

STUDY AID — PENDING INDEPENDENT AUDIT

These notes are study aids for DGCA examination preparation. They are PENDING INDEPENDENT AUDIT and must not be used for operational flight planning. Always verify procedures against current AIPs, NOTAMs, and your operator's manuals.

GENERAL NAVIGATION • THE NAVIGATION COMPUTER

Chapter 8A

Calculation of Heading and Ground Speed

Chapter 7 asked: I am pointing here, where will I end up? That is the question a radar controller creates for you. This chapter asks the question you ask, on every flight you ever plan — I want to end up there, so where do I point?



Opening plate — The line on the chart is the track. It is the one thing you decide. Everything else in this chapter is the arithmetic of persuading an aeroplane to follow it.

the track — what you chose the heading — what you must fly to get it

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SIXTY SECONDS AT THE PLANNING TABLE

You have drawn a straight line from your departure to your destination and measured it: **040°(T)**. Your aircraft will true **146 knots**. The forecast wind is **315/20**.

Now answer the only question that matters before you start the engine: **what number do you put on the compass?**

It is not 040. If you fly 040 you will arrive somewhere to the right of where you meant to be, and the longer the leg the further right you will be. You have to aim off — upwind — and the whole skill is knowing by exactly how much, and what it costs you in speed over the ground.

Chapter 7 gave you the machinery. This chapter turns it around and points it at the real question.

1 • Three jobs, one triangle

Everything the wind face of a navigation computer has ever done — and everything the CX-3 does with a wind — is one of three jobs. They are the same triangle of velocities each time. What changes is which side you already know and which one you are hunting.

To find	From	When you use it	Where
Track Ground speed	Heading TAS W/V	When you are held on a heading somebody else chose — a radar vector, an engine-out drift-down, a mandatory departure heading.	Chapter 7
Heading Ground speed	Track TAS W/V	Flight planning, and re-planning in the air when the track changes or the wind turns out to be something else. This is the common one.	This chapter
W/V	Heading TAS Track Ground speed	Wind finding in flight. The wind you find is more recent and more local than any forecast you were handed on the ground.	Chapter 8B

The examiner will test all three, and will not tell you which is which

The three look alike on the page and the difference is only in which quantities the question hands you. Before you touch anything, do this: **list what you were given.**

Given a *heading*? Row one. Given a *track* and asked for a heading? Row two. Given *both* a heading and a track? Row three — you are finding the wind, and you should already be reaching for a different function.

It takes four seconds and it is the single highest-value habit in this chapter.

2 • Why Chapter 7 was not a warm-up

It is tempting to file "given heading, find track" as the easy one that exists only to explain the triangle. It is not. Here is the day it saves you.

You are established on airway R123, on a track you planned and a heading you worked out for it, with the forecast wind still set on your computer. At **1003** ATC gives you a mandatory radar heading of **030°(T)** for traffic. You come off the airway. You note your VOR/DME position at that moment — and this is the habit that matters, because it is the last certain thing you will have for six minutes.

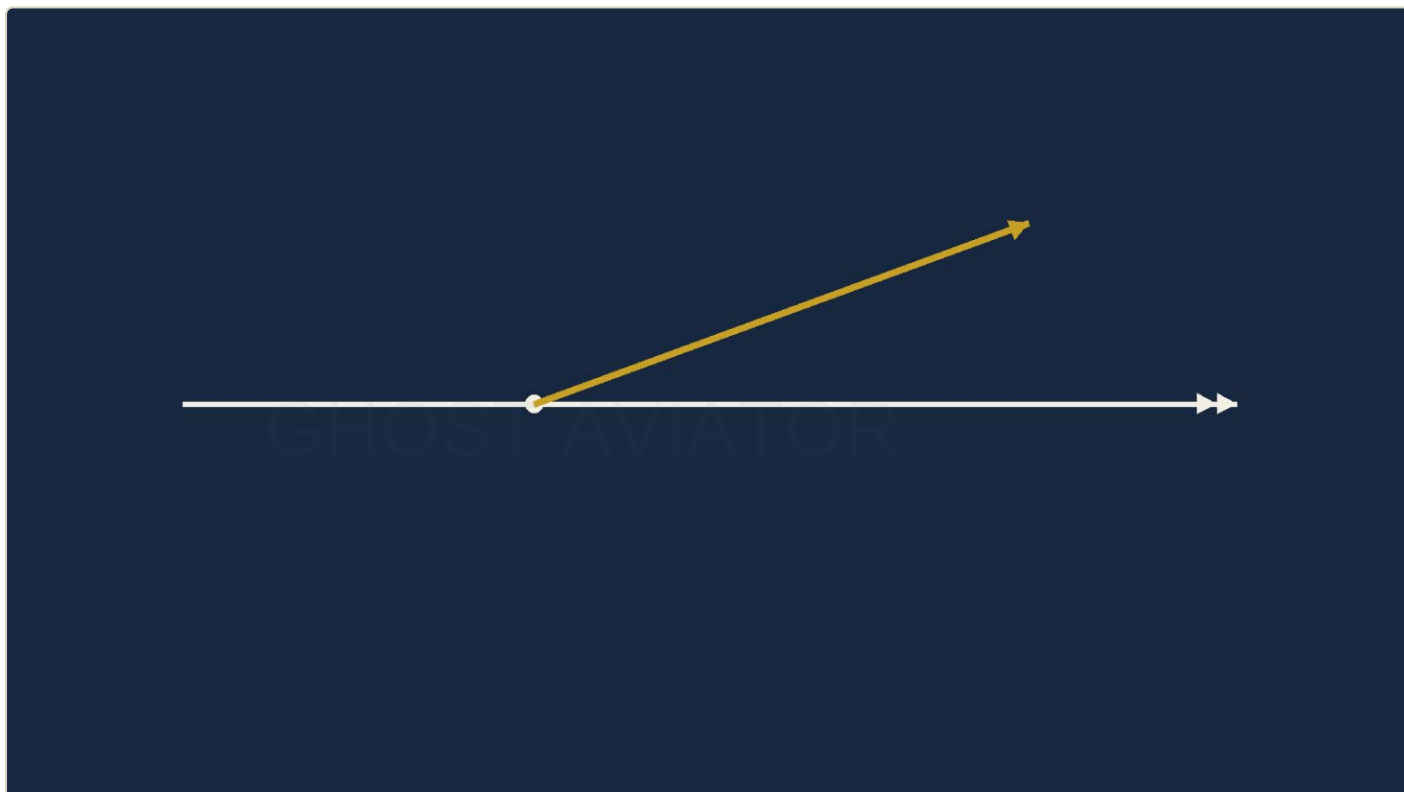


Figure 8.1 — Cleared off the planned track on a radar heading. The airway is still where it was. You are not.

