Instrument Pilot

The journal of PPL/IR Europe No. 43 May-June 2004

2004 AGM

By Ian Chandler

PPL/IR Europe tries each year to vary the AGM of the organisation, usually by holding it in different venues. The 2004 AGM was always going to be different once we managed to secure Niederrhein as its venue. Niederrhein is the former RAF Laarbruck, which the RAF left in 1999. From then until 2003 the base was left largely untouched and then in May 2003 Airport Niederrhein opened for business with daily Ryanair flights to England. Since then with Dutch money and a Dutch airport operator the airfield has grown quickly with a low-cost airline 'V-Bird' flying several times a day to many varied locations all over Europe.

This Junkers G31 aircraft was being used for pleasure flights at Niederrhein when it burst a tyre on landing causing several of our inbound members to exercise their skills in the hold

1st May 2004 was not only our AGM but also the airport's first anniversary and the airport management had decided to hold a birthday party for anyone and everyone who wanted to come. We were specifically asked to hold our meeting on 1st May so that there would be more aircraft at the airfield for the public to see. However I don't believe they expected the huge number of people to turn up that did.

The airport terminal was swamped and the airfield roads congested, and to delay several of our members causing further 'grey hair' moments for yours truly, the runway became blocked when an aircraft burst a tyre on landing!

Eventually 18 out of the expected 24 aircraft braved the poor UK weather and had arrived safely at Niederrhein. A good buffet lunch was served in the airport restaurant in an area reserved for us that all but a few latecomers enjoyed. The local arrangements had, following a visit by me in February, been put together by Rob of the based GA handling agent, Solidhandling. He was extremely busy handling all the GA arrivals not just PPL/IR members but other airport visitors. However eventually we located our coach for the transfer to the former Sergeants Mess where our meeting was to be held. Arriving we found the door locked and no one around; we tried a nearby building in case there had been a mistake, but no one could be found. After frantic telephone calls by our driver we returned to the terminal!

Not wishing to waste time, I urged your chairman to start the AGM, so the 2004 AGM became unique, not only the first to be held in Germany but also the first to be held on a bus! Reports were read out from the aisle using the coach's PA system and accounts duly adopted and directors duly re-elected. (Even I was re-elected despite everything!) Whilst this was going on, the airport technical officer arrived and explained that the operator of the Club had left the day before after an argument with the management but no one had told Rob or us! However keys were eventually located and off we went again.

This time we successfully gained entry and rapidly set up our equipment for our guest Markus Görnemann of the LBA (German equivalent of the CAA) to talk to us on the German interpretation of Mode S, Link 2000+ and P-RNAV. Unfortunately we were running behind our schedule and our guest had to leave us rather quickly after his presentation which didn't enable us to ask many

P 18 ▶

> "The 2004 AGM was unique, not only the first to be held in Germany but also the first to be held on a bus!"

PPL/IR EUROPE

Mode S – *PPL/IR Europe's views*

In reply to the request for our views on Mode S, our Chairman, Paul Draper, submitted the following (slightly edited) response.

Mr A P Knill
Manager Surveillance & Spectrum Management
Directorate of Airspace Policy

Dear Mr Knill

CONSULTATION FOR THE PROPOSAL TO AMEND THE AIR NAVIGATION ORDER 2000 FOR THE PURPOSE OF INTRODUCING A NEW SECONDARY SURVEILLANCE RADAR SYSTEM IN NOTIFIEDTERMINALMANOEUVRING AREAS AND EN-ROUTE AIRSPACE IN THE UK FROM 31 MARCH 2005

In general the proposal for carriage of Mode S transponders is recognised as a contribution to air safety. However there are a number of points we wish to make in so far as the proposals affect our membership and indeed the GA community in general:

1. Question 5

"Compliance Costs for Business, Charities, and Voluntary Organizations"

We note you have not included a note on compliance costs for private aircraft owners/operators. We consider this should be done as an unrealistic view results from their exclusion. It is also the case that private owners/operators usually do not fly their aircraft for large numbers of hours per annum and the cost burden upon them is therefore greater pro-rata than other operators.

5.2.2 Option 3:

"...the cost of the purchase of a Mode S Enhanced Surveillance capable transponder, with which to replace an existing transponder, for small aircraft is estimated to be about £3000 to £4,000. The estimated cost of the subsequent embodiment and integration of the transponder into the avionics of the small aircraft to meet Option 3 is not currently known."

We know of a member who has a very current estimate for installing a new Elementary Mode S unit in a modern airframe (TB20) at a cost of £5,500. This is while the dollar/pound rate is particularly advantageous and with more normal exchange rates the cost would be £6,000. It is also most likely the older the airframe the more the installation costs.

We are aware of one other European manufacturer who has produced a unit at £1,500 but has thus far only managed to get it certified for a/c to 2,000 lbs MTOW but is working on certification for heavier a/c. On the basis the unit cost for a heavier a/c is around that figure the total installation cost would likely be £3,000 representing a significant saving to a low time IFR user and a good reason to delay installation as long as possible.

