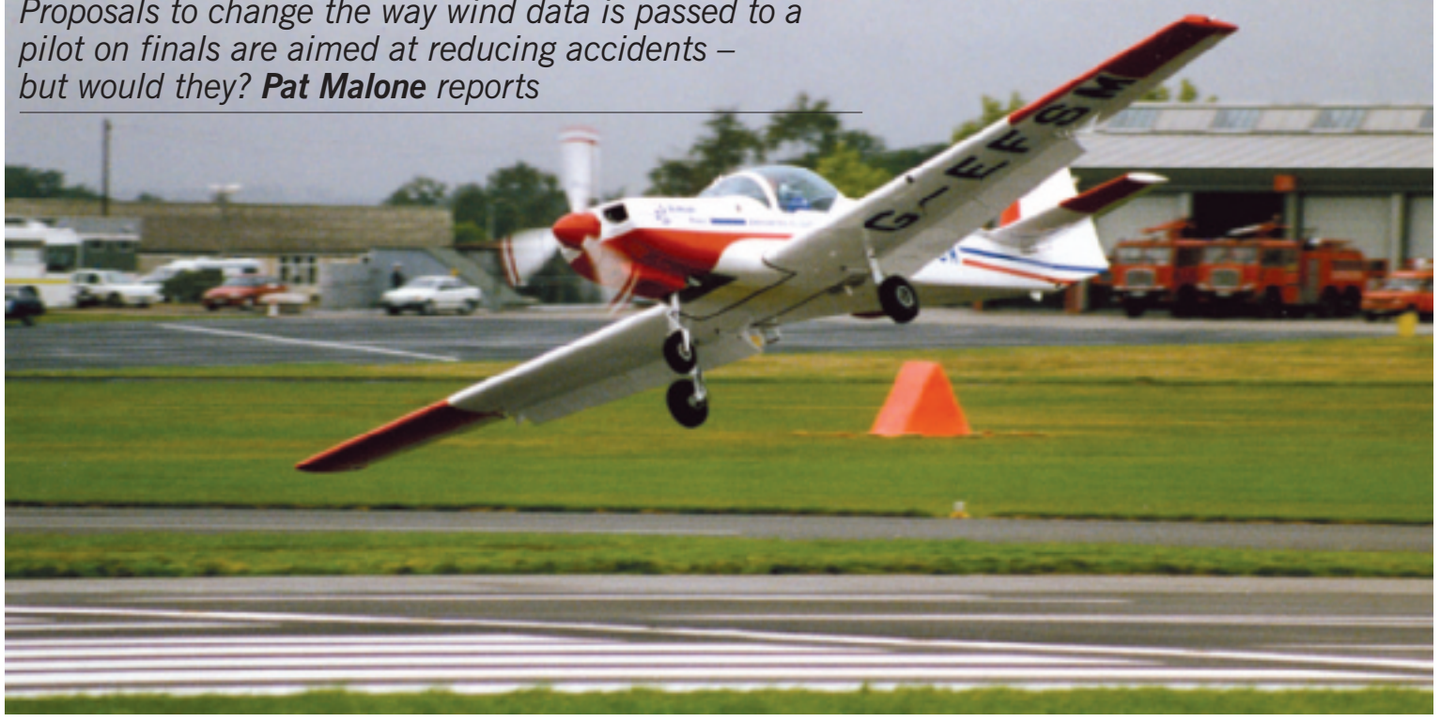
When the wind blows...

Proposals to change the way wind data is passed to a pilot on finals are aimed at reducing accidents – but would they? ***Pat Malone*** *reports*



Great news! I'm not as dumb as I thought I was. For years I've been hiding my shame at being congenitally incapable of calculating an accurate crosswind component on final approach, and now it turns out that you can't, either! A study by Cranfield University found that 98 percent of pilots could not derive a crosswind that was accurate to within one knot from the conventional wind information passed by ATC – wind direction and strength – and established that trying to work it out degrades pilot performance at a critical time.

The authors of the study are urging that we change the way crosswind information is passed to pilots to give us a straight number, and that crosswind limits for all aircraft should be placarded in all cockpits because many of us don't know what they are. The evidence is strong, and it seems perverse to say that personally, I'm not entirely in accord with their conclusions and I don't agree with their suggestions. You will probably beg to differ – I'm sure we'll get letters. Before reaching out an aggrieved hand for your pen, read on.

The study, 'Crosswind Landings in General Aviation: A Modified Method of Reporting Wind Information to the Pilot' was produced by Matt Ebbatson, Don Harris and Steve Jarvis of the Department of Human Factors at Cranfield University and published in the International Journal of Aviation Psychology. It uses data from its own research to conclude that only two per cent of pilots can accurately work out a crosswind component from the ICAO-approved wind data passed up by ATC, while pilots in a survey group who were given the exact crosswind value could recall it when asked before touchdown. A significant proportion of pilots could not state the crosswind limit for the aircraft they flew most often.

The study's authors quote AOPA statistics to show that during 1997 there were 619 GA fatalities, of which 73 percent were attributed to 'pilot-related causes'. "In the eight-year period spanning 1996 to 2003 a total of 107 events occurred in which the poor handling of crosswind conditions was a contributory factor," the study says. "Approximately 14 percent of these events occurred when the pilot attempted to land the aircraft in crosswind conditions that were stronger than the aircraft's crosswind limit."

