

Instrument Pilot

The PPL/IR Europe Magazine

IP110 • AUTUMN 2016

LIBERTY / DISCOVERY XL-2

RNAV APPROACHES

Siljan Air Park

How to take off and land!



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Chairman's corner

by Paul Sherry



On June 23rd 2016 the majority of citizens of the UK voted to leave the EU. The margin was relatively small – 51.9% to 48.1% – but nonetheless decisive. We will all have our own views on the outcome and indeed the quality of the debate leading up to the vote. But, as the UK's new Prime Minister has stated – 'Brexit means Brexit' so we are all going to have to get used to the new reality. Two questions arise – firstly, what will happen during the uncertainty of the transition from the current status quo and, secondly, what will the new relationship between the UK (if we still have a UK) and the rest of continental Europe look like?

As I have so often said in this column (and repeat here) *PPL/IR Europe* sees itself as a European organisation supporting the GA IFR pilot wherever they may be based. For historical reasons, the UK has a long tradition of accessible IMC/IFR flight. Because of the physical location of the British Isles, we are forced to contend with weather that may make VFR flight challenging. When researching this article I tried to find out when the first IMCR (Instrument Meteorological Conditions Rating) was issued. I was unable to track down the exact date but the closest I could get was the 'early 60's'. If that date is indeed correct then the UK has a 50 year history of allowing flight under both IMC and IFR rules outside Class A airspace.

Indeed I have personally recently taken advantage of that system by using it to log 800 hours IFR in the 18 years I have been flying GA. Why is 800 hours a magic number? Because with 800 hours IFR, it allows that individual to participate in the Instrument Rating Instructors (IRI) course and subject to successful completion of the Assessment of Competency, to hold an instrument instructor rating. As a GA pilot with a day job, I do not think I could have done this in any other country in Europe. Logging 800 hours of IFR flight would likely mean working as a professional pilot and there is a substantial difference between 800 hours IFR cruising in the flight levels

with the autopilot on, the sun streaming through the windows in clear VMC and 800 hours of actual IMC, operating single crew. I have been fortunate enough to own three pressurised aircraft that helped me clock up the relevant hours. But it has all been genuine single crew GA IFR – and with quite a lot of real IMC experience. Indeed I am grateful to a very forward-looking IMC instructor who on completion of my IMCR in 2000, encouraged me to carefully log IFR and IMC time. "You never know when you might need it" – and he was right. In 2000, with a newly minted IMCR on my UK CAA licence, I had no idea that I may one day have ambitions to become an instructor. I only started to think about adding an instructor rating to my licence in 2014 and had to wait until 2016 before I had 'ticked the 800 hour IFR' box.

PPL/IR Europe sees itself as a European organisation supporting the GA IFR pilot wherever they may be based

If I was to repeat getting an instrument rating for GA use, then I would seek out at least some instruction from someone who had real world GA IFR single pilot experience. While there are many excellent instructors who have logged 800 hours IFR in the commercial environment, I would argue there is a big practical difference to logging 800 hours IFR multi-crew, in the flight levels with the autopilot engaged and logging 800 hours single pilot, sometimes having to work quite hard to keep the aircraft sunny side up and roughly where air traffic expect you to be. So, an encouragement to you all – if you have any ambitions whatsoever to share your GA knowledge and experience as an instructor, keep that logbook up to date and accurate. One final point – in the days before EASA, the UK CAA would allow 1 hour of genuine IMC to count for 4 hours of IFR. A UK pilot could therefore apply to become an IRI, subject to satisfactory completion of the course, with 200 logged hours of 'operating the aircraft by sole reference to instruments'. This was much more

achievable than the 800 hours IFR limit which came in with JAA/EASA. *PPL/IR Europe*, working through our contacts at EASA, is seeking to have the 1 to 4 hour rule re-instated by EASA. We may yet achieve this goal and open out the options to many more GA pilots to become IRI's. So get logging...

Returning to my original theme of the impact of the Brexit vote, it is already being asked by some within the GA community of how should the future relationship with aviation in the European context be shaped? This is not a topic just for 'Brexiters' or even just for British pilots. It is likely to affect us all including that large subsection of our membership that operate their aircraft under IFR within the boundaries what may be described as continental Europe. Some pilots might be tempted to

think 'let the British go off and do their own thing if that's what they want'. An understandable conclusion and I have personally not yet thought through all the possible implications. But I can assure you that it will be an

ExCo agenda item for our next meeting in October. Why I am concerned is because of the long history of the UK with IMC/IFR GA flight, the UK GA IFR community has much experience and to share with our partners right across Europe.

Many of the positive changes we have seen in our particular area of operations have been proposed and pushed through by the UK GA IFR community – indeed many proposed by *PPL/IR Europe*. The CB-IR process and the conversion of an ICAO compliant third country IR to an EASA IR are examples. We have had other small but notable achievements on the European stage, including the retrospective AML STC on the Garmin X30W GNSS navigators. This has saved several pilots thousands of Euros. The only country in Europe that has shown any interest in GNSS approaches outside controlled airspace is the UK CAA, documented in CAA Publication CAP1122. I know we are still making glacial progress but progress is being made and we have a positive and professional working relationship with the

UK CAA. The GA department, headed up by Tony Rapson, has shown itself receptive to new ideas where many other NAA's have yet to be persuaded. Much of the Part-M Light changes were proposed from the UK. You can surmise from the general tone of this discussion that I feel there is more to be accomplished working together than apart. I know we all like to 'EASA bash' but there have been some positives. For example on the subject of STC's, we now do not have the crazy situation where an STC is accepted in country A but not in country B. And, where there is a regulatory topic to discuss, we only have one regulator to discuss it with. The role of the NAA's should, in principle, be limited to audit and oversight.

I am not arguing that EASA has suddenly changed its appearance overnight and should now be embraced. There is still much to do and we can never give up trying to change things for the better. But a likely result of uncertainty will be paralysis and lack of decision making and we can ill afford that just when nearly five years or more of careful reasoned argument is beginning to have some effect on the GA community.

For those in the GA community in the UK whose passion for aviation can be fully met operating within a single state, then I understand why there may be a demand to 'go it alone'. And it may be appropriate for that to be respected and facilitated. But the GA community has very broad interests and will never be completely united in its views. *PPL/IR Europe* members regularly use their aircraft for 'purposeful transport' and routinely cross state boundaries in achieving that goal. We can now train in different countries and have equivalence of recognition. We can have our aircraft maintained and/or upgraded in different EASA countries with relative ease. Manufacturers of equipment for GA aircraft have one regulatory authority to deal with so I argue that, for some GA communities, a unified European regulator is on balance a benefit. ExCo will discuss this carefully at our forthcoming meeting. Presently there is an ongoing poll on the forum that will inform our decisions. But please, if you want to express a view (whether it be a brief comment or a longer discussion), then feel free to email me at chairman@pplir.org. Unless you share your views then we won't know what they are – and we will have to make an educated

guess....!

Other items of interest: - Aero Expo Sywell happened over the weekend of 1st to 3rd July. The weather was a little mixed and on the Friday I was quite glad that we were in our usual spot at the back of Hangar A – nicely protected from the wind and showers. But the weather steadily improved as the show progressed and Sunday was a good aviating day. We had a good team on the stand – John Dale, Peter Geldard, Alan South, Jim Thorpe – to mention but a few – supported by Sali Gray (and my apologies for not naming anyone else who came and stood shoulder to shoulder with us all). I was pleasantly surprised at how many new people joined as Sywell has a very mixed pilot attendance. John Dale and Jim Thorpe's attendance was a bonus as many people had training related questions and so we had both instructors and examiners on hand to give definitive answers. We had good conversations with many pilots – some with aspirations to become an IFR pilot, some with IMCR/IR(R)'s who were just starting out on their IR journey and some IR pilots who have never heard of us. Yes – there are quite a few!

PPL/IR Europe members regularly use their aircraft for 'purposeful transport'

ExCo remains very conscious of the costs of attending Aero Expo Friedrichshafen and Aero Expo Sywell and it is a notable part of our annual expenditure. There may be some members who feel that it is a jolly mainly for ExCo members. If you are one of those people – and it is a fair question that deserves a reasoned answer – then let me assure you that the team work extremely hard. Before I got involved with both Friedrichshafen and Sywell, I had never appreciated the work involved in setting up a stand at a 'trade show', standing there all day (Friedrichshafen is 09:00 to 18:00 – they are long days) trying to persuade perhaps slightly skeptical passers-by that you are not there to sell them something (well, actually we are – but arguably they get more out of the £75 membership than it costs them if they use it to the full) and then packing up the stand at the end and travelling home. Logistical planning for Friedrichshafen starts in January and takes multiple conference calls. Yes – a few beers do get consumed in the evenings but I can only say that I come home exhausted and then have to go back to work the next day.

But unless something changes then, as the current chairman, it remains my view that if we want to promote IFR for GA and recruit new members, then you have to get out there and talk to people.

On the subject of *PPL/IR Europe* events, a huge 'thank you' to Colin Williamson for the excellent organisation of his first *PPL/IR Europe* weekend fly out to Luxembourg over the weekend of 15th - 17th July. The weather was kind to us and we walked a lot and learned about Luxembourg. The food and wine was excellent. In fact 'too' excellent – I had to recalculate the W&B when getting back to the airport. Note to self (and Colin) for next time – generous breakfast + 3 course lunch (and wine) + 3 course dinner (and wine) in need of modification, please. But for those who didn't come then you missed a great weekend. We are already thinking about options for next year. There may be an appetite to possibly re-instate the longer tours so one suggestion was to start with a weekend city break for those who could only make the weekend. But those who could make a whole week would use that as a jumping off point for the rest of the week. Watch this space...

