JOHN ABSOLON

Landing on the Numbers

David Jacobson has been campaigning since 1987 to have pilots adopt his landing technique. **Steve Hitchen** spent a couple of days with the maestro finding out if the Jacobson Flare really is the Holy Grail of smooth landings.

anding is aviation's great inconsistency. In most other operations, pilots can manipulate the controls so that the aeroplane performs in a relatively predictable manner, but in landing, the outcome is much less certain because it relies on individual judgement, timing and touch. Were it not so, pilots would talk about them in the same so-what manner as they talk about take-offs and turns.

Terms such as "greaser" and "arrival" would not exist in aviation lexicon.

And it seems every instructor has a different method of trying to teach judgement; a trick to gauging flare height and hold-off, resulting in a new crop of pilots that make the aeroplane meet the Earth in a different way to their contemporaries. Consistency does not answer the roll call.

But is that the way it should be? In an industry that prides itself on control by numbers and systems that give predictable outcomes, we are still using the tried-and-found-guilty method of landing by intuition. Our pioneers developed it in the fledgling days of aviation, and it seems we've done little to refine the process ever since.

One person who can't be accused of accepting the status quo is former Qantas captain David Jacobson. Since 1987 he's been on a personal quest to improve the landing process so that pilots use numbers to guarantee greasers every time rather than a system based on what "looks about right".

His technique, the Jacobson Flare (JF), sinks the slipper into several sacred cows, which doesn't go down well with traditionalists. That doesn't make him the most popular figure in aviation, but it does make him one of the most innovative.

Inside the issue

Using as few words as possible, the JF technique is one where pilots use their line of sight to fly the wheels onto the runway. It uses constants, not variables, and its integrity lies in mathematics that defy the wreckers. Jacobson developed it in answer to several questions that textbooks have been lax in answering, and to eliminate hit-and-miss flying from the landing phase.

LEFT: David Jacobson has been on a quest to improve landing techniques for nearly 50 years.

BELOW: Knowing the height of the pilot's eyes above the ground is crucial to the Jacobson Flare, easily found with a measuring tape!

MAIN: Long hold-offs are not part of the Jacobson Flare, which advocates a slow descent to the runway instead.

To land precisely, you have to know the answer to five questions ...

It all started for Jacobson with his own ab-initio training in 1965, when his instructor gave him a brief on the concept of aiming points, but could shed no more light on when the flare should start than any other instructor could. It created for him more questions that contemporary teaching could answer.

"Why is landing so hard to learn in the first place?" he muses at the beginning of his seminars. "Why do students generally double their hours between first circuit training and first solo? Why does the technique not work on another aircraft or another airport? How come we land beautifully one time, yet stuff it up the next? Why is it different with different flap settings? Why does a 30-metre or 45-metre wide runway throw me off? Are we really confident with our next landing? Why are there so many accidents?"

Current training is based on repetition until the student pilot starts to get the hang of the visual cues and control inputs and judgment is learned. According to Jacobson, the problem lies not so much with the students, but with the techniques taught.

"Is landing really so difficult or are landing techniques inadequate? That's my point, and has been for 50 years. For 100 years we've been trying to teach perception and judgement, and you can't do that. It comes at its own rate for every single student.

"There's never been a quantifiable recognised landing technique or even–more baffling to me–any recognition for the need for one. It's been ignored like it's a taboo subject!"

Jacobson sought a better technique for ensuring consistency in landings. Finding none, he created his own with the help of a former TAA captain who happened to be a whiz with mathematics and whiteboards. Together, they devised and proved the JF, borrowing heavily from triangulation used in the legendary Dambusters raids during WWII.

For those of us who grey-out at the mention of the word "mathematics", be not afraid. Although there is scope to delve deeply in to the Pythagoras behind the JF, it's not needed to make the technique work. In practice, one calculation is made for each type of aeroplane, which stays fixed for eternity; there's no need to ever make the calculation again.

