figures "FL80 2700a" are displayed below an airway.
What does the "FL80" indicate?

a. The Route MORA (a Safety Altitude)
b. Minimum Enroute Altitude
c. Maximum Authorized Altitude
d. The base of the airway

12. In the Jeppesen SID, STARs & IAP directions are given as :

a. True Course/Track
b. Magnetic Course/Track
c. True Heading
d. Magnetic Heading

13. Refer to CAP697 SIMPLIFIED LRC (use Figures 4.5.3.1 & 4.3.1B)
Given : Distance 997 ngm tail wind component 160 kt landing weight 45000 kg
Cruise weight 56000 kg FL370 ISA 0°C
The fuel required and trip time is:

a. 11200 kg 4 hr 09 min
b. 5300 kg 1 hr 09 min
c. 4200 kg 1 hr 51 min
d. 5000 kg 2 hr 00 min

14. Refer to CAP697 MRJT Figure 4.4
Given:
Aircraft mass 43000 kg
Destination airfield elevation = 3500 ft Alternate airfield elevation = 10 ft
ISA conditions
What is the final reserve?

a. 2110 kg
b. 1025 kg
c. 1038 kg
d. 1055 kg

15. Refer to CAP697 MRJT Figure 4.5.4
An aircraft with an estimated landing weight of 55000 kg plans a descent from FL310 through turbulence; the mean wind component in the descent is 45 kt headwind.
The fuel and ground distance are:

a. 280 kg 82 ngm
b. 270 kg 107 ngm
c. 270 kg 79 ngm
d. 275 kg 117 ngm

16. Refer to CAP697 MRJT Fig 4.3.2B
Given :
5000 kg fuel available Cruise at FL210 50 kt headwind Landing weight 45000 kg
How far could you fly?

a. 600 ngm
b. 750 ngm
c. 500 ngm
d. 670 ngm

17. Given : MTOM 62000 kg MLM 54000 kg
DOM 35500 kg MZFM 51300 kg
Take Off Fuel 14500 kg Landing Fuel 3500 kg

The maximum traffic load for this flight is :

a. 15000 kg
b. 15800 kg
c. 12000 kg
d. 4000 kg (2 Marks)

18. Refer to CAP697 MRJT Figure 4.3.1B
Given
Trip Distance 1000 nm Nil wind FL 290
For a temperature increase of 30°C the approximate change in Trip Time is:

a. +10%
b. -5%
c. -10%
d. +7%

19. Refer to CAP697 MRJT Figure 4.2.1.
If an aircraft's cruise weight is 50000 kg the Optimum Altitude for a .78 Mach flight is:

a. 35500 ft pressure altitude
b. 36200 ft pressure altitude
c. 35500 ft altitude
d. FL360

20. Reference CAP697 MRJT Figure 4.5.3.2
Given:
Brake Release Mass 62800 kg Fuel to TOC 1400 kg
0.74 Mach Cruise at FL310 ISA -10°C Wind component 50 kt head
Mass at first reporting point after TOC 59500 kg

The planned ground distance TOC to the first reporting point is:

a. 356 nm
b. 314 nm
c. 277 nm
d. 280 nm

21. Given:
Track 185°(T) Variation 9° east Heading 182°(M)
Which is the lowest suitable ICAO IFR cruising level ?

a. FL280
b. FL310
c. FL290
d. FL270

22. Reference CAP697 MRJT Figure 4.5.1.
Given:
Climb to FL350 ISA+6°C MSL airfield Brake Release Weight 57500 kg

The time, fuel, TAS and distance covered are:

a.	22′	1625 kg	395 kt	114 nam
b.	20′	1625 kg	395 kt	117 nam
c.	20′	1630 kg	395 kt	100 nam
d.	21′	1675 kg	398 kt	133 nam

23. Reference CAP697 MRJT Figure 4.3.6.
Given :
Time to alternate 54min Landing weight 55000kg Wind component 50kt tail

The alternate fuel and ground nautical mile distance are:

a.	2500 kg	320 ngm
b.	1500 kg	175 ngm
c.	2350 kg	355 ngm
d.	2200 kg	350 ngm

24. Reference CAP697 MRJT Figure 4.5.3.1
Given:
Pressure altitude 33000ft LRC OAT -61°C Cruise time 29min
Zero wind Initial Gross weight 54100kg

