NAVIGATION

The actual examination paper consists of twenty five questions with a multiple choice of four answers A, B, C or D. The candidate should indicate the chosen answer by placing a cross in the appropriate box on the answer paper provided.

Time allowed 1 hour 30 minutes.

The pass mark is 75% so the minimum number of questions that must be answered correctly to obtain a pass is nineteen. Marks are not deducted for incorrect answers.

Electronic calculators are not allowed to be used during the examination so a good working knowledge of the CRP Computer is essential, particularly as time is usually at a premium for most candidates during the navigation examination.

To work through the navigation section, you require an ICAO 1:500,000 Navigation Chart edition 29 or later, a CRP Computer, navigation scale ruler, protractor, and a chinagraph pencil.

The explanation section follows the question section and each explanation is prefixed EN (Explanation Navigation).

All flight planning in this book is predicated on CAA South of England and Wales Sheet 2171CD Edition 29.

NAVIGATION - QUESTIONS

Q1 Given a W/V of 26015 track of 296°T, what heading and TAS should be flown to maintain a ground speed of 120kt on track?

A - 112°T at 132kt.

B - 300°T at 132kt.

C - 292°T at 132kt.

D - 120°T at 132kt.

Q2 Given a heading of 070°T, a track of 061°T, a TAS of 120kt and a G/S of 118kt, find the W/V.

A - 13019kt.

B - 15019kt.

C - 33019kt.

D - 31019kt.

Q3 Given a heading of 080°T, a track of 087°T, a TAS of 100kt, and a G/S of 85kt, find the W/V.

A - 04719kt.

B - 12319kt.

C - 32719kt.

D - 22719kt.

Q4 Given a Hdg of 138°T, a track of 141°T, a TAS of 122kt, and a G/S of 101kt, what is the W/V?

A - 16520kt.

B - 12030kt.

C - 13121kt.

D - 31121kt.

Q5 Given a wind of 12025kt and a track of 343°T, what true heading and TAS should be flown in order to maintain a ground speed of 160kt?

A - 170°T 141kt.

B - 349°T 147kt.

C - 155°T 142kt.

D - 350°T 143kt.

Q6 Given a TAS of 125kt, a track of 120°T, and a W/V 26025kt, find the true heading and ground speed.

A - 127°T - 143kt.

B - 113°T - 107kt.

C - 125°T - 140kt.

D - 307°T - 143kt.

Q7 An aircraft's demonstrated cross wind limit for both T/O and landing is 16kt. If the prevailing surface wind is 22kt, what is the maximum acceptable angle of surface wind to runway for T/O and landing?

A - 50°.

B - 55°.

C - 60°.

D - 45°

Q8 The commander of an aircraft with a cross wind limitation of 14 kt for both take off and landing has the option of three operational runways. Given a surface wind of 25018kt, which of the following runways give a cross wind that is within the aircraft's limitations?

A - 22, 29 and 33.

B - 29 only.

C - 29 and 33.

D - 22 and 29.

Q9 If the surface wind is 23020kt and the maximum demonstrated cross wind component for the aircraft is 15kt; which of the following runways would be suitable for either a take-off or landing?

A - 15, 27, and 32.

B - 27 and 32.

C - 27 only.

D - 15 only.

Q10 An ATCU reports the surface wind as being 32022kt. Your A/C has a cross wind limit for T/O of 17kt and may not accept a tail wind component. Runways 18/36, and 06/24 are available. Which runways will give both head and cross wind components that are within your aircraft's limits for T/O?

A - 36 only.

B - 06 and 24.

C - 18 and 36.

D - 06 and 36.

Q11 On a chart with a scale of 1:1,000,000, 30cm represents:

A - 162nm.

B - 81.0nm.

C - 40.5nm.

D - 16.2nm.

Q12 Given a chart scale of 1:1,000,000, what is represented by a chart distance of 11 inches?

A - 17.3nm.

B - 165nm.

C - 150nm.

D - 16.5nm.

Q13 During a flight between **X** and **Y**, a distance of 160nm, having kept a constant heading, you pinpoint your position as 120nm along track and 8nm port of track. Assuming no change in wind velocity, what heading alteration is needed at that point to fly direct to **Y**?

A - 12 degs stbd.

B - 24 degs stbd.

C - 20 degs port.

D - 16 degs stbd.

Q14 An aircraft on a heading of 005°M is fixed as being 40nm down track and 4nm port of track. What would be the new heading to make the destination 60nm on from the position fix?

A - 010°M.

B - 355°M.

C - 015°M.

D - 005°M

Q15 A direct reading magnetic compass in an aircraft that is executing a level turn at a constant rate in UK air space will be subject to the smallest turning error as the aircraft turns through:

A - headings of north and south.

B - any of the cardinal points of the compass.

C - headings of east and west.

D - north east, south east, south west and north west

Q16 When using a direct reading magnetic compass to make an anticlockwise turn onto a southerly heading, the turn should be stopped:

A - on the desired heading.

B - after the desired heading.

C - before the desired heading.

D - 15° before the desired heading when making a standard rate turn.

Q17 Given a heading of 233°T, a local variation of 6°W and compass deviation of 1°E, the compass heading is:

A - 228°C.
B - 226°C.
C - 240°C.
D - 238°C.

Q18 Given a compass heading of 080°C, a compass deviation of 4°E, where the local magnetic variation is 5°W, what is the true heading?

A - 075°T.
B - 079°T.
C - 084°T.
D - 081°T.

Q19 At an altitude of 3500ft, if the OAT = +15°C, and the RAS is given as 95kt, what is the TAS?

A - 95kt.
B - 98kt.
C - 101kt.
D - 104kt.

Q20 Given a RAS 110kt, a pressure altitude of 7500ft, and an OAT of –5°C, what is the TAS?

A - 111kt.
B - 122kt.
C - 114kt.
D - 118kt.

Q21 Given a RAS of 105kt, a pressure altitude of 6000ft, and outside air temperature (OAT) of –10°C, find the TAS.

A - 109kt.
B - 112kt.
C - 117kt.
D - 121kt.

Q22 On a flight from A - B, distance 120nm, you use 18gals of fuel. In similar meteorological conditions, how much fuel would you use going on to C, which is a further 168nm on from B.

A - 25.2gal.
B - 43.2gal.
C - 19.6gal.
D - 33.2gal.

Q23 Assuming a flight plan time of 1hr - 40min, a fuel consumption of 12gals/hr plus a reserve of 10gals at the destination, what is the minimum fuel required?

A - 27gal.
B - 28gal.
C - 30gal.
D - 34gal.

Q24 Given the following data:

Fuel for start up, taxy, run up and take-off	=	2 Imp gals.
Planned flight time	=	1hr - 30min.
Planned diversion time	=	20min.
Fuel consumption rate	=	10 Imp gals/ hr.
Reserve required at the alternate aerodrome	=	7 Imp gals.

What is the minimum fuel required before start up?

A - 24 Imp gals.
B - 28 Imp gals.
C - 32 Imp gals.
D - 36 Imp gals.

Q25 An obstruction symbol  on an ICAO Aeronautical Chart annotated 1400 means:
(600)

A - it is 600ft in height on ground 1400ft amsl.

B - it rises to 600ft amsl on ground 1400ft amsl.

C - it rises to 1400ft amsl and is 600ft in height.

D - it rises to 1400ft amsl on ground 600ft amsl.

Q26 Refer to your chart.

At position N5300 W00245 at an altitude of 2000ft on the Barnsley Regional QNH you are in the:

A - Shawbury Airborne Interception of Aircraft Area.

B - Shawbury Aircraft Information Advisory Area.

C - Shawbury Intense Military Training Area.

D - Shawbury Area of Intense Aerial Activity.

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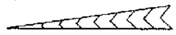
27 The UK aeronautical chart symbol  indicates a civil aerodrome that:

A - has parallel runways, and the left hand runway only is available for landing without prior ATC permission for aircraft that may be experiencing difficulty. Pilots should land in the direction indicated by the arrow.

B - has one or more instrument approach procedures outside regulated airspace. Pilots are strongly advised to contact the ATSU concerned when flying within 10nm of that aerodrome.

C - has two primary runways, one of which is fitted with a visual localiser, its direction being that indicated by the symbol. This equipment is used in conjunction with VASIs/PAPIs to maintain an accurate visual approach path over difficult terrain.

D - has one or more instrument approach procedures outside regulated airspace. Under section 2 (Aerodromes) of the UK. AIP, pilots are required to contact the ATSU concerned when flying within a radius of 10nm of that aerodrome.

Q28 Refer to your chart.

The Symbol * in front of the designator D203 located at (N5203 W00334) means:

A - DACS – Danger Area Crossing Service.

B - D203 Notified by Notam.

C - Subject to bye laws that prohibit entry when active.

D - see chart legend for Controlling Authority frequency for D203.

It is planned to carry out a flight under VFR from SHOREHAM (N5050.03 E00017.57) to WATTISHAM (N5207.62 E00057.47) via FARTHING CORNER (N5119.80 E00036.17).
The planned destination alternate is CLACTON (N5147.08 E00107.84).
Complete the flight plan (Appendix I) and then answer questions 29 - 48.

Q29 What is the magnetic heading from SHOREHAM to FARTHING CORNER?

A - 052°.

B - 232°.

C - 055°.

D - 237°.

Q30 What is the ground speed from SHOREHAM to FARTHING CORNER?

A - 92kt.

B - 97kt.

C - 103kt.

D - 107kt.

Q31 What is the magnetic heading from FARTHING CORNER to WATTISHAM?

A - 211°.

B - 027°.

C - 207°.

D - 029°

Q32 What is the flight plan time from SHOREHAM to WATTISHAM?

A - 57 min.

B - 63 min.

C - 28 min.

D - 34 min.

Q33 What is the magnetic heading from WATTISHAM to CLACTON?

A - 153°

B - 336°

C - 331°

D - 157°

Q34 Given the following data:

Fuel required for start up, taxy, run up and take-off	=	3US gal.
Planned flight time	=	1hr - 25min.
Planned diversion time to alternate airfield	=	20min.
Fuel consumption rate	=	10US gals/ hr.
Fuel for approach and landing or missed approach	=	3US gal.
Fuel required to be on board overhead the alternate airfield	=	10US gal.

The minimum fuel required to be on board before start up is:

A - 33.5 US gal.

B - 31.5 US gal.

C - 37.5 US gal.

D - 40.5 US gal.

Q35 Given the following data:

The aircraft basic empty weight	=	1420 lb.
Pilot's weight	=	186 lb.
Fuel load	=	38US gal.
Fuel specific gravity (SG)	=	0.71
Fuel weight	=	?
Maximum authorised weight	=	2325 lb.

The maximum PAYLOAD that may be carried is:

A - 549 lb.

B - 499 lb.

C - 494 lb.

D - 399 lb.

Note: The term 'payload' describes the weight of passengers, baggage and fuel which may be carried and does not in any way imply that a PPL holder may be paid for carrying cargo.

Q36 The maximum demonstrated cross wind component for an aircraft is 16kt. Given an 18kt wind speed, by how many degrees can a runway heading differ from the wind direction before the surface cross wind component equals 16kt.

A - 45°.

B - 60°.

C - 30°.

D - 75°.

Q37 Refer to your Aeronautical Chart ICAO 1:500 000.

The chart is sub divided into rectangles bounded by lines of longitude and latitude at half degree intervals. Within each rectangle is a 2-figure group printed in blue, the first figure being twice the size of the second figure. These figure groups denote:

A - the safety altitude for that rectangle in feet amsl. The two-figure group being 1000s and 100s of feet respectively.

B - the maximum elevation figure (MEF) for that rectangle.

C - the maximum elevation figure (MEF) for that rectangle, which is not a safety altitude. The two-figure group being 1000s and 100s of feet respectively.

D - the maximum elevation figure (MEF) for that rectangle which is not a safety altitude. The two-figure group being 100s and 10s of feet respectively.

Q38 For the first half of the leg from SHOREHAM to FARTHING CORNER, what type of hazard to navigation occurs from the surface upwards.

A - HANG/PARA GLIDING winch launch site.

B - Mast elevation 1007 ft amsl.

C - Haywards Heath VRP.

D - London TMA from the surface to 3500ft amsl.

Q39 Twenty two nautical miles down the first leg you pinpoint your position as 2 nm right of track overhead Crowborough. Assuming that the wind hasn't changed, what alteration to heading should you make in order to arrive overhead FARTHING CORNER?

A - 8° stbd.

B - 12° stbd.

C - 14° port.

D - 11° port.

Refer to Appendix M.

Q40 Assuming there is no controlled airspace, the first leg from SHOREHAM to FARTHING CORNER is to be conducted according to the Quadrantal Rule at the lowest available flight level (FL). If the Regional Pressure Setting is 1015hPa you should operate at:

A - FL30.

B - FL35.

C - FL40.

D - FL45.

Q41 Under the Low Flying Regulations Rule 5, the minimum altitude to transit Crowborough rounded up to the nearest 100ft would be:

A - 1800ft

B - 2000ft

C - 2500ft

D - 2300ft.

Q42 Part of your first leg from SHOREHAM to FARTHING CORNER is covered by the GATWICK CTA. To avoid controlled airspace, that part of the leg must be flown at:

A - 1400ft on the Gatwick QNH.

B - 2000ft on the Chatham regional pressure setting.

C - 2000ft on the Gatwick QNH.

D - 1400ft on the Chatham regional pressure setting.

Q43 Your fuel consumption is 8US gals/ hr and overhead FARTHING CORNER a fuel check indicates 22US gallons remaining. Allowing your planned flight time to WATTISHAM and planned alternate with a required minimum 6US gallon reserve overhead CLACTON, what will be your safe fuel endurance overhead CLACTON?

A - 2 hours 14 minutes

B - 1 hour 12 minutes

C - 1 hour 28 minutes

D - 1 hour 17 minutes.

Refer to your chart and to Appendix 'T' and answer the following question

Q44 You have just turned at FARTHING CORNER at 2500ft on track to WATTISHAM. It is recommended that you:

A - contact LONDON INFORMATION on 124.6MHz and advise them of your intentions for that leg.

B - contact Southend ATC on 127.72 MHz 15nm before reaching the Southend Zone Boundary.

C - Contact Southend ATC on 128.95 MHz 15 minutes before reaching the Southend overhead.

D - contact Southend /Approach/ Radar on 130.77 MHz 10nm before reaching the Southend Zone Boundary.

Q45 Assume your ATA FARTHING CORNER was 1120 UTC. At 1130 UTC you pinpoint your position as being on track 20nm from FARTHING CORNER.

What is your revised ETA for WATTISHAM?

A - 1148.

B - 1145.

C - 1142.

D - 1152.

Q46 10nm from WATTISHAM at an altitude of 3500ft you commence descent to join overhead WATTISHAM at 1500ft. If your ground speed in the descent is 90kt, what is the approximate rate of descent required?

A - 270ft/min.

B - 300ft/min.

C - 330ft/min.

D - 350ft/min.

Refer to the extract from the Pooley Flight Guide (Appendix O) and answer the following question.

Q47 You arrive at WATTISHAM on a Tuesday evening at 1810UTC and are unable to raise Wattisham Approach on 125.80MHz or Talkdown on 123.30MHz or Wattisham Tower on 122.10MHz. You should:

A - make blind calls inbound and outbound. If advised of glider flying, call Glider A/G Station 'Anglia base' and request gliders cease launching prior to arrival and departure. Make blind calls as before.

B - join overhead at 2000ft and observe if there is any glider activity. If not, join the circuit downwind left hand with caution and land at your own discretion.

C - not land, as Wattisham closes at 1700UTC Monday to Friday.

D - land no earlier than 30 minutes before sunset at which time glider operations will have ceased.

Q48 Prior to reaching the Southend Zone, you are at an altitude of 2000ft and experience a complete radio failure.

You should:

A - Squawk 7600, turn left to leave the Southend Zone to the east.

B - Squawk 7600 turn right and track north via the Essex coast remaining at 2000ft on the Chatham Regional Pressure Setting.

C - Squawk 7500 climb to 3500ft on the Chatham Regional Pressure Setting to remain vertically well clear of the Southend Zone.

D - Squawk 7600 maintain present altitude, turn right and leave the Southend Zone to the west.

It is planned to carry out a flight under VFR from SHIPDHAM (N5237.74 E00055.78) to TATENHILL (N5248.80 W00145.63) via BOURNE (N5245.50 W00022.50).
The planned destination alternate is COSFORD (N5238.42 W00218.25).
Complete the flight plan (Appendix J) and then answer questions 49 - 68.

Q49 What is the magnetic heading from SHIPDHAM to BOURNE?

A - 097°M.

B - 269°M.

C - 277°M.

D - 088°M.

Q50 What is the ground speed from SHIPDHAM to BOURNE?

A - 77kt.

B - 69kt.

C - 65kt.

D - 72kt.

Q51 What is the magnetic heading from BOURNE to TATENHILL?

A - 267°.

B - 270°.

C - 275°.

D - 279°.

Q52 What is the magnetic heading from TATENHILL to COSFORD?

A - 242°M.

B - 246°M.

C - 250°M.

D - 253°M.

Q53 What is the total flight plan distance from SHIPDHAM to TATENHILL?

A - 98nm.

B - 91nm.

C - 103nm.

D - 95nm.

Q54 Upon leaving SHIPDHAM, a sudden deterioration in the weather forces you to turn back and decreased visibility creates difficulty in finding SHIPDHAM. What facility at SHIPDHAM may help you visually locate the aerodrome?

A - A flashing green light located on the aerodrome reference point.

B - Alternate flashing white/red light located at the airfield datum.

C - A flashing white light located at the highest point on the aerodrome.

D - An aerodrome identification beacon flashing SA in green.

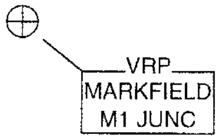
Q55 Given the following data:

Fuel required for start up, taxy, run up and take-off	=	2US gal.
Planned flight time	=	1hr - 30min.
Planned diversion time to alternate airfield	=	15min.
Fuel consumption rate	=	8US gals/ hr.
Fuel for approach and landing or missed approach	=	3US gal.
Fuel required to be on board overhead the alternate airfield	=	5US gal.

The minimum fuel required to be on board before start up is:

A - 18 US gal.
B - 21 US gal.
C - 24 US gal.
D - 27 US gal.

Q56 Refer to your chart.



(NOT ACTUAL SIZE)

At position N5241.73 W00117.45 there is a symbol illustrated above, which is:

A - a visual reference point which an aircraft must route to and fly over when cleared to do so.
B - a mandatory entry point for routing south-north through the East Midland CTR.
C - a visual reference point. Unless specifically instructed by ATC, flight directly over a VRP should be avoided.
D - a mandatory reporting point for transit of the East Midland CTR.

Q57 Given the following data:

The aircraft basic empty weight	=	1329 lb.
Pilot's weight	=	186 lb.
Fuel weight 42US gal SG.0.72	=	?
Maximum authorised weight	=	2325 lb.

The maximum PAYLOAD that may be carried is:

A - 558 lb.
B - 543 lb.
C - 521 lb.
D - 511 lb.

Note: The term 'payload' describes the weight of passengers, baggage and fuel which may be carried and does not in any way imply that a PPL holder may be paid for carrying cargo.

Q58 The maximum demonstrated cross wind component for your aircraft is 11kt. Given a 16kt wind speed, by how many degrees can a runway heading differ from the wind direction before the surface cross wind component equals 11kt.

A - 30°.
B - 45°.
C - 60°.
D - 75°.

Airborne at 1135 UTC. Set heading over SHIPDHAM at 1137 UTC climbing initially to 2800ft on the Barnsley Regional Pressure setting.

Q59 What is your ETA for Bourne N5245.50 W00022.50?

A - 1232 UTC.
B - 1209 UTC.
C - 1225 UTC.
D - 1217 UTC.

Q60 During the published hours of watch, Marham MATZ, should be contacted on a frequency of ....**(i)**.... at the greater of ....**(ii)**.... distance/time from the zone boundary to request MATZ penetration.

	(i)	(ii)
A -	124.60MHz.	10nm/5min.
B -	128.90MHz.	15nm/10min.
C -	121.50MHz.	10nm/ 5min.
D -	124.15MHz.	15nm/5min.

Q61 Upon leaving Bourne, you have to negotiate the Cottesmore/ Wittering clutched MATZ at your planned 'Safety Altitude. You should contact:

A - Cottesmore on 130.20 MHz and expect a MATZ penetration using the Cottesmore QFE.

B - Wittering on 117.60 MHz and expect a MATZ penetration on the clutched QNH.

C - Cottesmore on 124.15 MHz and expect a MATZ penetration using the Cottesmore QNH.

D - Cottesmore on 117.6 MHz and expect a MATZ penetration using the Cottesmore QFE.

Q62 You pinpoint your position overhead the Melton Mowbray VRP (N5244.34 W00053.47) having held a constant heading from BOURNE. Approximately what heading change should have been made at BOURNE to maintain your planned track to TATENHILL?

A - 10° stbd to 280°M.

B - 15° port to 255°M.

C - 20° port to 250°M.

D - 25° stbd to 295°M.

Refer to Appendix P.

Q63 Having consulted the extract from the AIP at Appendix 'P', at TATENHILL you are advised to keep a good look out for:

A - unlicensed runways 04/22.

B - displaced threshold on runway 08.

C - high tension cables running northwest/ southeast.

D - military traffic.

Q64 At position N5248.05 W00048.10, 2nm NW of the Cottesmore MATZ, what is the height of the mast above ground level?

A - 1050ft.

B - 1487ft.

C - 437ft.

D - 613ft.

Q65 In order to comply with Rule 5 of the ANO (Low Flying Regulations), the minimum altitude to over fly the mast at position N5248.05 W00048.10 would be:

A - 1501ft.

B - 1987ft.

C - 2500ft.

D - 1113ft.

Q66 At Melton Mowbray VRP (N5244.34 W00053.47) at an altitude of 2500ft on the East Midlands QNH, East Midlands ATC is unable to route you through their CTA and instruct you to remain clear of controlled air space. Your best course of action would be:

A - climb to FL85 to observe the Quadrantal Rule and over-fly East Midlands CTR direct to Tatenhill.

B - descend to 1400ft on the East Midlands QNH and route direct t to Tatenhill.

C - descend to 2400ft on the East Midlands QNH and route west to CATTON AERODROME (N5243.64 W00140.01), then north north west to Tatenhill.

D - descend to 1400ft on the East Midlands QNH and route east to CATTON AERODROME (N5243.64 W00140.01), then north north east to Tatenhill.

Q67 The red pecked line surrounding the name East Midlands means?

A - Active only during those times published by Notam.

B - Customs Aerodrome.

C - Instrument traffic only, light aircraft will only be cleared into the CTR under Special VFR.

D - Arrival and departure aerodrome for international traffic.

Refer to the Appendix Q an extract from the Pooley Flight Guide to answer question 38.

Q68 The Pooley Flight Guide informs that PPR applies to Tatenhill and:

A - circuits 1000ft aal, RH on 04, LH on 08, 22 & 26.

B - the grass strip to the north is unfit for power driven light aircraft.

C - non-radio aircraft must telephone with ETA prior to departure to Tatenhill.

D - circuits 1000ft aal, LH on 04 & 08, RH on 22 & 26.

It is planned to carry out a flight under VFR from ST MARY'S Scilly Isles (N4954.76 W00617.45) to PLYMOUTH via WOLF ROCK Light House (N4956.42 W00548.50) and CAMELFORD Quarry (N5036.00 W00438.50).

The planned destination alternate is BODMIN (N5029.95 W00439.88).
Complete the flight plan (Appendix K) and then answer questions 69 - 86.

Airborne at 0940 UTC. Set heading over ST MARY'S Scilly Isles at 0943 UTC climbing to 4000ft on the Scillies Regional Pressure setting.

Q69 Prior to transiting the Culdrose AIAA, pilots:

A - are strongly advised to contact Culdrose LARS on 134.05MHz.
B - are strongly advised to contact St Mawgan LARS on 126.50MHz.
C - should contact Land's End on 114.2MHz.
D - should contact Culdrose LARS on 126.50MHz.

Q70 What is the magnetic heading from ST MARY'S Scilly Isles to WOLF ROCK?

A - 091°M.
B - 086°M.
C - 081°M.
D - 077°M.

Q71 What is the ground speed from ST MARY'S Scilly Isles to WOLF ROCK?

A - 122kt.
B - 129kt.
C - 134kt.
D - 138kt.

Q72 What is the magnetic heading from WOLF ROCK to CAMELFORD Quarry?

A - 033°.
B - 040°.
C - 044°.
D - 051°.

Q73 What is the total flight plan time ST MARY'S Scilly Isles to PLYMOUTH?

A - 41 min.
B - 59 min.
C - 1 hour 8 mins.
D - 47 min.

Q74 What is the magnetic heading from PLYMOUTH to BODMIN?

A - 104°.
B - 283°.
C - 304°.
D - 122°.

Q75 Given the following data:

Fuel required for start up, taxy, run up and take-off	=	2US gal.
Planned flight time	=	2hr - 30min.
Planned diversion time to alternate airfield	=	22min.
Fuel consumption rate	=	6US gals/ hr.
Fuel for approach and landing or missed approach	=	3US gal.
Fuel required to be on board overhead the alternate airfield	=	7US gal.

The minimum fuel required to be on board before start-up is (rounded up to the nearest whole gallon):

A - 30 US gal.
B - 27 US gal.
C - 24 US gal.
D - 20 US gal.

Q76 Given the following data:

The aircraft basic empty weight	=	1401 lb.
Pilot's weight	=	174 lb.
Fuel weight 40US gal SG.0.73	=	?
Maximum authorised weight	=	2325 lb.

The maximum PAYLOAD that may be carried is:.

A - 443 lb.

B - 486 lb.

C - 421 lb.

D - 506 lb.

Note: The term 'payload' describes the weight of passengers, baggage and fuel which may be carried and does not in any way imply that a PPL holder may be paid for carrying cargo.

Q77 The maximum demonstrated cross wind component for your aircraft is 15kt. Given a 19kt wind speed, by how many degrees can a runway heading differ from the wind direction before the surface cross wind component equals 15kt.

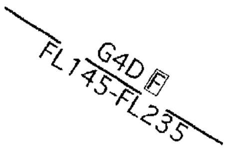
A - 20°.

B - 40°.

C - 60°.

D - 80°.

Q78 What is the blue dashed line illustrated below, running north west from Land's End VOR?



A - A boundary line at which radar cover of UK mainland terminates below the lowest flight level of airway G4D.

B - A boundary line for which ATC clearance to cross eastbound over UK mainland is required.

C - The centre line of an Advisory Route within Class F Airspace.

D - The centre line of airway G4D base FL145 extending to FL235.

Q79 After turning at WOLF ROCK, you accept a Flight Information Service (FIS) from Culdrose LARS advising the controller that you plan to over-fly the St Mawgan MATZ at 4000ft. Your altitude west of the MATZ should be based on:

A - the St Mawgan QFE.

B - the lower of the Scillies Regional Pressure Setting and the Wessex Regional Pressure Setting.

C - the St Mawgan QNH.

D - the Scillies Regional Pressure Setting.

Q80 Approaching Perrenporth, you advise Culdrose LARS that you are temporarily descending to 3000ft to avoid low cloud, so now you:

A - are not legally required to contact Perrenporth above 2330ft amsl but would be advised to do so.

B - must contact Perrenporth Radio on 118.10MHz.

C - must request a clearance to transit the Perrenporth Zone via Culdrose LARS because the Perrenporth frequency is not on the chart.

D - would be advised to contact Culdrose LARS on 134.05MHz.

Refer to Appendix M.

Q81 After passing St Mawgan, you plan to observe the Quadrantal Rule for the remainder of the leg to CAMELFORD Quarry. Assuming a Regional Pressure Setting of 998hPa, what would be the correct Flight Level to fly? Assume the Transition Altitude = 4000ft.

A - FL40.

B - FL45.

C - FL50.

D - FL55.

Q82 8nm miles after leaving CAMELFORD Quarry, you pinpoint your position as being 1nm right of track. Assuming a constant heading has been flown from CAMELFORD Quarry, and the wind remains unchanged, approximately what alteration to heading should be made to arrive overhead PLYMOUTH City Airport.

A - 9° left.

B - 11° left.

C - 15° left.

D - 19° left.

Q83 The area depicted on your chart at position N5040 W00400 delineated by a solid 1 mm magenta line is a:

A - Scheduled Weapons Firing Range form the surface to 1000ft amsl activated by Notam.

B - Scheduled Danger Area from the surface to 10,000ft amsl, also to 24,100ft with notification, the times of activity being notified in the AIP and by Notam.

C - permanently notified Restricted Area from the surface to 10,000ft amsl and when notified to 24,100ft amsl.

D - Scheduled Danger Area from the surface to 24,100ft with notification, the times of activity being disseminated by Notam.

Q84 Overhead CAMELFORD Quarry, a fuel check establishes you have 12 US gallons remaining. Assuming flight plan times and a constant rate of consumption of 8 US gallons/hour, what would be your remaining fuel endurance overhead BODMIN should you have to divert.

(Round up fuel quantities to the nearest whole gallon.)

A - 1hour

B - 1 hour - 10 min.

C - 1 hour - 15min.

D - 1 hour - 27min.

Q85 Having diverted to BODMIN, when 8nm from the Bodmin zone boundary having climbed to 4100ft, you commence the descent to enter the Bodmin Zone at 1700ft on the Bodmin QNH. Assuming a ground speed of 80kt, what would be an appropriate constant rate of descent?

A - 400ft/min.

B - 450ft.min.

C - 500ft/min.

D - 550ft/min.

Refer to Appendix R.

Q86 Upon first contact with BODMIN Radio you are advised that the active runway is 32 and the surface wind is 35018kt. You should anticipate:

A - circuit height is 1000ft agl.

B - a safety height of 1000ft aal because of a rifle range bearing 085 distance 1.4nm.

C - wind shear and strong turbulence on departure from runway 14 associated with strong down drafts up to 1000 aal.

D - In strong wind conditions, wind sheer and turbulence may be encountered on the approaches to all runways. Down draught effect and sudden changes in surface wind velocity are possible in light wind conditions in summer months.

A flight is planned to be made under Visual Flight Rules from YEOVIL (N5056 W00239.5) via overhead YSTRADGYNLAIS (N5147 W00345) to ABERPORTH (N5207 W00433) with SWANSEA AERODROME (N5136 W00404) as the planned alternate. Complete the flight plan at Appendix L before answering questions 87 - 101.

Q87 The magnetic heading from YEOVIL to top of climb (TOC) is:

A - 306°M.

B - 311°M.

C - 315°M.

D - 321°M.

Q88 The ground speed from the TOC to YSTRADGYNLAIS is:

A - 100kt.

B - 104kt.

C - 108kt.

D - 111kt.

Q89 The ground speed from YSTRADGYNLAIS to ABERPORTH is:

A - 115kt.

B - 111kt.

C - 108kt.

D - 105kt.

Q90 The total planned flight time from YEOVIL to ABERPORTH is:

A - 1hr - 06min.

B - 1hr - 13min.

C - 1hr - 20min.

D - 1hr - 01min.

Q91 The magnetic heading from ABERPORTH to SWANSEA is:

A - 346°M.

B - 164°M.

C - 160°M.

D - 352°M.

The aircraft was airborne at 1015 UTC and heading set overhead YEOVIL AERODROME at 1020 UTC climbing to FL45.

Q92 Departure instructions require you to route on track not above 2000ft until clear of the YEOVILTON MATZ, thereafter intending to maintain FL45 en route. Your main altimeter sub-scale should be set to:

A - YEOVILTON QFE to the MATZ boundary then Standard 1013.2hPa.

B - YEOVILTON QNH to the MATZ boundary then to the Cotswold Regional Pressure Setting.

C - YEOVILTON QFE to the MATZ boundary then Standard 1013.2hPa above the transition altitude.

D - YEOVILTON QFE to the MATZ boundary then YEOVILTON QNH above the transition altitude.

Q93 To which of the following frequencies would YEOVILTON RADAR most probably hand over your flight when crossing the Bristol Channel to facilitate a continued Radar Advisory Service (RAS)?

A - Cardiff Radar 110.7 MHz.

B - Bristol Radar 132.4 Mhz.

C - Filton Radar 124.85 Mhz.

D - Cardiff Radar 125.85 MHz.

Q94 At 1047 UTC you are on track passing abeam CARDIFF AERODROME (N5124 W00321) 2nm to the north east maintaining FL45. What is the revised ETA for YSTRADGYNLAIS:

A - 1100 UTC.

B - 1057 UTC.

C - 1108 UTC.

D - 1106 UTC.

Q95 At 1047 UTC CARDIFF RADAR advises you that only a limited service is available to a range of 25nm from the radar head situated at CARDIFF AERODROME (N5124 W00321). Based on the planned ground speed, at approximately what time would you expect the radar service to be terminated?

A - 1052 UTC.

B - 1058 UTC.

C - 1102 UTC.

D - 1108 UTC.

Q96 Consider the following data:

Fuel remaining overhead YSTRADGYNLAIS = 27US gallons.

Assume the planned flight time to ABERPORTH.

Fuel consumption to ABERPORTH = 9US gals/ hr.

Fuel endurance remaining when overhead ABERPORTH will be:

A - 3hr - 00min.

B - 2hr - 50min.

C - 2hr - 40min.

D - 2hr - 30min.

Q97 After passing under Airway G1 to the northwest inbound to ABERPORTH, if the planned flight is continued at approximately 1000ft agl, your altimeter sub-scale pressure setting should be:

A - Standard 1013.2hPa.

B - The Aberporth QFE.

C - The Aberporth QNH.

D - The Wessex Regional Pressure Setting.

Due to the wind aloft backing and decreasing, the actual time of arrival (ATA) at YSTRADGYNLAIS was 1057 UTC. At 1106 UTC the position is pinpointed as overhead the HELIPORT at CARMARTHEN (N5151 W00417).

Use this information to answer the following two questions.

Q98 At 1106 UTC, assuming a constant heading was held from YSTRADGYNLAIS, in order to parallel the planned track to ABERPORTH, the approximate heading change required would be:

A - 23° stbd.

B - 11° stbd.

C - 24° port.

D - 15° port.

Q99 At 1106 UTC, based on the ground speed from YSTRADGYNLAIS to CARMARTHEN Heliport, the revised ETA ABERPORTH is:

A - 1112 UTC.

B - 1115 UTC.

C - 1118 UTC.

D - 1121 UTC.

Q100 At a range of 15nm miles from ABERPORTH at an altitude of 4500ft, you are instructed to descend on the QNH to be level at 1500ft at a range of 5nm from ABERPORTH. Given a ground speed during the descent of 100kt, the minimum rate of descent would be:

A - 450ft/ min.

B - 500ft/ min.

C - 550ft/ min.

D - 600ft/ min.

Refer to Appendix 'S', the extract UK AIP AD 2-EGFH-1-3 SWANSEA and answer the following question.

