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CPL NAVIGATION 2 (AUSTRALIA)

CHAPTER 9 – FLIGHT PLANNING AND NAVIGATION EXERCISES

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FLIGHT PLANNING AND NAVIGATION EXERCISES

9.1 Flight Planning Exercise 1 – Pre-Flight Scenario

This exercise relates to a single pilot VFR charter flight. A flight plan form is not required, but can be used, if preferred.

The following is required:

- WAC of Sydney
- PCA
- Navigation equipment
- Jeppesen or AIP and ERSA manuals.

You are to plan a flight scheduled to depart YGLB on 20 July. No allowance is to be made for descent legs. The following is applicable:

Flight Details:	YGLB – YWWL – YMDG
Aircraft Type:	Helicopter or Fixed Wing – as required
Cruising Levels:	Charter company policy requires cruise levels to be at least 2,000ft above LSALT in accordance with the semi-circular rule
Cruising Speed:	125kts (CAS)
Maximum Fuel Available:	500 litres
Start & Taxi Allowance:	15 litres
Climb Adjustments:	Add 1 minute and 2 litres for each 1,000ft spent climbing.
Cruise Fuel Flow:	120 litres/hour
Variable Reserves:	As required
Fixed Reserves:	As required
Holding Fuel:	30 minutes at cruise rate (required at destination for traffic)
Weather Forecast:	South of YWWL: W/V 220/30, OAT +10°C North of YWWL: W/V 185/35, OAT +05°C.

Answer the questions that follow using the information provided above.

1. What type of map projection was used to make the WAC of Sydney?
2. What is the scale of the Sydney WAC?
3. Does the straight-line track between the three waypoints represent a great circle or rhumbline?
4. Which airfield does each of the following designators represent?
 - a. YGLB
 - b. YWWL
 - c. YMDG.
5. Are the spot heights on this chart indicated in metres or feet AMSL?
6. What is the LSALT between:
 - a. YGLB and YWWL?
 - b. YWWL and YMDG?
7. What cruise level should be used between:
 - a. YGLB and YWWL?
 - b. YWWL and YMDG?
8. What is the planned track (°T) between:
 - a. YGLB and YWWL?
 - b. YWWL and YMDG?
9. Which type of weather forecast could be used for en route wind and temperature data, if it was not given?
10. What TAS will be flown on each leg?
 - a. YGLB and YWWL?
 - b. YWWL and YMDG?

11. Answer the following questions regarding the leg YGLB to YWWL:
 - a. What is the crosswind component?
 - b. What is the head/tail wind component?
 - c. What is the drift?
 - d. If ETAS needs to be calculated, what will it be?
 - e. What is the true heading?
 - f. What value for variation is applicable on the leg?
 - g. What is the magnetic heading?
 - h. What is the groundspeed?
 - i. What is the leg distance?
 - j. What is the EET for the leg, planned as a cruise sector?
 - k. How much flight fuel is required for the first leg, planned as a cruise sector?
 - l. How much altitude is gained during the climb for the leg towards YWWL?
 - m. How much climb time and fuel is required for the first leg?
 - n. What is the total time and fuel required for the first leg?

12. Answer the following questions regarding the leg YWWL to YMDG:
 - a. What is the crosswind component?
 - b. What is the head/tail wind component?
 - c. What is the drift?
 - d. If ETAS needs to be calculated, what will it be?
 - e. What is the true heading?
 - f. What value for variation is applicable on the leg?
 - g. What is the magnetic heading?
 - h. What is the groundspeed?
 - i. What is the leg distance?
 - j. What is the EET for the leg, planned as a cruise sector?
 - k. How much flight fuel is required for the 2nd leg, planned as a cruise sector?
 - l. How much altitude is gained during the climb for the leg towards YMDG?
 - m. How much climb time and fuel is required for the second leg?
 - n. What is the total time and fuel required for the second leg?