□ the planned track along the airway ■ the radar heading you were given

At **1009** the conflict clears and you are told: *own navigation to Clacton*. At the same moment the VOR unlocks. You have no area navigation. **Where are you, and what track takes you to Clacton?**

The six minutes, worked. Forecast W/V 315/15, TAS 160 kt, heading flown 030°(T), from 1003 to 1009.

METHOD 1 — THE ARITHMETIC

Case 1: heading known, track wanted

1. The wind is *from* 315, so it points *toward* 135°.
2. Add the two vectors, east and north:
 $E = 160 \cdot \sin 030 + 15 \cdot \sin 135 = 90.61$
 $N = 160 \cdot \cos 030 + 15 \cdot \cos 135 = 127.96$
3. Ground speed: $\sqrt{90.61^2 + 127.96^2} = 156.8$
4. Track: $\tan^{-1}(90.61 \div 127.96) = 35.3^\circ$

Track 035°(T) · GS 157 kt · drift 5°S

METHOD 2 — THE CX-3

the planning menu, run forwards

1. The CX-3 has two wind functions. **PLAN** takes **TCrs**, **TAS**, **WDir**, **WSpd** and returns **GS** and **CHdg**.
2. **FLT** → **Wind Correction** takes **GS**, **TAS**, **TCrs**, **THdg** and returns the **wind**.
3. **Neither of them answers this question.** Heading plus wind, solving for track, is not a function on the machine.
4. So this one is trigonometry, on the **CALC** keypad. Four lines, and it is exact.

Not a CX-3 function — use Method 1

Which do you use? *There is no choice here, and that is worth knowing before you are sitting in cloud with six minutes of DR to run. The CX-3's two wind functions solve the planning problem and the wind-finding problem. The Chapter 7 case — heading and wind in, track out — is a genuine gap in the instrument. Know the triangle and you are never stuck; reach for a menu and you will hunt for a function that does not exist.*

Now the part that turns a number into a position. Six minutes is one tenth of an hour. At 157 knots over the ground that is **15.7 nautical miles**. From the position you noted at 1003, draw 035°(T) and step off 15.7 miles. That is your **DR position** — dead reckoning — and it is the best estimate anyone can give you.

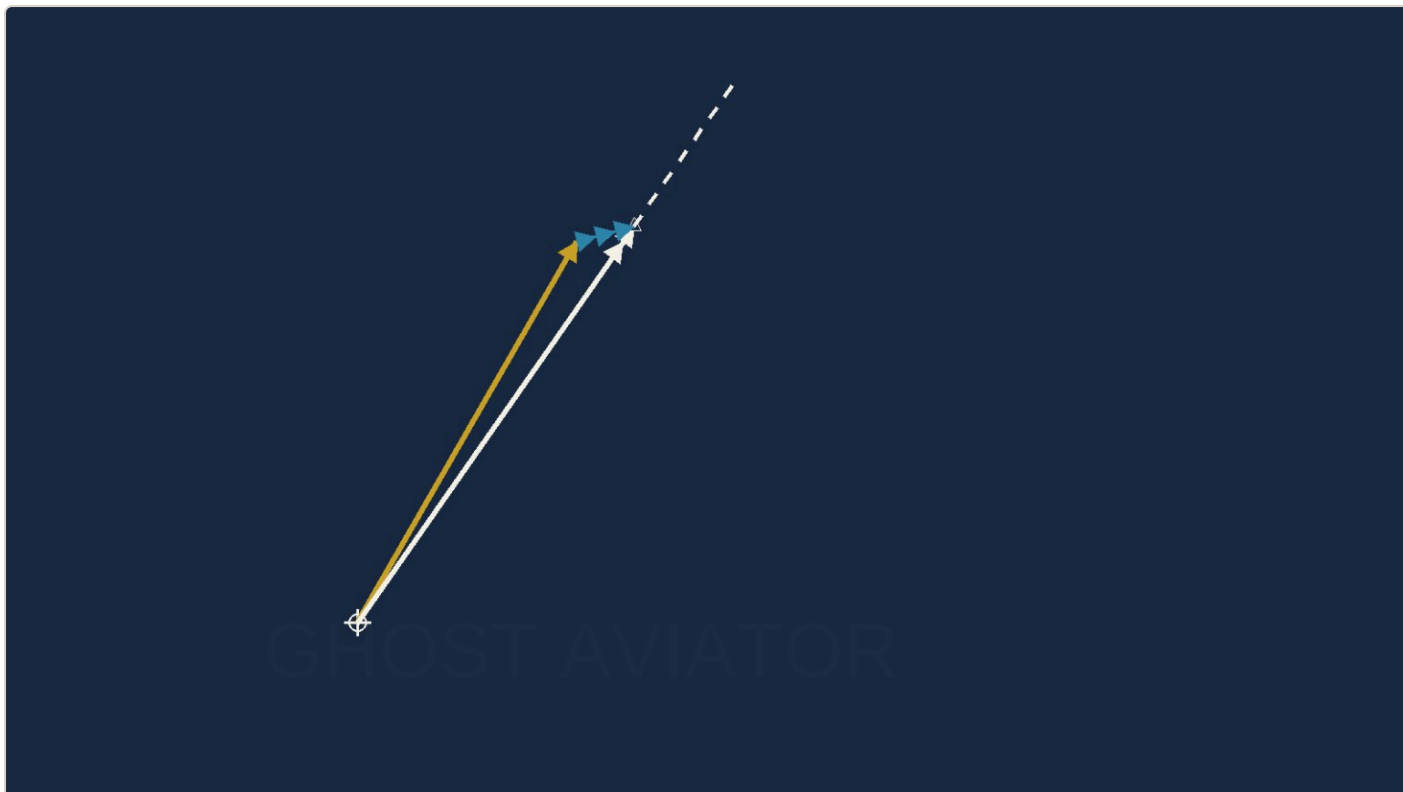


Figure 8.2 — Known fix, plus track, plus distance run, equals DR position. Draw from there to Clacton and you have your new desired track — which is a Chapter 8 problem all over again.

■ heading flown — 030° ■ track made good — 035° , 15.7 NM ■ the wind that made the difference

Note what just happened, because it is the shape of real navigation

You used **row one** of the table to find where you had got to, and then immediately needed **row two** to work out the heading that would take you to Clacton from there.

