Instrument Pilot

The *PPL/IR Europe* Magazine | No. 71 | January-February 2009

Trip to Granada

Part 2 , By Peter Holy

CONTENTS

PPL/IR EUROPE

This is the second half of a two-part article describing an IFR (airways) flight from Shoreham (EGKA) in the UK to Granada (LEGR) in Spain. The first part published in the last issue of ***Instrument Pilot*** *(IP70)* covered all the pre-flight preparation.

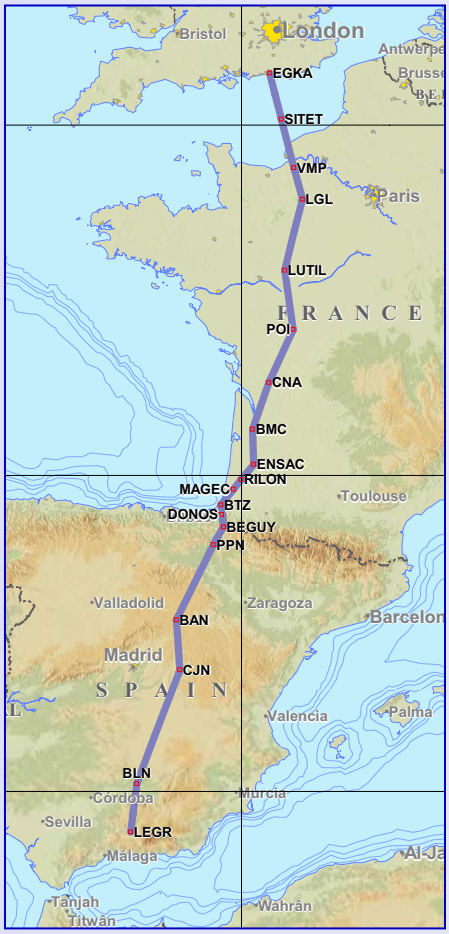
Shoreham to Granada, direct!

The outbound routing was EGKA SITET A34 LGL A55 POI B19 ENSAC R10 BTZ R299 PPN R10 CJN G5 BLN LEGR FL100; alternate Malaga LEMG; distance: 832nm (great circle), 869nm (airways), see right.

The Eurocontrol routings given here will most likely not work by the time you might try them because the precise form needed to get the route into the computer changes from one week to the next; and there are frequent differences between weekdays and weekends which are largely due to a lack of military activity on weekends.

The weather conditions started pretty good, but it was immediately clear that the significant weather form (SigWx) prediction of high cloud over the Channel was going to be borne out.

P 18 ▶



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For reports on meetings, conferences and other activities attended in the last 12 months by directors and members of the executive on behalf of PPL/IR Europe members, see www.pplir.org – Lobbying

***** STOP PRESS *****

Transfer of Flight Briefing Unit from Heathrow to Swanwick on 28th January 2009 at 12:00 UTC. NOTAM B00084/09 refers:

The UK parent AFTN facility will move to the Swanwick air traffic control centre as of 28 Jan 2009 at 12:00UTC.

Parent AFTN units at the Scottish Air Traffic Control centre and at Heathrow Flt Briefing Unit will close at this time.

The Swanwick air traffic control centre will manage the parent AFTN function alongside the flight planning online facility. Pilots who do not have a flight planning online account should fax FPL and associated messages to 01489 612793 ensuring that they are correctly addressed.

There is a 24 hr helpdesk for all enquiries 0845 601 0483 or 01489 612792. The helpdesk AFTN address is EGGGYFAJ.

AIP Sup 5/2009 and 6/2009 due for issue on 26 Feb 2009 refer. Any queries on the supplements should be directed to the helpdesk. Useful links www.flightplanningonline.co.uk and www.ais.org.uk.

***** STOP PRESS *****

In IP67 and IP68 we published Peter Holy's article on having his Socata TB20's Lycoming IO540 engine overhauled in the US following service bulletin SB569A on faulty crankshafts. Although this specified a 21st February 2009 life limit, various national CAAs took a more relaxed view on how quickly it needed to be done in issuing their related airworthiness directives making replacement mandatory. The FAA, for instance, in AD 2006-20-09 allows a 12 year deadline starting when the crankshaft entered service; however, apparently the Turkish CAA has taken it literally, grounding all affected engines from 21st February 2009.

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The extended deadline for US airmen certificate holders to comply with the ICAO language proficiency requirements expires at the end of March 2009.

If you hold a stand alone FAA licence you can order a replacement plastic certificate on-line or by mail for a $2 fee; however, for holders of 61.75 certificates (based on their CAA licence) or those who still have old style paper certificates, a trip to the US may be needed. AOPA, IAOPA and AOPA-US are trying to obtain clarification from the FAA. See FAA website for details: www.faa.gov/licenses_certificates/airmen_certification/english_proficiency/

***** STOP PRESS *****

PPL/IR Europe membership fees for 2009 are now overdue. See website for details: www.pplir.org/index.php?option=com_facileforms&Itemid=49

Caveat Emptor when using an approach plate

By Adèle Stephenson

The last issue of ***Instrument Pilot*** (*IP70*) published the first of a three part series on non-precision approach CFIT, which had obviously been meticulously researched on this interesting subject. I may be jumping the gun as two parts are still to come but would like to offer an angle which may or may not be useful to readers.

Approach plates (or charts, whichever you like to call them), as presented, are not necessarily accepted without comment by companies and airlines. Readers of ***Instrument Pilot*** are assumed to be private pilots with a serious interest in instrument flying and are therefore not in receipt of operations manuals issued by an employer. There are some aspects in relation to the company use of approach and departure plates which are worth copying.

Published plates

To begin with, just because a plate is published doesn't mean that it should be flown (What?!). I can think of several approaches, and one departure, which were banned outright by companies for whom I have flown. They simply didn't consider them to have a sufficient safety margin – or perhaps they thought our flying wasn't accurate enough! So 'because it's there' isn't an automatic reason to tackle it.

Airports are also put into categories depending on ease of use and some have a written departure and/or an approach special briefing. If it relates to an approach, it must be used during the briefing by the crew in conjunction with the approach plate. One such airport briefing started with the words 'this is a beastly little place to get into' without a word of censorship for language from the CAA. It went on to say that at first sight there didn't appear to be a problem, with ILS and all the trimmings available, but went on to define in exact detail the clearance required from high ground at various points in the procedure, what to look out for and what not to do. This type of briefing would have been most useful to the Alice Springs accident crew.

Armchair review

A great deal of this information can be spotted in advance from a careful study of an approach or departure plate when one is not airborne but sitting at a well lit desk with a cup of coffee in hand. DIY ops manual, in fact.

The Alice Springs accident, taken as an example of chart presentation, occurred in 1995 so some 14 years have passed since then. The charts, therefore, have left me confused – I may have missed something or it may just be the Australian habit in the last century of doing aviation things slightly differently.

We presume that Captain Angry was intending to fly a straight in approach and land on Runway 12, but no minima for such an approach is shown, only circling minima and (today) the two are vastly different animals.

Circling minima

For example, at a certain UK airport with an NDB/DME approach, the minima shown for a Cat C landing is 560 feet (on QNH) and 450 metres. For the same approach but circle to land on another runway, the minima are 800 feet and 2,400 metres. Quite a difference.

Which brings us on to page 5 of the article, commencing 'The situation for circling approaches is less clear'. At this point the company operations manual kicks in and I quote from the manual of the last company that I flew for:

'When below cloud at or above circling minima, carry out a normal or low visual circuit.'

Normal and low visual circuits are defined elsewhere. If you commence an approach with the intention of circling to land, the circling minima are the definitive figures, no question. Once the decision has been taken at circling minima that the approach can be made, there is no further descent restriction. You are flying visually. It is really just common sense and can be used by private pilots who do not have the benefit of a company operations manual.

If it is examined in the context of the Alice Springs approach, for a circling approach visual contact must be made at an altitude of 3,200 feet in a minimum visibility of 4,000 metres. This is only 1,411 feet above aerodrome level. That kind of height and visibility is going to be needed to manoeuvre visually a Cat C aircraft on to a stable final approach to another runway.

Missed approach when?

If, however, visual conditions are not achieved at circling minima, that altitude must be maintained and the point at which the missed approach must be commenced has to be determined. This is done in the approach briefing. In the Alice Springs case, it appears to be the centre of the runway and as there is no DME shown it must be done on a stopwatch from the AS beacon. The Australian format plate in Figure 2 shows 'NDB to MAPt' but you have to be clear that the AS is an NDB and the other two are locators!

The main differences between the Jeppesen and the Australian plate, as shown, appear to be that the Australian plate has the step down fixes (SDFs) underlined, meaning that the altitude at that point is plus whatever-you-like but minus nothing. Additionally the mileage is shown as zero at the MAPt on the Jeppesen but zero at the AS on the Australian. You can take your pick as to which you prefer….. But because it would be possible at night to be clear of cloud at 3,200 feet in a visibility of 4,000 metres, and therefore be without a descent restriction, but unable to see the terrain ahead in the dark, this circling approach should merit a company brief and/or restriction since the plates ignore this point.

P 4 ▶

◄ P 3 ***Additional information on plates***

On today's approach plates there is very important information at the bottom, particularly in respect of the vertical profile. There may be a list of distances and altitudes for a continuous descent approach. There is a table of groundspeed against times for certain distances and also – very important – the required rate of descent (ROD). There may also be other notes included which would not merit the space unless they were vital. Essential reading material!

Looking at the Alice Springs plates, Jeppesen seem to have used different scales on the spacing of the beacons compared to the Australian format. These approaches can be all over very quickly (even without a crash!) and picking out the information during the approach briefing means forewarned is forearmed. For example, the 3.6nm between the first and second beacons on the Alice Springs approach at 120kts will take less than two minutes. The purpose of the article is not to comment on Captain Angry's failings but from the times given he must have been going like a bat out of hell and therefore making life even more difficult for himself.

The ROD is so important it cannot be emphasised enough, particularly if the approach does not have steps but is a long, straight run in of say, five miles. Curiously enough it is easier to get too high than too low, especially if there is a tailwind (usually the reason for circling-to-land) so picking the correct groundspeed from the table and noting carefully the matching ROD required and going for it makes life much easier.

Plates normally come with a little booklet explaining the set up and providing a key. Good training captains are apt to ask classroom questions on the subject to see if pilots actually understand what is in print! Private pilots have to test themselves.

Briefing the approach – use a data card

For 'remembering' minima as briefed, all three airlines for which I flew had data cards to be clipped on the instrument panel in front of both pilots. They had boxes to be filled in, one side covered take-off, the other side landing. If the Alice Springs crew had used a data card, the minima for the particular approach that they were flying would have been written up in front of them in big black figures – no guesswork. The card would have been filled in during the approach briefing. Private pilots can create their own data cards, it is to be recommended (unless the possessor of a perfect memory).

On Page 9 in relation to Figure 5, we are asked the question 'would you have commenced a 1,500ft/min descent… if that terrain profile had been shown on your chart?' Well, a 1,500ft/min ROD on the approach means you have lost the plot anyway.

Terrain - something nasty underneath?

Personally, I am interested in the SDFs, not a terrain profile. I am aiming to make the SDFs and take it as read that there is something nasty underneath. When I do want to know about terrain, it is later on. Take some of the 'into a valley' approaches, which are typical of airports where circling is often required. The instrument approach is flown down to circling minima, visual conditions obtained, but one is then faced with hills on three sides of the airport. In order to space the visual circuit in less than perfect visibility, I want to see the immediate terrain surrounding the airport shown on the plate in order to decide on a suitable circuit height. In these cases it is shown on the horizontal, not vertical, profile which is quite satisfactory.

The compilers of plates are human beings! Too much information and they are accused of clutter – too little and they hit the safety barriers…

Non-precision approach CFIT

…step-down fixes and chart gremlins

By Chris Cook

Part 2 of 3, Confusion reigns

In Part 1 of this article, I looked at the possibility of instrument approach chart (IAC) presentation being a contributory factor in step-down fix (SDF) approach accidents, and the moves by Flight Safety Foundation in conjunction with ICAO to introduce improved charting standards. In particular, the resultant incorporation of a new profile presentation into PANS-OPS in November 2004 was covered in some depth, explaining the depiction of procedure altitude and the use of shaded blocks to show minimum obstacle clearance altitude for each portion of the final approach segment.

