IFR Accident Review HB-LSD

by Vasa Babic

1. Introduction

Over the years, I have tended to write "general" safety articles for our membership, trying to identify patterns in IFR GA accidents, and a couple of key themes have emerged from this work around the risk of Controlled Flight into Terrain (CFIT), which makes up a significant proportion of IFR accidents

- For lighter piston aircraft, a common scenario for CFIT fatalities in Europe is the intersect of IMC (or marginal IMC), terrain and "off-route" or "ad-hoc" IFR

- For more advanced and turbine aircraft, the most common CFIT cause in Europe appears to be low descent in very poor weather to non-instrument runways

Both these are distinctly "European" risks. The enroute IFR system is often unavailable for light aircraft with limited altitude capabilities, and at its worst in regions with terrain that precludes convenient low-level airways – hence the "off-route risk" for light piston GA. The availability of IFR airports accessible to GA is limited in many parts of Europe, such that very capable IFR aircraft may use VFR airports as 'de facto all-weather' destinations.

Outside of these recurring CFIT accidents, my perception is that the safety record of GA IFR in Europe is relatively good. But it is far from perfect, and in October last year we discussed an accident on the *PPL/IR Europe* Forum (see https://www.pplir.org/forum/accidents-and-incidents/30203-seneca-accident-at-basel-7-dec-2016?limitstart=0) which brought together a number of instructive points I thought were worth expanding on in an article.

The accident happened at Basel-Mulhouse (LFSB) Airport on December 7th, 2016 at night, following an ILS approach to Rwy 15. The aircraft was a Piper Seneca III, HB-LSD. The pilot (sole-occupant) was killed.

For emphasis, pictures of the aircraft before and after the accident are below.

2. Fatal Accident to HB-LSD on 7th December 2016

The accident was investigated by the French BEA and a translation of their clear and relatively short report is available on the BEA website at https://www.bea.aero/uploads/tx_elydbrapports/BEA2016-0759.en.pdf.

HB-LSD departed Nuremberg that afternoon on an IFR flight plan to Basel-Mulhouse. Conditions at the destination were night IFR with RVRs near minima. The TAF had forecast 300m visibility (RVR is measured taking into account runway light intensity; at night it could be more than double the visibility) and 100' cloud base, with a TEMPO for freezing fog and 100m visibility. The actual conditions reported to the pilot on the approach were RVR 750 m at touchdown, 650 m at mid-point, 800 m at the stop end. Clearly these were demanding conditions.

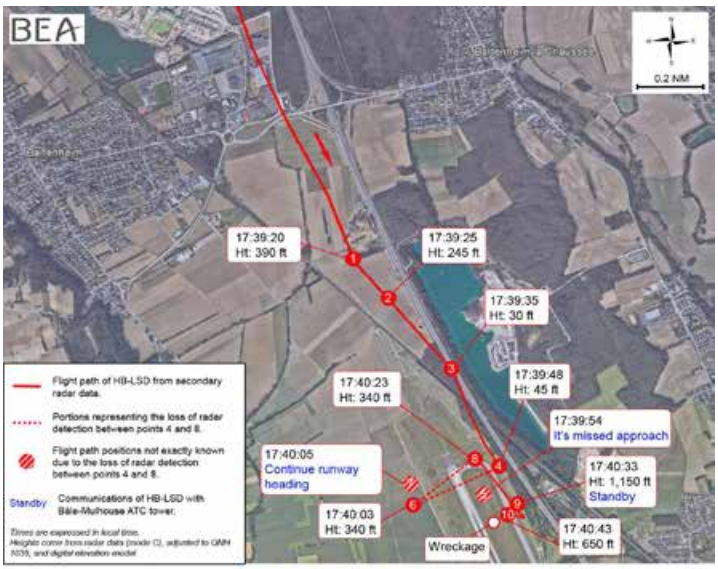
Let's look at the pilot's background - he was very experienced; he owned a Cessna 210 as well as the Seneca; had US, Swiss and South African licences, had been flying for more than 20 years and had more than 3200 hrs, with 1300 hrs of piston twin time. A year earlier the Seneca had been equipped with an approved Garmin GTN650 installation, including TAS, TAWS and Lightning Detection and an Aspen EFD1000 PFD. The pilot had revalidated his Instrument Rating six months previously, and his Examiner reported that he was "vastly" experienced in IFR and knew his Seneca very well.