The three jobs are not three separate exam topics. They are three moves in one continuous argument with the wind, and a real flight uses all of them inside ten minutes.

GHOST AVIATOR

3 · Solving for heading and ground speed

This is the one you will use for the rest of your flying life. You join your turning points on the chart with a ruler and measure the line. **The track is now known.** What you do not know is the heading that will hold you on it, because the wind is going to push you off, and you do not know your ground speed, because the wind is going to help or hinder you along the way.

Take the example from the planning table:

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- **TAS** — 146 kt
- **W/V** — 315/20
- **Desired track** — 040°(T)

First, see the mistake

Before the correct method, fly the wrong one for a moment, because the wrong one is what the exam options are built from.

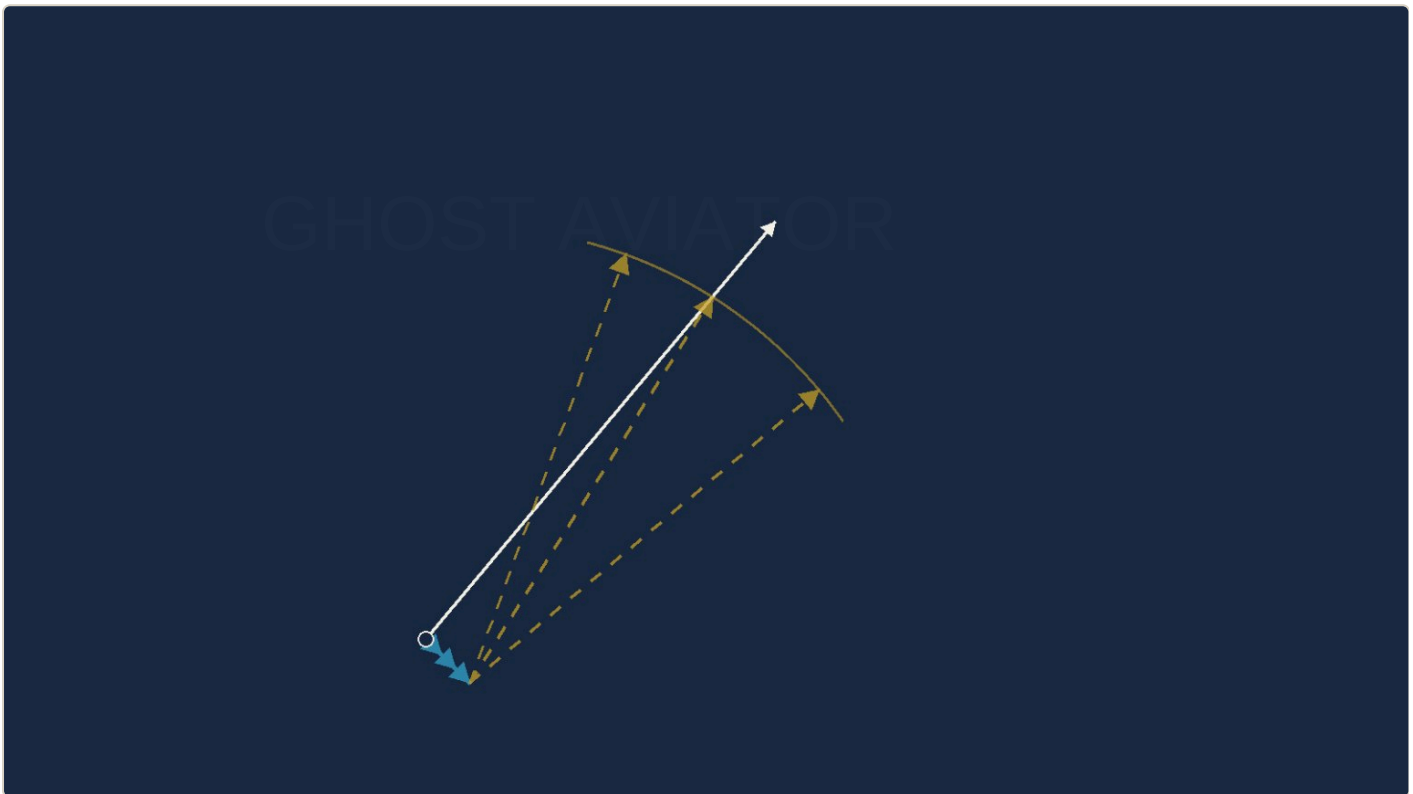


Figure 8.3 — The shape you have to close. You know the wind, you know how long the air vector is (146 knots), and you know which line the answer has to lie along (040°). The only unknown is *which way the air vector points*.

- desired track — the line you must end up on
- wind — known, from 315 at 20
- air vector — length known, direction unknown

Suppose you simply set **040° as the heading** and flew it. Run Chapter 7's arithmetic on that and you get a track of **048°** — eight degrees of starboard drift, and eight degrees to the right of where you wanted to be.



Figure 8.4 — Heading 040° gives a track of 048°. The wedge between the white ground vector and the track you wanted is the whole problem, and over 100 nautical miles it is fourteen miles of error.

■ heading flown — 040° ■ wind — 315/20 ■ track achieved — 048°, not 040

Read that drift figure again, because it is the key to the whole method

Flying 040 gave **8° starboard** drift. So the fix is to aim **8° to the left** — try 032 — and the wind will push you back onto 040.

That is the reasoning, and it is correct. The only question left is whether the drift is *still* 8° once you have swung the nose, and that is Section 4.

Now solve it properly

Drift and WCA are the same number with opposite signs — and only one of them belongs in the formula

Chapter 7 defined them as a mirrored pair. **Heading 090, track 097** means **drift +7°** (starboard) and **WCA -7°**. Same seven degrees, opposite sense.

The formula below computes the drift, not the WCA. $\sin^{-1}(W \cdot \sin \theta \div TAS)$ is the angle at the aircraft between the air vector and the ground vector, and that angle is the drift. So it goes into the identity you already know, read backwards:

$$\text{Track} = \text{Heading} + \text{Drift} \rightarrow \text{Heading} = \text{Track} - \text{Drift}$$

Why this matters more than a naming quibble. Take the same wind and put Chapter 7's *signed* WCA into this chapter's subtraction by mistake: $040 - (-7.84) = 047.8$. You have aimed **16 degrees the wrong way** — and it is the reversed-wind error the sanity check on the next page is built to catch. One quantity per formula. The formula takes drift.