From hours of pouring over charts drawn to the new profile presentation (alright, I'm exaggerating just a little!), I came to two unspoken conclusions: namely that they offer a greatly-reduced chance of misinterpretation at times of high workload, as long as sufficient effort is made to understand their basis; and that they're better still when they incorporate a visual representation of terrain profile, as in the UK CAA's implementation.

So, that's it then. Use only IACs drawn to the new standard, get to grips with the basis of the presentation and you'll be sure to increase your chances of living to a ripe old age! Making for a very short Part 2 of this article… except, unfortunately, nothing in aviation is ever that simple. Sadly, the new chart standard is being introduced so slowly as to proliferate the number of differing profile representations we have to work with. Further, in a number of instances, the implementation is so poor as to inject confusion and actually increase the chances of misinterpretation, thereby entirely undermining the objective of this safety-based initiative.

The new standard, destined eventually to apply across the board to all non-precision instrument approach procedure charts, is being adopted immediately for new or revised procedures but introduced only 'progressively' for existing procedures. That's a euphemism for saying 'when we get around to it, but don't hold your breath.' The tardiness is well typified by the chart for Prestwick's LLZ/DME/NDB RWY 31, ironically used as the conventional procedure with FAF illustration in the UK CAA's AIC on the subject (see Figure 3 in Part 1). Despite the CAA re-formatting this chart one year after the AIC was published, it lingers today still drawn to the old standard.

In this section, as its heading suggests, I'll take us for a run round just a few of the 'opportunities for confusion' that I've come across in my research for this article. I cannot hope to cover them all, because every instance requires one or more IAC profiles to be viewed and there simply isn't the space available. Those that seemingly have the biggest 'killer potential' I've saved for Part 3 (entitled ***Focus on the gotchas***). Between the two, the examples I've given ought to drive home the principal message, which is: 'if you're likely to need a step-down fix instrument approach, be sure to have a very clear understanding of its

Figure 6, Blackpool NDB/DME Rwy 28

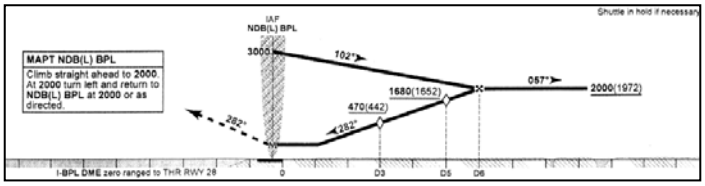
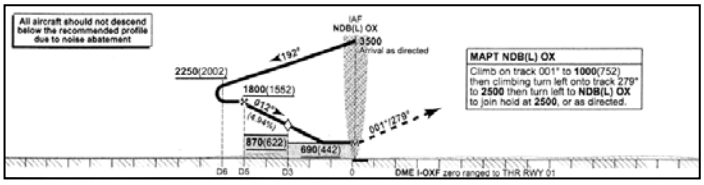
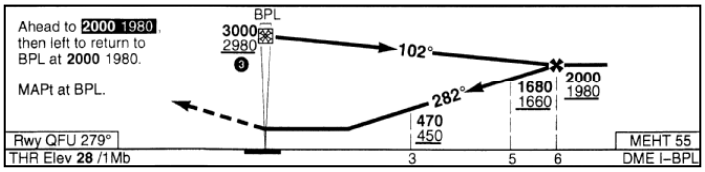
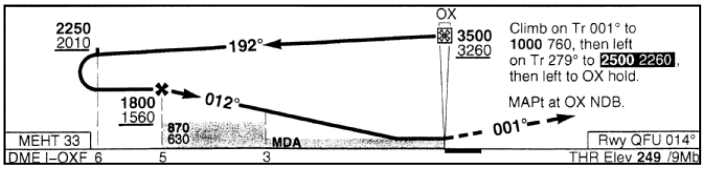


Figure 7, Oxford NDB/DME Rwy 01

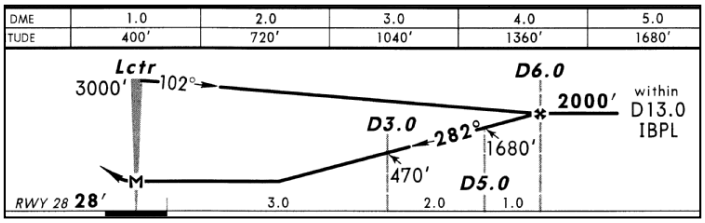


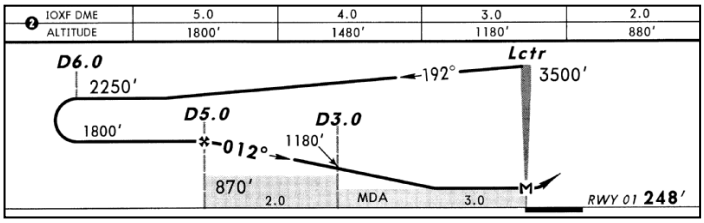
CAA charts





Aerad charts





Jeppesen charts

profile before you take-off.'

As a baseline for comparison, let's start with an SDF approach charted to the old standard, and look at the profile as published by the three producers who, between them, doubtless supply the vast majority of ***Instrument Pilot*** readers – UK CAA, Aerad and Jeppesen. Figure 6 shows these three profiles for Blackpool's NDB/DME RWY 28. Except for the lack of SDF altitude-underlining on the Jeppesen chart to emphasise they're not-below figures, more of which later, the presentations are similar and all seem quite clear. I imagine any regular user of a particular chart type would be quite confident of the correct interpretation.

Contrast those old-standard profiles to the three new-standard ones for Oxford's NDB/DME RWY 01, reproduced as Figure 7. Whilst this happens to be the approach involved in the G-LENY CFIT, I must emphasise I haven't chosen it for that reason. Here we see some differences creeping in between the three presentations, with serious potential for confusion.

Take a look at the minimum obstacle clearance altitude (minimum OCA) data in the shaded blocks. The CAA chart has each figure centre justified; but Aerad and Jeppesen both position the information at the furthest point from where it forms the minimum OCA for an SDF. The CAA representation is undoubtedly preferable, although from a human-factors standpoint there could well be a case for positioning it adjacent to the applicable SDF. In Part 3 of the article, we'll see an incident in the Seychelles that, arguably, arose directly from misreading this information as forming the minimum OCA at the earlier SDF.

Take a look also at the inclusion in the Jeppesen chart of the 1,180ft figure at the D3.0 SDF, which is absent from the other two. Relaxing behind a desk rather than sweating in front of an instrument panel, it's easy to see this represents the procedure altitude at the SDF (rather than its minimum OCA), and this is confirmed by cross referencing to the recommended distance/altitude table. Now, however, let's embark our passenger and fly to Blackpool, where we descend in the NDB/DME RWY 28 procedure using the same provider's chart. Check it out, it's the one we looked at earlier at the bottom of Figure 6; sure enough, it has an identical depiction of SDF altitudes. We're under quite a lot of pressure on this approach, having accumulated more ice en-route than we would have wished, and our attention to the chart is not all it should be.

But after mastering the chart for Oxford, we fly the approach in the sure knowledge those figures represent procedure altitude. Except, unfortunately, they don't! In the Blackpool chart, drawn to the old specification, an identical representation of altitude data by the same provider actually depicts the minimum OCA rather than the procedure altitude, which in the case of the second SDF of 470ft puts us 570ft below where we should be for a constant angle descent. Oh dear!

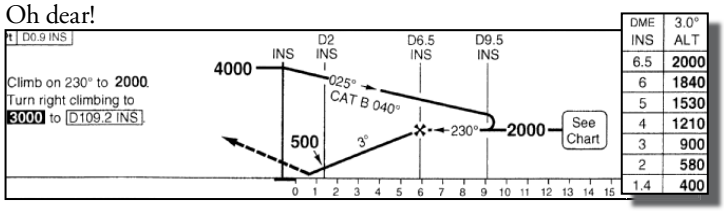


Figure 8 Inverness VOR/DME Rwy 23: Navtech *aerochart*

Let's put it behind us, though; whilst we may have scared that farmer senseless, we lived to fly the last sector of the day: a radar-vectored approach onto final for the VOR/DME RWY 23 at Inverness. After our near-death experience at Blackpool, we decide to revert to the Aerad charts we've used for the twenty years prior to our recent change to Jeppesen. Studying the relevant chart (see Figure 8) whilst approaching top of descent, we know the 500ft altitude at D2 is our target procedure altitude rather than an SDF minimum OCA because it's not underlined and, as with the CAA charts, Aerad have always underlined altitude figures that are 'don't fly below' (refer back to Figure 6). Selecting gear down upon reaching the FAF, we fail to notice the wind has veered and will cause our carefully calculated rate of descent for the 3° descent profile to result in an angle more like 3.3°. Naturally, we are diligent in cross-checking our progress with the distance/altitude table as we slide down the approach, but aren't unduly worried when we're 90ft below the recommended figure at 4D because, hey, these are targets not platforms and plus or minus 100ft is perfectly adequate for government work (author's note: hmm?). On approaching 2D, 'terrain, terrain, pull up, pull up' drowns out the landing clearance from ATC ... we've just established that the 500ft altitude is, after all, an SDF minimum OCA despite its lack of underlining, thanks to Navtech's recent and unloved rework of the Aerad charts (which is happening progressively for all approaches - see IP69, page 17). Good job we spent the money on TAWS.

Many pilots who achieved their IR through the UK CAA route, me included, have a relationship with Aerad charts that compares to their affection for an old pair of slippers! In consequence, there's more than a little anguish around at the total revamp now being imposed by Navtech following their acquisition of the European Aeronautical Group. Here are two profiles from the new 'aerochart' series, one to the old ICAO standard and one to the new. Are these masterpieces in clarity … or accidents waiting to happen? You decide.

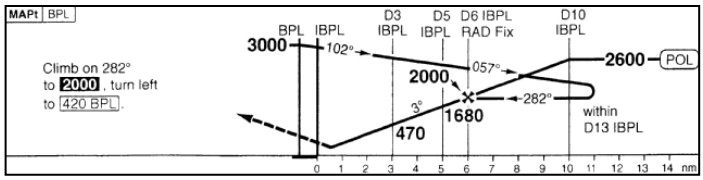


Figure 9 Blackpool NDB/DME Rwy 28: Navtech *aerochart*

Start with Figure 9 the new aerochart profile for Blackpool's NDB/DME RWY 28. Imagine you're in moderate turbulence, self-briefing for the approach whilst trying to update ATC on progress with your 'urgency' situation following an earlier PAN call due to a rough-running engine. Is 1,680ft the platform altitude for crossing the FAF? Are the various figures procedure altitudes or minimum OCAs? Try this for a brief moment – then look back to Figure 6 at three alternative depictions of the same approach profile and decide which you think is the least user-friendly and most capable of misinterpretation.

