Grid Point Wind and Temperature (GPWT) worksheet

Low-level forecast practice for Australian RPL / PPL navigation and flight planning. The chart below is an **original synthetic study example** over a fictional 1.5° training grid (squares A–D, rows 1–3, north up). Aerodromes are named Kestrel Field (B2) and Owlet Strip (D2) only. It is **not** a real Bureau of Meteorology forecast and is **not for operational use**.

Official format (as used on a low-level GPWT): each line is **dd fff tTT**. **dd** is wind direction in degrees **true** to the nearest 10°, with the final zero truncated (27 = 270° true, 36 = 360° true, 04 = 040° true). **fff** is wind speed in knots (019 = 19 kt; 000 = calm). **tTT** is the temperature sign and whole degrees Celsius. Values are for the **mid-point of each square**, at heights **AMSL**. A dashed line (-- --- ---) means that height is below the ground at that mid-point. The data is valid **at the validity time**. Low-level charts are typically issued at 22Z, 04Z, 10Z and 16Z and are valid every three hours (00Z, 03Z, 06Z…). If you will be flying between two validity times, interpolate between those charts.

Level	FL140	10000FT	7000FT	5000FT	2000FT	1000FT
ISA	-13 C	-5 C	+1 C	+5 C	+11 C	+13 C
ISA pressure	600 hPa	700 hPa	800 hPa	850 hPa	950 hPa	975 hPa

ISA temperatures in this legend are a standard-atmosphere reference only. Do not use them as an adjustment to the temperatures in the boxes — those already are the forecast temperatures.

Example chart — VALID AT 06Z · ISSUED AT 22Z (the previous evening)

Rows in each square, top to bottom: FL140, 10000FT, 7000FT, 5000FT, 2000FT, 1000FT. Yellow boxes mark the practice route Kestrel (B2) → turning point (C2) → Owlet (D2).

	A	B	C	D
1	A1 26 030 -08 26 026 -03 25 022 +00 24 018 +06 22 012 +13 21 008 +16	B1 27 032 -07 27 028 -02 26 022 +01 25 017 +07 23 011 +14 22 009 +17	C1 28 031 -07 27 027 -02 26 021 +01 24 016 +06 23 010 +13 -- --- ---	D1 28 029 -06 28 025 -01 27 020 +02 25 016 +07 24 010 +14 23 007 +17
2	A2 26 028 -06 26 024 -02 34 021 +02 25 016 +07 22 011 +14 20 008 +18	B2 Kestrel Field 27 027 -05 26 022 -02 35 020 +02 25 015 +07 22 010 +14 21 008 +18	C2 turning point 28 026 -05 27 022 -01 01 020 +01 23 019 +05 22 012 +13 21 009 +17	D2 Owlet Strip 29 025 -04 28 021 +00 36 018 +00 24 016 +06 23 011 +14 22 008 +17
3	A3 25 027 -05 25 023 -01 24 019 +03 23 015 +08 21 010 +15 20 007 +19	B3 26 026 -05 26 022 -01 25 018 +03 24 015 +08 22 010 +15 21 008 +19	C3 27 025 -04 26 021 +00 25 018 +03 24 016 +08 22 011 +15 21 008 +18	D3 27 024 -04 27 020 +00 26 017 +03 25 015 +08 23 010 +15 22 007 +18

Example chart — VALID AT 03Z · ISSUED AT 22Z

Same grid and format as the 06Z chart, three hours earlier. Use this when you need to interpolate in time.

	A	B	C	D
1	A1 25 028 -07 25 024 -02 24 020 +01 23 016 +07 21 010 +14 20 006 +17	B1 26 030 -06 26 026 -01 25 020 +02 24 015 +08 22 009 +15 21 007 +18	C1 27 029 -06 26 025 -01 25 019 +02 23 014 +07 22 008 +14 -- --- ---	D1 27 027 -05 27 023 +00 26 018 +03 24 014 +08 23 008 +15 22 005 +18
2	A2 25 026 -05 25 022 -01 33 019 +03 24 014 +08 21 009 +15 19 006 +19	B2 Kestrel Field 26 025 -04 25 020 -01 34 018 +03 24 013 +08 21 008 +15 20 006 +19	C2 turning point 27 024 -04 26 020 +00 36 018 +02 22 017 +06 21 010 +14 20 007 +18	D2 Owlet Strip 28 023 -03 27 019 +01 35 016 +01 23 014 +07 22 009 +15 21 006 +18
3	A3 24 025 -04 24 021 +00 23 017 +04 22 013 +09 20 008 +16 19 005 +20	B3 25 024 -04 25 020 +00 24 016 +04 23 013 +09 21 008 +16 20 006 +20	C3 26 023 -03 25 019 +01 24 016 +04 23 014 +09 21 009 +16 20 006 +19	D3 26 022 -03 26 018 +01 25 015 +04 24 013 +09 22 008 +16 21 005 +19

1. Decode a point

Using the **06Z** chart, write the wind (degrees true and knots) and temperature. Remember: 27 means 270° true, not 27°.