And on the machine: the CX-3's **FLT** → Wind Correction function outputs a field called **WCA**. It is an *output* you read, never an input you compute with, so its sign convention cannot bite you here — but check which way your unit signs it before you quote it in an answer.

Worked example 8A.1. TAS 146 kt, W/V 315/20, desired track 040°(T). Find the heading to fly and the ground speed.

METHOD 1 — THE ARITHMETIC

one formula, no iteration, exact

1. Turn the wind round. From 315 means it points **toward 135°**.

2. Angle between the wind and the track:

$$\theta = 135 - 040 = 95^\circ$$

3. The drift you are going to get (starboard positive):

$$\text{Drift} = \sin^{-1}(20 \times \sin 95 \div 146)$$

$$= \sin^{-1}(19.92 \div 146)$$

$$= \sin^{-1}(0.1365) = 7.84^\circ$$

4. Heading: $\text{HDG} = 040 - 7.84 = 032.2^\circ$

5. Ground speed:

$$\text{GS} = 146 \cdot \cos(7.84) + 20 \cdot \cos(95)$$

$$= 144.63 - 1.74 = 142.9$$

HDG 032°(T) · GS 143 kt

METHOD 2 — THE CX-3

this is what the PLAN menu is for

1. **PLAN** → open a leg.

2. **TCrs** = **040** — the track you measured off the chart, not the heading.

3. **TAS** = **146**.

4. **WDir** = **315**, **WSpd** = **20**. Enter the wind as it is given — the direction it comes *from*. The machine turns it round for you.

5. **Var** = **0** and **Dev** = **0**. See the red box below. This step is not optional.

6. Read **CHdg** and **GS**.

HDG 032°(T) · GS 143 kt

Which do you use? *Both, and for different reasons. In an exam with one triangle to solve, the formula is four keystrokes on a scientific calculator and it never asks you what the variation is. On a real flight plan with six legs, the PLAN menu carries the wind, TAS, variation and fuel flow across every leg and totals the trip at the bottom — and that is Chapter 8B.*

Sanity check — do this before you believe any answer. The wind is from 315, which is off your left shoulder on a track of 040. So it must push you right, and you must therefore aim left. Heading 032 is left of track 040. Correct.

And it is very nearly a pure crosswind ($\theta = 95^\circ$, almost square on), so it should barely change your speed along the track. Ground speed 143 against a TAS of 146 — three knots lost. Correct.

If you had produced heading 048 and ground speed 146, you would have applied the wind backwards — and both errors appear together. The heading has swung 8° to the wrong side of the track, and the three knots you should have lost have become a small gain, putting the ground speed just above the TAS instead of just below it. Whenever the wind is forward of the beam and your ground speed comes out higher than your TAS, you have reversed the wind.

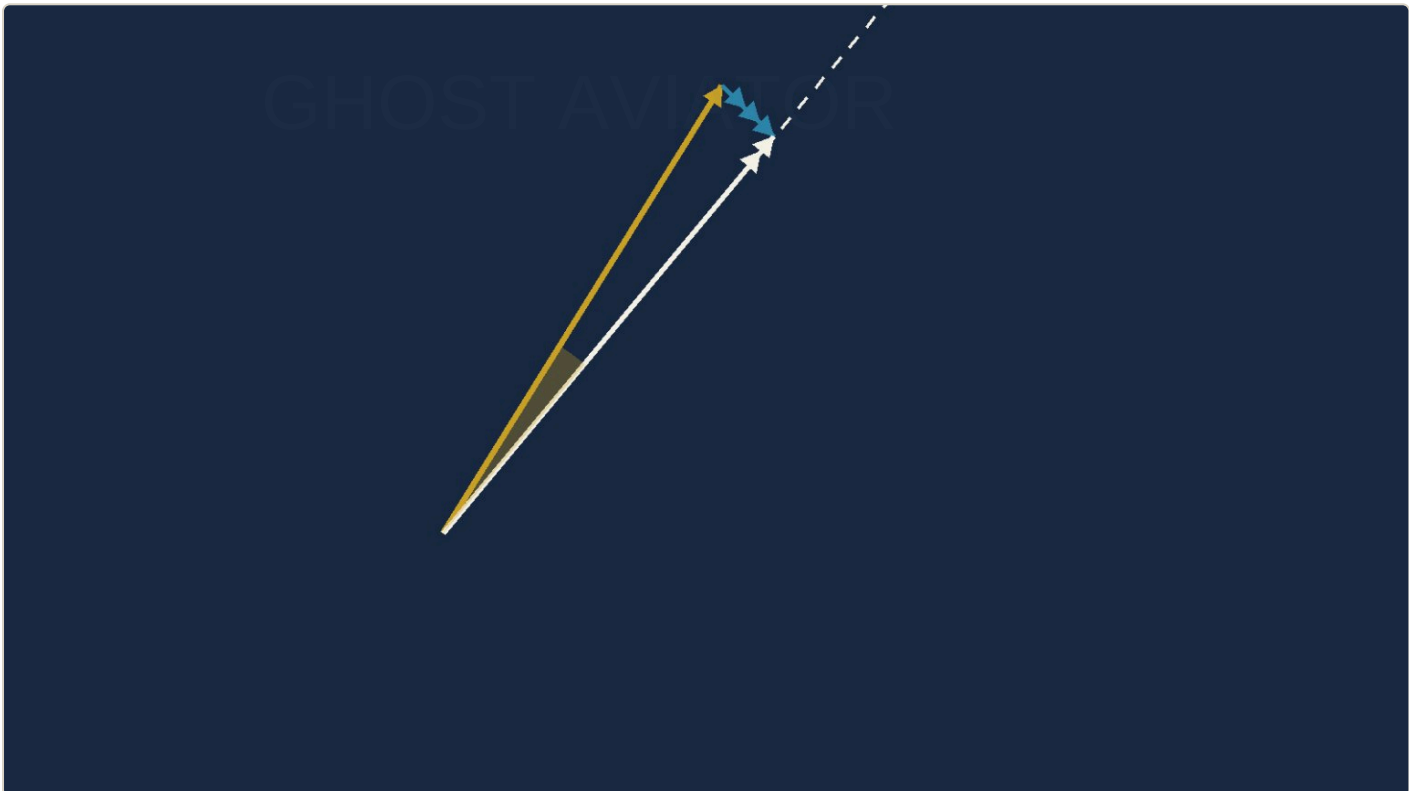


Figure 8.5 — Heading 032°. The wind still pushes 8° right, and 8° right of 032 is exactly 040. The triangle has closed on the line you wanted.