By the time you read this CRM 3 will have probably happened at Hawarden on 24th September. The interest in this has been strong for CRM1 and CRM2 but, at the time of writing, there are still some places for CRM 3. If Instrument Pilot pops through your letterbox or into your email in-tray before the above date and you are interested (and I strongly recommend it) then please go to the Events section of our website or contact our meeting secretary Colin Williamson – meetings@pplir.org.

On the subject of meetings, Anthony Bowles and Alan South are running a Weather Day 2 – on Saturday 28th November in London. Again the first was excellent (slightly thwarted by the weather!). We felt London in November was a good option and accessible for many by train as the meeting will be held at Matthew Lavy's chambers in Pump Court, Temple. More details are on the website.

Here's hoping to see you either at Hawarden in September or in London in November.

Best wishes,

Paul Sherry
Chairman – *PPL/IR Europe*



Editorial

Summer in Europe and the UK has been mixed; there has been a fair amount of fine, sunny and warm weather interspersed with unsettled spells of thundery weather making GA flying conditions more challenging. As we move into the autumn, we frequently enjoy periods of more settled conditions in September and October with benign flying conditions once any early mist and fog have cleared. May it be so this year.

This edition of Instrument Pilot includes a review by Jean-Michel Karr of his Liberty XL-2, a remarkably versatile aircraft suitable for both instrument training and touring. There was an article by another member on his Liberty some years ago; Jean-Michel has orientated his article specifically towards its use as an instrument trainer. Timothy Nathan lectured on RNAV approach techniques to a wide audience range in the late spring and early summer and has provided a shortened write up of his lecture material for an article on this subject. There are now a large number of RNAV approaches available especially in mainland Europe, much fewer alas in the UK and you may have already be familiar with them; however, Timothy describes each type of RNP approach in

detail and highlights points of technique which you may have not fully considered. With RNP approaches becoming mandatory in August 2018 for all IR initial and renewal/revalidation flights, it is essential reading, demystifying what is a complex subject. Next in refresher mode, Jim Thorpe takes us back to basics with some thoughts and advice on takeoff and landing techniques.

Turning to travel, Russell Myles reflects on balmy summer days at Siljan Air Park in Sweden. You may not have even considered visiting Sweden, let alone buying a house on an airpark but after reading this article, at the very least, a flying trip to Sweden is a must. The very successful PPL/IR Europe social weekend outing to Luxembourg in mid July is written up by Per Rannerries. Finally, this issue's "Weekenders" article describes one member's trip to a European capital city, within easy reach of the UK mainland, boasting fabulous culinary (dried ants apart) and cultural experiences with many superb tourist attractions. A destination that should be on everyone's bucket list.

In a corrigendum to the editorial for the Summer IP, David Weston has pointed out that there are a small number of EASA registered Silver Eagles. Our apologies for missing this.

We had a different quiz in the Summer IP on the subject that a photograph never lies. Formerly, this may have been true but in these days of Photoshop and other image manipulation software, no longer. The photograph on the front cover (shown on the page opposite) in fact consists of two photographs; the first (bottom half of the picture) was a cockpit view during vectoring for an ILS approach at Accra Airport (the DME shows 14 miles to run) while the second (top half of the picture) was taken very shortly before landing. Many thanks to those members who emailed us their answers but there were actually quite a number of giveaways - the altimeter reading 4,400ft while Accra is at sea level, the HSI indicating a large 'fly right' command while out of the window, the aircraft is perfectly aligned with the runway and not least the airspeed indicator apparently indicating 158kt on short final - if this was right, then the pilot would certainly require corrective training in landing technique from Jim Thorpe!

Anthony Bowles
Phil Caiger
Graham Whittle

September 2016



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New Members

PPL/IR Europe extends a warm welcome to new and re-joining members

Deepak Mishra	EGSX	UK
Markus Kirchgeorg	LSZS	Switzerland
Christopher Bishop	EGSC	UK
Michael McGowan	EGKB	UK
Paul Brownell	EGTR	UK
Hamish Simmonds		UK
Piers Smerdon		UK
Roger Flavell		UK
Stuart Pink	EGKB	UK
Nicholas Lipczynski	EGKB	UK
Dean Arnold		UK
Neil Scarborough	EGBT	UK
Karl Hunkeler	LSZG	Switzerland
Andrew Johnson		UK
Chris Edkins		UK
John Sinnott		UK
Malcolm Smith		UK
Lee Robinson		UK
Yogesh Mehta		UK
Charles Drayson	EGBW	UK
John Wood	EGBP	UK
Ian Ilsley	LFMD	
Daniel Lassiter	EGLK	UK
Geoffrey Burning		UK
David Topp	EGBT	UK
Robert Godfrey		UK
Andrew Turner		UK
Paul Bishop		UK
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Front Cover of the IP109
Summer Issue



Golze Engineering

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Siljan Air Park

by Russell Myles

In the forests of central Sweden next to Lake Siljan is the small airfield of Siljansnäs (ESVS). It is not very big, with just 850m of hard runway and a parallel 850m of grass, is daylight only and just has an air-to-ground frequency; no radar, approaches or ATC. It is however a great place to visit and if the weather means you need to exercise the privileges of your IR to get there then the nearby airfields at Mora and Borlänge both have ILS.

Siljansnäs is a lovely place to visit and has become a preferred destination for pilots touring central Sweden. It has one distinctive feature which sets it apart from almost all the other Swedish airfields. It is not the flying club, although that offers gliding and powered flying, a regular social calendar and a fantastic fly in and airshow in early August. It is not the flying club sauna (every flying club should have a sauna!), the guest cabins or

jet all over the world lives about 30 miles north of Charlotte in North Carolina. Danny's airpark house is his home and his chipmunk is for fun. Here in Europe it seems that airpark homes are more likely to be second homes, used for holidays and the weekends. The Pilot article's author found the Vendée Air Park to be very quiet, with only a few people in residence at the time of visiting. We found the same when we took time to visit Siljansnäs in late May. Beautifully

the car for hire. It is not the ever-helpful Ingmar Lind who runs the airfield. It is not the fact you can get both avgas and mogas from the pumps. It is not even the "Flying Brewery", located in the castle like building abeam the runway mid-point. No, the main thing you notice when flying in is the village at the northern edge of the airfield. With taxiways and hangars! Siljansnäs is home to the Siljan Air Park, the most northerly airpark in Europe.

The airpark movement in the US is well established and thriving. The variety is huge, from two lines of houses either side of a grass runway to the other end of the scale at Spruce Creek in Florida, with hard runways, instrument approaches, a dedicated real-estate office and everything from single-seat ultralights to bizjets using the field, with a bunch of warbirds and "normal" aircraft thrown in for good measure.

In Europe there is much less choice when looking at airparks. A couple of plans were floated for airparks in the UK but they did not get very far when faced with planning laws, NIMBYs and less-than-understanding councillors. Over the channel in France, with a much more positive attitude to general aviation from local government, the choice expands. A short hop from Le Touquet at Verchocq is Aero Delahaye and the Atlantic coast is home to two airparks developed by the same team - the Vendée Air Park and Atlantic Airpark. There are several others scattered about in various stages of development.

An article long ago in Pilot magazine about Vendée Air Park highlighted one major difference between both sides of the Atlantic; in North America airparks tend to be residential, with people living there full time and commuting – a friend who skippers a wide-body

situated near the shore in an area of rolling hills, forests and lakes, it is surrounded by forests, wildlife and scenery and is just a very relaxing place to be.

The airpark started around 2005 but the airfield has been around since 1959 when "Toffe" Tolförs landed in a field at Siljansnäs for the first time and he was airfield manager for many years before handing over to Ingmar. Toffe lives in the village but also has a house at the airpark and is the "go-to-guy" – if you are away for a month or two and need your grass cut, he is the man. If you are coming for the weekend and need your heating turned up a day or two before, call Toffe.

Toffe does not do all the grass cutting though. While wandering about we saw movement in the distance, which turned out to be an automatic lawn mower! Quite a few of the houses have them, little wheeled things which seem to wander aimlessly about the grass.

A hundred years ago you could not programme your mower and flight was in its infancy. The museum at the airpark is located in the castle; this year it only opened on the fly in the weekend of "Kräftstjärtsvängen" but Toffe does occasionally show people round. The exhibits are mostly from the history of flight in Sweden, with several being borrowed from the Technical Museum in Stockholm. Of the old engines and aircraft, the *youngest* is from 1917. Hanging from the ceiling in the upper level are two aircraft by early Swedish designer, E Thulin. The Thulin 'A' is a copy of

a Bleriot; it still has a certificate of airworthiness and has flown in the last few years; the Thulin 'B' was his next aircraft (and his first "own" design) - a biplane on floats. Various engines and bits of aircraft are displayed, including a balloon basket, a cockpit section and cylinder heads from WW2 fighters. Also hanging from the ceiling is an engineless Fokker DR1 Triplane replica in aluminium.

The castle-like building housing the museum used to be the site of the "Biggles Café" – the café is no longer but part of the building has been taken over by a brewery, so it is OK! And you can still get a coffee at the club if you need to. The Flying Brewery is run by one of the airpark residents and produces a range of beers to "aviation standards". Toffe gave us some samples, which we took back to our holiday cabin for scientific research purposes - they were very drinkable.



The museum also once housed the Siljan Flying Circus which used to operate replica WW1 fighters. These were built as part of a scheme called "School at Work", where youngsters who had left school early were given a chance to get started again and hands-on aircraft construction formed part of the schedule. A Nieuport and Fokker Eindecker were among the end products of this admirable scheme and they formed the basis of the Flying Circus. Today the aircraft sit in a hangar needing a little bit of TLC to get flying again. Having just bought an SSDR microlight 80% replica Fokker Eindecker as a low-wind warm-day toy, we spent some time taking numerous photographs for comparison.