2. Questions 7 & 8:

"7 Identify Any Other Costs" & "What other costs not identified in this consultation document would arise from the implementation of this regulatory proposal and what quantitative data is available to support this?"

It is clear you have not adequately dealt with these questions, as you have not included costs associated with private general aviation owners/operators.

3. Question 8.1

"Issues of Equity and Fairness. It is envisaged that this regulation will have a greater financial impact on the smaller air transport operators, such as the General Aviation companies."

While we are pleased to note you acknowledge the difficulties of compliance on small air transport operators you have again not referred to the impact on private owners/operators.

4. Appendix 1 UK MODE S EXEMPTION POLICY

Section 1. 2 Transition Period

2.1 "A 2-year Transition Period from 31 March 2005 to 31 March 2007 will be applied. This Transition Period is the period during which these exemption principles will be applied fully to facilitate the transition to SSR Mode S. . .surveillance in the notified TMA and ENR airspace. At the end of the period, the exemption principles and the Policy will be reviewed and redefined as necessary".

We note the period is for only two years and would propose that it be extended to a three-year period to coincide with the current proposed date for carriage of basic Mode S by all aircraft.

This would enable more time to pass for other manufacturers to progress alternative transponder units thereby increasing competition and lowering costs. It would also give time for the LAST unit to be finalised and make the fitting of a basic Mode S unit by those not requiring regular access to the notified airspace a more economic proposition.

Section 2. 1 Applicability

1.1 a. "All fixed-wing aircraft having ***either*** *a maximum take-off mass in excess of 5,700kg* ***or*** *a maximum cruising true airspeed capability in excess of 463 km/h (250 kt), and which require* ***regular access*** *to notified TMA and ENR Mode S airspace under IFR and operating as GAT from 31 March 2005, must have full* ***Mode S Enhanced Surveillance functionality*** *in accordance with ICAO Annex 10 Amendment 77 SARPs, Volumes III and IV."*

We note you refer to true airspeed capabilities, which in our view is not a practical way to determine applicability since true airspeed does not figure in an aircraft's certification. The maximum speed at which an aircraft is certified (Vne) is an indicated speed. While this IAS can be converted to TAS at various altitudes, this is often not relevant, as many types of aircraft cannot achieve Vne in level flight at high altitudes. The maximum practical TAS for an aircraft is therefore not a value that can be derived from the aircraft's certification data. Aircraft caught by this problem are many of the small turboprops, both twins and singles, such as King Airs, MU-2s, Twin Commanders, Conquests, Cheyennes, Merlins, PC-12s and Meridians.

We also note that the speed limits used by ATC are based on "indicated" speeds and the two regulations noted below are examples:

A. CAP 393 (latest revision of Dec 03) refers to "indicator" speed (hence must be "indicated" speeds):

"Speed Limitation
23 (1) Subject to paragraph (3), an aircraft shall not fly below flight level 100 at a speed which according to its air speed indicator is more than 250 knots unless it is flying in accordance with the terms of a written permission of the Authority..."

B. ICAO holding procedure speeds (at all flight levels) in the Rules of the Air are quoted as "indicated" speeds.

The maximum speeds permitted in TMAs are also expressed as "indicated" airspeeds.

Given these precedents it does not seem logical to base the threshold for Enhanced Mode S on true airspeed and the question therefore arises if consideration could be given to amending this to indicated airspeed.

In addition, to fit Enhanced, assuming it is technically possible, will cost well over $50,000 because of changes to and interfacing with existing aircraft systems in order to obtain the necessary data. This makes it an uneconomic proposition for most aircraft of these types with old airframes.

1.1b. "All fixed-wing aircraft having a maximum take-off mass of 5,700kg or less ***and*** *a maximum cruising true airspeed capability of 463 km/h (250 kt) or less, and all rotary-wing aircraft, which require* ***regular access*** *to notified TMA and ENR Mode S airspace under IFR and operating as GAT from 31 March 2005, must have a minimum of* ***Mode S Elementary Surveillance functionality*** *in accordance with ICAO Annex 10 Amendment 77 SARPs, Volumes III and IV. However, compliance with Mode S Enhanced Surveillance functionality, or partial compliance where full compliance is not possible, will be encouraged."*

We are pleased to note that there is a "regular access" definition that excludes aircraft in this weight/speed category requiring less than an average of 30 hours flying time access per annum. We have noted that exemptions will be given on a case-by-case basis, however, bearing in mind the issues referred to in 1, 2 & 3 above we consider the access exemption definition should be increased to 50 hours per annum.

5. 2.2 "Aircraft operators who believe that they may be entitled to a Mode S exemption will, in the first instance, need to submit an application to the MECC. The MECC will then assess the application and issue any exemptions on behalf of the state regulators. A suitable application form will be developed and promulgated prior to the implementation dates."