■ heading — 032°, aimed upwind ■ wind — 315/20 ■ track — 040°, as planned



Figure 8.6 — The answer was never only the heading. The *length* of the closing side is the ground speed — 143 knots — and that is the number that decides your fuel and your ETA.

■ air vector — 146 kt, its length is your TAS ■ ground vector — 143 kt, its length is your GS

The trap that will cost you the mark: PLAN gives you a COMPASS heading

The CX-3's **PLAN** leg outputs a field called **CHdg** — **compass** heading. Its per-leg inputs include **Var** and **Dev**.

Every question in this chapter is worked in **degrees TRUE**. If a variation is left sitting in that field from a previous problem, the number the machine hands you is *not* the answer to the question you were asked, and it will be wrong by exactly the variation — which in India is enough to land you on a different option.

Set **Var = 0 and **Dev** = 0 before every true-heading problem, and check them, every time.**

With both at zero the compass heading, the magnetic heading and the true heading are the same number, and the output is the answer.

***How I know:** the CX-3 User's Guide V1.3 lists the **PLAN** leg inputs as **Dist**, **TCrs**, **TAS**, **WDir**, **WSpd**, **Var**, **Dev**, **Rate**, **Dep**, and its outputs as **GS**, **CHdg**, **ETE**, **Fuel**. That variation and deviation of zero collapse compass onto true is arithmetic, not a quotation. **FLAGGED:** whether the leg screen also displays a true heading beside **CHdg** is not stated in the Guide and needs one look at a physical unit.*

The trap next to it: "Wind Correction" does not correct for wind

There is a function on the CX-3 called **Wind Correction**, under **FLT**. Its name is exactly what you are looking for and it is not what you want.

It takes **GS**, **TAS**, **TCrs** and **THdg**, and it returns **WSpd**, **WDir** and **WCA**. **It solves for the wind**. It is row three of the table in Section 1, and it belongs to Chapter 8B.

To go from a known wind to a heading, you want **PLAN**. A student who has understood the triangle never gets this wrong; a student who has memorised menu names gets it wrong under time pressure, every time.

4 · When the drift changes under you

In the last example the drift was 8° starboard on a heading of 040 and it was still 8° starboard on a heading of 032. That is a convenient accident of that particular triangle, and it is not a rule.

Whether the drift changes when you swing the nose depends on three things: how big the wind is compared with the TAS, how far you swing, and what angle the wind was making with the heading to start with.



Figure 8.7 — A heading change that leaves the drift where it was. The two wedges are the same size. This is the comfortable case, and it is the one the last example happened to be.

■ air vector, before and after the swing ■ wind — identical in both ■ ground vector



Figure 8.8 — The same wind, a different swing, and the drift has shrunk. The second wedge is plainly smaller than the first. **This is the normal case, not the exception.**

■ air vector, before and after the swing ■ wind — identical in both
■ ground vector — note the smaller wedge

Why this section exists at all

On a rotating-disc computer, changing drift is a real operational problem: your first guess at a heading gives you a drift, you apply it, and the drift you read the second time is a *different number*. So you go round again. And again.

On a CX-3, and in the formula, this problem does not arise. The wind correction angle is computed from the geometry in one step. There is no first guess to be wrong about.

You still need to understand it, for two reasons. It is examinable. And it is the thing that tells you, in the air, that a small heading change on a windy day is not a small change to your track.

5 · Balancing the drift — the loop you will never fly

The classical procedure for the analogue computer is called **balancing the drift**. It is a guess-and-check loop, and it is worth exactly one read, because the moment you understand *why* it existed you will understand what the

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electronic computer actually did for you.

Take a hard case — a slow aeroplane in a strong wind, which is where the loop bites:

- **TAS** — 76 kt
- **W/V** — 110/40
- **Desired track** — 230°(T)