According to KSAK, the Royal Swedish Aero Club, the annual fly-in and air show at Siljansnäs on the first weekend in August is the country's biggest. 2015 was its 26th year and featured displays by a Swedish Air Force Gripen fighter, formation RVs and a C130. Even if the Flying Circus is unable to fly these days, there are plenty of flypasts and parked aircraft for the public to see and enjoy. The flying club puts on shuttle buses for the village residents: just

one example of engagement with the local community which has also included model aircraft design and build competitions for local youngsters. The flying club served breakfast Saturday and Sunday, with typical fly-in food but the yearly highlight is the crayfish party which takes place after the Kräftstjartsvängen. This involves a stream of aircraft flying around the southern end of Lake Siljan, via Rättvik, the "Dalhalla" concert hall, in a giant abandoned quarry and the local town of Leksand. We were puzzled as to the name, which roughly translated means crayfish tail turn. The mystery was possibly cleared up when we met local estate agent, Ragnar "Ragge" Valin, who said the bottom end of Lake Siljan looks like a crayfish tail. Personally I think it looks like a cat but you know those crazy Scandinavians...any excuse for a party

Right: Flying club BBQ

Top Left: Swedish Air Force Museum

Centre: Museum exhibits

Bottom: Mass fly out!



and the crayfish party is a traditional summer event. This one just has added aircraft.

Ragge showed us one of the houses for sale. There are several houses up for grabs and a few plots still available. One plot for sale has foundations already installed and there is also a hangar on two



plots combined; just add house! If you do want to do that there are a few rules. Houses are required to have an outer surface of wood. How this is done varies; some have cladding and some are made of logs. Roofing material should be of reddish colour. There are a few more restrictions; nothing too onerous or restrictive and the result is a variety of houses and hangars from the small wooden “stuga” through log cabins to a large one with a little control tower feature on the roof (that one is for sale). The plots are laid out so that the roads and taxiways do not cross each other – no “Give Way To Aircraft” signs here.

In terms of the airfield and flying in, there are a few rules to avoid annoying the locals. Air traffic is basically day only and should arrive by one of three reporting points: STORÖN, ÅKMYRAN or SILJAN. Circuits are to the south of 14/32 and “advanced flight” with powered aircraft must not take place within 5nm so take your aeros away a bit.

Anna, one of the British owners, says “Flying in Sweden is always very uncomplicated”; she even owned an SE-registered amphibian for a while. Siljan Air Park is quite close to the edge of the “Mountainous Area” where there are a few extra rules for single-engine aircraft. Mostly common sense safety stuff like filing a flight plan, carrying maps of the area, having suitable survival equipment, signalling equipment and appropriate clothing and aircraft markings. There is no need for a repaint if you are planning to visit Siljan, as it is outside the area and there are plenty of destinations for a tour.

Most airpark residents seem to fly in, have a relaxing few days and then fly out again. Although most owners are Swedish, there are Danes, Finns, Norwegians, Germans and a handful of other nationalities, including British. Wandering around the airpark we found a few people in evidence, walking the dog or tinkering in the house. It was very quiet and peaceful.

Siljansnäs village itself is also quiet. Situated about 2km from the airpark, it is mostly composed of traditional looking red-painted wooden houses around a white church and boasts a small supermarket, hotel, holiday cabins, petrol station/car dealer, bicycle shop and a kiosk. There is also the Siljans Pizzeria, with sit in or take away service. As in most small rural communities, it seemed to be a congregation point for the local teenagers; that the pizzas being fantastic may have something to do with it as well! At the top of the hill is a café and *Naturum Dalarna*, a nature museum with trails to viewpoints overlooking Lake Siljan. Inside there is a large selection of displays of local wildlife, history and geology. Lake Siljan forms part of the Siljan Ring, a meteorite impact crater

Top: Taxiway to the houses

Centre: Cabin in winter

Bottom: Trees, hills and lakes



52km in diameter and the largest in Europe, on the map you can make out the circular structure of the ring with the lake at the 6-7 o'clock position. About 17km from the airpark is Leksand, with a couple of larger supermarkets as well as more variety of shops. It is the seat of the *Leksandskommun* (the local municipality) and the headquarters of the department store chain Clas Ohlson. Slightly

Useful Web links:

Siljan Air Park <http://www.siljanairpark.se/>

Siljan Flying Club <http://www.siljansnasfk.com/>

Siljan AirPark Museum <http://www.airparkmuseum.se/>

Plot for Sale <http://www.airpark-plot-for-sale.co.uk/>

Summer house to rent <https://www.airbnb.co.uk/rooms/5938863?s=r76U>

Flying Brewery <http://www.flyingbrewery.com/>

further away and well worth a visit are the Orsa bear park, Falun world heritage site copper mine and the town of Mora, home to the famous Vasaloppet cross country ski race.

My Jeppesen VFR guide Sweden page for Siljansnäs states “irregular snow removal” so you may not be able to fly in or out during the winter but a winter sports enthusiast has plenty to keep them occupied. There are several ski hills nearby; not like an alpine mega resort but enough for a day trip. And there is cross-country skiing in abundance, even round the airfield. A recent local headline was “Car hits tree, no injuries”. It is not a vibrant hub of nightlife or a dizzy social whirl (except barbecue night at the *flygklubb* on Wednesdays and the yearly Kräftstjärtsvängen) but if you prefer peace and quiet with nature, trees, wildlife, cycling on quiet roads, kayaking on the lake and getting away from the big smoke in your own aircraft, Siljan Air Park could be the place for you. We are in the market for a tourer again... that house we looked at with Ragge the estate agent? We bought it. Come and visit!



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How To Take Off And Land!

by Jim Thorpe

I can almost see the initial reader reaction. What is this guy up to explaining such basic manoeuvres to experienced instrument pilots? Most weeks, I fly with pilots whom I have not met before revalidating, renewing or training for ratings. My impression is that few pilots really take positive control of the transition between earth and sky. The majority simply enter into a slightly hesitant negotiation with the aircraft in the hope that it will agree to deal with the transition on their behalf.

Typically, the departure will be a series of increasingly uncomfortable bounces trending towards the runway edge until the aircraft simply feels that flight is now its only option. Arrivals are often about selecting a power setting and some vaguely appropriate pitch angle and waiting till the runway contacts the wheels. If luck is with us, the mains will arrive nano seconds before the nose wheel at a point on the runway of the aircraft's own choosing.

Typically, instructors say "Adopt the take-off and landing techniques described in the flight manual". My view is maybe. The typical manual was written by the manufacturers' marketing department in the late 1960's or early 1970's. In a hangover from the days of biplane trained pilots, the use of flap for take-off tended to equate with a "hot ship". This had negative connotations and was thought bad for sales. Hence the manufacturers were reluctant to specify flaps for take-off.

Why would you want those tiny tyres to be in contact with the tarmac for a moment longer than necessary? Always use take off flap - at least one stage and in some aircraft two stages. Always use the short field or soft field rotation speed; they are anyway almost identical. I have never understood the marginal difference in technique that in the past at least was beloved of FAA examiners.

If you fly an MEP you enter in to the world of balanced field length and minimum control speed. These can result in heroic efforts to keep aircraft that want to fly on the ground with sometimes loss of control as the end result. My suggestion is always use flap, power against the

brakes according to circumstances and a positive rotation at the lowest speed the aircraft is willing to fly. The stall warner may bleat briefly; once off the tarmac or grass, push forward firmly and fly level in ground effect. In a few seconds you will be through minimum control speed in a twin and at best climb speed in a single or a twin.

The next near useless distraction is calling "positive climbing rate - gear up" or "no runway remaining - gear up". In general, a GA aircraft rotating as I suggest will always be climbing. Doubtless there are commercial aircraft or aircraft operated at MAUW where some sink is a possibility but this does not apply to GA aircraft.

(Note there are a very few aircraft like the BE36 Bonanza where it is more complicated. The drag of gear retraction is enormous due to the gear door arrangement. The clue is the big difference in gear down and clean best climb speeds - for such aircraft, get some conversion training from a knowledgeable instructor)

If you are IFR and expect to enter low cloud, the focus should be on getting the aircraft established in the climb with all actions completed before entering cloud and going onto instruments. If with a very low cloud base this is simply not possible, you need to establish your scan and not allow this to be disrupted by after take-off actions. In these circumstances you may need to delay any retracting until your scan and climb is well established. That said, if you decide to fly in circumstances that involve short runways and a low cloud base you may be asking for trouble.

So the take-off is full power, into wind aileron to counter any cross wind, a quick glance at the instruments to see nothing is amiss with the engine, ease the weight off the nose wheel and at the lowest reasonable rotate speed, give the yoke a positive pull back then, almost immediately, ease forward. A slightly aggressive version of this technique will make even an aircraft with a poor take off performance like a T tail arrow into a reasonable short field performer.

Almost immediately raise the gear and flaps (in stages if necessary). The couple of seconds delay between gear and flap is to spread any peak electrical loads which

may pop a breaker. In most aircraft you will now easily be at best rate of climb speed and a 6 or 7° pitch up will give you a decent performance. By now you will be six or seven hundred feet above the runway and can quickly run your after take-off checks, knock off the fuel pump if used and concentrate on navigating your first leg and making a reduction to climb power if required.

