



TWO Reds, TWO Whites Flying the Perfect ILS



Hints and tips gleaned from years of flying

Instrument Landing System approaches – the cornerstone of safe all-weather operations.
By James McBride

It is often said that the perfect flight doesn't exist and yet those of us in the commercial world are encouraged to aim for perfection at every level of our flying. Perhaps that's the answer to the question "Isn't airline flying boring?" I always wonder at this one, and after much thought have determined that this question is only really ever asked by people who have never done it. There really are so many variables that no two flying days are alike, even on the same route in similar weather – and this is the key. In the same way that some professional comedians talk about looking for the perfect joke, I think most of us airline pilots are ultimately in search of the perfect flight.

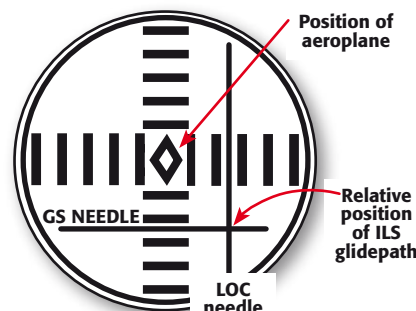
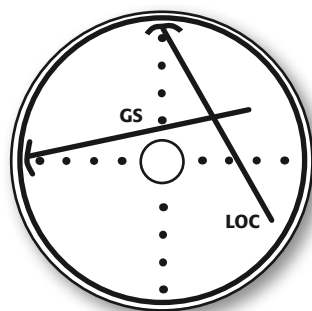
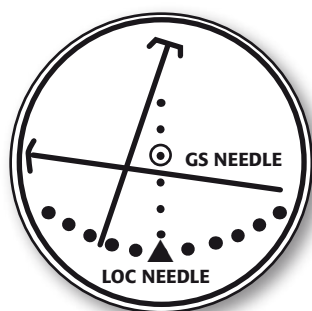
The ILS, or Instrument Landing System approach, has been around for sixty years or more and, together with flying on instruments itself, is still the cornerstone of safe and regular

commercial flights in all weathers. Precise radio beams from the ground are aligned with the optimum approach path for the runway. These are received by the aircraft and used to guide the pilot by displaying on his or her instruments any deviation from the ideal. Sounds easy? Well it is not. It can be a challenge even to the most experienced aviator.

The autoland system in all the larger commercial aircraft uses the same radio beams: in my view the perfect ILS is flown by the autopilot all the way to touchdown and monitored by two committed professional aviators who ensure that the system meets all the performance parameters as designed by the aircraft manufacturer, but of course that's not the whole story is it? The secret of flying a really good ILS approach starts miles away from the airport, even before you take off. Assuming you have



It's a relief to see the runway emerge from the gloom, even when its a sim you are flying



Left: over the years there have been many different analogue instrument presentations of the ILS

checked that the ILS is serviceable and available and that you have the required approach plate for the airfield then you have to consider the weather.

Analysing the weather

Really close analysis of the forecast weather conditions at the destination airport at the expected time of arrival is going to reveal several important facts. Firstly cloudbase – how close is it going to be to the minima? Will a go-around be likely or airborne holding a possibility? More fuel will then be needed to account for this. Time spent here at the planning stage is never wasted: ensure that you study the approach plate carefully, especially if flying single crew. Many years ago one of the pilots at the air taxi company where I worked returned from Gatwick having just done an approach there in bad

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weather. It was a localiser only approach (no glideslope) in a light twin and he got in even though the BA flight ahead of him and the Air France behind both went around! From our subsequent discussion it turned out that he didn't know what minima to use for the approach when the glideslope was unserviceable – very scary! So the message here is know your minima and stick to your guns, anything else could result in tragedy.

As part of the weather analysis, the wind plays a big part in how to fly the ILS approach. Remember it decreases and backs in the latter stages of the approach so it is necessary to take this into account when planning what heading will hold the localiser. The drift will be different at 2,000 feet compared to 200 feet on final. The aircraft groundspeed will reduce between the 'last platform altitude' (possibly 2,000-plus feet AGL) and short finals; therefore it will be more

susceptible to drift on short finals as you slow down. Planning for this in advance will make the flying of the approach much more accurate once you start to fly it, regardless of the aircraft type.

The groundspeed becomes a major consideration when deciding how much power will be needed on finals to maintain the three-degree glideslope. In the case of a 25 knot headwind with a single engined aircraft, this could result in a final approach groundspeed of only 60 knots. Using the time honoured 'five times groundspeed' calculation this would require a rate of descent of only 300 feet per minute as opposed to 450 in still air. The same principle applies to piston twins, turboprops, executive jets, airliners and even the Airbus A380 – it's all a matter of applied physics. It doesn't take a genius physics boffin however to make a

plan of the required vertical speed to scan during the approach in advance – just a thinking pilot staying ahead of the aircraft.

Think about technique

Now we can think about technique. We are talking about manually flying the approach here, more of the automatics later. 'Selective radial scan' is what the best instrument fliers use to control the aeroplane while operating in IMC. This means using the principle of the Attitude Indicator as the master instrument. Most of the pilot's focus is on the master with glances outwards (radially) to check the other performance and control instruments such as ASI, VSI, power setting, heading and of course the ILS needles themselves. It may not have escaped your notice that the ILS needles come

last on the list, because if all the rest is correctly set up and monitored, then the aircraft flightpath should follow the ILS as if it is on rails. It is possible to fly a very accurate ILS by chasing the needles; but that's all you will be able to do, you will have nil spare mental capacity for managing the rest of the flight safely. The SRS technique means that you will be able to think and fly at the same time – very important especially if you are flying the approach manually on your own.