Q101 You divert to SWANSEA due to reduced visibility at ABERPORTH. After making initial radio contact, the A/G station at SWANSEA you are advised that the active runway is 28. In anticipation of making this diversion, you consulted the UK AIP during your flight planning stage and expect that:

A - unserviceable portions of runway 28 short of the threshold marked by white crosses and a road running near to the threshold of runway 28. Any departure from the marked manoeuvring area may be hazardous.

B - unserviceable portions of runway 28 short of the threshold are marked by white crosses and a road runs near to the threshold of runway 28, but with a landing distance available (LDA) of 827 metres it is the longest runway and will not affect your landing.

C - a LH circuit in operation together with glider launching, free fall parachuting, and a landing distance of 827 metres with a displaced threshold.

D - unserviceable portions of runway 28 after the threshold marked by white crosses and a road running across the threshold of runway 28. Glider launching frequently takes place at SWANSEA. Only light aircraft may depart from the marked manoeuvring area during glider launching activity.

Q102 The accuracy of VHF Direction Finding (VDF) could be affected by:

A - propagation and site errors.

B - night effect.

C - airframe quadrantal and coastal refraction errors.

D - scalloping of the RT signal due to surface refraction.

Q103 Having transmitted for a QDM the controller responds 'QDM 080 Class Bravo.'

The controller has passed a magnetic bearing :

A - of the aircraft from the VDF station which is accurate to within +/- 2°.

B - of the VDF station from the aircraft which is accurate to within +/- 2°.

C - of the aircraft from the VDF station which is accurate to within +/- 5°.

D - of the VDF station from the aircraft which is accurate to within +/- 5°.

Q104 What is the format of presentation of an air traffic controller's VHF direction finding (VDF) information?

A - A series of radial blips on the primary radar

B - A cathode ray tube which radiates radial lines representing either true or magnetic bearings.

C - A digital readout of either a true or magnetic bearing of the aircraft to the station.

D - An analogue readout of either a true or magnetic bearing of the aircraft to the station.

Q105 Which of the following is true of an aircraft Automatic Direction Finding (ADF) system.

A - It comprises a single antenna and a controller.

B - The ADF operates on the radio compass principle.

C - The RMI or RBI needle always indicates the selected radial.

D - The RMI or RBI needle always indicates the selected heading.

Q106 A non-directional beacon (NDB) consists of:

A - a loop antenna together with a sense antenna which combine to determine an NDB signal direction.

B - radio magnetic compass and associated azimuth card and needle display.

C - ground based transmitter that radiates unidirectionally.

D - ground based transmitter that transmits omnidirectionally.

Q107 The component parts of an automatic direction finder (ADF) are:

1 A receiver.

2 A cockpit display.

3 A non directional beacon.

4 A loop antenna

5 A sense antenna

The correct combination of statements is:

A - 1,2,4 and 5.

B - 2,3,4 and 5.

C - 1,2,3 and 4.

D - all of the above.

Q108 A 4096 code transponder fitted to an aircraft is essential equipment to provide a controller with ________ information.

Select the answer that correctly completes this statement

A - primary radar.

B - precision approach radar.

C - azimuth.

D - secondary surveillance radar.

Q109 Primary radar range may be increased by:

A - using a wide radar antenna head that will transmit a higher energy narrow beam.

B - locating the antenna head clear of surrounding high ground and obstacles.

C - increasing the scan rate of the radar head.

D - increasing the frequency of the radar pulse train.

Q110 Secondary surveillance radar (SSR) information is:

A - presented in analogue form on the controller's strip.

B - displayed digitally on a secondary radar screen via a computer.

C - displayed on the same screen as primary radar information.

D - an analogue display.

Q111 In respect of a VOR, a radial is defined as:

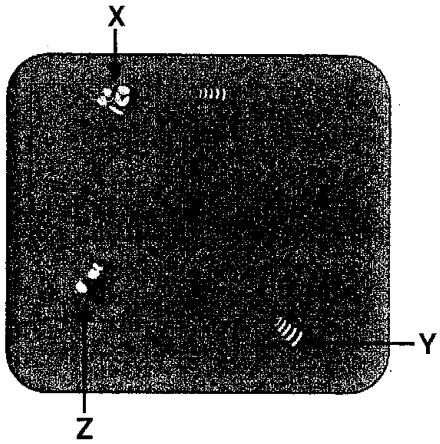
A - a true bearing TO the VOR

B - a magnetic bearing TO the VOR

C - a true bearing FROM the VOR

D - a magnetic bearing FROM the VOR

Q112 Study the diagram below which depicts an ATC primary radar plot illustrating three different returns: **X**, **Y** and **Z**. Return '**Y**' would most typically be?



A - A single aeroplane.

B - A ground return

C - A group of gliders .

D - A rain bearing cloud.

Q113 The use of Air Traffic Control (ATC) radar.

1 Provides weather information such as large convective clouds which are a hazard to aviation.
2 Makes radar vectoring available to the pilot.
3 Differentiates between aircraft and topography for the purpose of terrain clearance.
4 Provides the facility to feed aeroplanes with adequate spacing onto final approach.
5 Reduces air-ground radio communication traffic.
6 Enables a controller to safely handle a larger volume of traffic.

The correct combination of statements is:

A - 1,3,5 and 6

B - 2,4,5 and 6

C - 1,2,3 and 4

D - 2,3,4 and 5

Q114 Omni Ranging (VOR) operates in the _______ band.

A - UHF

B - VHF

C - MF

D - SHF

Q115 VOR reception may be affected by:

1 Topography in the immediate vicinity of the VOR transmitter.
2 The height of the VOR transmitter above sea level.
3 Aircraft altitude and slant range from from the VOR transmitter.
4 Thunderstorms and other electromagnetic interference.
5 Lowering of the ionosphere at night.
6 Coastal refraction.

The correct combination of statements is:

A - 2,4 and 5

B - 3,4 and 6

C - 1,5 and 6

D - 1,2 and 3

Q116 Distance measuring equipment (DME) employs a pulse train radar that provides _________ range from a ground based transponder.

Select the answer that correctly completes this statement

A - horizontal

B - composite.

C - parabolic.

D - slant

Q117 When maintaining a magnetic track of 090 away from an NDB with 6° right drift, the relative bearing indicator (RBI) will indicate:

A - 180° relative

B - 186° relative.

C - 174° relative.

D - 090° relative.

Q118 When tracking the 245 radial to a VOR, for the course deviation indicator (CDI) to operate in the correct sense, the omni bearing selector (OBS) should be set to:

A - 245.

B - 360.

C - 180.

D - 065.

Q119 When maintaining a constant track to an NDB with 8° port drift, the relative bearing indicator (RBI) will indicate:

A - 352° relative

B - 008° relative.

C - 172° relative.

D - 188° relative.

Q120 Having tuned and identified a VOR, the Omni Bearing Selector (OBS) is set to 255 and a 'FROM' indication is produced while the Course Deviation Indicator (CDI) is centred. In relation to the VOR, in which quadrant is the aircraft receiver located?

A - 360° - 089°

B - 090° - 179°

C - 180° - 269°

D - 270° - 359°

Q121 What VDF Q code should be used to obtain a true bearing from a VDF station.

A - QNH

B - QDR

C - QTE

D - QUJ

Q122 The promulgated range of NDBs published in the UK AIP is:

A - for night only with maximum bearing error of 1°.

B - for day and for night with maximum bearing error of 3°.

C - for day only with maximum bearing error of 5°.

D - for specific periods as published with maximum bearing error of 10°.

Q123 Flight operations at 520627N 0015119W at 1500ft agl would be illegal for:

A - fixed wing aircraft.

B - Fixed wing aircraft and helecopters.

C - helecopters.

D - all aircraft.

NAVIGATION
PRACTICE ANSWER SHEET

	A	B	C	D		A	B	C	D		A	B	C	D
1					21					41				
2					22					42				
3					23					43				
4					24					44				
5					25					45				
6					26					46				
7					27					47				
8					28					48				
9					29					49				
10					30					50				
11					31					51				
12					32					52				
13					33					53				
14					34					54				
15					35					55				
16					36					56				
17					37					57				
18					38					58				
19					39					59				
20					40					60				

NAVIGATION
PRACTICE ANSWER SHEET

	A	B	C	D
61				
62				
63				
64				
65				
66				
67				
68				
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71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				

	A	B	C	D
82				
83				
84				
85				
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89				
90				
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93				
94				
95				
96				
97				
98				
99				
100				
101				
102				

	A	B	C	D
103				
104				
105				
106				
107				
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111				
112				
113				
114				
115				
116				
117				
118				
119				
120				
121				
122				
123				

NAVIGATION ANSWERS

	A	B	C	D
1			X	
2		X		
3	X			
4			X	
5				X
6	X			
7				X
8				X
9			X	
10	X			
11	X			
12			X	
13				X
14			X	
15			X	
16		X		
17				X
18		X		
19			X	
20		X		

	A	B	C	D
21		X		
22	X			
23			X	
24		X		
25			X	
26				X
27		X		
28			X	
29			X	
30		X		
31				X
32	X			
33				X
34	X			
35			X	
36		X		
37			X	
38	X			
39				X
40	X			

	A	B	C	D
41	X			
42	X			
43				X
44				X
45		X		
46		X		
47	X			
48	X			
49			X	
50				X
51		X		
52		X		
53	X			
54				X
55			X	
56			X	
57	X			
58		X		
59				X
60				X

NAVIGATION ANSWERS

	A	B	C	D
61	X			
62	X			
63				X
64	X			
65		X		
66			X	
67		X		
68	X			
69	X			
70	X			
71		X		
72			X	
73				X
74		X		
75	X			
76				X
77			X	
78			X	
79				X
80	X			
81			X	

	A	B	C	D
82		X		
83		X		
84	X			
85	X			
86				X
87			X	
88		X		
89			X	
90				X
91		X		
92			X	
93				X
94				X
95			X	
96			X	
97				X
98	X			
99		X		
100		X		
101	X			
102	X			

	A	B	C	D
103				X
104		X		
105		X		
106				X
107	X			
108				X
109		X		
110			X	
111				X
112	X			
113		X		
114		X		
115				X
116				X
117		X		
118				X
119	X			
120				X
121			X	
122			X	
123			X	

NAVIGATION EXPLANATIONS

EN1(C)

Using the wind triangle side of the CRP computer, set the wind direction 260 on the rotating inner scale against the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc. Use a chinagraph or other soft pencil to mark the wind speed (15kt) on the centre line at a distance down from the centre dot: 100 – 15 = 85 on the speed scale (fig N1).

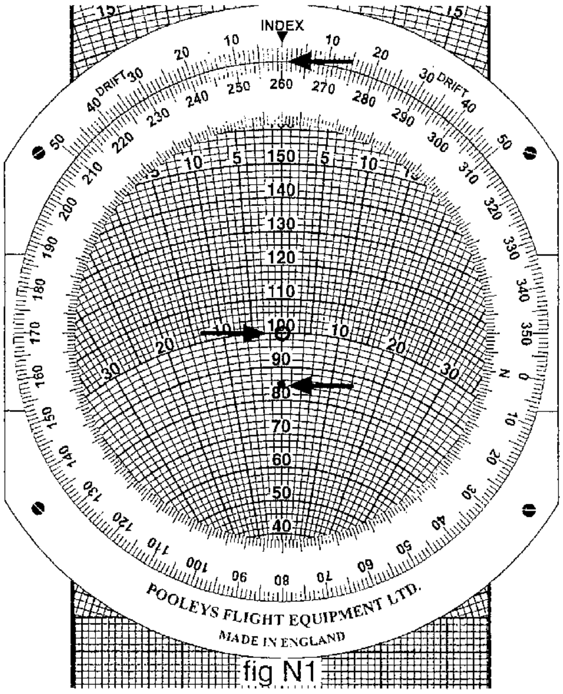


fig N1

Rotate the inner scale to set the true track 296 on the inner scale against the index mark at the top of the fixed outer scale.
By moving the slide, set the soft pencil mark on the 120 speed arc (fig N2).

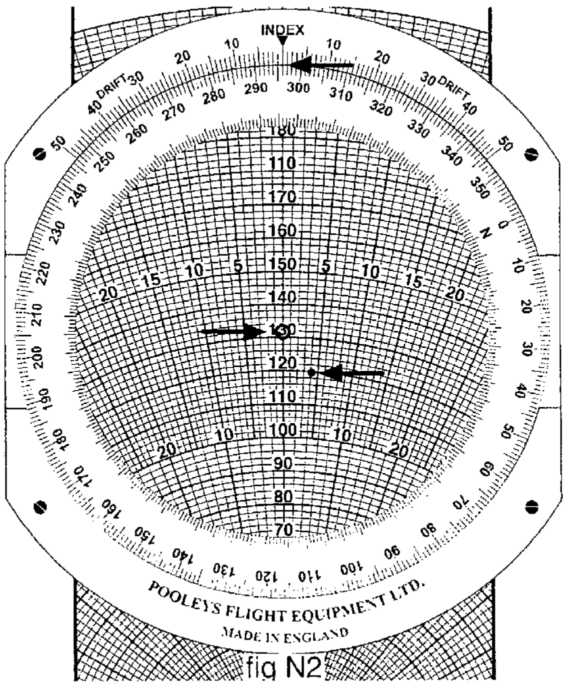


fig N2

The soft pencil mark has now moved to the right indicating 4° (stbd) drift.
Rotate the inner scale to the right 4° to correspond with the 4° stbd drift indicated by the soft pencil mark. The soft pencil mark is still indicating 4° stbd drift so no further adjustment is required (fig N3).

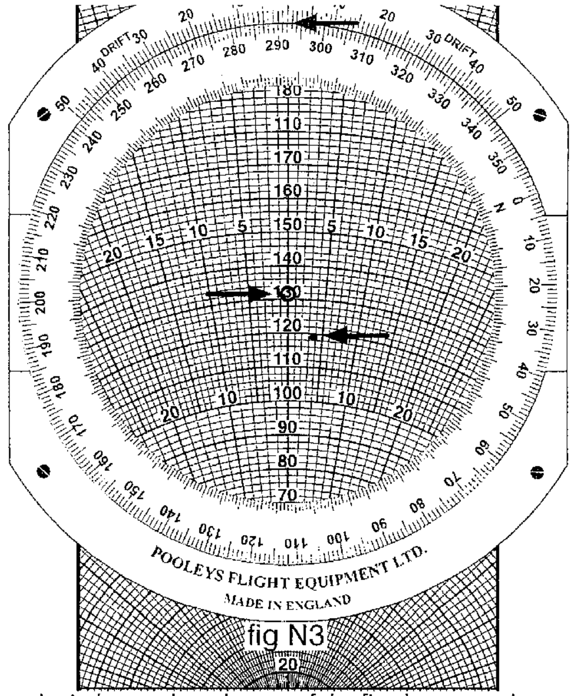


fig N3

Below the index mark at the top of the fixed outer scale, read off the **True Heading 292** on the rotating inner scale (fig N3).
The **TAS 132kt** appears under the centre dot on the speed scale (fig N3).

EN2(B)

Using the wind triangle side of the CRP computer, set the heading 070 on the inner rotating scale under the index mark at the top of the fixed outer scale.

By moving the slide, place the centre dot over the 120 speed arc (fig N4).

The drift = (track – heading) = (061° – 070°) = –9° left (port).

Note: If the sum of (track – heading) is + then the drift is to **starboard.**
If the sum of (track – heading) is – then the drift is to **port.**

Using a chinagraph or other soft pencil, mark the intersection of 9° left and the speed arc 118 (ground speed) (fig N4).

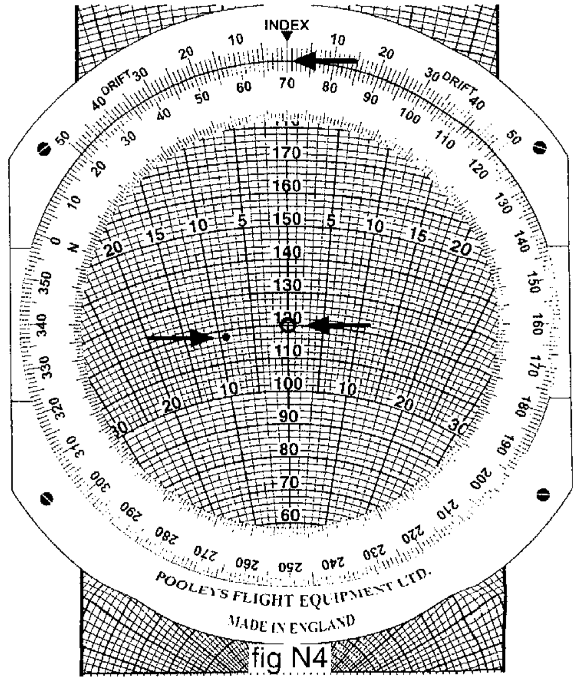


fig N4

Rotate the inner scale until the soft pencil mark is vertically below the centre dot.

Below the index at the top of the fixed outer scale, read off the *wind direction* ***150*** *on the rotating inner scale.*

Read off the wind speed on the speed scale represented by the distance between the centre dot and the soft pencil mark.
= **19kt** (fig N5).

W/V = 15019kt.

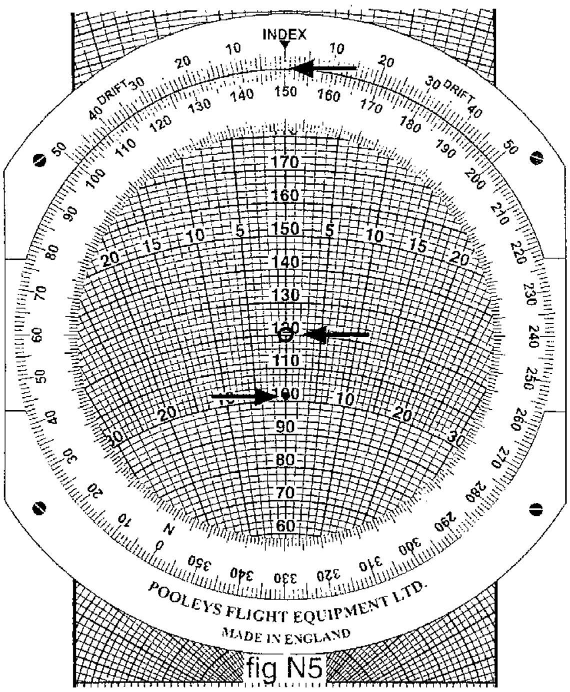


fig N5

EN3(A)

Follow the method in EN2.

EN4(C)

Follow the method in EN2.

EN5(D)

Follow the method in EN1.

EN6(A)

Using the wind triangle side of the CRP computer, set the wind direction 260 on the inner rotating scale under the index mark at the top of the fixed outer scale (fig N6).

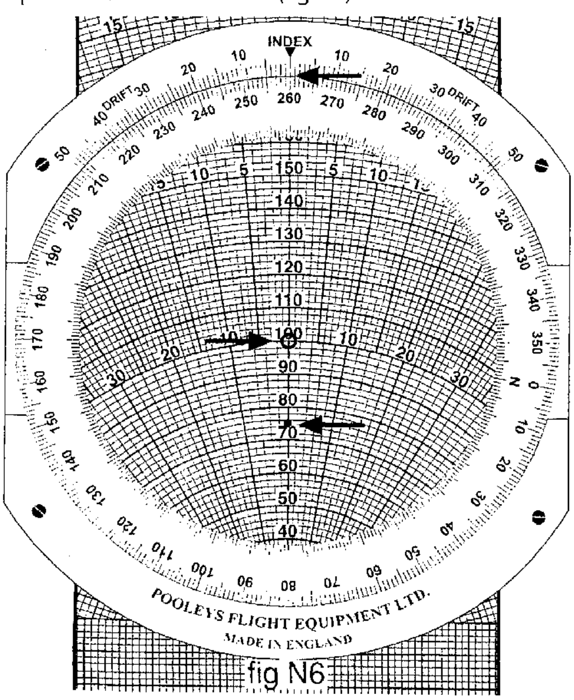


fig N6

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind-speed (25kt) on the centre line at a distance down from the centre dot. 100 – 25 = 75 (fig N6).

By moving the sliding scale, set the centre dot over 125 on the speed scale (fig N7).

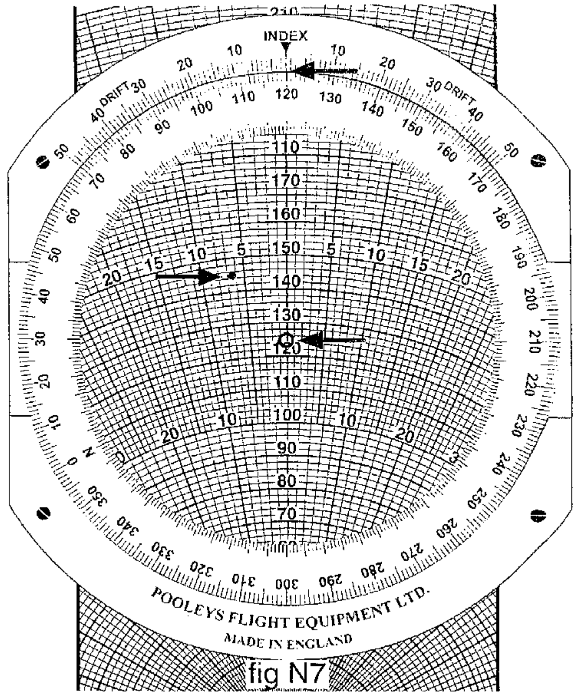


fig N7

Rotate the inner scale to place the true track 120 under the index mark at the top of the fixed outer scale.

The soft pencil mark has now moved 6° left indicating 6° left (port) drift (fig N7).

Rotate the inner scale left 6° and note that the soft pencil mark now indicates 7°left drift. Adjust the rotating inner scale until both the soft pencil mark and the rotating scale indicate the same drift: in this case 7° port
(fig N8).

Below the index mark at the top of the fixed outer scale, read off the true heading 127 on the rotating inner scale. Read off the ground speed 143kt from the speed arc under the soft pencil mark (fig N8).

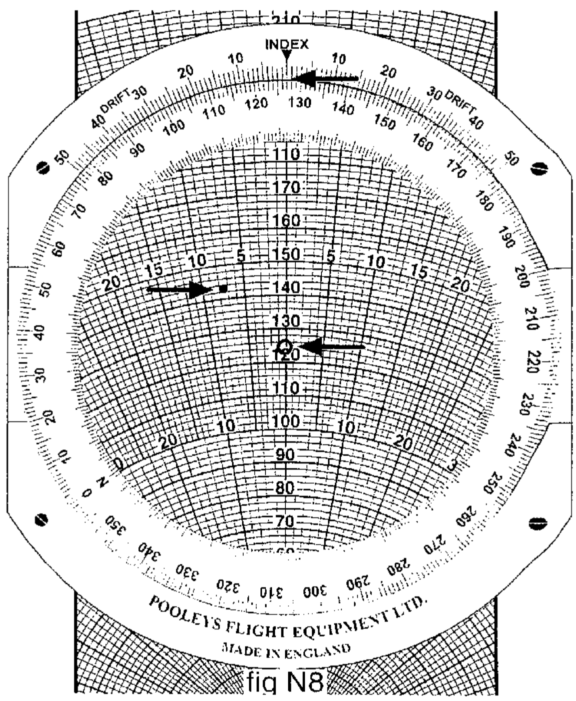


fig N8

EN7(D)

Using the wind triangle side of the CRP computer, set 0 or North on the rotating inner scale under the index mark at the top of the fixed outer scale (fig N9).

Using the squared grid section at the bottom of the low speed scale, set the centre dot (wind index) on the grid at the zero speed point at the top of the grid (fig N9).

Using a chinagraph or other soft pencil, mark the wind speed (22kt) on the centre line at a distance down from the centre dot. = 22. (fig N9).

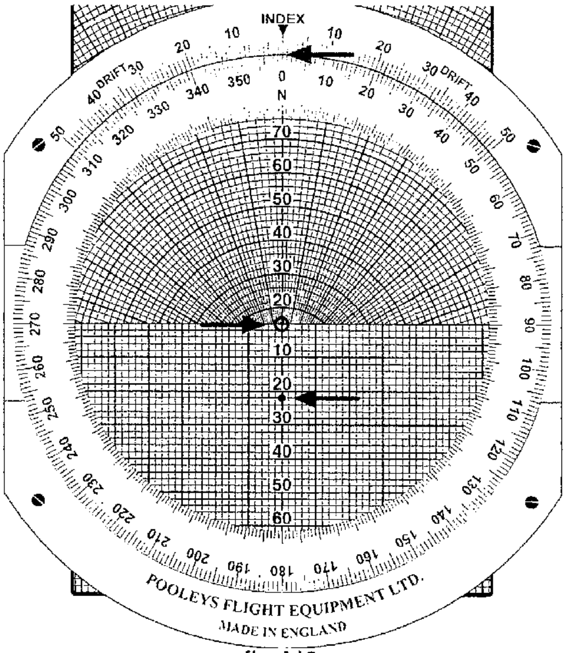


fig N9

Rotate the inner scale left or right until the soft pencil mark indicates a cross wind component of 16kt which in this instance = 45° left or right (fig N10).

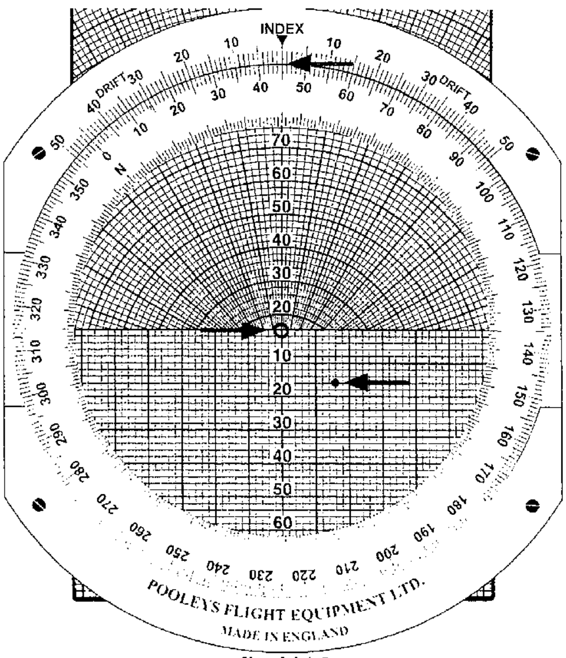


fig N10

EN8(D)

Runway 22

Using the wind triangle side of the CRP computer, set the wind direction 250 on the rotating inner scale under the index mark at the top of the fixed outer scale (fig N11).

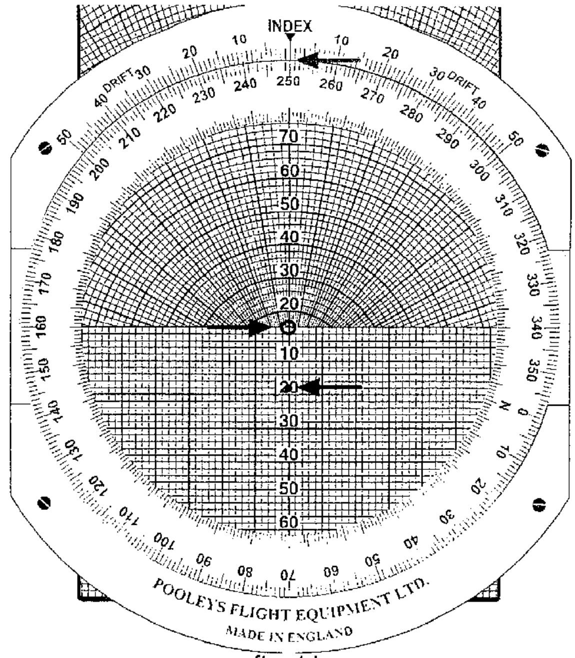


fig 11

Using the squared grid section at the bottom of the low speed scale, set the centre dot (wind index) on the grid at the zero speed point, at the top of the grid (fig N11).

Using a chinagraph or other soft pencil, mark the wind speed (18kt) on the centre line at a distance down from the centre dot. =18. (fig N11).

Set the runway heading 220 on the rotating inner scale, below the index mark at the top of the fixed outer scale (fig N12).

This will displace the dot so that the cross wind component (9kt from the left) can be read off horizontally from the grid centre line (fig N12).

The head wind component (15kt) can be read off vertically on the grid (fig N12).

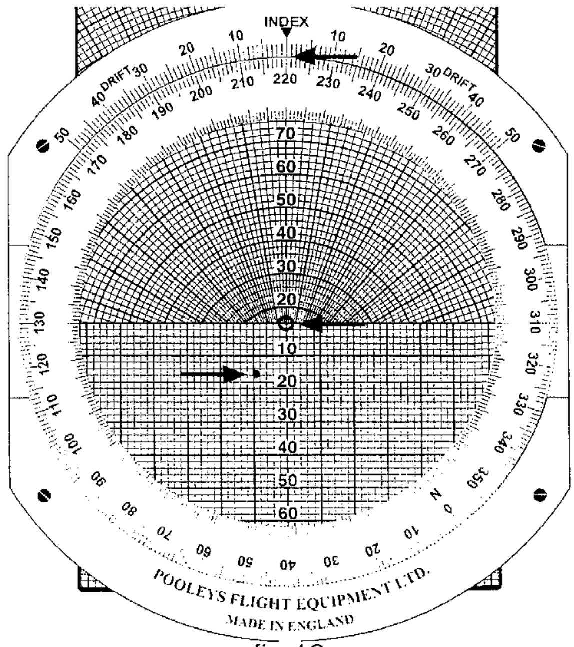


fig 12

Repeat the method for runways 29 and 33.

Runway 22: head wind component 15kt
cross wind component **9kt** from the left

Runway 29: head wind component 14kt
cross wind component **12kt** from the left.

Runway 33: head wind component 3kt
cross wind component **18kt** from the left.

Only runways 29 and 22 are suitable

EN9(C)

Follow the method in EN8.

EN10(A)

Follow the method in EN8.

Note: If the dot appears above the zero wind speed on the grid, this represents a tail wind component.

EN11(A)

$$\text{Chart scale} = \frac{\text{chart distance}}{\text{Earth distance}} = \frac{1}{1{,}000{,}000}$$

$$\text{Earth distance} = \text{chart distance} \times \text{chart scale}$$

$$= 30\text{cm} \times 1{,}000{,}000$$

$$\text{Earth distance} = 30{,}000{,}000\text{cm.}$$

$$\text{Earth distance} = \frac{30{,}000{,}000\,\text{cm}}{100\,\text{cm}} \times \frac{\text{meter}}{1}$$

$$= \frac{300{,}000\ \text{metres}}{1000\ \text{metres}} \times \frac{\text{km}}{1}$$

Earth distance = 300km

Note: It is always easier to work in metric and then convert to another unit of measurement.

Using the CRP circular slide rule, set 30 (300) on the rotating inner scale under the 'km-m-ltr' fixed index at the top of the fixed outer scale.

Under the 'naut m' (nautical miles) index arrow on the fixed outer scale, read off the Earth distance in nautical miles on the rotating inner scale = **162nm** (fig N13).

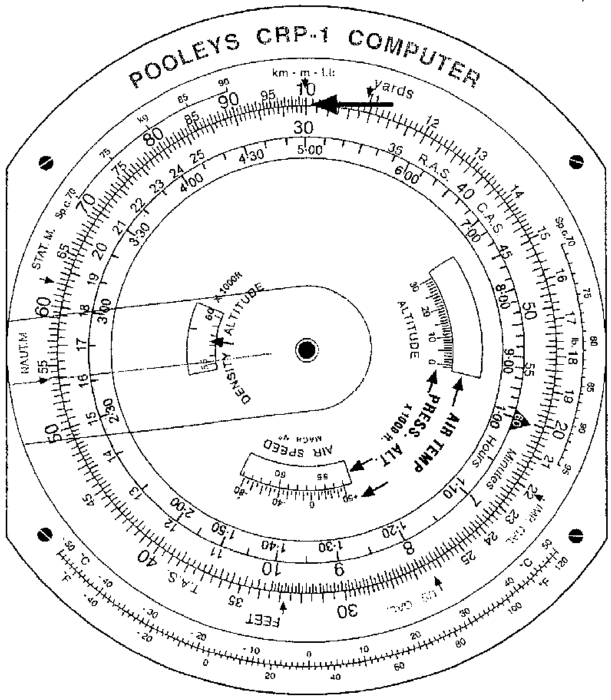


fig N13

EN12(C)

$$\text{Chart scale} = \frac{\text{chart distance}}{\text{Earth distance}} = \frac{1}{1{,}000{,}000}$$

$$\text{Earth distance} = \text{chart distance} \times \text{chart scale}$$

$$= 11\text{in} \times 1{,}000{,}000$$

$$\text{Earth distance} = 11{,}000{,}000\text{in}$$

$$\text{Earth distance} = \frac{11{,}000{,}000\,\text{in}}{12\,\text{in}} \times \frac{\text{ft}}{1} = 916000\text{ft}$$

$$\text{Earth distance} = \frac{916{,}000\,\text{ft}}{6080\,\text{ft}} \times \frac{\text{nm}}{1} = 150\ \text{nm}$$

Earth distance = 150nm.

Using the CRP circular slide rule, set 12 on the rotating inner scale below 11 on fixed outer scale.

Above the 10 index on the rotating inner scale, read off 916 (approximated) on the fixed outer scale (fig N14).

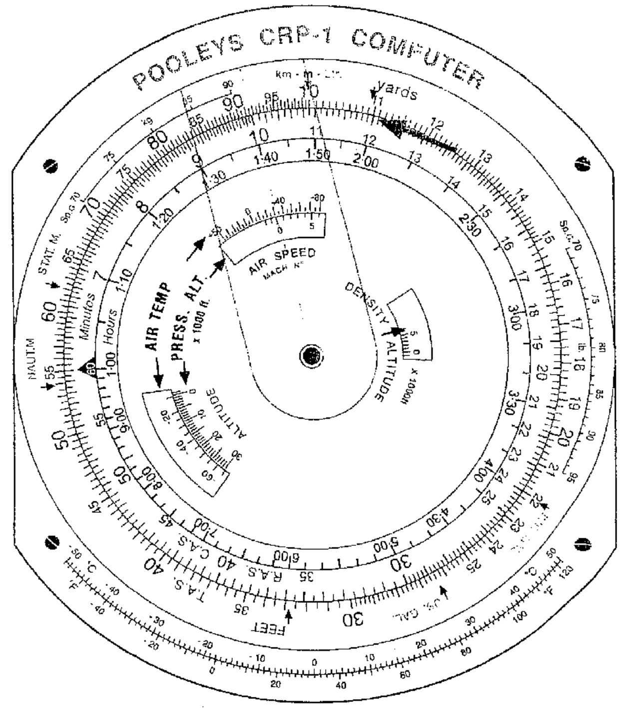


fig N14

Care must be taken when using the computer that the answer is made up of the correct number of digits.

(i) If the bottom whole number (12) is greater than the top whole number (11) one nought is removed from the original top line quantity. In addition to this:

(ii) if the bottom number is greater than 10 but less than 100, remove one nought.