The fuel required is:

a. 1100 kg b. 1200 kg c. 1207 kg d. 900 kg

25. Refer CAP697 MRJT Fig 4.3.1
Given :
FL370 @ LRC ISA +20°C Distance 800 ngm
50 kt headwind Landing weight 50000 kg

What is the trip fuel and flight time?

a.	5600 kg	2 hr 15 min
b.	4500 kg	2 hr 00 min
c.	4100 kg	1 hr 48 min
d.	4400 kg	1 hr 48 min

26. A flight is due to operate between London and Glasgow on a Repetitive Flight Plan (RPL). Prior to departure Glasgow is closed due heavy snow.
The operator intends to operate this flight to Edinburgh instead.
The correct action regarding flight plans is ?

a. This cannot be done, go back to airport hotel.
b. Operations should inform the London ATC Unit at least 10 minutes before departure
c. Cancel the RPL and file a standard ICAO Flight Plan to Edinburgh
d. Take-off for Glasgow and divert along route

27. A normal commercial IFR flight has an estimated EOBT of 1540 UTC with the estimated take-off time as 1555 UTC.
What is the latest time for filing the ICAO Flight Plan?

a. 1510 UTC
b. 1455 UTC
c. 1525 UTC
d. 1440 UTC

28. A flight from BIRMINGHAM (EGBB) to DUBLIN (EIDW) as an EOBT of 09:30 UTC Actual airborne time of 09:50, expected trip time of 1 hour, estimated flying time to SHANNON FIR (EISN) boundary of 55 minutes.
How should you complete item 18 of the ICAO flight plan regarding your estimate for the FIR boundary?

a. EET/EIDW1045
b EET/EISN1025
c. EET/EISN0055
d. EET/EISN0060

29. Refer to Jeppesen MUNICH 10-2B
When approaching Munich via TANGO with a westerly surface wind, the route and track miles to the IAF are expected to be?

a.	AALEN - WLD - ROKIL – MBG	90 nm
b.	AALEN - WLD - ROKIL	51 nm
c.	AALEN - WLD - ROKIL – MBG	124 nm
d.	WLD-ROKIL	10 nm

30. Refer to Jeppesen E(LO)1
The magnetic course and distance from LIFFY (N5329 W00530) and WAL (N5324 W00308) is :

a.	279° (M)	85 nm
b.	099° (M)	114 nm
c.	099° (M)	85 nm
d.	099° (M)	59 nm

31. Refer to Jeppesen Polar High Altitude Chart 5AT(HI).
What is the Grid track from Stornoway (N58 W006) to Kulusuk (N6530 W03710)?

a. 318°
b. 298°
c. 138°
d. 118°

32. Given :
A to B Distance 2050 nm Safe Endurance 6 hrs
GS OUT = 480 kt GS ON = 450 kt GS HOME = 380 kt

Calculate the distance and time to the Point of Equal Time from A.

a.	1272 nm	2 hr 39 min
b.	906 nm	1hr 53 min
c.	1111 nm	2 hr 19 min
d.	939 nm	1 hr 57 min

33. Given : GS OUT = 178 GS HOME = 249
Distance A to B = 450 nm Endurance 3 hours

What is the distance to the Point of Safe Return from A?

a. 204 nm
b. 311 nm
c. 415 nm
d. 262 nm

34. You plan to fly from A to B at a TAS of 230 kt, a GS of 255 kt and an initial cruising pressure altitude of 15000 ft.
What should you complete Item 15 of the ICAO Flight Plan?

a. K0230 F150
b. N0230 F150
c. N0255 S1500
d. N0230 FL150

35. Refer to Jeppesen E(LO)5.
What is the lowest continuous flight level you should maintain along B45 when flying from Czempin/CZE (N5207 E01643) to Chociwel/CHO (N5328 E01521)?

a. FL60
b. FL70
c. FL180
d. FL80

36. A current flight plan is :

a. the filed flight plan with amendments and clearances included
b. the filed flight plan without any changes
c. flight plan with correct time of departure
d. one that is stored via repetitive flight plan procedures

37. Refer CAP697 MRJT Figure 4.3.6
Flight from Paris to London with Manchester being the alternate.
Given:
London - Manchester 160 nm Mean track 350°(T) W/V 250/30°(T)
Estimated landing mass at alternate 50000 kg

What is the fuel and time to the alternate?

a. 1200 kg 20 min
b. 1600 kg 36 min
c. 1450 kg 32 min
d. 1300 kg 28 min

Refer to the Glasgow EGPF actual and TAFs and answer questions 38 & 39.

