Instrument Pilot

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Extra, Extra, read all about it...

2008 AERO EXPO

Aero Expo Edition

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PPL/IR EUROPE

...A review of the Extra 400 and Extra 500 Turboprop

by Jim Thorpe

Having an eagle land on your back is not an everyday experience. Neither is someone doing a barrel roll while you are entirely unaware and kneeling on the cabin floor. Both happening in the same day makes for a memorable experience.

PPL/IR Europe member Peter McCarthy and I had been invited to Dinslaken to look at the production of the Extra 500. The Extra Aircraft company and its famous boss Walter Extra are best known for their aerobatic aircraft. Some years ago they branched out to produce the Extra 400. This is an all composite pressurized six-seater powered by a 350HP water cooled Continental engine. About 20 aircraft have been produced but doubts about the longevity of the engine and its ongoing support from Continental have not helped sales.

Rolls Royce Allison engine

There had always been plans for a turboprop version and the Extra 500 is now certified with a Rolls Royce Allison engine of 450HP. The basic aircraft remains almost exactly the same except for somewhat larger tail surfaces. It is an unusual aircraft sitting low to the ground with rather small wheels, a limitation imposed by the need to fit them in the fuselage when retracted. It has a five bladed composite prop (four blades for the piston version) and a single clamshell entry door under the wing. The wings have slight anhedral and the T tail is rather like that of a Beech Duchess but even taller. I suspect that most people will either love or hate the looks. Talking at length to Walter Extra showed that great thought has gone into every aspect of the aircraft. It was a really remarkable experience talking to an individual who to a great extent has

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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***

Aero Expo 2008 takes place at High Wycombe on Friday to Sunday 13th to 15th June, between 10:00 and 17:00 (16:00 on Sunday). ***PPL/IR Europe*** is organising the seminar program which includes exciting topics such as:

- Using an Eclipse VLJ for air taxi operations;
- Self Flown GA transport in Europe, and
- Flying in the London area: infringements, LARS, Mode S - the ATC view.

Seminar presenters include representatives from the CAA, LAA, Met Office, NATS, Pilot Magazine plus several of our own members. We need volunteers to man the stand and the seminar area so that we can present a professional image at all times. If you can help then please contact Andrew Lambert by email at andrew.lambert@ems-uk.com. You can download A3 and A4-sized posters for the seminar program here: www.ems-uk.com/pplir/A3-Poster.pdf and www.ems-uk.com/pplir/A4-Poster.pdf. Why not get one displayed at your local airfield, clubhouse, maintenance organisation, briefing room, handling agent or even the local pub?

Aero Expo is a tremendous opportunity to promote ***PPL/IR Europe*** and instrument flying to the expected 11,000 or more visitors. Drop by our stand and say hello. If you can spare a couple of hours to help answer questions about the IR and encourage people to join that would be even better. If you are able to stay longer, quite a few members are staying overnight. We will be arranging a social dinner for the Saturday evening and if you are able to attend then please email Steve Dunnett so that he can gauge numbers (meetings@pplir.org).

This promises to be a great event. Full information about getting free tickets, obtaining landing slots and location details can be found at www.expo.aero/london.

PPL/IR EUROPE

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designed, or briefed the design of, every detail of the aircraft. This was a far cry from listening to a salesman, no matter how knowledgeable, who essentially is quoting from the handbook.

The company has gone through great upheavals over the last few years in the end being refinanced by a US investor. Plans to enter the US market have been abandoned, at least in the short term, as the cost of liability insurance is so great that quite a large minimum fleet is essential to make any economic sense. The current plan is to build a modest number of aircraft each year for the European market before certifying the Extra 500 in the USA. Although any new aircraft is something of a risk both to the manufacturer and the purchaser, this seems a credible plan. The engine is probably the most prolific turbine in the world, powering as it does most of the smaller turbine helicopters. The airframe is essentially identical to those now having thousands of hours of service in piston form so the potential for serious in-service surprises should be significantly reduced. News has recently emerged of a fleet order which should take almost all the aircraft the factory can produce for the next two years.

Cessna Silver Eagle

We had previously flown in a Silver Eagle, the turbine conversion of the Cessna P210 which uses an identical engine. While it is perhaps unfair to compare a conversion of a 40 year old design, the selling price and intended mission of the aircraft are similar. The Extra is larger than the Silver Eagle and is significantly roomier inside. There is no comparison between the rivet splattered, draggy P210 and the glassy smooth Extra fuselage. Nothing in aviation comes for free and the size advantage is paid for in additional empty weight and this means that the Extra does not perform quite as well as the Silver Eagle. However bear in mind this is in the context of having 450HP in airframes which traditionally would have utilized piston engines weighing twice as much as the turbine as well as having far less power. The classic problem with turbine conversion is that they cannot carry the addition fuel needed to give them any sensible range. The Silver Eagle is better than most in this regard since it starts with the good load carrying capability of the whole Cessna 210 range and can therefore support the extra tank in the baggage compartment. However even this pales against the 175 USG the Extra carries.

Turbine performance

A characteristic of the Allison engine and indeed smaller turbines is that they are temperature limited. Their smaller internal components dictated by the physical size of the unit cannot withstand the same temperatures as bigger engines like the Pratt & Whitney PT6. This means that they are very sensitive both to outside air temperature and to their own operating temperature which increases with altitude. In a rather counterintuitive way this means that a small turbine may produce less power than a well turbocharged piston engine at higher altitudes say between FL150 and FL200. On the other hand they are not as fuel inefficient at lower altitudes as bigger turbines and certainly have nothing like the problems of jets when operating at lower levels. The Extra 500 never burns more than 30gph and can burn as little as 18gph with 22gph being a sensible average. This means that flown for range 1400nm is possible with 800nm still being achievable if more sporting speeds are required. Flown within its limits i.e. restricting power settings at altitude, cooling is a management issue rather than the mechanical problem of large air cooled petrol engines.

A small turbine may produce less power than a well turbocharged piston engine at higher altitudes

Interestingly, the big water cooled Continental engine which has not found favour performed well during our test flight with coolant temperatures only creeping into the yellow in a long climb to FL180. I did adopt a more engine kindly and practical 130 knots rather than a best rate 110knots but was still seeing 1000 fpm for all but the last few thousand feet.

Many years ago I operated perhaps the only other innovation in 100 LL engines in the last 40 years, the Continental Tiarra. Member Ted Payton has been running one of the few remaining examples of this engine in his Robin Tiarra for many years. This engine is geared with the prop driven by the camshaft. While it had one or two issues it was very quiet and powerful and I felt that had Continental persevered, and if the US airframe manufacturers had not been so unwilling to innovate, it could have been a winner. The 350HP water cooled engine strikes me as the victim of a similar lack of perseverance and foresight. When the time came for the descent, and I suggested reducing power, I was told to put the nose down. At 1500fpm we saw over 250kts groundspeed albeit assisted by a slight tailwind.

How modern a design?

These speeds also illustrate another advantage of a new design. Turbine conversions of piston aircraft have to adopt the top of the green arc as their red line speed. They have no yellow arc. This is not an issue at high level with low indicated air speed; but it means for example that a Silver Eagle can exceed red line on take off well before the upwind end of the runway. The Extra however red lines at 219 knots - and has a horn that would wake the dead if you exceed this - so in most circumstances speed is simply not an issue.

Its pressurization system also shows the advantage of modern design. It can maintain a higher pressure differential than any of the older pressurized aircraft so at FL180 we had a cabin at only FL40. And it can keep the cabin at FL 80 even at its maximum altitude of FL250. Heating and air conditioning are pretty much essential in this class of aircraft. Even though bleed air is cooled before it enters the cabin it tends to be warm so air conditioning is needed unless the cabin is very cold.

One area where the Extra is not modern enough is in its avionics. The first aircraft has what only a few years ago was state of the art with two Honeywell EFIS and two Garmin 430s. The company is presently pondering which manufacturers' glass panels they should fit in production aircraft. One thing I hope they don't change is the engine instruments. When relegated to a large screen on the Avidyne or Garmin models engine displays are less than ideal. The Extra has dedicated airline style instruments which have normal sweep hands with an exact digital readout at the bottom of each dial. This meant that power settings or

instrument checks could be accomplished with a quick glance with a return for exact setting or recording when time allowed.

Flying the Extra 400

I was only a passenger in the turbine 500 but I had the opportunity to fly several hours in the piston engine 400. I was told that the flight characteristics are largely the same. On take off it was necessary to rotate positively as the aircraft did not want to take off itself when it was ready. In this regard it is rather like one of the larger Pipers rather than a Cessna; however if this rotation was anything more than a couple of degrees the nose would rear up to the accompaniment of a very loud stall warner. I think this may be a function of the enormously high T tail and the way the elevator becomes effective. Be that as it may, in spite of a warning from my mentor, that's what happened on my first three rotations. I was told that pretty much every pilot, irrespective of experience or briefing, does this at first and indeed by the fourth or fifth take off I had its measure.

The extra 400. Similar to the 500 but with a 350hp piston engine and four-blade prop

Landings were also unusual. The aircraft has quite low gear and flap speeds but the large four or five bladed prop makes slowing down easy. Once the gear and one stage of flap are down power must be added to maintain a normal 3 degree glideslope. The target threshold speed is 80 knots and then a really pronounced flare is needed for a definite main wheel landing. Judged correctly this produces a light touchdown but if the flare is a little high a real thumper ensues which cries out for a touch of power to soften the arrival. I managed a greaser on the first attempt and then of course reverted to acceptable thumpers. In the turbine, reverse thrust would have given very short rolls but in the piston aircraft firm use of the brakes still produced a respectable landing roll.

Long distance tourer

I don't have a huge experience of hand flying at FL180 and found the aircraft stable but prone to a very slight oscillation which I think was pilot induced. The large and very accurate attitude indicator made tiny variations obvious and I suspect was encouraging me to make small control inputs which I would not have done with a normal instrument. Most of the cruise was handled by the STEC autopilot which seemed to me to be doing a better job although my wife, an experienced passenger and fearless critic, reported a noticeable but not excessive fishtailing from the rear of the aircraft. She also reported that the lower noise and vibration levels made a real difference to her enjoyment. Presumably this is due to greater rigidity and insulation of the pressurized vessel. This was even more marked in the turbine and as a passenger I abandoned my headset without a second thought.

In an aircraft designed for long distance touring, small things can make a disproportionate impact on the user experience. It was evident to me from a host of details which I cannot deal with fully here that real thought had gone into this machine from both a pilot and an engineering perspective e.g. auto fuel balancing, all switch groups colour coded, pitot heat switches on at rotation. However, less thought had been given to domestic arrangements. Storage was limited and entirely within the pressure vessel, I suspect because hatches offended the engineers' desire for minimum drag. Although there was ample room for the six seats in comparison with other 6 seater planes, I would opt to remove two and replace them with storage fixtures of various kinds. The instrument panel, although functional, did not quite have the *wow* factor one should expect in this price range. For example, the labelling was on electroluminescent clear plastic which was functional and a huge step forward from post lights but it looked cheap even though, being aviation, I have no doubt it was expensive.