(iii) if the bottom number is greater than 100 but less than 1000, remove two noughts.

Therefore the distance will be 916000ft.

$$\frac{916000\,\text{ft}}{6080\,\text{ft/nm}} = 150\text{nm}$$

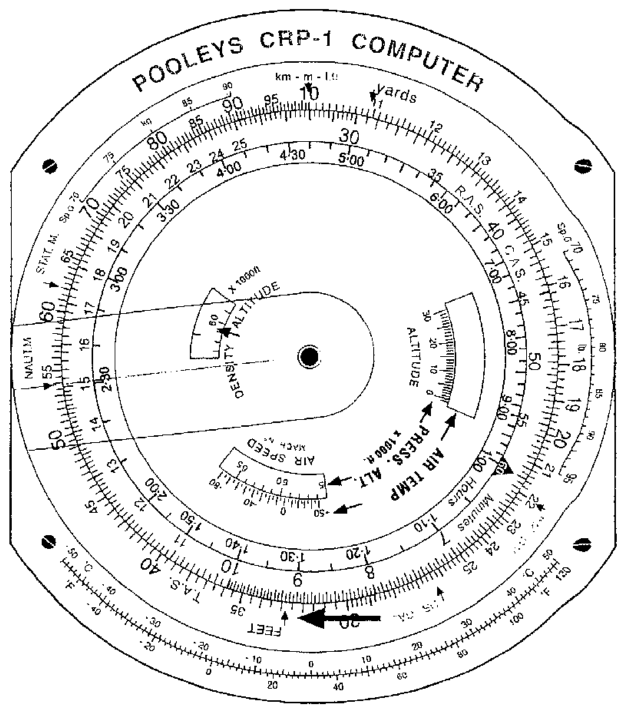


fig N15

Set this value (916) under the 'feet' index on the outer fixed scale. Under the 'naut. m' index on the fixed outer scale, read off the answer on the rotating inner scale = 15 (approximately). See (i) (ii) & (iii) = 150nm. and fig N15.

EN13(D)

This is the 1 in 60 rule which states that for every one degree an aircraft is off track it will be one nautical mile off track for every sixty nautical miles travelled.

To solve the problem using the 'closing angle method', two values must be established that are then used to calculate the alteration to heading required to fly direct to the destination.

1 The angle that the aircraft is off track (track angle error).

2 The distance remaining to the destination expressed as a fraction.

To calculate the track angle error 120nm along track.

1 $$\text{Track angle error} = \frac{\text{distance off track}}{\text{distance flown}} \times \frac{60°}{1}$$

$$= \frac{8\text{nm} \times 60°}{120\text{nm}} = 4° \text{ port}$$

2 The distance X to Y is 160 nm which divides into quarters.

Distance to go:	X	3/4	1/2	1/4	Y
	160nm	120nm	80nm	40nm	zero

The distance to Y = 40nm = 1/4 distance to go.

To find the alteration to heading at 1/4 distance to go: the fraction 1/4 is inverted to 4/1 and multiplied by the track angle error of 4°.

ie. $4 \times 4° = 16°$

As the drift is to port, the aircraft must alter heading to stbd by 16° to arrive overhead **Y**.

EN14(C)

Using the method in EN13:

1 $$\text{Track angle error} = \frac{\text{distance off track}}{\text{distance flown}} \times \frac{60°}{1}$$

$$= \frac{4\text{nm} \times 60°}{40\text{nm}} = 6° \text{ port}$$

2 The distance from X to Y is 100 nm which divides into fifths.

Distance to go:	X	4/5	3/5	2/5	1/5	Y
	100nm	80nm	60nm	40nm	20nm	zero

The distance to Y = 60nm = 3/5 distance to go.

To find the alteration to heading at 3/5 distance to go: the fraction 3/5 is inverted to 5/3 and multiplied by the track angle error of 6°.

ie. $\frac{5 \times 6°}{3} = \frac{10°}{1}$

As the drift is to port, the aircraft must alter heading to stbd by 10° to 015°M to arrive overhead the destination.

EN15(C)

Maximum turning errors occur when turning through or onto north or south.

Minimum turning errors occur when turning through or onto east or west.

Maximum acceleration errors occur on headings of east or west.

Minimum acceleration errors occur on headings of north or south.

When turning through the pole that is physically closer to the aircraft, it will be necessary to roll out early: that is, before the desired heading is indicated by the direct reading magnetic compass. For example, turning clockwise or anticlockwise through north in the northern hemisphere, stop the turn before the desired heading.

When turning through the pole that is physically further from the aircraft, it will be necessary to roll out late: that is, after the desired heading is indicated by the direct reading magnetic compass. For example, turning clockwise or anticlockwise through south in the northern hemisphere, stop the turn after the desired heading. See fig N16.

TURNING ERRORS IN THE NORTHERN HEMISPHERE

Turning From - To	Hemisphere	Direction of turn	Turn should be stopped
NW to NE	Northern	Clockwise	Before desired heading
NE to NW	Northern	Anticlockwise	Before desired heading
SE to SW	Northern	Clockwise	After desired heading
SW to SE	Northern	Anticlockwise	After desired heading

fig N16

EN16(B)

See EN15.

EN17(D)

See fig N17.

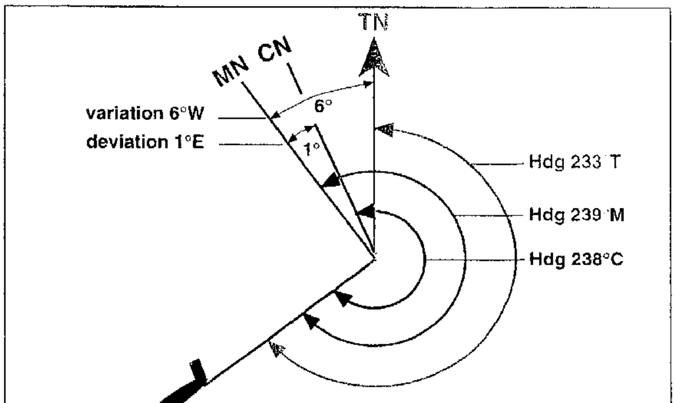


fig N17

The direct reading magnetic compass is subject to errors produced by local magnetic influences that cause the compass to deviate from magnetic north.

These errors are termed DEVIATION and vary in magnitude according to the aircraft heading.

The rule (east is least and west is best) that requires local variation between magnetic north and true north to be either added to, or subtracted from, the true heading to give magnetic heading applies to compass deviation.

The Rule:

West is best: add westerly deviation to the magnetic heading to give compass heading.

East is least: subtract easterly deviation from magnetic heading to give compass heading.

When compass deviation is applied to a magnetic heading the resulting compass heading is expressed in °Compass (°C).

233°T + local variation 6°W	= 239°M.
239°M – compass deviation 1°E	= 238°C
or 233°T + 6°W – 1°E	= 238°C.

EN18(B)

See EN17.

With this scenario the procedure given in EN17 is reversed.

80°C + 4°E – 5°W = 79°T

EN19(C)

Using the CRP circular slide rule, find the airspeed window (fig N18)

Note: Each division on the altitude rotating scale in the air-speed window represents 1000ft.

Each temperature division on the fixed scale above and below the window represents 5°C with + left and – right.

On the main slide rule, the inner rotating scale represents RAS and the outer fixed scale TAS (fig N18).

Rotate the inner scale in the airspeed window to set 3500ft below +15°C.

Read off above 95 (RAS) on the main rotating inner scale, the 101 (TAS) on the fixed outer scale (fig N18).

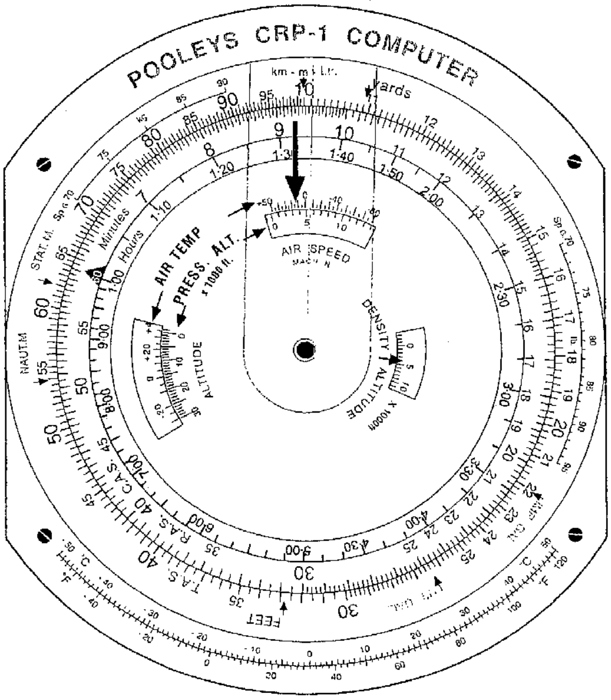


fig N18

EN20(B)

Follow the method in EN19.

EN21(B)

Follow the method in EN19.

EN22(A)

You are required to calculate the fuel consumption in nautical miles per gallon, and use this information to find the fuel consumed over a given distance.

Fuel consumption from A - B

nm per gal flown $= \frac{120\text{nm}}{18\text{gals}} = \frac{6.65\text{nm}}{1\text{gal}}$

Using the CRP circular slide rule, set 18 (gals) on the rotating inner scale below 12 (120nm) on the fixed outer scale.

Above the 10 index on the rotating inner scale, read off 6.65 (nm/gal) on the fixed outer scale (fig N19).

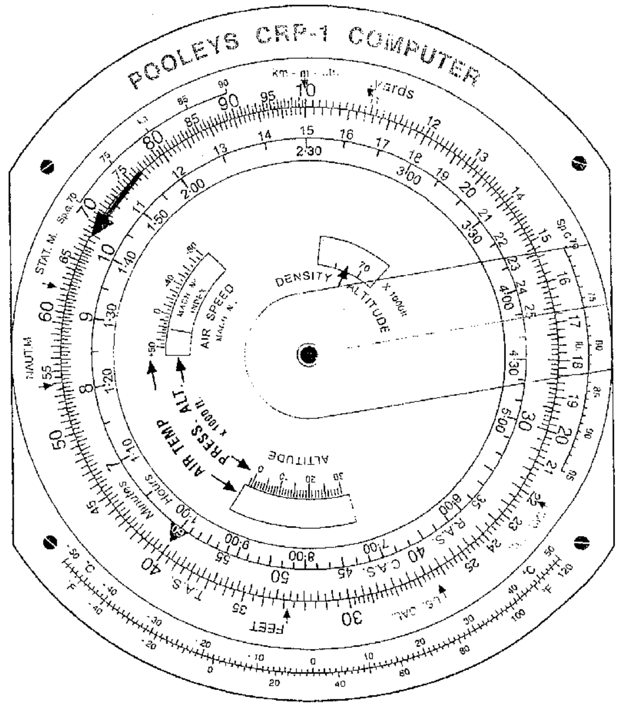


fig N19

Fuel consumed from B - C:

$$= \frac{\text{Distance}}{\text{nm/ gal}}$$

$$= \frac{168\cancel{\text{nm}} \times 1\text{gal}}{6.65\cancel{\text{nm}}} = 25 \text{ gals}$$

Using the CRP circular slide rule which is already indicating 6.65nm/gal, below 168 (nm) on the fixed outer scale, read off 25.2 (gals) on the rotating inner scale. (See fig N19).

EN23(C)

The rotating inner scale of the CRP computer may also be used as a time scale.

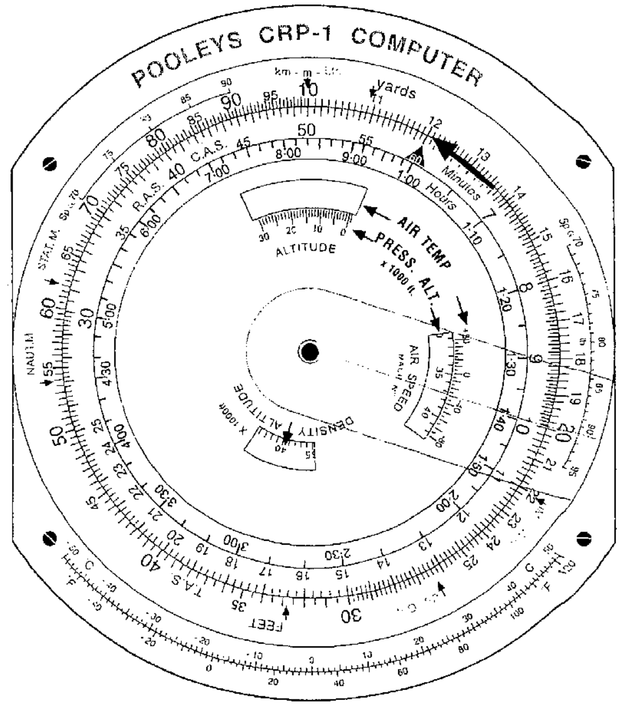


fig N20

Note: The red triangle containing the 60 index may represent 60 minutes or 1hr.

To find the fuel required for the planned flight time given a fuel consumption of 12gals/ hr:

Rotate the inner scale to set the 60 index (1 hr) under the 12 (gals) on the fixed outer scale.

From the 10 (100min or 1hr - 40min) on the inner rotating scale, read off 20 (gals) on the fixed outer scale (fig N20).

Flight plan fuel	=	20gal.
Reserve	=	10gal.
Minimum fuel	**=**	**30gal**.

EN24(B)

Add the planned flight time and diversion time then follow the method in EN23 for fuel requirement.

This is added to the start up fuel and required reserve to give the required fuel on board at start up.

Start up, taxy, run up and take-off	=	2 Imp gal
Flight plan fuel	=	18.3 Imp gal
Reserve	=	7 Imp gal

Total = 27.3 Imp gal. Rounded up to **28 Imp gal**.

EN25(C)

The two figure group juxtaposed with the obstacle gives:

(i) in brackets (600) the height of the top of the obstacle in feet above the ground upon which it is located = 600ft agl.

(ii) the top larger figure, the height in feet of the top of the obstacle above mean sea level = 1400ft amsl.

EN26(D)

To plot a location on a chart using latitude and longitude. Refer to your chart.

The chart has a superimposed graticule made up of vertical lines of longitude (meridians) and horizontal lines of latitude (parallels of latitude).

Both the meridians of longitude and parallels of latitude are at whole degree and half degree intervals interposed with minutes of a degree.

To plot N5300 W00245

Between W002° 30' and W003°, draw a horizontal line at N53°. Between N52° 30' and N53° 30', draw a vertical line at W002° 45'.

The intersection of the two drawn lines will be N5300 W00245.

The Shawbury Area of Intense Air Activity (AIAA)is from the surface to 3000ft altitude. To the SE is the Ternhill AIAA.

An AIAA is bounded by a line comprised of a chain of blue diamonds that are approximately 2mm wide at their widest point.

See the chart legend (Note 3). 'Night operations may be conducted by aircraft using reduced navigation and/ or anticollision lights' at both Shawbury and Ternhill.

EN27(B)

The symbol represents an aerodrome with one or more instrument approaches that are outside regulated airspace. Pilots are strongly advised to contact the relevant ATCU when operating within 10nm of that aerodrome.

EN28(C)

See EN26 to plot position.

The symbol ✻ prefixing the Danger Area identity number means that the area contains airspace that is subject to local bye-laws that prohibit entry during the periods that the Danger Area is active. See the chart legend.

EN29(C)

Follow the method in EN26 to plot the locations SHOREHAM and FARTHING CORNER and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix I.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 049°T**.

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between SHOREHAM and FARTHING CORNER = 45nm.

Track distance = 45nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 090 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 10kt on the centre line at a distance down from the centre dot. 100 – 10 = 90. (fig N21).

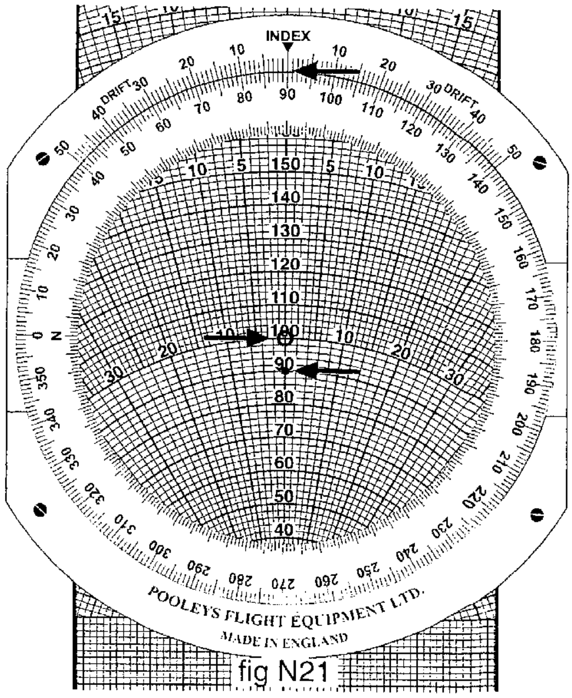


fig N21

By moving the sliding scale, set the centre dot over the TAS 105kt on the speed scale.

Rotate the inner scale to place the true track 049 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 4° to the left (fig N22).

Rotate the inner scale left 4° and note that the soft pencil still indicates 4° left.

Read off the **true heading 053°** under the index mark at the top of the fixed outer scale (fig N23).

Your heading will be 4° right of track. Therefore, the drift is to the left, or **4° port drift** (fig N23).

Read off the ground speed: the speed arc under the soft pencil mark = **97kt** (fig N23).

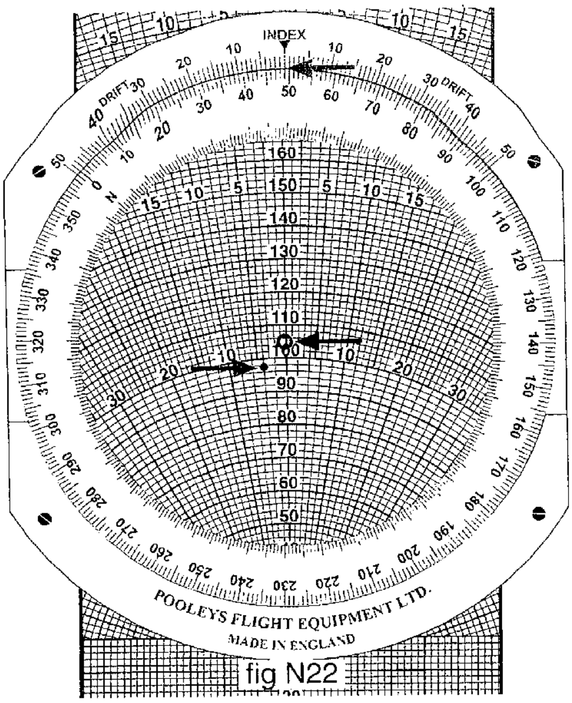


fig N22

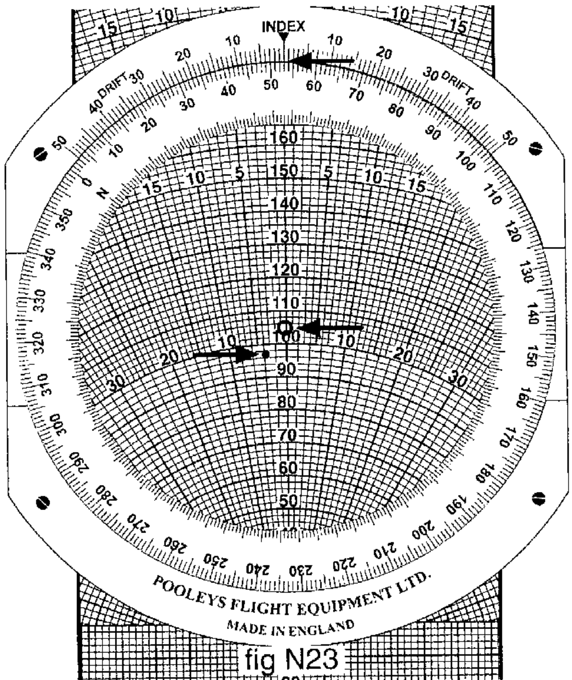


fig N23

The local variation = 2°W given in the flight plan.

Magnetic heading = 053°T + 2°W = **055°M**.

Time calculation

Distance SHOREHAM to FARTHING CORNER was measured at the beginning of this explanation = 45nm.

Ground speed SHOREHAM to FARTHING CORNER = 97kt. See fig N23.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 97 on the fixed outer scale.

Below 45 on the fixed outer scale, read off 28 minutes on the rotating inner scale (fig N24).

Time SHOREHAM to FARTHING CORNER **= 28 minutes.**

EN30(B)

See EN 29.

EN31(D)

Follow the method in EN26 to plot the locations FARTHING CORNER and WATTISHAM and draw a track line between the points plotted.

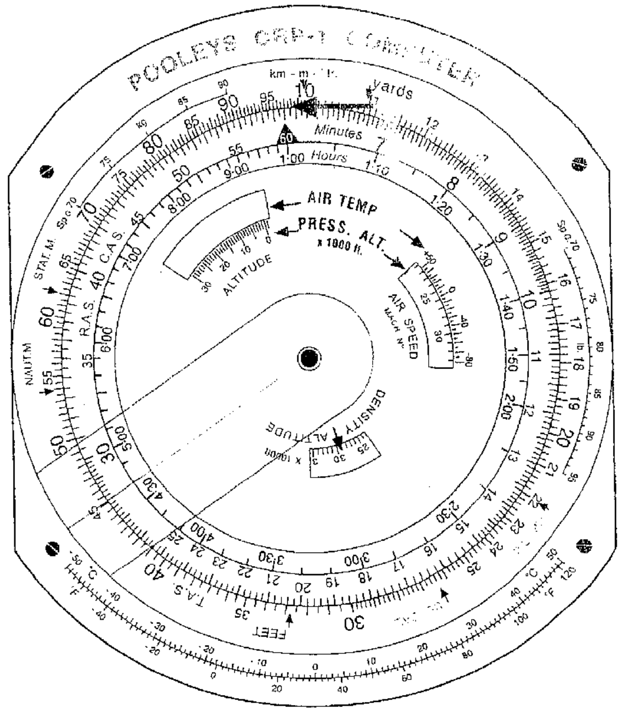


fig N24

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix I.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 016°T.**

Your chart scale = 1: 5000,000, so using a 1:5000,000 scale ruler measure the track distance between FARTHING CORNER to WATTISHAM = **50nm**.

Track distance = 50nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 110 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

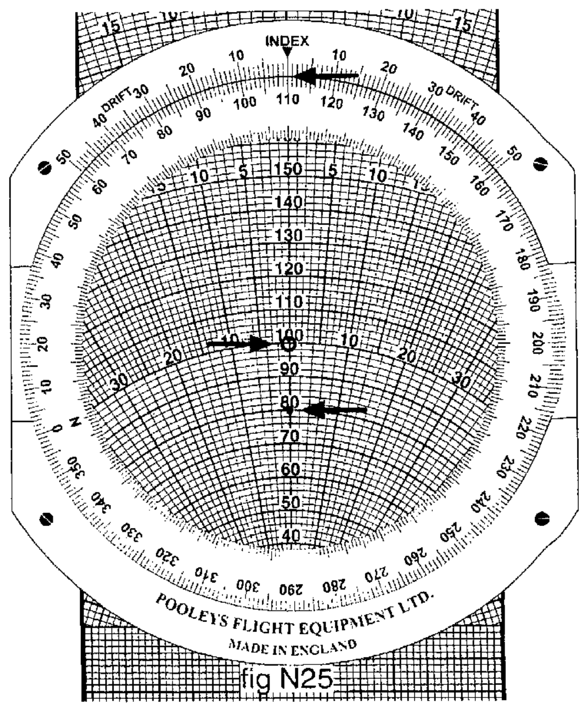


fig N25

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 − 20 = 80. (fig N25).

By moving the sliding scale, set the centre dot over the TAS 105kt on the speed scale.

Rotate the inner scale to place the true track 016 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 10° to the left. fig N26.

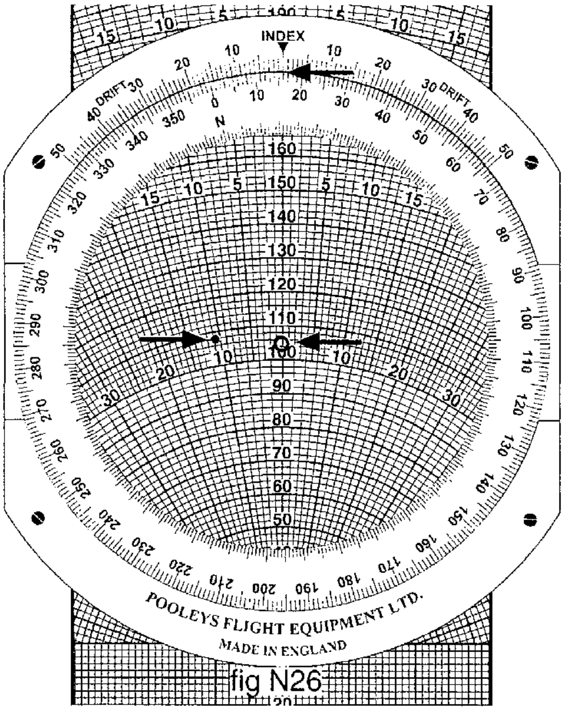


fig N26

Rotate the inner scale left 10° and note that the soft pencil mark now indicates 11° left.

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 11°.

Read off the **true heading 027** under the index mark at the top of the fixed outer scale (fig N27).

Your heading will be 11° right of track. Therefore, the drift is to the left, or 11° **port drift** (fig N27).

Read off the **ground speed:** the speed arc under the soft pencil mark = **104kt** (fig N27).

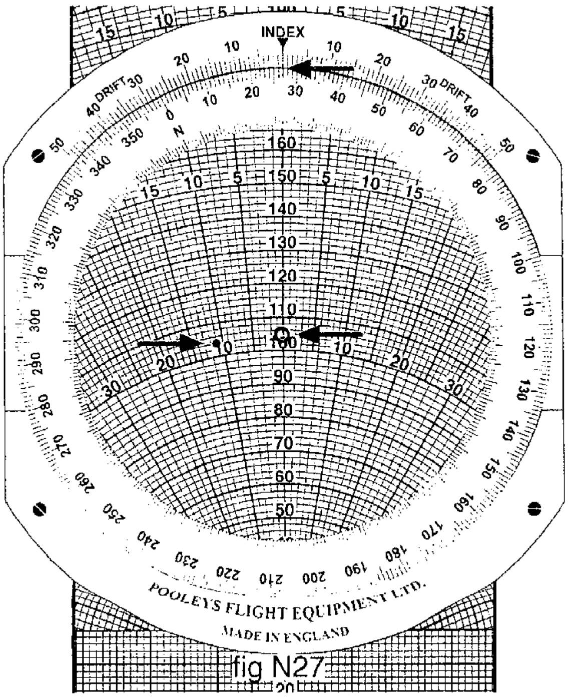


fig N27

The local variation = 2°W given in the flight plan.

Magnetic heading = 027°T + 2°W = **029°M**.

Time calculation

Distance FARTHING CORNER to WATTISHAM was measured at the beginning of this explanation = 50nm.

Ground speed FARTHING CORNER to WATTISHAM = 104kt. See fig N27.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 105 on the fixed outer scale.

Below 50 on the fixed outer scale, read off 29 minutes on the rotating inner scale (fig N28).

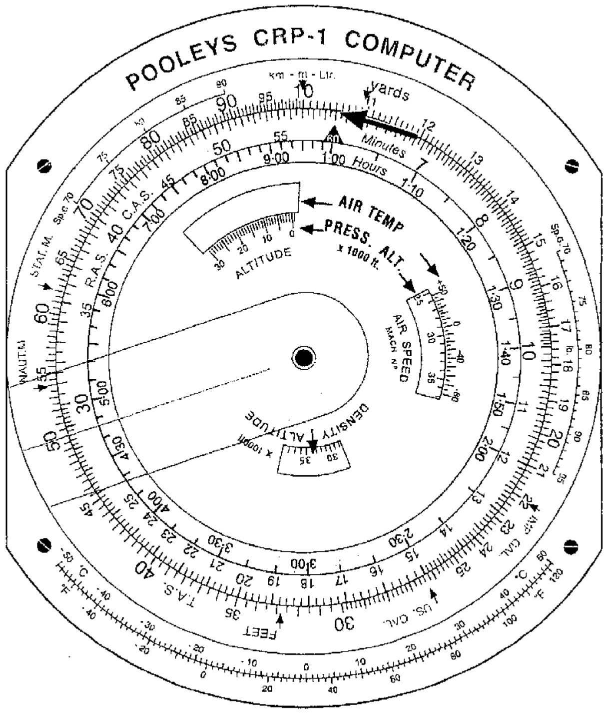


fig N28

Time FARTHING CORNER to WATTISHAM

= 29 minutes.

EN32(A)

See EN30 and EN31.

Flight plan time Shoreham to Farthing Corner = 28 min.

Flight plan time Farthing Corner to Wattisham = 29 min.

Flight plan time Shoreham to Wattisham = 57 min.

EN33(D)

Follow the method in EN26 to plot the locations WATTISHAM and CLACTON and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix I.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 163°T.**

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between WATTISHAM and CLACTON. = 21nm.

Track distance = 21nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 100 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 15kt on the centre line at a distance down from the centre dot. 100 – 15 = 85. (fig N29).

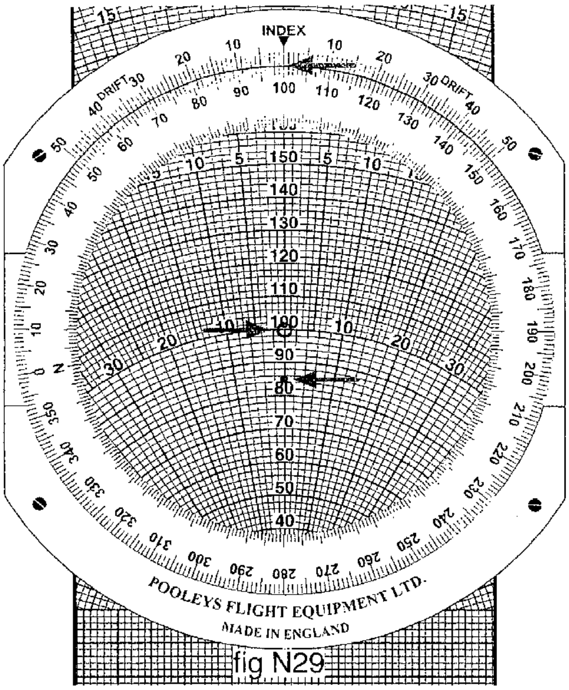


fig N29

The centre dot remains over the TAS 100kt on the speed scale.

Rotate the inner scale to place the true track 163 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 8° to the right (fig N30).

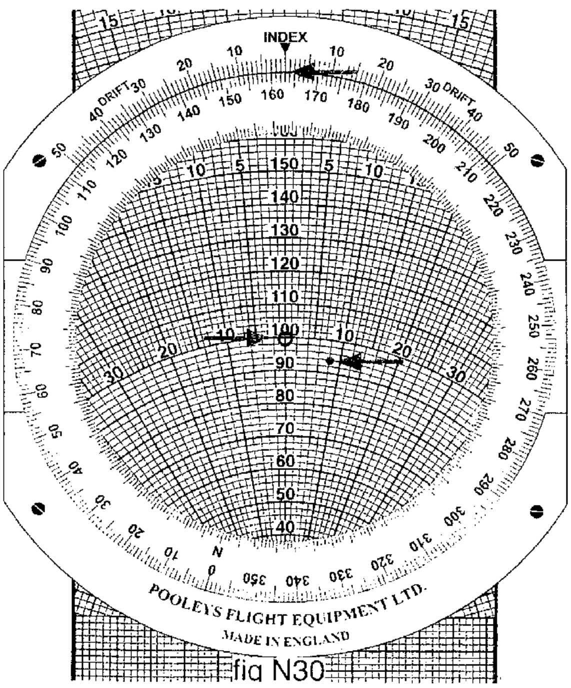


fig N30

Rotate the inner scale 8° right and note that the soft pencil still indicates 8° right.

Read off the **true heading 155°T** under the index mark at the top of the fixed outer scale (fig N31).

Your heading will be 8° left of track. Therefore, the drift is to the right, or 8° stbd drift (fig N31).

Read off the ground speed: the speed arc under the soft pencil mark = **92kt** (fig N31).

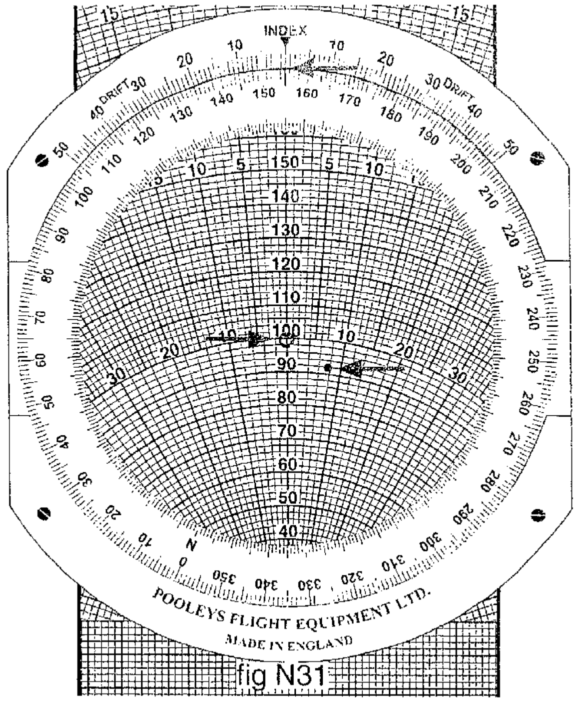


fig N31

The local variation = 4°W given in the flight plan.

Magnetic heading = 155°T + 2°W = **157°M.**

Time calculation

Distance WATTISHAM to CLACTON:
measured at the beginning of this explanation = 21nm.

Ground speed WATTISHAM to CLACTON: = 92kt. (fig N31).

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 92 on the fixed outer scale.

Below 21 on the fixed outer scale, read off 14 minutes on the rotating inner scale (fig N32).

Time FARTHING CORNER to WATTISHAM = **14 minutes.**

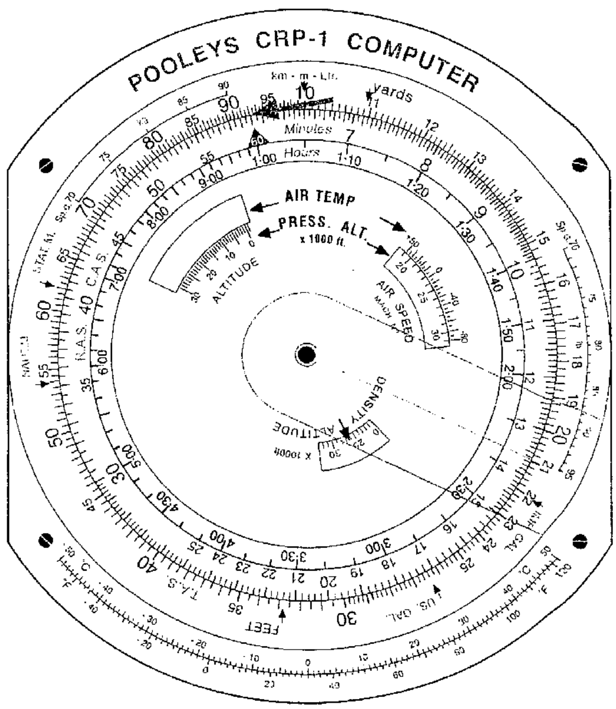


fig N32

EN34(A)

Planned flight time + diversion time = 1hr - 45 min.