13. Answer the following questions regarding the entire flight:
 - a. What is the total EET?
 - b. What is the total flight fuel?
 - c. How much variable reserve is required for the flight?
 - d. What amount of fixed reserves is required for the flight?
 - e. How much holding fuel is required in total?
 - f. What is the minimum legal fuel required for the flight?
 - g. Does the aircraft need to land at YWWL to refuel before continuing to YMDG?
 - h. How much margin fuel is in the aircraft before start, if it is refuelled to maximum capacity?
 - i. What is the aircraft's safe endurance?
 - j. What is the aircraft's total endurance?
14. What is the latitude and longitude of YMDG, as obtained from the chart?
15. At what LMT is EOD on the day of the flight at YMDG?
16. What is the latest Day VFR landing time allowed at YMDG (UTC)?
17. What is the latest Day VFR departure time allowed at YGLB (UTC)?
18. What standard time factor is applicable at YGLB?
19. What is the latest Day VFR departure time allowed at YGLB in standard time?

9.1.1 Answers – Exercise 1

1. Lamberts Conformal Conic Projection
2. 1:1,000,000
3. Great circle
4. (a) Goulburn
 (b) West Wyalong
 (c) Mudgee.
5. Feet above mean sea level
6. (a) Spot height 3,027ft “Mt Martin”, Country LSALT = 3527ft \approx 3550ft
 (b) Spot height 3,044ft “Hampden Hill”, Country LSALT = 3544ft \approx 3550ft.
7. (a) LSALT + company policy requirement = 5,550ft, so use A065
 (b) LSALT + company policy requirement = 5,550ft, so use A075.
8. (a) 293°T
 (b) 056°T.
9. GAF (Graphical Area Forecast) and GPWT (Grid Point Wind and Temperature) forecasts.
10. (a) 140kts
 (b) 141kts.
11. (a) 29kts LcW
 (b) -8kts headwind,
 (c) 12°R
 (d) ETAS=137kts
 (e) 281°T
 (f) 11.5°E (using \approx 12°E)
 (g) 269°M
 (h) 129kts
 (i) \approx 136nm (WAC ruler)
 (j) 63.26mins (use \approx 63mins)
 (k) 126 litres
 (l) 4,359ft (using 5,000ft for climb adjustments)
 (m) +5 mins climb time and +10 litres climb fuel
 (n) 68 mins and 136 litres.

12. (a) 27kts RcW,
 (b) +22kts tailwind,
 (c) 11°L,
 (d) ETAS=138kts,
 (e) 067°T,
 (f) 11°E, (g) 056°M,
 (h) 160kts, (i) 146nm (WAC ruler),
 (j) 54.75mins (use ≈55mins),
 (k) 110 litres,
 (l) 1,000ft,
 (m) +1min climb time and +2 litres climb fuel.
 (n) 56mins and 112 litres fuel.
13. (a) 124 mins, (63+5+55+1),
 (b) 248 litres, (126+10+110+2),
 (c) 37.2 litres (always round VR up, use ≈38 litres for both aircraft types),
 (d) Aeroplanes = 90 litres (45 mins at cruise rate),
 Helicopters = 40 litres (20 mins VFR at cruise rate),
 (e) 60 litres,
 (f) Aeroplane = 451 litres (15+248+38+90+60),
 Helicopters = 401 litres (15+248+38+40+60),
 (g) No,
 (h) Aeroplanes = 49 litres, Helicopters = 99 litres,
 (i) Aeroplanes = 148.5 mins (always round S/END down, use ≈148 mins),
 Helicopters = 173.5 mins (always round S/END down, use ≈173 mins),
 (j) 242.5 mins (always round endurance down, use ≈242 mins).
14. S32°33.8' E149°36.7'
15. 20 July at 1740 LMT.
16. 20 July at 0732 UTC (arc to time ≈9h58m using 149°37').
17. 20 July at 0458 UTC (subtract from latest landing time the total EET 2h04mins and also subtract holding time of 30 mins required at YMDG).
18. UTC+10 (YGLB is located in NSW).
19. 20 July at 1458 EST.

