Whiz Wheel – The Other Side

Christopher Hope

In these days of button pushing, GPS Systems, hand-held computers, and even cellular phone with features to spare, the lowly E6B wind computer often is lost in the bottom of the flight bag. And this is a shame. Because not only can the E6B perform all of the functions that the other computers do, it can do it with no batteries and, even more important, it can show the picture of what the wind is doing. And while there are numerous features on the "numbers" side, I want to talk about the much-maligned wind side.

I think one reason that pilots have trouble working wind problems on the E6B is that they are trying to remember a step-by-step procedure, and not really thinking about what they are trying to accomplish. So, let's step back and look at the big picture.

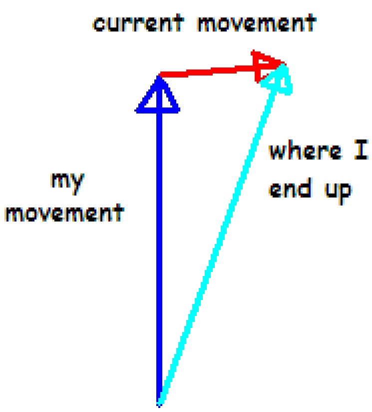

figure A

When you first started talking about the wind's effect on your path across the ground, your instructor probably likened it to paddling a canoe across the river, where the current moved you downstream as you tried to paddle straight across. (figure A.) (Actually, I liked the analogy of paddling downstream rather than across, and then having the current move me even further in my desired direction.) But in your instructor's picture, the current was always pushing perpendicular to your desired motion.

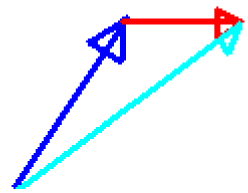
figure B

The question that is generally presented in this problem is this: If we know the speed of our paddling and direction of "my movement", ("straight across") and we know the speed and direction of the current ("downstream"), all we need to is draw the two to scale and draw the line from one end to the other. Then, knowing a little geometry we can calculate the angle and length of the result to figure out where we end up. (I am already getting that "too much geometry" hazy feeling.)

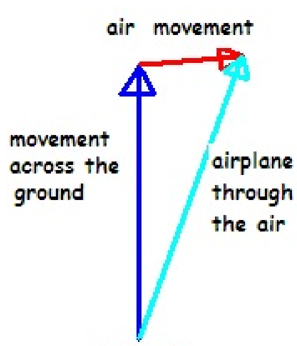

figure C

A more realistic situation might be where you are paddling to a point that is across the river, but somewhat downstream. And you are moved even further downstream than you desired (figure B.) No more nice 90-degree angle. Now, unless your are the guy (or girl) who always aced the geometry test calculating the angle between north and "my movement", and then the angle between "my movement" and "current movement" and doing all sorts of math things to find the last angle, you are probably now finding your eyesight moving toward hazy.. (My brain is getting reeeeeaal hazy now.) If we are going to convert this concept to moving through the air, we have to find a better way to compute.

So let's keep the idea that we can have one line to show our track through the air for one hour, (let's call that "air-line"), one line to show the effect of the wind over that same hour (wind-line), and then a third line to show, (for the same hour) our resulting track across the ground (ground-line.)

We know everything about the wind-line. We know how fast it is moving, and we know what direction it is coming from and going to, so we will be able to draw a one-hour picture of the wind.

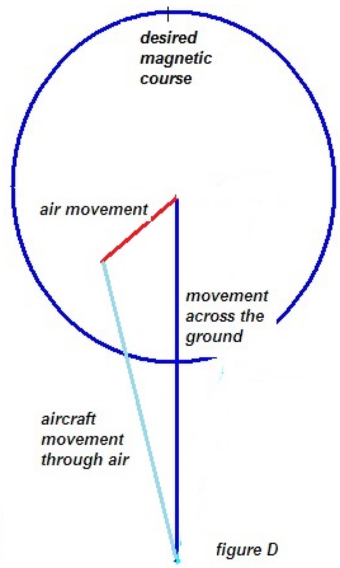

figure D

ALERT, ALERT-Just as adding plums and bananas give us meaningless information, so does adding knots and mph. And for that matter, so does adding true headings to magnetic headings. Keep all of the headings in the same family, and all of the speeds in the same family. It doesn't matter which, but I recommend that you convert everything to magnetic headings and knots.

So, grab that E6B, and let's figure it out. First of all, we really don't need to see the entire triangle. All we really care about is the ends of the three lines. So our wind computer doesn't need to be big enough for the whole thing – just the ends.

To allow this explanation to make sense, let's use some real numbers, and let's move our picture to the E6B.

Let's assume:
Our desired course - 340°, and our true airspeed is 110 knots
Our wind – coming FROM 230° at 20 knots
And we want to know what we should use for a magnetic heading, and what we will have for a ground speed.