The rotating inner scale of the CRP computer may also be used as a time scale.

Note: The red triangle with the 60 index may represent 60 minutes or 1hr.

To find the fuel required for the planned flight time given a fuel consumption of 10US gals/ hr.

Rotate the inner scale to set the 60 index (1hr) under the 10 (gal) on the fixed outer scale

From the 105 (105min or 1hr - 45min) on the inner rotating scale, read off **17.5 (US gal)** on the fixed outer scale (fig N33).

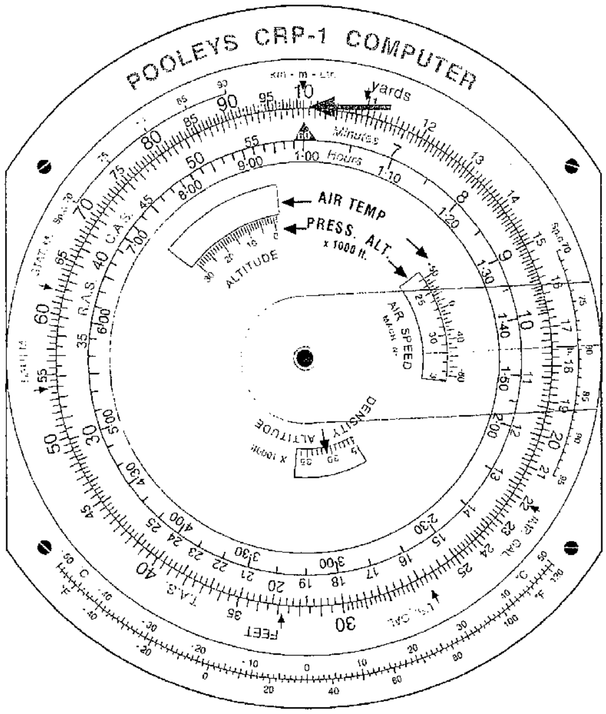


fig N33

Fuel for start and taxy & T/O	=	3.0 US gal.
Flight plan fuel + Diversion fuel	=	17.5 US gal. +
Approach & missed approach	=	3.0 US gal. +
Required reserve	=	10.0 US gal. +
Minimum fuel	=	33.5 US gal.

EN35(C)

First convert all volumes into the same unit of weight.
Fuel load 38US gal.

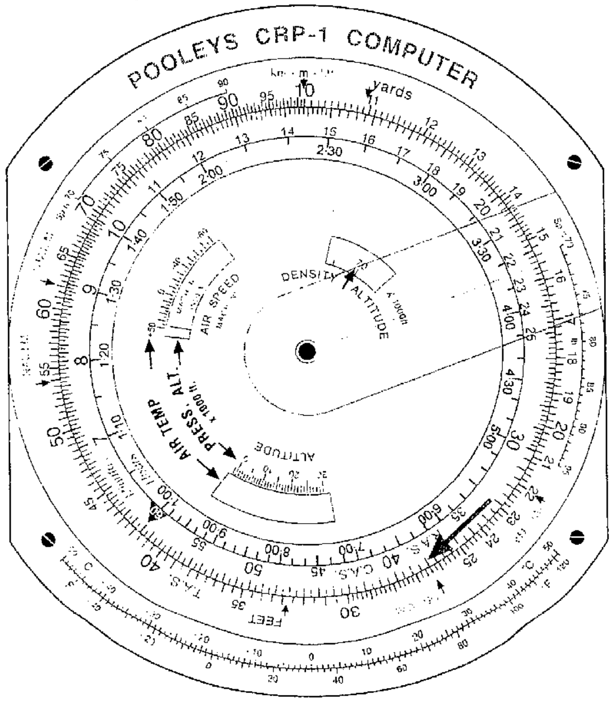


fig N34

Using your CRP circular slide rule, set 38 on the rotating inner scale under the 'US gal' index on the fixed outer scale.
Refer to the Imperial specific gravity (Sp.G) scale.
Below 71 on the outer scale, read off 225 lb. from the rotating inner scale (fig N34).
Fuel load = 225lb.

Maximum Payload

= MTWA – (basic empty weight + fuel load + crew)
= 2325lb – (1420lb + 225lb + 186lb)
= 2325lb – 1831lb
= **494lb**

EN36(B)

Using the wind triangle side of the CRP computer, set 0 or North on the rotating inner scale under the index mark at the top of the fixed outer scale (fig N35).

Using the squared grid section at the bottom of the low speed scale, set the centre dot (wind index) on the grid at the zero speed point at the top of the grid (fig N35).

Using a chinagraph or other soft pencil, mark the wind speed (18kt) on the centre line at a distance down from the centre dot = **18** (fig N35).

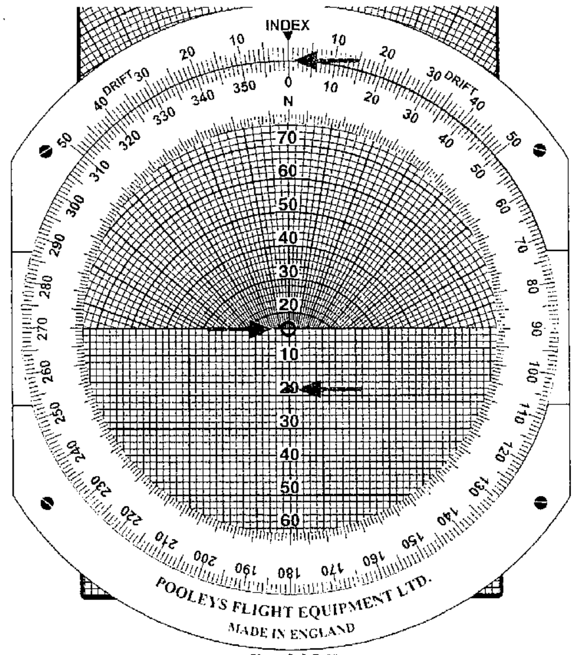


fig N35

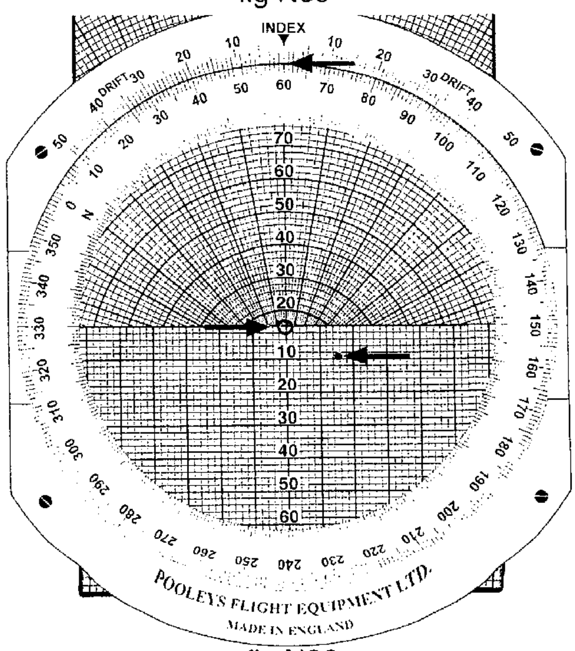


fig N36

Rotate the inner scale left or right until the soft pencil mark indicates a cross wind component of 16kt which in this instance = **60° left or right** (fig N36).

EN37(C)

See chart legend.

The larger figure 2 represents 2000ft, while the smaller figure 3 represents 300ft.

MEFs are the maximum elevation figures shown in quadrangles bounded by lines of latitude and longitude at 1/2 degree intervals. Each MEF is based on information available concerning the highest known feature in each quadrangle, including terrain and obstacles and allowing for unknown features.

An MEF is not a safety height.

EN38(A)

4nm along track from SHOREHAM to FARTHING CORNER is a HANG /PARA GLIDING winch launch site from the surface to 2700 ft amsl which constitutes a hazard to navigation.

EN39(D)

This is the 1 in 60 rule which states that for every one degree an aircraft is off track, it will be one nautical mile off track for every sixty nautical miles travelled.

To solve the problem using the 'closing angle method', two values must be established that are then used to calculate the alteration to heading required to fly direct to the destination.

1 The angle that the aircraft is off track (track angle error).

2 The distance remaining to the destination expressed as a fraction.

To calculate the track angle error 22nm along track.

1 Track angle error $= \dfrac{\text{distance off track}}{\text{distance flown}} \times \dfrac{60°}{1}$

$= \dfrac{2\text{nm} \times 60°}{22\text{nm}} = 5.5°$ stbd

2 The distance from SHOREHAM to FARTHING CORNER is 45nm which divides approximately into quarters of 11nm each.

	Dept.	3/4	1/2	1/4	Dest.
Distance to go:	45nm	33nm	22nm	11nm	zero

The distance to Destn = 23nm approximately 1/2 distance to go.

To find the alteration to heading at 1/2 distance to go:

The fraction 1/2 is inverted to 2/1 and multiplied by the track angle error of 5.5°.

ie. 2 x 5.5 = 11°

As the drift is to stbd, the aircraft must **alter heading to port by 11°** to arrive overhead FARTHING CORNER.

EN40(A)

Appendix 'M' is included as a removable leaf to practise this type of question.

Remember the Quadrantal Rule uses magnetic tracks.

The magnetic track SHOREHAM to FARTHING CORNER:

= 049°T + Varn 4°W

= **053°M**

Under the Quadrantal Rule your track lies between 000°M and 089°M.

Enter the graph at the sector safety altitude (MINIMUM ALTITUDE) on the left hand side of the graph which in this instance is 2100ft.

Move horizontally across to meet the vertical line representing the QNH given as 1015hPa.

Move vertically upwards to intercept the next angled line that emanates from the right hand side of the graph representing a magnetic track angle range of 0 - 089, together with the next available flight level for that track range.

In this instance FL30. See fig N37.

EN41(A)

Low flying regulations (Rule 5)

An aircraft other than a helicopter must not fly over a congested area below a height that would allow it to land clear of the area and without danger to people or property if an engine fails, or less than 1000ft above the highest fixed object within 600 metres, whichever is higher.

A congested area in relation to a city, or settlement means any area which is substantially used for residential, industrial, commercial or recreational purposes.

See the chart legend (culture).

Crowborough is defined as a city or large town indicated on the chart to have a spot height of 787ft amsl.

Any transit of Crowborough must be at least 1000ft above the spot height at a minimum altitude of 1787ft. = **1800ft.**

EN42(A)

1nm to the east of Crowborough is the Gatwick CTA from 1500ft to 2500ft amsl. At your planned sector altitude of 2000ft, your planned track passes through this section of the CTA.

To avoid controlled airspace, you would have to descend to pass under the CTA on the Gatwick QNH as the London TMA is immediately above the Gatwick CTA. The only correct multi-choice answer is 1400ft on the Gatwick QNH.

EN43(D)

Safe endurance fuel overhead FARTHING CORNER

= 22US gal - 6US gals = 16US gals.

Endurance $= \dfrac{16\text{US gal}}{8\text{US gals/hr}} \times \dfrac{60\text{min}}{1\text{hr}} = 120$ min

Using your CRP circular slide rule:

Set the 60 (1hr) index on the rotating inner scale under 8 (US gals) on the fixed outer scale.

Below 16 (US gals) on the fixed outer scale, read off 120 (min.) on the rotating inner scale (fig N38).

Sector time:
FARTHING CORNER to WATTISHAM = 29min.

Sector time:
WATTISHAM to CLACTON = 14 min.

Time FARTHING CORNER to CLACTON = 43min.

Fuel endurance overhead CLACTON = 120 mins - 43 mins:

= **77 minutes or 1 hour - 17 mins**

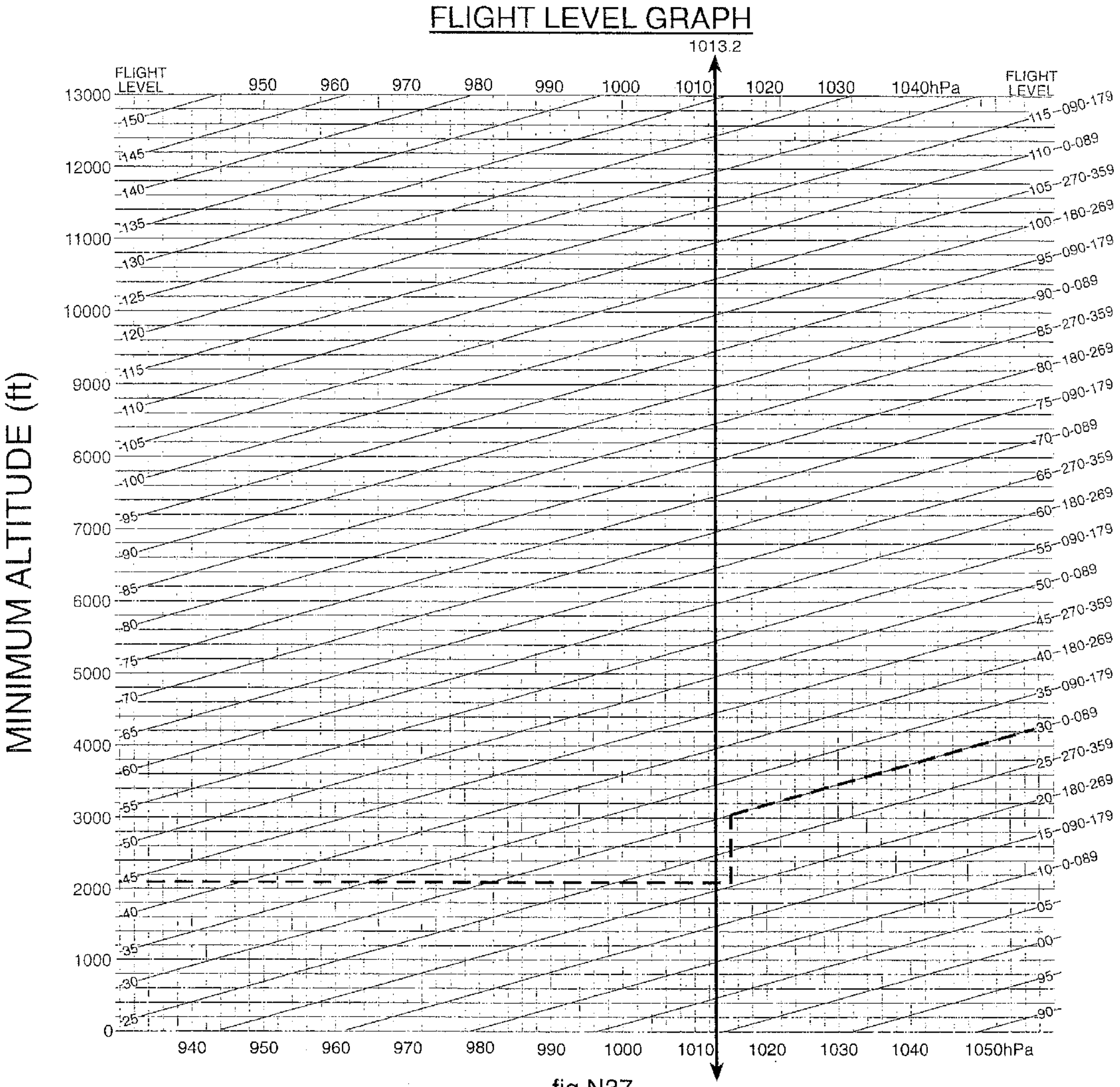


fig N37

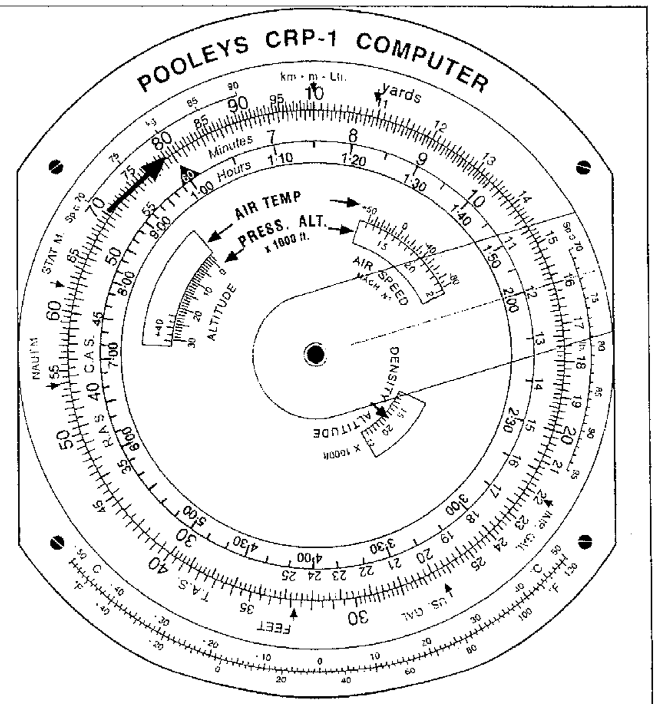


fig N38

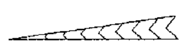
EN44(D)

Contact Southend Radar/ Approach on **130.77 MHz** at least 10 nm before reaching the Southend Zone Boundary.

See Appendix T. Important to note is that the Southend Radar frequency 128.95 is not continuously guarded so a call on that frequency may not receive a response.

UK AIP AD 2-EGMC-1-6 (10 Jul 03)

See EN27



The Southend Zone lies within Class 'G' airspace and has more than one instrument approach procedure (AIP) denoted by the chart symbol above.

Refer to the chart legend below Aerodrome RT Frequencies.

The symbol is aligned with the main instrument runway (civil). Pilots who intend to fly to or adjacent to aerodromes with IAPs are strongly recommended when flying within 10 nm of the aerodrome to contact the aerodrome ATCU.

EN45(B)

$$\text{Ground speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{20\text{nm}}{10\cancel{\text{min}}} \times \frac{60\cancel{\text{min}}}{1\text{hr}}$$

$$= 120\text{kt}$$

Using your CRP circular slide rule, set 10 (min) on the rotating inner scale under 20 (nm) on the fixed outer scale.

Above the 60 (1hr) index on the rotating inner scale, read off 120 (kt) on the fixed outer scale (fig N39).

Distance remaining to WATTISHAM.

$$= (50 - 20)\text{nm} = 30\text{nm}$$

$$\text{Time to WATTISHAM} = \frac{\text{distance remaining}}{\text{ground speed}}$$

$$= \frac{30\cancel{\text{nm}}}{120\cancel{\text{nm/hr}}} \times \frac{60\text{min}}{1\cancel{\text{hr}}} = 15\text{min.}$$

Using your CRP circular slide rule, the 60 minute (1hr) index on the rotating inner scale is already set under 120(kt) on the fixed outer scale.

Below 30 (nm) on the fixed outer scale, read off 15(min) on the inner rotating scale (fig N39).

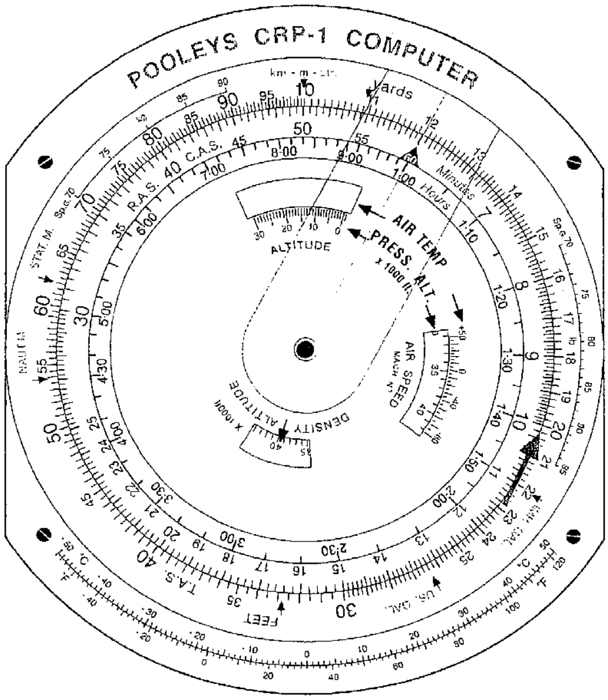


fig N39

ETA WATTISHAM = 1130 + 15min

= 1145 UTC

answer = 1145 UTC

EN46(B)

Time from 3500 to overhead WATTISHAM at 1500ft.

$$\text{Time} = \frac{\text{distance}}{\text{ground speed}}$$

$$= \frac{10\cancel{\text{nm}}}{90\cancel{\text{nm/hr}}} \times \frac{60\text{min}}{1\cancel{\text{hr}}} = 6.66\text{min.}$$

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale, under 90 (kt) on the fixed outer scale.

Below 10 (nm) on the fixed outer scale, read off 6.66 (min) on the rotating inner scale (fig N40).

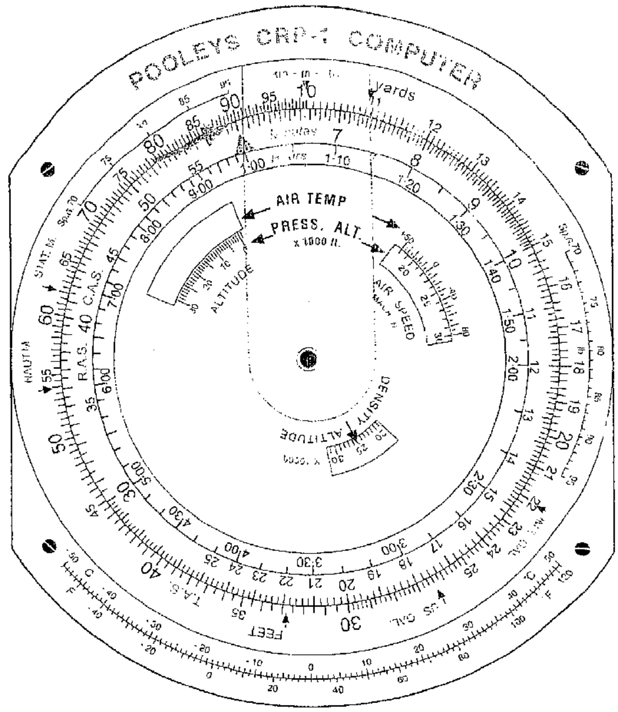


fig N40

$$\text{ROD} = \frac{\text{altitude reduction}}{\text{Time}}$$

$$\text{ROD} = \frac{(3500 - 1500)\text{ft}}{6.66\text{min}} = \frac{2000\text{ft}}{6.66\text{ min}}$$

$$= \mathbf{\frac{300ft}{min}}$$

EN47(A)

Refer to Pooley Flight Guide, extract for Wattisham Appendix 'O'.
The opening hours are published as being Mon-Fri 0800 - 1800.
Your arrival time is after the published hours of opening and glider launching occurs after that time.
Under the 'Remarks' section for outside normal hours it states:
'Call App or Twr, if no reply call A/G 'Wattisham Radio' for any SAR activity status and make blind calls inbound and outbound. If advised of glider flying, call the glider air/ground station 'Anglia Base' and request gliders cease launching prior to arrival and departure. Make blind calls as before'

EN48(A)

Turn left to leave the Southend Zone to the east. The radio failure squawk code 7600 would be picked up by Southend LARs and your actions understood.

A right turn would take you towards the Danger Area D138 which is permanently notified from the surface to 35,000ft amsl for which there is a Danger Area Activity Information Service from Southend Approach on 128.95MHz. (See chart legend.)

You cannot climb to over-fly the Southend Zone at 3500ft because that is the lower limit of the London TMA which is Class 'A' Airspace.

EN49(C)

Follow the method in EN26 to plot the locations SHIPDHAM and BOURNE and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix J.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 280°T.**

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between SHIPDHAM and BOURNE = 48nm.

Track distance = 48nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 250 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 – 20 = 80. (fig N41).

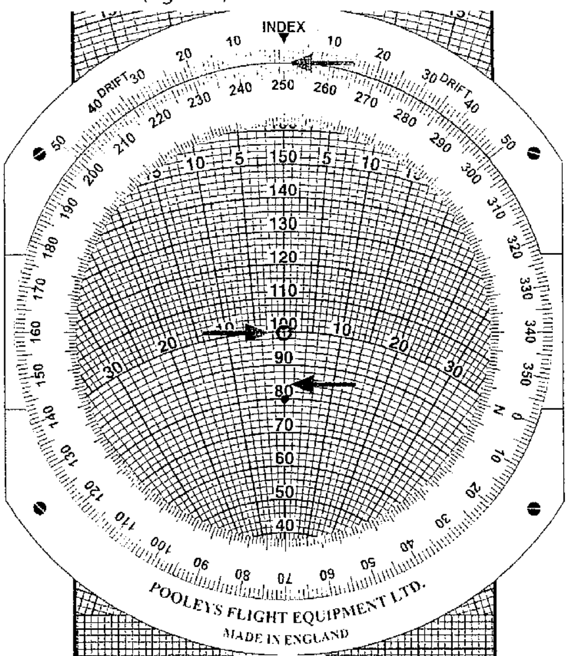


fig N41

By moving the sliding scale, set the centre dot over the TAS 90kt on the speed scale.

Rotate the inner scale to place the true track 280 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 8° to the right. fig N42.

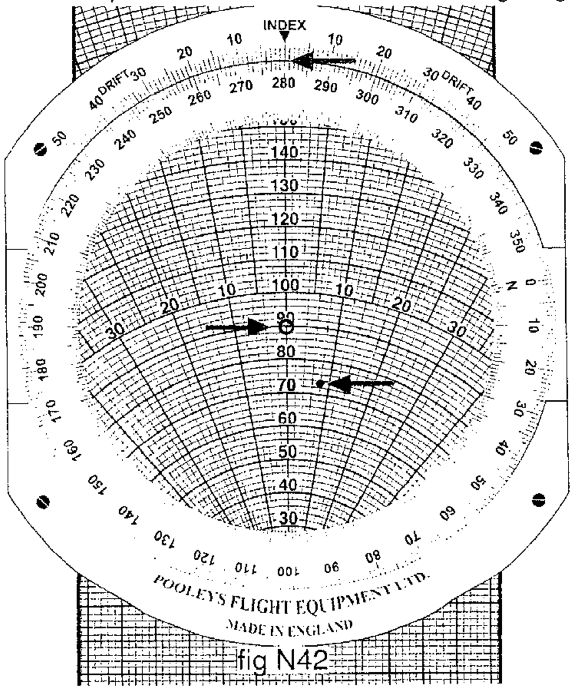


fig N42

Rotate the inner scale right 8° and note that the soft pencil now indicates 6° right.

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 6°.

Read off the **true heading 274** under the index mark at the top of the fixed outer scale (fig N43).

Your heading will be 6° left of track. Therefore, the drift is to the right, or **6° stbd drift** (fig N43).

Read off the **ground speed:** the speed arc under the soft pencil mark = **72kt** (fig N43).

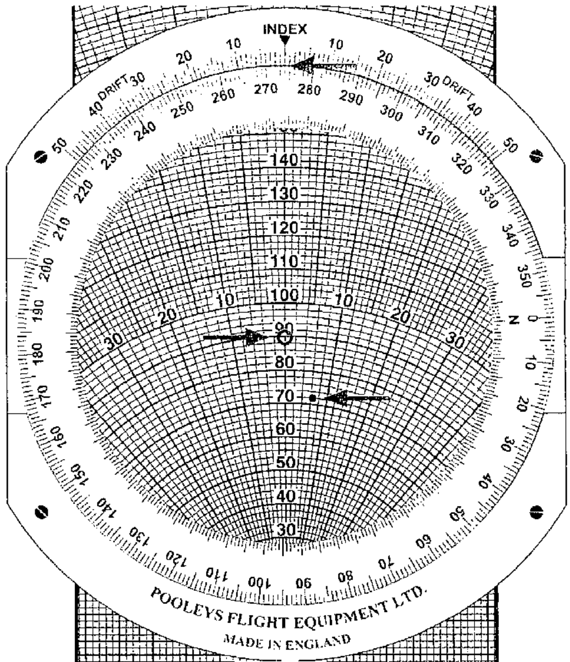


fig N43

The local variation = 3°W given in the flight plan.

Magnetic heading = 274°T + 3°W = **277°M.**

Time calculation

Distance SHIPDHAM to BOURNE was measured at the beginning of this explanation = 48nm

Ground speed SHIPDHAM to BOURNE = 72kt. See fig N43.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 72 on the fixed outer scale.

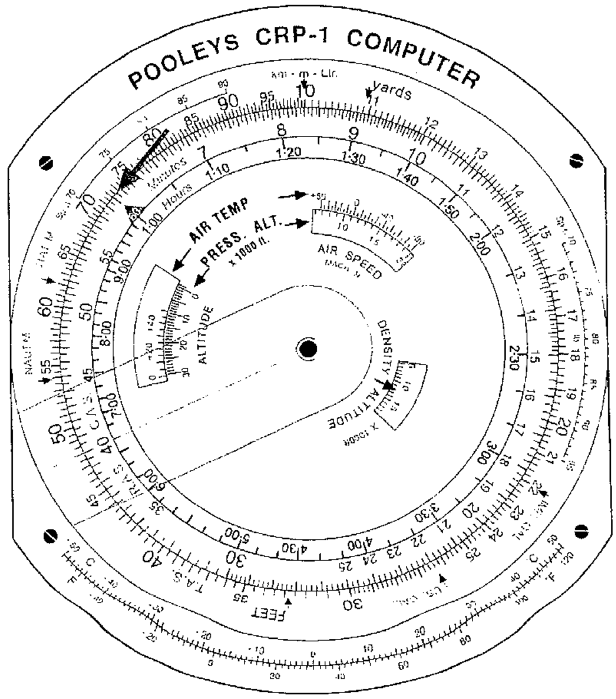


fig N44

Below 48 on the fixed outer scale, read off 40 minutes on the rotating inner scale (fig N44).

Time SHIPDHAM to BOURNE = 40 minutes.

EN50(D)

72kt.

See EN49 and fig N43.

EN51(B)

Follow the method in EN26 to plot the locations BOURNE and TATENHILL and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix J.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 273°T.**

Your chart scale = 1: 5000,000 so using a 1: 5000,000 scale ruler measure the track distance between BOURNE and TATENHILL. = 50nm.

Track distance = 50nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 250 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 25kt on the centre line at a distance down from the centre dot. 100 − 25 = 75. (fig N45).

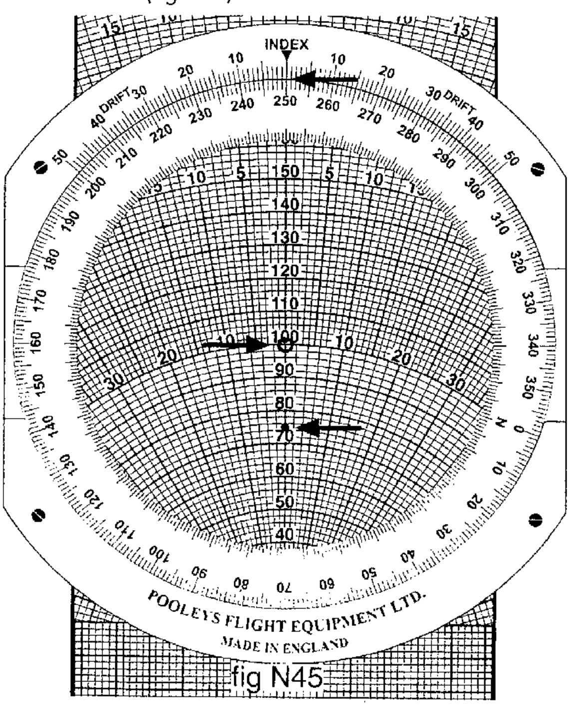


fig N45

By moving the sliding scale, set the centre dot over the TAS 95kt on the speed scale.

Rotate the inner scale to place the true track 273 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 8° to the right (fig N46).

Rotate the inner scale right 8° and note that the soft pencil mark now indicates 6° right.

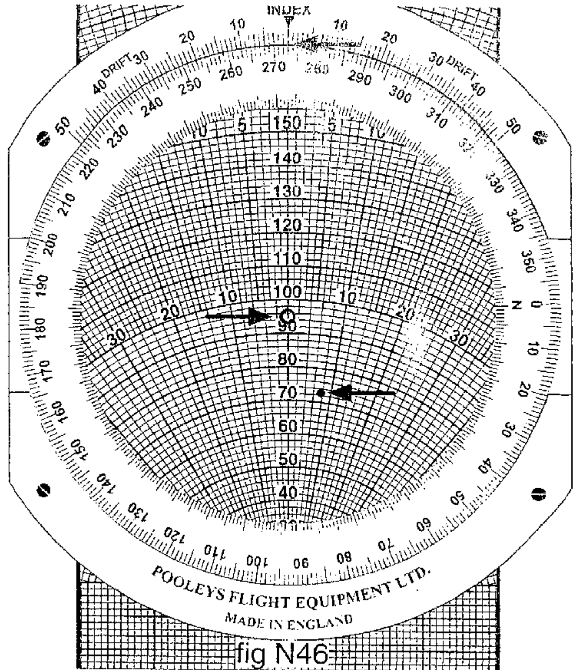


fig N46

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 6° (fig N47).

Read off the true heading 267 under the index mark at the top of the fixed outer scale (fig N47).

Your heading will be 6° left of track. Therefore, the drift is to the right, or **6° stbd drift** (fig N47).

Read off the ground speed: the speed arc under the soft pencil mark = **71k** (fig N47).

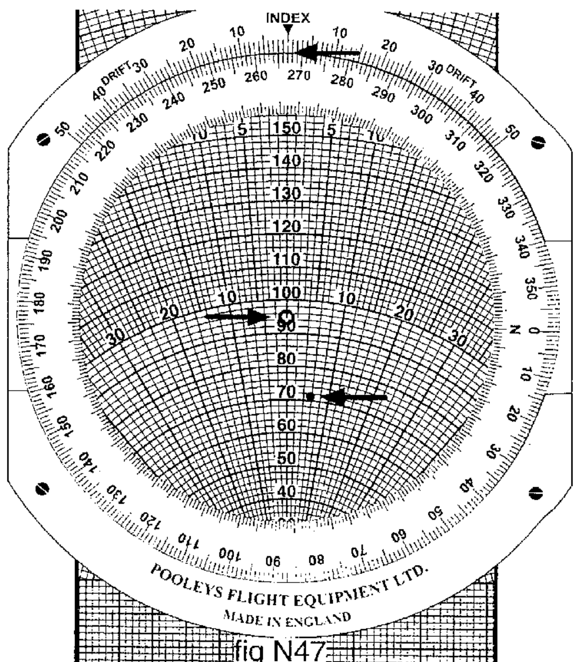


fig N47

The local variation = 3°W given in the flight plan.