We consider there will be a need to ensure that the necessary exemptions can be applied for and granted sufficiently early to enable operators to be certain of gaining access to the airspace from 31st March 2005. In practice this would likely mean exemption consents being applied for by mid 2004 and approved without delay. This is because if exemption is not granted the operator would of course have to be able to source and have fitted the new equipment before 31st March 2005.

It will also be necessary to ensure the exemptions application and consents procedures are in place as soon as possible for aircraft which it is considered to be technically not feasible to fit Enhanced to their airframes.

We hope you will take our comments into account and we should be pleased to discuss any aspect of them further if that would assist.

Yours sincerely,
Paul R Draper

PPL/IR MEETING GLOUCESTER – 3 JULY 2004

The next PPL IR meeting will be held at Gloucester on Saturday 3 July 2004. **John Arscott** of the Directorate of Airspace Policy and **John Thorpe**, Chief Executive of GASCo, will be making presentations. The meeting is scheduled to begin at 11:00 and end at 15:30hrs. Full details on the PPL/IR Europe website www.pplir.org. Please let me know if you are planning to attend so adequate lunch and transport arrangements can be made.

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The Truth About True Airspeed

By Thomas B. Haines

With the debate about whether the Mode S speed limit should be based on TAS or IAS, the author gives us a definitive article on the subject

Altitude is your friend in more ways than one. There are critical moments in flight when you'd give about anything to have back a little more altitude. But beyond the safety cushion of a few thousand more feet in which to work things out when they go wrong, altitude also makes our flights more efficient — up to a point.

Because true airspeed increases with altitude, you are almost always better off flying higher on cross-country flights — assuming headwind components do not increase dramatically with altitude. In addition, your airplane burns less fuel at higher altitudes, allowing you to stay there longer than would otherwise be possible. As a result, true airspeed seems almost too good to be true — like something dreamed up by a slick door-to-door salesman: "Buy today and I'll throw in the Miraculous Airspeed Booster that not only allows you to fly faster, but on less gas! Think of yourself, madam, flying your Airknocker 150 right up in the flight levels on no more gas than I can put in this measuring cup!"

Well, you get the idea.

And yet despite the magic of true airspeed, few pilots seem to really understand the potential. Often when we run an aircraft report on a turbocharged airplane, we get e-mails or letters from pilots who question the airspeeds in our spec boxes at the end of the article. Unless you read carefully, we seem to be reporting that the airplane cruises faster than its VNE, or the speed that you should never exceed. Take the New Piper Malibu Mirage, for example. Its maximum cruise is about 215 knots true airspeed. It achieves this speed at its maximum operating altitude of 25,000 feet. Meanwhile, the design's VNE is 198 knots indicated airspeed. It's easy to become confused if you overlook the difference between KTAS and KIAS. Remember, because the atmosphere at 25,000 feet is much less dense than at sea level, the airspeed indicator at maximum cruise will show only about 130 to 140 knots — right around the airplane's manoeuvring speed of 133 knots indicated airspeed. So, technically, you can rack the airplane around up there at its full design limits and not do any damage — possible, but not exactly good form, particularly if you have passengers on board trying to enjoy lunch in the back.

Think of your airspeed indicator as being calibrated to be accurate at sea level on a standard day when the barometric pressure is 29.92 inches of mercury (1013.2 hpa) and the temperature is 59 degrees Fahrenheit. Under those conditions, your indicated and true airspeeds are equal. Go blazing along, brushing the waves at 100 KIAS, and you can bet that the flight computer will tell you that your true airspeed is also 100 knots — assuming no error in your airspeed indicator or pitot-static system and

P 18 ▶

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The Birth of GA

So for those PPL/IR members who don't want to mix with the VFR plebs, hully hully! One of the last bastions of IFR **only** flight is about to open up to those people who actually look outside to navigate! China has been starting to create VFR charts with the help of the FAA Charting Office as part of a push to creating a complete GA infrastructure within the country. Obviously this is an enormous task as a lot more than simply charts are required!

Uniworld LLC is an American company sponsoring the China GA forum later this month where all aspects of the GA explosion will be discussed. Soon a flying holiday along the Great Wall of China could be a reality! (Just remember to keep it on your left…)

Diesel Diamond Twin Certified in Europe

The Diamond DA42 was certified by the new European Aviation Safety Agency (EASA) at the Berlin Air Show. As well as being the first certification for a diesel-powered twin, this was also the first European aircraft certification for Garmin's G1000 glass cockpit.

Cirrus on Top?

Although Cirrus Aviation are still relatively the new boys on the block, they are certainly not pulling their punches. "We want to be the number-one manufacturer." is their stated intent, and even Cessna are worried! Cessna expect to build about 600 piston singles in 2004, against Cirrus's projected 500 aircraft, however Cirrus took orders in January and February approximately double the number of aircraft anticipated (around 100 'planes) and have subsequently ramped up production to two planes a day. Cessna acknowledge that Cirrus is "real-competition" and underline this by having to point out that Cessna have delivered more than 185,000 aircraft over the years… but the past is the past, and the present reality is that if Cirrus' year keeps going as well as it has started, they could well be top of the heap by the end of the year!