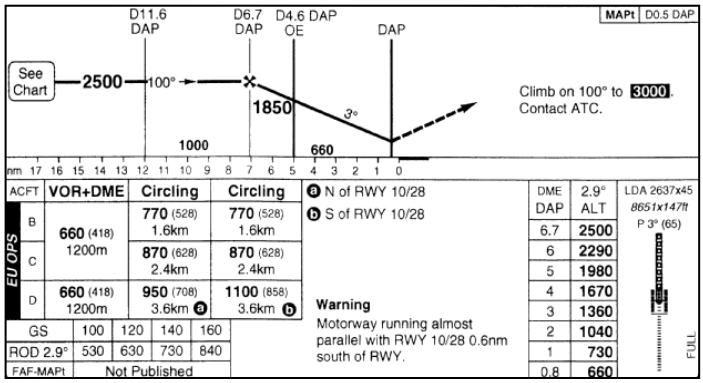


Figure 10 Dublin VOR Rwy 10: Navtech *aerochart*

Now turn to Figure 10, which is the aerochart profile for the Dublin VOR RWY 10 procedure. It's drawn to the new ICAO standard, although the absence of shaded blocks for the minimum OCAs means you can be forgiven for not recognising it as such. Navtech says the omission (which has been carried through all of its revamped presentations of new-standard IACs) is down to a printing error and will be rectified. Three amendment cycles later, however, they remain unchanged! I confess to having found this chart incomprehensible, even sat in front of a computer with all the time in the world to spare. What is the significance of the 1,850ft altitude? Since it's emboldened like the 2,500ft platform altitude to the FAF, presumably it's a not-below altitude. But, there again, the 1,000ft and 660ft figures seem to be minimum OCAs, and they're not emboldened. Could it be a procedure altitude? Perhaps; although the table of recommended distance versus altitude infers a procedure altitude at the SDF of 1,860ft (1,980ft less 0.4 x 310ft). The lack of any other minimum OCA shown between D6.7 and D4.6 surely indicates it must actually be the minimum OCA for that portion of the final approach? If it's supposed to be the minimum OCA, though, there's another problem … given it's higher than the previous 1,000ft minimum OCA, and that would be against the rules. Help! Maybe the IAA chart in the Irish AIP can shed some

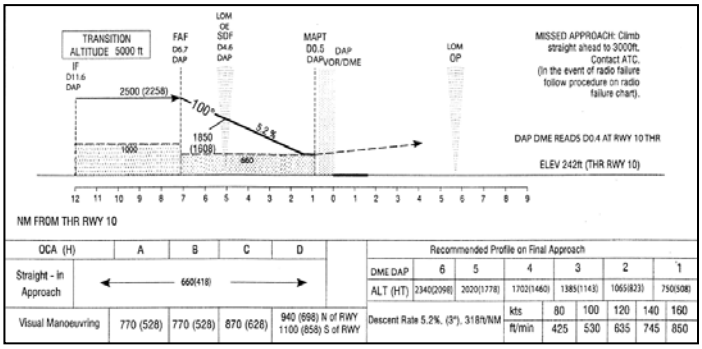


Figure 11 Dublin VOR Rwy 10: Irish AIP chart

light (see Figure 11)? Well, that at least resolves one ambiguity: the 1,000ft and 660ft altitudes are indeed minimum OCAs, but the 660ft applies from D6.7 not D4.6. However, the meaning of the 1,850ft altitude is ever more a mystery; the AIP chart uses different figures in the recommended distance/altitude table which would have the procedure altitude at the SDF equate to 1,890ft (2,020ft less 0.4 x 318ft). So it's definitely not the minimum OCA, and it's definitely not the procedure altitude. What the heck?

Which neatly takes us to yet another source of confusion: the styles adopted by both of the main commercial producers (as well as those of some of the national aviation authorities) are not able to deal unambiguously with the occasional need to show three altitudes in respect of an SDF. Why does this need arise? Well, in the case above at Dublin, apparently the procedure designer simply wanted to have a not-below altitude of 1,850ft at the fix! Responding to my query, he said he understood it was confusing so it was due to be redrawn as a 1,890ft target procedure altitude next time the chart was revised.

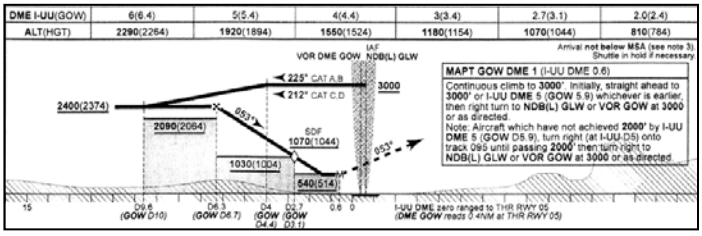


Figure 12 Glasgow NDB/DME Rwy 05: CAA AIP profile

A variation of this problem is where there are apparently three altitudes for the SDF, but two of them are the same figure. Eh, you say, what does that mean? Take a look at the example in Figure 12, which is the UK CAA chart profile for Glasgow's NDB/DME RWY 05. Here there's a procedure altitude in the distance/altitude table at 2.7d of 1,070ft, whilst the same figure is also shown on the profile as an undesignated not-below altitude; plus there's a not-below minimum OCA of 1,030ft. So, what exactly does it mean? Must you be above 1,070ft at the SDF … or only above 1,030ft? Well, apparently it's a mistake – a hangover from the previous standard where, because minimum OCAs weren't shown, any SDF had to be a not-below figure even though it might have been higher than that strictly required for obstacle clearance. The 1,070ft is really just a procedure altitude, and nothing else. The nice folk at the CAA's DAP tell me there are several UK IACs around like this and they're working their way through them, eliminating the ambiguity. P 7 ▶

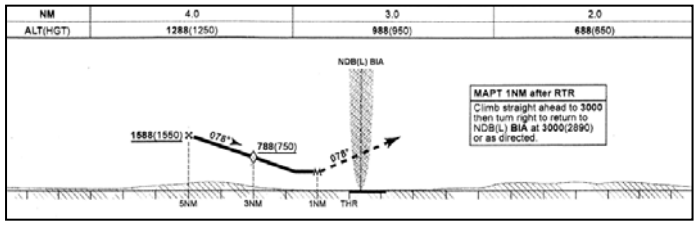


Figure 13 Bournemouth SRA 2nm Rwy 08: CAA AIP Profile

◀ P 6

Finally, the Bournemouth 2nm SRA RWY 08 profile in Figure 13 is a rather different example of an SDF with three relevant altitudes at 3nm. Since it's drawn to the old standard, it currently only shows two of them: a procedure altitude of 988ft in the table and an undesignated, not-below altitude of 788ft on the descent profile. When this IAC is eventually redrawn to the new standard, however, I would expect it also to feature a shaded-block minimum OCA (prior to the SDF) of less than 650ft. So what is the relevance of 788ft? Turns out it's a not-below altitude for noise abatement purposes! While you may not be endangering safety by descending below it, you could nonetheless find yourself having tea and biscuits with the relevant flight-crew licensing authority. Certainly that's what happened to the crew of a Boeing 757 who bust it during an SRA approach into Bournemouth in January 1996, believing they were flying the NDB/DME procedure (with radar-vectors to final), which, at that time, was SDF free.

Confusion reigns

Confusion abounds in the profile presentation on step-down fix approach charts. Single-pilot and in bad weather, the possibility for misinterpretation is all too real; throw in an airsick passenger or an illuminated alternator warning light, and the 'holes' really start to line up. My principal recommendation follows directly from this shortcoming:

'Where a non-precision approach with one or more step-down fixes is a reasonably likely outcome at either the destination or the alternate, it is highly desirable to study and understand the profile altitudes/distances as part of the pre-flight planning exercise rather than for the first time during an in-flight approach self-briefing. Any ambiguities need to be resolved pre-departure, possibly by resort to the chart of a different producer.'

Chris Cook, a JAA CPL/IR with circa 1,700 hours, has flown a G-reg Beech A36 Bonanza since 1992 and been a member of PPL/IR Europe for the past ten years. He is an engineering industry adviser to several private equity firms and executive chairman of a technology spin-out from the University of Oxford developing novel, radio-frequency sensors for, amongst others, the aircraft industry.

GPS – a view from across the pond

By Derek Fage, our roving correspondent at AOPA Expo in California

With the first general aviation GPS approach in Britain coming on line at Shoreham (EGKA) on 20th November 2008, following two years of evaluation by the CAA, I felt it would be an idea to write an article on what's currently happening in the United States following a visit to the AOPA Expo in San Jose, California just a few weeks earlier. Looking at what has been implemented by the FAA (see http://gps.faa.gov) for use in the US is like a breath of fresh air to those of us who have been waiting for GPS approaches in Europe for many years.

WAAS in the US

The Wide Area Augmentation System (WAAS) is a satellite-based augmentation to GPS that provides extremely accurate navigation to the continental United States and significant portions of Alaska, Canada, and Mexico. It broadcasts its correction and integrity messages via two geostationary earth orbiting (GEO) satellites positioned 23,000 miles above the equator and aligned to provide continuous services to the majority of North America.

Using WAAS improves the accuracy of the GPS signal from typically 20 to 30 metres down to around 1.5 to 2 metres, vertically and horizontally. WAAS reached initial operating capability for aviation use on 10th July 2003. It uses a system of ground stations to compare GPS positioning to a known position that has been precisely surveyed. A correction message is calculated and transmitted to a geostationary satellite that then re-broadcasts this message to the WAAS receiver in your aircraft. The receiver can then apply this correction to its calculated position providing this much improved accuracy

The improved accuracy and integrity provided by WAAS means that you can fly:

- lateral navigation/ vertical navigation (LNAV/VNAV) approaches, and
- localizer performance with vertical guidance (LPV) approaches.

WAAS and GPS approaches

An aircraft equipped with an approved and certified GPS installation is considered an RNAV (area navigation) aircraft and is capable of flying an LNAV approach. This is the standard basic GPS approach such as the RNAV (GNSS) RWY 02 approach at Shoreham. To fly an LNAV/VNAV approach you must either have a certified baro-VNAV system (rare) or a certified WAAS receiver.

- LNAV - offers lateral guidance only. LNAV height minima are generally around 400 feet AGL. Non-WAAS receivers can only use the LNAV or circling minima. This is what the first GPS approach in the UK at Shoreham uses.
- LNAV/VNAV - a vertically guided approach with a typical decision altitude of 350 feet AGL.
- LPV - provides lateral and vertical navigation. LPV capability enables pilots to descend with stabilised vertical guidance to decision altitudes as low as 200 feet AGL with visibility minima as low as one half mile when the terrain and airport infrastructure support the lowest minima.

Whilst LNAV/VNAV and LPV approaches provide vertical guidance that appears like a glideslope, they do not meet the more stringent standards required for precision approaches. Therefore a new class of instrument procedures has been designed to accommodate approaches that offer vertical navigation but do not meet the strict ICAO requirements for precision approaches. In addition to falling into a new category of approaches, LNAV/VNAV approaches often have a higher decision altitude than the MDA on the LNAV approach. This is due to the location of the missed approach point on LNAV approaches. This often causes pilots to take a second look at their approach plates.

Soon, some RNAV GPS instrument approach procedures will have a new line of minima. Labelled on the charts as 'LP', localizer performance minima will allow operators with appropriately certified WAAS navigation systems to fly instrument approaches in potentially lower weather conditions to runways that do not qualify for LPV minima. These new approaches are the result of new terminal instrument

procedures criteria recently approved by the FAA and will benefit both fixed wing and rotary wing for IFR operations.

Technically, LP differs from existing LNAV minima by allowing approach developers to use a smaller obstacle evaluation area based on localizer like angular guidance and the much smaller integrity limits of WAAS. Obstacles offset from the approach course that raise the MDA for an LNAV approach may not necessarily affect the MDA for LP. This results in potentially lower minima, and in the case of poor instrument meteorological conditions, the difference between landing and diverting to another airport. If WAAS correction is lost, avionics default to LNAV procedure.

As of 18th December 2008, there were currently 1,390 published WAAS LPVs (see image below for locations). In addition, a major milestone for GNSS, and a significant milestone for the aviation community, was achieved on 25th September 2008 when the number of WAAS LPV procedures available in the US surpassed the number of instrument landing system (ILS) procedures.

Table: Total number of WAAS capable approaches by type at 18th December 2008

LNAV Procedures	3829
LNAV/VNAV Procedures	1535
LPV Procedures	1390
GPS Stand-Alone Procedures	804

WAAS milestones:

- July 2003 - WAAS is commissioned by the FAA for instrument flight use supporting minima as low as 250 feet.
- September 2003 - the first WAAS LPVs are published.
- October 2004 - FAA Administrator Marion C. Blakey announces that US avionics manufacturers are building new WAAS receivers or upgrading existing GPS receivers to WAAS capability and urges aviation users to equip.
- December 2004 - the FAA installs four additional WAAS reference stations in Barrow, Bethel, Fairbanks and Kotzebue, Alaska as initial steps in a planned WAAS expansion.
- March 2005 - the FAA finalizes a Geostationary Satellite Communications Control Segment contract with Lockheed Martin for WAAS geostationary satellite leased services to 2016.
- June 2005 - the first international WAAS reference station is installed in Canada.
- March 2006 - due to outstanding system performance, WAAS is approved to support lower minima, as low as 200 feet.
- August 2006 - WAAS service is expanded to cover all of Alaska.
- November 2006 - a new WAAS GEO, the PanAmSat Galaxy XV, is integrated into WAAS, increasing WAAS availability throughout the US.
- July 2007 - a second new WAAS GEO, the Telesat ANIK-F1R, is integrated into WAAS, completing the implementation of enhanced WAAS GEO coverage. Later in the same year, the original WAAS Inmarsat GEOs are phased out.
- September 2007 - WAAS service is expanded to cover large portions of Canada and Mexico.
- June 2008 - the number of WAAS LPV capable avionics passes the 35,000 mark and continues to climb steadily each month.
- September 2008 — the number of runways served by WAAS LPVs surpasses the numbers of runways served by ILS.