Magnetic heading = 267°T + 3°W = **270°M.**

Time calculation

Distance BOURNE to TATENHILL was measured at the beginning of this explanation = 50nm

Ground speed BOURNE to TATENHILL = 71kt. See fig N47.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 71 on the fixed outer scale.

Below 50 on the fixed outer scale, read off 42 minutes on the rotating inner scale (fig N48).

Time BOURNE to TATENHILL = 42 minutes.

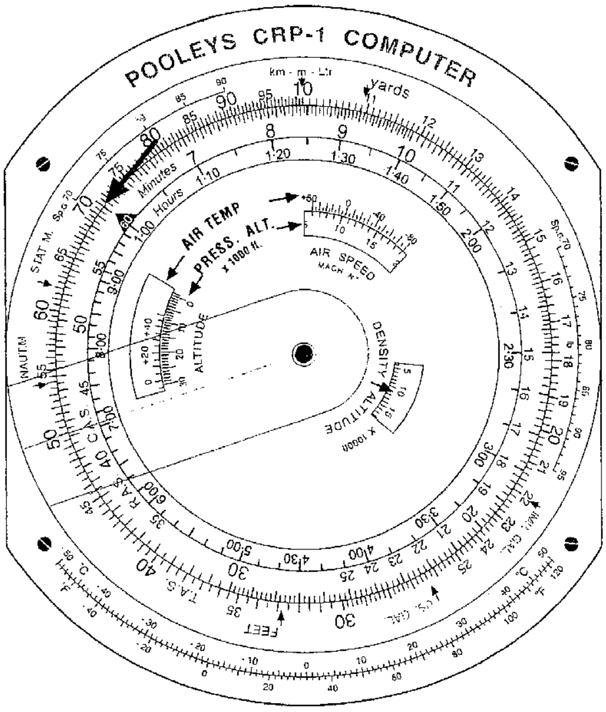


fig N48

EN52(B)

Follow the method in EN26 to plot the locations TATENHILL and COSFORD and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix J.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 242°T**.

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between TATENHILL and COSFORD. = 22nm.

Track distance = 22nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 245 on the rotating inner scale under the index mark at the top of the fixed outer scale.

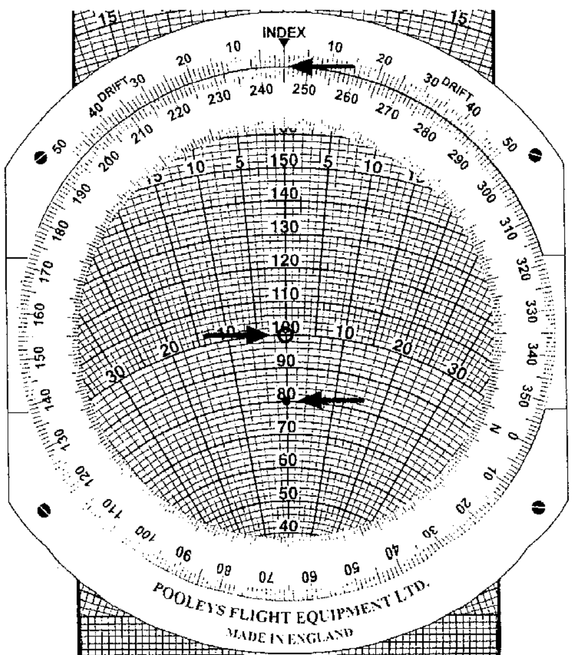


fig N49

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 − 20 = 80. (fig N49).

By moving the sliding scale, set the centre dot over the TAS 90kt on the speed scale.

Rotate the inner scale to place the true track 242 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has moved only a small amount which requires no further adjustment (fig N50).

Read off the **true heading 242** under the index mark at the top of the fixed outer scale (fig N50).

There is no measurable drift (fig N50).

Read off the **ground speed:** the speed arc under the soft pencil mark = **70kt** (fig N50).

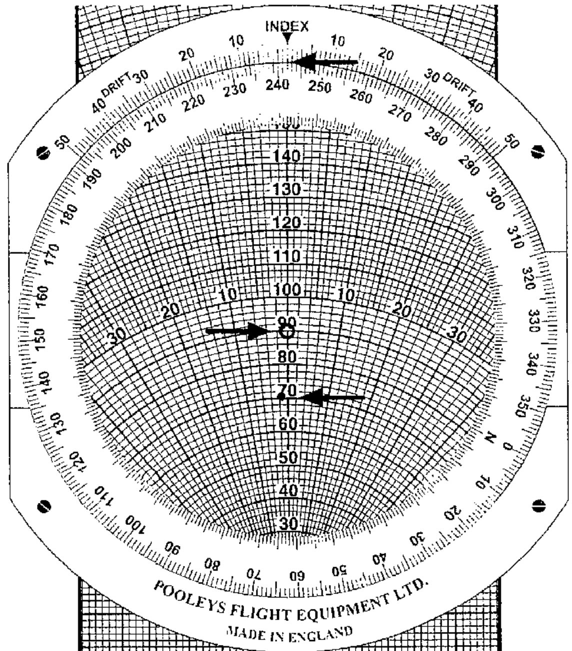


fig N50

The local variation = 4°W given in the flight plan.

Magnetic heading = 242°T + 4°W = **246°M**.

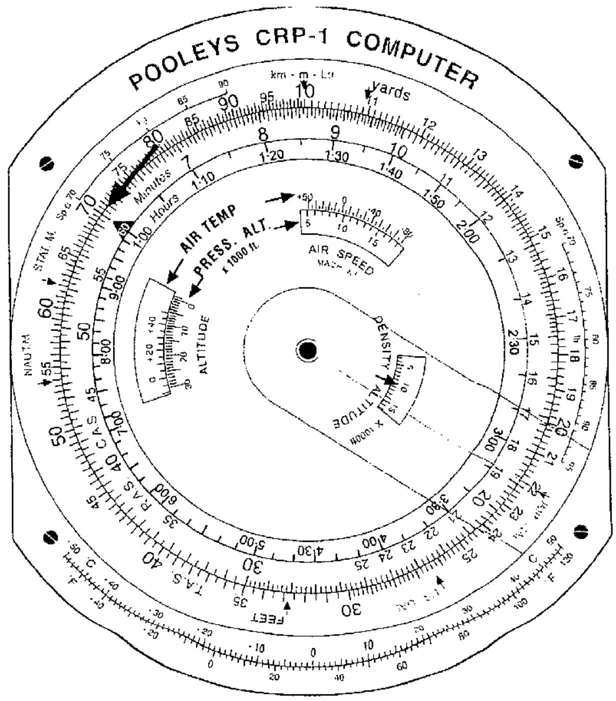


fig N51

Time calculation

Distance TATENHILL to COSFORD was measured at the beginning of this explanation = 22nm.

Ground speed TATENHILL to COSFORD = 70kt. See fig N50.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 70 on the fixed outer scale.

Below 22 on the fixed outer scale, read off 19 minutes on the rotating inner scale (fig N51).

Time TATENHILL to COSFORD = **19 minutes.**

EN53(A)

Refer to the flight plan 'Appendix J Completed'

Distance SHIPDHAM to BOURNE	=	48nm
Distance BOURNE to TATENHILL	=	50nm
Total flight plan distance	=	**98nm**

EN54(D)

Refer to your chart and the Shipdham Zone and chart legend.

Within the ATZ there is printed, inblue an Aerodrome Light Beacon symbol beneath which are the letters FIG meaning 'flashing in green'.

The beacon flashes the morse identification code underneath = SA. See fig N52.

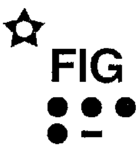


fig N52

Note: FIR at military aerodromes means flashing in red.

EN55(C)

Planned flight time + diversion time = 1hr - 45 min.

The rotating inner scale of the CRP computer may also be used as a time scale.

Note: The red triangle with the 60 index may represent 60 minutes or 1hr.

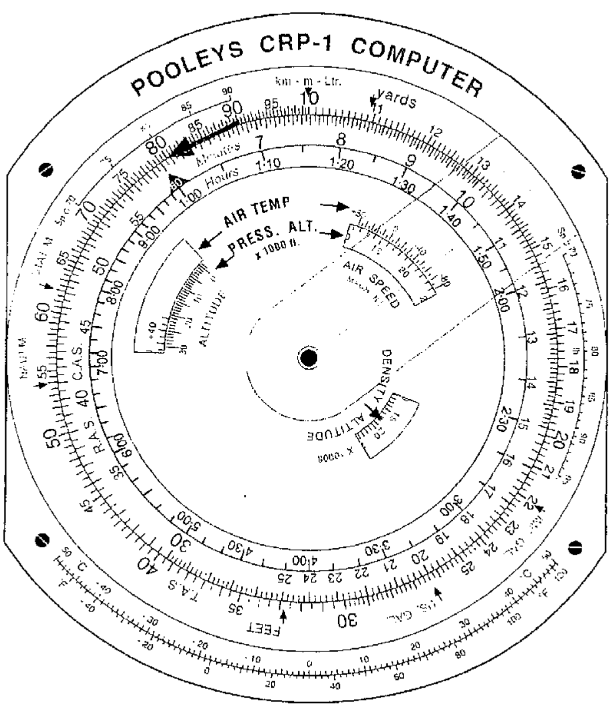


fig N53

To find the fuel required for the planned flight time + diversion time given a fuel consumption of 8US gals/hr.

Rotate the inner scale to set the 60 index (1hr) under the 8 (gal) on the fixed outer scale.

From the 105 (105min or 1hr - 45min) on the inner rotating scale, read off 14 (US gal) on the fixed outer scale (fig N53).

Fuel for start and taxy & T/O	=	2.0 US gal.
Flight plan fuel	=	14.0 US gal. +
Approach & missed approach	=	3.0 US gal. +
Required reserve	=	5.0 US gal. +
Minimum fuel	=	**24.0 US gal.**

EN56(C)

Refer to your chart and chart legend and fig N54.

(NOT ACTUAL SIZE)

fig N54

This is a Visual Reference Point (VRP).

VRPs are used to navigate aircraft to fixed points at specific levels when either entering or leaving controlled airspace.

As a point above the surface where aircraft both converge and diverge, direct over-flight of a VRP should be avoided unless specifically instructed to do so by an ATCU.

EN57(A)

First convert all volumes into the same unit of weight.

Fuel load 42US gal.

Using your CRP circular slide rule, set 42 on the rotating inner scale under the 'US gal' index on the fixed outer scale.

Refer to the Imperial specific gravity (Sp.G) scale.

Below 72 on the outer scale, read off 252 (lb) from the rotating inner scale (fig N55).

Fuel load = 252lb.

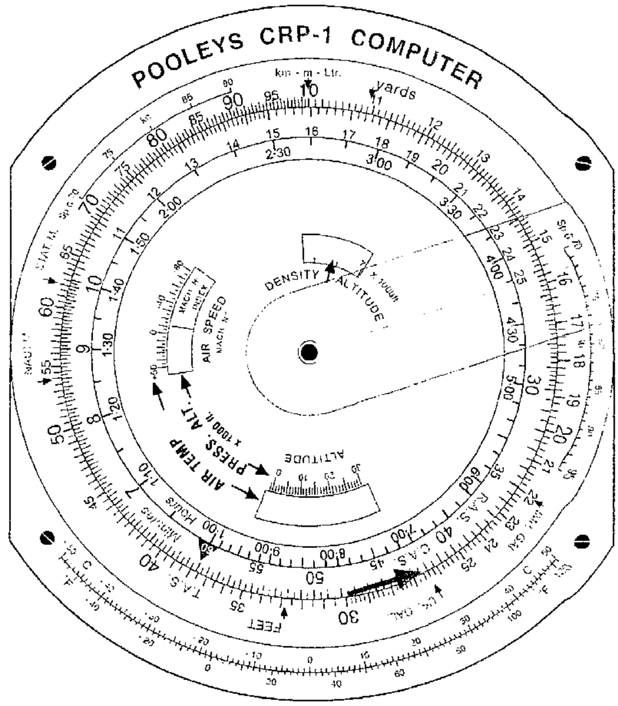


fig N55

Maximum Payload

= MTWA – (basic empty weight + fuel load + crew)

= 2325lb – (1329lb + 252lb + 186lb)

= 2325lb – 1767lb

= **558lb**

EN58(B)

Using the wind triangle side of the CRP computer, set 0 or North on the rotating inner scale under the index mark at the top of the fixed outer scale (fig N56).

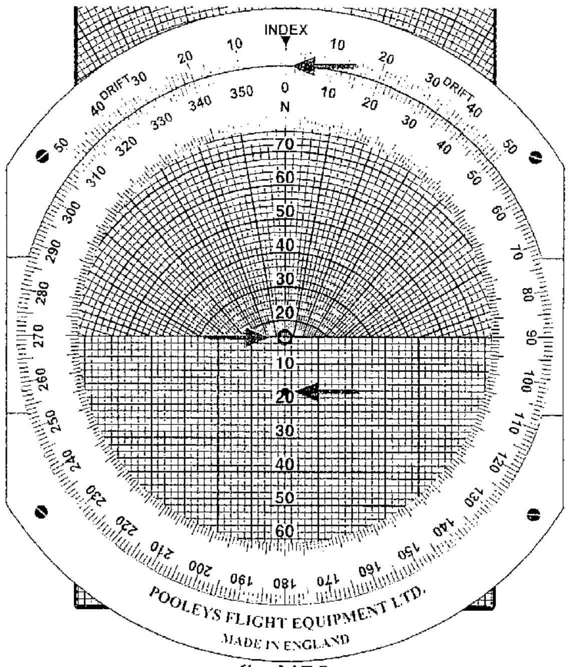


fig N56

Using the squared grid section below the low speed scale, set the centre dot (wind index) on the grid at the zero speed point at the top of the grid (fig N56).

Using a chinagraph or other soft pencil, mark the wind speed (16kt) on the centre line at a distance down from the centre dot. = 16. (fig N56).

Rotate the inner scale left or right until the soft pencil mark indicates a cross wind component of 11kt, which in this instance = **45°** left or right (fig N57).

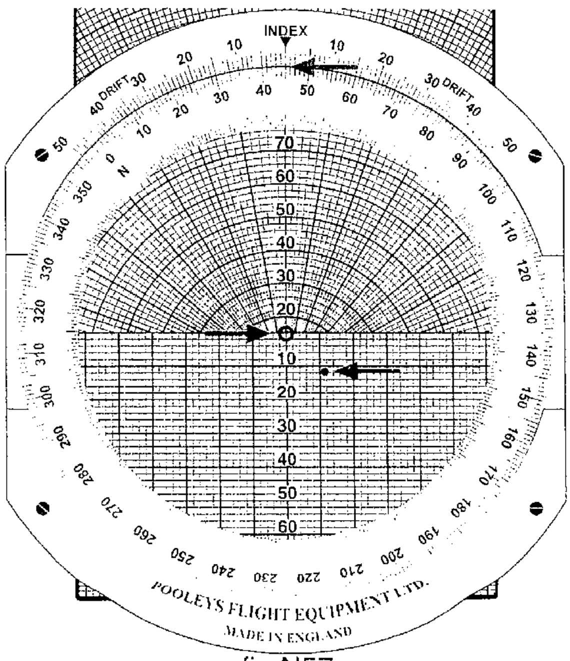


fig N57

EN59(D)

Refer to the Flight Plan 'Appendix J Completed'.

Set heading overhead SHIPDHAM 1137 UTC.

Sector time to BOURNE 40 minutes.

1137 + 40 minutes = **1217 UTC**.

EN60(D)

Refer to your chart.

The published frequency for Marham MATZ is 124.15MHz. given within the MATZ itself and on the ATCU frequency list on the left hand side of the chart.

An aircraft commander should contact Marham MATZ on 124.15MHz at least 15nm or 5 minutes before reaching the MATZ boundary.

EN61(A)

Refer to your chart.

Cottesmore and Wittering are a clutched MATZ which means, for the purpose of ATC, they are joined and any MATZ penetration through either Cottesmore or Wittering will be controlled by just one ATCU.

Cottesmore is the controlling authority on 130.20 MHz.

Being clutched, both airfields will have a common QNH but not a common QFE, so penetration of the Cottesmore MATZ will be on the Cottesmore QFE.

EN62(A)

Refer to your chart.

Draw a track line from BOURNE to the Melton Mowbray VRP.

Using a suitable protractor, measure the angle between the original planned track from BOURNE to TATENHILL and the track BOURNE to the Melton Mowbray VRP = 10° left of your planned track.

Your heading at BOURNE should have been increased (to stbd) by 10° to 280°M.

EN63(D)

Refer to Appendix P, 'Warnings'.

Pilots are advised to keep a good lookout for military traffic.

EN64(A)

See fig N58.

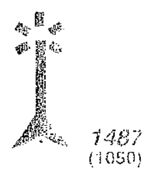


fig N58

The two-figure group juxtaposed with the obstacle gives:

(i) the top larger figure, the height in feet of the top of the obstacle above mean sea level = 1487ft amsl.

(ii) in brackets (1050)ft agl which is the height of the top of the obstacle in feet above ground.

(iii) If (ii) is subtracted from (i): 1487ft - 1050ft, this gives the height of the ground amsl upon which the mast is located. = 437ft amsl.

EN65(B)

Low Flying Regulations (Rule 5)

An aircraft must not fly closer than 500 feet to any person, vessel, vehicle or structure. The 500 feet should be treated as a semi-spherical shape about a person, vessel, vehicle or structure.

Over-flight must be at (1487 + 500)ft = 1987ft amsl.

ICAO Annex 2 Ch 4.6.(b) UK. ANO Rules of the Air - Rule 5.

EN66(C)

Refer to your chart.

The most direct route would be to descend to 2400ft on the East Midlands QNH and fly westward remaining under the East Midlands CTA to CATTON AERODROME.

From CATTON, you could safely turn NNW to TATENHILL remaining well clear the East Midlands CTR to your right.

EN67(B)

See fig N59

EAST
MIDLANDS

fig N59

Refer to your chart and to the chart legend.
When the name of any facility is surrounded by a pecked line, in magenta it means that facility is a 'Customs Aerodrome'.

EN68(A)

Refer to the Pooley Flight Guide extract, Appendix Q.
Circuits 1000ft aal, RH on 04, LH on 08, 22 & 26.

EN69(A)

An AIAA is bounded by a diamond shaped blue line approximately 2mm wide. An AIAA is intensively used for military operations at all promulgated levels.

The Culdrose Area of Intense Air Activity (AIAA) is from the surface to 5800ft altitude for which the controlling authority is Culdrose LARS on 134.05 MHz.

See the chart legend (Note 3). 'Night operations may be conducted by aircraft using reduced navigation and/ or anticollision lights' at Culdrose.

Prior to transiting any AIAA, pilots are strongly advised to contact the relevant controlling ATCU.

EN70(A)

Follow the method in EN26 to plot the locations ST. MARY'S and WOLF ROCK and draw a track line between the points plotted.

Although the track of 084°T is given in the flight plan, the points still have to be plotted in order to measure the track distance.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix K.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 084°T.**

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between ST. MARY'S and WOLF ROCK = 19nm.

Track distance = 19nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 250 on the rotating inner scale, under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 – 20 = 80 (fig N60).

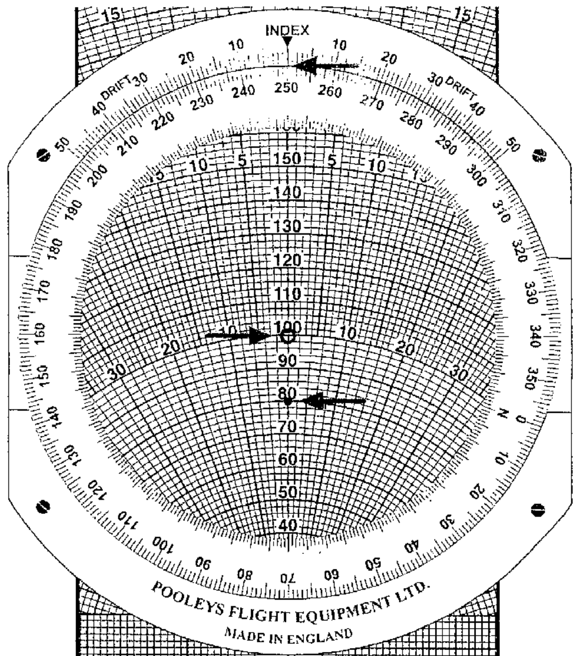


fig N60

By moving the sliding scale, set the centre dot over the TAS 110kt on the speed scale.

Rotate the inner scale to place the true track 084 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 2° to the left. (fig N61)

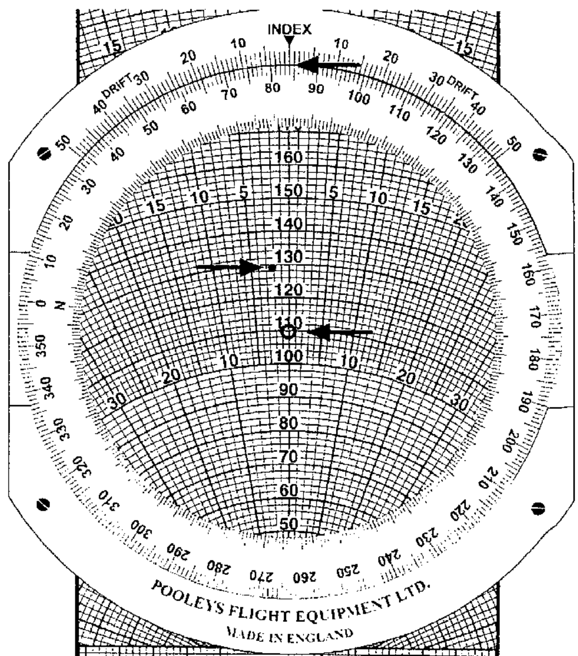


fig N61

Rotate the inner scale left 2° and note that the soft pencil still approximately indicates 2° left.

Read off the **true heading 086** under the index mark at the top of the fixed outer scale (fig N62).

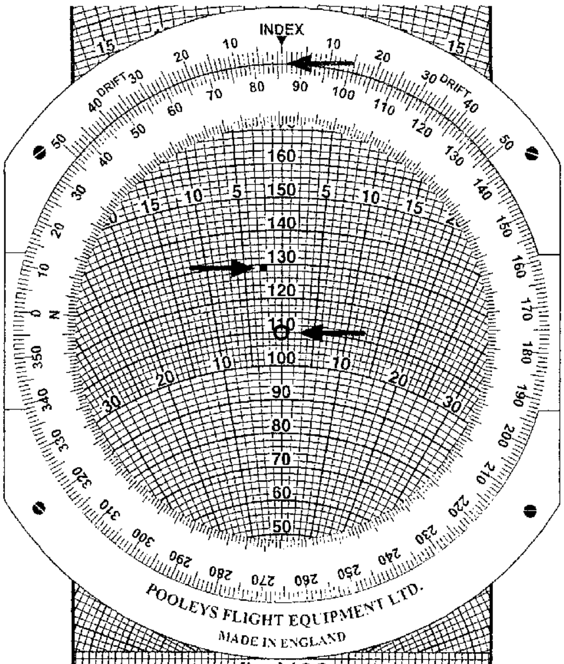


fig N62

Your heading will be 2° right of track. Therefore, the drift is to the left, or **2° port drift** (fig N62).

Read off the **ground speed:** the speed arc under the soft pencil mark = **129kt** (fig N62).

The local variation = 5°W given in the flight plan.

Magnetic heading = 086°T + 5°W = **091°M**.

Note: Given in the flight plan are the track of 084°T and drift 2° port which is to the left of track. If the drift is to the left, then the cross wind component must be from the right. The true heading must be right of track to off-set the cross wind component.

If the heading is right of track it will be greater than the track, so always add a port drift component to the track and subtract a starboard component to obtain a true heading.

Although both track and drift are given in the flight plan, the calculation has to be accomplished to find both the ground speed and time for the leg.

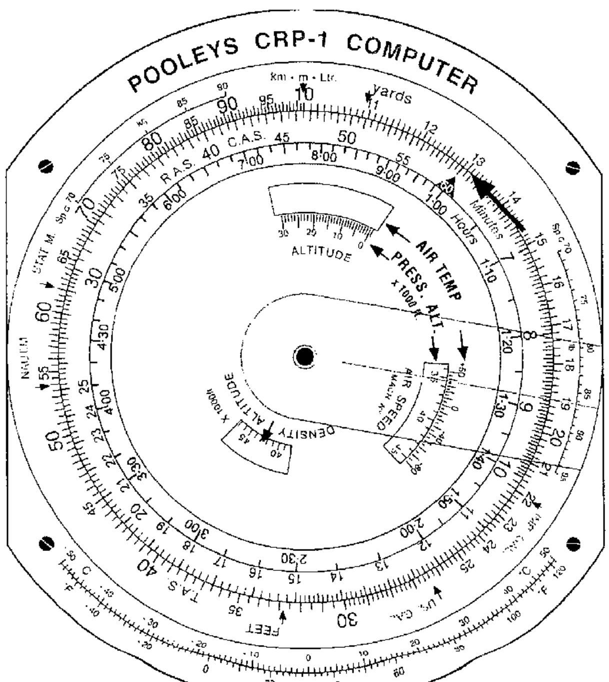


fig N63

Time calculation

Distance ST. MARY'S to WOLF ROCK was measured at the beginning of this explanation = 19nm.

Ground speed St. MARY'S to WOLF ROCK = 129kt.

See fig N62.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 129 on the fixed outer scale.

Below 19 on the fixed outer scale, read off 9 minutes to the nearest minute on the rotating inner scale (fig N63).

Time ST. MARY'S to WOLF ROCK = 9 minutes.

EN71(B)

129kt.

See EN70 fig N62.

EN72(C)

Follow the method in EN26 to plot the locations WOLF ROCK and CAMELFORD and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix K.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. True Track = **049°T**.

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between WOLF ROCK and CAMELFORD = **60nm**.

Track distance = 60nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 270 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 25kt on the centre line at a distance down from the centre dot. 100 − 25 = 75 (fig N64).

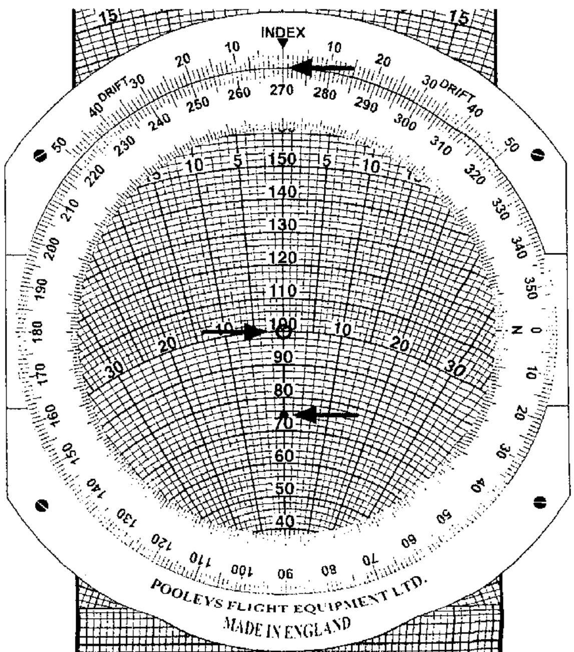


fig N64

By moving the sliding scale, set the centre dot over the TAS 110kt on the speed scale.

Rotate the inner scale to place the true track 049 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 7° to the right (fig N65).

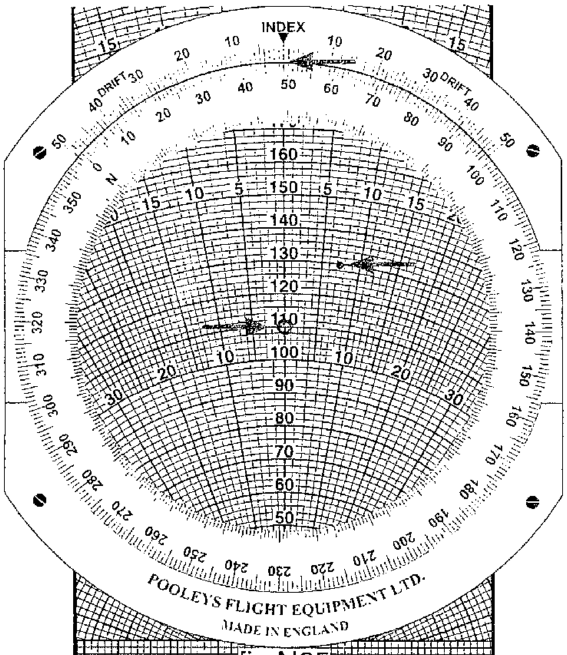


fig N65

Rotate the inner scale right 7° and note that the soft pencil mark still now indicates 9° right.

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 9° right.

Read off the **true heading 040** under the index mark at the top of the fixed outer scale (fig N66).

Your heading will be 9° left of track. Therefore, the drift is to the right, or **9° stbd drift** (fig N66).

Read off the **ground speed**: the speed arc under the soft pencil mark = **127kt** (fig N66).

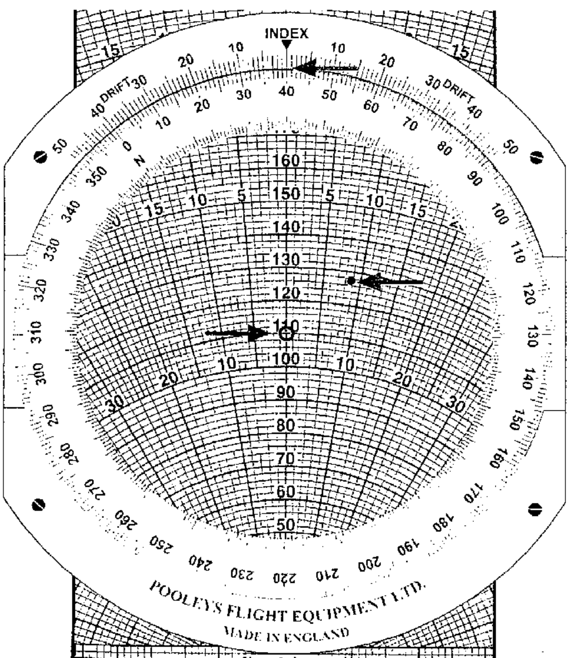


fig N66

The local variation = 4°W given in the flight plan.

Magnetic heading = 040°T + 4°W = **044°M**.

Time calculation

Distance WOLF ROCK to CAMELFORD was measured at the beginning of this explanation = 60nm.

Ground speed WOLF ROCK to CAMELFORD = 127kt. See fig N66.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 127 on the fixed outer scale.

Below 60 on the fixed outer scale, read off 28 minutes to the nearest minute on the rotating inner scale. (fig N67).

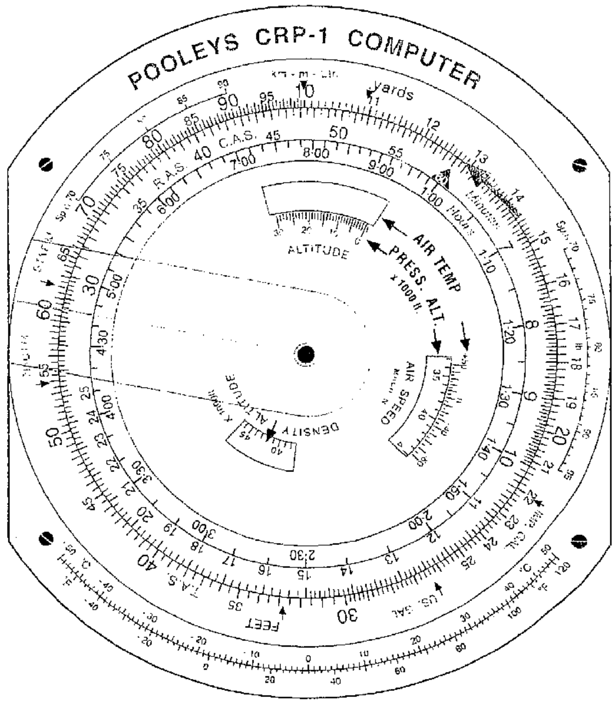


fig N67

Time WOLF ROCK to CAMELFORD = 28 minutes.

EN73(D)

To calculate the total flight plan time from ST. MARY'S to PLYMOUTH you first have to complete the flight plan for the leg CAMELFORD to PLYMOUTH.

Follow the method in EN26 to plot the locations.

CAMELFORD and PLYMOUTH and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix K.

The track angle 118°T is given in the flight plan.

True Track = 118°T.

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between CAMELFORD and PLYMOUTH = 23nm.

Track distance = 23nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 270 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 25kt on the centre line at a distance down from the centre dot. 100 − 25 = 75. (fig N68).

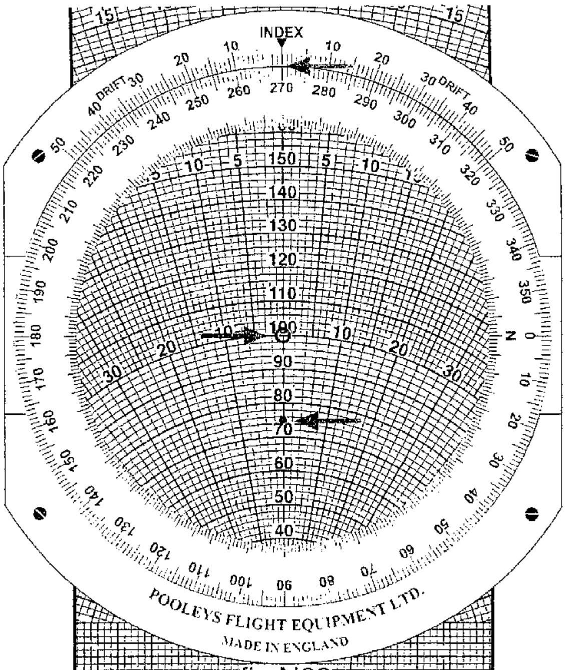


fig N68

By moving the sliding scale, set the centre dot over the TAS 110kt on the speed scale.

Rotate the inner scale to place the true track 118 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 5° to the left (fig N69).