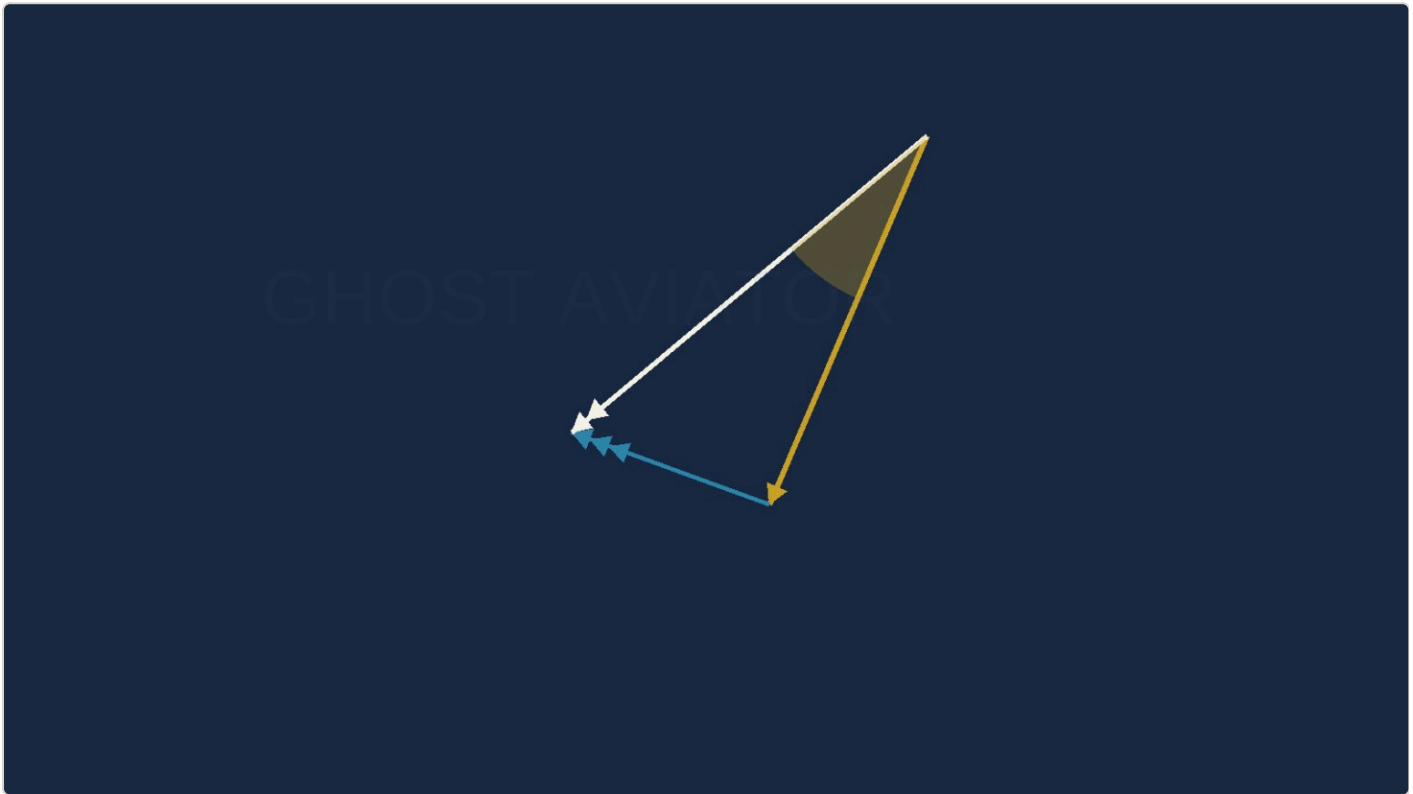


Figure 8.9 — W/V 110/40 against a TAS of 76. The wind is more than half the aeroplane's own speed. Look at how far the closing side swings away from the nose — this is what a light aircraft in a strong wind actually looks like.

■ air vector — 76 kt ■ wind — 40 kt, over half the TAS ■ desired track — 230°

What the loop does, and where it lands

Set the desired track against the heading index and read the drift. It is **20° starboard**. So swing 20° left and look again — and the drift has grown to 25°. Swing to 25° and look again: 27°. Swing to 27°: still 27°. It has stopped moving, and you have your answer.

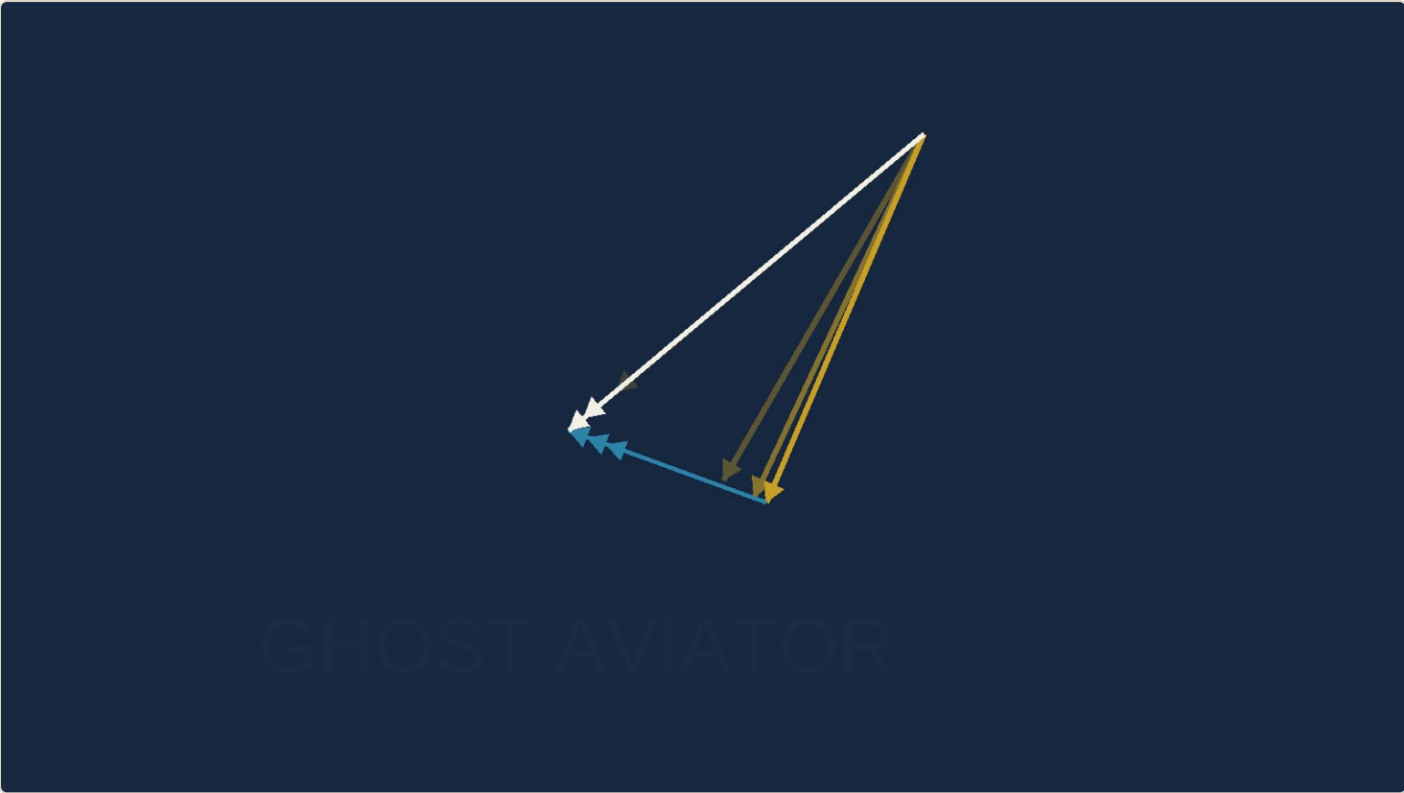


Figure 8.10 — The loop, drawn as it actually behaves: three guesses closing in on one answer. Each ghost is a heading that was nearly right. **The CX-3 goes straight to the solid one.**

the guesses, and the answer they converge on wind — unchanged throughout desired track — 230°

Here is that loop with the arithmetic run alongside it, so you can see that the old procedure and the modern formula are the same mathematics wearing different clothes:

Attempt	Heading tried	Track it gives	Drift read	Book reads	On track?
1	230	249.8	19.8°S	20°S	no — 20° right
2	210	235.4	25.4°S	25°S	no — still right
3	205	231.6	26.6°S	27°S	nearly
4	203	230.1	27.1°S	27°S	yes

Every drift figure the source book reads off the disc is reproduced by the arithmetic to within half a degree. The loop is not folklore — it genuinely converges. It is simply slow.

Worked example 8A.2. The same problem, solved in one step. TAS 76 kt, W/V 110/40, desired track 230°(T).