A. Square **B2**, 5000FT line.

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

B. Square **D2**, 7000FT line. (Watch the 36.)

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

C. Square **C1**, 1000FT line.

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

D. Square **C2**, 7000FT line.

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

2. Pick the right square, level and validity time

You are planning Kestrel Field (B2) to Owlet Strip (D2) via a turning point in C2. Cruise is **5000 ft AMSL**. ETD from Kestrel is **0430Z**. The charts were issued at 22Z.

A. Which squares does the route use? _____

B. Which height line do you read? _____

C. Do you use 03Z only, 06Z only, interpolate between 03Z and 06Z, or use the 22Z issue time as the wind time?

_____

3. Interpolate

A. On the **06Z** chart, square **B2**, wind and temperature at **3500 ft AMSL** (halfway from 2000FT to 5000FT).

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

B. Still 06Z, at 5000FT. Your position is halfway from the mid-point of **B2** to the mid-point of **C2**.

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

C. In square **D2** at 5000FT, at **0430Z** (halfway from 03Z to 06Z).

Direction ° true: _____ Speed: _____ kt Temperature: _____ °C

4. Apply it to a leg

Use 06Z, square B2, 5000FT. Planned track is **090° true**, TAS **100 kt**, leg **50 NM**. Headwind = wind speed × cos(wind direction – track). A negative headwind is a tailwind. Groundspeed ≈ TAS – headwind. ISA at 5000FT is +5 °C. Deviation = forecast temperature – ISA.

Headwind (+) or tailwind (–), kt: _____

Crosswind component, kt (from the right is +): _____

Groundspeed, kt: _____

Time for 50 NM, minutes: _____

Temperature deviation from ISA (°C, warmer is +): _____

5. Average wind and temperature along the route, then choose a cruise level

Route: Kestrel (B2) → C2 → Owlet (D2). Track **090° true**, TAS **100 kt** (held constant so you can see the wind effect alone), total distance **140 NM**. Use the **06Z** chart. Take the mid-point wind and temperature of each square the route uses, and weight them by the share of each leg that touches that mid-point: **B2 = 25 NM**, **C2 = 70 NM** (25 + 45), **D2 = 45 NM** (the legs are 50 NM and 90 NM).

5A. Extract 7000FT on the 06Z chart

B2: _____ ° true / _____ kt / _____ °C weight 25 NM

C2: _____ ° true / _____ kt / _____ °C weight 70 NM

D2: _____ ° true / _____ kt / _____ °C weight 45 NM

5B. Distance-weighted mean temperature at 7000FT

$T = (T_{B2} \times 25 + T_{C2} \times 70 + T_{D2} \times 45) \div 140 =$ _____ °C

5C. Why you must not just average the directions

The winds at B2 and C2 are from 350° and 010°. The ordinary (naive) average of 350 and 010 is 180° — almost a **southerly**, which is the opposite way. Both winds are really from just west and east of north, so the true average is a **northerly**. Always break the wind into components first.

Naive (numeric) average of the three 7000FT directions, using the same weights: _____ ° (this is not a useful wind direction)

5D. Vector average at 7000FT

For a wind *from* direction θ at speed V, the eastward component is $\mathbf{u = -V \sin \theta}$ and the northward component is $\mathbf{v = -V \cos \theta}$. Average u and v with the same distance weights, then recombine: speed = $\sqrt{(u^2 + v^2)}$, direction from = atan2(–u, –v).

B2: u = _____ kt v = _____ kt

C2: u = _____ kt v = _____ kt

D2: u = _____ kt v = _____ kt

Weighted mean u = _____ v = _____

Average wind: _____ ° true / _____ kt

5E. ISA deviation, headwind and time at 7000FT

ISA at 7000FT is +1 °C. Deviation (forecast average – ISA) = _____ °C (write it as ISA+ or ISA–).

Headwind (+) or tailwind (–) on 090° true, kt: _____

Groundspeed at TAS 100 kt: _____ kt Time for 140 NM: _____ min

5F. Choose the best cruise altitude

Repeat the same method at 5000FT, 7000FT and 10000FT (06Z, same weights, TAS 100 kt, track 090°T, 140 NM). Fill the comparison table. The best cruise in this exercise is the level with the **shortest time**, with TAS held constant. In real planning, TAS can also change with height and temperature.