GLASGOW EGPF
SA 271420Z 19010KT 9999 RA FEW010 BKN030 08/06 Q1012
FC 271322 20007KT 9999 SCT020 BKN030 TEMPO 1322 6000 -RA BKN012 PROB30
TEMPO 1318 24018G30KT BECMG 1922 32010KT
FT 271812 25012KT 9999 BKN020 TEMPO 1803 7000 -RA BKN012 BECMG 1922 35008KT

38. What is the temperature and dewpoint at 1420Z on the 27th?

a. No data given
b. Temperature +8°C Dewpoint +6°C Refer to SA for 1420z
c. Temperature -8°C Dewpoint -6°C
d. Temperature +10°C Dewpoint +12°C

39. What is the worst visibility you might experience when landing at 0200Z on the 28th?

a. No data given covering this period
b. 10 kilometres or more
c. 7 kilometres in light rain
d. 7000 metres in moderate rain

40. Refer CAP697 MRJT Fig 4.7.2
Given :
ETOPS approval for 120 minutes Weight at diversion 50000 kg Long Range Cruise

Your diversion airfield should be within ...

a. 742 nm
b. 379 nm
c. 768 nm
d. 1101 nm

41. Refer to Jeppesen AMSTERDAM Schiphol SID 10-3
Which of the following statements is true regarding an ANDIK departure from RWY 19L ?

a. Contact Schipol Departure on 119.05 Mhz when passing 2000 ft and report altitude
b. the distance to ANDIK is 25 nm
c. cross ANDIK below FL60
d. maximum IAS 250 kt till turning left at SPL 3.1DME

42. You are cruising at FL250 and need to be at FL50 10 nm before a VOR/DME. Your rate of descent is 1250 ft/min and your GS in the descent 250 kt.

How far before the VOR/DME should you start your descent ?

a. 66.7 nm
b. 83.3 nm
c. 98.5 nm
d. 76.7 nm

43. You required to uplift 40 US Gallons of AVGAS with Sp.G of 0.72.
How many litres and kilograms is this?

a. 109 ltr 151 kg
b. 182 ltr 131 kg
c. 182 ltr 289 kg
d. 151 ltr 109 kg

44. Refer CAP697 MRJT Figure 4.3.2C
Given :
Mach 0.74 cruise Trip fuel available 17000 kg FL280
Estimated landing mass 52000 kg Trip distance 2500 ngm

What is the maximum wind component ?

a. Zero
b. 25 kt head
c. 25 kt tail
d. 60 kt head

45. Refer to Jeppesen E(LO)1
What type of radio navigation aid is located at Perth (N5626 W00322)?

a. VOR on 110.4 MHz and NDB on 394 KHz
b. TACAN on 110.4 KHz
c. VOR on 110.4 MHz
d. VOR/DME on 110.4 MHz

46. Given :
DOM 33510 kg Traffic load 7600 kg Taxi fuel 250 kg
Trip Fuel 2500 kg Contingency fuel 125 kg Final reserve fuel 983 kg
Alternate fuel 1100 kg

What is the estimated landing mass at the destination?

a. 43318 kg
b. 45818 kg
c. 42218 kg
d. 43193 kg

47. When completing an IFR flight plan the "Total Elapsed Time" in item 16 is from….

a. take-off to overhead the destination airport
b. from first taxiing under own power until the IAF for destination airport
c. take-off to the IAF for the destination airport
d. take-off until landing at the destination airport

48. An aircraft has been planned to fly via a significant point based upon the TIR VORDME, QDM120 at range of 95nm.
The correct entry for the ICAO Flight Plan is:

a. TIR300095
b. TIR120095
c. TIR30095
d. 300095TIR

49. Reference E(HI) 4 (CAA FOR EXAMS).
GIBSO (N5045.1 W00230.3)
Aircraft intending to use UR-14 will be expected to cross GIBSO at or above FL?

a. FL200
b. FL250
c. FL280
d. FL310

50. Reference E(HI)5 CAA for examinations.
From Mende-Nasimbals (N4436.4 E00309.7) to Gaillac (N4357.3 E00149.5) via UG5.