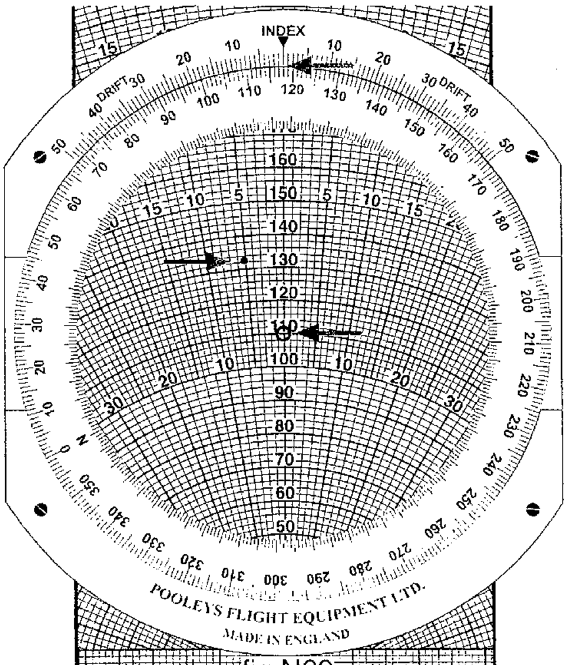


fig N69

Rotate the inner scale left 5° and note that the soft pencil now indicates 6° left.

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 6° left (fig N70).

Read off the **true heading 124** under the index mark at the top of the fixed outer scale (fig N70).

Your heading will be 6° right of track. Therefore, the drift is to the left, or **6° port drift** (fig N70).

Read off the **ground speed**: the speed arc under the soft pencil mark = **132kt** (fig N70).

The local variation = 4°W given in the flight plan.

Magnetic heading = 124°T + 4°W = **128°M**.

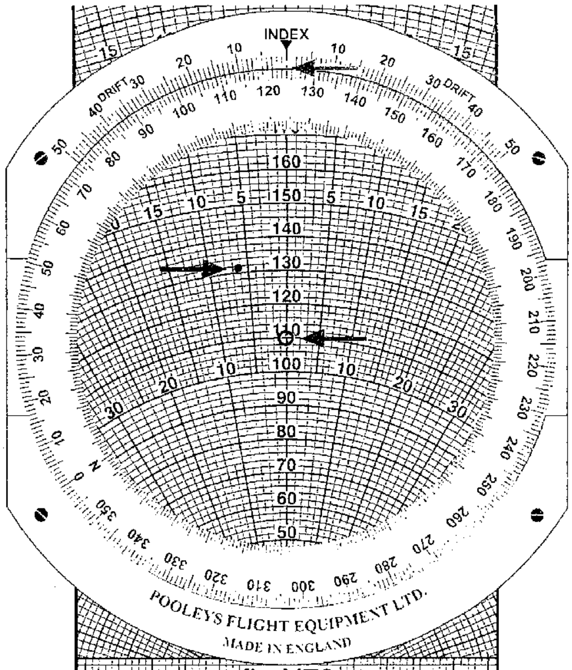


fig N70

Time calculation

Distance CAMELFORD to PLYMOUTH was measured at the beginning of this explanation = 23nm

Ground speed CAMELFORD to PLYMOUTH = 132kt. See fig N70.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 132 on the fixed outer scale.

Below 23 on the fixed outer scale, read off 10 minutes to the nearest minute on the rotating inner scale (fig N71).

Time CAMELFORD to PLYMOUTH = **10 minutes**.

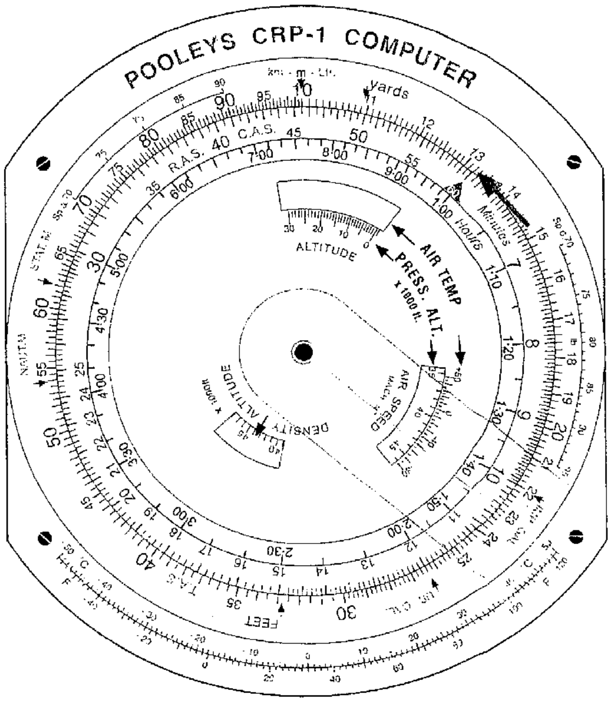


fig N71

To calculate the time ST. MARY'S to PLYMOUTH.

Refer to the flight plan 'Appendix K Completed'.

Time ST. MARY'S to WOLF ROCK	=	9min
Time WOLF ROCK to CAMELFORD	=	28min
Time CAMELFORD to PLYMOUTH	=	10min
Time ST. MARY'S to PLYMOUTH	=	**47min**

EN74(B)

Follow the method in EN26 to plot the locations PLYMOUTH and BODMIN and draw a track line between the points plotted.

As each item of flight planning information is measured or calculated, enter it into your flight plan Appendix K.

Use any suitable plotting protractor with a grid superimposed.

Place the centre of the protractor over the track mid-point, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel. **True Track = 282°T.**

Your chart scale = 1: 5000,000, so using a 1:5000,000 scale ruler measure the track distance between PLYMOUTH and BODMIN = 22nm.

Track distance = 22nm.

Use the wind triangle side of your CRP computer.

Set the wind direction 270 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

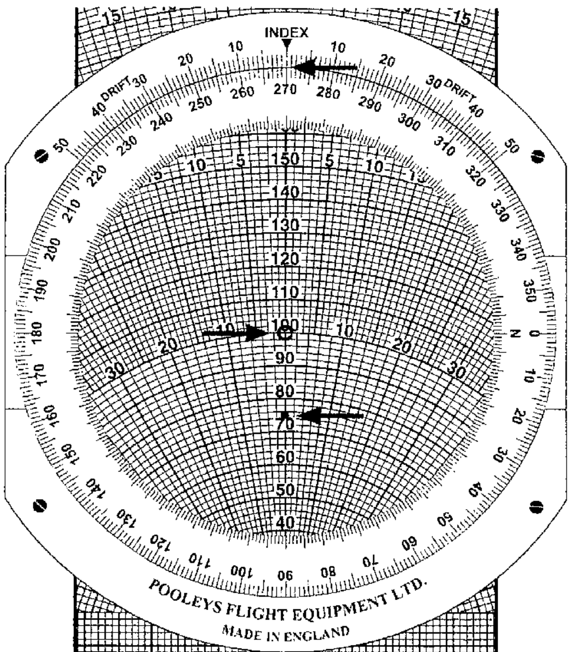


fig N72

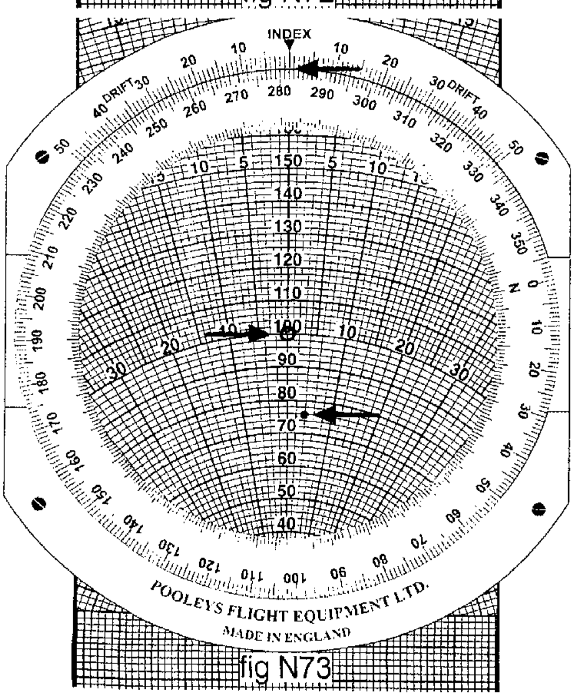


fig N73

Using a chinagraph or other soft pencil, mark the wind speed 25kt on the centre line at a distance down from the centre dot. 100 − 25 = 75. (fig N72).

The centre dot remains over the 100kt TAS on the speed scale.

Rotate the inner scale to place the true track 282 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 4° to the right (fig N73).

Rotate the inner scale right 4° and note that the soft pencil mark now indicates 3° right.

Adjust the rotating inner scale until both the soft pencil mark and the rotating inner scale indicate the same drift. In this instance 3° right.

Read off the **true heading 279** under the index mark at the top of the fixed outer scale (fig N74).

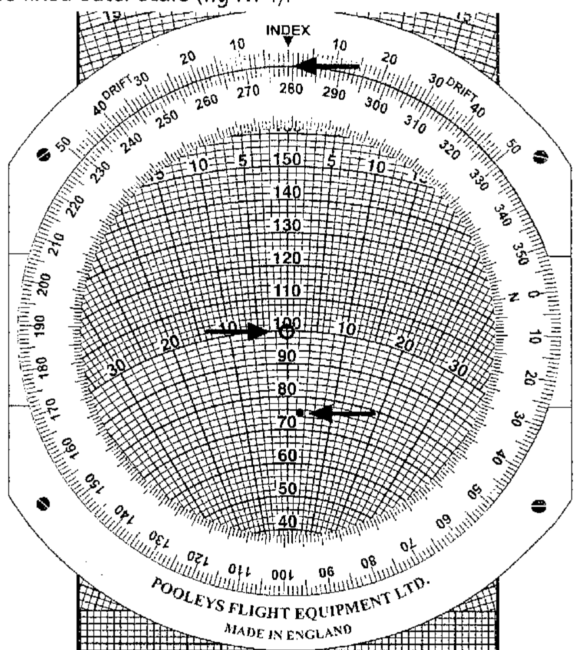


fig N74

Your heading will be 3° left of track. Therefore, the drift is to the right, or 3° stbd drift (fig N74).

Read off the ground speed: the speed arc under the soft pencil mark = **75kt** (fig N74).

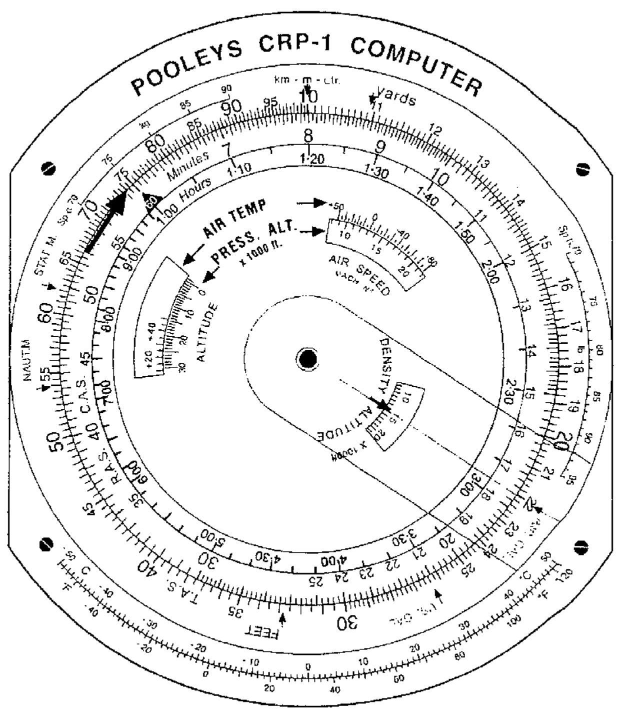


fig N75

The local variation = 4°W given in the flight plan.

Magnetic heading = 279°T + 4°W = **283°M**.

Time calculation

Distance PLYMOUTH to BODMIN was measured at the beginning of this explanation = 22nm.

Ground speed PLYMOUTH to BODMIN = 75kt. See fig N74.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 75 on the fixed outer scale.

Below 22 on the fixed outer scale, read off 18 minutes to the nearest minute on the rotating inner scale (fig N75).

Time PLYMOUTH to BODMIN = 18 minutes.

EN75(A)

Planned flight time + diversion time = **2hr - 52 min.**

The rotating inner scale of the CRP circular slide rule may also be used as a time scale.

Note: The red triangle with the 60 index may represent 60 minutes or 1hr.

To find the fuel required for the planned flight time given a fuel consumption of 6US gals/ hr.

Rotate the inner scale to set the 60 index (1 hr) under the 6 (gal) on the fixed outer scale.

From the 172 (172min or 2hr - 52min) on the inner rotating scale, read off 17.2 (US gal) on the fixed outer scale (fig N76).

Round up to the nearest whole gallon = **18US gal**.

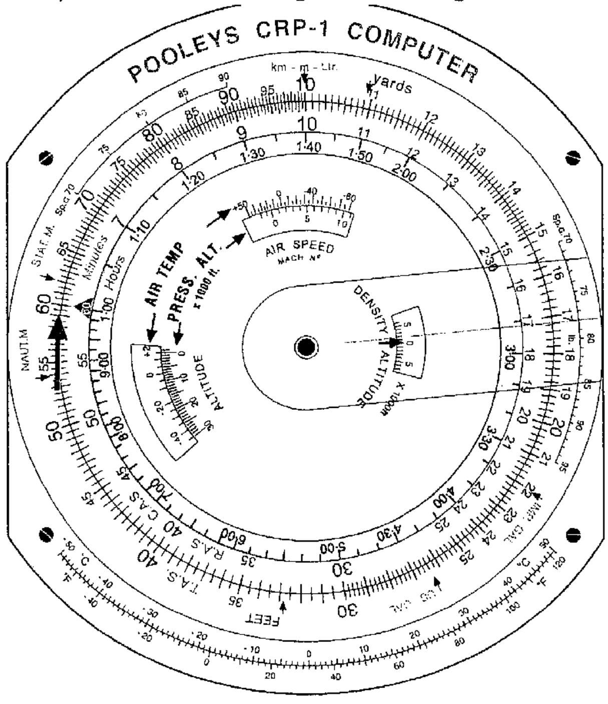


fig N76

Fuel for start and taxy & T/O	=	2.0 US gal.
Flight plan fuel	=	18.0 US gal. +
Approach & missed approach	=	3.0 US gal. +
Required reserve	=	7.0 US gal. +
Minimum fuel	=	**30.0 US gal.**

EN76(D)

First convert all volumes into the same unit of weight.

Fuel load 40US gal.

Using your CRP slide rule computer, set 40 on the rotating inner scale under the 'US gal' index on the fixed outer scale.

Refer to the Imperial specific gravity (Sp.G) scale.

Below 73 on the outer scale, read off 244 (lb.) from the rotating inner scale (fig N77).

Fuel load = 244lb.

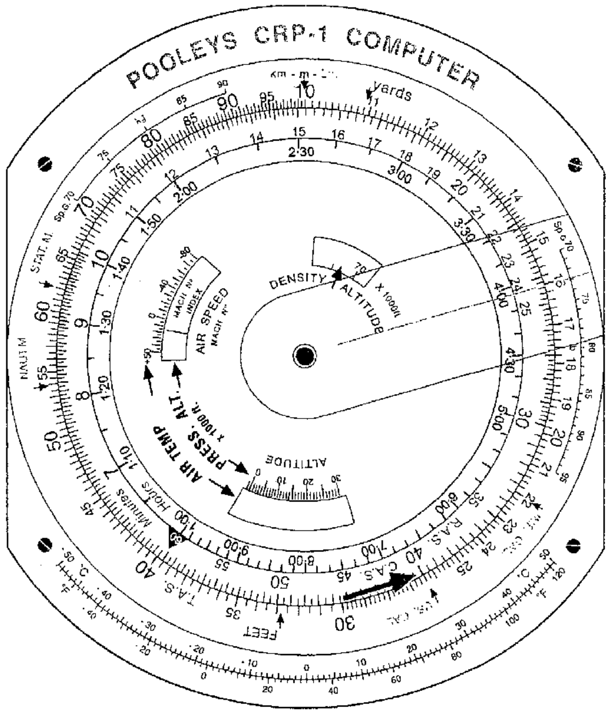


fig N77

Maximum Payload

= MTWA – (basic empty weight + fuel load + crew)

= 2325lb – (1401lb + 244lb + 174lb)

= 2325lb – 1819lb

= **506lb**

EN77(C)

Using the wind triangle side of the CRP computer, set 0 or North on the rotating inner scale under the index mark at the top of the fixed outer scale (fig N78).

Using the squared grid section at the bottom of the low speed scale, set the centre dot (wind index) on the grid at the zero speed point at the top of the grid (fig N78).

Using a chinagraph or other soft pencil, mark the wind speed (19kt) on the centre line at a distance down from the centre dot. = 19. (fig N78).

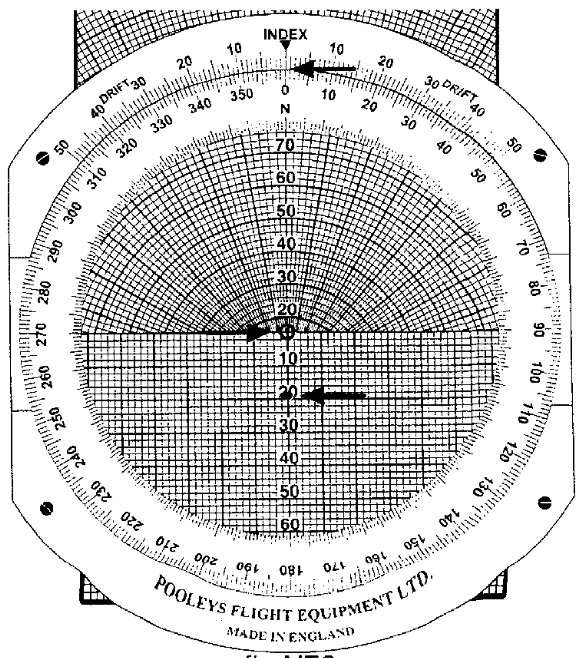


fig N78

Rotate the inner scale left or right until the soft pencil mark indicates a cross wind component of 15kt which in this instance = **60°** left or right (fig N79).

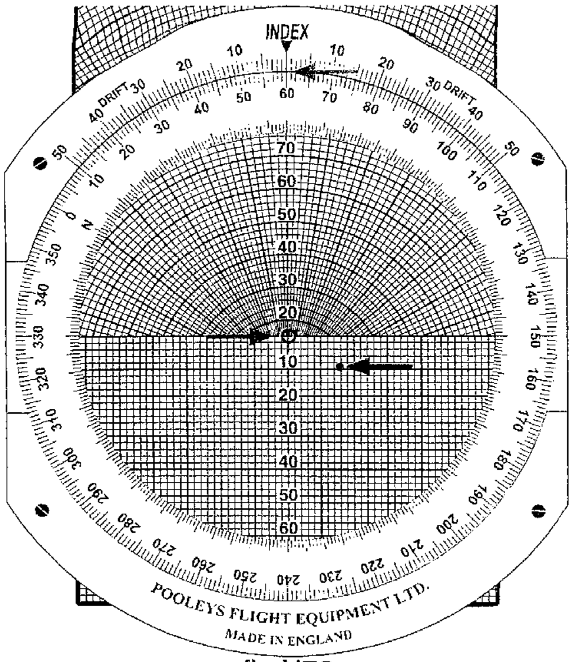


fig N79

EN78(C)

See fig N80.

G4D is an Advisory Route in Class F Airspace within which neither an ATC clearance nor a radio are required although RAS or RIS may be available from an Air Traffic Service Unit.

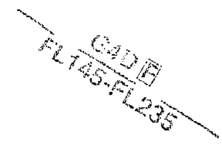


fig N80

EN79(D)

Refer to your chart.

To the west of the St. Mawgan MATZ, you should have your altimeter sub-scale set to the current Scillies Regional Pressure Setting.

Over-flight at 4000ft will position you above the MATZ but the Scillies/ Wessex ASR boundary line bisects the MATZ so the Wessex Regional Pressure Setting would have to be entered into your altimeter sub-scale as you cross the ASR boundary.

Note: If the controller at St Mawgan is very busy controlling other traffic in the St Mawgan area, Culdrose may ask you to free call St Mawgan to advise the controller there of your intentions. For the purpose safe separation, you may be asked to use the St. Mawgan QNH for transit over the St. Mawgan MATZ.

EN80(A)

Refer to your chart: Perrenporth Zone and your chart legend. Perrenporth ATZ is from the surface to 2000ft aal. The airfield datum as published on the chart is 330ft amsl making the upper limit of the ATZ 2330 amsl.

At 3000ft you would be above the Perrenporth ATZ and are therefore not legally required to speak to them. However, it would be advisable to let Perrenporth Radio know of your presence on 119.75 MHz. as it is both a winch and a foot launch glider and hang glider site.

FLIGHT LEVEL GRAPH

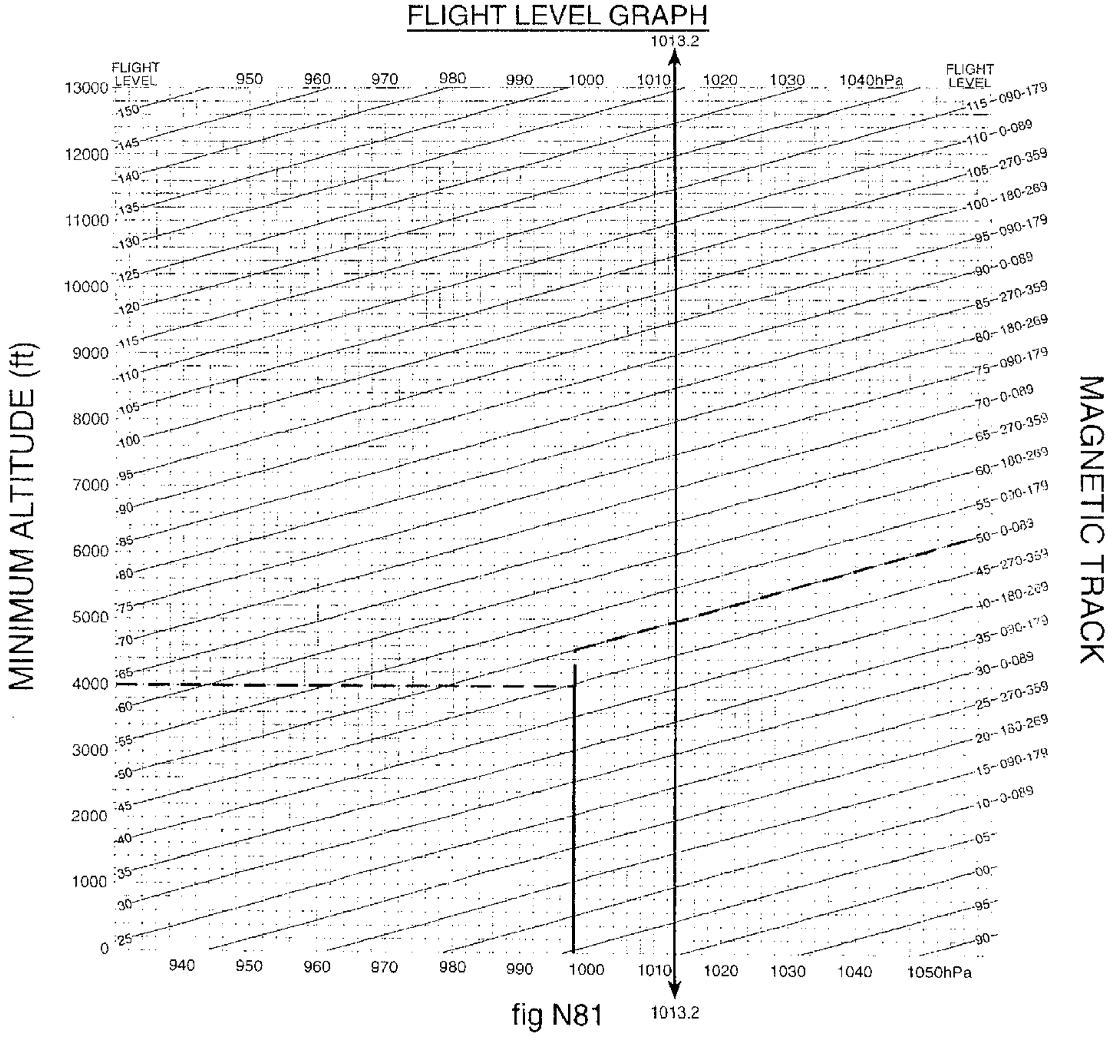


fig N81

EN81(C)

See fig N81.

QUADRANTAL RULE

Unless otherwise instructed by ATC, an aircraft operating under Instrument Flight Rules (IFR) outside Controlled Airspace above 3000ft amsl (altitude), or above the Transition Altitude, whichever is higher, up to Flight Level 240, must be operated in accordance with the Quadrantal Rule.

According to the MAGNETIC TRACK being flown, this rule determines the cruise Flight Level (FL) which itself is based on the standard altimeter sub-scale setting of 1013.2hPa when above the transition altitude.

UK. ANO Rules of the Air - Rule 30.

Note: A FLIGHT LEVEL is a vertical position expressed in hundreds of feet using the standard altimeter sub-scale setting of 1013.2hPa. For example, 4000ft = FL40 or 5500ft = FL55.

Under the Quadrantal Rule, your track of:
049°T = 054°M lies between 000°M and 089°M.

FL30 is not available as the transition altitude is at 4000ft and the QNH is below 1013.2hPa.

Enter the graph at the sector safety altitude (MINIMUM ALTITUDE) or Transition Altitude whichever is greater on the left hand side of the graph which in this instance is the transition altitude of 4000ft.

Move horizontally across to meet the vertical line representing the QNH given as 998hPa.

Move vertically upwards to intercept the next angled line that emanates from the right hand side of the graph representing a magnetic track angle range of 0 - 089, together with the next available flight level for that track range. In this instance **FL50**.

EN82(B)

This is the 1 in 60 rule which states that for every one degree an aircraft is off track it will be one nautical mile off track for every sixty nautical miles travelled.

To solve the problem using the 'closing angle method', two values must be established that are then used to calculate the alteration to heading required to fly direct to the destination.

1. The angle that the aircraft is off track (track angle error).
2. The distance remaining to the destination expressed as a fraction.

To calculate the track angle error 8nm along track.

1 Track angle error $= \frac{\text{distance off track}}{\text{distance flown}} \times \frac{60°}{1}$

$= \frac{1\text{nm} \times 60°}{8\text{nm}} = 7.5°$ right

2 The distance from CAMELFORD to PLYMOUTH City Airport is 23 nm which divides approximately into thirds of 8 nm.

	Camelford	2/3	1/3	Plymouth.
Distance to go:	23nm	15nm	8nm	zero

The distance to Plymouth = 15nm = 2/3 distance to go.

To find the alteration to heading at 2/3 distance to go:

the fraction 2/3 is inverted to 3/2 and multiplied by the track angle error of 7.5° expressed as a vulgar fraction.

$= \frac{15°}{2}$

ie. $\frac{3}{2} \times \frac{15°}{2} = \frac{45°}{4} = 11.25°$

As the drift is to the right, the aircraft must alter heading to the left by approximately 11° to arrive overhead Plymouth City Airport.

EN83(B)

Refer to EN26 to plot position. Refer to the chart legend.

*D011/10 OCNL/24.1

*	denotes the area contains airspace that is subject to local bye-laws that prohibit entry during the periods that the Danger Area is active.
D	denotes the area is a danger area
/	denotes the surface is the lowest level.
10	denotes the vertical extent in 1000s of feet amsl. = 10,000ft. amsl.
OCNL	denotes, when notified, a variation in 1000s of feet to the vertical extent amsl.
	A Danger Area delineated by a solid magenta line is a Permanently Notified Danger Area.

D011 is a Permanently Notified Danger Area from the surface to 10000ft amsl and when Notified to 24,100ft amsl. It contains airspace that is subject to local bye-laws that prohibit entry during the periods that the Danger Area is active.

EN84(A)

Refer to Appendix K Completed.

Endurance fuel overhead CAMELFORD = 12US gal.

Endurance $= \frac{12\text{US gal}}{8\text{US gals/hr}} \times \frac{60\text{min}}{1\text{hr}} =$ **90 min.**

Using your CRP circular slide rule:

Set the 60 (1hr) index on the rotating inner scale under 8 (US gals) on the fixed outer scale.

Below 12 (US gals) on the fixed outer scale, read off 90 (min.) on the rotating inner scale (fig N82).

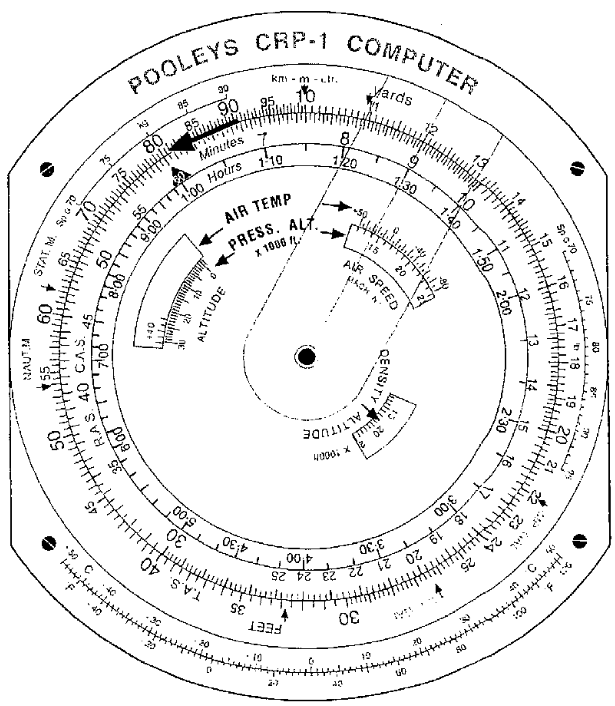


fig N82

CAMELFORD Quarry to PLYMOUTH	=	10min.
Time: PLYMOUTH to BODMIN	=	18min +
Time CAMELFORD to BODMIN	=	28min

Fuel burn CAMELFORD to BODMIN:

$$= \frac{8\text{US gal}}{1\cancel{\text{hr}}} \times \frac{1\cancel{\text{hr}}}{60\cancel{\text{min}}} \times \frac{28\cancel{\text{min}}}{1} = 3.7\text{US gal.}$$

Rounded up to the next whole gallon = 4US gal.

Fuel endurance overhead BODMIN:

$$= 12\text{US gal} - 4\text{US gal} = 8\text{US gal.}$$

Endurance overhead BODMIN:

$$= \frac{8\cancel{\text{US gal}}}{8\cancel{\text{US gals/hr}}} \times \frac{60\text{min}}{1\cancel{\text{hr}}} = \mathbf{60min.}$$

Using your CRP circular slide rule:

The 60 (1hr) index on the rotating inner scale is already set under 8 (US gals) on the fixed outer scale.

Below 8 (US gals) on the fixed outer scale, read off 60 (min) on the rotating inner scale. (fig N83)

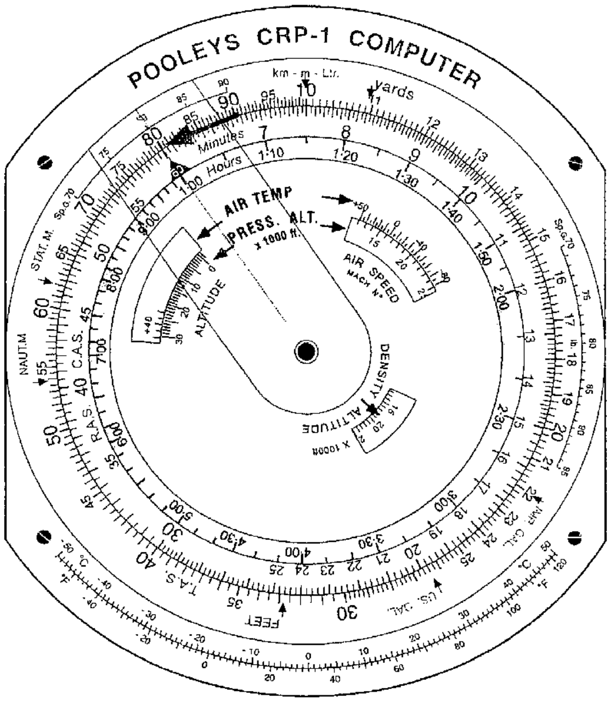


fig N83

EN85(A)

Refer to your chart and measure the distance along track Liskeard to the Bodmin Zone Boundary = 8nm

$$\text{Time to BODMIN} = \frac{\text{distance remaining}}{\text{ground speed}}$$

$$= \frac{8\cancel{\text{nm}}}{80\cancel{\text{nm/hr}}} \times \frac{60\text{ min}}{1\text{hr}} = 6\text{min.}$$

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale, under 80 (kt) on the fixed outer scale.

Below 8 (nm) on the fixed outer scale, read off 6 (min) on the rotating inner scale (fig N84).

$$\text{ROD} = \frac{\text{altitude reduction}}{\text{Time}}$$

$$= \frac{(4100 - 1700)\text{ft}}{6\text{min}} = \frac{2400\text{ft}}{6\text{min}}$$

$$= \frac{400\text{ft}}{\text{min}}$$

Using your CRP circular slide rule, set the 6 (60) on the rotating inner scale, under 2400 (24) on the fixed outer scale.

Above 1 on the rotating inner scale, read off 40 (400) on the fixed outer scale (fig N85).

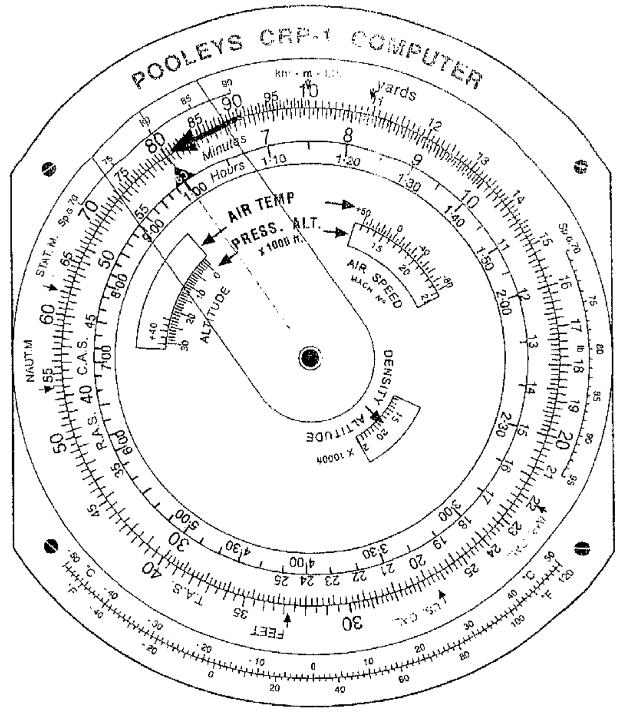


fig N84

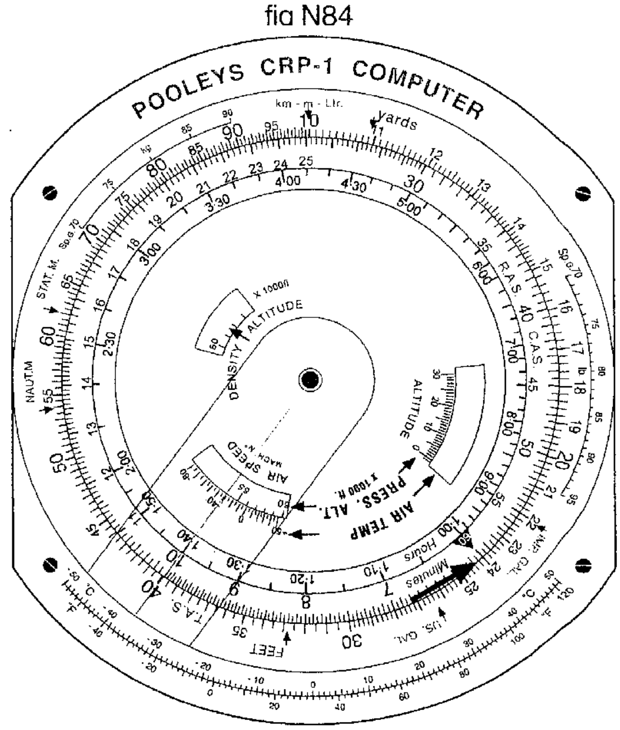


fig N85

EN86(D)

Refer to the Pooley Flight Guide extract Appendix R.