Although it may seem out of order, the first line we are going to put on our big circle is the wind. Set the direction that the wind is coming from under the top index, set the grommet on 100, and draw a line straight up from the center equal to the wind velocity. If you wish, you can put an arrow on the end of the line that ends at the center. It should look like figure E:

figure E

Next, we will draw the line that represents us going across the ground. So, turn the wheel until the ground course that we want to fly (that is, the heading that we would fly if there was no wind) is at the top of the scale Then slide the plate up or down until the end of the wind line is on the arc corresponding to the true airspeed. It should look like figure F:

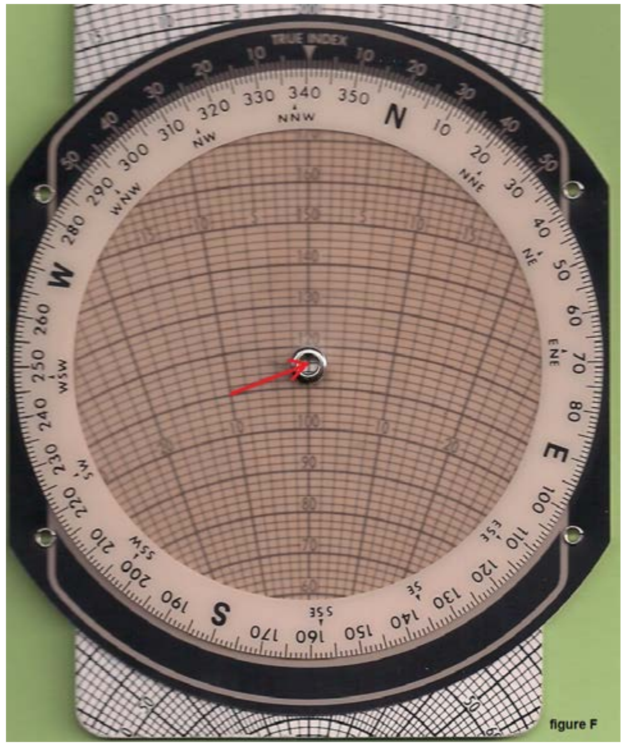
figure F

Now, if we desired, we could add the "ground track" line and the "air track" line similar to the lines shown in figure D. If we did so, we would get figure G.

Generally, however, most people stop with the wind line. But in either case, the number under the top index is the ground track and the number under the grommet is the ground speed.

The number at the tail end of the wind is the true airspeed, and the number of degrees to the left or right is the drift correction you will need to fly to attain that course. Course , plus or minus the drift correction, is your heading.

So, in this example, our ground track is 340° and our ground speed is 115. Our true airspeed is 100, and in order to attain a ground track of 340°, we will need to steer 10° left of that, or 330°

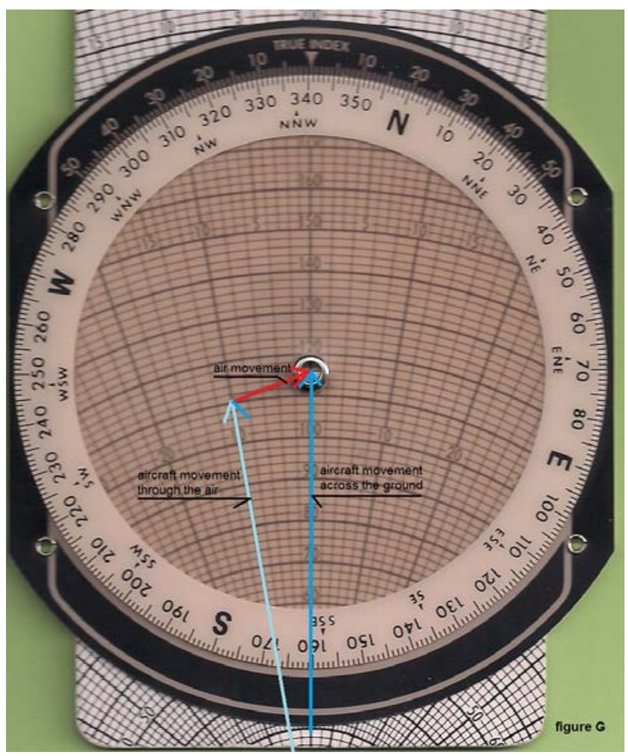

figure G

Now, if you are like me, you like to have a quick way of checking that you did not make some careless error in your calculations. Take just a few seconds to make the "Am in the ballpark?" check.

First, is the ground speed answer reasonable? If you have a direct tailwind, the ground speed will be exactly equal to the true airspeed value plus the wind value. And if you have a wind right on the nose, the groundspeed will be equal to the true airspeed value minus the wind value. (In our example, with a wind of 20 and the true airspeed of 110, the ground speed must be between 90 and 130 knots.) If your groundspeed value is not between these two, you have an error somewhere. (Hint. Did you ensure that the true airspeed value was under the end of the wind line? Is the length of your wind line correct?)

Now make a quick check for the left \ right drift. On a piece of scratch paper, imagine north at the top of the page and draw a short arrow more or less in the direction you will be traveling. (northwest in our case.) Don't bother to get too fancy. Just a northeast or southwest line sort of thing. Then right next to that, draw an arrow in the direction that the wind is moving. Make sure you don't do this backwards. A wind from 230° for example, is coming FROM the southwest, and going TO the northeast. With these two arrows, you will be able to see at a glance if you expect to be blown to the right or to the left as travel along.

Sound complicated? Nah. Nothing to it. Try it next time you are planning your trip and you will wonder why you spent all of that money on an electronic wind computer.

Have fun and keep flying.

Chris Hope has taught fledgling and experienced pilots for 40 years, mostly in the Kansas City area. He teaches ground school at a local community college.
Chris holds flight instructor certificates for single engine land and sea airplanes and multi-engine land planes, as well as for instrument training. He holds ground instructor certificates for advanced and instrument training. Chris is an FAA Gold Seal Instructor and certified as a Master Certified Flight Instructor.