Which of these levels is the lowest available?

a. 290
b. 310
c. 330
d. 350

51. Reference E(HI)4 (CAA FOR EXAMS)
What is the total distance and mean true course between Abbeville (N5008.1 E00151.3) and Biggin (N5119.8 E00002.2) on UA20?

a. 100 nm 321°T
b. 162 nm 313°T
c. 162 nm 316°T
d. 100 nm 316°T

52. An aircraft is carrying Maritime Survival Equipment.
The correct entry at Item 19 is:

a. Cross out indicators P, D and J; tick M.
b. Circle indicator M.
c. Tick indicator M.
d. Cross out indicators P, D and J.

53. Refer to Training Manual, Amsterdam page 10-9X.
What is the minimum radar altitude for a Cat 2 ILS DME approach to runway 01L?

a. 88′
b. 100′
c. 300m
d. 103′

54. At a fuel Relative Density of 0.80 an aircraft turbine engine burns 220 litres per hour. If Relative Density is 0.75 what is the fuel burn?

a. 235 l/hr
b. 206
c. 220
d. 176

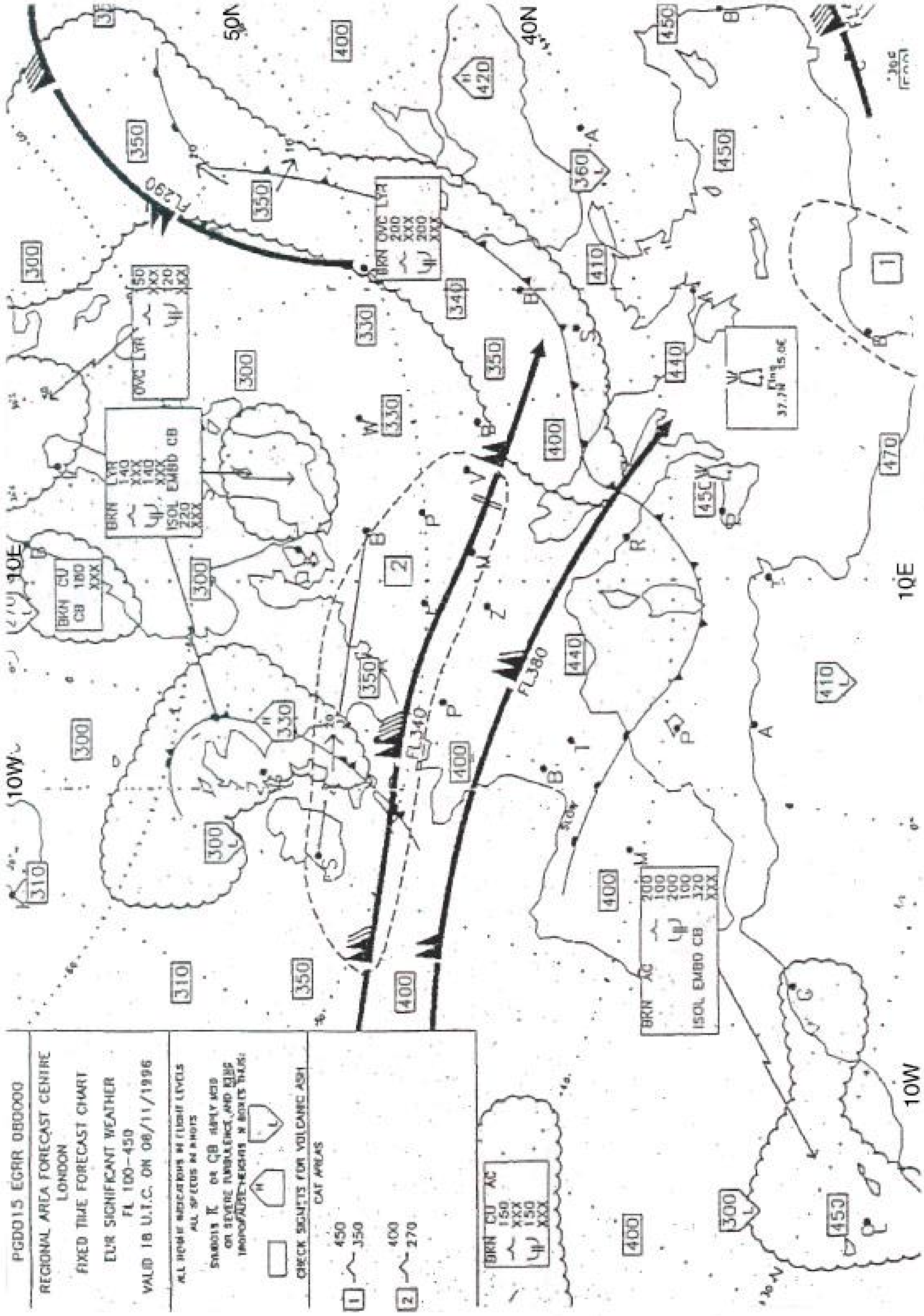
55. Refer to Annex "A"
The weather feature lying from Northern Ireland (N54 W007) into the Atlantic ocean at N38 W019 is a.