If I had been writing this article a month earlier, I would have said that mechanical fuel pumps were totally reliable and putting on the electric pump was a waste of time. Now I am not so sure; a few weeks ago passing 1000 feet, the rate of climb sagged and as I looked for the cause the TIT alarmed and the engine started to wind down. It appeared the mechanical pump had failed. Selecting low boost had no effect but the guarded switch for high boost did the trick. Even here, simply selecting low boost for take-off would not have helped and in normal circumstances, high boost with a working mechanical pump, will also stop the engine. It is Hobson's choice.

When it comes to landing, very few pilots seem to select an aiming point on the runway and then direct the aircraft to that point by use of the controls. You point the aircraft where you want it to go and then, by changes of power and perhaps configuration, make it go where it was pointed at the target speed.

In most circumstances the desired configuration is unsurprisingly gear down and full flap. In spite of the well documented tendency for even experienced pilots to land gear up, very few pilots bother with a final approach check. At Rate One Aviation, we use "LUC" rather than "reds blues greens" or "PUFA". We think it is a bit late to be worrying about altimeters at this stage in the approach and we have found that without a reminder pilots forget about the need for a clearance. Thus L for levers means whenever you make a significant change of any control lever, usually the throttle, you consider all three, U for undercarriage of course and C for clearance for a landing or low approach. We run this check twice, one just before the final descent and again when visual.

The transition from instrument

approach speed to full flap limiting speed is sometimes a problem. There is never any justification for changing the aircraft configuration while on the ILS. You select whatever is appropriate, the top of the drop most often for gear and one stage of flap, prop full fine and mixture rich. Then do not change anything that might destabilise this critical phase of flight until you become visual.

Off an ILS to minimums you may be better off landing with part flap but on a non-precision approach there is plenty of time to bleed off a little speed and select full flap if the flap limiting speed is an issue. I have to admit to being a little casual about the low flap limiting speed on our aircraft in the past but very expensive repairs to cracks in various bits of flap related structures have now persuaded me otherwise.

Most heavier aircraft like to carry a trickle of power into the flare. In any sort of cross wind you will have to kick off drift and lower a wing so that the into wind main wheel touches first. It should be possible to keep the column coming back almost to the extent of its travel as the speed decays. The nose drops naturally

to the ground having bled off a significant amount of speed. This helps avoid heavy braking that risks flat spotting the tyres.

Most GA types at reasonably light weights should be able to be down and stopped in 500 meters if handled properly. Why not take a safety pilot and do some practice? It is good fun and one day may save you a lot of money. I once flew a session with an experienced pilot who had come for instrument practice. His instrument flying was good but his landings left me quite worried that I was about to become intimate with the upwind boundary fence on a 1400 metre runway. I said nothing as he had just revalidated a mountain rating at a very demanding tiny airstrip so I persuaded myself he was just having an off day. The very next morning he ran his £300K aircraft through the upwind fence of a small airfield in some style. This was a lesson for me as an instructor to always say what you feel needs saying. It also emphasises the point that it is not uncommon for pilots to be quite good at instrument flying while at the same time having allowed their basic airmanship to seriously decline.



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Liberty / Discovery XL-2

Long Range Trainer / Tourer

by Jean-Michel Karr



Photograph © 2008 Jessica Ambats for Liberty Aerospace



On the parking stands of any PPL/IR AGM, one airplane with 'junior Cirrus looks' seems oddly modest; the Discovery (née Liberty) XL-2. Yet it is safe to claim, with 10 years experience, that the XL-2 is a credible synthesis of training and long-range touring aircraft. Evolved from the aerodynamics of the tricycle Europa, designed by Ivan Shaw with wings by Don Dykins (BAC/Airbus), this two-seater is rooted in a strong British gene pool. It started with the desire to make a certified Europa at 1.25 scale for every dimension – fuselage, flying surfaces and even engine, replacing the 100 hp Rotax engine with a 125 hp Continental.

In a bold move, the XL-2 became the first and still is the most popular, certified aircraft with FADEC ignition technology instead of magnetos. The XL-2 is also the first two-seater to be IFR certified since the Cessna 152, which says much about its potential for instrument training. With a fuel burn under 20 litres avgas per hour, a range of 522 nautical miles (5+ hours, less reserves), this is the kind of "go-places" airplane that takes you from Greece to the North Cape in comfort and safety. It has even been known to cross the North Atlantic with no modifications.

History and configuration

Back into 2008, HB-KOV was the first EASA-registered IFR certified XL-2. Since then, a dozen XL-2's have found their way into European airspace, a little less than 10% of the current worldwide airworthy fleet. The manufacturer, now called Discovery Aviation, supports the aircraft efficiently thanks to a large inventory of spare parts, dispatchable on a day's notice; in addition, they are reportedly ramping up for the production of their next twenty airplanes.

HB-KOV has recently been fitted with an Aspen EFD 1000, in addition to the original dual GNS 430, GTX 330 transponder and a Bendix/King KN-62A DME. One day, all approaches will have GNSS overlay approved for the missed approach segments. *[Editor: we can but so hope!]* In the meantime, we are either restricted to approaches where no ADF is required or where we can declare a simulated approach remaining VMC for the missed approach segment and use the NDB waypoint on the GNS 430. On the bright side, the aircraft is EASA approved for IFR (single pilot), LVO approach and landing CAT-1, PBN RNAV 5 (B-RNAV) and RNP APCH LNAV. The absence of an autopilot is a choice, one that again spares the weight of the install and focuses on hand-flying the airplane. As instructors, we very much depend on the student as autopilot!

The main design objective for our avionics configuration is efficient training for the EIR (en-route) and CBM (Competency-based modular) instrument rating, both for FAA/ICAO IR conversions and new candidates. Following the example of Rate One Aviation, we also operate a Redbird FMX simulator undergoing EASA FNPT-II approval with commonality in the instrumentation, DME and GPS NAV/COM setups.

Operation

Preflighting the XL-2 is quite standard; one will notice that all flying surfaces are articulated with pushrods instead of cables and hence are very responsive. There is a single fuel tank located at the back of the seat, near the center of gravity, containing 106 usable litres. Entry begins with sitting on the wing. Once seated, the cockpit simplicity is striking and ideal for training: single lever power control, FADEC engine/absence of mixture, fixed pitch propeller and fixed gear free much time for proper execution of instrument procedures.



Performance and power settings

With wide open throttle and 80kts IAS, the rate of climb at MTOW on a standard day at elevation 1400' exceeds 500 ft./m, hence complying with the LSGG SID requirements for R/W 05 and 23. Other typical power settings would be:

high-speed cruise: 65% power, giving 115 kts TAS

economy cruise 53% power, giving over 100 kts IAS

3° approaches: 2750 rpm giving 127-131 kts on a 3° glide – a good compromise between the operational needs of busy Geneva airspace and the aircraft's 2800 RPM red-line.

Comfort

When Ivan designed this airplane, he had the seat designs inspired by his Range Rover seating; the plush resemblance lives up to this day. Factor in a cabin width of 122 cm / 48 inches and one can fly for hours without rubbing shoulders with the student nor feeling any discomfort.

Stability

Rate one turns can be established and maintained with minimal use of the control column: Steep turns, most uncommon in instrument flight, do require more input but are very manageable without nose dip. Thankfully, the airframe is very stable outside of cloud. In cloud, it is wise to pull back well below the 100 kts Va in order to smoothen the flight experience, as the light airframe would otherwise tend to be bounced around – think of this as another great learning feature.

With only the simplest icing protection (pitot heat, windshield heat, alternate air, alternate static), one is precluded from training in forecast icing conditions. Given the feeble power reserve at altitudes above 11,000ft, descending is the most likely option to exit unfavourable levels.

Redundant systems

Approaches are conducted using the conventional CDI's (course deviation indicators) rather than the Aspen, again to reduce complexity and to resemble the experience in the simulator. The beauty of this arrangement is that one can toggle between traditional instruments scan, limited panel with the Aspen turned off or glass panel only navigation by covering the traditional gauges. Add in to this the redundancy of having two airspeed indicators, two attitude indicators, two vertical speed indicators, two slide and slips and two altimeters.

The electrical system is designed so that the FADEC engine draws its required power from the alternator first. If the alternator fails, they are powered from the main "A" battery. If the main "A" battery fails,

a secondary “B” battery is certified to produce one hour’s worth of power to both FADEC and electric artificial horizons and directional gyro. The Aspen has also an uncertified back up power as well for 30 minutes in case of electrical failure; these mitigation measures are comforting while doing maritime crossings.

And on the flip side

Surely there must be disadvantages as well. In order to remain within the allowances of useful load, two **heavy** individuals would need to limit their fuel and/or remain below the 100 pounds/45 kg of baggage allowance. An optional maximum takeoff weight increase of an extra 97 pounds is available as an STC from the manufacturer. Personally, we prefer the original version of the airplane as the modifications required by the STC change the initial flap setting from 20° to 10°, with the original 320 meter take-off roll then substantially increased.

The finger-actuated brakes may appear peculiar. Whenever there is enough power to provide rudder authority, we suggest using the adjustable rudder pedals for macro movements on the ground and use only the finger brake for small movements and fine-tuning course on the yellow line. This way, brake pads are spared; and as the finger-brakes are located in the middle console, the instructor can monitor usage at all times and intervene if needed.

One would not be as enthusiastic in recommending this airplane if its primary intention was a basic trainer with repetitive landings. The landing technique does require some flare finesse and avoidance of three point landings. Unlike a Cessna 172, the XL-2 can only be a first choice aircraft in a multi-role capacity (some basic training, advanced ratings, IFR, recurrency etc) rather than as a primary trainer only. With relatively small wheels, taxiing on grass is not its strongest point but grass landings and takeoffs are quite acceptable and routinely used in Geneva.