The perfect barrel role

Our demonstration flight in the Extra 500 was piloted by Walter Extra himself. Kneeling in the back, taking photographs, I was aware that we had adopted some fairly extreme attitudes; but it was only after the flight that Peter McCarthy - who had been in the front right hand seat - informed me that we had completed a barrel roll while I knelt on the cabin floor taking photographs, completely unsecured and utterly unaware. I am living proof that a perfectly executed barrel role maintains 1 G all the way round.

A very large bald eagle!

Towards the end of the visit Walter said he had a small errand to complete and we might like to accompany him to his home to see something interesting. It was a complete surprise when he opened a door in his garden and a very large American bald eagle emerged eager for what we later found was a much delayed meal. I make no claim to understand eagle psychology but it appeared to perceive my back as a suitable initial perch. I was just wearing a sweatshirt and apparently M & S have not tested their products for their eagle claw friction capacity. Much flapping, clawing and screeching ensued. It seemed advisable to keep still with my head down and hope for the best. Thus I found myself with a very large, hungry eagle with sharp talons raking my back while Walter bombarded me with fluffy yellow dead chicks. This seemed an unlikely aircraft sales technique so I was willing to believe that he was trying to entice the eagle to consume something more appetising than my head. Eventually after several hours - or perhaps only a few very long seconds - the eagle caught on and took to the sky. It is disappointing that Peter McCarthy, possibly because he was focussed on ensuring there was a respectable distance between himself and the eagle, failed to capture this surreal moment for posterity. After confirming that I was not dripping any fluids which might encourage it to see me as either very scared or a food source I spent ten interesting minutes watching the eagle pluck chicks from the sky. Apparently Walter had raised it from the egg. It recognised him as a food provider and thus by and large remained cooperative.

A niche for the Extra 500?

You will appreciate that the return to the factory for a final look at the aircraft was something of an anticlimax. I very much look forward to seeing how the Extra 500 develops. It is not quite as sexy as the VLJs, some of which are in a similar price range. On the other hand it is a far more practical tool for the real European GA IFR world. It could deliver a 1000nm trip at 200knots and FL200 as well as popping 40nm at 3000ft for an expensive bacon roll. It therefore strikes me as having the potential to develop its own niche just as the TBM 700 seems to have done.

King Schools' Practical risk management for single-pilot IFR

Product review by Jim Thorpe

Our esteemed editor asked me to review the King Schools' course on Practical Risk Management for single pilot IFR. I was familiar with their approach from previous study for FAA qualifications. I had found that if one trained oneself to ignore a certain irritation factor in the American style of presentation they did an excellent job of getting you through the FAA tests. They follow the syllabus and give clear minimalist explanations which get the job done. In the less defined context of making single pilot IFR safer I wondered if the presentation style would work quite as well.

The course comes on two CDs and takes about three hours to work through. Each topic is the subject of a short presentation and then there are one or two questions based on the immediately preceding topic. Although it is possible to continue without correctly answering the questions the system tries to dissuade you from doing this. The carrot is a course certificate which gives an entitlement to a small reduction in insurance costs with one US broker.

Use of mnemonics

I would guess that most IFR pilots would find little to disagree with in the material although an experienced pilot would put this in the category of useful reminders rather than the revelation of revolutionary new techniques. The Kings have developed a number of mnemonics which frankly I doubt many pilots will adopt.

- PAVE is Pilot, the Aircraft, the enVironment and External pressures.
- IMSAFE is Illness, Medication, Stress, Alcohol, Fatigue and Emotions.
- CARE is Consequences, Alternatives, Reality and External pressure.

Use of checklists

However a run through of the underlying concepts was worthwhile. One which caught my attention is the use of checklists to confirm prior actions rather than using them as a 'to do' list. Having recently taken to instructing IMC I have been struck by the degree to which checklists are disruptive and/or useless. In the air they disrupt the instrument scan and often the workload means that the least significant items get done and the few really important ones get missed. Who decided that it was a good idea to bend down in a key stage of flight risking disorientation to check that no lunatic passenger had sneaked forward and put the handbrake on during the flight? A better technique would be to do the few things that really matter such as checking for carb ice and having the correct plate to hand and if and when time allows confirming this and running through the secondary items with the checklist.

Self briefing

A proper approach briefing using the plate and a willingness to speak important prompts out loud also struck me as useful. Mind you this can go too far. I have had to dissuade a recent student from a mantra like chant of 'must keep to rate one Fred' and 'one bar width adjustment Fred' (name changed to protect the guilty) - while ignoring needles pinned on distant corners of the dials or descent limitations long passed!

I am probably also converted to the idea of giving some form of pragmatic pre-departure captain's brief. So many pilots seem to religiously do their ground checks but give little thought to the take off process itself or the navigation required immediately after take off.

I was rather taken with Martha Kings' pronouncement that if your rate of descent is greater than your height above ground you have less than a minute to live. I find myself hard put to explain its practical value but still feel it has an authoritative, rather religious, ring to it and I will try hard to find some opportunity to put it to use.

Conclusion

Inevitably there are a few topics such as the Direct User Access Terminal System (DUATS) which don't translate well from the US to Europe but they were not a serious problem. Overall I think this is a useful product which deals competently with many of the issues faced by single pilots flying IFR. I guess that only those new to instrument flying would actually want to buy the product but if more experienced pilots have the chance to work through the presentations I doubt if they would feel that their time was wasted.

The CDs can be purchased through the King Schools website at www.kingschools.com/PracticalRiskManagement.asp.

IR skill tests and licence proficiency checks

Compiled by David Earle

Pat Lander, CAA Chief Flight Examiner

EXAM01: "To pass just fly straight and level, climb and descend, and turn…" Based on an address by Pat Lander, CAA Chief Flight Examiner, to the PPL/IR Europe AGM on 19th April 2008

We were privileged to have Pat Lander, the CAA Chief Flight Examiner, as a guest speaker at the ***PPL/IR Europe*** AGM on 19th April 2008 in Liverpool. He talked about meeting the IR test standard both as a student and as a holder. From his experience, he provided many helpful pointers about what to do, and what not to do, to be successful. What follows is a summary of the key points from his presentation. The views expressed are his own: any mistakes are the Editor's.

Initial IR skill test vs. revalidation: the differences

There are important differences in approach between the initial IR skill test and subsequent IR revalidation by Licence Proficiency Check (LPC). The IR skill test is designed to enable the candidate to demonstrate the acquisition of the required instrument flying skills and knowledge under six section headings, all of which must be passed.

1. Departure
2. General handling
3. En-Route Procedures
4. Precision Approach
5. Non-Precision Approach
6. Simulated Asymmetric Flight (for multi-engine)

The requirements are set out in Standards Document 1 Notes for the Guidance of Applicants taking the Initial Instrument Rating Skill Test (Aeroplanes).

Revalidation may be undertaken as a part of a proficiency check for the revalidation of a class or type rating when one of the sections required (Section 3b) is dedicated to instrument flight. Or it may be carried out as a stand alone IR revalidation in a single pilot aeroplane. Its purpose is to demonstrate continued safe competence with the demands of instrument flight. As such it can be somewhat more relaxed than the initial skill test with some room to refresh rusty skills and repeat exercises where appropriate. Examiners are encouraged to be as flexible as possible as far as the skills of the candidate permit this.

These requirements are set out in Standards Document 14 Guidance to Class Rating Examiners - Single Pilot Aeroplanes (SPA). Standards Document 36 deals with multi-engine aeroplanes.

> ***All you need to do to pass the instrument flying test is fly straight and level climb and descend and turn!***

Mental preparation

There may be benefits for candidates in adopting the sports psychology based technique used by many athletes for their tests and checks. Mental preparation in advance can make a big difference on the day. This might include "chair" flying, imagining likely profiles in your head; reviewing power settings and attitudes; running through routines and drills; and reviewing the effects of wind. All without leaving the ground! And finally **IMAGINE A SUCCESSFUL OUTCOME** so as to benefit from a positive attitude!

Pre-flight preparation

- Read up on how instrument approach procedures are designed and know the operating rules in accordance with the AIP and PANS-OPS Vol 1.
- Practise flight planning before each training flight under test conditions.
- Take full advantage of any knowledge of likely test profiles to pre-plan as much as possible before arriving for the test (hint: ask the flight school to tell you how much the examiner weighs!).
- Always keep planning as simple as possible to leave more time immediately before the test to study the route and procedures e.g. if information is available on the charts you are using you don't need to transfer this onto your plog.

En-route

- Mostly all you have to do is fly straight and level!
- Once you have reached the top of climb and are established in the cruise you can use the autopilot in heading (HDG) mode (but not NAV mode), demonstrating navigation skills.
- If you are going to use the auto-pilot remember to include appropriate testing pre-flight.
- The autopilot should be disconnected when you descend toward the aerodrome (or on a closing heading before the instrument approach for IR revalidation).
- Remember to work from the en-route chart not just from your own plog.
- Use practised routines to overcome nerves and avoid mistakes.
- Never be idle, always think ahead: get the Met; brief approaches; set up the aids before descent to the aerodrome.
- And don't forget traffic awareness which remains your responsibility as commander, not the instructor nor the examiner. Act on any traffic information provided by Air Traffic Control.

Approach to aerodromes generally

- Plan ahead the whole time e.g. anticipate if an increased rate of descent will be needed because ATC may leave you higher than expected.
- Maintain robust routines for altimeter setting and crosschecking. A mis-set altimeter is a **FAIL**.
- Write down altitude clearances on your log unless you have altitude bugs available. An altitude bust is a **FAIL**.
- Take advantage of any NDB tracking to assess the wind effect.

Use of NavAids

- Always set up aids in good time.
- **TIMTS** mnemonic may help:
  - **T**une.
  - **I**dent.
  - **M**arkers (less important these days).
  - **T**rack selectors (compare with chart).
  - **S**electors especially important to check that the correct functions have been selected e.g. NAV1 or 2; DME1 or 2 or frequency; and VOR vs. GPS.

Holding

- This is an art not a science.
- The mechanistic approach associated with relative position at various bearings from the beacon is directed at the early stages of learning.
- Keep it simple.
- Don't forget the effects of ADF dip.
- Consider the best option when alternative hold joins are available. For instance a Section 1 (parallel join) may be preferable to a Section 3 (direct join) when approaching the beacon across the hold on the 70 degree line. This can help to give a more accurate join on the inbound track to the beacon and another opportunity to assess the wind, rather than just overflying the beacon before trying to turn on to the outbound leg.