We assume, the study says, that pilots can derive the crosswind from the ICAO format. But the vast majority of pilots not only lack the candlepower for the task, they fly more sloppily while they're trying to work it out. The authors quote several studies to show that even simple sums take up a lot of human bandwidth, and say we shouldn't be essaying hard ones when our brains are engaged in landing an aircraft. "Passing information about the strength of the runway crosswind component directly should relieve some of the cognitive demands on the pilot and hence produce superior performance," they say.

To test its hypotheses, the study used a sample of 55 GA pilots whose experience ranged from ten hours to 15,000 hours. None were told the precise purpose of the survey, and red herrings were thrown in to ensure they didn't guess. The use of calculators and whizz-wheels was not allowed. They were thrown the following question: 'If you were landing on runway 22 and the surface wind was reported as 290°/20kts, what would be the crosswind component across the runway and would it blow from your left or right?' Pilots had a maximum of 30 seconds to answer the question.

Only one pilot got the answer to within one knot. Nine (16 percent) calculated a crosswind component stronger than the correct value, and thus were judged to be wrong but safe. The large majority, 34 pilots (62 percent) said it was weaker than the correct value, and eleven (20 percent) ran out of time. Four pilots said the crosswind was blowing from the wrong direction. Three made no response on direction.

Above: now, was it 30 degrees off gives half wind strength, or half-off gives 30 percent, or...?

The correct answer was 19 knots from the right, as any fule kno.

Pilots were also asked the crosswind limit for the aircraft they most commonly flew, and while 39 (71 percent) gave a value equal to or below the maximum demonstrated value for their type, six pilots (11 percent) gave values that were higher than the maximum figure and ten pilots (18 percent) couldn't come up with an answer.

The study then moved to a simulator configured as a C172. Again, the purpose of the exercise was disguised. A different group of 20 pilots, again representing a wide range of experience, was split into two, with half being given conventional wind information and the other half being told explicitly what the crosswind component was. Wind information was delivered during the early stages of the approach, and pilots' ability to maintain speed and track was measured. On a one-mile final, pilots were asked what the crosswind was. After they responded, or after ten seconds, the sim was paused and they were asked whether they would elect to land or go around – the crosswind was two knots outside the aircraft's demonstrated limit. They were then allowed to continue.

In all cases, the pilots who were given the crosswind component as a straightforward value were able to recall it at the one-mile point. In the group who received the conventional wind report, seven pilots produced an erroneous value less than the true value, one produced an erroneous value six knots higher than the true value, and one ran out of time. Despite the crosswind being in

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Above: crosswind landings 'should not require exceptional skill or strength'

excess of the demonstrated limit for the 172, 15 of the 20 pilots elected to land; five went for a diversion. The report notes that pilots who were told the actual crosswind were more likely to comment that the crosswind strength was particularly high, although the majority still ultimately made a decision to land. Some commented that the crosswind was outside limits, but they were comfortable with it.

The study's analysis showed there were differences between the two groups in terms of their flying performance, which was measured using a large number of statistically accepted parameters. Those who were given a straightforward crosswind number stuck more closely to localiser, glideslope and airspeed.

The study says: "An accurate crosswind component can be calculated using the following formula: $V_{xw} = V\sin(\theta)$ where V_{xw} is the crosswind component to be calculated, V is the total wind velocity, and è is the angle between the wind and runway." You betcha. It goes on to say that pilots use a variety of rules of thumb to calculate crosswind component, and that these are generally quite accurate if used properly. The study proposes that instead of all this palaver, ATC wind reports on finals should specifically include the runway crosswind component, and that all aircraft should have their crosswind limit clearly marked in the cockpit.

But how would this play in the real world? A precise number is only of value in making a precise calculation; in this case, perhaps an exact crab angle in degrees, or some wing-low value. But that's not how it happens. Instead, the GA pilot seeks to maintain the localiser or extended centreline using a crab angle appropriate to the strength of the hooley and the direction from which his aeroplane tells him it is blowing. It's a sight picture thing. The accuracy of the number is usually rendered academic by the fact that when it's most needed, it's least accurate – the strongest crosswinds are often gusting, changing by the second. And how would the information be derived, with what ground equipment, at what cost to whom? Would ATC be prepared to accept the responsibility, and the consequences of error? Who would be qualified to pass it? Obviously it would be beyond the remit of an A/G service…

And as to placarding with the aircraft's crosswind limit – please, no! Our aeroplanes already look like the Dead Sea Scrolls. The helicopter I fly even has an ungrammatical sentence written on the T-bar of the cyclic! Further, we should not fall into the trap of believing that if the max demonstrated crosswind stated in the manual is 25 knots, then 24 knots is safe and 26 knots is dangerous. The certification process requires that a test pilot should demonstrate three takeoffs and landings, with at least one to a full stop, in a 90 degree crosswind of at least 20 knots or 0.2 VSO, whichever is greater, but not exceeding 25 knots. The pilot should make a qualitative evaluation of control capability, forces, aircraft dynamic reaction in gusty conditions (if available) and general handling characteristics. The aircraft must be satisfactorily controllable without requiring exceptional piloting skill or strength.

And that's all she wrote – in the subjective judgement of the expert at the stick, the plane can be landed with the crosswind at that speed without exceptional skill. And you don't have to keep going until you wreck one, you can stop at 25 knots. Consenting adults therefore apply their own limits, which in many cases are a lot lower than the number in the manual. Personally, I don't believe that having that number imprinted in the cockpit or in the brain is going to have any serious impact on accident statistics at all. I'm sure there are plenty of people who are going to tell me I'm wrong, so now it's your turn. Replies for publication to *pat@richmondaviation.co.uk* - polite this time, eh? ■