What's next? LAAS to provide ILS like precision approaches

The Local Area Augmentation System (LAAS) is a ground based augmentation system (GBAS) to GPS that focuses its service on the airport terminal area for precision approach and departure procedures and terminal area operations. It broadcasts its correction message via a VHF radio data link from a ground based transmitter.

LAAS demonstrates accuracy of less than one metre both horizontally and vertically. This very high accuracy, along with increased integrity and availability, will enable Cat I precision approaches initially with the ability to provide Cat II/III precision approaches in the future. It also provides the ability for flexible curved approach paths (one of the ideas behind the microwave landing system approach). LAAS should also provide fewer arrival and taxi delays than ILS as LAAS eliminates ILS critical areas.

LAAS is currently in a research and development phase focusing on reducing risks for future developments with regard to integrity and safety. The FAA is working with the industry on the certification of the first LAAS ground station in Memphis, Tennessee and this site will then be used to prove operation concepts and to obtain the first non-Federal US approval for LAAS category operations.

What about outside the USA?

The FAA is also working with other international service providers to facilitate the development of an ICAO SARPS compliant Category I LAAS based on the Memphis prototype. The FAA is working towards international GBAS implementation and interoperability through the sharing of technical knowledge and approval processes. Australia, Brazil, Germany, and Spain have been actively supporting this and have installed prototype GBAS systems and are involved in technical and operational evaluation activities.

Currently, WAAS satellite coverage is only available in North America; however, other governments are developing similar satellite based systems. In Asia, its the Japanese Multi-Functional Satellite Augmentation System, while Europe has the Euro Geostationary Navigation Overlay Service (EGNOS). Eventually GPS users around the world will have access to precise position data using these and other compatible systems.

The EGNOS website (www.esa.int/esaNA/egnos.html) does not publish a detailed timeline on WAAS in Europe. It currently carries a story about a successful test in February 2008 at San Sebastian airport in Spain using EGNOS to guide an aircraft during a landing.

An Air Nostrum Dash 8 aircraft flew four test approaches to runway 04 at San Sebastian, employing LPV. The trials were performed as part of the **G**NSS **I**ntroduction in the **A**viatio**N** sec**T**or (GIANT) project. GIANT is a European Commission Sixth Framework Programme project with the aim of supporting the introduction of EGNOS and Galileo services into the aviation market while demonstrating to the responsible authorities that the required safety levels are achieved. Unfortunately there does not at present appear to be any commitment currently to a date when this will go live.

Summary

The benefits of WAAS have been fully embraced by the FAA with development and testing for ILS like approaches to be implemented in the future; however the prospect of WAAS approaches in Europe does not look like something

that's going to be happening in the short term. We now have the first UK GPS approach at Shoreham with more to follow, so now we need to continue the work we've been doing to start trying to get GPS approaches into airfields without ATC whilst we wait to see what happens with EGNOS which would allow for the tantalising possibility of WAAS in the future.

Note: Vasa Babic has produced an 'RNAV Training Manual' that provides a detailed guide and reference for IFR pilots using GPS and, specifically, aims to meet the theory training for P-RNAV and GPS approaches. This manual is available at www.pplir.org/rnavmanual. *The illustration showing the location of WAAS LPV procedures in continental US is taken from the FAA website at* http://gps.faa.gov *together with the table of WAAS capable approaches by procedure type.*

Cirrus Vision, one of the many aircraft on display at AOPA Expo

AOPA Expo 2008 - a report from a recent PPL with IR aspirations

By Tammy Fage, another roving correspondent in California

As a relatively recently qualified, low hours, private pilot about to embark on my IMC - with long term plans to gain the IR - the 2008 AOPA annual convention in San Jose, California was my first experience of attending an event of this size. With little idea of what to expect I wasn't let down by my vague expectations of American dazzle – and it started from the very beginning. My rather dull sounding pronunciation of AOPA '*A Oh Per*' was immediately replaced by the lilting American *'A Oh Pee A*' which, with the grand auditoria, enthusiastic speakers and sparkling presentation aids, kept making me think of '*YMCA*'. Indeed, at times, I half expected the exuberant presenters to slip into some hand signalling dance!

Still, onto the Expo itself. With over 600 exhibits, an extensive static aircraft display (with more than 70 aircraft on show) and a wide range of informative and educational seminars there was much to see and do in three days although we were only there for the last two. It immediately became apparent to me that, despite my relatively recent introduction to the joys of flight, technology is moving on apace. The flight panel and instruments I learnt with about a year ago looked almost redundant in this environment. Glass cockpits of every shape, size and price tag glittered across the vast exhibition hall.

Glass cockpits – easier to fly but not easier to operate

I began to think not only am I about to experience the challenges of learning to fly purely on my 'basic' instruments, I suspect that sometime in the not too distant future I will have to transfer all these lessons to highly coloured, incredibly detailed, computer screens. I made a point of checking out all of the aircraft on display in the hall – and I struggled to find any without some form of glass cockpit. This didn't surprise me as you can't fight advancement; but I found it fairly daunting to think that an inexperienced pilot like me may soon have no choice but to go high tech.

Now it's not the technology per se that I am slightly cautious about. I assume it is as easy to learn your way around a glass cockpit as it is to learn what each 'standard' instrument does. It is more about whether low time, inexperienced pilots will be 'encouraged' to fly in weather and conditions they wouldn't consider with a basic panel – much of the technology on display tacitly implied all weather flying – and a far greater reliance on the auto pilot than at present. I kept thinking will the skill base and knowledge be there if the glass panel fails? I think Rod Machado summed it up for me during one of his seminars saying '*technically advanced aircraft may be easier to fly but they are not easier to operate*' and '*they are based on avionics, not mechanical complexity*'. This is something I will always keep in mind when, as I am sure is inevitable, I become a devotee of the glass cockpit.

Apart from the huge range of flying related paraphernalia – ranging from general pilot supplies and avionics to training providers and pilots associations - a few more unusual exhibits were on display. These included the futuristic looking *ICON A5 Sport Aircraft*, with foldable wings, which you can fly from land and water (price tag 139,000 US dollars). A fun looking plane – although probably not suited to Jersey's rough seas much to the husband's relief!

Less work, greater safety, more fun

The range of seminars available at the Expo was impressive covering everything from medical and legal issues to safety education and insights into flying with the latest technology, plus the odd session on flying humour which seemed to attract the largest audiences!

I attended a number of the safety related sessions including '*Single pilot flying strategies: less work, greater safety, more fun*' and '*Top five mistakes pilots make*'. These were, without exception, extremely well presented and full of useful tips and information. These sessions alone emphasised to me not only the value of learning and practising basic instrument flying but also how to get the most fun out of your flying, and pushing the boundaries safely.

In summary, AOPA Expo 2008 was a great event, with much to interest any flying enthusiast. If you get the chance to attend one in the future I'd certainly recommend it, but take a comfortable pair of shoes and a large wallet!

FLYING SAFARI IN SOUTHERN AFRICA

By Steve Dunnett

Well, there we were, all togged up (more about that below) and ready to go. Sarah and I, along with Mike and Tracy Birchall, setting off from Lanseria airport in the northern suburbs of Johannesburg, on a 12 day self-fly safari up through Botswana and Zambia before returning to the Republic of South Africa. Sarah has long wished to go on an African safari and realised the best way to tempt me out of the lab was to suggest we go fly ourselves. Mike and Tracy operate their own immaculate Alpi Pioneer from the same farm strip in South Wales where we base our Piper Dakota. Although operating a PFA aircraft, Mike is one of the intrepid group of ***Flyer***-listed pilots who have combined forces to train together for their instrument rating and are on course to cause a major jump in annual issue of new PPL/IRs. When we raised with them our interest in a self-fly safari holiday, they were up for joining us; and four heads are better than two, not least because Mike knows Africa and African bureaucracy well through his work travels. It was now nearly a year since the original idea to finding ourselves with new South African licences ready to set out from Lanseria.

Preparations

No doubt you can plan it all out yourself from scratch, but there are South African flying schools that specialise in welcoming European and American pilots to flying in southern Africa, not just for cheap and sunny training but also for the special opportunities provided by flying safaris. Southern Africa not only prides itself in being the cradle of mankind but is home to some of the most amazing wilderness and large game wildlife on the planet. After searching the Internet, extending email enquiries to several safari organisers, and talking to Irv Lee at Popham, we decided to entrust our deposits to Christina and Nick Hanks (www.selfflysafari.com).

They proposed the itinerary, which was personalised to our individual interests and schedule, made all the bookings, cheerfully amending them each time our plans changed; met us at the airport; and generally looked after us like family for all our tourist interests as well as flying preparations. And they prepared trip kits for each of us with all the maps, frequencies, official forms, international documents and a wadge of cash in each of the local currencies to pay all fees and local fares for every leg of the trip. Faultless.

We spent the first four days at Lanseria receiving detailed briefings on flying at high density altitude (about which, more below), local flight procedures and ATC, and preparing for the South African air law exam. This, along with a general handling test and cross-country check rides, was required for issue of a South African licence (restricted to daytime VFR) on the back of our JAA licences. There have been some horror stories about the bureaucracy of changing regulations for validation of foreign licences during the first half of 2008, with at least one report of pilots who were required to submit copies of their FAA licences three months in advance for issue of a three months restricted licence that had expired by the time they then arrived in South Africa. They were not able to undertake their pre-paid safari. However, the national CAA has been responsive to smoothing out the unintended glitches that accompanied their recently introduced, security driven authorisations (which contrasts nicely with some other national aviation authorities one could name). Licence issue, for us, simply involved sending scanned copies of our licences several weeks beforehand, the two check flights, plus advance completion of a multi-choice questionnaire in standard aviation format, ending with instructor sign-off. We were certainly dependent however on the Hanks knowing the ropes and taking all the forms through the administrative system behind the scenes.

It need only have taken two days, but we wanted to allow extra time for any hiccups, and this enabled us to take the familiarisation more gently as well as including some extra sightseeing (the University of Witwatersrand 'Origins' museum of early mankind was a must). Our itinerary took in five very different safari destinations: tented camps, hundreds of miles from the nearest made-up road, which were only accessible by charter or private flight in the middle of the salt pans of the Kalahari (San Camp), and in the high inland Okavanga delta (Little Kwara); proper safari lodges in the game reserves, Mashatu on the Limpopo river, and MalaMala on the edge of the Kruger; and the retro-colonial luxury of the Royal Livingstone hotel overlooking the Victoria Falls. I will be pleased to show all 1,700 holiday slides of big cats, little cats, meerkats, ostrich, hornbills, bee-eaters, desert hares and desert scorpions (and all the other big game in stunning proliferation) to anyone with the patience, but this is supposed to be an article for pilots! *Editor: by concession one picture of a wild animal allowed per issue.*

Two noble steeds, but the 180 hp Piper didn't cope as well as the high wing Cessna

Hot and high

The first challenge we encountered was density altitude. I may have passed all the theory, but I have never experienced trying to get an aging variable-pitch 180hp Piper Cherokee to maintain level flight when it is 40°C on the ground, which rises to 4,000 – 5,000 feet in central Botswana, and still 30°C at our lowest semicircular cruising level of 7,500 feet. On the first leg of our trip from Lanseria, refuelling and clearing customs in the Botswana capital Gaborone, and onwards across the Kalahari to San Camp, we departed 100lb under 2,400lb MTOW but even with careful leaning I needed full throttle, maximum climb power (25 inches, 2,500 rpm) to maintain straight and level. The needles indicated we were drinking fuel (like Cardiff city centre on a Saturday night).

Dipping the tanks on arrival at San Camp suggested we did not have enough fuel for our next planned destination, Kasane, in northern Botswana, so we diverted to Maun to refuel and confirmed that we had indeed been using 14 gals per hour instead of the book figures of 9-10 for normal cruise performance. We began to understand why the large engine high-wing Cessna – mostly C182 and C210 – seemed to be the generic light aircraft everywhere we went in the high inland plateaux of southern Africa. The low-wing Piper really is unsuitable for this climate, at least with a 180hp engine (whether our 235 hp Dakota would have sufficed would be interesting to explore, but that will have to be next time). In fairness to the Hanks, this was not the aircraft intended. We had booked two C182s and the second aircraft flown by Mike performed flawlessly in these conditions. However ours went tech the day we arrived and the little Piper was all that was available at short notice. The partial, but adequate, solution to our performance problem for the remainder of the tour was that Mike and Tracy carried all the luggage, ours and theirs, in the 182. By keeping to under 2,100lb we could manage a normal cruise performance and even manage 100-200 ft/min climb performance for clearing the major ridges. The South Africa escarpment on our last legs goes to 7,600 feet, and it still did not get much below 25°C at 8,500 feet. Well, that was one challenge.