Under Warnings: In strong wind conditions, wind sheer and turbulence may be encountered on the approaches to all runways. Downdraught effect and sudden changes in surface wind velocity are possible in light wind conditions in summer months.

EN87(C)

When climbing, the track angle may be measured from the departure point as the track distance will be very short.

Follow the method in EN26 to plot the locations YEOVIL and STRADGYNLAIS and draw a track line between the points plotted.

Leg information is given in the flight plan but for practise:

Use any suitable plotting protractor with a grid superimposed. Place the centre of the protractor over YEOVIL AERODROME, at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel = **321°T.**

The track distance of 10nm is given in the flight plan.

Use the wind triangle side of your CRP computer.

Set the wind direction 260 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 15kt on the centre line at a distance down from the centre dot. 100 − 15 = 85. (fig N86).

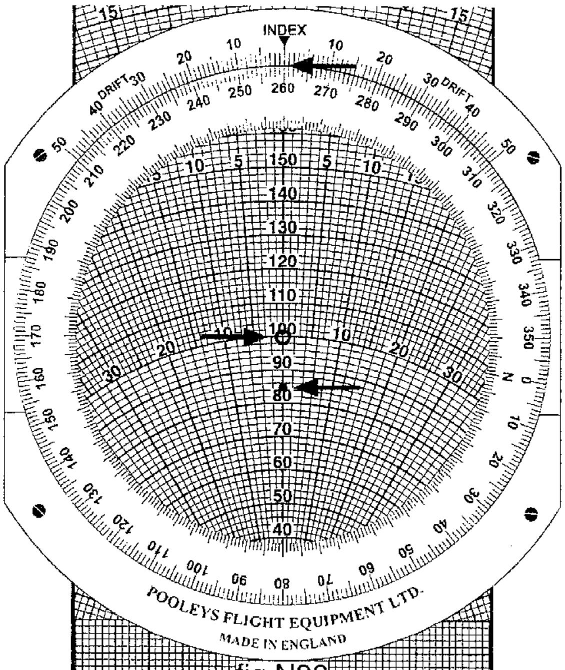


fig N86

By moving the sliding scale, set the centre dot over the TAS 80kt on the speed scale.

Rotate the inner scale to place the **true track 321** under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 10° to the right (fig N87).

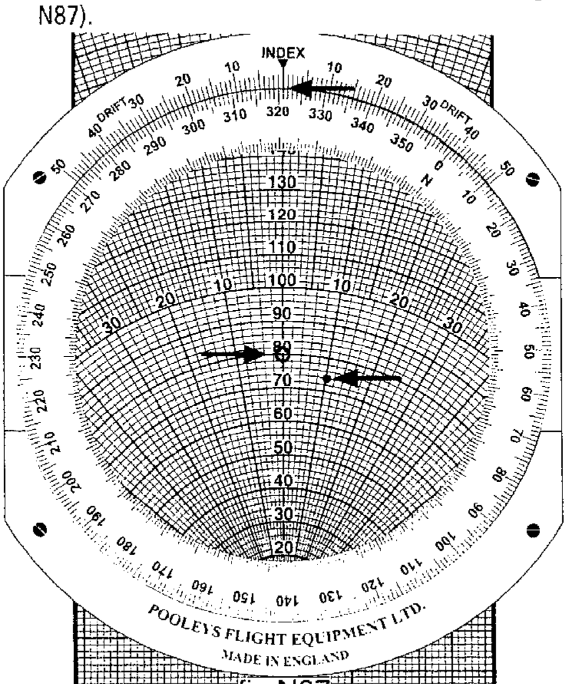


fig N87

Rotate the inner scale right 10° and note that the soft pencil mark still indicates 10° right drift (fig N88).

Read off the true heading **311** under the index mark at the top of the fixed outer scale (fig N88).

Your heading will be 10° left of track. Therefore, the drift is to the right, or 10° stbd drift.

The local variation = 4°W.

Magnetic heading = 311°T + 4°W = **315°M**.

Read off the **ground speed**: the speed arc under the soft pencil mark = **71kt** also given in the flight plan. (fig N88).

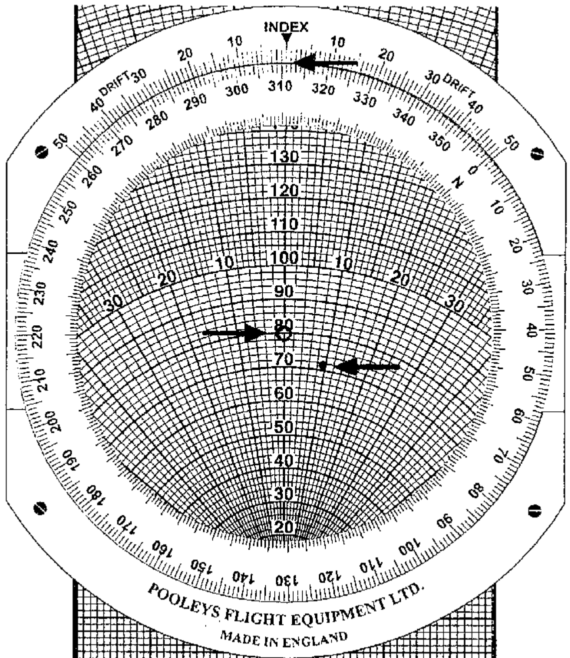


fig N88

Time calculation

Distance YEOVIL to TOC given in the flight plan = 10nm.

Ground speed YEOVIL to TOC = 71kt. See fig N88.

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 71 on the fixed outer scale.

Below 10 (nm) on the fixed outer scale, read off 8.5 minutes on the rotating inner scale (fig N89).

Time YEOVIL to TOC rounded up = **9.0 minutes**.

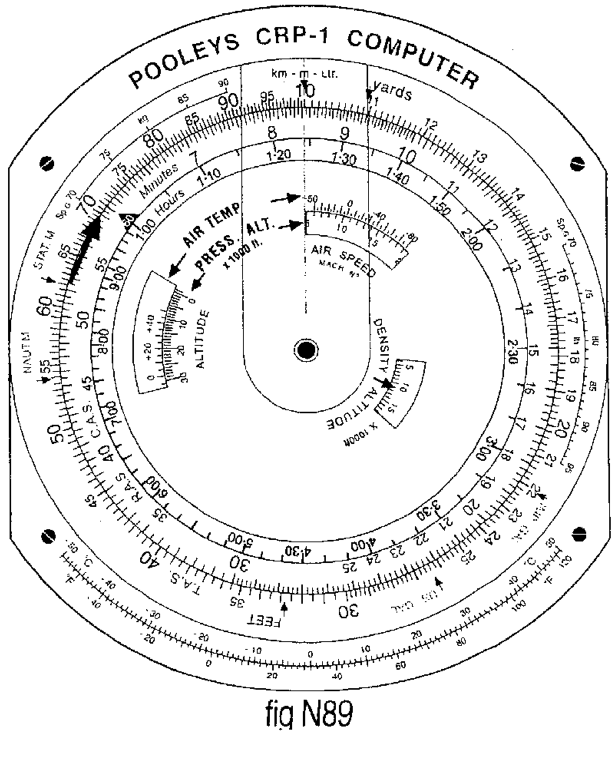


fig N89

EN88(B)

Along the track line from YEOVIL to STRADGYNLAIS measure and mark 10nm to identify TOC.

Use any suitable plotting protractor with a grid superimposed. The track should always be measured at approximately its mid-point to avoid convergency error.

Place the centre of the protractor over the approximate track mid-point at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel = **321°T** also given in the flight plan.

The track distance is given in the flight plan = 55nm.

Using the wind triangle side of your CRP computer, set the wind direction 260 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 − 20 = 80. (fig N90).

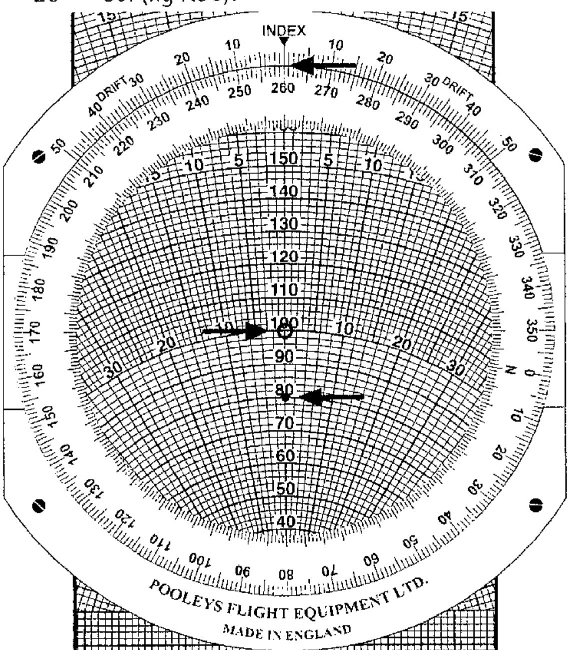


fig N90

By moving the sliding scale, set the centre dot over the TAS 115kt on the speed scale (fig N91).

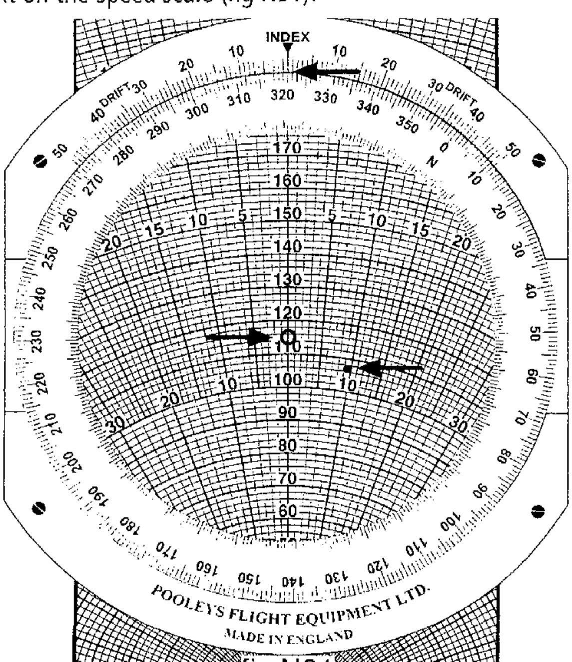


fig N91

Rotate the inner scale to place the true track 321 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has moved 9° to the right (fig N91).

Rotate the inner scale right 9° and note that the soft pencil still approximately indicates 9° right (fig N92).

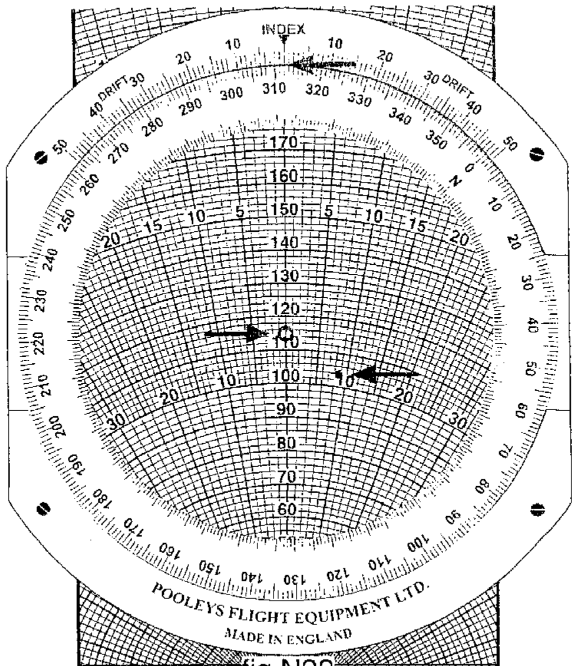


fig N92

Below the index mark at the top of the fixed outer scale, read off the **true heading 312** on the rotating inner scale.

Read off the **ground speed**: the speed arc under the soft pencil mark = **104kt.**

The local variation = 4°W.

Magnetic heading = 312°T + 4°W = **316°M**

Time calculation

Distance TOC to YSTRADGYNLAIS is given in the flight plan = 55nm.

Ground speed TOC to YSTRADGYNLAIS = 104kt (fig N92).

Although the time calculation made in fig N93 = 32 minutes, this is unnecessary as the beginning and end sector times are available from the flight plan which if subtracted = 32 minutes.

Time TOC to YSTRADGYNLAIS = 32 minutes.

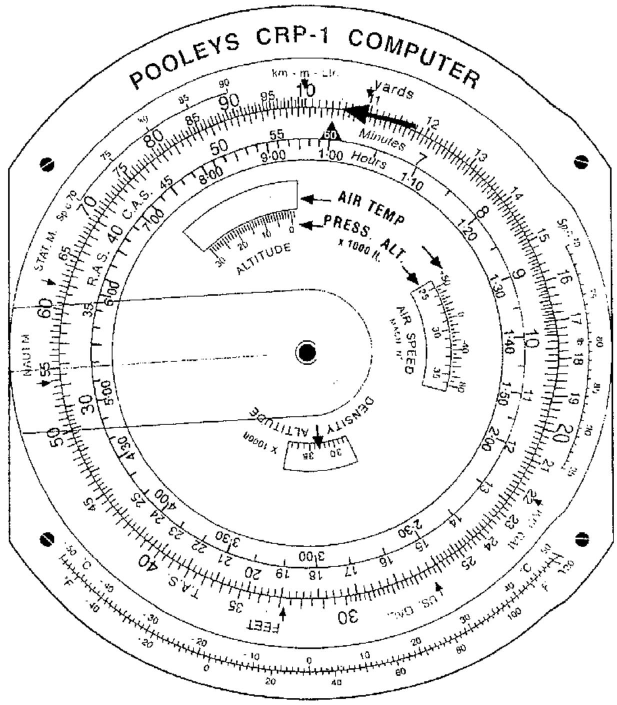


fig N93

EN89(C)

Follow the method in EN26 to plot the locations YSTRADGYNLAIS to ABERPORTH and draw a track line between the points plotted.

Use any suitable plotting protractor with a grid superimposed. The track should always be measured at approximately its mid-point to avoid convergency error.

Place the centre of the protractor over the approximated track mid-point at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel = **304°T**.

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between YSTRADGYNLAIS and ABERPORTH = **36nm**.

Using the wind triangle side of your CRP computer, set the wind direction 230 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 − 20 = 80 (fig N94).

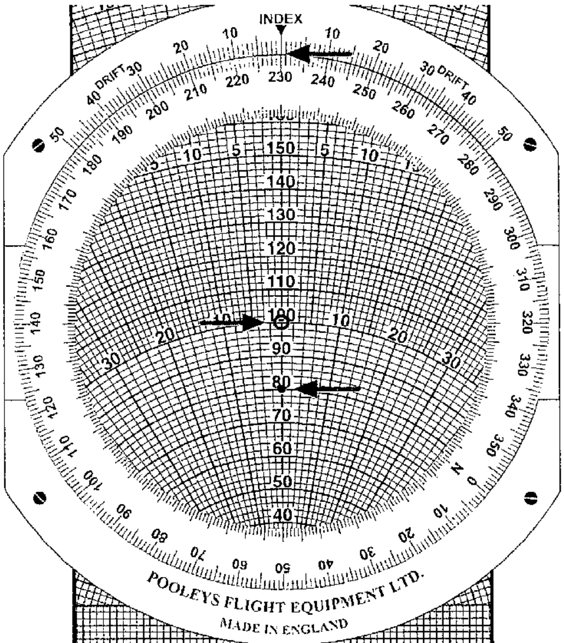


fig N94

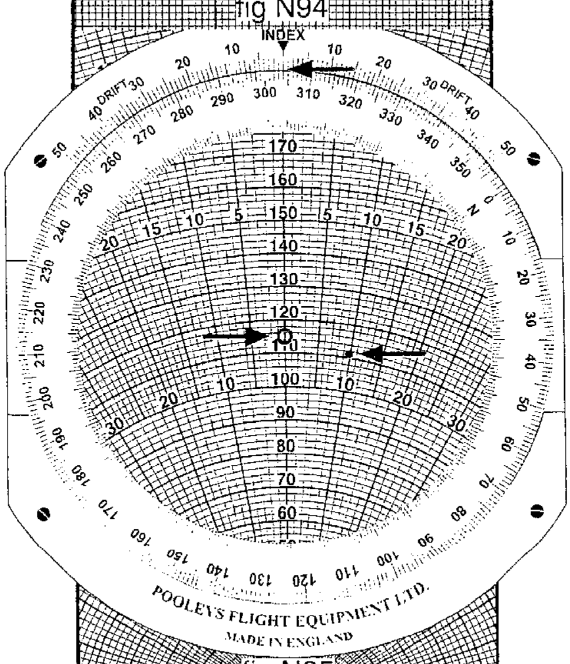


fig N95

By moving the sliding scale, set the centre dot over the TAS 115kt on the speed scale.

Rotate the inner scale to place the true track 304 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has moved 10° to the right (fig N95)

Rotate the inner scale right 10° and note that the soft pencil still approximately indicates 10° right (fig N96).

Below the index mark at the top of the fixed outer scale, read off the **true heading 294** on the rotating inner scale (fig N96).

Read off the **ground speed:** the speed arc under the soft pencil mark = **108kt.** (fig N96).

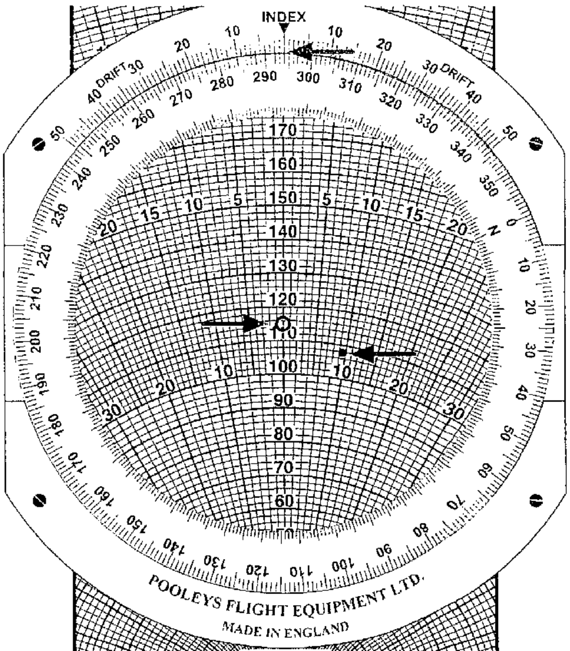


fig N96

The local variation = 4°W.

Magnetic heading = 294°T + 4°W = **298°M**

Time calculation

Distance YSTRADGYNLAIS to ABERPORTH = 36nm.

Ground speed YSTRADGYNLAIS to ABERPORTH = 108kt (fig N96).

$$\text{Time} = \frac{\text{distance}}{\text{ground speed}} = \frac{36\not{\text{nm}}}{108\not{\text{nm/hr}}} \times \frac{60\text{min}}{1\not{\text{hr}}}$$

= 20 minutes.

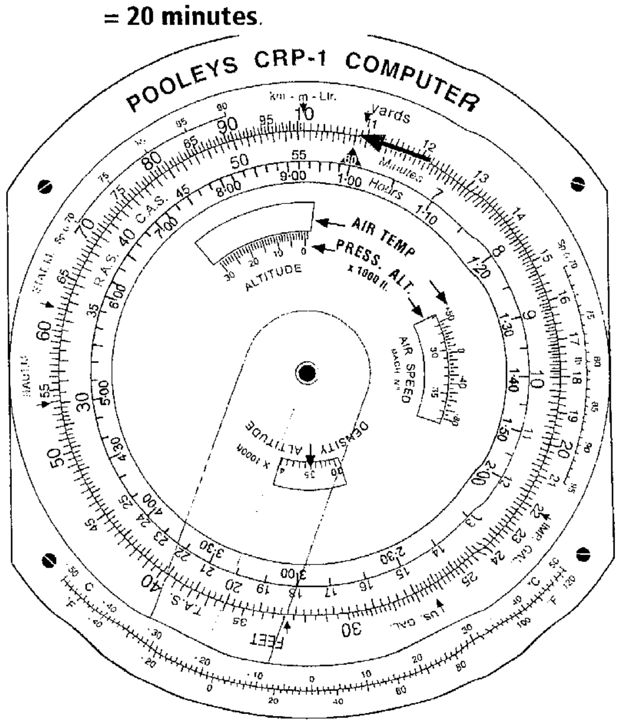


fig N97

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 108 on the fixed outer scale.

Below 36 on the fixed outer scale, read off 20 minutes on the rotating inner scale (fig N97).

Time YSTRADGYNLAIS to ABERPORTH = **20 min.**

EN90(D)

Refer to Appendix L Completed.

Time YEOVIL to TOC	=	9.0min
Time TOC to YSTRADGYNLAIS	=	32.0min +
Time YSTRADGYNLAIS to ABERPORTH	=	20.0min +
Time YEOVIL to ABERPORTH	=	**61.0min**

EN91(B)

Follow the method in EN26 to plot the locations ABERPORTH and SWANSEA and draw a line between the points plotted.

Use any suitable plotting protractor with a grid superimposed.

The track should always be measured at approximately its mid-point to avoid convergency error.

Place the centre of the protractor over the approximated track mid-point at the same time aligning one of the grid vertical lines with a suitable chart meridian.

Measure the track at the edge of the protractor in the direction of travel = **149°T.**

Your chart scale = 1: 5000,000, so using a 1: 5000,000 scale ruler measure the track distance between

ABERPORTH and SWANSEA = **36 nm** rounded up.

Use the wind triangle side of your CRP computer.

Set the wind direction 230 on the rotating inner scale under the index mark at the top of the fixed outer scale.

By moving the slide, set the centre dot (wind index) over the 100 speed arc or other convenient speed arc.

Using a chinagraph or other soft pencil, mark the wind speed 20kt on the centre line at a distance down from the centre dot. 100 − 20 = 80. (fig N98).

The centre dot remains over the TAS 100kt on the speed scale (fig N98).

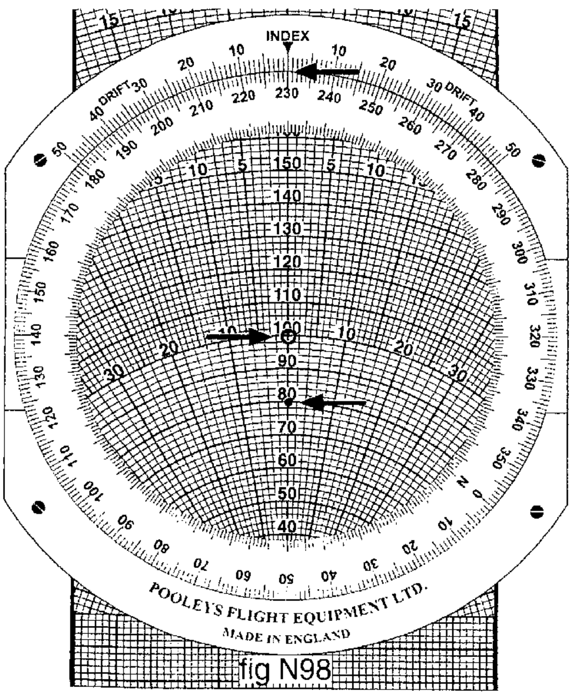


fig N98

Rotate the inner scale to place the true track 149 under the index mark at the top of the fixed outer scale.

Note: The soft pencil mark has now moved 11° to the left (fig N99).

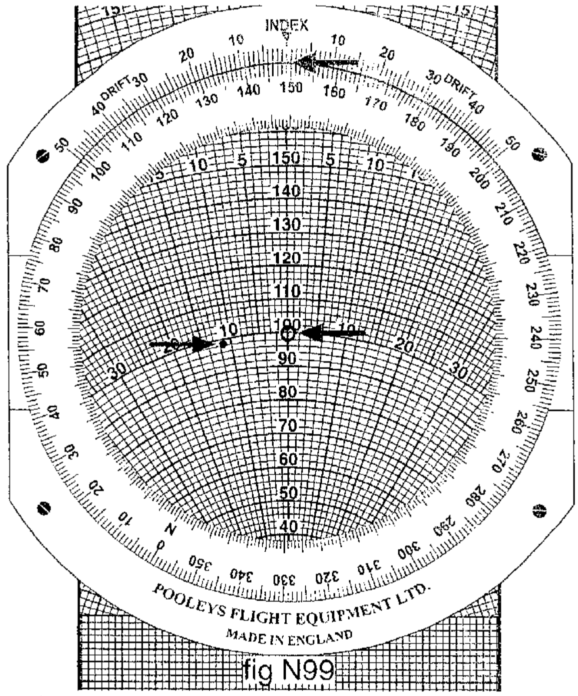


fig N99

Rotate the inner scale left 11° and note that the soft pencil mark still indicates 11° left drift (fig N100).

Below the index mark at the top of the fixed outer scale, read off the **true heading 160** on the rotating inner scale (fig N100).

Read off the **ground speed**: the speed arc under the soft pencil mark = **95kt**. (fig N100)

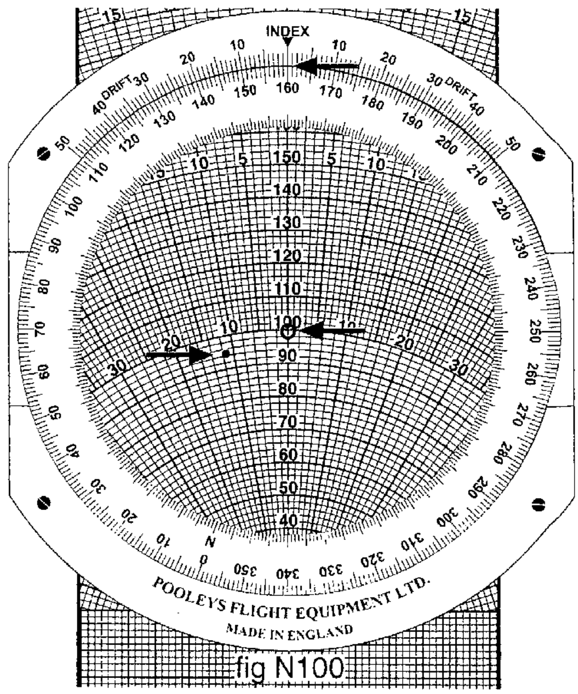


fig N100

The local variation = 4°W.

Magnetic heading = 160°T + 4°W = **164°M.**

Time calculation

Distance ABERPORTH to SWANSEA = 36nm.

Ground speed ABERPORTH to SWANSEA = 95kt (fig N100)

$$\text{Time} = \frac{\text{distance}}{\text{ground speed}} = \frac{36\cancel{nm}}{95\cancel{nm}} \times \frac{1\cancel{hr}}{1} \times \frac{60min}{1\cancel{hr}}$$

= **23min**

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 95 on the fixed outer scale.

Below 36 on the fixed outer scale, read off 23 minutes (rounded up) on the rotating inner scale (fig N101).

Time ABERPORTH to SWANSEA = **23 minutes.**

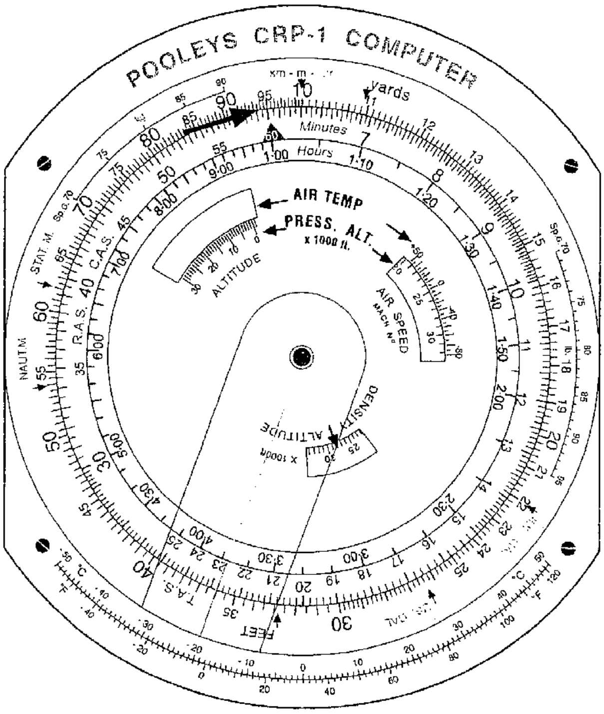


fig N101

EN92(C)

The MATZ QFE should be set while departing through the YEOVILTON MATZ.

Upon vacating the MATZ it would be acceptable to use the MATZ QNH to climb to the transition altitude 3000ft as this would involve a short climb.

From the transition altitude the standard setting of 1013.2hPa should be set and maintained.

In this instance the main settings would be the MATZ QFE and standard 1013.2hPa as the MATZ QNH is only transitional.

EN93(D)

Refer to your chart.

On track you would route through the CARDIFF CTR (SFC - FL55). As Cardiff provides a LARS the hand-over would be to CARDIFF RADAR 125.85 MHz.

EN94(D)

This question offers a trap for the candidate to fall into.

The times TOC and abeam CARDIFF are given so the ground speed must be based on these figures.

The distance Yeovil to TOC of climb given in the flight plan is 10nm and the distance Yeovil to abeam CARDIFF can be measured on your chart = 37nm so distance TOC to abeam CARDIFF = 27nm.

Time TOC to abeam CARDIFF = 1047 - 1029 = 18 mins.

Groundspeed TOC to abeam CARDIFF = $\frac{\text{distance}}{\text{time}}$

$$= \frac{27\text{nm}}{18\text{ mins}} \times \frac{60\text{mins}}{1\text{hr}} = 90\text{kt}$$

Distance abeam CARDIFF to YSTRADGYNLAIS by measuring the chart = 28nm to the nearest nautical mile.

Sector time from abeam CARDIFF to YSTRADGYNLAIS based on the ground speed TOC to abeam Cardiff.

$$\text{Time} = \frac{\text{distance}}{\text{ground speed}}$$

$$= \frac{28\text{nm}}{90\text{nm}} \times \frac{\text{hr}}{1} \times \frac{60\text{min}}{1\text{hr}} = 18.66\text{min}$$

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 90 (kt) on the fixed outer scale.

Below 28 (nm) on the fixed outer scale, read off 18.66 (min) on the rotating inner scale (fig N102). Round up to the nearest minute = 19 minutes. (figN102)

ETA YSTRADGYNLAIS = 1047 UTC + 19min

= **1106 UTC**

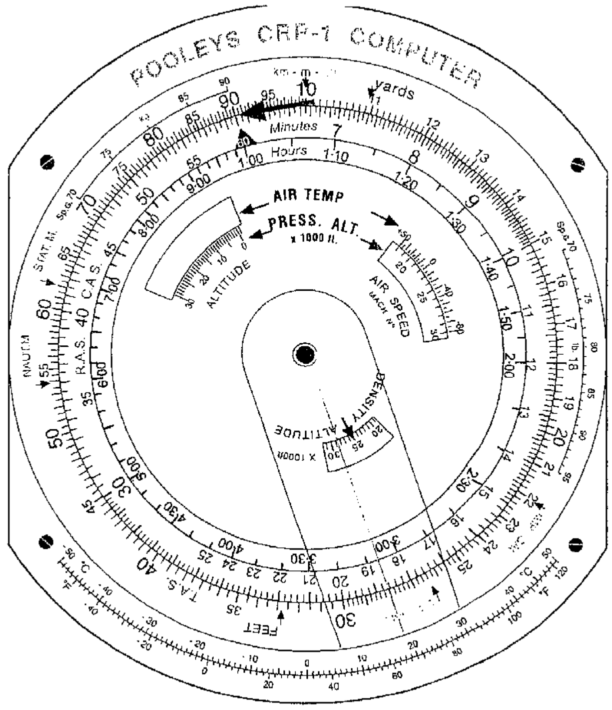


fig N102

EN95(C)

$$\text{Time} = \frac{\text{distance}}{\text{ground speed}}$$

$$= \frac{25\text{nm}}{104\text{nm}} \times \frac{\text{hr}}{1} \times \frac{60\text{min}}{1\text{hr}} = 14.5\text{min}$$

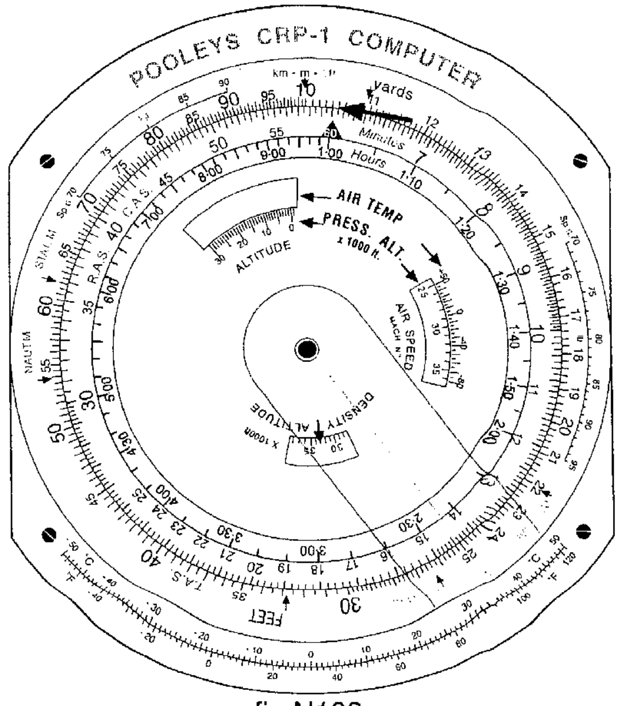


fig N103

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 104 (kt) on the fixed outer scale.

Below 25 (nm) on the fixed outer scale, read off 14.5 (min) on the rotating inner scale (fig N103).

Radar service will terminate at 1047 UTC + 14.5 min
= 1101.5 UTC.

Nearest answer = 1102 UTC.