How it works

"Someone once said the way to land an aeroplane is to aim at the Earth and just miss," Jacobson says. "It's a lovely way of putting it and not entirely silly! The body of the aeroplane does miss; the undercarriage touches but the fuselage doesn't, even though you're aiming it at the Earth initially.

"To land precisely, you have to know the answer to five questions:

1. Where to aim
2. How to aim
3. When to stop aiming and start flaring
4. How much to flare
5. How fast to flare."

Simply put, the JF uses three points as cues for flaring the aeroplane: a Flare Cut-off point (where you start to raise the nose), Aim Point 1 (where you aim your eyes before the flare) and Aim Point 2 (where you aim your eyes after the flare). The pilot flies a steady glideslope keeping Aim Point 1 in the same position relative to the aircraft glare shield, but noting a Flare Cut-off marker that is closer to the aeroplane by a pre-determined distance. Once that marker is no longer visible over the nose, the pilot takes four seconds to raise the nose of the aircraft to Aim Point 2, which is most often the end of the runway.

The you just wait until the main wheels make contact, usually just after the four-second mark.

It sounds simple, and largely it is, although some maths is involved to calculate the distance the Flare Cut-off is ahead of Aim Point 1. Finding that distance is a function of the height the pilot's eyes are above the ground, the distance the main gear is behind the pilot, and the desired height above the threshold. All those numbers are mashed together to find the distance before Aim Point 1 that you should start to raise the nose.

The good news is they have an app for that. Jacobson designed his Jacobson Flare app (reviewed in *Australian Flying* November-December 2014) with a calculator to enable math mugs to punch in some numbers and get back a definitive distance. For most light aircraft of the Cessna/Piper/Beechcraft singles type, the answer is generally about 30 metres.

Final approach has traditionally been flown using the secondary effects of controls, which Jacobson believes is the wrong way to go about it.

Getting practical

To fly the JF, you have to suspend a few cherished beliefs and practises that have held you in good stead until now. Firstly, you have to forget a lovely, long hold-off; and secondly, you're going to have to get used to flying final approach like you're on an ILS, that is, holding speed with throttle and height with pitch.

A critical part of the JF is the ability to hold Aim Point 1 in a constant position relative to the aircraft glare shield. To do that, you have to maintain a constant glideslope–about 4° for a GA aircraft–and you've got little hope of doing that if you're using the elevator to control speed because the nose is pitching up and down.

Many pilots–mainly IFR–long ago discarded the practice of using secondary effects of controls to slide down final, so for them it is not much of a leap. For David Jacobson, that concept never gelled with him from his very first landings.

"I thought what I was being told was just odd," he recalls. "I was being told to pitch on final for airspeed, rate of descent with power. That didn't make sense. Why would I want to fly what I even knew then to be most precise manoeuvre any of us are asked to do in an aeroplane using the secondary effects of the controls? Why wouldn't you use the primary effects?"

It takes a bit of practise to switch your thinking, but once you have re-trained your hands you'll slot into a comfortable landing groove. And the benefits of being able to hold the aim point steady in the windscreen become immediately apparent: a stable approach is a happy approach.

To that end, Jacobson's coaching spends quite a bit of time on techniques to hold Aim Point 1 in a steady place relative to the glare shield. For the JF to work, you have to have eyes only for that point, straying occasionally to the airspeed indicator.

"The aim point is the one constant," he stresses. "Everything beyond that point will appear to move up in the windscreen and everything short of it will appear to move down. Ultimately, the glare shield will overtake them whilst we still have that relationship between Aim Point 1 and the glare shield.

"Because you don't pitch for airspeed, you don't change your line of sight to Aim Point 1."

Fixing that point in the windscreen will take either imagination or a bit of trickery. Some pilots envisage a spider web over the windscreen with the centre of the web over Aim Point 1. For others, it may be a dartboard frame with the bullseye in the centre; whatever works for you.

If that's not the go for you, there are several tricks you can use to create a marker on the aeroplane, which you then relate to Aim Point 1 on final. Jacobson himself has used a whiteboard marker, a greasy thumbprint or a conveniently situated splattered bug (every windscreen has at least one of those).