Minimising distractions is an important aspect of the management side of things. For example, you should get into the habit of simplifying your R/T so that only the really key words are transmitted – when handed over to Tower frequency, keep it short and precise. If the Tower clears you "G-XX Continue only. Expect late landing clearance", your response should simply be, "Continue, G-XX". Reading back just the proword is essential for two reasons, it keeps the frequency clear of surplus transmissions and ensures that you as the operator are not distracted from job one – flying the aircraft!

As part of staying ahead of the aircraft, most of us preset the next expected radio frequency in the standby window ready for a one switch change on handover, when going from one ATC agency to the next. There is a time when this is not a good idea and that is on final approach when you are talking to Tower – always have in mind that a late go-around may result especially if you are not visual at Decision Height (Decision Altitude if flying a QNH approach).

In the event of a go-around the one frequency which you will need in a hurry is that of the Approach controller. There is no rush to chop to Ground control after landing when moving at only 20 knots or so, contrast this with the situation during an unplanned go-around when you are working quite hard to operate the aircraft systems and you are climbing/accelerating towards 200 knots at the same time!

One memorable approach

Having said at the beginning, that in my view the perfect ILS is one flown by autopilot, being monitored and operated by the human element in the cockpit, you could be forgiven for thinking that all automatic approaches are the same, you would be wrong. The circumstances surrounding each approach make some more perfect than others. One of the most memorable I have ever done was back in 1993 while flying as a captain on the Boeing 757.

We were subchartered to operate with a callsign of 'FunJet' (where do they get these names from?) for a Spanish carrier. Our destination was Helsinki in Finland from the Canary Islands which was a flight of some five hours or more. During preflight in Las Palmas, I asked my co-pilot Rob how much fuel he wanted to take, as he was flying the sector as the handling pilot. His response took me a little by surprise because he nominated a fuel load which was a lot more than I had in mind. He had made



Looking for two reds and two whites – and coping with quite a crosswind from the right at the same time

'This was exactly what I did not want to hear; we were already committed to using them as an alternate airport and my tension level went up a gear'

a careful study of the Helsinki weather and reasoned that the early morning fog might hang around longer than forecast, so we should be prepared to make an autoland there. We had two diversion airfields on the flightplan. The first was Stockholm which was a long way away from destination and needed a lot of fuel, but where the weather was excellent. The second was a place called Turku – quite close to Helsinki, but with similar weather forecast although the last we had received was that it a viable option.

After five hours flying, we were in the descent and advised by ATC to slow down as "some holding" would be necessary. The expected frontal clearance had not arrived and the fog was as bad as ever – we would have to make an automatic ILS approach.

Our first holding pattern started at something ridiculous like 15,000 feet. Well at least the fuel burn will be less up here, I thought and I was very conscious of our fuel situation now. The controller was very busy and there were lots of flights holding for Helsinki. His words, "FunJet XXX, take up the hold you are number 21 for approach!" did not instill any confidence that we would be arriving in Helsinki any time soon. As Rob was flying the aircraft, I was busy with the electric slide-rule, calculating and recalculating the fuel situation.

We had been holding for some fifteen minutes and were about to go below minimum fuel to make Stockholm in the event that we had to go-around – it was decision time. The air

traffic controlling was very efficient and soon we would be able to make our approach. The weather was right on the minimums for an autoland, (in Category 2 conditions – 100 feet Decision Height on the Radio Altimeter) with fog and low cloud. It had been snowing earlier, but the runway was reported clear.

Checking with our only alternate

I decided to just check with Turku, now our only alternate to see if they had received any aircraft in from Helsinki, "Off the ATC frequency Rob, I'll just check the Turku latest weather". The response from Turku was not good. The weather was right down to the limits now and they replied, "No we have not received diverting aircraft from Helsinki, but some have diverted from here!" Ouch! This was exactly what I did not want to hear; we were already committed to using them as an alternate airport and my tension level went up a gear. I thought to myself either way this is going to be *very close*.

As we left the hold with radar headings for Helsinki, the controller advised, "You have 40 track miles to touchdown..." Phew, not even a shortened routing for us – we will have to delay putting flaps out and gear down to save fuel, I mused. Rob was well up to speed with the aircraft and was handling the automatics with assured competence.

All the time, I was thinking to myself, if we don't get in from this approach it will immediately become a Mayday situation, as we

Boeing 757 EHSI in 'Full' ILS mode, with complete compass rose visible, DME (top left), actual wind (bottom left) and indicating the happy position of being both on centreline and on glidepath

had minimum fuel reserves and our only possible alternate airport had poor weather down to minimums...

The aircraft locked on to the ILS beam exactly and flew down the glideslope with real precision. "One thousand feet..." nothing seen, complete clag outside. "Five hundred feet..." still nothing to see outside, I am nearly holding my breath now willing the fog to clear.... "One hundred above..." "STILL NOTHING!" Oh *please*... "Decide?..." – *fantastic, two reds, two whites – we're visual*,

"LANDING!" I all but shout the executive command as I take control for the touchdown on the frozen runway.

The main gear touched down in just the right place and the nosewheels thumped all the runway centreline lights as we decelerated towards the turn-off under autobraking. "Good girl, Oscar Julie!" I said as I breathed a great sigh of relief. As the aircraft slowed to taxi speed, the computer came up with the message on the screen 'Insufficient Fuel'.

Yes – when I think back now, some 13 years later, that really was the perfect ILS. ■



Below: Boeing 757 Electronic Attitude Direction Indicator, speed tape showing 141 kt IAS, groundspeed 142, RadAlt 1,580 ft and decision height 101 – on centreline and on glidepath too!