a. Cold front
b. Warm front
c. Occluded front
d. 100 kt jetstream at FL310

56. Refer to Annex "A"
When flying from Paris (N49 E002) to Lisbon (N39 W009) what is the worst significant weather might you encounter at FL280?

a. None
b. Severe turbulence and icing within CBs
c. Moderate CAT at FL400
d. Moderate turbulence and icing

ANNEX A


PGDD15 EGRR 080000
REGIONAL AREA FORECAST CENTRE
LONDON
FIXED TIME FORECAST CHART
EUR SIGNIFICANT WEATHER
FL 100-450
VALID 18 U.T.C. ON 08/11/1996
CHECK SIGMETS FOR VOLCANIC ASH
CAT AREAS
FL290
FL340
FL380

ANSWERS TO SPECIMEN EXAMINATION PAPER

1	C	11	B	21	D	31	A	41	A	51	D
2	C	12	B	22	B	32	D	42	D	52	D
3	D	13	C	23	C	33	B	43	D	53	B
4	D	14	D	24	A	34	B	44	B	54	A
5	A	15	C	25	A	35	D	45	C	55	A
6	B	16	A	26	C	36	A	46	A	56	B
7	A	17	C	27	D	37	C	47	C		
8	D	18	B	28	C	38	B	48	A		
9	A	19	A	29	A	39	C	49	B		
10	D	20	C	30	C	40	A	50	A		

EXPLANATIONS TO SPECIMEN EXAMINATION PAPER

1. c. from the Aeronautical Information Publication. FACT

2. c. 349°(M) 62.5 nm

3. c. a VOR/DME call sign LBU frequency 109.20 MHz
(radio aids panel)

4. d.

16 min	5 gall	52 ngm	
14000	23	7.5	48
6000	7	2.5	12
	16mins	5gals	36nams + ($\frac{16}{60}$ x 60) = 52 ngms

5. a. 67.3 PPH 140 kt
ISA Temp -5°c, so ISA Dev = -10°c ⇨ Interpolate!

ISA	-20°c	11.4	68.4pph	143KIAS
ISA		11.0	66.2pph	137KIAS
ISA -10		11.2	67.3pph	140KIAS

6 b. 186 kt
ISA at 12000 = -9°
Convert ISA +15 into actual temperature of +6° then enter graph

7. a. 4 hr 25 min
Use left hand side of graph for 65% power

8 d. 175 ngm
$\frac{33}{60}$ x 40 = 22 197 – 22 = 175.

9 a. 39 kg
110 kg at take-off
$\frac{110}{3.1}$ x 1.1 = 39 kg (Maybe 39 / 1.3 to get 30 trip & 9 reserve)

10. d. FL165
Min Ht req'd = 12090 amsl (QNH) +2000′ = 14090′ min Alt
1013 - 986 = 27mB x 27 = 729′ +14090 = 14,819′ min P.Alt
VFR = Even +500
Min FL = FL165

11. b. Minimum Enroute Altitude
Jeppesen - introduction p57

12. b. Magnetic Course/Track
All tracks magnetic unless marked "T" or "G"

13. c. 4200 kg 1 hr 51 min
tail wind component 160 kt

TAS = 427

Use 725 nam with no wind correction

$\frac{427}{587} = \frac{725 \text{ nam}}{997 \text{ ngm}}$

14. d. 1055 kg
Remember use 1500 ft above alternate
Use 1500 ft from 4.4
Fuel flow is 2110 kg/hr @ 43000 kg
Remember 30 minutes for FR

15. b. 270 kg 107 ngm
Use bottom table NAM = 93
$\frac{19}{60} \times 45 = 14$ 93 – 14 = 79 ngm

16. a. 600 ngm
NB. Working backwards through the graph

17. c. 12000 kg

	T/O	LND	STRESS
Max	62000	54000	51300
-Dom	35500	35500	35500
-Fuel	14500	3500	N/A
= TL	12000	15000	15800

Take the lowest of the 3 TL figures

18. b. -5%
ISA -10 = 2.55 hrs
ISA + 20 = 2.40
$= \frac{0.15}{2.55} \times 100 = 5.88\%$ less as TAS increases.