Technically VMC

The second challenge of hot and high was how hazy it became in the heat and dust. We never saw a cloud in 12 days of flying – not even a little, distant, wispy one – but with no horizon in the haze and a clear view of a total blank white saltpan on the surface there was absolutely nothing to see for reference. It was indeed clear of cloud, in sight of surface and >5km visibility, and so was technically VMC, but to all intents and purposes it required fully IFR procedures to maintain straight and level. And the third challenge was engine management. Of course, I am spoilt at home with an EDM700 and FS450 in the Dakota, and had to relearn accurate leaning by engine sound alone, which was fine in the cruise. Moreover I had read about and been briefed on leaning on the ground before take off. However, I soon learned from practice to throw the check list out of the window: a normally aspirated Lycoming simply will not fire fully rich on start up at 40°C and 5,000 feet. It required something akin to injection procedures, setting one half inch of throttle, starting with mixture full lean, and tickling mixture in while cranking. Fortunately, I worked that out in time without flooding the engine and before fully flattening the battery because there was no other help available within several hundred miles of the first strips. It all makes sense in theory when you think about it, but experience makes for rapid learning of new tricks.

Bush flying

Notwithstanding the heat and altitude, flying in and out of bush strips provided less problems than I anticipated, perhaps because I am used to operating a heavy PA28 from a 600m farm strip and so am used to nailing the numbers. All the bush strips were much longer, 1,000 - 1,200 yards, well, I suppose there is lots of space in the middle of nowhere. The usual rules apply, circle the airfield and do a low pass to chase off unwanted wildlife, but we had little problem other than with the occasional antelope or warthog, and none of them refused to scarper, unlike what they say about buffalo. We gathered that hyenas are prone to chew up tyres, and indeed electric fences were erected around our two aircraft to discourage animals at MalaMala where this has been a real problem. We were advised by the Hanks to ignore advice to pee on the tyres to achieve the same purpose, a local joke played on foreign pilots, in particular if they are female and flying low wing aircraft!

The other feature of flying in southern Africa, especially when leaving South Africa itself, is the distances between usable landing strips, the remoteness in between, the need for detailed fuel planning and importance of complying with regular standard position reporting and search and rescue procedures. Our flights typically involved two legs on each day. We would depart and arrive at one or other P 13 ▶

EUROSTUFF

By John Pickett

Changes to helicopter instrument rating

It is proposed by EASA that the instrument rating (helicopter) should no longer be 'type specific'. This means that the existing system whereby an IR (H) is aligned with a specific helicopter type will be changed to the system that currently applies to fixed wing aeroplanes. In the future a pilot holding an IR (H) will be able to exercise the privileges in any helicopter for which he or she holds a current type rating.

More Russian satellites launched

Launch of three Glonass-M satellites on 25th December 2008; Roscosmos photo by S. Sergeev (Tsenkicom)

According to the International GNSS Service (IGS) the three new Russian GLONASS satellites are now broadcasting navigational signals. As ***Instrument Pilot*** goes to press, confirmation is awaited that Russia has launched three further satellites. IGS reports that it is currently monitoring 48 operational satellites. There are 32 GPS and 16 GLONASS satellites. It is wondered whether the European Galileo programme will catch up and be operational in 2012?

Life raft standards

Recently there has been considerable discussion about the manufacturing standards of life rafts and their survival pack contents. Investigations showed that whilst there are strict rules concerning the manufacture of life jackets, the manufacturers of life-rafts are self-regulating, albeit to ISO9650. Over the years the impressions gained were that when a life-raft needed 're-certification' it was sent back to the manufacturer or a specialist inspection organization. The life-raft would be examined, tested and if serviceable repacked and re-certificated. All true, but it was learned that there is no standard testing organisation and protocol.

One manufacturer quotes that their life rafts meet 'government standards'. Another states that their life rafts are manufactured to 'a high standard'. Further investigation showed that some life jackets on the market conform to CE standard EN396 whilst others do not. There does not appear to be a similar standard for life rafts. It is a minefield and as the writer's life raft is due for testing, examination and re-packing shortly, he would like to hear of other members' opinions.

Retirement age up for French aircrew

The French Senate recently passed a law to raise the voluntary retirement age of professional pilots to 65 years of age. The law also applies to all other aircrew including cabin staff. Despite the change in the retirement age, aircrew will retain the right to retire at 60 or at anytime up to their 65th birthday. It is anticipated that the law will be effective from 2010.

Duty free allowance up

From the 1st January 2009 the duty free allowance for 'other goods' is increased to £340 for those entering the UK from countries outside the European Union. There are some differences in the allowances for those arriving in private aircraft. Pilots should check the HM Revenue & Customs website www.hmrc.gov.uk/index.htm for the current situation.

Proposed flight training changes

Notice of Proposed Amendment (NPA) number 22 published by EASA introduces some wide-ranging changes. Approved Training Organisation (ATO) is the new title for a Flying Training Organisation (FTO) according to EASA; however, the proposed amendment to European Law also covers such diverse activities as medical assessments and test flying. It is interesting to note that an ATO must be a 'legal entity' although the term is not defined.

The major change is that all flight and synthetic flight training will have to be conducted at an ATO. This would make the registered training facility for PPL training redundant.

Another major proposal is that, while flight training can be conducted at an unlicensed airfield, there must be Air Traffic Control in place. This will create additional costs for an airport operator and consequently for an ATO.

EASA is also proposing the introduction of a comprehensive Safety Management System (SMS) for all ATOs although an ATO that is a 'one man band' may use a subcontractor to manage this. The part of the NPA devoted to SMS occupies some 12 pages and is obviously derived from an AOC application. AOPA says 'The extensive requirements for management and quality control systems will be completely overwhelming for small training organizations'.

EASA NPA17 flight crew licensing

The response date concerning the EASA Flight Crew Licensing NPA is delayed again until February 2009. One of the reasons for the delay is that other NPAs that are associated with flight crew licensing have only just been published. The deadline for the implementation of all EASA rules remains the 8th April 2012; however it is anticipated that the new rules proposed in NPAs 17 and 22 will come into effect well before that date.

AOPA is one of the organisations concerned about the proposed

flight and ground training for the Leisure Pilots Licence (LPL) 'The basic LPL allows a pilot to take a passenger after 20 hours of flying, ten of them dual'.

Aircraft lighting guidance

The International Federation of Airline Pilot Associations (IFALPA) recently published recommendations concerning the use of aircraft external lights. Eurocontrol, BALPA, IFALPA and the US FAA have developed a 'best practice'. Currently there are not any international agreements, or accepted procedures, for the use of aircraft external lights on the ground. For many years the practice of leaving landing lights on after take-off has resulted in a reduced number of bird-strikes.

The following guidelines have been reproduced from ***The Log***, the magazine of BALPA.

Flight crew procedures

Before starting	Anti-collision lights/beacon	ON
	LOGO lights	Operator policy
Taxi-out, moving on own power[1]	Taxi lights[2]	ON
	Nav/Position lights (night)	ON
	Nav/Position lights (day)	Operator policy
	Turnoff lights[2]	ON
Crossing any runway[3]	Strobe lights	ON
	Turnoff lights	ON
	Landing lights	ON
Entering any runway before takeoff	Strobe lights	ON
	when T/O clearance received: Landing lights	ON
Taxi-in, runway vacated[1]	Landing lights	OFF
	Strobe lights	OFF
	Runway turnoff lights[2]	ON

Note 1. To signal intent to other pilots, consider turning taxi and runway turn off lights OFF when stopped, yielding, or as a consideration to other pilots or ground personnel.

Note 2. Runway turn off lights and taxi lights should always be ON during taxi. Outside the runway, they may be temporarily switched OFF to avoid the blinding or dazzling effect, they should always be used when crossing a runway.

Note 3. When crossing a runway, the factual status of the runway, active or not, does not have any effect on the use of lights. Operators or Captains should consider turning ALL exterior lights on when crossing any runway.

Flying Order Books and Ops Manuals requiring a differing usage of lights to the above, take priority.

CPDLC and ADS

The first business jet aeroplane to use CPDLC/ADS (Controller Pilot Data Link Communications and Automatic Dependent Surveillance) recently satisfactorily completed a transatlantic flight. The aeroplane flew from Savannah in the US to Luton using the system for trans-oceanic communication and position data reporting. The system allows ground based computers to exchange information with the aeroplane's computers. This eliminates the need for pilots to use HF radio communications to obtain clearances and to make position reports.

◀ **Flying safari in southern Africa...**
continued from page 11

of the camps where the airfields are just a strip in the bush with no fuel and services, and the ranger comes out in a jeep to pick you up. The in-between stops were at functional airfields in one of the centres of population. These are little more than small towns in Botswana, where we spent most of our time, with three million people in a land larger than France. At these stopovers we would refuel, pay landing fees, file flight plans for all forthcoming legs, and clear customs and immigration for crossing the international borders. BP is the ubiquitous supplier of fuel– we seldom had more than a 5 minute wait for fuel, and the AirBP card proved invaluable. Now the direct debit invoices have come in, the average cost of fuel over the trip worked out at £1.14 per litre (at an average 9.4 gallons per hour once we had got the weight and balance issues sorted) which we considered not bad by current European prices. Landing fees were similarly modest, maybe $10 or so a time. In the whole trip we only once came across even a hint of bribery, when it was suggested that 100 pula in the landing fees book might result in more substantial bills for immigration fees being mysteriously mislaid.

Cross border paperwork

Cross border immigration/emigration and customs controls were however a realm for paperwork. Every flight crossing a border required immigration clearances, customs clearances, passenger fees and general declaration forms for movement of aircraft and passengers similar to the Gen Dec forms we use in the UK. Other than that duplicate copies have to be filed in the right log books, with all the signatures and the appropriate stamps. That can take quite a while to complete, even when the right official can be located in or around the airport and its environs, and when that person can actually find the one right book of forms among stacks of hundreds of identical files within the booth. Patience is a virtue, siestas are good for you, African clocks run at their own speed, and that is what we have come to enjoy, isn't it - and notwithstanding there being only 250 miles to complete on the next leg with nightfall approaching before we can enjoy the safari drive and/or sundowners.

We were strongly advised from multiple wise counsellors that we should travel as aircrew and look like aircrew, epaulettes and all, to smooth our passage through customs and immigration. Mike and I were up for it, Sarah and Tracy considered it naff in the extreme and surely they could not be that gullible... It did however work. With two crew declared and looking the part, all passenger fees were waived, aircrew are left to happily wander around the airfields without being accompanied everywhere, and we could pass through all the border checks carrying only a hand bag of headsets and clipboards. It is only an 'n of 1' (for the statistically minded among you), but the one time we went through a border in our regular short sleeve shirts, was the only time we had to unload all the bags from the aircraft, have everything scanned, and bags opened and searched. We decided to go for the smooth ride and cope with feeling like plonkers!

And in spite of all the quips, Botswana and its people are as wonderful, friendly, vibrant and resourceful as Mma Remotswe describes. Thank you Mike and Tracy for such wonderful company. Thank you Nick and Christine for coordinating for us a flying holiday of a lifetime.

Pilots' talk

Dates for your diary

Early 2009. Guided visit to AAIB, Farnborough

This will be a half day visit, midweek. Visit agreed but date still to be confirmed. Further details will appear on the website. Questions or expressions of interest to Steve Dunnett (meetings@pplir.org).