And to help them on their way..

Cirrus has announced the latest addition to their line-up, a new version of the popular SR22, the SR22-G2. The G2 features a new fuselage and cowl (for easier maintenance), a redesigned engine mount for a smoother ride, new blended-airfoil Scimitar Select Hartzell propellers, and many other design features including a new leather interior.

Insurance Co-operative… A way to reduce premiums?

So when the Canadian Company Seawind who supply the Seawind Amphib (water/land) homebuilt, which hopes to produce certified factory-built versions shortly, were told how much insurance premiums would be on their product, they came up with a novel idea. As they claim the main problem is that there just isn't enough historical data for the insurance companies to fairly assess the premiums, the company has formed an insurance co-operative, where owners will put up a bond and pay initially high premiums which will drop significantly as the fleet builds. The bond money will then be returned. The company stress that the insurance plans will be strictly non-profit. "We are only doing this to sell airplanes!" said a company spokesman.

Fuel Woes…

In the USA Gas is cheap and everyone drives enormous cars… but even there things are beginning to change. The American Automobile Association reported that fuel costs had hit an all time high of nearly $2 a gallon, and aviators were seeing prices for 100LL closer to $3. Even the big boys are suffering with the price of Jet A1 climbing and many airlines tacking $5 fuel surcharges on to every ticket…

But of course a major part of the problem is that the supply of 100LL for GA is pretty limited. In the US the entire GA fleet is now dependant upon one producer for 100LL, and even that producer is not committed to producing TEL (tetra-ethyl lead) fuel after 2010.

With no acceptable replacement fuel available, and the certification process for such a fuel likely to take years, GA should be very concerned!

Although…

The first certified GA engine to run on unleaded Mogas was on show at Sun'n'Fun. It is apparently a retooled, re-engineered and improved model of the Lycoming 360 from Superior Air Parts, and delivers around 180hp from either aspirated (O-360) or injected (IO-360) engine models. Apparently the engine is quite happy running on 100LL, unleaded or any mix of the two!

Very quick Lancair

Lancair are proud to boast that their new turbo-charged Columbia 400 has a maximum recommended cruising speed of 235 KTAS at FL250 with a useful load of around 1100lbs. With 140 people already waiting for aircraft the plane is already a success, and further models are likely to offer extras such as de-ice and possibly even pressurisation.

Lancair also advised owners of Columbia 300 and 350 aircraft to inspect the fuel pressure transducer after finding a tendency for it to chafe against its mounting bracket. They have also asked the FAA to issue an AD on the matter.

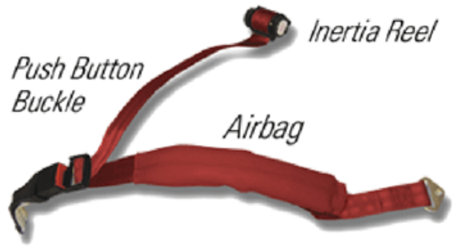
GA vs Airlines, here we go again…

Richard Anderson is CEO of Northwest Airlines, and seems to have decided that GA is a good target. In a recent edition of his in-flight magazine, we ran an editorial entitled "Fairness for All Airport Users" where he claimed that various taxes, fees, etc., made up almost a quarter of the cost of an airline ticket, but that private aviators are not paying their fair share of the costs of the aviation infrastructure.

AOPA immediately responded setting up a meeting between president Phil Boyer and Richard Anderson. The meeting was apparently "productive" but led to the result that the two men will "agree to disagree" on the issue (*this is obviously a new definition for the word productive*). He also believes that in this case, part of the reason for the article is to do with a law-suite that Northwest has launched against the Metropolitan Airport Commission, which runs Minneapolis-St Paul International airport which Northwest uses, and 6 smaller GA airports which it doesn't, but which receive some of the revenues it pays to help cover costs.

In the UK and most of Europe we pay not insubstantial landing fees at most GA airports, and in the main extremely high ones at airports shared with commercial traffic, so the same arguments do not apply, but I'm sure that this will be a chorus that we will hear many times with regard to GA use of airspace, radar and Euro-control services!

Airbags for Aviation



Mooney have become the latest to offer seatbelts with built-in airbags on some of its models. For a mere $6,000 all four seats can be fitted with these new gadgets that inflate when sensors detect a 9G deceleration. A Mooney spokesperson said "We strongly feel that by offering the inflatable seatbelt we have not only listened to our current customers, but have addressed the issue of increasing safety with no need for uncontrollable devices such as a parachute system". *I wonder who they're talking about there…*

Apparently Airbus and other manufacturers are also evaluating the product for commercial use as it is believed that the initial impact of many air-crashes are survived by passengers, who are rendered unconscious and then die in the post-crash fire.