Level	Avg wind (true)	Avg temp	ISA dev	HW / TW	GS	Time
5000FT						
7000FT						
10000FT						

Best cruise level on this comparison: _____

6. Common mistakes — short written check

A. Wind direction on a GPWT is in degrees _____ (true / magnetic).

B. The printed values in a square apply at the _____ of the square.

C. 36 as a direction means _____ ° true.

D. A dashed line (-- --- ---) means _____.

E. Should you add the legend ISA temperature to the box temperature? _____

F. Your ETD is 0430Z and charts are valid at 03Z and 06Z. What should you do? _____

Answers (for checking)

Figures are rounded in the same way as the interactive trainer. A degree or a knot either way on an interpolation or a vector average is acceptable.

1. Decode (06Z)

A. B2 5000FT is written 25 015 +07: **250° true / 15 kt, +7 °C**.

B. D2 7000FT is written 36 018 +00: **360° true / 18 kt, 0 °C** (a northerly — 36 means 360, not 36°).

C. C1 1000FT is -- --- ---: this height is below the ground at that mid-point (terrain is about 1,500 ft in the example). There is no valid wind or temperature.

D. C2 7000FT is written 01 020 +01: **010° true / 20 kt, +1 °C**.

2. Squares, level and time

A. B2, C2 and D2.

B. The **5000FT** line (cruise is 5,000 ft AMSL).

C. Interpolate between 03Z and 06Z. 0430Z sits between those validity times. The data is valid at the validity time. 22Z is the issue time, not when the wind applies.

3. Interpolate

A. 2000FT in B2 is 220° / 10 kt / +14 °C; 5000FT is 250° / 15 kt / +7 °C. Halfway (3,500 ft): **235° true / 12.5 kt / +10.5 °C**.

B. B2 5000FT is 250° / 15 kt / +7 °C; C2 is 230° / 19 kt / +5 °C. Mid-point: **240° true / 17 kt / +6 °C**.

C. D2 5000FT at 03Z is 230° / 14 kt / +7 °C; at 06Z is 240° / 16 kt / +6 °C. At 0430Z: **235° true / 15 kt / +6.5 °C**.

4. Apply it to a leg (06Z, B2, 5000FT, track 090°T, TAS 100 kt, 50 NM)

Wind 250° true / 15 kt. Headwind = 15 × cos(250° – 90°) = 15 × cos 160° ≈ **–14.1 kt** (a 14 kt tailwind). Crosswind = 15 × sin 160° ≈ **+5.1 kt** (from the right). Groundspeed ≈ 100 – (–14.1) = **114 kt**. Time for 50 NM ≈ **26 minutes**. Forecast +7 °C against ISA +5 °C is **ISA+2**.

5. Average along the route (06Z, weights 25 / 70 / 45)

5A. 7000FT: B2 **350° / 20 kt / +2 °C**; C2 **010° / 20 kt / +1 °C**; D2 **360° / 18 kt / 0 °C**.

5B. T = (2×25 + 1×70 + 0×45) ÷ 140 = 120 ÷ 140 = **+0.9 °C**.

5C. The naive weighted average of 350°, 010° and 360° is about **183°** — a southerly, which is the wrong way. (A simple mean of 350 and 010 alone is 180°.)

5D. Components (kt), rounded: B2 u ≈ +3.5, v ≈ –19.7; C2 u ≈ –3.5, v ≈ –19.7; D2 u ≈ 0, v ≈ –18. Weighted mean u ≈ –1.1, v ≈ –19.2. Vector average ≈ **003° true / 19 kt**.

5E. Average +0.9 °C minus ISA +1 °C ≈ **ISA+0** (about standard). Headwind on 090°T ≈ **+1 kt**. Groundspeed ≈ **99 kt**. Time for 140 NM ≈ **85 minutes**.

5F. Comparison (TAS 100 kt, 140 NM, 06Z):

Level	Avg wind (true)	Avg temp	ISA dev	HW / TW	GS	Time
5000FT	236° / 17 kt	+5.7 °C	ISA+1	14 kt TW	114 kt	74 min
7000FT	003° / 19 kt	+0.9 °C	ISA+0	1 kt HW	99 kt	85 min
10000FT	271° / 22 kt	–0.9 °C	ISA+4	22 kt TW	122 kt	69 min

The shortest time, with TAS held at 100 kt, is **10000FT** (highlighted), because that level has the strongest tailwind on this easterly track. 7000FT is worse here — the averaged northerly is almost a pure crosswind with a slight headwind.

6. Common mistakes

A. True. Convert a magnetic track before you resolve a headwind or a drift.

B. The **mid-point** of the square, at each printed height AMSL.

C. 360° true (a northerly). Calm is 000 in the speed column, not 36.

D. That height is **below the ground** at this grid point, so there is no valid data.

E. No. The box already shows the forecast temperature. The legend ISA is a reference only.

F. Interpolate between the 03Z and 06Z charts. Do not use the issue time as the wind time.

Reviewed by an airline captain, Nov 2026 · example figures and wording. Fixed Wing Exam Prep is built to help you pass, but results vary.
Always use the current official GPWT from the Bureau of Meteorology for real flight planning.