But one of the simplest is to place something light and small like a piece of white card or insulation tape on the glare shield so that it reflects onto the windscreen in exactly the right spot. Then on final, all you do is cover Aim Point 1 with the reflection and down the glideslope you go.

Initiating the flare

The story so far: the pilot is sliding down final maintaining Aim Point 1 constant in the windscreen and controlling speed with throttle and height with pitch. The approach is nice and stable, but that's something we should all be looking for anyway regardless of what technique we employ. The guts of the JF comes in what happens next.

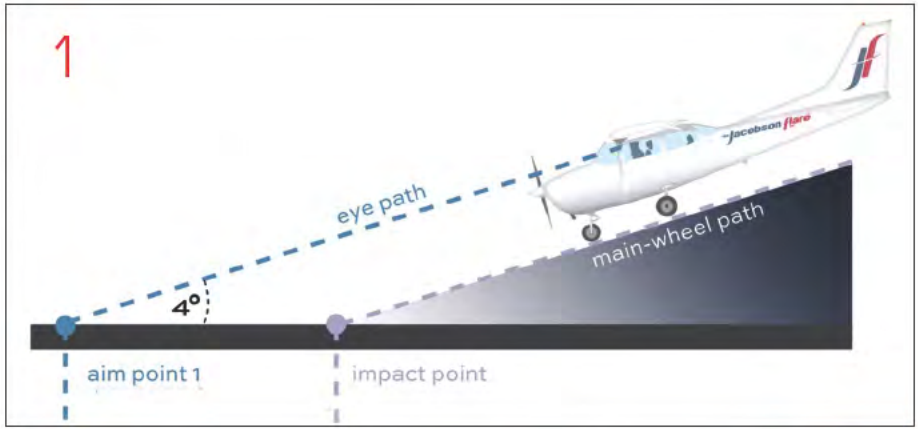
Using peripheral vision, the pilot is keeping an eye on the Flare Cut-off Point. This is a marker of some description on the ground that is before Aim Point. How far before was determined earlier by punching numbers into the iPad App. The marker itself can be just about anything: a cone, a discoloured

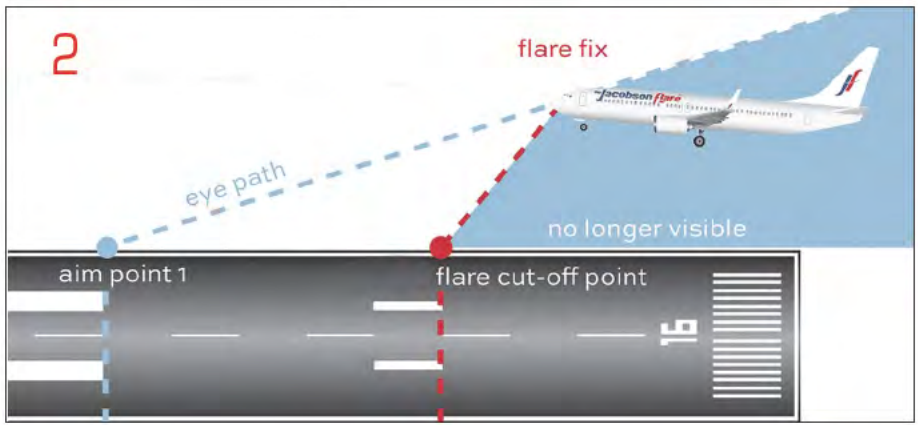
patch of grass or even the boundary fence, if it's in the right spot.

On sealed runways, it's dead easy: the white lines, piano keys and touch-down zone marks make brilliant references for the Flare Cut-off. As most of these should conform to Manual of Standards Part 139 Chapter 8, working out a point to start the flare is dead easy. The white centrelines are very conveniently 30 m long, which means the pilot uses the far end of the line as Aim Point 1 and the near end as the Flare Cut-off. That presumes that 30 m is the right distance for your aeroplane.