Spanish Information

For those planning on fleeing the cold rugged summer of Northern Europe for warmer climbs, the Spanish AIP is available on the Internet, conveniently in both Spanish and English! No registration appears necessary and the site can be found at: http://ais.aena.es/aipeng/Hoja_presentacion_AipEng.htm

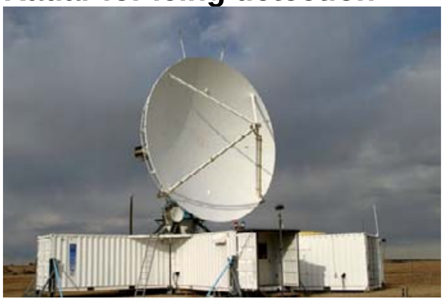
Jeppesen Anniversary & new pilot training kits

Jeppesen sent us a press release to let us know that this year celebrates the 40th anniversary of the launch of the Jeppesen Bottlang Airfield Manual. Originally started in 1964 by Hans Bottlang the business was founded to provide detailed VFR flight information for Germany with overview charts for Austria and Switzerland. Within three years approach charts were available for these two countries as well, and the overview charts included all of central Europe. Jeppesen acquired Bottlang in 1986.

Jeppesen also sent us a press release this month, trumpeting the launch of their new European pilot training kits, including, they say, two kits designed for "instrument rating (IR) students". They claim that the kits have been designed with the help of feedback received from their dealers and European flight schools, and so are fully tailored and priced for great value.

Unfortunately, as we go to print, http://www.jeppesen.com still seems to have a large empty space in the online shop headed "European Pilot Kits" so we can't tell you what's in them, or just how great value for money they are!

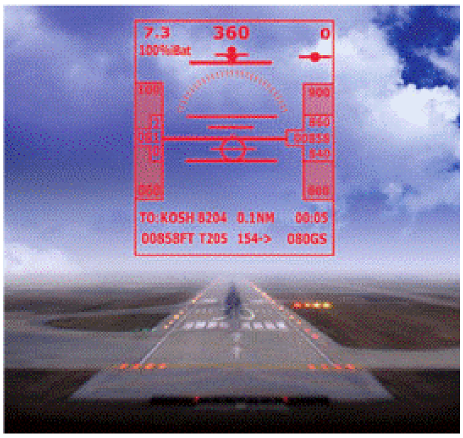
Radar for icing detection



S-Polka is the new radar system from the National Center for Atmospheric Research (NCAR) designed to pinpoint the location of water droplets in clouds that cause icing.

The system uses two radars with different wavelengths (S-Pol – 3,000MHz and Ka-band 35,000MHz), and by processing the differences in the reflected images scientists believe that they will be able to show exactly where the water is. This could eventually provide an important warning system for pilots!

Retinal Projection…



Sounds scary – but in reality it is simply an extension of the head-up display. Instead of projecting data onto a screen that you can see as well as see through, the data is projected backwards into the eye. Microvision have had the system on test with Military pilots for some time, and is also being used in Iraq by the US Army. In addition Honda has just bought a system to use with data-manuals to help mechanics fix cars faster. In cockpit tests from 3 years ago, pilots wearing the system were able to spend more time looking out for other traffic instead of scanning instruments, because all the data was always immediately available.

Would go nicely with…

NASA's Langley Research Center's new Distributed Air/Ground Traffic Management system is designed to allow pilots to plan their own routes and safely and seamlessly fit into the traffic flow. Researchers and Pilots were scheduled to use simulators to *fly* planes into a virtual copy of the Dallas-Fort Worth airspace on May 20th. Controllers watch their progress, but the pilots use the autonomous flight management system to fit themselves into the flow.

Spirits Having Flown

David Bruford offers a sobering report on the effects of alcohol on pilots in the light of recent events.

> "Besides the pilot was a partially empty bottle of vodka with a loose cap"

Research of UK aircraft accidents over the last twenty years reveals that up to 75% involve 'human factors' as a principal cause. Further study shows that fourteen of these cases involved alcohol, some as a contributory factor, and others as the prime reason for the accident. This may not seem a great number but it only represents cases where a pilot was detected as being under the influence of alcohol because of their actions or the events that occurred.

In March 1981 a pilot climbed into a hired PA 28 and taxied for take off. He had not booked out or called in to the Chigwell Flying Club as was expected. Had he done so, he would have been advised by the CFI that all flying had been cancelled due to the bad weather, poor visibility and a low cloud base. After take off he climbed into cloud, reappearing shortly afterwards. The aircraft then completed a low barrel roll, pulled up vertically ahead of some tall trees, stalled and crashed. A toxicological examination of the pilot showed an alcohol level of 367mg (milligrams) per 100ml (millilitres). Authorities in the UK use milligrams per millilitre to describe blood/alcohol levels. Most other countries use a direct percentage that is easier to envisage. The UK car-driving limit is 80mg/100ml, and this equates to a level of 0.08% of alcohol in the blood stream. In this case the pilot's blood/alcohol level was 0.375%, four and a half times the UK's legal driving limit.