9.2 Flight Planning Exercise 2 – In-Flight Scenario

This exercise relates to the in-flight events of a single pilot VFR charter flight. Information from the previous exercise (pre-flight scenario) is referred to. The following is required:

- Planned values from the pre-flight exercise
- A WAC of Sydney
- PCA
- Navigation equipment
- Jeppesen or AIP and ERSA manuals.

The flight you planned previously has taken off from YGLB at 0200UTC on 20 July. Refer to pre-planned values unless specified otherwise in the questions.

Flight Details:	YGLB – YWWL – YMDG
Aircraft Type:	Helicopter or Fixed Wing – as required
Cruising Levels:	As planned
Cruising Speed:	125kts (CAS)
Aircraft Fuel Status:	500 litres in the tanks before start
Start & Taxi Allowance:	15 litres
Climb Adjustments:	As planned
Cruise Fuel Flow:	120 litres/hour
Variable Reserves:	As planned
Fixed Reserves:	As planned
Holding Fuel:	30 minutes at cruise rate (still required at destination for traffic)
Weather Forecast:	As planned
Aircraft Position:	At 0200UTC overhead YGLB (all parameters as planned).

Answer the questions that follow using the information provided above, in conjunction with the pre-flight planning for the flight.

1. What is the maximum range from GLB, that the aircraft may use the beacon?
2. Which magnetic bearing from GLB would indicate the aircraft is on track?
3. On the leg YGLB to YWWL, during which stage of the cruise is the aircraft closest to the ground?
 - a. First 40nm from YGLB
 - b. Between 40 and 80nm from YGLB
 - c. Last 40nm from YWWL.
4. At 0222UTC you fix the aircraft overhead Rugby NDB, steering 268°M. Answer the following questions:
 - a. What is the designator and rated coverage for Rugby NDB?
 - b. What was the TMG from YGLB?
 - c. What was the average groundspeed?
 - d. What was the track error?
 - e. What magnetic heading is required to parallel track?
 - f. What magnetic bearing from Rugby NDB would confirm that the aircraft is flying parallel to the planned track?
 - g. What is the drift, while the aircraft tracks parallel to track?
 - h. What relative bearing would be shown on the fixed card ADF to Rugby NDB, when the aircraft is flying parallel to track?
5. At 0222UTC (overhead Rugby NDB), you alter heading as calculated. After 10 minutes you spot another aircraft and want to tell him your position relative to Young airfield. You transmit the following:
 - a. I am 18nm west of Young airfield
 - b. I am 18nm east of Young airfield
 - c. I am 37nm north-west of Young airfield
 - d. I am 37nm south-east of Young airfield
 - e. Sorry, I don't know where I am.

6. At 0247UTC you pinpoint the aircraft's position overhead a high mast close to Bribbaree. Answer the following questions:
 - a. How far is the aircraft off track and to which side?
 - b. What has been the average groundspeed since 0222UTC?
 - c. Are you allowed to use the NDB at YWWL to home to the turning point?
 - d. What drift was the aircraft experiencing up to the fix, if the current TMG was 279°M and the heading was 256°M?
 - e. What magnetic heading is required to fly directly to YWWL from the fix?
 - f. What is the revised ETA for YWWL?

7. At 0315UTC you arrive overhead YWWL after diverting around a thunderstorm. You alter heading as per flight plan for YMDG. Answer the following questions:
 - a. How many minutes did you arrive earlier or later than originally planned, in terms of the pre-flight planning?
 - b. Do you expect to have more or less fuel remaining, than planned (assuming the consumption rate remained the same)?
 - c. How much total fuel should be remaining in the tanks, according to the pre-flight fuel planning, once overhead YWWL?
 - d. If there is only 330 litres remaining, how much more/less fuel did the aircraft use than planned for the first leg?
 - e. What was the average fuel consumption for the first leg?
 - f. Using the new average fuel flow calculated; how much flight fuel is required in total for the leg to YMDG?
 - g. What is the minimum fuel required to proceed from this fix to YMDG, using the latest/best planning information?
 - h. With 330 litres total fuel available in the tanks, does the aircraft have sufficient fuel to continue to YMDG and how much margin fuel is there?