Was it reasonable for this pilot to attempt this approach? I think it is reasonable, in principle, that a very experienced PPL/IR, in a well equipped Seneca, should attempt an approach to 750m RVR on a 4000m runway at an international airport with eight potential IFR alternates, including Zurich, available within 50nm.

The accident sequence unfolded in two phases:

In the ***first phase***, on the ILS, the pilot descended to a height of 390ft (point 1 below) and then deviated right about 15 degrees to intercept a major road parallel to the runway, descending to 30ft AGL (point 3). It seems reasonable to conclude that:

i At 390ft, the runway approach lights were not visible given the 750m RVR
ii Lights on the parallel road were likely visible



iii The pilot interpreted this as the runway environment and discontinued the ILS, using this erroneous visual contact to make the very low approach

Ironically, this potentially catastrophic first phase was not the fatal one. From the 30' descent point, the pilot initiated a climb and tracked slightly back towards the runway.

The ***second phase*** began abeam the threshold, between the road and the parallel taxiway. The pilot declared a missed approach and read back the missed approach instructions to fly runway heading. However, at the same time, he initiated a very rapid 360 turn to the right (at a rate 3-4x greater than rate 1) with a zoom climb to over 1000' AGL towards the end of that turn. The climb ended in a stall and the aircraft crashed near the runway 15 PAPI lights.

Whilst it is easy to believe that confusion with the road lighting was the cause of the first phase of this accident, there is no particular evidence for anything other than disorientation causing the final phase of manoeuvring that led to a stall.

3. Could it happen to you?

My default answer to this is "yes" for most accidents. Excluding the more extreme examples of recklessness, most accidents happen to sensible pilots through unfortunate errors and circumstances that they would "not reasonably expect". But they do happen and they could happen to any of us. The value of studying a report such as this is to learn or reinforce risk mitigations we may not have known or may not have been applying systematically.

Misidentifying road lighting as approach lighting at night in 750m RVR is a mistake I think is very easily done. I have misidentified the large Farnborough Airport as the small Blackbushe Airport nearby in perfect day VMC, despite being very familiar with both. Our minds can see what we expect and then lock on to that false picture model despite a succession of contradictory visual cues unfolding.

An aircraft on a 3º glideslope at a 200' DH is about 900m from the threshold. Most of us are familiar with the sight picture as we break cloud (in the aircraft or in a simulator) in reasonable visibility – you see the runway in front of you in its entirety. With an RVR of 1km or less, you do not really see the runway at DH, it may be just the centreline and the first two or three cross bars of the approach lighting system.

Ironically, the most common training exercise we do in IFR, an ILS to DH minima, does not help much in the most difficult ILS scenario – when RVR is near or at minima. In training, the "hard part" we focus on is accurate instrument flight to DH, then the "easy part" is to look up, see the runway and land. In low visibility, the instrument flight phase to DH is no different, but the harder part is looking up to see an unfamiliar partial sight of a lighting system and then safely continuing to land. One of the most challenging tasks an instrument pilot can face is one we never really practice, so I think that failing to distinguish one partial lighting picture (the approach lights) from another (a parallel road) which is closer and more prominent is a mistake I think many of us could be at risk of making at the end of a demanding night flight.

Looking at it in isolation, the second phase of this accident, the disorientation, steep turn, zoom climb and stall during a missed approach, is perhaps "less expected" in an experienced instrument pilot. It is something most of us would hope not to do. But if ever there is a time one may be liable to this kind of disorientation, it must be following the stress of a near-death experience like descending to 30' above a road.

4. Risk Mitigation methods

Having concluded that this accident is very much a "it could have happened to me", I do think there are a series of SOPs that we should apply in low visibility approaches that could sensibly mitigate the risks the HB-LSD accident illustrates.

4.1 Personal minima

I do not like writing about personal minima, because they are so individual and situational. I also believe that PPL/IRs train to operate to IFR minima and if the right boxes are ticked (proficiency, currency, fitness, aircraft serviceability, prudent planning, reserves and alternates) then we should be able to fly to them. But flying to RVR minima is a task which mainstream GA training gives us only limited preparation for. It is just different and more difficult and even more "unforgiving of error" than anything else we do, and it is something a qualified and current IR holder should treat with considerable caution unless they have some recent experience or training in lower visibility. In terms of aircraft equipment, the IFR we fly is very inclusive – a full glass panel is nice, but there is little you cannot do with basic analogue instruments and a Garmin 430. RVR to minima is more demanding – it needs a dependable,

coupled autopilot and flight director; legally below 800m and practically I would say to 1km or more.