METHOD 1 – THE ARITHMETIC

no loop, no guessing, one pass

1. Wind from 110 points **toward 290°**.

2. $\theta = 290 - 230 = 60^\circ$

3. $\text{Drift} = \sin^{-1}(40 \times \sin 60 \div 76)$
 $= \sin^{-1}(34.64 \div 76)$
 $= \sin^{-1}(0.4558) = 27.1^\circ$

4. $\text{HDG} = 230 - 27.1 = 202.9^\circ$

5. $\text{GS} = 76 \cdot \cos(27.1) + 40 \cdot \cos(60)$
 $= 67.65 + 20.00 = 87.6$

Watch the rounding. 87.6 rounds to **88**. The published answer is 87, read off a disc. Half a knot on a 76-knot aeroplane changes nothing — but say 88 if you are asked to round.

HDG 203°(T) · GS 87.6 kt

METHOD 2 – THE CX-3

identical keystrokes to the last example

1. **PLAN** → open a leg.

2. **TCrs** = **230**.

3. **TAS** = **76**.

4. **WDir** = **110**, **WSpd** = **40**.

5. **Var** = **0**, **Dev** = **0**.

6. Read **CHdg** and **GS**.

HDG 203°(T) · GS 87 kt

Four attempts, or one line. *That is the whole argument for the electronic computer, and it is why this course does not teach you to balance the drift. Understand the loop; do not run it.*

Sanity check. *The wind is from 110 and you are going to 230 — that is a wind on your left, and behind you. Behind, so ground speed should beat TAS: 87 against 76, yes. On the left, so it pushes you right and you aim left: 203 is left of 230, yes. Twenty-seven degrees of correction is enormous, and it should be — a 40 knot wind on a 76 knot aeroplane. If a light aircraft question ever gives you a single-figure correction with a wind that size, check it again.*

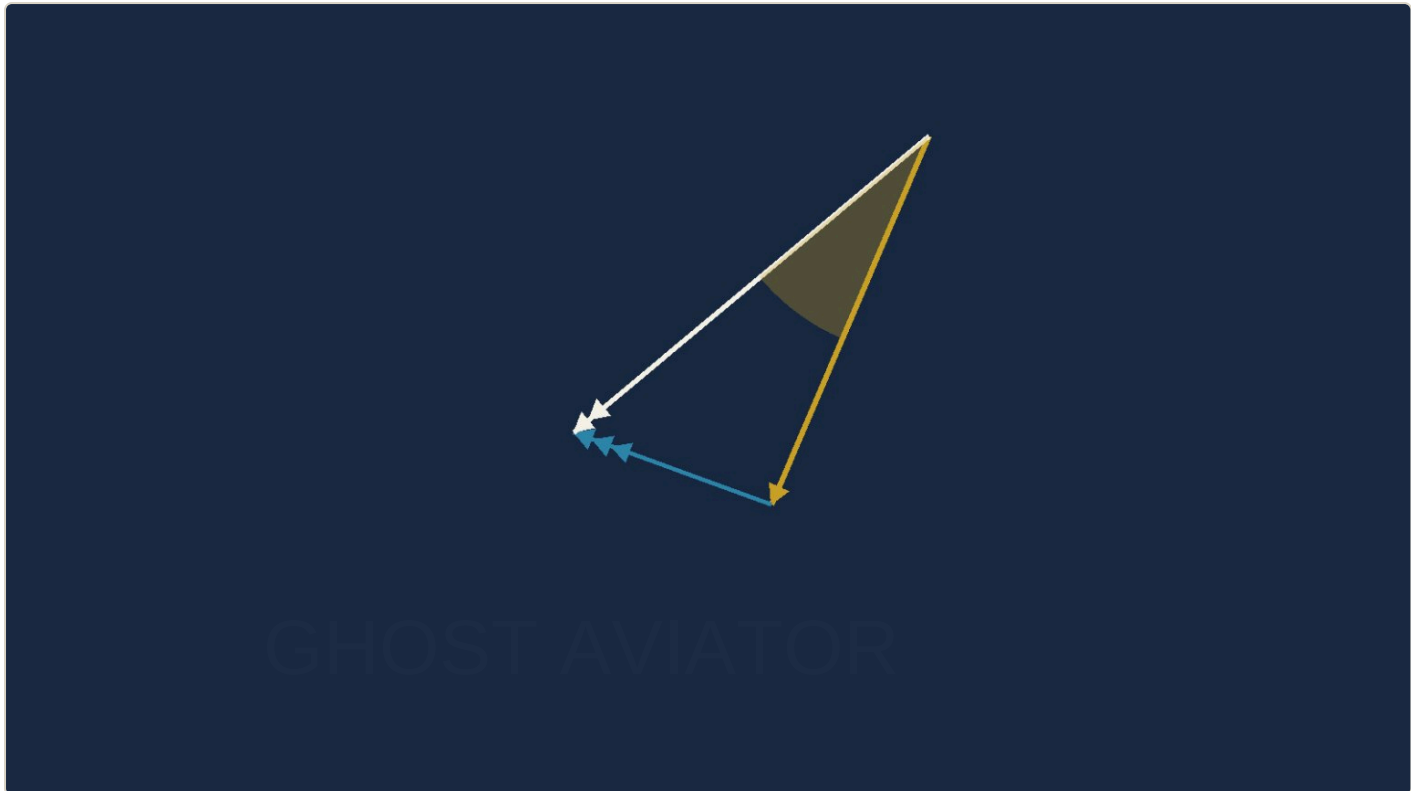


Figure 8.11 — The balanced solution. Heading 203° , 27° of starboard drift, track 230° , and a ground vector that is *longer* than the air vector because the wind is behind you. Every guess in Figure 8.10 was trying to reach this one shape.

■ heading — 203° , 76 kt
 ■ wind — 110/40, from behind and left
 ■ track — 230° , 87 kt over the ground

The examinable residue, in three lines

You will not be asked to run the loop. You may well be asked what it was *for*. The answer:

1. The first drift you read is the drift for the *wrong* heading, so it is only a first approximation.
2. Applying it changes the geometry, so the drift changes too.
3. The loop repeats until the drift you apply and the drift you read are the same number — that is what "balanced" means, and it is the same condition the formula satisfies in one step.

Questions

What you are given, and what you are finding

Each row hands you a **W/V**, a **track you must make good**, and a **TAS**. Two columns are blank: **heading** and **ground speed**.

This is row two of the Section 1 table — the planning case — thirty times over. All directions are **degrees TRUE**. There is no variation anywhere in this set, which is exactly why **Var** and **Dev** must be sitting at zero before you start.