The following month a pilot booked out at Cambridge Airport for a return flight to Panshanger where he had flown in from two hours earlier. During radio exchanges between the aircraft and Cambridge Tower the pilot seemed confused and appeared to have difficulty in understanding instructions. That proved evident as he taxied in the wrong direction and proceeded to take off without clearance. During his ensuing two-hour flight the aircraft was observed flying through the Stanstead Zone so erratically that the police were alerted. He subsequently called Panshanger stating that he was turning finals but five minutes later transmitted a Pan call before crashing into trees on Stanmore Common. The aircraft had run out of fuel but beside the pilot, who was suffering from fatal injuries caused in part by not wearing a seat belt, was a partially empty bottle of vodka with a loose cap.

These are extreme cases but research over the last four decades has revealed a high incidence of alcohol in the blood of pilots involved in fatal accidents. In the United States the percentage of pilots with elevated blood alcohol levels involved in fatal general aviation accidents during the early 1960s was approximately 43%. This proportion fell during the 1970s to an annual rate of between 15% and 20%. The association between elevated blood alcohol levels and fatal, general aviation aircraft accidents have tended to remain at the 10% - 30% level in recent times. This is not the case when military and professional commercial aviation accidents are investigated. It is logical to assume that this is because strict discipline exists within the commercial and military organizations. This factor combined with random blood tests carried out by some companies and the high likelihood of being reported by other flight crew, aware of their own professional obligations, restricts the inclination to drink. Private pilots however have no such controls or testing imposed upon them although this will shortly change.

Pilots will shortly have an actionable BAC level 75% lower than car drivers.

Under the UK's Railways And Transport Safety Act 2003 there is provision for blood/alcohol tests to be carried out on all pilots, professional and private, following an accident, incident or where there is reasonable cause. This law includes a 20mg or 0.02% Blood Alcohol Concentration (BAC) action level, which brings the regulation into line with the existing rules relating to public transport operations under JAR-OPS1. In a research article that appeared in Aviation, Space and Environmental Medicine in February 1999, the results of a survey of 438 pilots revealed that many pilots are exceeding the 0.02% BAC level. A random sample of 1,000 pilots from all categories was obtained from the CAA database, these were mailed a questionnaire and 43.8% were returned, anonymously, to Cranfield University. (See Table 1. Source: Drinking & Flying: A Structural Model. Authors: Emma Maxwell, M.Sc. and Don Harris, B.Sc, PH.D.)

How good is the accident data?

An average of 20% of fatal accidents involving alcohol is a high figure and open to challenge. A variety of factors, primarily the effects of

TABLE 1: REPORTED INSTANCES OF CONTRAVENING THE 0.02% BAC DRINKING AND FLYING REGULATION BROKEN DOWN BY LICENCE CATEGORY						
	No: Had never flown with a BAC > 0.02%		Maybe: Had probably flown with a BAC > 0.02%		Yes: Had flown with a BAC > 0.02%	
PPL (231)	167	72.29%	24	10.39%	40	17.32%
CPL (44)	16	36.36%	8	18.18%	20	45.45%
ATPL (187)	42	22.46%	24	12.83%	121	64.71%

putrefaction on measured blood alcohol levels have caused some to argue that these postmortem studies do not accurately reflect the true incidence of alcohol ingestion by aviators. However, regardless of technical discrepancies in some studies the balance of data does suggest a strong correlation. The considerable amount of statistics available combined with the consistency and trends of the results would tend to support the assumption that alcohol has a causative role in many of these accidents. In the UK the CAA Medical Branch have determined that blood/alcohol concentrations of 40 milligrams per 100 millilitres (0.04%) are associated with a highly significant increase in errors committed by both experienced and inexperienced pilots, even in the most simple of aircraft. This is half the legal driving limit and may be produced by drinking just two units of alcohol (one pint of beer or one double whisky). Besides being illegal; Article 57(2) of the Air Navigation Order states: "A person shall not, when acting as a member of the crew... be under the influence of drink or a drug to such an extent as to impair his/her capacity so to act." It also means taking a needless risk.

In Australia the statistical correlation between elevated blood alcohol levels and fatal civil general aviation accidents has prompted attempts to identify pilot impairment during flight, simulated flight, and a variety of flight related tasks. In-flight evaluation of pilots with blood alcohol levels of 0%, 0.04%, 0.08% and 0.12% has suggested that even quite low blood concentrations of alcohol cause significant performance decrements in flight. This study concluded that "... blood alcohol concentrations of 0.04% are associated with substantial and highly significant increases in the number and potential seriousness of procedural errors committed by both inexperienced and highly experienced pilots." Other studies performed using aircraft flight simulators support the relationship between the blood alcohol level and the number of procedural errors. These duties have been shown to be impaired by blood alcohol concentrations of 0.025%, 0.04%, 0.08%, 0.1% and 0.15%. Russian studies in a similar vein revealed that during the initial four hours after an alcohol intake of 0.02% (a quarter of the UK drink/drive limit and the equivalent to one whisky or half a pint of beer) a sudden depletion of psychological reserves and deterioration of operator's reliability is noted, and interestingly, the less elaborate professional skills appear to be the most vulnerable.