EN96(C)

Endurance overhead YSTRADGYNLAIS.

$$= \frac{\text{endurance fuel}}{\text{rate of fuel consumption}}$$

$$= \frac{27\cancel{\text{US gals}}}{9\cancel{\text{US gals}}} \times \frac{1\text{hr}}{1} = 3\text{hr.}$$

Using your CRP circular slide rule, set the 60 (1hr) index on the rotating inner scale under 9 (gals) on the fixed outer scale.

Below 27 (gals) on the fixed outer scale, read off 180 (min) or 3 (hr) on the rotating inner scale (fig N104).

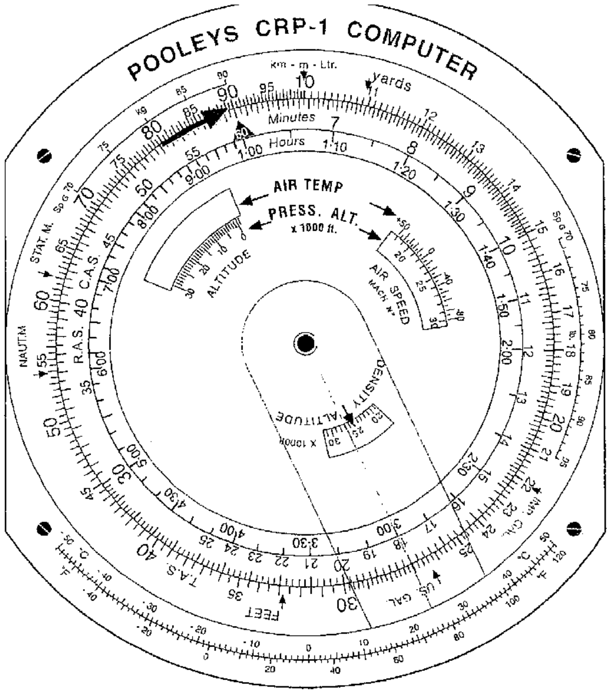


fig N104

Sector time YSTRADGYNLAIS to ABERPORTH
= 20min when rounded up to the nearest minute.

Fuel endurance overhead ABERPORTH
= 180min – 20min
= **160min or 2hr - 40min.**

EN97(D)

The flight would be in the open FIR within the Wessex Altimeter Setting Region (ASR), therefore the Wessex Regional Pressure Setting should be set on the altimeter sub-scale.

EN98(A)

At 1106 UTC the aircraft was 7.5nm left of track and approximately 19nm along track between YSTRADGYNLAIS and ABERPORTH.

Using your CRP circular slide rule set the 19 (nm) on the rotating inner scale under 7.5 (nm) on the fixed outer scale.

Above 60 (nm) on the rotating inner scale, read off approximately 23.5° on the fixed outer scale (fig N105).

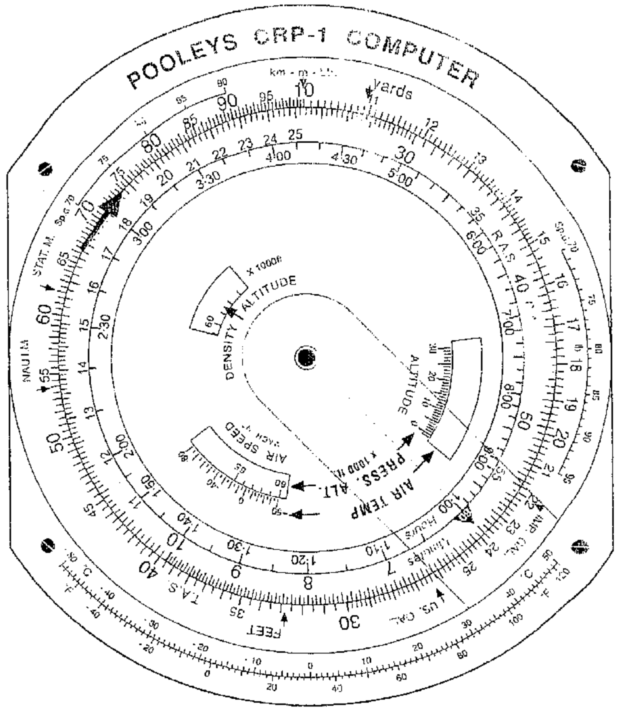


fig N105

Track angle error or drift = 23.5° port.

Alternatively, draw a line between YSTRADGYNLAIS and the heliport at Carmarthen and simply use a suitable protractor to measure the track angle error from the point of origin. ie YSTRADGYNLAIS. = 23°.

To parallel planned track, alter heading 23° to stbd .

EN99(B)

Time YSTRADGYNLAIS to CARMARTHEN = 9min, which is at approximately half distance.

Time CARMARTHEN to ABERPORTH = 9min.

ETA ABERPORTH = 1106 UTC + 9 min
= 1115 UTC.

EN100(B)

Time from TOD to 1500ft:

$$= \frac{\text{distance}}{\text{ground speed}}$$

$$= \frac{10\cancel{\text{nm}}}{100\cancel{\text{nm}}} \times \frac{\cancel{\text{hr}}}{1} \times \frac{60\text{min}}{1\cancel{\text{hr}}} = 6\text{min}$$

Using your CRP circular slide rule set the 60 (1hr) index on the rotating inner scale below 100 (kt) on the fixed outer scale.

Below 10 (nm) on the fixed outer scale, read off 6 (min) on the rotating inner scale. (fig N106)

In this case what you set is what you read off but with an adjusted decimal place.

$$\text{ROD} = \frac{\text{altitude reduction}}{\text{time}}$$

$$= \frac{(4500 - 1500)\text{ft}}{6\text{min}} = \frac{3000\text{ft}}{6\text{min}}$$

$$= \frac{500\text{ft}}{\text{min}}$$

Using your CRP circular slide rule, set the 60 (min) index on the rotating inner scale under 30 (3000ft) on the fixed outer scale.

Above 10 (1 min) on the rotating inner scale, read off 50 (500ft) on the fixed outer scale. = 500ft/min (fig N107)

The minimum ROD = 500ft/min.

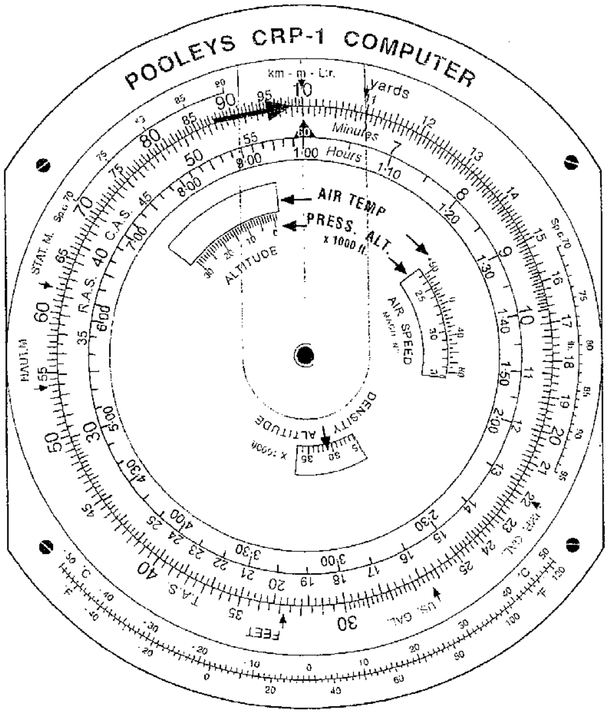


fig N106

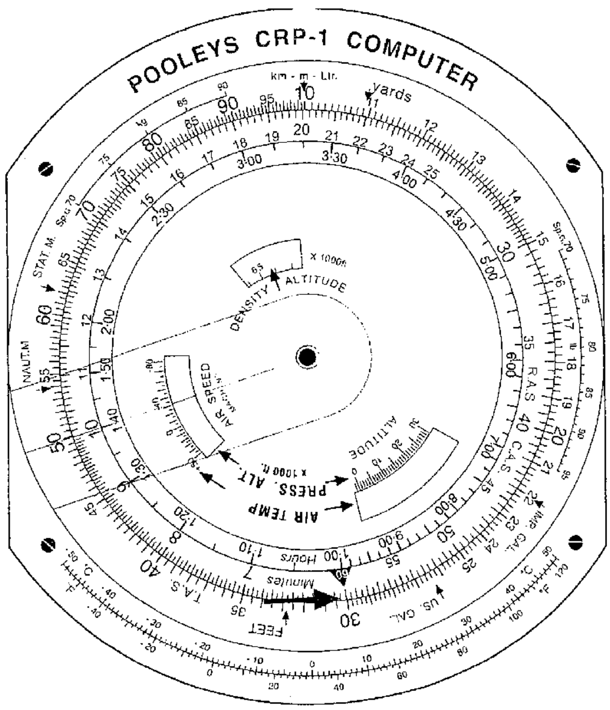


fig N107

EN101(A)

Refer to Appendix S under 'Warnings'.

Unserviceable portions of the runways short of the thresholds to Runways 10 and 28 marked by white crosses and a road passes near to the threshold of runway 28.

Not all taxiways are available for use. Any departure from the marked manoeuvring area may be hazardous.

EN102(A)

Propagation and site errors.

The propagation of Very High Frequency (VHF) radio waves is essentially line of sight, unlike Low Frequency (LF) and Medium Frequency (MF) wave propagation employed by NDB systems. LF and MF waves are refracted by the Earth's surface where reception is often possible well beyond the visible horizon. At night, LF and MF wave propagation produces sky waves causing ambiguity of the signal at the ADF receiver. VHF signals do not involve either sky or surface wave propagation and remain accurate both by day and by night.

VHF Range is determined essentially by line of sight reception and transmitter power. Where possible, VHF transmitters are located on flat terrain where signal propagation will not be affected by buildings or hills which can cause signals to be reflected and arrive at an aircraft or ground receiver along an incorrect path.

In the case of VDF, the VHF transmitter is airborne. An aircraft at low level with a range of hills between itself and the VDF antenna may produce an inaccurate bearing at the ground station.

There are 3 classes of VDF bearing accuracy 'A', 'B' or 'C',

Class 'Alpha' = +/– 2°

Class 'Bravo' = +/– 5°

Class 'Charlie' = +/– 10°

A Class 'Bravo' bearing of 176° means your bearing lies between 171° and 181°

If the VDF controller considers the bearing accuracy to be 'Class Alpha' the protocol is that the class of bearing is not passed to the aircraft commander. Where the amount of degradation of bearing accuracy is known, the VDF controller will classify the bearing as either 'Class Bravo' or 'Class Charlie'.

EN103(D)

See EN102 & EN104.

A QDM is the magnetic bearing of the VDF station from the aircraft. Class Bravo = +/– 5°. The actual bearing is between 075°M and 085°M

EN104(B)

There is more than one format for the presentation of VHF Direction Finding (VDF) information but whatever the system, they all utilise the aircraft's VHF communication equipment to obtain a bearing.

A cathode ray tube with a radial line representing either a QDM or QDR (fig N108 A) which is the correct answer to the question and which was state of the art in the nineteen eighties is now somewhat redundant having been replaced by more modern technology.

More representative of equipment now in general use is the digital display illustrated by (fig N108 B) The outer azimuth features a circle of lights at 10° intervals which show the general direction of the transmitting aircraft in relation to the VDF antenna.

The controller has an option of selecting either QDM or QTE, also a 'store' button which retains the bearing of the last aircraft to transmit on the VDF frequency. Immediately a controller hears an aircraft transmitting for VDF, the bearing can be captured and stored in the event that the controller is occupied with another task at that time. Transmissions by other aircraft will not affect the display once a bearing has been stored.

If an aircraft has been identified by a radar controller, It is possible for the controller to obtain an accurate bearing from the primary radar plot. A cursor is clicked onto the centre of the screen which represents the airfield and then onto the identified aircraft requesting a QDM. Bearing and range information, depending upon the system in use, will be displayed in the top right corner of the plot. (fig N108 C). Some systems paint the information next to the radar target but the method of obtaining the bearing using a cursor is fairly universal.

A great advantage of the cursor is that a QDM to any waypoint within radar range and known to the controller may be obtained simply by the controller clicking on the target aircraft and then on the waypoint.

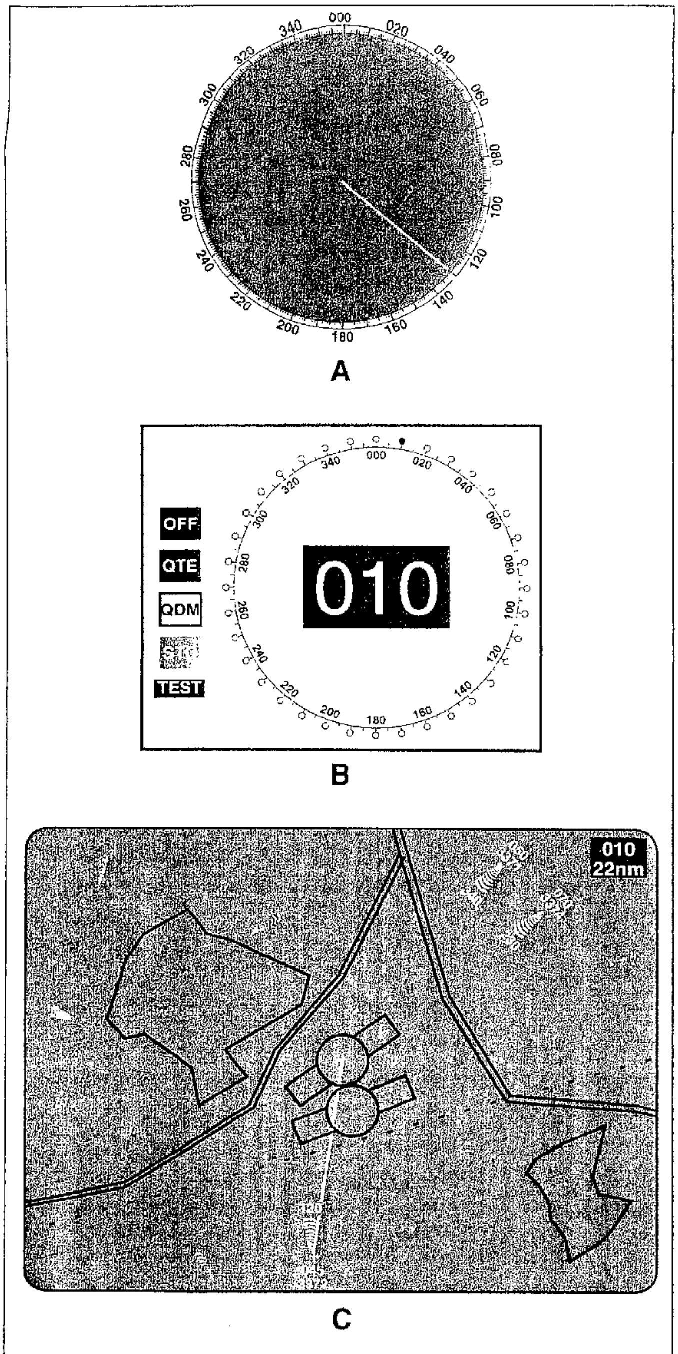


fig N108

It must be emphasised that the use of radar to obtain track bearings is not 'VDF' as it does not employ a VDF antenna and does not operate in the VHF frequency range. Further, its use should be restricted to aircraft uncertain of position as it is not intended as a back up for inadequate flight planning and poor navigation.

EN105(B)

Automatic Direction Finder (ADF) is an airborne radio aid to navigation employing the principle of a radio magnetic compass that operates in the Low and Medium Frequency Band (LF & MF). See EN102.

Elemental is an airborne rotating loop antenna through which passes the vertically polarised radio waves emitted omnidirectionally by the ground based Non Directional Beacon (NDB). The vertical elements of the loop are at different distances from the NDB and therefore at different parts of the signal phase. Because of the phase difference, the vertical elements of the loop will have different voltages. Any voltage difference will induce a current flow across the loop. See fig N109

The current flow at loop position X is at a maximum because the antenna is lying along the line of the signal producing a maximum phase and voltage difference. This is amplified and used to drive an electric motor that rotates the antenna until it lies at 90° across the signal in the null position Y. At the null position, the phases are equal and opposite as are the voltages which cancel each other out and the current ceases to flow.

This null position could have been resolved by the loop antenna rotating either clockwise or anticlockwise to one of two null positions 180° apart. The possibility of such ambiguity is resolved by the incorporation of a fixed sense antenna that determines there must be only one null position in 360°.

The null position is computed within the tuner receiver and displayed as a needle bearing on either a cockpit mounted Radio Bearing Indicator (RBI) or a Radio Magnetic Indicator (RMI). The needle always pointing directly to the NDB.

EN106(D)

See EN105

EN107(A)

See EN105

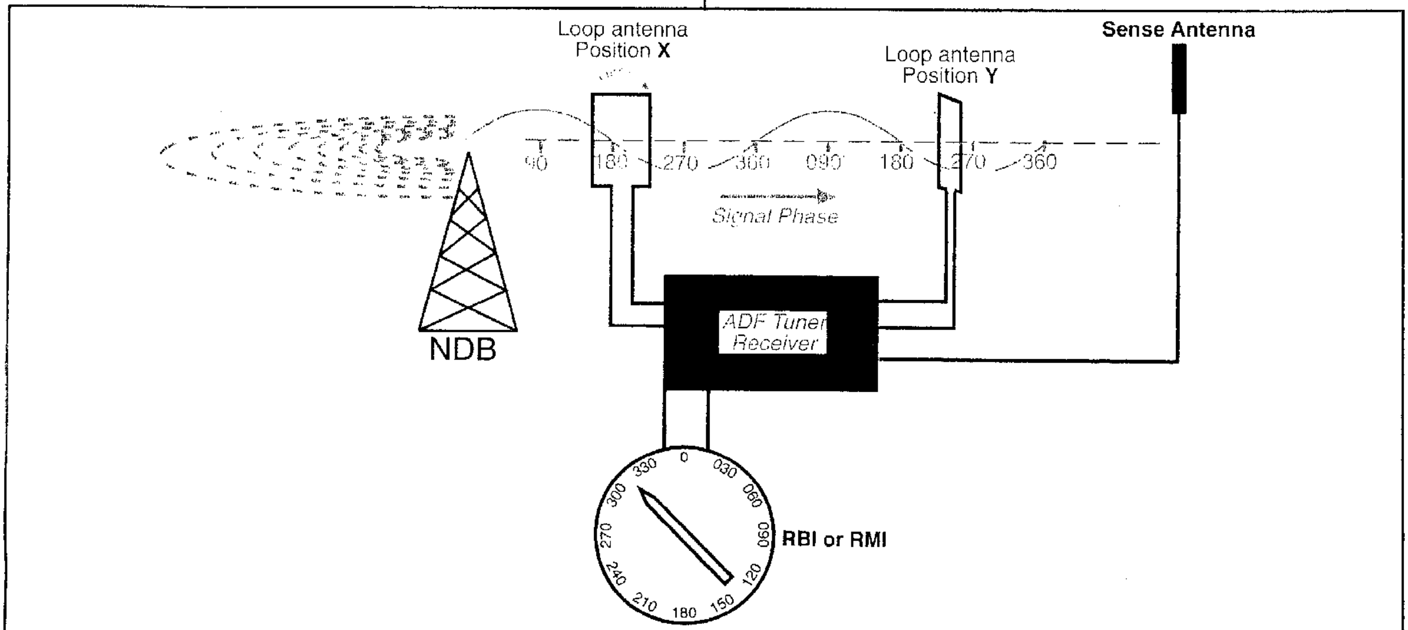


fig N109

EN108(D)

A 4096 code airborne transponder provides a controller with Secondary Surveillance Radar (SSR) information.

The basic painted target on a radar screen is termed the primary return. If both the ground radar station and aircraft are SSR equipped, a four figure code together with constant height read-out may be incorporated with the primary target.

The airborne secondary surveillance radar transponder has two modes that are in current use, namely modes 'Alpha' and 'Charlie'. (fig N110)

TRANSPONDER

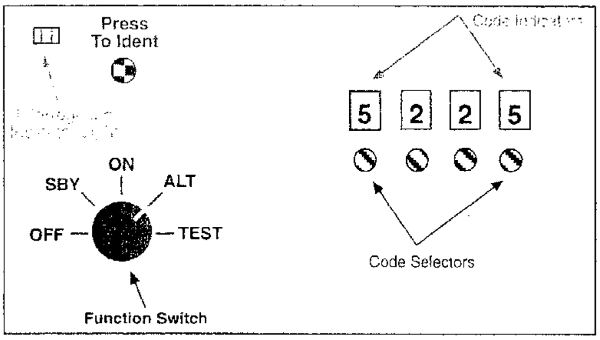


fig N110

Mode 'Alpha' or **ON,** when selected, displays on the radar controller's plot, the four digit squawk code entered into the aircraft transponder.

Mode 'Charlie', or the '**ALT**' (altitude) mode, provides the additional function of a constant readout of altitude next to the four digit code. The transponder is interrogated from the ground station, which fires a series of pulsed signals at set intervals. The pressure altimeter is connected to an altitude digitiser which determines one of the 4096 codes produced by the transponder, irrespective of the code selected in the transponder window.

In mode 'C', the transponder pulse train is transmitted omni-directionally with altitude information based on the standard altimeter setting of 1013.2hPa irrespective of the aircraft's altimeter sub-scale setting. When received at the SSR radar antenna, the radar computer will decode the pulse train and paint the appropriate altitude next to the target on the radar plot together with the mode 'A' code. (fig N111)

When asked to 'squawk **Charlie**', turn the transponder mode switch to '**ALT**'.

RADAR PLOT

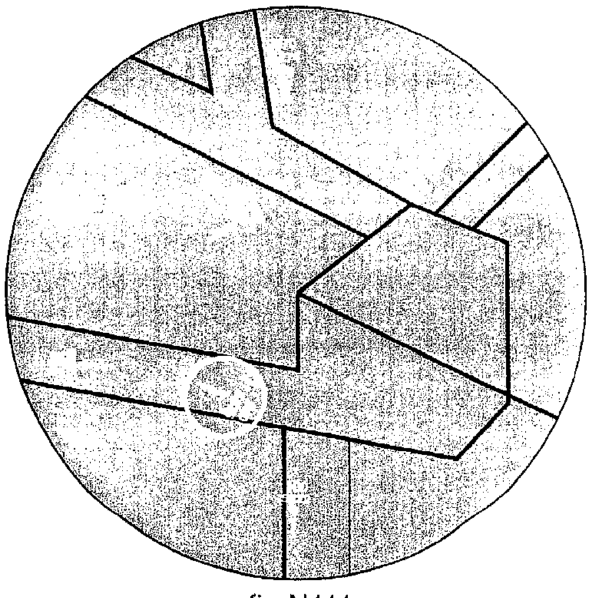


fig N111

EN109(B)

Radar is a line of sight facility so its range and accuracy may be degraded by obstacles or high ground lying directly between the radar head and the target aircraft.

Theoretically, for a given design of radar head, power output and frequency, it is impossible to increase radar range. However, locating the radar head above any obstacles or high ground would help to guarantee its designated coverage.

EN110(C)

See EN108.

EN111(D)

VOR means VHF Omni Ranging. See also EN114 & 115.

In respect of a VOR, a radial is a magnetic bearing FROM the VOR station.

All VOR stations operate in the Very High Frequency (VHF) wave band and emit a modulated carrier wave. Both the signal frequency and amplitude are modulated, both occurring at the same time. Frequency is modulated with a 30Hz wave form which establishes an omnidirectional reference signal. All airborne receivers at the same distance from the VOR station irrespective of bearing from the station will receive a reference signal at the same phase.

Because the signal is amplitude modulated, both the signal strength and phase will vary according to the bearing and range of the airborne receiver from the ground station. This known as the variphase signal.

The airborne receiver will receive two signals, the reference and variphase signals. It is arranged that on a magnetic bearing of 360° from the ground station both the reference and variphase signals are in phase. On any other bearing, the phase difference will be directly related to the magnetic bearing or radial from the VOR ground station.

EN112(A)

Y is a primary radar target representing a single aeroplane that is tracking away from the radar head.

X & **Z** would most typically be ground clutter as the frequency of primary radar would not allow it to paint a primary aircraft target at the same time as weather. Weather radar operates at a much higher frequency than primary radar.

EN113(B)

ATC radar provides a controller with a constantly updated picture of what is happening within her/ his airspace. Because a controller can immediately locate the position of any aircraft, the necessity for RT traffic is significantly reduced.

The ability to create a flow of aircraft to and from any runway whilst maintaining both adequate vertical and horizontal spacing is obviated by a continuously updated picture.

Being able to see both identified and unidentified traffic enables a controller to handle a larger number of aircraft at any one time whilst maintaining adequate separation.

Further, any pilot new to the area and uncertain of the local geography may be radar vectored onto a final approach. Vectoring would reduce the cockpit work load, circumvent becoming unsure of position in a high density traffic area and guarantee safe separation.

EN114(B)

Very High Frequency (VHF). See EN111 and EN115..

EN115(D)

A VOR transmitter produces a complex A9W VHF carrier wave which is:

1 frequency modulated to provide a reference signal where all points at the same distance from the station will receive a reference signal at the same phase.

2 amplitude modulated (varied in strength) depending upon its bearing from the transmitter to provide a variphase signal. As the bearing from the station increases or decreases, the phase of amplitude modulation will increase or decrease.

A VOR receiver produces bearing information (radial) by comparing the phases of frequency modulation (reference signal) and amplitude modulation (variphase signal).

Site Error

Buildings or rising terrain in close proximity to the VOR transmitter may cause radio waves to be reflected and arrive at the airborne receiver along a different path and at a different phase to that of the direct signal. The two signals will combine to produce a composite signal that will result in the display of bearing information with a large error. (fig N112)

through geographical location where interference is unavoidable, an appropriate entry will be made in the COM section of the AIP. Errors due to station interference within the DOC should not exceed 1°.

Total VOR error = Transmitter error.....+/- 1°

Airborne Equipment error........................+/- 3° +

Station Interference.................................+/- 1° +

Total +/- **5°**

EN116(D)

DME is a pulse train secondary radar transmitted omnidirectionally from air to ground. If within range of a ground station (transponder), the pulsed energy from the aircraft will be received, amplified and re-transmitted again omnidirectionally by the ground transponder.

When the pulse train arrives back at the aircraft DME receiver, the airborne equipment measures the time between transmission and reception of the pulse train. This time element together with speed of propagation are used to calculate the slant range or line of sight range of the aircraft from the ground transponder.

The pulse train, unique to a particular aircraft transmitter is transmitted in the Ultra High Frequency (UHF) band between 960 and 1213MHz, with frequency or channel spacing at 1 MHz intervals. Each channel has two frequencies spaced at 63MHz.

SITE ERROR

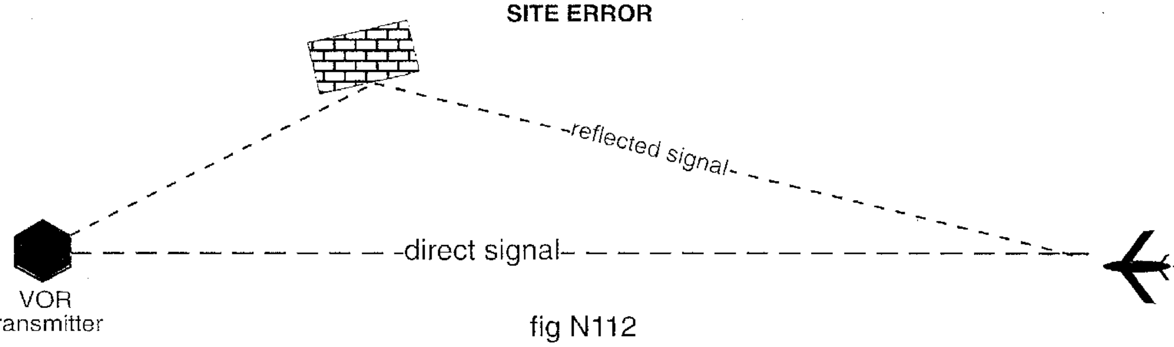


fig N112

Transmitter error is restricted to +/- 1°. VOR transmitters are self monitoring so should this error be exceeded, the transmitter will automatically shut down and the morse ident will be suppressed for a few minutes while a stand-by transmitter is automatically brought on line.

Airborne Equipment Errors

It is impossible for the VOR receiver to measure phase difference with total accuracy and some residual error will always exist. However, the phase comparison error produced by the airborne equipment should not exceed +/- 3°.

Propagation Errors

The only error of this nature occurs at extreme range over uneven terrain where the signal scallops over the surface. Where this is known to exist within the Designated Operational Coverage (DOC), an appropriate annotation is made to the relevant entry in the UK. AIP-ENR Section 4-1. There is no propagation error in the form of night effect because VOR operates in the VHF band which is not subject to ionospheric refraction so sky waves are not produced. For this reason, DOC for VORs is valid for both day and night.

Station Interference

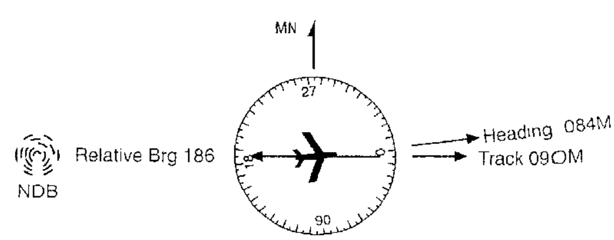
Theoretically, if an aircraft's altitude was great enough, it could receive transmissions from VOR stations operating at the same frequency. In practice, the geographical locations of VOR stations are such that this does not occur as it would create a situation where the signal from the selected VOR could be corrupted by an erroneous bearing signal. Should such a situation be possible

One frequency for interrogation of the ground transponder which upon receiving a signal, modulates the frequency by 63MHz and re-transmits it as a response pulse. Hence the airborne DME receiver will only be receptive to a frequency 63MHz lower than the one it transmitted.

A ground transponder is only capable of transmitting about 2700 pulses per second. Given that the average interrogation rate from aircraft is 27 pulses per second, a ground transponder can only handle a maximum of 100 aircraft at any one time. Should the number of aircraft attempting to lock on to the ground transponder exceed 100, it would only respond to nearest 100 aircraft.

E117(B)

See fig N113



Rel Brg 186° + Magnetic Hdg 084° - 180° = QDR from the NDB = 090°M

fig N113

If the 6° drift is to the right (starboard) then the heading must be 6° to the left (port) to offset the drift and maintain the desired track (QDR) away from the NDB.

E118(D)

See fig N114

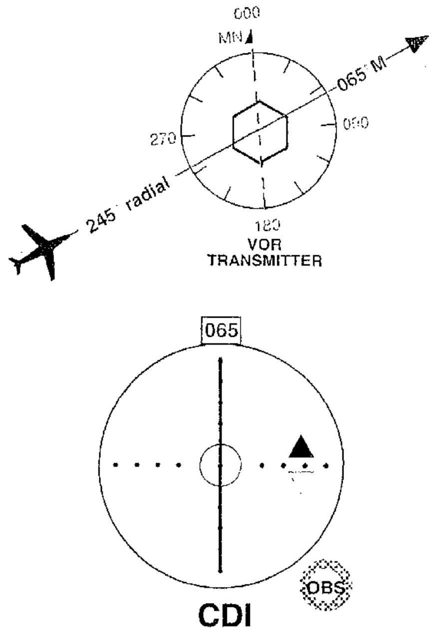
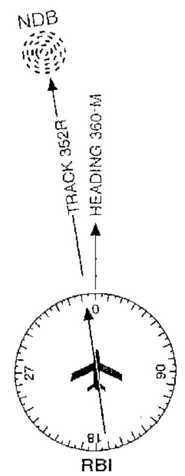


fig N114

The aircraft is tracking **TO** the VOR along the 245° radial so its actual track is 065°M. When 065 is selected in the OBS window, the course deviation needle will be centred with a **TO** indication.

E119(A)

See fig N115



Relative Brg + Magnetic Hdg = QDM to the NDB

fig N115

In a nil wind situation maintaining a constant track to an NDB the RBI needle will indicate 000° Relative.

For ease of explanation, assume the aircraft heading 000°M or North which corresponds with the miniature aeroplane on the RBI. The heading is 8° to starboard or right of track) and the RBI needle pointing directly towards the NDB is 8° left of heading = 352° Relative.

E120(D)

See fig N116

With 285° displayed in the OBS window together with a FROM indication, the system is expecting the aircraft to follow a TRACK of 285°M away FROM the VOR transmitter.

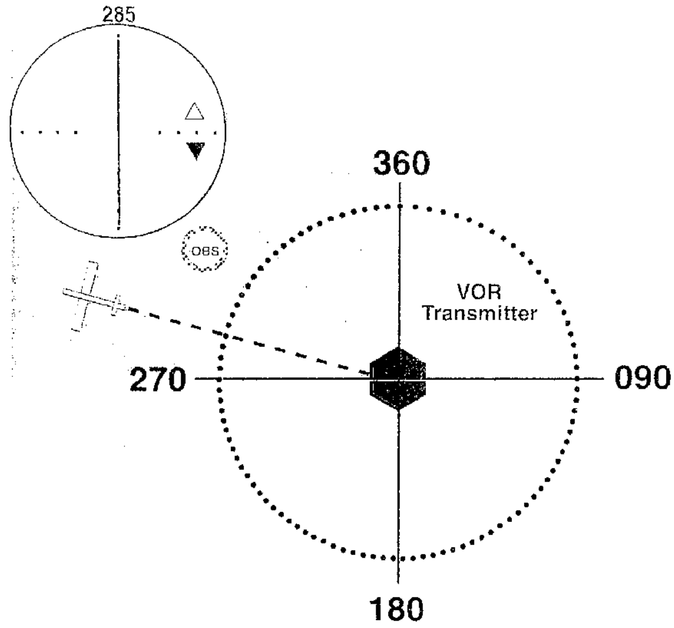


fig N116

The aircraft is ON TRACK because the CDI is centred and therefore located on the VOR 285 radial which places the aircraft in the north west quadrant 270° - 359°.

E121(C)

True bearings from a VDF stations are particularly useful when plotting a position fix on a visual navigation chart as local magnetic variation does not have to be accounted for. Two true bearings at roughly 90° to each other from two different VDF stations normally suffice.

The correct Q code to obtain a true bearing from a VDF station is QTE. Conversely, the correct Q code to be used to obtain a true bearing from an aircraft to a VDF station is QUJ.

E122(C)

The promulgated ranges of NDBs published in the UK AIP are for day time only with maximum bearing error of +/- 5°.

E123(C)

Refer to your chart and to fig N117.

fig N117

Located at 520627N 0015119W is Restricted Area R204 which is from the surface up to an altitude of 2200ft. The reader is invited to see note 2 at the foot of the chart which reads:

RESTRICTED AREAS. Restricted areas R107 R151, R152, R204, R212, R214 and R318 applies only to Helicopters and to Microlight Aircraft. See UK AIP ENR 5-1

R204 has a circle radius 2 nm centred on 520627N 0015119W and overlies Long Lartin Prison. The Restricted Area applies only to helicopters. Flight permitted by any helicopter operated by or on behalf of a police force for any area of the United Kingdom.

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