NDB tracking and approach

- This is a "popular" category to fail.
- Maintaining a continuous, low-volume ident on the NDB is not essential but is advisable. It's especially important for safety reasons to ident just before you commence descent.
- If the NDB fails don't assume ATC will know about it and tell you. (It's very rare but it happens)
- If the NDB fails, don't continue to fly the approach, tell ATC and consider your safe options.
- The GPS overlay for NDB approaches cannot be used, although the whole flight plan can be loaded into the GPS.
- GPS can provide useful information e.g. ground speed.
- When non-precision GPS approaches are available these will be an option for the non-precision approach section and may be tested.
- Minimise the dip errors by limiting bank when making heading corrections, making use of rudder.
- Make sure you know where the wind is and use it, don't fight it, when intercepting tracks.
- Make small heading changes.
- Watch out for step down fixes (SDF) and don't bust *not below* heights and altitudes.
- Where there are no SDFs, opinions vary on whether to dive down ASAP or fly a 3 degree glide slope (both are legal and the latter approach is more favoured by the airlines but less appropriate for light aircraft). Use the advisory altitudes to assess your rate of descent.
- Remember a minimum descent altitude (MDA) is not a decision altitude.
- Be careful of the positioning of the missed approach point.

ILS approaches

- ILS ident is best done on base leg when there should be a strong signal
- Unduly early attempts to ident the ILS downwind may give the impression it is not working and induce unnecessary panic!
- Estimate drift when descending and anticipate its change at 1000ft.
- At the descent point, set rate of descent (ROD) and note attitude.
- Better still make sure you know your power/attitude combinations.
- Don't chase the needles – fly power/attitude/ROD.
- Crosscheck altitude and DME distance against glidepath.

Asymmetric flying of multi-engined aircraft

- You don't need to watch the balance ball to keep control when an engine fails.
- Keep the wings level and hold the heading with rudder (the ball *will* be central). Use 'dead leg' to identify 'dead engine' in the usual way.
- Take your time; don't rush the emergency checks.
- If the rudder has a trim, use it.
- Maintain blue line (Vyse) best rate of climb speed or slightly less - not more - because Vyse is based on maximum weight which decreases as flight progresses.

IR revalidation by proficiency check

- Most of the skill test content is covered in Section 3b of the LPC.
- Failure rate is relatively low reflecting the more relaxed approach and different attitude.
- Failures are most often a result of lack of training or insufficient preparation.
- Every second IR revalidation can be done in an FNPT II, providing that the intervening flights are made in a real aircraft. If you have access to a proper flight simulator, it can be used for every revalidation.

Conclusion

According to EXAM01, in order to gain or revalidate an instrument rating, all you need to do to pass is demonstrate basic instrument flying skills, and…

- fly straight and level;
- climb and descend;
- and turn!

THE SKIPPER AND THE CORPSE

(with apologies to Fawlty Towers)

By Adèle Stephenson

I was plugged into an ECG machine at the time, wires attached all over, when the Authorised Medical Examiner said chattily 'Death is so final, isn't it?' I hoped he wasn't referring to me as the ancient electrical plugs and loose connections looked liable for a catastrophic short circuit at any time – but on this occasion I survived to fly another day.

His comment, however, was not actually true when considered beside a piece of advice given to me early in my career. An ancient warrior of a captain fixed me with a beady eye and said 'no one, but NO ONE dies on an aircraft. 'Even if they are stiff and cold they are merely seriously ill, removed in a wheelchair or on a stretcher *and they die on the tarmac at the foot of the steps;'* I knew better than to say anything and he continued '*otherwise the paperwork is horrendous.'*

Maybe he had done several pilgrimage flights as passengers were said to feel honoured if they died en route. The airline had another word for it. Worse still, he might have been doing charters where every seat is filled compared to schedules when there is usually a bit of spare space. Experienced cabin crew tell me that if a block of three seats are empty it isn't so bad - lay out the corpse and put a blanket over it – but if it is sitting up rigid a meal tray in front of it may make the situation look more normal...

Continue or divert?

On one of the first CRM courses – flightdeck only and no cabin crew – we were given various 'scenarios' and asked what we would do. One of them split the class bang in two: captains of a certain age on one side of the line and young captains and first officers on the other. It was a not-impossible situation of a passenger possibly having a heart attack somewhere over Europe with 1½ hours to go to the UK and no trained medical staff on board. The only possible diversion was fairly close below but it was night, the weather poor, non-precision aids and no knowledge of medical facilities there.

The younger captains and the first officers were kindly humanitarians 'must save the poor man's life, get on the ground as soon as possible etc'. The older brigade (self included) only had to give it half a thought 'tell him to sit tight!!!!' He might die in the next 90 minutes, but if still alive there would be first class paramedics waiting to meet the aircraft in the UK. From the cruise it would take at least half-an-hour to land at the airfield below (charts? aids serviceable? approach procedures? minima?) and with the language difficulties – stray from R/T English and you are doomed to misunderstanding – there would be no saying what would be waiting, probably the police and not an ambulance in sight.

Having off-loaded the near corpse into unknown and foreign hands, together with distraught spouse no doubt wanting suitcase out of 85 identical ones in the rear hold, there would be refuelling (will they give credit?) and load sheet (is there a blank one in the docs file?). Last but far from least, an interim landing adds a sector to the day's duty hours – are we legal to continue or do we night-stop well over a hundred people at the company's expense? 'Oh,' said the junior captains 'we hadn't quite considered all that.' (Passengers don't often have heart attacks in light aircraft, but apart from the duty hours aspect it is still worth taking some of these matters into account before making an instant plunge earthwards into other problems.)

Our instructor informed us that there was no right or wrong answer to the scenario, it was designed to promote discussion. Someone suggested we should describe the whole problem to the victim and ask for his views!

Only one exit

About five years ago a friend of mine did have a major problem with not only a corpse, but a spread-eagled one. He was flying for a non-UK airline going to a destination in France. A passenger became more and more ill then managed to collapse in the forward galley. The cabin crew couldn't shift him (he was a large man) and as they were already on descent with the seat belt sign on they had to leave him. A call to the handling agent reassured them that paramedics would meet the aircraft but a misunderstanding meant that the crew shut down the engines as soon as they had cleared the runway. The paramedics refused to find transport out to the aircraft and said they would only be available on the air bridge. Accordingly the engines were re-started and the aircraft docked. The front door was opened and the paramedics practically fell over the figure on the floor. A quick examination and verdict was pronounced 'il est mort'. They stood up, dusted down their hands and prepared to march off. 'Well aren't you going to DO something?' said the captain. The answer, as translated by the agent, was that their duties only covered the living not the dead. Meantime all the passengers were standing in the aisle waiting to disembark. This aircraft type has no rear doors so there was no possibility of getting them off except through the front door on to the airbridge. 'Have you ever tried getting an undertaker at a moment's notice at a French airport?' said my distraught friend. 'We had to push the corpse aside, try to hide him behind a bit of curtain and disembark the passengers round him…..' That one definitely did die on the aircraft.

The easy ones were those who had turned their toes up while at the holiday resort. They were frequently young men who had tried to fly from hotel balconies without success. The answer was always a forklift truck for the box to go in the hold and a special escort each end for the sobered friends/relatives. Straightforward.

And obnoxious drunks

One non-dead corpse was removed from an aircraft flown by a colleague who diverted while en route to the UK from the southern Mediterranean. It was in the 1970s and nowadays what happened would not be allowed, it would be classified as assault. A drunken passenger was making himself so totally obnoxious that a landing was clearly necessary. The captain took a good decision,

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Chairman's Corner

PPL/IR Europe AGM at Liverpool (19th April '08)

It was very pleasing indeed to see the huge turnout for the AGM. Apart from dealing with the necessary formalities, we were treated to two excellent presentations. The first - by Pat Lander, CAA Chief Flight Examiner - covered what is required to meet the IR test standard. An article based on his very practical address is included on page 6. The second - by executive committee member Vasa Babic - introduced the work he has been doing on developing an RNAV training manual. More detail can be found on our website.

Good turn out for the PPL/IR Europe AGM at Liverpool

I was rather concerned that the departure of so many aircraft would lead to long delays but Liverpool ATC were very effective firing members off with great efficiency even accepting local aircraft for circuits in the middle of all this activity. Of course nothing is perfect and I had to be the one whose was mistakenly given a start without an IFR clearance to hand. Feeling somewhat pressured I unwisely offered to go VFR and then had something of a scramble with an unfamiliar VFR standard routing.

My arrival was also slightly unsatisfactory as Manchester tried to refuse an IFR clearance but gentle resistance 'its blowing 40 knots and low level VFR near Snowdon is a bad idea' which the unkind might characterise as whinging did lead to a change of heart with a FL80 arrival. Remember that NATS now have a reporting scheme in place for logging refusals for crossing or entry to CAS. A polite remark to the effect that 'the refusal noted for NATS reporting at time xxx' might oil the wheels. Let me know about any specifics.

Joining controlled airspace

I will be raising with NATS the whole topic of joining CAS from locations where a handover is impossible. This can arise after a departure from an instrument airfield via a routing that passes outside CAS with no obvious source of a radar service. Another scenario is exercising member Andy Hopper. He is trying to clarify exactly what happens when he files from his strip near Cambridge. It is unclear what happens to the VFR portion of his plan, does it get sent to anyone and do the estimates for time of joining CAS even reach the desk of the relevant airways controller.

The real world of hard IMC

I have been instructing IMC pretty much full time for the last few weeks. Its been an interesting experience. I had not realised how little poor weather I encounter on average. If you fly for pleasure you tend not to go to places where the weather is awful or you amend timing or routing to avoid the worst.

If you instruct you fly unless there is a strong reason not to. I have found that I am willing to go as long as I have a couple of thousand feet between the freezing level and the SSA and as long as there is a decent chance of acquiring any serious CBs visually by getting on top or between layers. The met reports with their inevitable PROB30 of almost everything that's bad are not that useful. It also emphasises to me how capricious ice is with very small changes in altitude or location making a significant difference.

This IMC instructing experience may well change my views on the best way of dealing with the question of a European instrument qualification. I suspect that this matter will be taking up a lot of the committee's time over the next couple of years and its important we do our best to help the right decisions be made.

PPL/IR Europe at Aero Expo (13–15th June 2008)

Finally can I ask you all to make a real effort to come and see us at Aero Expo London at the Wycombe Air Park? You will find details elsewhere in this issue. We want to see as many members as possible. If all you can manage are a few minutes to have a coffee and a chat that will be fine. We expect to have a 'meet and greet' area.

If you can spare a couple of hours to help to man the stand and talk to prospective members that would be even better. We appreciate that not everyone can spare the time to be regularly active in the work of ***PPL/IR Europe***. However I suggest it is not asking a lot for most of you to pop into what should anyway be an interesting show and demonstrate support for your committee.