The piloting of an aircraft is a complex task. It requires the interpretation of a variety of sensory information, the cognitive evaluation of this information and the performance of various motor tasks in response to the perceived situation. The basic faculties required to be able to successfully pilot an aircraft include an adequate and unimpaired sense of vision and hearing, sufficient intelligence and judgement, suitable personality and motor skills. The motor skills necessary include adequate power, dexterity, and coordination to manipulate aircraft controls, correlate speech for radio communication and the strength and agility to get in and out of the aircraft. These requirements may be obvious and simplistic to a qualified pilot, but even they may recall that substantial training was originally required to turn those basic attributes into the ability to successfully and safely pilot an aircraft.

The demands of flying an aircraft are much greater than those of driving a car. The pilot is exposed to additional factors such as the hypoxia with increasing altitudes, high noise levels, the requirement for radio communication, higher accelerations during aircraft maneuvering and visual-vestibular illusions with the potential for loss of three-dimensional orientation. Even quite low levels of alcohol can act to impair the human faculties required to fly in a safe and effective manner. The ingestion of alcohol influences virtually every system in the human body in some way or another. The metabolism of many body systems is altered including the gastro-intestinal tract, liver and pancreas, muscles, blood, heart, endocrine organs, immune system, respiratory system, fluid and electrolyte balance and possibly even the propensity to develop cancer. Its effect is most pertinent in its impairment of a variety of central nervous system functions.

How fast and how much?

In the UK the driving limit of 0.08% can be reached by drinking four units of alcohol (two pints of beer or two double whiskies) but the subsequent BAC level is dependent upon the weight of the drinker. The rate and amount of consumption determines how long it takes to reach a certain BAC level and how long that level will last. Although alcohol quickly reaches the blood stream and so the brain, the rate of alcohol elimination from the body is fairly constant. Three drinks in one hour will take effect just as quickly as one drink, but the BAC level for three drinks will go higher and remain high for a longer period.

The weight of the drinker will determine the volume of blood in their body. A 240-lb individual has a larger volume of blood in his or her body than a 120-lb individual. How much blood determines how much alcohol will have to be consumed by a given individual before a certain BAC is reached. A 120-lb individual will reach the legal limit of intoxication after consuming four drinks in one hour, while it will take eight drinks in the same hour for a 240-lb individual to reach the same BAC level.

While the effects of a drink are immediate, it takes the body 20 to 40

P 9 ▶

> "Even quite low levels of alcohol can act to impair the human faculties required to fly in a safe and effective manner"

Cirrus SR22 BRS survivor describes parachute deployment

Monday 12 April 2004 - Saturday should have been a good day for Jeff Ippoliti. And, ultimately, we'd have to suggest that it was. Despite low scud and low visibility, he was very comfortable with his SR22, an IFR-equipped aircraft that he'd logged nearly 600 hours in, and one he'd come to depend on for an unparalleled degree of freedom in getting where he wanted to go... swiftly.

A founding member of the highly regarded Cirrus Owners and Pilots Association, Jeff had been flying a Cirrus Design SR22, Serial Number 80, for several years and simply wouldn't think of owning anything else. He loved the speed, the looks, and the safety features and he'd gotten quite comfortable with his personal bird, N916LJ.

> "Minutes after departure, I started experiencing instrument failures, one after another. No warning. No smoke. No clues."

He started the morning picking up his airplane at the local service centre, where he'd had it worked on, in order to deal with "some electrical (and other) issues." The shop assured him he was good to go, and after his usual pre-flight and prep, Jeff launched out of Ft. Lauderdale Exec (FXE) en-route to Palm Beach International, a short hop up the road. Weather was not all that good. Broken bases at 400 feet and IFR visibility meant that much of the trip would be conducted under IFR, though the scud reportedly had a number of "occasionally broken" layers up to, and through, 6,000 feet.

Ippoliti launched IFR, from FXE, and encountered "heavy IMC" shortly after leaving the ground. Settling into his normal scan and IFR flying patterns for the short trip up the coast, Jeff went into the soup at only 400 feet AGL and continued the SR22's robust climb, now approved to proceed to 2,000 feet, as he switched over from tower frequencies to the local centre. From there, a pleasant effort requiring professional instrument flying skills started tasking him in ways he had hoped to avoid. "Minutes after departure, I started experiencing instrument failures, one after another. No warning. No smoke. No clues. Just gauges going out one after another."

As the first gauge failed, Jeff told Centre he wanted to turn back. Centre immediately gave him vectors for the return, but thereafter the perceived succession of failures made the turn-around seem fairly iffy. Ippoliti was stunned. Not only were gauges failing, but also they were failing in systems that didn't appear to be related. In a matter of seconds, just hundreds of feet from the ground and untold obstacles obscured by IMC, he really didn't know what to trust. This couldn't be good.