A remarkable compromise

It is hard to emphasize the importance of simplicity for basic instrument training; one can focus on the activities that need to be performed methodically during procedures – a great advantage for the subsequent skill test. After the building blocks are solidly in place and possibly



maintained with hour-building at the XL-2’s affordable operating cost, it is always possible to upgrade to a bigger iron.

The benefit of flying an aircraft keeping up with the flow of traffic at 160 kts as against 130 kts at two or three times the hourly cost is a choice that individuals will have to make for themselves. The energy consequences of additional weight and speed are squared and fuel consumption in a heavier aircraft can be over three times what the XL-2 uses. In Switzerland, this cost implication is increasingly important.

The combination of operating the lowest carbon-emitting IFR airplane available and extensive use of a full-motion simulator mean that we can deliver an instrument training product in a fraction of the ecological footprint previously required. The Continental engine is well managed by the FADEC system, which compensates for differences in cylinder temperatures and optimizes mixture 240 times per minute.

The best way to try out the XL-2 is during an introductory or initial assessment flight before a Competency-Based instrument rating or FAA/IR conversion course. We have found that in under two hours, most pilots are able to assimilate the specificities of the airplane.

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PPL/IR in the heart of Europe

by Per Ranneries

Good company, good food and an excuse to fly somewhere you may not have considered previously. That is the brief summary of the *PPL/IR Europe* Social weekend. This year the destination was Luxembourg, home of banks and international companies seeking to lower their taxes but much more than that as we shall see.

One advantage of participating in an organised tour is that most of the planning is done for you, except the actual flying. Oh, and then the meals! Colin Williamson, the new Meetings & Events Secretary, provided us with a smorgasbord of choices for lunches and dinners that sent me searching through Wikipedia and pasting into Google Translate in order to find out what I was choosing - a bigger task than planning the flight in Autorouter, which was done in about 15 minutes.

For me the weekend started Friday morning, departing from Roskilde in my trusted old Piper Warrior. I was looking at 4 hours of flight which I could have done in one leg but I prefer 2-3 hour flights or less, so I planned a stop at Ganderkesee (EDWQ) just west of Bremen. I had been there a few years earlier and I knew they had a nice restaurant. Sitting in the restaurant overlooking the runway, I had completely forgotten about all the food I knew would be served during the weekend, so I thought "When in Germany do as the Germans" and had a large schnitzel for lunch.

The flight itself was uneventful, apart from a few level changes when I found myself in clouds below the freezing level. When handed over to Luxembourg Approach, they said "10 degrees to the left" followed by "Descend till 3000 feet" and "cleared ILS approach runway 24, contact tower". IFR can really be very easy sometimes! A Follow Me car was waiting to guide me to parking and then drive me to the GA terminal. The driver also offered to call a taxi but I had heard Jim Busby on the radio during the final stages of the flight so I decided to wait and share a taxi to the hotel. That also gave me the opportunity to get something for the €60 handling charge in the form of coffee and a cola.

Friday evening was fairly relaxed with



A framed view of Luxembourg City. Photo: Anne Noble

drinks and dinner at the hotel

Saturday - cemetery and fortifications

Saturday was packed with sightseeing led by a local guide who spoke more languages than I can remember, as do most Luxembourgers, not least due to the fact that all subjects in the schools are taught in different languages in the different grades. Perhaps something that other small countries like my own could learn from? The first stop was the American cemetery just outside town where General Patton is buried with thousands of US casualties from WW2. Patton was not killed during the war but had expressed the wish to be buried with his soldiers. From the cemetery we went back to town and ended after a brief photo stop at the Museum of Modern Art built on top of the remains of the fortification of Luxembourg (Fort Thüngen).

We did not go into the museum but a few pieces were on display outside. As is the case with a lot of modern art I was not quite sure what to think of it.

After a walk through some of the tunnels of the fort, it was time to go into

the centre of town for lunch and take leave of the bus as the rest of the day would be done 'per pedes apostolorum'. The afternoon was a good opportunity to burn off most of the calories from lunch since the guided walk, after a stroll through the city centre took us through yet another system of tunnels under the city and then down through the gorge and up again to the hotel.

During the walk we were given an introduction to the history of Luxembourg that, at least in part, explained how such a small country has managed to exist for so long through diplomacy and strategically giving up bits of land to its neighbours. During the centuries Luxembourg has been part of both Spain and the Netherlands perhaps contributing to making it a very "European" country.

Dinner on Saturday evening was at restaurant Apoteca in the town centre and we had an excellent meal.

Sunday - Palace and going home

Sunday had just one sightseeing item on the agenda, a guided tour of the palace of the Grand Duke, situated in the centre of town next to the parliament. As palaces go it is quite small but perhaps fitting considering the size of the country. It is however not the home of the Grand Duke and his family, that lies outside of town and I imagine it is somewhat bigger. The palace in town is used for formal events; in fact it was used for a visit of US secretary of state John Kerry the day before our visit. Unfortunately photography was not allowed inside the palace; my memory of the visit is that it is dominated by paintings of the grand dukes through history and their families, which gave the new guide a perfect excuse to repeat much of the history lesson we had received on Saturday.

There was time for a short stroll through the town and a cup of coffee before a very



Above: Modern art meets ancient and new architecture

Right Top to Bottom:

PPL/IR Europe members pose for the camera outside the Chambres des Députés

A view of the city centre

Luxembourg Fortress Walls

nice lunch. Despite the delicious food some of us were anxious to get to the airport and start the flight home so we decided to skip dessert and went on our way. Arriving at the GA terminal we had to go through a passport check. If that is always the case or if it was because Air Force Two was still parked on the apron was not clear to me. It did however confirm that it is a good idea to bring the passport, also when it really should not be necessary. As it turned out, John Kerry had parked his aircraft at the exit from the GA terminal but I was stupid enough to ask if I could take a picture, which was denied, so the opportunity was lost.

There are a few interesting points to fuelling at Luxembourg Airport. Like most people, I prefer to refuel right after landing but since the fuel station is on another apron than the one we were parked on and also in another security zone, that would have been very cumbersome since it is not allowed to taxi from the fuel station to the GA parking. The fact that I had arrived from an uncontrolled airfield without any form of security checks and did not have any security to compromise is not a point I tried to raise, fearing that it would trigger all kinds of checks. The self service fuel pump will only give about €80 worth of fuel before requiring a new swipe of the credit card but as the fuel was quite cheap (1.65€/l) I chose to fill the tanks with three go's.

The flight home was even more straightforward with long directs that took me right over Köln airport but unfortunately in solid IMC, so another photo opportunity was lost. Again, I stopped at Ganderkesee, however this time I only had a salad that I could barely finish after the weekend's extravaganza.

The airport

Luxembourg is one of the bigger airports I have visited and overall the experience was positive. ATC was friendly and efficient, as was the staff at the handling agent but a €60 handling charge for what was essentially a drive from my aircraft and free coffee and soft drinks seems a bit steep, although the cheap fuel did provide some compensation.



The town

Luxembourg proved to be an interesting destination, especially for those interested in European history but also with good dining and as far as I could see, a good night life. I did however not test the latter.

This was not my first PPL/IR Europe event (in fact I think it was the fourth) and it is certainly not going to be the last.

It was however the first social weekend organized by Colin Williamson and he did a very good job. I for one will be back and I can only encourage other members to try it out.



Approach Chart Quiz

by Graham Whittle

Blackpool EGNH

Following my “Weekenders” article in the Summer Issue (IP109), you are planning a flight to enjoy the delights of Lytham St Annes and Blackpool. The forecast is for a surface wind of southerly 20 knots and overcast at 800 feet.

Question 1

Looking at the choice of approaches you decide to come in from the east rather than carry out the NDB approach over the sea. For Runway 28 there is a choice of the ILS, NDB or RNAV. You plan to use the ILS.

There is another runway 13/31 available without an approach procedure. If you chose to descend on the ILS to break cloud then manoeuvre to land on 13 with less cross wind, what is the minimum altitude you should circle at?

Question 2

You notice that the FAF is within restricted area R312. Is there any information on the plate that advises how to deal with this?

Question 3

Where should you look in the AIP if you want to find out more information about R312?

1. Aerodrome Information Generic
2. Aerodrome Index Specific
3. Enroute Information ENR 5 Navigation Warnings
4. Enroute Information ENR 1 General Rules and Procedures.

Question 4

Leaving airways from POL on radial 273, what is the minimum sector altitude?