This event is a major effort to increase our profile and membership. We have had significant past success in addressing specific issues but if we cannot move on to broaden the appeal of the IR and attract increasing numbers of younger members we will inevitably decline.

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landing at an Italian airport which he knew well, a regular company destination so there was a handling agent already in place and no fuel or paperwork problems. After landing John put his hat on and went back into the cabin. Two of the biggest and toughest carabinieri came up the rear steps. There was absolute silence. Every passenger pointed at the miscreant. Silence continued. One massive hand jerked him out of his seat by his collar. The other man produced a syringe and stuck it into him. Silence continued. The body suddenly went limp. It was dragged to the rear steps and shoved down them. John turned to find the refueller at his elbow. He whispered a fuel figure and tiptoed back to the flightdeck. Not a scenario that anyone had anticipated!

Who controls the parking brake..?

When it comes to one of the pilots dying on the flightdeck – well, it was a certainty on the Fokker F27 as to the critical casualty. The aircraft was designed so that the captain flew the aircraft. He was allowed to have the parking brake but the first officer had control of every other system and all were out of reach of the left hand seat…….death of the captain would have been an inconvenience, but the first officer's demise would have been a disaster. Even Basil Fawlty would have found it difficult to cope.

Self-flown GA IFR transport in Europe: a User's Guide Part 4 of 4

By Vasa Babic

Vasa Babic continues with the final part of a four-part series on self-flown GA IFR transport in Europe

Aircraft performance and equipment conclusions

This is a hard section to write, because aircraft owners are very loyal to their chosen types. Partly it's human nature, but also it's because the choice of aircraft and equipment is so inherently subject to individual mission needs, budget and preferences. I know pilots who commute safely and reliably in C172s, and I know pilots who fret that their Citation CJ2s are too slow. I'll only comment on some specific aircraft features I developed a view on during the course of the 50 sectors described in previous editions of ***Instrument Pilot***.

Range

In practice, the requirement for a fuel stop is a very significant barrier to flying yourself on any kind of transport trip. Turnarounds that should be 45 minutes have a way of taking 90 minutes or more; and then your GA flight has used up much of the day to replace a two-hour airline flight. Long range is also very handy if it means that a round-trip can be flown without needing to worry about Avgas cost or availability at the destination.

Speed

I think that where you live is the biggest factor determining what speed you require from a GA aircraft. If your home is three hours drive from Heathrow and fifteen minutes from your local airport, almost any reasonable piston machine will be faster than airline travel for sectors within continental Europe. If you are based in the south of England, a 170-knot airplane will get you to northern Spain, southern France or Switzerland in a realistic three to three and a half hours. If you live in Glasgow, that becomes an unrealistic seven hours including fuel stop.

My simple rule of thumb would be that a "practical radius" is three to three and a half hours for weekend personal travel or a 24 to 48-hour business trip.

Certified de-ice equipment

This is an interesting issue because I found the operational need for de-ice boots to be minimal, and yet without known-ice capability, I don't think I could have planned anything like this kind of travel schedule. I love some of the new, technically advanced singles like the Cirrus and Columbia. However, any serviceable Seneca or Aztec from the 1970s, with analogue radios and dated trim, is a vastly more capable transport machine. This is a problem for new designs, which are subject to more stringent icing certification and the more critical performance of laminar-flow wings.

Pressurisation

Some pilots find portable oxygen a very practical solution and some find that they and their passengers wouldn't contemplate the tubes, hoses and bottles involved. I found that flight above FL100 was needed only in airways that crossed the Alps or Pyrenees, or to help get more direct routings through some TMAs. However, the quiet and comfort of a pressurised, air-conditioned cabin is very pleasant, and I think that some de-iced, pressurised piston types represent very good value in the used market; eg. the older Piper Malibus or the Cessna 340.

Turbine engines

Avgas availability has been the single biggest planning problem and cause of delay during my transport flying. Even when airports and handlers assure you that Avgas is available, you can turn up and find that there is none, or that it takes hours for the fuel supplier to attend to you. Madrid and Helsinki are the two destinations I found that do not have an airport with both Avgas and suitable IFR facilities and opening hours and I suspect that the list will get longer over time. This makes the Diamond DA42 Twin Star a very attractive option for shorter range transport (e.g. up to 500 nm) and used Piper Meridians or JetProp conversions ideal for one to three passengers on longer trips.

Summary

Because most GA airplanes are used for touring, training and hobby flying, I think the used aircraft market offers some quite good value for pilots with transport needs who are willing to ignore the conventional wisdom of hangar talk and pilot forums. The best value is in the unfashionable old light twins. You simply have to make an economic calculation that offsets higher fuel, maintenance and Eurocontrol charges against the cost of capital and depreciation in newer but less capable aircraft. De-iced Mooneys, Malibus and Cessna 210s are the best single-engined piston choices, I think. The pressurised twin Cessnas are very viable as a low-cost alternative to an old King Air.

The current GA transport aircraft market is somewhat polarised between the marginally capable piston sector and turboprops costing $2m or more. However, the new single-engine Very Light Jets being developed by Eclipse, Diamond, Cirrus and others may well change this significantly in future years. The 25,000 ft altitude, 1,000nm IFR range and 250-300 KTAS performance of these types would be perfectly suited to the mission profile I've described.

Overall conclusions

The cost of General Aviation is Europe is high, and its utility is limited by restrictions and regulations. However, once you escape the 24 hr PPR, Hi-Vis jacket, no-can-do misery inflicted on leisure pilots, Europe's IFR infrastructure is very effective and accessible. With an aircraft costing little more than an exotic sports car and an operating cost comparable to business class airline tickets, the determined PPL/IR pilot can benefit from the full flexibility and convenience of personal air travel. Achieving this safely and reliably does need maintenance, training, planning and operating standards which are comparable to a commercial GA operator.

APPENDIX

Additional comments from PPL/IR Europe members

A number of members read a draft version of this article and provided very useful feedback. I've made some corrections and edits to the main document, and included additional comments below:

Reliability of flight completion

I asked Timothy Nathan, an ATPL holder and former business jet pilot, to review this article in detail. He reports achieving close to 100% flight completion in his PA23 Aztec, a light twin equipped with de-icing and a WX500 stormscope.

Robert Lough, who flies a similar PA23 but without the stormscope, does need to cancel occasional flights when embedded CBs are forecast.

Peter Holy, who flies a Socata TB20 (single-engine, normally aspirated, non-de-iced) on some very long IFR trips across Europe, completes about 75% of intended flights. The cancellations are due either to potentially hazardous icing or CBs, or to IMC conditions that are likely to be safe but uncomfortable for passengers. Peter's website has an article on European IFR (http://www.peter2000.co.uk/aviation/ifrflying/ifrflying.html) which includes a detailed section on weather planning methods for non-de-iced aircraft.

On the basis of our rather small sample, I would estimate the following flight completion rates as reasonably achievable, in northern Europe, for piston IFR aircraft:

- 95% with de-icing and weather avoidance avionics.
- 85% with de-icing but without weather avoidance.
- 75% without de-icing or weather avoidance.

It is notable how a relatively basic aircraft needs only known-icing certification and a $5,000 stormscope to achieve excellent dispatch reliability.

Timothy and Robert both commented that they need to use de-ice boots reasonably regularly and that my sample of flights encountered an unusually low incidence of icing conditions.

Impression of overall costs

This article describes a Cessna 421, with advanced avionics, flying to large international airports. I should emphasise that PPL/IR operations can be, and typically are, much more inexpensive than this, without any compromise in reliability or safety:

First, because aviation is subject to diminishing returns of various kinds. For example, $100,000 is the starting point for an aircraft with the "known-icing and stormscope" 95% reliability described above. One could spend five or 50 times this amount to buy considerably more performance and comfort, but achieve only a minor flight dispatch improvement, of perhaps one in 50.

Second, because accident statistics convincingly show that pilot training and operating procedures are the critical factors in GA safety, and until one consistently approaches commercial standards in this respect, aircraft features and equipment are probably irrelevant.

Finally, because the choice of airport and handling service is very much down to individual preferences. I describe the large airport option in some detail because it will be unfamiliar to many readers. The majority of PPL/IRs find small, friendly and efficient GA airports a better alternative.

Flight planning

Darren Wheeler, a pilot and ATCO, explained how last-minute flight plan filings, whilst often acceptable to IFPS, should be avoided because they are more likely to encounter slot and operational ATC delays.

Howard Gold recommended two additional websites for PDA weather access: http://activitae.com/pda and http://pda.meteox.com. Howard finds carrying a carry light portable printer on trips useful; the Canon IP90 is a suitable example.

Additional topics

Kyprianos Biris suggested two related topics which would make the article more comprehensive: twin vs. single-engine safety, and examples of aircraft acquisition and operating costs. I can't write anything meaningful on these subjects at present, but have added a few notes and web links which might be useful:

Twin vs. single-engine safety

AOPA in the US publishes an annual study of GA safety, the Nall Report, which is the best single source I've found for comparative accident statistics: www.aopa.org/asf/publications/06nall.pdf.

Twin and single-engined piston aircraft have similar fatal accident rates, but it's difficult to isolate the effect of airplane class from other inherent differences in mission types, pilot qualifications and operating conditions.

The reason some pilots prefer a twin for all-weather transport are well summarised by Timothy Nathan in the following article: www.pplir.org/index.php?option=com_content&task=view&id=74. However, the example of the well-respected US aviation writer, Richard Collins, who has decades of IFR transport experience in a single-engine Cessna 210, makes it difficult to argue that there is much, if anything, that can be done in a piston twin which can't be achieved in the right type of advanced single.

Many pilots are nervous of takeoffs in

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EUROSTUFF

By John Pickett

JAA role officially replaced by EASA

It has happened. Despite the protestations by many that it would not happen for years, EASA officially took over responsibility from the former Joint Aviation Authorities, for pilot licensing and aircraft operations throughout the EU, on the 8th April last.

What does it mean to us?

The Chief Executive of the Joint Aviation Authorities (JAA) Andre Auer stated "to begin with, EASA will continue to regulate using the Joint Aviation Requirements (JARs) in operations and FCL, but transposition of the JARs into EU law should be complete by about 2012."

Next, the JAA system, including the JAA Liaison Office will close. The JAA will become a training facility for national aviation authority staff employed in non-EASA States. Those are the States that have been members of the JAA on a voluntary basis.

So the JAA protocol will continue under the legal control of EASA. However, the major developments, initially, will be in the flight crew licensing that is outside the requirements of the JARs. The new licensing system for light aircraft pilots will provide for conversion terms to JAR licences but will be a brand new "stand alone" system.