Work across the rows, one row at a time. Do not do them column by column. Going by rows makes you think about what each operation is *for*; going by columns turns it into typing.

Set one — ten rows, and the speeds are deliberately mixed: rows 1 to 4 are light-aircraft speeds, rows 5 to 10 are jet cruise. Nothing about the method changes between them, and that is the point — but your *sanity check* does. A 15° correction is ordinary at 94 knots and impossible at 620. Do these on the formula first, then repeat the set on the CX-3 and check that the two agree. If they ever disagree by exactly the variation, you know what you forgot.

#	HDG°(T)	W/V	Track required°(T)	TAS	GS
1		040/40	155	140	
2		280/27	226	94	
3		320/14	198	136	
4		190/52	284	260	
5		270/83	132	544	
6		310/105	262	572	
7		300/60	355	620	
8		270/75	113	570	
9		240/80	301	455	
10		210/55	313	545	

Set two — twenty rows, mixed again, from 74 knots to 620. Watch the rows where the wind is nearly straight down the track: the correction angle collapses to almost nothing while the ground speed moves a very long way. Those two facts are independent, and exam distractors are built out of confusing them.

#	HDG°(T)	W/V	Track required°(T)	TAS	GS
11		335/75	220	553	
12		040/20	005	110	
13		125/35	045	196	
14		170/23	113	210	
15		145/20	021	80	
16		170/30	287	220	
17		300/30	200	137	
18		180/40	130	190	
19		280/24	116	199	
20		262/90	234	605	
21		210/80	071	620	
22		190/80	339	523	
23		305/30	038	585	
24		295/60	355	515	
25		340/85	091	588	
26		235/66	032	485	
27		055/35	197	176	
28		255/15	018	180	
29		090/15	147	74	
30		020/25	140	99	

Answers

Read the drift column, not just the heading

The drift column is not in the source book. It is here because it is the quantity you can check *in your head*: wind from the left must give starboard drift and a heading left of track, and wind from the right must give the mirror image. If a heading you calculated has drift on the wrong side, you have applied the wind backwards, and no amount of re-reading the arithmetic will show it to you as fast as that one glance.

#	HDG°(T)	W/V	Track°(T)	TAS	GS	drift
1	140	040/40	155	140	152	<i>15°S</i>
2	239	280/27	226	94	76	<i>13°P</i>
3	203	320/14	198	136	143	<i>5°P</i>
4	272	190/52	284	260	258	<i>12°S</i>
5	138	270/83	132	544	603	<i>6°P</i>
6	270	310/105	262	572	496	<i>8°P</i>
7	350	300/60	355	620	584	<i>5°S</i>
8	116	270/75	113	570	638	<i>3°P</i>
9	292	240/80	301	455	411	<i>9°S</i>
10	307	210/55	313	545	555	<i>6°S</i>

#	HDG°(T)	W/V	Track°(T)	TAS	GS	drift
11	227	335/75	220	553	581	<i>7°P</i>
12	011	040/20	005	110	93	<i>6°P</i>
13	055	125/35	045	196	187	<i>10°P</i>
14	118	170/23	113	210	197	<i>5°P</i>
15	033	145/20	021	80	89	<i>12°P</i>
16	280	170/30	287	220	232	<i>7°S</i>
17	212	300/30	200	137	139	<i>12°P</i>
18	139	180/40	130	190	162	<i>9°P</i>
19	118	280/24	116	199	222	<i>2°P</i>
20	238	262/90	234	605	524	<i>4°P</i>
21	076	210/80	071	620	678	<i>5°P</i>
22	334	190/80	339	523	590	<i>5°S</i>
23	035	305/30	038	585	586	<i>3°S</i>
24	349	295/60	355	515	482	<i>6°S</i>
25	083	340/85	091	588	613	<i>8°S</i>
26	029	235/66	032	485	545	<i>3°S</i>
27	190	055/35	197	176	202	<i>7°S</i>
28	014	255/15	018	180	188	<i>4°S</i>
29	137	090/15	147	74	65	<i>10°S</i>
30	127	020/25	140	99	109	<i>13°S</i>

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What I checked in this answer key, and what I did not

Every one of the thirty rows was recomputed from first principles — full vector solution, not the small-angle approximation — and compared against the printed key.

All thirty headings agree to within half a degree. Every one rounds to the printed value. There is no disputed heading anywhere in this set.

All thirty ground speeds agree to within 1.2% — 24 of 30 within 2 knots, the largest single residual 3.15 knots on a ground speed of 675 (row 21). That spread is exactly what reading an analogue disc to the nearest small division produces at these speeds, and none of it is large enough to move an exam answer onto a different option.

This is a sound question set. That is worth saying plainly, because it is not true of every set in this book — Chapters 5 and 6 each carried real arithmetic errors that are flagged in their own chapters. This one came through clean.

***One typographical defect in the source, for completeness:** in the printed answer table, row 12's wind is set as O40/20 — a capital letter O where a zero belongs. The value is 040/20 and nothing depends on it, but it is the kind of character that breaks an automated extraction silently, and it is recorded here so nobody chases it twice.*

The chapter in six lines

Take these into the exam

1. **Three jobs, one triangle.** Given a heading, you are finding track. Given a track, you are finding heading. Given both, you are finding wind. Name the job before you touch anything.
2. **Wind toward = $W/V + 180$.** More marks are lost on this one line than on any other in navigation.
3. **Track = Heading + Drift**, starboard positive. Turned round for this chapter: **Heading = Track – Drift**. It is the same identity read right to left, and it is the only rearrangement you need.
4. **Drift = $\sin^{-1}(W \cdot \sin\theta \div TAS)$** , where θ is the angle between the wind-toward direction and the track. Then **GS = $TAS \cdot \cos(\text{Drift}) + W \cdot \cos\theta$** . **The wind correction angle is that same number with the sign reversed** — Chapter 7's definition, unchanged. Compute with drift; report WCA.
5. **On the CX-3 this is PLAN, not Wind Correction.** Wind Correction solves for the wind. And set Var and Dev to zero for any true-heading question.
6. **Sanity-check the side.** Wind on your left pushes you right, so you aim left. Wind behind you raises ground speed above TAS. Two seconds, and it catches the reversed-wind error every time.

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Next — Chapter 8B: the Practice Flight Plan, where the `PLAN` menu stops being a way to solve one triangle and becomes a flight plan with legs, totals, fuel and an ETA — and where variation finally enters, with the sign trap that comes with it. Then wind finding: row three of the table, and the one job left.

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