With the marker in the peripheral, the pilot holds the attitude and speed until the Flare Cut-off disappears under the nose. The great cardinal sin here is if the pilot watches the marker go under the nose, thereby taking their eyes off Aim Point 1 too early.

Once the marker is gone, it is simply using four seconds to raise the pilots eye line (still held constant relative to the glare shield) to Aim Point 2, which in most cases will be





1. This screenshot from the JF iPad app shows how using the technique will fly the pilot's eyes to Aim Point 1.
2. When to flare? With the eye path fixed on Aim Point 1, the flare is initiated when the Flare Cut-off is no longer visible over the nose.

FROM TOP TO BOTTOM:

Aviation pioneers developed landing techniques on a trial-and-error basis, and not a lot has changed over the ensuing decades.

Sealed runways with standard markings make excellent reference points for the Flare Cut-off, the centre lines being 30 m long.

In most cases, Aim Point 2 will be the end of the runway. Note the pilot's eye line and not the cowling goes to Aim Point 2.

the end of the runway. Note: this does not mean you must do it within four seconds, it means your eye line should arrive at Aim Point 2 right on the count of four. Rushing a JF will result in a nasty balloon.

What you are not doing is holding off. The JF flare is a gradual loss of height until the wheels contact. Done right (or even slightly wrong) the landing is generally smooth, which both plane and passengers will thank you for.

And the beauty of the JF is that instructors can give exact feedback rather than vague mumbles about judgement that can't be quantified.

Booby traps

Although the JF is fairly straight forward once the distance between Aim Point 1 and the Flare Cut-off Point are established, converting over to Jacobson's technique from conventional teaching has some booby traps.

Swapping from using secondary effects to primary effects of controls on final is not as easy as it sounds. The tendency is always to revert to embedded training when the picture out the window starts to resemble a Picasso painting. It will take discipline to think backwards until such time as it becomes automatic. Patience, perseverance and practice are the keywords here.

The second big no-no is the flare transition. Some of you will have worked out that using the JF means you start to ease the stick back higher off the ground than you do using conventional landings. This is why you must use all four seconds to get your eye line to Aim Point 2. If you snatch back on the stick, you have only one option: go around. You'll be slowing and ballooning, and not within a cooee of Earth contact. There's not a whole lot to like about that scenario.

Resistance

The Jacobson Flare is simple and based on rock-solid mathematics. Jacobson himself used it throughout his flying career and it has been the saviour of several heavy-jet pilots who just could not get it together any other way. It is the only landing technique that identifies the issues, resolves the problems and answers the five critical questions.

Why, then, has it not been adopted as the standard, industry-wide technique for landing?

When asked, a serving heavy-jet pilot had this to say about the airlines' attitudes towards the Jacobson Flare.

"If student pilots were taught the correct technique for assessing rate of closure to the ground and how to feel the aircraft through the flare, then there isn't a problem. Flying an aircraft is more than just being a mechanical machine behind the wheel, otherwise we might as well get monkeys to do the flying or, worse, an autopilot!

"The JF had a lot of adverse criticism from various parts of [airlines] over the years with proponents and opponents with most people coming back to what Boeing and Airbus preach."

There's the crux of the issue: resistance in the airline industry to go against what the manufacturers recommend as official practise. But what of general aviation?

Most likely, despite all of David Jacobson's efforts, the JF is suffering from a lack of exposure in GA; many pilots have never heard of it, and many CFIs are reluctant to change from established thinking.

And that established thinking is enshrined in the CASA Flight Instructors' Manual (2006), which states that the student should be taught to use power to regulate the angle of descent. As this contradicts the JF technique, it is clear that David Jacobson's quest to change the aviation world has a long way to go.

Which is a shame, because there are a lot of pilots out there who might find landing a lot easier than current teaching permits it to be.

This article is not intended to be an instructional feature. Pilots wishing to try the Jacobson Flare should talk with their flying instructor first. More information at www.jacobsonflare.com