A large amount of work on the system was done before EASA was given legal competence. The Light Aircraft Pilot's Licence (LAPL) will become a reality in a comparatively short amount of time. Unlike the JAR system EASA started with a clean sheet of paper and designed a system that it saw reflects the general aviation industry requirements for less regulation, simplicity and growth.

What is very obvious is that we are in the middle of a major change in policy over general aviation and IFR operations in particular. Recent articles in the aviation press have indicated that EASA, as an agency of the Commission, does not respond to lobbying. The protocol is through the NPA (Notice of Proposed Amendment) system. NPAs are published at regular intervals and can be viewed on the EASA website. Individuals may register to be sent NPAs by email. Responding to the NPAs is simple. It can be conducted on line with the minimum of effort. The NPA system is the way that EASA is influenced and the way that the policy relating to general aviation is changed. It is very important that we voice our concerns through this process. It is too late to complain when the date for response is passed and the changes become law!

European Space Agency wins bid for new earth monitoring satellite

In April the European Space Agency (ESA) signed a 305 million Euro contract, in Paris, with Thales Alenia Space to provide the first Sentinel-3 earth observation satellite. The launch of the satellite is planned for 2012. Sentinel-3 is devoted to oceanography and land-vegetation monitoring and is an important element in the European Global Monitoring for Environment and Security (GMES) programme.

Russian aircraft may be grounded

EASA has advised that hundreds of Russian built aircraft in service within the European Union should be grounded. A large number of general aviation aircraft including helicopters are included. The problem is that of airworthiness certification. Hitherto certain aircraft have been operated under an exemption. EASA is now responsible for issuing certification. It says that it has received only a small number of applications relating to just 39 aircraft!

ELT requirements for air transport

On the 16th July 2008 a proposed amendment to the European Council Regulation (EEC No 3922/91) concerning emergency locator transmitter requirements comes into force. This requires an automatic ELT for all aircraft first issued with a C of A after 1st July 2008 and used for commercial air transport.

It is not known when similar requirements will be applied to non-commercial flights. Updates will be posted in future editions of ***Instrument Pilot***.

Poor hearing No. 1 reason for loss of licence on medical grounds

Audiogram due at the next medical? Recent research has shown that the number one cause of the loss of a flying licence on medical grounds is that of hearing loss. Noise related hearing loss is prevalent in pilots flying piston engine aircraft. The research shows that use of noise attenuating headsets reduces the incidence of hearing loss.

Squawk 7401 in Scotland

The UK CAA has recently reminded pilots that whilst flying in Scotland, and using "Scottish Information" on 119.875, they maybe required to squawk 7401. Whilst "Scottish Information" does not have a radar display the intention is that other ATC units will be able to "see" the aircraft and advise Scottish Information of a potential airspace violation.

Bio fuel developments

The price of Brent Crude oil reached $130 a barrel in Europe at the time of going to press.

Meanwhile the development of synthetic fuels is proceeding at an ever-increasing pace. SASOL of South Africa is seeking approval of a completely synthetic jet fuel. Johan Botha has recently said, "Once the project is certificated, it loses its identity as synthetic fuel and becomes Jet A1".

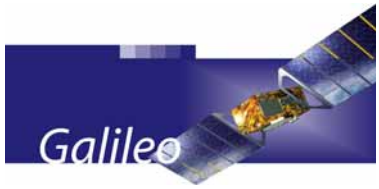
In Europe, Airbus recently welcomed journalists to the launch of the first flight test of a big aircraft powered by gas-to-liquid fuel. It is anticipated that by the year 2030 a third of the global airline fleet could possibly operate on bio fuel.

EASA supports PPL flying instructors

EASA is supporting the concept of returning to the use of "PPL Instructors". For many years flying instructors have been required to hold a Commercial Pilot's Licence or an Airline Transport Pilot's Licence prior to gaining a Flight Instructor's Rating.

In the 1960s and 1970s, before the law was changed, it was common for PPL holders, seeking a career in aviation, to gain experience by instructing. As the new EASA Light Aircraft Pilot's Licences will not comply with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organization (ICAO) there is no requirement for flight instructors to hold a professional pilot's licence. This will, hopefully, improve the current situation where there is a chronic shortage of experienced flight instructors. It will also bring new blood into the industry throughout Europe. Perhaps it well help in the training of the 74,000 professional pilots that is alleged will be needed in the next 24 years!

Galileo funding approved and second satellite launched



As reported in the last edition of Eurostuff, the current funding estimate for Galileo, Europe's satellite navigation, positioning and timing system, has recently been estimated at 3.4 billion Euros. This funding has now received approval through the Galileo Implementation Regulation (GIR). The GIR is the legal document that releases funds for the establishment of ground stations, building satellites, and the provision of launchers. It is anticipated that these contracts will need to be closed by December 2008 to ensure that Galileo is up and running by the end of 2013.

Meanwhile, on the 27th April the second Galileo satellite was launched. GIOVE-B is a 500 kg satellite built by a European team led by Astrium GmbH, with Thales Alenia Space providing integration and testing. The satellite was launched from Baikonur cosmodrome in Kazakhstan and is now under control of Telespazio's spacecraft operations centre in Fucino, Italy.

Galileo critic, Mrs Gwyneth Dunwoody, dies

Mrs Gwyneth Dunwoody died on the 17th of April. As Chairwoman of the British House of Commons Transport Committee she was fiercely critical of the Galileo project. Mrs Dunwoody once said of Galileo, "The government must stop this folly and endeavour to bring the European Commission to its senses".

She will be remembered, amongst many other attributes, for her common-sense approach to the numerous problems presented to the Transport Committee.

She will be sorely missed.

More Russian GLONASS satellites

Whilst Galileo now has two satellites in space, the Russian plan is to increase the number of satellites launched in the GLONASS programme from 6 to 13. The intention is to have a constellation of 24 satellites by the end of 2008 and a further six planned for deployment in 2009. This will bring the complete system satellite numbers to 30. They will include satellites that will be used as spares in case of malfunction.

Galileo footnote

For those members who are interested in the various applications of Galileo, the European GNSS Supervisory Authority has recently published the "Galileo Open Service Signal In Space Interface Control Document" (Galileo OSSISICD) that can be downloaded from www.gsa.europa.eu/go/galileo/os-sis-icd.

Self-flown GA IFR transport in Europe
continued from page 11

a twin and happy cruising in a single. Personally, I prefer to accept the extra 60 seconds of risk in a piston twin departure in order to feel more relaxed during the subsequent hours of cruise flight. I don't believe there is any substantive safety argument either way it's down to individual preferences and perceptions.

Aircraft acquisition and operating costs

This is such a broad subject, that I'll merely try to give a simple indication of the costs involved:

1. Getting a PPL/IR from zero hours costs $50,000 ($10,000 for the basic PPL, $20,000 for experience building and $20,000 for the instrument rating). Training is much cheaper in the USA.
2. New IFR-capable airplanes start at $250,000 and used ones at $75,000. Aircraft decline in value about 10% each year or require an equivalent refurbishment spend to maintain their value. New and used aircraft prices are available at www.aso.com. Depreciation and cost of capital can be calculated on this basis.
3. For a typical private owner, flying 75-150 hrs/year, I would suggest the following cost approximation:

- 3% of airplane value for insurance cost.
- $20,000 of fixed cost for training, supplies, parking/hangarage and airport fees.
- $1 per hp per hour for all other expenses. (Engine hp is a good proxy for many aircraft costs related to maintenance, weight, complexity and fuel consumption. For example, aircraft piston engines burn 0.2 litres of Avgas per unit of max hp per hour, over an average operating cycle).

Other resources on the PPL/IR Europe website for pilots interested in GA IFR

- "Getting a Rating": http://www.pplir.org/index.php?option=com_content&task=view&id=107&Itemid=74.
- "Flying IFR": http://www.pplir.org/index.php?option=com_content&task=view&id=108&Itemid=95.

Keep every single scrap of paper!

By Peter Holy

Documents for aircraft parts is a rather tedious subject, normally dealt with by one's maintenance organisation. However, it is worth a bit of an aircraft owner's time to learn at least something about it. This enables owners, particularly of N-reg aircraft, to source both new and overhauled parts directly from the USA, and have them fitted and signed off by an airframe & power plant technician with an inspection authorisation. This can be a major cost saver over the traditional supply route via the UK distributor etc.

The downside is that if the aircraft is later to be transferred to a European register, there could be major problems with the issue of the CofA if the appropriate documentation on the parts in question is not available. This is a trap worth avoiding, given the small but constant uncertainty concerning the future of N-reg aircraft in Europe, for the sake of both covering all bases and preserving the aeroplane's market value.

Traceability

The general requirement for aviation parts is traceability. This enables a defective part to be traced all the way back to the manufacturer, enabling the recall of an entire potentially defective batch. It is also intended to prevent the use of inadequate specification or outright counterfeit parts. So, each part should be accompanied by the appropriate documentation, and this documentation must be retained after the part has been installed.

The surprising bit is that the legal requirements under both FAA and UK CAA do not *generally* specify any particular form for the documentation. So, while someone may say that an official release certificate is mandatory e.g. an FAA 8130-3 form or EASA-1 form, in reality it probably isn't and any documentation which supports the traceability requirement will do. This is particularly the case for the countless small parts on an aircraft such as small screws, pipe fittings, etc. These are traditionally accompanied by a certificate of conformity and due to the nature of the aviation supply chain would not normally come with other documentation.

U.S. sourced parts fitted to an N-reg aircraft

In general, a suitable certificate showing traceability is required. The commonly used 8130-3 form is desirable but not mandatory; indeed many smaller U.S. vendors either cannot supply it (because they don't have an in-house person authorised to sign it) or they charge extra for it. For parts sourced in Europe, a JAR-1 or EASA-1 form meets FAA requirements too.

> ***The general requirement for aviation parts is traceability***

A potential problem arises if the N-reg might later be transferred to G-reg. You may never intend to do this but if the aircraft has had parts fitted which are not supported by documentation acceptable in Europe, this can impact its market value. In that case, if you take care to get an 8130-3 form for everything, that should be fine for all *new* parts except Class 1 components (engine and propellers) which ought to come with an 8130-4 Export Certificate of Airworthiness. Trivial items (e.g. small screws) ought to come with some kind of documentation too but in practice this doesn't matter, not least because nobody notices them.

U.S. sourced parts fitted to a G-reg aircraft

The UK CAA document covering this is Airworthiness Notice 14 (AN14) and this specifies nothing more than "the component shall be accompanied by an appropriate release certificate from the state of export following maintenance in that state and prior to fitting to the UK registered aircraft". An 8130-3 form has customarily been acceptable for this purpose, although not for aircraft operated for Public Transport. Normally, Public Transport means an Air Operator's Certificate is required, particularly as under current EASA regulations the CofA is the same and it is the *actual* maintenance regime that determines whether the aircraft may be used for Public Transport.