8. At 0315UTC (overhead YWWL), you steer the pre-planned heading for YMDG. At 0340UTC, you obtain a GPS pinpoint S33°07'54" E148°14'18". Answer the following questions:
 - a. Describe what is directly below the aircraft.
 - b. What was the track error?
 - c. What was the track made good (TMG) in degrees magnetic?
 - d. What was the drift experienced up to this position?

- e. What magnetic heading is required to parallel track?
 - f. What magnetic track is required to fly directly to YMDG?
 - g. What magnetic heading is required to steer directly for YMDG?
 - h. What is the updated ETA overhead YMDG?
 - i. Is the ETA at YMDG acceptable in terms of day VFR requirements?
9. Which one of the following frequencies should be used to cancel SARTIME when parked on the ground at YMDG?
- a. 6610 kHz
 - b. 6565 kHz
 - c. 126.7 MHz
 - d. 133.05 MHz
 - e. 119.1 MHz.

9.2.1 Answers – Exercise 2

1. 40nm (all hours).
2. 280°M ($292^{\circ}\text{T} - 12^{\circ}\text{E}$ Variation).
3. A
4. (a) RUG, 50nm (all hours), (b) measured as $304^{\circ}\text{T} - 12^{\circ}\text{E} = 292^{\circ}\text{M}$,
(c) 123kts (45nm in 22 mins), (d) 12°R , (e) 256°M , (f) 280°M , (g) 24°R ,
(h) 204°R .
5. B
6. (a) 7nm right of track, (b) 120kts (50nm in 25 mins), (c) Yes (within 50nm),
(d) 23°R , (e) 249°M (REQ TRK measured as 283°T , apply variation & drift),
(f) 0308UTC (42nm at 120kts = 21 mins).
7. (a) 7 mins later (planned ETA 0308UTC), (b) Less, (c) 349 litres,
(d) 19 litres more, (e) 124 litres/hr,
(f) 116 litres (113.67 litres cruise $\approx 114 + 2$ litres for the climb),
(g) Aeroplane: 284 litres ($2 + 114 + \approx 18 + 90 + 60$),
Helicopter: 234 litres ($2 + 114 + \approx 18 + 40 + 60$),
(h) Aeroplane: 46 litres,
Helicopter: 96 litres.
8. (a) Parkes airfield,
(b) $\approx 9^{\circ}$ (9.3° from 1:60 rule using dist off 11nm and distance gone 71nm),
(c) 036°M ($\text{FPT } 056^{\circ}\text{T} - 11^{\circ}\text{E} = 045^{\circ}\text{M} - 9^{\circ}\text{TE} = 036^{\circ}\text{M}$),
(d) 20°L (calculated TMG 036°M vs Planned HDG 056°M),
(e) 065°M (current heading $056^{\circ}\text{M} + 9^{\circ}\text{TE}$),
(f) 054°M (CA calculated with 1:60 rule, using distance to go 77nm & distance off 11nm, calculated CA = 8.57° , so use $\approx 9^{\circ}$. $\text{FPT } 045^{\circ}\text{M} + 9^{\circ}\text{CA} = 054^{\circ}\text{MHDG}$).
(g) 074°M (parallel HDG $065^{\circ}\text{M} + 9^{\circ}\text{CA} = 074^{\circ}\text{MHDG}$),
(h) 0407UTC (GS 170kts (71nm in 25mins), Dist to go = 77nm at 170kts = 27 mins flight time, ETA 0340EST + 27mins = ETA 0407UTC,
(i) Yes, latest day VFR landing time allowed at YMDG was calculated as 0732UTC during the pre-flight planning.
9. 6610 kHz (refer to the PCA, 133.05 MHz only available in the circuit).