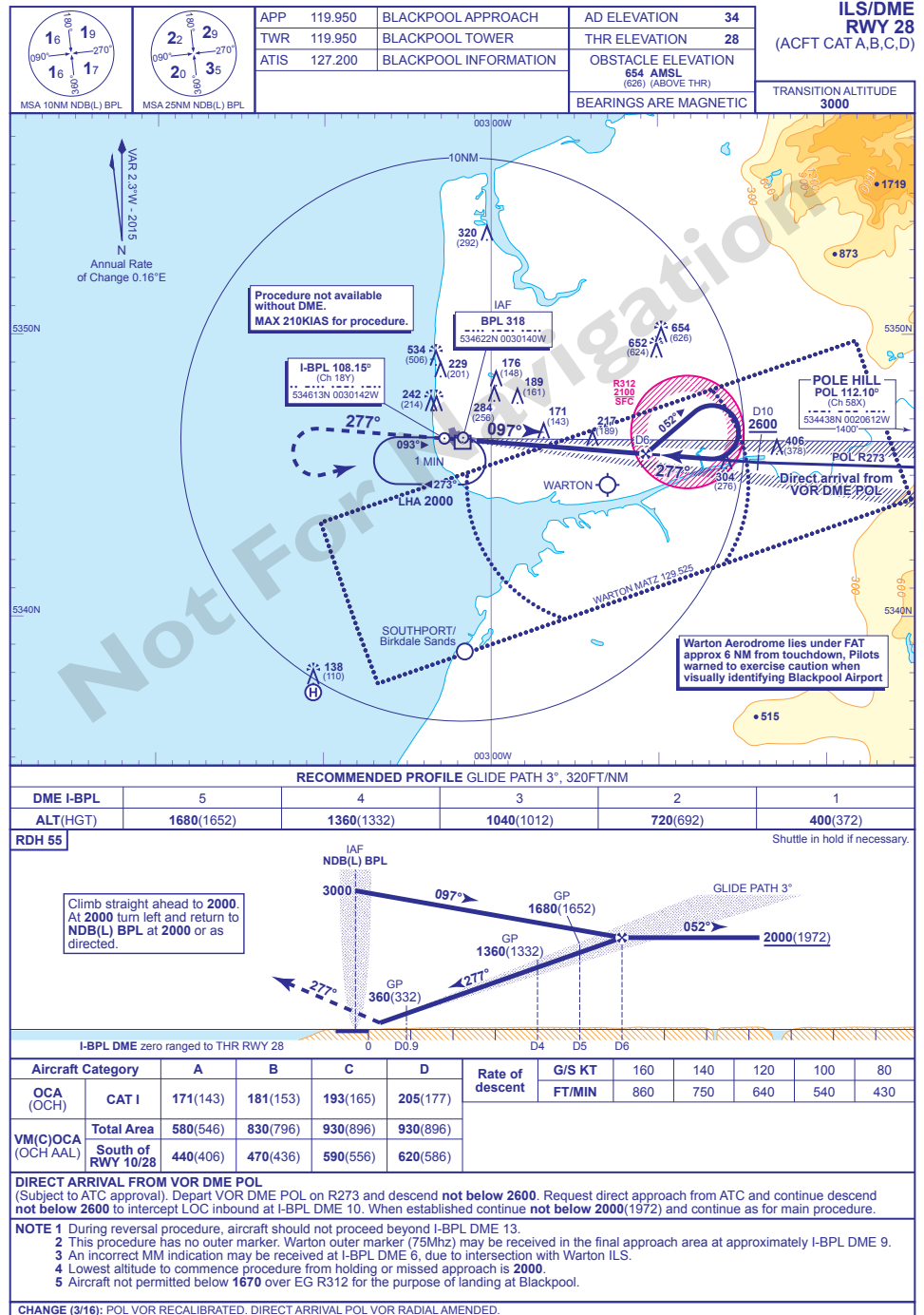
1. 2600
2. 1700
3. 2000
4. 3500

Question 5

If the cloud break occurs before 6 DME what do you need to be aware of? (There is a warning on the approach plate).

Answers on page 24.

INSTRUMENT APPROACH CHART - ICAO



RNAV Approaches

How prepared are you?

by Timothy Nathan

After 50 years of comparative stability in IFR navigation and approaches, we are now in a time of unprecedented change. For the second half of the last century everything was pretty stable with ADF, VOR, DME, ILS and Radar, all of which were ground-based, with pretty much the same cockpit operation between different manufacturers and different installations.

We are now in a time of great change. ICAO resolved that there should be an approach with vertical guidance to all instrument runways and the European Commission, Eurocontrol and EASA are strongly encouraging ANSPs and airports to achieve this goal by 2024. Furthermore, airspace constraints mean that aircraft have to be operated closer and closer together and that means that they must be navigated and manoeuvred more accurately. Most of this will be achieved with RNAV technology

What does this mean for us? Well, RNAV approaches are good news for light general aviation. We get high quality navigation guidance at reasonable cost and the lack of ground based equipment means more approaches at smaller airports. But we also have to make our contribution. By 2019 pilots and aircraft operating in controlled airspace will need to be PBN capable. That will entail Theoretical Knowledge and flight training. It will also require IFR aircraft used for skill tests and proficiency checks to have RNAV approach approval.

The growth of RNAV, particularly LPV, approaches is very rapid, over the past few years they have been most common in France, Benelux and Germany but now they are spreading all over Europe, particularly at smaller airfields which have traditionally only had non precision approaches.

Different words for the same thing?

These approaches have been called so many different things over the years that there is a certain amount of confusion

among pilots as to what each set of initials really means. Initially they were called GPS approaches. However, as other satellite systems, such as GLONASS and Galileo, were launched, the designation had to be changed to GNSS, which covers all the different constellations. But then it was agreed that other area navigation technologies could be used, provided they were accurate enough. Hence the next change to RNAV. But it was then recognised that technology used for approaches, particularly precision approaches, must have a degree of error recognition and handling. An RNAV system, in order to meet the standards of Required Navigation Performance, must have fault awareness. Hence the correct current name for these approaches is RNP.

But the letters we hear most bandied about are PBN. Performance Based Navigation has not only the requirements of precision and resilience provided by RNP but also encompasses a wide range of other requirements, such as procedures, training, certification and much more. That is why we must become PBN qualified to be allowed to operate in PBN airspace.

RNAV/RNP/PBN Procedures

PBN brings with it a greater expectation of automation and very accurate track keeping, more reliance placed on aircraft, less on ATC, hence less vectoring and more following SIDs and STARs and more procedural (as opposed to radar vectored) approaches. PBN means that pilots need to understand their equipment, procedures and obligations such as:

- Ensuring that GNSS databases and plates are up to date
- Ensuring that equipment is working
- Checking satellite coverage and availability
- Referring to up to date plates, charts and NOTAMs.

Augmentation principles

All certified GNSS equipment has one of two kinds of augmentation system.

Older (TSO129) units have Aircraft Based Augmentation System (ABAS), which means RAIM for GA. RAIM is fault aware but not fault resilient (though some units go beyond the specification and provide a level of fault resilience.) This means that the pilot will be warned that the integrity of the system has been compromised. The most common of such units is the GNS430.

Newer (TSO146) boxes have Satellite Based Augmentation System (SBAS). SBAS increases reliability and accuracy and is fault resilient (it will exclude dubious signals from particular satellites and resolve a position based on those that remain). SBAS is called WAAS in USA and EGNOS in Europe. Confusingly, the 'W' in GNS430W stands for WAAS, although that is not the correct terminology in Europe.

SBAS integrity monitoring is required for vertical guidance. Thus no SBAS means no glideslope.

The SBAS system is based on a number of small satellite receiving stations called RIMS (Ranging and

Integrity Monitoring Stations), which are fixed on concrete plinths all over and beyond the area of coverage. When they receive a GPS signal, a central system calculates the difference between that and their known position, horizontal and vertical. The difference signal is retransmitted to geo-stationary satellites. The onboard SBAS receiver combines the corrections with its own GPS reception to achieve very high accuracy of typically 1m horizontally and 2m vertically.

Readers will also come across a system called GBAS. This provides CATIII-like accuracy for CAT and is outside the scope of this article.

Augmentation and regulation

The Aircraft Flight Manual must state what approaches airframe is approved for. If the AFM does not specifically allow for a particular approach then you are not permitted to fly it. We have heard of ramp checks being made on aircraft which have arrived using an RNAV approach.

Two dimensional (2D) approaches require RAIM for fault detection. Loss or unavailability of RAIM, which generally means five usable satellites in view, means that the approach cannot be started or continued. RAIM must be checked, online or on the receiver, before the approach is made. RAIM availability forecast can be checked in advance on <http://augur2.ecacnav.com/augur/app/npa>. If RAIM is not forecast to be available, the approach must not be started. If a RAIM or integrity warning appears during the approach, it must be immediately discontinued and a missed approach started.

Three dimensional (3D) approaches require SBAS. 3D has generally replaced the expression “precision”, i.e. those with vertical guidance. SBAS supersedes RAIM, so RAIM no longer needs be checked. As I mentioned above, in order to perform a 3D approach you need both suitable equipment and approval. The most common light aircraft certified equipment capable of 3D approaches are the Garmin GTN series, the GNS W series, later G1000s and, more recently, the Avidyne IFD540. If you have an older GNS unit, it can be upgraded relatively cheaply to W standards and thanks to PPL/IR Europe, can be a certified on most light aircraft very cheaply.

The different types of approach

There is, quite justifiably, quite a lot of confusion between the different types of approach available.

LNAV and LNAV+V

Non-SBAS boxes are only capable of LNAV approaches. They are annunciated as APR, because, when they were designed, they were the only approach available. Unlike conventional approaches (ILS, VOR, NDB) the horizontal guidance provided by a non-SBAS box does not increase in sensitivity as you approach the runway. It only provides a pair of tram lines 0.3 nautical miles either side of the final approach track. That makes it rather inaccurate as you approach the runway, which is one of the reasons why LNAV minima tend to be rather high.

An SBAS box performing the same LNAV approach annunciates LNAV. However, in the case of Garmin boxes (and I do not know if this is also true of other manufacturers) the accuracy and sensitivity of the horizontal guidance is

considerably greater than in non-SBAS boxes, similar to that of an ILS localiser. There is, however, no certified vertical guidance. But, although the accuracy of an LNAV approach using an SBAS receiver is greater than on a non-SBAS box, no advantage can be taken in terms of minima, because the approach designers have to assume the worst case of a non-SBAS receiver being in use.

Further confusion is added by the LNAV+V approach. From a regulatory and design point of view, the LNAV+V approach is exactly the same as an LNAV approach. However, Garmin provides an advisory glideslope from the Final Approach Fix (FAF) to the Missed Approach Point (MAP). This glideslope assists the pilot in ensuring that the aircraft follows the non-precision descent profile and passes through all the check altitudes. However it is not a certified to glideslope and it remains the responsibility of the pilot to check his descent using conventional means, usually GPS range against altitude. Unlike certified 3D approaches, the glide slope is not guaranteed to provide terrain separation after the MAP. In a few places this can lead to distinct danger as the synthesised glide slope penetrates terrain.