There is obviously a grey area regarding just how trivial a part needs to be before traceability documentation is no longer required. In practice, small parts like instrument panel screws are routinely regarded as exempt.

There is a distinction between *new* and *used* parts. Note that an overhauled engine or propeller is a used part, even if you have owned it all along! On used parts, AN14 states.

"Prior to 28 September 2008 where it is intended to fit used components which have been maintained in a state other than the United Kingdom to an aircraft, in accordance with this Airworthiness Notice, the component shall be accompanied by an appropriate release certificate from the state of export following maintenance in that state and prior to fitting to the UK registered aircraft. For Class 1 components (engines …. and propellers) an export statement is required (e.g. from the USA, a Form 8130-4 for Class 1 components and Form 8130-3 for all other used components). After 28 September 2008 all used components fitted to UK-registered aircraft must be in compliance with Part M Subpart E."

So, for non-Class 1 parts, an 8130-3 is sufficient but apparently not mandatory; however, Class 1 parts do need fancy paperwork. The FAA form 8130-4 is an Export Certificate of Airworthiness. This needs to be signed by an FAA designated airworthiness representative (DAR) who charges around $200 in the USA. In the UK, an FAA DAR may charge in excess of £1000! To be safe, anybody purchasing a new or overhauled engine from the USA ought to obtain an 8130-4 form for it even if fitting it to an N-reg aircraft.

Dual release

There are many companies in the USA which have JAA/EASA approval. These companies can issue an 8130-3 form which carries the company's EASA approval number, and such an 8130-3 form is as good as an EASA-1 form. In this case, the 8130-3 form is good enough for a Class

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Pilots' talk

Compiled By David Bruford

Dates for your diary

13th - 15th June 2008 - Aero Expo High Wycombe

Join ***PPL/IR Europe*** at the UK's premier UK aero fair. See page 2 for details.

27th - 29th June 2008 - Jersey International Air Rally

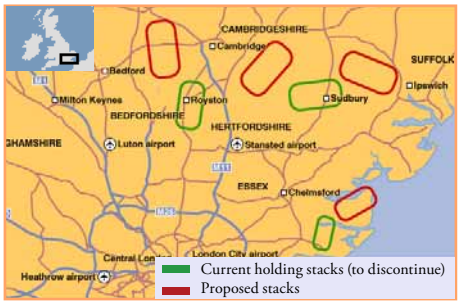
Changes to this annual event mean that attendees have the choice of the full weekend package (full rally package) or the rally entry fee and the Saturday night prize giving dinner (basic rally package).

For more information contact either the Jersey Aero Club on info@jerseyaeoclub.com, Telephone +44 1534 743990, the rally manager, evelinehawkin@hotmail.co.uk or see www.jerseyaeroclub.com/rally.php.

28th June – 2nd July 2008 Malta Air Rally

The annual International Air Rally of Malta will be held for its 39th year in June/July 2008 and offers the opportunity for some friendly flying rivalry, good laughs and some excellent trophies in the friendly and beautiful island of Malta. More details at www.geocities.com/maltarally/main.htm or email George Kissaun at kissaung@mail.glabal.net.mt

NATS proposes changes for southeast England



UK service provider NATS has unveiled proposals to alter flight paths around major airports in southeast England. The region includes major London hubs such as Gatwick, Heathrow and Stansted; medium-sized airports such as Luton and London City; and smaller facilities such as Southend. Ian Hall, NATS director of operations, said that the changes are intended to cut delays and fuel burn, as well as reduce by 20% the number of people affected by noise from departing aircraft flying below 4,000 feet.

Correction: aircraft insurance

Some erroneous insurance requirements were quoted in the last edition of ***Instrument Pilot*** on page 6. Mandatory minimum third party aircraft insurance liability values are prescribed in SDRs (special drawing rights) based on the maximum take off weight/mass in kilograms as follows:

<1000 kg	SDRs 1,500,000
<2700 kg	SDRs 3,000,000
<6000 kg	SDRs 7,000,000
<12,000kg	SDRs 18,000,000

But these values vary dependent upon passengers, cargo etc. The SDR conversion rate is currently quoted as about 83p.

Mode S datalink reaches milestone

The Mode S flight identity datalink passed a major landmark with the first-ever tracking and identification of an aircraft without the assignment of secondary surveillance radar (SSR), Eurocontrol announced in mid-February. A Lufthansa B-737 flying between Frankfurt and Munich on 18th January became the first aircraft to be identified by having its Mode S transponder identification automatically matched against flight-plan data held by ATC, Eurocontrol stated.

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1 component too. The major engine manufacturers have EASA approvals nowadays but there was an hilarious temporary situation when Continental did not have this, so while one could install a new engine in a G-reg aircraft, one could not have the same engine overhauled by Continental because it was a "used" part!

The moral of this story is: **keep every single scrap of paper**; every invoice, delivery note, certificate, the lot. And keep it for ever. You never know when you will need it. Aircraft maintenance is necessarily done on trust, a maintenance company is not normally going to query whether some installation done 10 years previously was correctly documented; but when an aircraft is being placed on a new register, an inspector goes through everything, and anything that looks out of place will draw attention.

The future?

EASA Part M Maintenance is due to start in September 2008. This will introduce new requirements and few people yet understand it well. On the face of it, it looks like recognition of FAA certification will be a bigger problem than under the UK CAA, but the reality of aviation is that nearly everything is made in the USA anyway, and EASA will have to find a way to deal with this.

N-reg owners are able to operate outside EASA requirements so long as they comply with FAA requirements, but the need to keep the paperwork straight is going to be at least as important as in the past, since some level of local maintenance oversight is virtually certain for political reasons. Obtaining EASA acceptable documents for major items e.g. an 8130-4, is highly recommended: your FAA maintenance facility is not going to do that unless specifically asked.

An alternative viewpoint concerning a forced transfer of N-reg to G-reg is that the UK CAA will always requires an Export Certificate of Airworthiness **for the whole aeroplane** for such a transfer. Such an Export CofA will cover all the parts in it including, for example, an overhauled engine.

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Saint Exupery mystery solved?

Has the final chapter been written in one of the great aviation mysteries? A former Luftwaffe pilot says he shot down Antoine de Saint Exupery as the French writer, considered by some to be the greatest aviation author, flew his P-38 off the coast of France in 1944. But Horst Rippert, now 88, who claimed 28 victories during the Second World War, says he never would have opened fire if he'd known his favourite author was at the controls. "If I had known it was Saint-Exupery, I would never have shot him down," Rippert told the UK's Daily Telegraph newspaper. "He knew admirably how to describe the sky, the thoughts and feelings of pilots. His work inspired many of us to take up our vocation."

Apparently Rippert has kept the secret all these years and gave it up after being tracked down by Luc Vanrell, a diver who found the wreck of Saint Exupery's aircraft in 1998, and a war researcher named Lino van Gartzen. Saint Exupery was flying for the Free French from Corsica and was on a reconnaissance flight when Rippert said he spotted the Lightning from above and it was easy prey for his Me-109. Many believed the writer, who penned such classics as Pilote de Guerre (Flight to Arras), had committed suicide, but there has also been a persistent theory that he was shot down.

Reaction to ADS-B plan tepid

The FAA has a lot of input to consider as it takes the first steps toward implementing its NextGen airspace and air traffic control system. Comments have now closed on a Notice of Proposed Rulemaking (NPRM) on the implementation of Automatic Dependent Surveillance-Broadcast (ADS-B). ADS-B is considered to be the fundamental technology of NextGen and there's a lot at stake in making sure it's done right. So far, it appears that most stakeholders agree ADS-B is the way to go but they aren't completely satisfied with the way the agency is going about it. For instance, the Aircraft Electronics Association, which represents virtually all the companies that make and fix avionics, says the FAA's proposed next-generation communications, navigation and surveillance (CNS) system is more elaborate than it needs to be and wastes the money aircraft owners have already spent on their current gear.

In a news release AEA government affairs expert Ric Peri described the system envisioned as "ADS-B on steroids" and called for the agency to take a deep breath. "The FAA must develop a

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Europe Air Sports (EAS) AGM at Cologne (15th - 16th March 2008)

By Paul Draper

At the EAS AGM in March, president Sir John Allison agreed to stay in post for one further year.

His overarching original message to EASA from EAS was, and remains, "what is permitted and conducted safely today in individual countries should continue to be permitted under the new regime". Because of political issues this has not always been the case.

Claude Probst, rulemaking director of EASA, and two of his officials attended. Amongst a number of issues discussed or mentioned those most relevant to ***PPL/IR Europe*** members were:

- EASA is trying to simplify issues of collective ownership of aircraft.
- The Light Aircraft Pilots Licence – although the politicians seem keen to revert to naming it the Leisure (Aircraft) Pilots Licence - will apply to aircraft under 2 tonnes. There are opportunities and threats on medical standards and as a result EAS are proposing that the one time EASA wish to add an IR be dropped. To add it would introduce a higher medical certificate need.
- Future EASA ratings will include towing, mountain flying and aerobatics.
- Aerodromes "if open to public use" will be subject to regulations.
- EASA are working with the UK CAA over possibly allowing the IMC to continue via a safety case. Interestingly the glider pilots hard-fought continued right to "cloud fly" is not agreed as yet and a solution is needed for the future.
- ***PPL/IR Europe*** were pleased to have been involved in discussions on the IR and wished to continue to contribute. When the Notice of Proposed Amendment (NPA) is published by EASA, Mr. Probst said ***PPL/IR Europe*** will be able to pursue this further.
- Asked by ***PPL/IR Europe*** about the continued basing of N-registered aircraft in Europe. Mr. Probst said there is no formal timescale for EASA preventing such long term basing **but** it is a matter that gets mentioned regularly in bi-lateral talks with the FAA who state they have no interest in such aircraft based overseas and have no real resource to oversee them. Transference of pre-2003 aircraft to EASA certification may well be a problem but an agreement is under discussion: amongst other things, it would require design information from US manufacturers and agreement from owners that continuing airworthiness standards will be via EU standards.
- Aviation security. The EC is still pushing for **all** airports to be included in the new security proposals and a decision is awaited as to whether aircraft up to a certain size will be excluded.
- Proposals for NPAs to be issued as follows:
  - March – flight crew licensing
  - April – authority requirements
  - May – safety management systems
  - June – operations
  - July – third country aircraft
  - August – operational suitability certification

All will need addressing/comment by ***PPL/IR Europe.***

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proposal utilizing an 'evolutionary' process that utilizes existing avionics to the maximum extent possible, rather than this stepped 'revolutionary' process of wholesale technology replacement of the entire CNS suite in general aviation aircraft," Peri said. It's worth noting that AEA wasn't consulted on the NPRM. Even big supporters of NextGen, like the Air Transport Association, are leery about the proposal as it stands. ATA says the system, as proposed, won't produce the needed improvements in capacity and efficiency and will subject aviation to "enormous costs."