If you don't use "Personal Minima" and/or SOPs, make an exception for approaches in low visibility and develop your own.

4.2 Stable approaches

The strict criteria used in the commercial world for stable approaches are not obviously applicable to a light aircraft. Landing a fast, two hundred ton, airplane from 200 ft is different to landing a slow, two ton, one on the same runway. I have flown some pretty ragged ILS approaches, where I have struggled to keep the needles centred but in good visibility I have never had any difficulty in landing safely from an ILS DH. This 'good enough' standard for the IR test (needles half-scale deflection, able to land safely from DH) *is not good enough for an approach to RVR minima.*

Because the visual reference is so limited and unfamiliar in low visibility, there are some very real risks in the visual phase after DH:

- Instinct and optical illusion can cause you to 'dive for the lights' and descend below the glide path or it may (it is happened to me) cause you to hesitate and level-off when you should be continuing descent.

- Any track error or drift angle or wind change can cause disorientation more easily when "visual" is only a murky light pattern.

- Our instinct to seek and identify expected visual references, in a pressured moment, can lead us to misidentify and 'lock on' to road, car park, apron and taxiway features and/or lights as 'the runway'.

Because this list of potential errors is so comprehensive, the safest thing to do at DH if you become visual is……absolutely nothing……as long as the approach is aligned and the aircraft is trimmed and stable. If you are stable on the ILS, continuing on that stable path assures you are not following any false instincts or visual cues, until (say at 100 - 150 ft) the runway environment is much clearer and confirmed. If you are not stable, it is inevitable you need to correct - but the cues available for that correction are confusing and subject to all the errors listed above.

If an approach to RVR minima is anything other than fully stable at any point near, at or after the DH, you must go-around

As you become visual, do nothing….other than go-around if appropriate.

4.3 Use of Autopilot and Flight Director to DH

The most reliable way to assure a stable approach is to use a dependable coupled autopilot and it is a legal necessity below 800m. Whilst you have to disconnect the AP at its minimum use height, you should continue to have FD guidance available in the visual phase. An approach to minima is not a time to be practising hand-flying and raw data skills. It's also not something to try with an erratic old autopilot.

Use all the automation available to you in full during an approach in low visibility

4.4 Instruments until DH and cross-check after DH

In training, we are taught (rightly I think) to stay on instruments until the DH and then to make a distinct transition to visual flight and not to continue with a mix of the two. I think this is right for a "normal" ILS.

In low visibility, I think it is doubly important to avoid looking up before the DH. RVR reports are very current and very accurate. If the RVR is below 1000m, you will not get any useful cues before DH. At best, such cues might be disorientating, at worst, fatally misleading. The HB-LSD accident is the clearest possible example of this risk. If you look at the BEA diagram above, the pilot began his "visual phase" from 150 ft above DH. At this distance and with the reported RVR, it is likely none of the approach lights were visible. What was visible was the parallel road that was much closer, although a little offset from track.

I think it would be difficult to distinguish between the pattern of lights on a road and the lights on a runway in night and in low visibility. By being stable on the ILS and ignoring visual cues before DH you eliminate that risk. If you are on track and on glide at DH, the Approach Lighting System is not something you could easily ignore in favour of a road half a mile abeam of you. The entire approach environment is designed with this in mind! But it doesn't work 100 ft, 200 ft or 300 ft above DH, as this accident shows. Of course, this is a very specific and unfortunate situation – but it is not a unique scenario. A lot of airports have long straight roads parallel to the runway, and a lot of others have roads or aprons or carparks in the undershoot. Misidentifying and locking onto the wrong visual cue almost never happens on the ILS at DH – but it can easily happen in the last phases of the ILS before DH.

Do not look up or be distracted by any visual cues before the DH.