Pilots using LNAV+V must use LNAV minima, even though the display, sensitivity and accuracy are much the same as for the ILS.

LNAV/VNAV

LNAV/VNAV approaches were an early attempt to replicate barometry based glideslopes, which are only found in large commercial aircraft. They are comparatively rarer than other kinds of approach but there are still plenty of them about.

On Garmin boxes the sensitivity of both needles is similar to an ILS but that is not required by the specification, hence different minima. So if you are making an LNAV/VNAV approach you should use the LNAV/VNAV minima. It annunciates as L/VNAV on the receiver. The glideslope is certified and should provide safe terrain and obstacle clearance all the way to the threshold.

There has historically been a regulatory problem with approaches which are coded for LNAV/VNAV, where the regulatory authority is not satisfied that the obstacle surface has been appropriately considered. In these cases, vertical guidance has been

switched off in the database and therefore, somewhat ironically, neither LNAV/VNAV nor LNAV+V vertical guidance is available. If you make an LNAV/VNAV approach you must be prepared for the reasonable expectation that there will be no glideslope.

LPV

The Localiser Precision with Vertical guidance (LPV) approach is the big daddy of them all. It has the same sensitivity and precision as an ILS and operates to similar minima. The actual cone of sensitivity is slightly adjusted from the ILS model. The localiser component of the ILS is based on an aerial at the far end of the runway, whereas in the LPV the end point is at the threshold, ie the length of the runway closer to the MAP. If the sensitivity were based on that, it would be impossibly sensitive near the MAP, so instead it reaches a maximum sensitivity shortly before the MAP and then remains constant. The glideslope follows a similar pattern. Most people find the LVP rather easier to fly than the ILS, both because of these adjustments and its comparative stability and reduced twitchiness.

The LPV has coded into the database a Final Approach Segment data block, which defines with great precision, reliability and repeatability the exact position in space of the final approach path, particularly aspects like height over the threshold, with redundancy checks. If a redundancy check fails, the approach will not be available and the receiver may fall back to a less accurate approach, such as LNAV.

When flying the LPV to LPV minima, it is important to monitor the LPV annunciation on the receiver. There are circumstances under which the annunciation will change to LNAV. Provided you are above 1000' when this happens, you can continue but only to LNAV minima. Below 1000' it is a go around.

FAF Checks

The following vital actions should precede the final descent at the Final Approach Fix:

1. The Final Approach is shown in Magenta
2. The Annunciation is correct for the approach (eg LPV, LNAV)
3. HSI is centred (or very nearly so)
4. The HSI To Flag is showing

Fly over/Fly by waypoints

It is an important part of PBN procedure that you know whether a waypoint must be flown over or flown by. Typically a PBN track must be flown within 1nm and that includes the expected turn. Most waypoints are fly-by and in some AIP procedure drawings the arc is shown, as it is on SBAS receivers. But some procedures demand fly over, usually to ensure terrain or obstacle avoidance.

Fly-over waypoints are represented by a circle around the symbol and must be crossed before the turn is made. Fly-by waypoints have no circle and should be anticipated before the turn is made. The anticipation is calculated by SBAS receivers based on groundspeed and wind. It can be hand flown but is designed to be followed by GPSS/Roll Steering.

Approach Design

It is easiest to understand approach design by working backwards through it.

Its purpose is to place the aircraft at the Missed Approach Point (MAP) in a stable descent. That is achieved by ensuring that it is at the Final Approach Fix (FAF) at the correct altitude and speed and pointing in the right direction. To ensure that that happens, an Intermediate Fix (IF) is created before the FAF, lined up with the final approach. The distance from the IF to the FAF must be at least 3.3nm, to ensure both stability and that autopilots have time to activate the glideslope (many need to be on the final approach for 20 seconds before they will do so).

But it is a design condition of the IF that no turns may be made at it which exceed 90°. In order to ensure that this happens, Initial Approach Fixes (IAFs) are created such that an aircraft arriving from any direction can go to an IAF and then turn towards the IF without exceeding the limitation. That is the reason that so many procedures fall into the “T”, “Y” or Trident shapes. These formats are not the only option but they do provide the most efficient way to ensure that all the specifications are met with the minimum flight distance from any direction. In “T” or “Y” procedures the IF also serves as an IAF for aircraft approaching from within 90° of the final approach track. In trident shaped procedures there is an additional leg from an IAF before the IF, which is normally there for terrain or airspace separation purposes.

The choice of IAF is usually

determined by the direction of arrival of the aircraft and the plate will often have acceptable segments for each IAF drawn on it together with a Terminal Arrival Altitude (TAA) for each sector of arrival. The TAA is effectively the same as a sectorised MSA. However, in some cases there is only one IAF and a reversal turn has to be made at it, in others there is a choice of IAF which may be exercised by the controller or the pilot depending on circumstances. It is important to note whether each of the fixes in the procedure is fly-over or fly-by, as this can be of safety critical on some approaches. The receiver will already be coded with this information, so the HSI must be precisely followed.

Transitions

Transitions are the section of instrument flight procedures which link the standard arrival to the approach. In Garmin receivers the IAF is known as the Transition. In some Garmin boxes, such as the GNS series, the pilot is prompted to enter the transition and it is difficult to overlook; however, in the GTN series radar vectors are assumed unless you specifically select the IAF you want. Pilots must then be careful to discipline themselves to ensure that the appropriate IAF or transition is entered.

Y and Z Approaches

Sometimes there is more than one approach of the same type to the same runway. When this happens they are designated with a letter after the name of the approach. The choice of approach will sometimes be made by the controller but sometimes it is a decision that the pilot must make, for example by category of aircraft or equipment carried. For example EGMD Lydd has different approaches for Category A & B aircraft and Category C aircraft. In other cases it may be a question of whether the aircraft carries an ADF or DME.

Approach Speed Categories

Aircraft are categorised according to their final approach speed. Many private pilots seem to assume that all light aircraft are Category A but this is far from the case. Most GA IFR aircraft are in category B (i.e. with an approach speed of between 91 and 120 knots). As this affects minima as well as choice of procedure, it is important to know what category you are

flying.

Trombones

The flightplan in the receiver always proceeds top to bottom without fail and without exception. It might seem obvious but it does help explain some of the odd things that we sometimes see happening.

In some receivers and under certain circumstances, if you put in an instrument approach procedure or a STAR without removing the latter part of the flight plan, such as the arrival waypoint and the airfield itself, you can find yourself proceeding to the overhead of the airfield and then all the way back to the beginning of the STAR or the procedure. It is important to check, therefore, that the sequence of waypoints and legs in the flight plan makes sense and represents what you want to do. Usually, the easiest way of doing this is to look at the map view.

“Cleared for the Approach” and Activate Approach

You will normally hear the expression “cleared for the approach” when the controller is transferring to you the responsibility for flying the instrument approach procedure. If you are on radar vectors, it tells you that the vectoring is finished and that it is your responsibility to establish on the final approach track and to descend with the procedure.

However, if it is said before the start of the procedure it means that you should proceed directly to the IAF, arriving there at the procedure altitude, ensuring that you do not descend below the TAA until you reach the IAF. On the receiver this can be achieved in any of three ways: selecting “Activate Approach”, DCT IAF or removing the waypoints before the IAF.

Activate Approach means the same thing as “cleared for the approach”, proceed DCT to the IAF then follow the waypoints from there, from top to bottom to the MAP. There is no other “magic” involved.

The Missed Approach and SUSP

At the MAP sequencing goes into SUSP mode, which means that waypoint sequencing is suspended. While in SUSP mode, guidance is straight ahead indefinitely. It does not follow the Missed Approach Procedure. This is initially safe to follow as you concentrate on go-

around, focussing on aviation as opposed to navigation or communication.

But, on an SBAS receiver, as soon as your hands and brain are free, deactivate SUSP mode. The Missed Approach is now activated. This can all be done on autopilot with GPSS/roll-steering but you may need to change mode from APPR to HDG, depending upon the autopilot. But if you are flying with a non-SBAS receiver, such as a GNS430, it is important that you only press SUSP once you are above the first height restriction. Doing so early risks turning towards terrain and obstacles.

On the RNAV approaches, the MAP is at the threshold, not where you go around. This is necessary because otherwise there would be no guidance beyond the MAP, which could be dangerous in poor visibility. For this reason, there is likely to be an extended period between your decision to go around and reaching the point at which the receiver goes into SUSP mode. At a ground speed of 80 knots from a 300ft decision altitude, it is a full 45 seconds to the MAP.

Many missed approach procedures still demand navigation to an NDB. PPL/IR Europe is trying to persuade the authorities that it is acceptable to use GPS fix substitution and that therefore an ADF is not required. So far, no such agreement has been reached; therefore, if you do not have an ADF you should negotiate with ATC an alternative missed approach procedure.

Flying the hold on arrival

Because the receiver will always sequence flight plan waypoints from top to bottom, it is not possible to insert the hold in the correct arrival sequence. The hold is therefore placed at the end of the MA Procedure. To enter the hold on arrival, you must highlight the hold and press DCT to activate it. Normally, when the hold is cancelled, you can simply activate the approach or activate the outbound leg of the procedure in order to continue the approach.

Error modes

As described above, augmentation is needed for all GNSS approaches. Therefore if augmentation is lost, the pilot must initiate a missed approach. Indications of lost augmentation include a RAIM warning, an INTEG or LOI flag, the annunciator does not show the correct mode (ie APR for non SBAS systems or LNAV, L/VNAV, LNAV+V or LPV for SBAS systems) or that the track is not magenta.