The Department of Defence (DoD) is concerned ADS-B might work a little too well. It doesn't want to advertise all its flights and wants a way to fit the system without letting everyone know its aircraft are there at times which, of course, is the exact opposite of the main selling point of ADS-B. DoD is also concerned that ADS-B can be hijacked by terrorists or enemies and wants to know what is going to be done to prevent "spoofing" the system.

Maintenance engineers found guilty of pilot manslaughter

In a precedent case that may eventually influence European courts, a New Zealand jury deliberated for roughly ten hours before finding former maintenance company owner John Horrell, 56, and senior engineer, Ronald Potts, 60, guilty of manslaughter for the death of a pilot in a helicopter crash. The pilot and father of nine, Philip Heney, was killed when a tail component failed while landing a Robinson R22 helicopter, near his home. A passenger survived the crash. The accident took place Aug. 26th, 2005 the same day Heney retrieved the aircraft from Skytech Aviation, where it had undergone maintenance. A prosecutor claimed the defendants failed to ensure that a licensed aircraft maintenance engineer directly supervised the work and failed to ensure it was inspected twice by qualified engineers. Counsel for the defendants argued former workshop owner Horrell could not be expected to determine if the supervision was sufficient and that the accident was not the result of intentional criminal action, but human error. Horrell and Potts were each sentenced to 300 hours of community work and ordered to pay compensation.

CFMU flight plan validation web address

The CFMU flight plan validation web address has changed to: www.cfmu.eurocontrol.int/j_cia_public/cia_public/pages/ifpuv-structured.jsf.

Blind pilot flies supersonic

Miles Hilton-Barber, 59, an Englishman who has been blind for about 20 years, recently flew with a sighted co-pilot at speeds up to 1,100 mph over Cape Town, South Africa. The English Electric Lightning jet climbed to 50,000 feet in under two minutes, according to the BBC. The record-setting event raised £50,000 for the charity Seeing is Believing which helps blind children in developing countries. "There are 37 million blind people in the world today, and 28 million could see again tomorrow if the money was available," Hilton-Barber said. He previously flew an ultralight from London to Sydney, and has also tried wingwalking and mountain climbing.

"The rush was incredible. It was just wonderful," Hilton-Barber told the BBC. "Of course, I couldn't see anything but my co-pilot told me that when we were flying upside down at 50,000 feet, you could see the curve of the earth."

CAA strategic review update

By Paul Draper

Following the recent dialogue events with representatives from the GA industry ***PPL/IR Europe*** was invited to attend a "one to one" meeting on 14th March with Sir Joseph Pilling who has been appointed by the Aviation Minister to carry out the review for the Government. We had previously attended, and submitted evidence to, the House of Commons Transport Committee that in 2006 recommended the setting up of this review.

We were able to highlight points made at the two main events we had attended and discuss points arising plus assist Sir Joseph's knowledge on GA matters.

Some of the items we proposed and discussed were:

- Commercial Air Transport (CAT) and GA would, via a high level "Forum" reporting directly to the Minister, deal with advice requests from, and formulate advice to, the Government as to policy matters. This would include, for example, maintaining a national airfields network accessible to GA, promotion of the industry, and those who work within it for the benefit of UK plc, ensuring good relationships with the EC and EASA on aviation matters. This Forum would not be directly linked to the national aviation authority (NAA), presently the CAA.
- The NAA tasks and objectives should be restructured so that it provides a proportionate safety oversight to aviation, both CAT and GA.
- GA should be delegated to supervisory bodies that are currently acting in that role or could do so e.g. BGA and LAA. There would need to be an agreed dividing line as to size and/or classification of aircraft to which this applies: currently 5,700kg weight limits are used for other divisions and should be appropriate in this case. However, the division between commercial and private use of aircraft poses problems.
- The NAA would implement the relevant EU laws on behalf of the Department for Transport (DfT) per the normal arrangements for Member States and will continue to contract with EASA to perform certain other functions. There should be no "gold plating" of EASA regulations at national level.
- The part of the NAA that has the oversight of GA would require a much reduced operating size and cost compared to the current high cost base within the CAA.
- The NAA should:
  - Appoint a non-executive (part time) board member with specific responsibilities for GA;
  - Establish, in conjunction with the DfT, an appeals procedure whereby an alternate dispute resolution system/arbitrator is established (avoiding the need to use judicial review procedures).

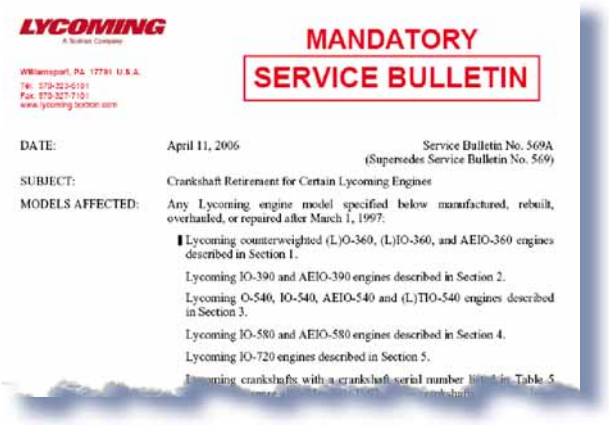
The review conclusions should be prepared and submitted to the Minister in June but we do not know how long the Government will take to decide on its response and any possible restructuring.

Most of the GA industry that attended the events wished to see major change in the NAA to reflect the major changes to aviation in the period since the Aviation Act 1982 formally established the CAA. We wait to see whether Sir Joseph agrees with the industry's views and if the Government can accept the need for changes, if any, that might be proposed.

SB569 crankshaft swap

(part 1)

By Peter Holy


LYCOMING

MANDATORY
SERVICE BULLETIN

DATE: April 11, 2006 — Service Bulletin No. 569A (Supersedes Service Bulletin No. 569)

SUBJECT: Crankshaft Retirement for Certain Lycoming Engines

MODELS AFFECTED: Any Lycoming engine model specified below manufactured, rebuilt, overhauled, or repaired after March 1, 1997:

- Lycoming counterweighted (L)O-360, (L)IO-360, and AEIO-360 engines described in Section 1.
- Lycoming IO-390 and AEIO-390 engines described in Section 2.
- Lycoming O-540, IO-540, AEIO-540 and (L)TIO-540 engines described in Section 3.
- Lycoming IO-580 and AEIO-580 engines described in Section 4.
- Lycoming IO-720 engines described in Section 5.
- Lycoming crankshafts with a crankshaft serial number listed in Table 5

This article is the first of a two parts describing an IO-540-C4D5D engine rebuild, to comply with Lycoming's service bulletin SB569. Part two will appear in the next edition of Instrument Pilot

The crankshaft service bulletin

During the period 1997-2002 Lycoming's crankshaft subcontractor produced around 6,000 crankshafts using a modified forging process. Around 2001/2002, some of these were additionally structurally weakened and failed, with loss of life in some cases. This fiasco resulted in the FAA recalling many crankshafts by serial number as presumably those made with the defective procedures were identifiable by batch. By the end of 2005 there were no more recalls but litigation in the USA dragged on, both a class action between aircraft owners and Lycoming, and between Lycoming and its crankshaft subcontractor.

Eventually, on 11th April 2006, Lycoming issued a service bulletin (SB569A) which placed a 12 year life limit on all of these crankshafts, additionally mandating replacement if the engine crankcase is opened up for any other reason. This is now an airworthiness directive and is thus mandatory. The 12 year deadline means that all the affected crankshafts (around 5,000 of them) must be replaced between 2009 and 2014. Lycoming paid for engine removal/replacement and the engine repair on the early recalls but they are not paying for the cost of the massive SB569A recall.

Options for owners

Lycoming have done two things to reduce the compliance cost:

a) Owners can purchase a new crankshaft for US$2,000 but this offer expires February 2009. This includes new bearings and piston rings and is a fraction of the normal crankshaft list price. This option means that owners who do not want to rely on Lycoming's quality control procedures, and who would have used an independent engine rebuilder instead, have a strong economic incentive to change their crankshaft before that date.

b) Owners sending their engine for an overhaul to Lycoming will get a new crankshaft fitted free. This option may protect Lycoming from a class action, because they have always adopted a position that an engine must be overhauled after 12 years anyway.

Given that most private owners do any major maintenance in the winter (due to weather) the $2,000 offer left three possible winters: 2006/07, 2007/08 and 2008/09. The last one is probably not a wise choice since owners using independent engine shops are likely to do it then, and owners happy to send their engine to Lycoming will probably also do it at the last minute i.e. at the 12 year deadline which will be 2009-2014 depending on when their engine was made.

I decided to do it in the winter of 07/08. My objective comprised of both compliance with the SB569A crankshaft replacement requirement and improving the engine by a higher grade reassembly process than is done by the manufacturer.

Which engine shop?

One has to do some "due diligence" before sending an engine off to an engine shop. Most consumer surveys, whether published or anecdotal, of aircraft or engine maintenance organisations find that for every happy customer there is at least one unhappy one. The least bad problems are delivery times that massively over-run previous estimates, in some cases forcing the retrieval of the disassembled engine after 4-5 months and transferring it to another engine shop to finish it. Then it gets worse, with serious build defects causing engine failures. Outright document forgery to cover up work which was not actually done is not unknown. One can speculate on the reasons for this variation: it could be that "aviation has always been like that" but the most likely reason is that many customers want to pay peanuts. This strips the businesses of the capability to employ good people and run proper project estimation and management systems. In general, car mechanics are paid a lot more than aircraft maintenance people. There is also the tight regulatory environment for aviation maintenance which enables a firm turning out poor work to hide behind its approvals and certification. Businessmen familiar with the quality management standard ISO9000 will recognise this immediately. This is exacerbated by the European approach to certification which is to apply it to the organisation rather than to an appropriately qualified individual inside the organisation which is how it's done in the USA.

Timescale

The next requirement was to eliminate downtime if possible. Traditionally this is done by getting an exchange engine. Unfortunately, whereas my engine had only about 700 hours on it, most engines in the exchange marketplace are much older, around 5,000 hours. Because the value of an engine (and thus the aircraft) relates to how old it is, most owners overhaul their own engine when it's young and use the exchange option only when it is old. A 5,000-hour engine should be fine because all parts of relevance are either replaced or tested for cracks, but the methods used cannot detect a subsurface crack (particularly in aluminium) and there are other factors. For instance a crankcase which has been through a couple of overhauls will have had its mating surfaces machined down to a level where it will have to be replaced the next time - very expensive! It would be foolish to swap a 700 hour engine with a known perfect history for a 5,000 hour engine with a totally unverifiable history and potentially any number of undeclared prop strikes. Finally, my particular IO-540 engine variant, an

IO-540-C4D5D (dual magneto single shaft) is rare and is thus very rare in the exchange engine marketplace. I could have done an exchange by buying a new engine but at around US$60,000 - minus what one can get for the old one after paying for the SB569 crankshaft swap on it - this is an expensive option, especially as many careful buyers then send the brand new engine to a specialist engine shop to be "looked at".