After the DH, the visual landing is not easy in low visibility. It is tempting to say that, given you are stable, aligned and visual, you should transition entirely to visual flight. I do not think that is right for two reasons:

- Firstly, the right thing to do at DH is nothing. The aircraft should be trimmed and stable. If it is not, go-around. If it is, you should have the capacity to look down and monitor or cross-check instruments – at least for the next 10 or so seconds until 100' AGL.

- Secondly, there is a risk of visual misjudgement even with ground references and after DH. It is very easy to misjudge how you continue on the visual glidepath (the PAPIs will likely not be visible at DH in RVR below 1000m) and if there was a drift angle on the ILS, it is also easy to be disorientated on azimuth.

So, whilst we cannot depend on the ILS for sole reference below 200 ft, the ILS and Flight Director are available for information and cross-check. If stable and your visual reference and the ILS agree, continue. If your visual cues indicate a correction in conflict with the ILS, I would go around. If at or below 100 ft AGL there is any need to even think about looking at the ILS, I would go around.

Whilst visual below DH and above 100' AGL, cross-check the ILS and Flight Director; go-around rather than manoeuvring in conflict with the ILS/FD.

4.5 Missed Approach preparation and methods

Even in initial private pilot training, I think we are taught to "expect every approach to be a go-around". This gets repeated in instrument training.

Of course, we tend to ignore this, because almost no approaches in practice end in a go-around. So whilst we stay current, practice go-arounds, brief on missed approaches and readback instructions, I think it is often a bit perfunctory in real life.

If there is one time to really expect and be prepared for a missed approach, it is in low visibility. It is not just because you may not get visual reference – if the RVR is at or above minima you most likely will (the minima are calculated given the geometry of the approach lighting system in order to assure this and the RVR is measured and reported in close to real time) – it is also because you have to be aligned and stable at DH and continuing below, should go-around if ever the approach needs more than minor corrections.

Fly a low visibility approach (really, truly) expecting to go-around at any moment.

A missed approach is complicated, and more task intense than the approach itself. Of course, in training, we are pleased if we can execute a good missed procedure, hand-flying and completing all the checks, making the right radio calls, etc.

In real-life, from a low visibility ILS, a missed approach is a critical manoeuvre. Ideally, one would have all the avionics ready to sequence, the hold in mind etc, just as we do in training. None of this matters, only the immediate actions do! You revert to wings level, pitch up and power up. Any further tasks should be done grudgingly, one by one, in a stable climb on runway heading. Just as we use the autopilot on a low-vis ILS, we should use the autopilot on the missed approach as soon as able. If GPS waypoint sequencing is not quite right, forget about it – use the AP in pitch and heading mode. If for some reason you are not using the AP, also switch off the FD – never fly with a conflicting FD indication that you are "ignoring" until you set up the GPS properly.

We should also remember that the HB-LSD incident was not a missed approach. It was an emergency manoeuvre following a near-catastrophic deviation from an instrument approach. It ended in a fatal crash, I suspect, because the pilot became disorientated due to the task load associated with transitioning to the missed procedure. I do not believe that a 3,200hr pilot, even a very stressed one, could not have held wings level – pitch up for a minute or two. But I can easily believe that any single pilot could become distracted and disorientated trying to perform all the missed approach tasks "as normal" recovering from 30' above a road.

If something does not work out right on a low visibility approach, treat it like an (incipient) emergency and do not worry about ATC or the details of the missed approach procedure until the situation is safe and stable, ideally on autopilot and above 1000' AGL.

Prior to the approach, of course it is good to fully brief MAP details like "at 4DME or 2000', which ever is sooner, turn right to track and hold at the XYZ". But in the final approach, the self-briefing mindset should be "wings level, pitch up, power up for go-around" and nothing more.

Have in mind only 3 actions for the go-around – wings level, pitch up, power up. Do not consider any other task until stable in the climb out and then only flap, trim and gear. Leave everything else until you are on autopilot above 1000' AGL.

5. Concluding remarks

We study accidents to learn from them. I have read an old saying that aviation safety lessons have been earned and paid for by the accidents of the past. Whilst accidents do not often exactly repeat themselves, accidents in the community of European PPL/IRs have sometimes shown repeated patterns, especially in the CFIT examples I mentioned above. We are a small enough community that we cannot afford to see a *pattern* of accidents. Even a single accident can be a strong signal for how we can try to manage risk and apply better SOPs and I think this is one such accident.