If other aids are tuned and identified, they can be used to their minima. If a lesser approach is indicated (eg LNAV rather than LPV) above 1000' the approach can be continued to appropriate minima.

FPL equipment codes

To fly an RNAV approach you must specify the capability in the FPL. To enter codes in the FPL, the right approvals must be in AFM.

It is important to get the codes right; a typical GA aircraft may be SBDFGRY/B1 with PBN/B2D2S1 in item 18. If you do not have S1 you may not be permitted to do an RNAV approach. Commercial software, eg SkyDemon, AeroPlus, RocketRoute, Autorouter etc, can help get this right but if in doubt, ask on the PPL/IR Europe forum about your particular equipment fit.

Training

To fly an RNAV approach you must be trained. This means different things in different states. But in all states, from August 2018 RNAV approaches become mandatory on all IR initials and renewals. Also, all IFR pilots, current and new, will need to pass a PBN theoretical knowledge exam by August 2018. We do not yet know what format this will take and it will probably vary from state to state; some states may take the view that an oral examination by the IRE is sufficient. But anyway, the examiner may ask theoretical, procedural and practical questions at initial test or revalidation as he sees fit.

Equipment diversity

TSO 129 (non SBAS) and TSO 146 (SBAS) set technical standards but the user interface can be very different across receivers. Peculiarities can cause confusion or disorientation at a critical moment. You must make sure you are properly trained on the equipment you are going to use, being particularly clear on alert and error annunciations.

Overlay approaches

While this article is about RNAV approaches, I must also mention overlay approaches, which have not been specifically designed for RNAV but follow the tracks of existing, conventional approaches. These are either advisory or approved as an RNAV approach, though the vast majority in Europe are advisory. The receiver will identify which it is and, if the overlay is advisory, will give a warning notice.

If it is advisory, you are obliged to use underlying aids such as ILS, NDB, VOR and DME. The overlay is only assisting you in doing so. Be sure to set and fly the right category. Garmin is poor at labelling, with no differentiation between them; generally "Slowest is Lowest" ie Category A is at the bottom of the list and category D at the top.

The most common in error is to fly the final approach with HSI or OBS still set to the GPS. Therefore make use of the ILS CDI Auto Selection but still visually check that it has successfully switched to VLOC. ILS should auto select between IF and FAF but it must be checked and CDI pressed if necessary. The autopilot will not engage the glideslope if ILS is selected too late (typically 20 seconds before the FAF).

Ask the Forum

This has been a very short taster for the subject. If you have any queries, ask on <https://www.pplir.org/forum>. Someone will know!



Answers from Quiz on page 20.

- Q1 580 ft
- Q2 Yes: Note 5 at the bottom of the plate states that aircraft are not permitted below 1670 ft over R312 for the purpose of landing.
- Q3 3 is the correct answer. ENR 5.1 gives the precise details of all the UK prohibited, restricted and danger areas. R312 is on page 35.
- Q4 3500 ft (However direct arrivals are advised to descend not below 2600 ft on leaving POL)
- Q5 It is very easy to mistake Warton runway for Blackpool if you are not familiar with the area.





Events



Crew/Cockpit Resource Management (CRM)

Harwarden, Saturday 24th September

A third seminar – the first two seminars were oversubscribed and have proven to be very well-regarded. Thus a further CRM seminar is planned for 24th September to accommodate all those unable to attend earlier and those who would now like to.

The one day seminar on Cockpit Resource Management will be presented by Captain Lyn George of Global Air Training, which specialises in training for commercial pilots. This 1 day course has been specifically organised with and for PPL/IR Europe members, focussing on the specific challenges and scenarios confronted by the general aviation pilot operating under single crew conditions and flying under instrument conditions. The course will cover: flight planning, risk analysis, decision making processes, standard and emergency procedures. The goal is to review and train for the highest levels of risk management and safety in all our flying activities.

- Programme outline
- Introduction and Goals
- Human Error
- Decision Making
- Situational Awareness
- CFIT
- Stress and Performance
- Summary, Questions and Overview.

Instrument Weather Seminar II

London, 26th November 2016

A second Instrument weather seminar presented by *PPL/IR Europe* members Anthony Bowles and Alan South will take place on 26 November 2016 at 4 Pump Court, London.

The first instrument weather seminar was held in Carlisle in June 2014 and was highly successful for those who attended. However, the gods of irony intervened and atrocious summer convective activity on the day meant that many did not make it.

We are planning interactive sessions with all participants and to that end, attendance is limited to 20 people. If oversubscribed, priority will be given to less experienced pilots and those who did not attend the first seminar.

The purpose of the day is to review and train for weather decision making on routes and equipment typically flown by *PPL/IR Europe* members. The day will cover:

- A more practical understanding of the weather parameters of interest to the private instrument rated pilot than is covered in the theoretical knowledge exams
- Modern forecasting methods and resources
- Practical analysis of real-life weather scenarios by the participants themselves

The seminar is about equipping the participants to make informed weather decisions that are right for them as individuals. Importantly, it is not about advocating flight in any more or less extreme weather. The content is relevant to all pilots flying under IFR, whether EASA, FAA or IR(R) rated.

The presenters have more than 50 years' experience between them of using light aircraft to go places on schedule and an unusually keen interest in meteorology.

The day will start with tea/coffee and registration at 1100 and conclude by 1700. A sandwich lunch will be available. If there is sufficient demand, it may be possible to organise a social dinner after the event; please indicate if you would be interested in this when booking your place.



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Weekenders

Copenhagen

by Ed Bellamy

While pondering my usual dilemma of finding excuses to fly to interesting destinations in Europe, a friend of mine, who sometimes comes flying with me (and finds it generally agreeable), mentioned that he had booked a table for three at Noma a while ago and had yet to fill one of the two places – was I interested?

Noma is a restaurant in Copenhagen, famous for innovative and unusual dishes. My friend Nick is a bit of a foodie and wanted to tick it off the bucket list. As per usual, I immediately started to consider how practical avoiding scheduled commercial air transport would be. I had in fact visited Copenhagen the year before and found Roskilde to be a very agreeable GA aerodrome – all the facilities of a ‘proper’ airport but with a very relaxed, friendly atmosphere, straightforward ground procedures and very little commercial traffic. So the odds looked good.

Nick was coming in from Prague, so we would meet (along with the third member of our party) in Copenhagen. However, he was enthusiastic about the prospect of coming back to the UK with me.

One would not have guessed it was Spring when I pitched up to North Weald on the day of the trip – driving rain, overcast at around 600ft, temperature 13° and generally miserable. The route out to the east promised sunnier skies, so with the anti-ice pumping

away, I was soon accelerating down runway 02 at Weald. A swift welcome from London Control was followed by the usual flurry around setting the course, autopilot, etc. With the aircraft settled in the climb and heading out towards Clacton, the magic moment at which one realises that above the clouds, the sun always shines, came to pass at around FL80.



The route towards Denmark takes you out over Amsterdam and the north coast of Germany. By the early evening Bremen radar was silent for minutes at a time. Looking out across the North Sea on the left and the flat expanse of northern Germany on the right, it felt like I was the only aircraft in the sky.

The contrast between the weather at Weald and Roskilde could not have been greater – blue skies and just the faintest of breezes. A few local aircraft were circuit bashing but otherwise the aerodrome was quiet and somewhat deserted. The chap on the desk called me a taxi – which astonishingly appeared in the short time it took me to make use of the facilities and walk outside. It takes about 35 minutes by taxi into the town or one can take the train in from Roskilde station, which is a few minutes away from the airport.

My previous visit to Copenhagen had been in the depths of winter – we had only just escaped heavy snow that started as we were departing, so it was refreshing to see it on a sunny spring evening. It is a handsome city, with a neoclassical look about the centre. We were staying in the Hotel D'Angleterre – a very pleasant if somewhat expensive option (Copenhagen is generally quite an expensive city).

flavours (did you know that dried ants are very good for giving a citrus taste?) but our stomachs were left feeling somewhat wanting. We consoled ourselves with some large ice cream cones and a wander around the canals. It was another beautiful day, with the waterside lined with couples and groups enjoying drinks and picnics. You can tell the locals by how well dressed they are – the people of Copenhagen have an understated style that makes it easy to distinguish them from the often scruffy tourists.

We then took a boat tour from Nyhavn, an inlet canal from the harbour surrounded by bars and restaurants which offers extensive outdoor seating. The standard tour goes out into the harbour, circling around various points of interest such as (amongst others) the “Little Mermaid” (a sculpture of the Hans Christian Andersen character), various palaces and Danish military ships, the Copenhagen Opera house and the headquarters of Maersk, the Danish shipping conglomerate. It is a good option if one wants a relatively quick overview of some of the city's main highlights. We were just happy to be enjoying a pleasant evening on the water.

Roskilde proved just as agreeable on departure as it had on arrival. To my slight surprise we were given a slot time which



We were only there for a couple of days but Copenhagen has a fair amount to offer the discerning tourist, whether that be history in the form of the various palaces, churches, galleries or slightly quirkier options, like the Tivoli Gardens amusement park or the Old Carlsberg Brewery. We had a quick look around the Amalienborg Palace. I also wanted to look at the Royal Stables at Christiansborg Palace but there was not quite time.

Our culinary destination proved to be perhaps an innovation too far – the cooking was very experimental with some extraordinary

delayed us by 15 minutes but other than that, we were on our way with one of the lightest of brushes with airport bureaucracy possible this side of the Atlantic.

There are probably destinations which are ultimately more interesting than Copenhagen and there are certainly more challenging flights but if all you want is a trip a bit further afield than the norm, a stress free airport experience with easy access to a decent European capital, it should be high on your list.

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