Tolerances

The final requirement was to get back an engine reassembled to the closest possible tolerances, particularly with respect to dynamic balancing of moving parts. Lycoming assemble engines with relatively wide tolerances on component weights and dynamic balance limits, which results in some engines being much smoother than others. This is accepted as normal in aviation but should not be. Specialist engine shop practice in the USA is that pistons and gudgeon pins should be weight matched to within 1gram (1g), con-rods are weighed separately at each end and also matched to within 1g, and the crankshaft is dynamically balanced to within 1 gram-inch. What a mix of metric and imperial units! On crankshafts, Lycoming's factory tolerance appears to be around 50 gram-inches. Yet it is difficult to find a UK engine shop which is interested in dynamic balancing of a crankshaft and many won't do even trivial measures like weight matching the pistons - something a child could do with £20 postage scales.

Blueprinting is an old expression which in the aviation context means building the engine from carefully weight-matched parts, and gas flowing by smoothing out the inlet manifold passages to aid airflow into the engine.

Dynamic balancing of crankshafts is completely legal under FAA rules if done by an FAA repair station with the appropriate authorisation for this scope of work. I have not found anything suggesting it is illegal under CAA/EASA rules either although some UK engine shops claim otherwise (but never offer references to back up the claim). It is controversial as - if done properly - it involves removing metal. What most critics don't realise is that the manufacturer already does dynamic balancing and removes vast amounts of metal in the process. Incomprehensibly, the manufacturer then stops without bothering to finish the job accurately.

Weight matching of reciprocating parts obviously cannot be illegal since good or bad weight matching is entirely accidental in normal engine assembly so doing it more accurately deliberately is no different. If however one is to remove metal then the company needs the appropriate FAA authorisation for the scope of work. One does not generally need to remove metal from pistons because they are cheap and plentiful and selecting a weight-matched set is easy, but if metal does need to be removed there are well established locations on the base of the piston. One would not remove metal from Lycoming con-rods as these have no "fat" but again it is easy enough to find matched sets especially as one can match an underweight small-end with an overweight piston.

Gas flowing is routinely done on engines operated under the U.S. experimental regime and is very effective in increasing engine efficiency (power for a given fuel flow rate) by reducing pumping losses. Regarding certified engines, my enquiries suggest that most FAA inspectors would approve the removal of casting flaws in the inlet passages, but anything beyond that is a no-no. And a certified engine is not permitted to exceed its maximum factory rated horsepower anyway so any result would be limited to a reduced fuel consumption - yet the fuel servo needs to be adjusted to a specific full throttle flow rate band so, perversely, that would make a significant efficiency gain illegal too.

Finally, there is a variety of certified aftermarket parts which can potentially be fitted. After many discussions with engine shops I avoided these as most offer very little benefit. For example, one can get a camshaft which contains additional oil feed holes: this assists lubrication during engine starting but with modern oils and frequent flying this is not an issue. The one thing which would have been worth getting is the new Lycoming roller tappets (cam followers) which avoid a well known Lycoming issue with tappet surface disintegration, but these require new crankcases which are very expensive.

UK engine builders

Advantages of a UK engine shop include: avoidance of shipping cost, delays and damage (the engine goes in the back of a van); the bigger shops are EASA certified so no future issue with aircraft registry transfers; and one can drop in and sort out any problems, face to face.

One engine shop offered to rebuild the engine with weight-matched parts, but they would achieve partial crankshaft balancing merely by matching an overweight crankshaft big-end bearing with a con-rod whose big-end was similarly underweight. No dynamic balancing of the crankshaft itself.

Another engine shop offered to rebuild the engine with a dynamically balanced crankshaft sourced from Lycoming, then passing through a specialist U.S. crankshaft balancing shop which charges around $200. They would generate an EASA-1 form for £800 over the crankshaft price, a substantial mark up for the EASA paperwork. This was amusing though irrelevant on the scale of this project but ultimately I did not use that company due to too many reports from unhappy customers.

Another very well known company (which went bust soon afterwards) claimed that parts sourced from the USA come with bogus documentation... At this point I had enough.

There are definitely some small engine builders scattered around the UK who do excellent work. Unfortunately they are not easy to find references for, and some of the reports I have seen were terrible. A common thread seems to be timescales which are totally out of control, with some highly reputed builders taking 4 months; OK if one is doing an exchange engine, or one is working a bigger project on which the engine is not the critical path. Most of the very small shops don't have EASA approvals which restricts the use of the engine to a private CofA G-reg aircraft. For an N-reg aircraft one needs an FAA airframe & power plant technician (with an inspection authorisation if it's a geared engine) to sign it off.

US engine builders

My aircraft is on the US N register so I have no need for EASA documentation, but there is always the simmering issue of an attack by the European regulators on foreign registered aircraft in Europe. See my article on parts documentation, on page 14, which covers the acceptability of US paperwork to CAA/EASA when placing an aircraft onto the G register.

In the USA, there are many specialist engine shops which have FAA repair station approval for dynamic balancing using metal removal. Compared to the vast amounts of metal already removed by the crankshaft manufacturer, the amount removed in this secondary process is small and there is no safety issue in this very long established practice. The metal is also removed in the same locations at which the manufacturer removes it. The FAA repair station then issues the finished engine with an 8130-3 release form. But you don't get an EASA-1

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form which can come only from the biggest "production line" engine overhaulers and none of those look good in U.S. consumer satisfaction surveys.

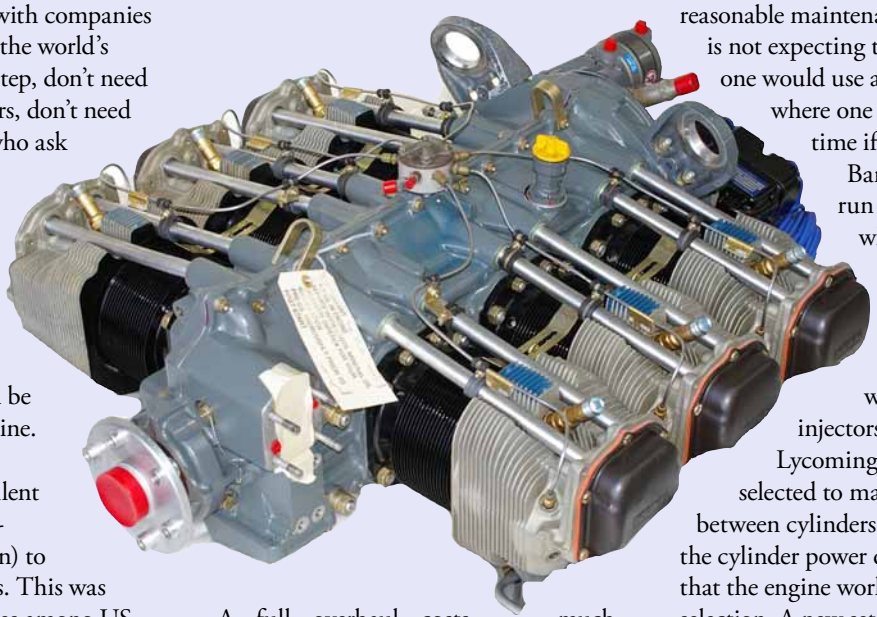
You can however get an 8130-4 form - an export certificate of airworthiness - by paying more to cover the cost of the engine shop calling in an FAA designated airworthiness representative (DAR) to sign the certificate. With such a form, the engine is good for any EASA aircraft except perhaps AOC operations (this situation is unclear at present).

I contacted a number of U.S. engine shops, starting with the big well known ones. A recurring issue in dealing with companies in the USA is that they have the world's largest market on their doorstep, don't need to deal with foreign customers, don't need to deal with any customers who ask more than three questions, and this is reflected in frequent difficulties in communications. The company's work may be good but if they don't answer emails or faxes prior to doing business, one would be a fool to send them one's engine. I also used a survey done by Aviation Consumer (an excellent non-advertising subscription-only U.S. aviation publication) to eliminate a number of names. This was followed by informal enquiries among US pilots.

Barrett Precision

After examining the options for several months during the latter part of 2007, I settled on Barrett Precision in Tulsa, Oklahoma. I found a number of satisfied former customers, zero unhappy customers, and they communicated in a straight and open manner. They offered a wide range of options on the extent of work done in this case: the crankshaft swap is an engine "repair", not an "overhaul".

Their pricing was good too: $3,600 for the most basic option which included dynamic crankshaft balancing and weight matching of reciprocating masses, all to 1g, and with cylinder work starting at $150/cylinder it would have been hard to reach the prices quoted in the UK which started around the $15,000 area assuming that no new parts are needed. They had apparently previously dealt with UK customers and the cost of air freight was estimated at only $500 (each way) using Eagle Global (now called CEVA) who they had used previously.



A full overhaul costs much more - $32,000 - because it includes new Lycoming cylinders and many new parts. If my engine had e.g. 1500 hours, an overhaul might be worth doing but not at 700 hours. Interestingly the TB21 engine, a TIO-540, would cost $48,000. These are still highly competitive prices by UK standards.

A one hour dynamometer (dyno) run – to measure torque and power characteristics - is included as standard, with extra time beyond this charged at $500 per hour. I specified five hours total engine run time, more than most owners go for but this should bed in the piston rings, making the first flight less critical.

Barrett Precision offer a warranty of two years or 400hrs, whichever occurs earlier. In the US, the engine would generally be sent back to them. Here in Europe, they would ask the customer to nominate a known/reputable engine shop and would liaise with the shop regarding rectification work. However the majority of issues tend to be cylinder related, do not require the crankcase to be opened, and can thus be done by any reasonable maintenance shop. Obviously one is not expecting trouble. If one was then one would use a local UK engine shop where one can give them a hard time if necessary.

Barrett Precision's dyno run includes a lean test, where they check that the six EGTs peak at the same common fuel flow rate. My engine was originally fitted with a set of GAMI injectors. These are standard Lycoming injectors with flow rates selected to match airflow imbalances between cylinders in order to balance up the cylinder power delivery. It is important that the engine work does not upset this selection. A new set of GAMIs costs about $1,000.

They confidently quoted a five week turn-around. Barrett Precision is located in an area containing numerous aviation engineering companies. They can get parts and engine accessory overhauls, cylinder machining, etc, done virtually on their doorstep.

Part 2 of this article will be published in the next issue, covering how the engine rebuild turned out.