19. a. 35500 ft pressure altitude

20. c. 277 nm
Mass at TOC = 61400
61400 kg = 4989 nam TAS = 434 – 10 = $\frac{424}{374}$ = $\frac{314 \text{ nam}}{277 \text{ ngm}}$
59500 kg = 4675 nam GS = 374
314 nam

21. d. FL270
185 – 9 = 176°(M) therefore ODDs

22. b. 20′ 1625 kg 395 kt 117 nam

23. c. 2350 kg355 ngm
backwards through the graph

24. a. 1100 kg
ISA -10 TAS 433 - 10 423 kts
29 mins at 423 kts = 204 nam/ngm
54100 = 3929 – 204 = 3725
3725 nam = 53000
54100 – 53000 = 1100 kg

25. a. 5600 kg 2 hr 15 min

26. c. Cancel the RPL and file a standard ICAO Flight Plan to Edinburgh
Rule

27. d. 1440 UTC
Rule - IFR 1 hour before EOBT not take-off time

28. c. EET/EISN0055
Always enter elapsed times in hours & minutes not estimates

29. a. AALEN - WLD - ROKIL – MBG 90 nm runway 26 in use, MBG is IAF

30. c. 099°(M) 85 nm
42 + 17 + 26

31. a. 318°
Align protractor along the Grid parallels

32. d. 939 nm 1 hr 57 min
$\frac{2050 \times 380}{450 + 380}$ = 939 nm @ 480 = 1hr 57 min

33. b. 311 nm
$\frac{3 \text{ hrs} \times 249}{178 + 249}$ = 1.75 hrs @ 178 = 311 nm

34. b. N0230 F150
Jeppesen Air Traffic Control p436/7

35. d. FL80
Lowest continuous is FL70 off chart THEN remember even level track

36. a. the filed flight plan with amendments and clearances included
FACT

37. c. 1450 kg32 min
Mean track 350°(T) W/V 250/30°(T) Using CRP5 get a 5 kt tailwind to enter graphs

GLASGOW EGPF
SA 271420Z 19010KT 9999 RA FEW010 BKN030 08/06 Q1012

FC 271322 20007KT 9999 SCT020 BKN030 TEMPO 1322 6000 -RA BKN012 PROB30
TEMPO 1318 24018G30KT BECMG 1922 32010KT

FT 271812 25012KT 9999 BKN020 TEMPO 1803 7000 -RA BKN012 BECMG 1922 35008KT

38. b. Temperature +8°C Dewpoint +6°C Refer to SA for 1420z

39. c. 7 kilometres in light rain worst visibility
The FT covers from 1800 on the 27th to 1200 on 28th
"worst" must include TEMPOs

40. a. 742 nm

41. a. Contact Schipol Departure on 119.05 Mhz when passing 2000 ft and report altitude

42. d. 76.7 nm
$25000 - 5000 = \frac{20000}{1250} = 16$ mins @ 250 kt = 66.7 nm + 10 = 76.7 nm

43. d. 151 ltr 109 kg
Use CRP5 set 40 against USG then read off others

44. b. 25 kt head
Back from fuel, normal from distance.

45. c. VOR on 110.4 MHz

46. a. 43318 kg
Taxi fuel 250 kg not included
Trip Fuel 2500 kg and used by destination
What is the estimated landing mass at the **destination**?

47. c. take-off to the IAF for the destination airport
RULE

48. a. TIR300095
Jeppesen Air Traffic Control p438

49. b. FL250
See chart note 11

50. a. 290
Though an even level direction, look for the "<O"
which indicates odd levels in that direction

51. d. 100 nm 316°T
321°(M) – 5°w

52.	d.	Cross out indicators P, D and J. Jeppesen Air Traffic Control p439
53.	b.	100′ Radio Alt will be AGL ie: about (QFE) ht Amsterdam is below MSL
54.	a.	235 l/hr Use Navigation Computer 220ltrs @ SG 0.8 = 176 kgs 176 kgs @ SG 0.75 = 235 ltrs
55.	a.	Cold front
56.	b.	Severe turbulence and icing within CBs Near Lisbon sigwx includes CBs left panel states MOD to SEV turb and icing.