25th April 2009. *PPL/IR Europe* One-day meeting and AGM, Shoreham Airport

One-day meeting and fly-in at Shoreham Airport, with topical seminars and AGM. Please see our website www.pplir.org (> Events > Forthcoming Events) for information, booking form, and for any late changes or updates. Address queries and return booking forms to Steve Dunnett (meetings@pplir.org) or by post to Prof S.B. Dunnett, School of Biosciences, Cardiff University, Museum Avenue, Cardiff CF10 3AX, Wales, UK

12 - 14th June 2009. Aero Expo will be returning to Wycombe Air Park

Following our successful participation last year, with both a stand and our contribution to the seminar programme, we will be there again this year and are looking for support from our membership. In particular:

- for volunteers to man the stand - last year it was run on the basis of just two-hour slots and great fun,
- volunteers to prepare and present seminars,
- suggestions for what should be on the stand, and any critique of last year, would be welcomed and
- support with exhibition materials or temporary storage near (or at) Booker.

All offers of help to Sali (memsec@pplir.org). The web site for 2009 www.expo.aero is up and running.

4 - 5th July 2009. Weekend meeting, Angoulême/Cognac, France

Combining gastronomy, tour of vineyards and a major cognac house (Courvoisier in Jarnac), and seminar presentations on the Sunday morning. We will be staying at the Chateau de l'Yeuse. We propose to use Angoulême as the airfield for arrivals, as it is a designated customs/immigration port of entry with full IFR procedures, whereas Cognac is military and does not have customs facilities. Full details on the website. Organised by local member Willem van Rijk. Please address visit queries to Willem (vanrijkwillem@orange.fr) and expressions of interest and booking forms to Steve Dunnett (meetings@pplir.org).

September. *PPL/IR Europe* 2009 Autumn Tour

A seven or eight day tour is under consideration. Please send expressions of interest to Jim Thorpe (jim@tredunnock.com).

UK key airshow dates 2009

UK airshow dates for 2009 can be found on the aeroflight website: www.aeroflight.co.uk/shows/showdate.htm

CAA Safety Evenings

23/02/2009	Halfpenny Green, Bobbington Village Hall	Tony Dring	01384 221106
25/02/2009	Fairoaks, Fairoaks Flight Centre	Stephen Howarth	07974 951430
19/03/2009	Humberside, TBD	Mel Stewart	01652 688833
24/03/2009	Shoreham, TBD	James Crabbe	01273 440852

(TBD = To be decided.)

See http://www.caa.co.uk/default.aspx?catid=224&pagetype=69 for the latest information.

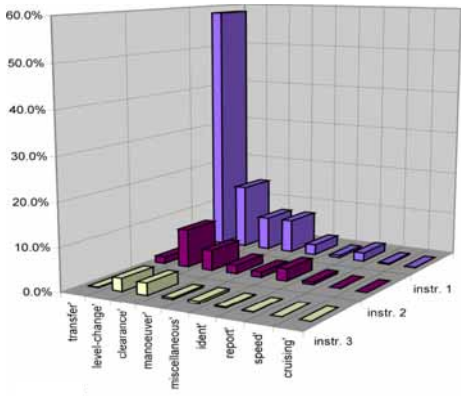
From analogue broadcast radio towards end-to-end communication

An innovative approach to ATC voice communication, similar to cell-based mobile phone systems, was presented at a recent aeronautical conference

In addition to reducing task load by making sector changes transparent for aircrews, the approach requires the bandwidth of only a single voice channel!

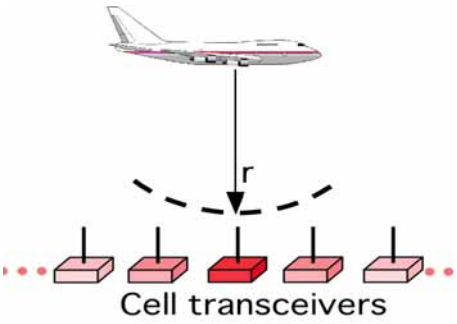
The capacity of the current ATC system is, among other factors, limited by the maximum number of aircraft that a controller can handle simultaneously in a sector. This led in the past to a decrease of sector sizes in order to increase overall ATC capacity. Decreasing sector sizes results in a large number of sectors and a correspondingly large number of radio channels. Furthermore, the greater the number of sectors, the more sector handovers there are per flight, resulting in greater workload for both controllers and pilots and greater frequency occupation.

Studies have shown that more than half of radio calls are related to sector changes and the associated frequency management (see graphic below).



Mobile phone systems employ a cell based end-to-end communication concept. Ongoing EU research proposes the use of a similar end-to-end concept for ATC air ground voice communication. A large number of ATC transceivers would be deployed in a regular pattern. Each

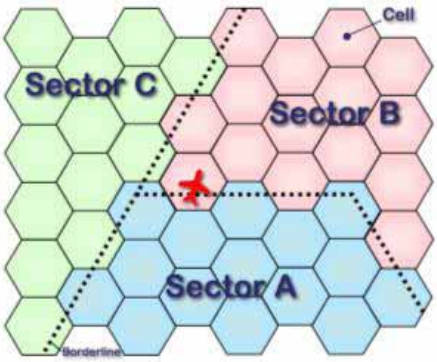
transceiver would be located in a cell of an ATC ground network. There would be many cells within each sector. The whole network would operate within the bandwidth of a single radio channel, and all transceivers would be connected to a network management unit.



Provided the cells are sufficiently small, the distance between an aircraft and the nearest ground transceiver is approximately equal to the flight level of the aircraft. The power of aircraft and ground transmitters only needs to be sufficient to cover this range. Communication with an aircraft is via the ground transceiver corresponding to the aircraft's current cell.

For air to ground communication the nearest ground transceiver receives the greatest energy while neighbouring cells receive an attenuated signal. All received signals are linked to the network management unit. By triangulation techniques the network management unit determines the closest cell to the transmitting aircraft. The signal received from an aircraft is removed from neighbouring cells by signal processing in the network management unit. A sector controller hears the transmissions from all cells within his or her sector.

The figure below shows the cell layout for such an ATC ground network and its operational sectorisation.



For ground to air communication the controller has to indicate the aircraft being addressed (e.g. with a mouse) in order to identify the cell for transmission. Aircrews no longer need to be aware of the division of the airspace into sectors - the ATC sector organisation is invisible to them.

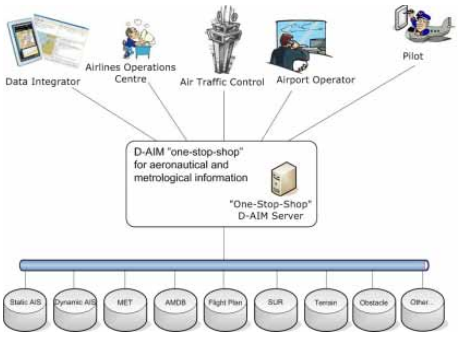
Major benefits of air ground end-to-end communication are:

- ATC sectors are invisible to the aircrew.
- Prevents loss of communication related to frequency change.
- Concept requires only minor air-side changes (reduction of transmitter power).
- Enabler for new operational concepts.
- Avoids shortage of communication channels.

A copy of the full report can be found here: www.eurocontrol.int/eec/gallery/content/public/documents/newsletter/2008/issue_3/AIAA2008paper.pdf.

D-AIM - Digital Aeronautical Information Management

A successful first flight test was conducted on 18th November as part of the D-AIM trials. After having performed D-AIM system verification in a lab environment during the autumn the day had come for the first live flight using the Flight Information Service (FIS-B) developed within in the D-AIM project. The data link transceiver and electronic flight bag (EFB) equipped aircraft took off from Norrköping airport and made a 40 minute flight around Östgöta TMA.



The applications tested were Runway Closure NOTAM, Temporary Segregated Area (TSA) activation, METAR and SIGMET over FIS-B, everything presented to the pilots on a NavAero EFB with software developed by LFV. The system behaved as expected and gave valuable pilot input for further development of the system. More information can be found on the Eurocontrol webpage (www.eurocontrol.int/aim/public/standard_page/daim.html) and at www.d-aim.aero.

Airport 'clowns'

Taxpayers in Cornwall are facing a bill of at least £250,000 because of a bureaucratic mistake that has shut the county's main airport for three weeks. The county council, which owns Newquay Cornwall Airport, failed to secure a CAA licence to operate the facility ahead of a handover deadline agreed with the RAF, which ceased to provide air traffic control services on 1st December. The mistake happened despite £6 million being spent on contractors and consultants to oversee the handover, and a previous missed deadline in August.

The council admits it is facing compensation claims totalling 'hundreds of thousands of pounds'. Ryanair has cancelled all its flights to and from Cornwall until March, describing council officials as 'clowns'. Mark Kaczmarek, an independent councillor, said: 'The outcome has been a waste of Cornish taxpayers' money and a reduction in the very transport links that the investment was supposed to provide in the first place.'

A council spokesman said it was 'too early to say' how much it had spent on free buses to take stranded passengers to the nearest available airport in Plymouth, Devon, 50 miles away. Despite the fiasco, no one has resigned. Colin Jarvis, the deputy director of Cornwall county planning, transportation and estates department, said: 'This was always a challenging project. We are working to the date of 20th December to reopen.'

And indeed, at 07:20hrs on the 20th December an Air Southwest flight full of skiing enthusiasts took off on schedule, bound for Grenoble in the French Alps.

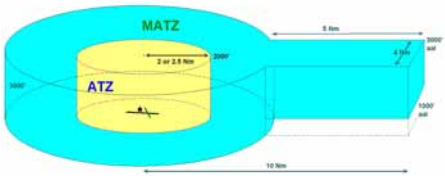
US AOPA says GA greenhouse gas imperceptible

The US Aircraft Owners and Pilots Association (AOPA) has commented on a set of proposed regulations from the Environmental Protection Agency (EPA) that seek to regulate greenhouse gas emissions under the US Clean Air Act, specifically targeting emissions by general aviation aircraft that hopefully will set a precedent for European aircraft operators. The EPA's own greenhouse gas emissions inventory shows, according to AOPA, that general aviation jets and pistons generated only 5.54% of the total aviation contribution and 0.74% of the overall transportation sector contribution. Of that 0.74%, 0.61% came from jet-powered aircraft and 0.13% from piston-powered aircraft. This compares with 81.33% for on-road motor vehicles, 12.53 % for commercial and military aviation, 2.4% for locomotives and 2.26% for marine vessels. 'Overall,' said AOPA, 'it is inherently obvious when evaluating the data that GA's impact on the global climate is currently and will continue to be exceedingly small. Any

EPA requirement that would result in the installation of pollution controls on GA aircraft or require a change in how GA aircraft are operated would have safety and cost implications that cannot be ignored.'

ATZs in MATZs and European border crossings

From the old stalwart of the UK CAA's General Aviation Safety Leaflet (GASIL) comes the advice that Military Aerodrome Traffic Zones (MATZ) procedures contained in the AIP are shortly to be amended. Where the pilot of an aircraft wishing to enter a MATZ or combined MATZ also intends routing through one or more of the Air Traffic Zones (ATZs) contained within it, they must include that intention in their initial call, and ask specifically for clearance through each of the ATZs they wish to enter.



It may not be possible for the MATZ controller to obtain clearance through an ATZ which he/she does not control. Military aerodromes frequently open outside their normal published hours, so pilots should always make the initial call 15 miles or five minutes flying time from the boundary, and if no reply is received try again. If, after two transmissions, no reply is heard, proceed with caution. However, if the aerodrome is published as being open and no reply is obtained, it is strongly advised that the MATZ should be avoided. It should also be remembered that most military ATZs are permanently active, and unless permission to enter is given by the appropriate Air Traffic Controller, the ATZ must be avoided.

The GASIL also carried a reminder on **European border crossings**. Pilots in particular need to understand the regulations of every country in whose airspace they intend to fly. These regulations are contained in the Integrated Aeronautical Information Package (IAIP) of the appropriate state, usually as published on their own Air Traffic Services' website or that of Eurocontrol. Several pilots (British in particular) have apparently been breaching Customs regulations when flying to and from Europe. Most of Europe has an `open border' policy under the **Schengen agreement**, which means general aviation aircraft may enter and leave signatory countries, taking off from and landing at any aerodrome within these countries, with no more formalities than a filed and accepted flight plan. However, **the UK is NOT a signatory to Schengen**. Pilots flying from the UK to another country must make their first point of landing at an '**official border crossing point**'. The same points must also be the last point of departure when returning to the UK. The aerodromes which have been designated 'official points' are listed in the individual States' IAIP, and may be marked on their official charts. UK customs aerodromes, where incoming foreign flights must make their first landfall, are marked with a dashed line around their names such as SHOREHAM but other countries in Europe may perhaps mark them as 'international aerodromes'. Once having landed at an official point, other borders within that 'Schengen area' may be crossed without having to use the 'official points' until leaving the Schengen area for the UK, when again an 'official point' must be the final aerodrome of departure. UK pilots will be aware that HM Revenue and Customs may permit UK nationals to fly to or from non-customs airports in the UK P 17 ▶

Letter to the Editor

Sir,

*Reading the latest issue of **Instrument Pilot** (IP70) it appears to try and sound a slightly muted positive note with its articles on GPS approaches and European IFR, yet for me it is all 'too little too late' to stop the nagging feeling that I might eventually have to simply unceremoniously hang up my wings. I might just hang in there for the expected announcement by EASA on European IFR in the spring.*

I am a CAA PPL (I'm still keeping my old licence) with an IMC and Night Rating plus full FAA IR. I have flown about 600 hours of which about 80 are single pilot in command in actual IMC plus at least an equivalent number of hours flown on airways across Europe and North Africa in VMC conditions. I used to fly an American registered AA5A which has a cruising speed of 110 knots and a service ceiling of ten thousand feet. Unfortunately this type of aircraft is not very practical for business purposes and I reluctantly sold it after many years.

I can take a budget airline flight to a European destination, and the two hour flight time will equate to an eight hour journey counting the way to and from the usual, inconveniently located, regional airports and the additional time requirement of current airport security arrangements. In my AA5 I could probably cut that total journey time down to five hours, going point to point, albeit at four to five times the price, but in either case the day of travel is lost for business. Hence I started looking for higher performance aircraft, and thankfully there are many options now on the GA market, but none of them affordable for outright purchase on my budget.

So after having experienced the convenience of aircraft ownership, I looked at hiring again. This is where my problems became serious. Even contract hire firms like Cumulus only have aircraft on the G-register, and scud running the latest Cirrus at between 1,500 and 3,000 feet across European airspace under VFR flight rules does not appeal to me. Since then, I have only flown to keep numerous ratings current, a most frustrating situation.

I did consider converting my IR to the European version, but besides the insult involved in asking me to go back to school in order to pass theory exams for the sole purpose of entitling me to do what I have been doing happily and legally for many years, namely flying IFR and on airways in Europe, I am not prepared to take out the considerable amount of time and money required. I wouldn't mind a single exam e.g. on European air law, plus a check ride with an examiner, but to sit exams aimed at commercial pilots when I never intend to fly commercially makes no sense at all. It's taken me tens of thousands of pounds and countless man hours to get to the skill level of piloting I have, but to European bureaucrats writing the rules of the sky this obviously counts for nothing.

*The term 'leisure pilot' they recently coined just about sums up nicely what they think of PPLs. I am glad **PPL/IR Europe** and other pilot organisations I belong to are fighting for the future of GA, but at the pace their voice is being heard I will eventually have to let my ratings lapse simply to cut my losses. The cynic in me says that this is exactly what they want by not solving the problem in a timely fashion: no more PPLs in controlled airspace. Those wanting to fly for business are expected to hire the plane with the pilot.*

Yours truly,
Dr Sahib Bleher

Reply from Jim Thorpe, Chairman PPL/IR Europe

The Editor has asked me to write something partly in response to Sahib's letter and partly by way of a more general update.

The PPL IR minority

Firstly, I am absolutely convinced that there is no conspiracy. Cock up always trumps conspiracy. There are very few instrument-rated private pilots and even fewer who use their aircraft actively for business. Why would anyone want to conspire against us? It is to the credit of bureaucrats over the years that although they have often disadvantaged us in the pursuit of broader objectives, by and large they have made some attempt to be accommodating when the collateral damage is pointed out. The whole political process of first the JAA, and then EASA, was not one with which the pilot community engaged actively enough or early enough. It is hardly surprising that it is difficult to effect change in favour of a minority in months or even years after some hard-won compromise between 30 odd states has been drafted.

The PPL/IR interest has always sat rather uncomfortably between that of the leisure pilot and the commercial pilot. The leisure emphasis arose not because of EASA but because of the desire of the vast majority of private pilots (who are strictly leisure pilots) to be independent of the burdensome regulatory framework of the commercial flying world. I feel it is important for us to be able to demonstrate that we train to the same standards as a commercial IR and pass the same flight test but this does not mean that the structure and content of the training needs to be identical. I don't want to rehearse the whole FAA licence argument here. I entirely accept that there is no practical problem; however, it is seen as an unacceptable practice in much of Europe and the FAA has told EASA they don't accept the responsibility for oversight. My view is that the principal is a lost cause (*Don't shoot the messenger: I have both an N-reg aircraft and an FAA/IR*). The way forward is to fight for acceptable conversion routes for both licences and aircraft.

Hopeful signs?

To turn to the positive there are a lot of hopeful signs. Firstly, there are significant numbers of modern aircraft both new and second hand. There are a wider variety of hire schemes than ever before. Access to capable travelling machines has never been better. We, as a group, have been much more active in the political process for the last five or so years and are now having an input into documents and proposals at a much earlier stage and are starting to see results. Yes, the timescales are of the order of three to five years but that is just the real world and is not aviation specific. There is no hope for us unless we can have a significantly larger population of instrument-rated pilots and the key to that is a more accessible instrument rating.

I have now spent my first full day at the initial meeting of the EASA FCL.008 group which will draft the proposed European IR. I am not going to make myself a hostage to optimistic detailed speculations at such an early stage. But what I can say is that I was uniformly impressed with the openness and calibre of the participants. There was total acceptance that some better system needed to be devised. My personal hope is that there will be an ICAO compliant accessible instrument rating largely based on competence assessment rather than hours based courses.

And the FAA IR holders?

While I don't expect any FAA/IR holder to be overjoyed, I would hope that conversion options will be available which they can live with. The UK IMC or, more accurately a possible European sub-ICAO qualification, is a more complex issue considering the widely different airspace structures across Europe. I have put forward some suggestions in a discussion paper to the FCL.008 group and they will be considered at the next meeting which will be late in January. I expect to be able to report more fully in the next edition of ***Instrument Pilot***.

So where does this leave Sahib. Nothing will change till 2012 and perhaps later. At least we cannot blame Europe for lack of access to N-reg aircraft. If Sahib cares to put his needs on the forum it may be that a member can help. Looking further down the line I am reasonably confident that a viable means of licence conversion will open up.

◀ P 16 provided certain conditions are complied with. Pilots must not assume these concessions apply in other countries!

Report blames US pilots and controllers for Brazil midair

According to reports in several Brazilian newspapers, US Legacy 600 pilots Joseph Lepore and Jan Paladino and Brazilian controllers will be blamed for the September 2006 midair in which an ExcelAire owned Embraer Legacy 600 collided with a Gol Airlines Boeing 737-800 over Brazil's Amazon jungle, killing all 154 aboard the airliner. A final accident report, leaked to the Brazilian press in December and confirmed by both the NTSB and Brazilian aviation safety agency Cenipa, claims the Legacy's transponder was 'inadvertently turned off by the hand of one of the pilots,' which was the 'central point in a chain of errors' leading to the collision between the Legacy and Boeing 737 at FL370. A transponder turned off or set to 'standby' mode also places its TCAS into 'standby' mode. The controllers will be taken to task for failing to note the drop in transponder returns from the Legacy, miscommunication about the Legacy's altitude and failure of communication between the crew and ATC. ExcelAire executive vice president David Rimmer said, 'the transponder is a distraction from the true cause of the accident: ATC put two airplanes on a collision course for about an hour. It was compounded by multiple catastrophic errors and weaknesses within the ATC system.'

Eurocontrol statistics and forecasts

European traffic fell 7% in November 2008 vs. November 2007 and the trend continued in December. A decline of this magnitude has not been seen since the months immediately following 9/11. Even the low-cost carriers, which have been the biggest contributor to growth in Europe, had fewer flights in November than in November 2007, the first such decline in 15 years. And preliminary data shows that delay from all causes per delayed flight in November was 29 minutes up from approximately 26 minutes in November 2007.

continued from page 1

As soon as the French coast was reached, the high cloud vanished, to be replaced with a reasonably smooth overcast at about FL120, and I descended to FL130 hoping this would be it, and I could do my best fuel management.

However, this didn't last long and soon I had to climb again to stay above the muck. Paradoxically it was scattered/broken and ground was always visible throughout the entire flight, so it could be argued that a low level flight would have been better. The problem with that strategy is that one can get stuck between a lowering cloud base and rising terrain when the only way is UP, through the clouds, which brings the risk of icing and a possible reduction in climb performance bad enough to not ever reach the top. Remaining on top at all cost is the only way! This consideration would have also prevented this flight from being done under VFR as one would only have got as far as the Pyrenees.

Around Biarritz I was at FL190 and only just remaining above the general layer. This was not exactly as forecast and curiously nothing in the 06:00Z satellite images (visible or IR) suggested it, so it must have formed in the last few hours. The TB20 will do FL200 and I have done that previously. I also had an oxygen bottle which was big enough to not worry about getting used up, but I did not want to waste fuel. There was a lot of much higher cloud - plenty of towering cumulus to at least FL250-300 - so a lot of heading changes were required. I have never done as much zigzagging on any IFR flight before

An additional problem was an almost constant headwind of about 10kt. The forecast was an almost pure crosswind initially, changing to a tailwind in Spain as one passed around the eastern part of the high pressure area (wind flowing clockwise around a high pressure area in the northern hemisphere); however, after the Pyrenees things started to improve.

Fuel management

The computed fuel on board (FOB) at destination came close to a level at which I would have had to stop for fuel, reaching 21USG at this point. This was right on the margin, based on destination, then alternate, then two hours at cruise speed, with which I would be prepared to continue nonstop to Granada.

However, in Spain, matters improved rapidly and I descended from FL190 to FL120 in several steps - ATC did not allow it to be done in a single step - but I managed a more or less continuous 300fpm descent, which recovered a lot of energy lost in the climbs. The headwind also finally changed to the forecast tailwind, of about 10kt.

The crucial decision point for whether to do a fuel stop was planned to be near Zaragoza. Approaching this point, I had 44USG in the tanks, slightly over half (total usable TB20 fuel capacity is 86.2USG) and the fuel at the destination calculated by the flow computer (linked to the GPS) was 27USG which amounted to a reserve at the destination of about three hours at cruise. So I decided to continue to Granada. There was no way I was going to use up half the tanks in the remaining bit of the flight, probably about one third, especially given the wind change and the lower cruise level being more efficient. Had something gone badly wrong e.g. a 50kt headwind (not sure where that could have come from on the day...) there were other diversion options.

I was given an ATC shortcut to ANZAN, about 200nm in one leg. Madrid Control asked to verify the aircraft type as they could not believe that a TB20 was doing such a long trip... and at the end the ATCO wished me a good flight and 'good tailwind'.

In the Trinidad, one normally flies with fuel tanks balanced or, if flying alone, with the left tank substantially emptier than the right tank. However, when flying close to the fuel limit, one needs to be careful to avoid a tank running dry at an inconvenient moment! The TB20 has very accurate fuel gauges but even so, with about 80nm to run, I decided to run down one fuel tank as far as possible, so the last bit of the flight would be done using the other fuel tank whose contents would then be something close to the remaining fuel calculated by the flow computer. Some experts, including John Deakin (of AVweb), recommend running one tank completely dry i.e. until the engine stops, claiming this to be safe because of the certification requirement for the engine to restart within something like 10-20 seconds of switching to the other tank. But I did not want to risk this, especially over the barren Spanish terrain, so I ran down the left tank until the low fuel warning light came on which happens at the 10USG point (one quarter full). At this point the right tank was half full which, with about 30nm left to run, was plenty.

Arrival at Granada

Granada is surrounded by serious terrain and I was planning on flying the BLN 1D STAR (the only one which connected to my filed route which terminated at BLN) followed by the rather long approach to runway 09. ATC had about an hour earlier advised that Granada was on 09. NOTAMs showed that 09 ILS was out of service but actually only the glideslope was out of service.

I did indeed get the BLN 1D STAR but Granada ATC advised that the wind had changed and was now 270/07G13 and offered either a downwind landing on the massive, approx. 3,000 metre runway, or the 09 LOC approach followed by a right hand circle to land on RWY27. I said I would take the downwind landing; however, having flown the STAR and with about 10nm to run to the VOR, they asked if I would accept a visual approach, downwind join, right-hand circuit to land. I accepted this as the conditions were fully visual and the runway could be seen from many miles away; it also knocked at least 20nm from the remaining distance. The resulting steep descent from 9,000ft to about 2,900ft was fun, with the gear down to help the descent. I did not want to fly too far over the built-up area to the east of the airport so flew a steep - almost a glide - approach to the runway.

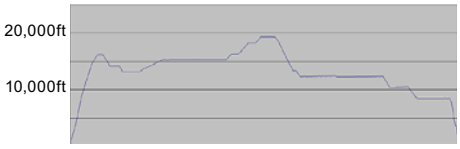
The only traffic was a GA aircraft departing IFR to Morocco. Granada gets a dozen or so 737s daily but remains totally laid back. The airport has a massive concrete apron with a further extension being built. There were a dozen or so GA aircraft parked, several knackered Cessnas with flat tyres which seemed to have been there for years, a Cirrus SR22 and a Piper Meridian. I could not help observing that the only apparently airworthy examples were all N-reg! I got a FOLLOW ME truck to parking - all very easy. Avgas turned up within minutes. The price was Euro 2.30/litre. Payment methods were Visa or cash.

The post-landing fuel on board was 23.4USG. The fill was therefore calculated at 237.4 litres. The bowser put in 238 litres which (assuming it was 238.0 which I doubt since the pump did not show a decimal point) corresponds to an error of 0.25% - not bad after a flight of 6 hours 50 minutes!!

23.4USG is about 7USG worse than the originally calculated reserve fuel - this was the cost of all that climbing and zigzagging, plus the headwind along most of the flight. The MTOW of a TB20 is 1,400kg. On this flight, the takeoff weight was approximately 1,305kg and 171kg of fuel was used on the flight. I do not have the exact track distance actually flown - the airways route is 869nm - but the above translates to approximately 19 UK miles per gallon.

The altitude plot of this flight is below. The climb rates of the steps to 19,000ft are approximately 200fpm.

Vertical profile of the route from Shoreham to Granada



There is no bus for the apron; you walk to the terminal to the GA office which is found by following the signs marked 'C' and taking the stairs. The staff were most helpful although only one could speak English. There was nothing to do, though they telephoned Zaragoza (my next planned stop) with my details to check if we could fly there: the reply was it was OK but they wanted a fax with the usual details. Getting out of the airport was easy. We picked up a hire car, the wait for the car rental staff to come back from a siesta was far longer than refuelling the aircraft and everything else.

Granada is a very historic city, with countless spectacular sights. It is almost surrounded by mountains, with the Sierra Nevada to the south. A visit is highly recommended and we spent 5 days there.

The return route

The return route was to be in two parts: Granada to Zaragoza and Zaragoza to Shoreham. This was done partly because we wanted to have a look at Zaragoza and partly to avoid returning to the UK with relatively minimal fuel. The UK often has poor weather, Shoreham had a poor (NDB only) instrument approach and the combination results in a high probability of having to divert, so it is not wise to mess around with fuel.

Unfortunately, sitting in the aircraft on the Granada apron, it was discovered that Zaragoza had refused permission – rejected the flight plan, basically, without an explanation – for the flight there. I have subsequently investigated this with the Spanish authorities and, to cut a long story short, they claimed they did not get my faxes regarding PPR although they eventually admitted getting at least one of them. However, the communication was abruptly terminated at the Spanish end when I tried to find out what actually happened afterwards. I do have an explanation but not one suitable for printing!

The only lesson to learn from this is to always make a positive contact the day before and obtain a confirmation. In Spain this may need a native speaker and the best way to sort that is to collect the phone number of someone at the departure airport office who can make the call on your behalf. The easy option was to fly to the alternate, Pamplona. This has Avgas, according to published data. I pressed the van driver to call his boss and actually telephone Pamplona to check this. He came back saying Pamplona has no Avgas!

I have since made some phone calls and the published phone number for Pamplona is duff - and after some struggle and slowly dictating Alpha... Victor... Golf… Alpha… Sierra several times (no English speakers anywhere) established that they probably don't have Avgas.

Re-planning IFR flights for different destinations in a hurry is a considerable hassle because - without a printer which I do have but did not bring, and anyway it is not battery powered so can't be used while next to the aircraft - one doesn't have the printed plogs, approach charts and enroute airway charts. While it is quite possible to hack it by copying out some of the stuff onto paper and relying on electronic devices such as my LS800 tablet computer running Jeppview, I don't really like doing it. Autoplan IFR (www.autoplan.aero/) makes the Eurocontrol route planning trivial but there is still a lot of work to do.

So we decided to fly to San Sebastian where we have been before and really liked. The helpful Granada operations department offered to re-file the flight plan, which they did and gave me the new routing; but when I called up the tower to get the departure clearance they said the flight plan was refused because one of the waypoints would not be acceptable. This was not very surprising since I had by then used Autoplan IFR to check what kind of routing might work, and it was nothing like the one they gave me... So, in the cockpit with a laptop on my lap, I worked out a new routing and filed it over the Internet using my 3G capable laptop, this time using Homebriefing www.homebriefing.com/ - which I subscribe to for Euro 37 per year for ten flight plans (the new AFPEx service www.flightplanningonline.co.uk/) is useless in any mobile situation due to data volume.

The weather was checked and it was OK for the first leg at least. The TAFs and METARs were OK. The 12:00Z MSLP chart showed no frontal activity. The 12:00Z SigWx form showed nothing of relevance at altitude.

From Granada to San Sebastian

The routing was LEGR VIBAS B112 BLN G5 CJN R10 SSN LESO FL100; alternate Biarritz LFBZ; distance 381nm (great circle), 392nm (airways).

Despite the logical SID which connects to the filed route (which starts at VIBAS), Granada tower gave me the BLN 1N one. Oh well... Off we went.

The weather turned out to be very different from the forecasts and, as is often the case for vertical cloud extent, the SigWx form turned out to be meaningless as an indicator of cloud. (Note: the SigWx form does not forecast vertical cloud extent; the vertical extents of the scalloped areas apply to the icing or turbulence only!) There was extensive cloud cover over much of eastern Spain up to about FL250, and some isolated stormscope returns. We climbed to FL170-180 to remain on top but could not climb higher presumably due to descending air which could have been a mild 'mountain wave'. We were at 14,000ft above the terrain and the wind at our level was just 20kt. Temperature was minus 11°C which is also substantially warmer than standard. It was doubtless correct to keep out of the cloud layer since a lot of it was quite dark and full of water, so would have resulted in airframe icing.

The service from Madrid (on frequency 124.870, around 11:00Z-12:00Z) was appalling and the worst I have ever come across under IFR. Repeated calls for climbs or heading changes 'due weather' were ignored. She could obviously hear me though. At one point I said 'is anybody there???' but again got no reply. We managed OK but it was a right hassle. Any worse and I would have made a PAN call and just got on with it. Unfortunately, it is known that some ATCOs cannot speak English beyond the stock phrases e.g. 'cleared for the ILS' and they simply ignore the radio.

We remained at high level till about 30nm before the destination and then did a steep descent to the VOR approach for runway 22. Biarritz provided a radar service until established on the VOR inbound and allowed the descent to be substantially extended over the sea, in order to lose the altitude. About 2mm of ice was picked up in the descent but as the 0°C level was about FL100, and the terrain about 2,000ft, this was immaterial.

San Sebastian airport is a small informal place which has some scheduled turboprop and light jet traffic and there was zero delay in getting out. Everyone was very friendly. The fuel man kindly drove me to his hut to pay and then drove me back to the aircraft. Payment is possible with Visa or cash. My Air BP card was not accepted anywhere on this trip.

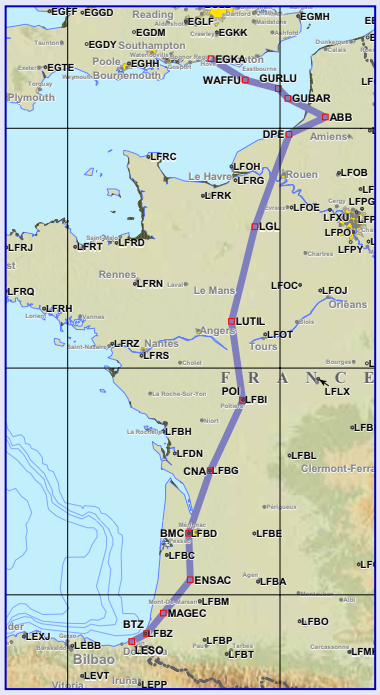
San Sebastian is a lovely old city with a long beach, lots of bars, interesting architecture and lots of outdoor life. Highly recommended!

P 20 ▶

◀ P 20

From San Sebastian to Shoreham

The routing was LEZG BTZ R10 ENSAC B19 POI A55 LGL H20 DPE R50 ABB T27 GURLU Y8 WAFFU EGKA FL100; alternate Bournemouth EGHH; distance: 452nm (great circle); 553nm (airways).



Looking at the route, it is pretty obvious that one would ask for a shortcut from LGL onwards. The DPE/ABB/GUBAR nonsense is an artefact of the shortage of north direction airways in that area, but ATC normally let you go. On the day of the flight a potential spanner dropped into the plan in the form of a NOTAM of an airshow nearby. I phoned them up - 'no problem'.

The MSLP weather chart showed no frontal activity. The SigWx form showed nothing significant at high level. TAFs and METARs showed nothing significant for anywhere near the time of the flight. The Form 414 showed a 15 to 20kt headwind for most of the route. One rarely sees a better weather picture but unfortunately the forecasters can easily get the higher altitude part of it quite wrong. In this case, there was the option of hacking it below the 0°C level but above the French airway minimum altitudes which are mostly around FL070.

In the departure clearance, San Sebastian surprisingly would not give me one of their SIDs, just a squawk and a climb to 5,000ft to BTZ. I got handed to Biarritz Approach who took over immediately and gave me a climb to FL100, and after that it was one long run all the way to Shoreham.

The weather was near perfect, with just a lot of haze. I asked for, and got, the expected shortcut from LGL to SITET (effectively direct to Shoreham) although they had to transfer me to Paris Control for it. This took a massive chunk out of the route.

About an hour before arrival at Shoreham, the Honeywell KFC225 autopilot packed up again, with the same burning smell from the pitch servo which I got at the last identical failure a year or so previously. I pulled the three autopilot circuit breakers and continued manually. Fortunately, this failure quickly led to the realisation that it happened at precisely the same GPS location as the last one - 48.15129 N 0.28158 E – and the very useful discovery that some or possibly all of the frequent servo failures of this autopilot

Stunning scenery in the mountains around Granada

On the ramp at Granada trying to file a new route using 3G laptop

(in all aircraft types in which it has been fitted) have been caused by radio frequency interference from ground sources. I am an electronics engineer, and found that the design of the servos contains two vulnerabilities which would enable this failure mode.

Apart from the autopilot failure, the entire trip was uneventful and the aircraft performed perfectly. Other than jet contrails at high levels, no other aircraft were seen anywhere enroute, and no obvious GA traffic was heard on the airways sector frequencies. So much for 'crowded' European airspace. This is common on IFR flights around Europe as there is little or nothing flying enroute below FL200.

Total IMC time on this trip was around 10 minutes on the descent into San Sebastian. This demonstrates how an IR enables one to avoid bad weather. Many pilots believe that an IR is used to fly in cloud but nothing could be further from the truth.

Approach to San Sebastian

Airborne times for the three legs were: 6:50hrs; 2:45hrs and 3:35hrs. Fuel prices ranged between Euro 1.70 and 2.30 per litre. This is a massive increase from the previous year. Spanish airports however remain very cheap. Granada cost Euro 20 for landing and six nights parking. San Sebastian cost Euro 12 for landing and two nights parking.

More information on IFR flying and Peter's Socata TB20 aircraft can be found on his own website at www.peter2000.co.uk/aviation/.

Postscript from Peter Holy on Part 1

I would like to amplify a couple of points on engine management which appeared in the first part of this article.

Flying at a lower rpm improves engine efficiency not only because it reduces friction losses but also because it shifts the combustion pressure profile, in time, to a point more appropriate to the slower burning lean of peak (LOP) mode. Somewhat mysteriously, range is much less dependent on altitude than one might think so long as the engine is running LOP the whole time, including climbs and descents. I think this is because the loss of non-turbo engine efficiency caused by the lower power operation inevitable at high altitudes is more or less compensated for by the true airspeed gain.