With an unknown number of hazards looming, he informed ATC that he was clearly in trouble. And after some initial hope of heading back, the SR22 pilot realized that turning back to the airport was something he wasn't sure he could do with his gauges continuing to fail in rapid succession. "I told Centre I couldn't turn back... that I was going to pull the 'chute."

Jeff then told Aero-news.net (ANN) that one of the few responses he remembered from that moment on was Centre responding, "You're going to pull what?" From there, Ippoliti's activities were quick and assured. "I'd thought about this... but I never expected to have to do it." Jeff pulled the power back, killed the engine and reached up for the BRS CAPS handle...and pulled. Despite all his trepidation, Jeff noted that the pull went well. "No problem with that, it pulled easily." BANG!

The chute OPENED. Ippoliti then described feeling a little 'G' as the plane slowed, swung around a bit, and then things calmed down remarkably fast. "From there it was almost a non-event. The ELT went off right away and prevented me from understanding Centre because it was so loud, and the pilot door came off as the chute fired... but the ride down lasted only seconds as I came down on some trees and just... stopped."

Ippoliti was alive and had landed in a local park. The aircraft was not only intact, but surprisingly suffered limited damage... "A lot less than what might have been," he noted. He doesn't have much to say about the landing impact, as the trees apparently absorbed most of the energy, and turned history's third emergency CAPS landing into a "relative non-event."

People who watched the plane land came immediately to the site and Ippoliti soon found himself in the role of dutiful reporter (and unwanted centre of attention) to the numerous Law Enforcement, FAA and other government agencies who converged on the scene. "FAA was terrific," he said, and the support he got from Cirrus Design, shortly thereafter (including a ride home), "was fantastic." Jeff graciously called ANN less than 24 hours after his ordeal... a time when there had to be a lot of things on his mind, though one thing seemed certain. When asked if he was going to get

P 17 ▶

Spirits Having Flown
Continued from **Page 7**

minutes to completely absorb all the alcohol consumed. Because of this, the BAC will continue to rise for a while after drinking has stopped. Alcohol is eliminated from the body through breathing, sweating and processing by the liver. The liver handles 90% of alcohol disposal and works at a constant speed, consequently removal from the body occurs at a constant rate and for an average person that rate is 0.015% BAC per hour.

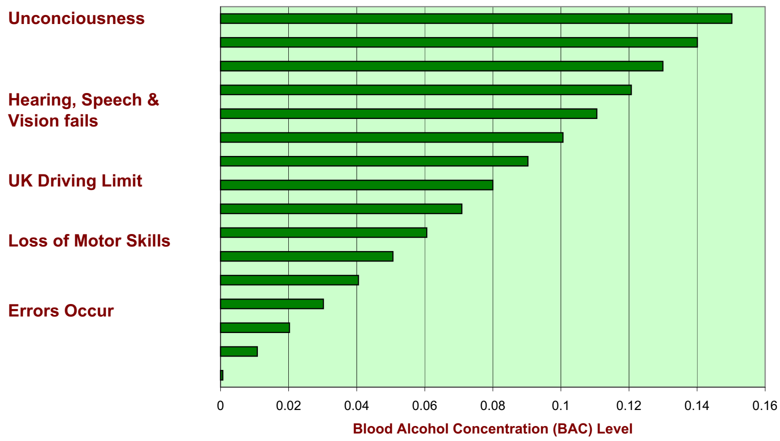
This is a fairly slow process that means a person will remain impaired by alcohol for an extended period after he or she has stopped drinking.

What happens when you drink alcohol?

At a BAC of 0.01% to 0.04% alcohol reaches the outer layers of the cerebrum, the area of the brain that controls judgment, reason and inhibitions and his or her behaviour begins to change. At 0.05% to 0.09% alcohol penetrates further into the cerebrum and to the areas associated with higher motor and sensory skills. A noticeable decrease in fine motor skills and response to sensory information occurs. A person is likely to become more talkative, noisy or moody, with a feeling of increased alertness and ability. In reality their reaction time, judgment, and ability to respond to sudden emergencies has decreased. At a BAC of 0.10% alcohol affects an individual's hearing, speech, vision and balance. There is a decreased sense of pain; slurred speech and staggered walking may be evident. At this concentration the chances of a lone pilot navigating and landing an aircraft is very slim and operating a motor vehicle is illegal anywhere in the United States or Europe. When a BAC level of 0.15% or higher is reached the entire cerebellum and portion of the medulla, which controls involuntary functions, is affected and unconsciousness may occur.

There is also one side effect of alcohol that diabetic pilots should already be aware of, alcohol-induced hypoglycaemia. (This only applies to diabetics controlled by oral drugs - insulin dependent diabetics cannot be medically certified in the UK or Europe.) Hypoglycaemia is the state of a lower than normal blood sugar level. When this occurs normal performance may be impaired due to insufficient sugar for the central nervous system to function. This precludes a pilot from flying under any circumstances but can be compounded or triggered by alcohol, which lowers the blood sugar level.

The Effects of Alcohol



Documentary evidence shows that this has been the cause of at least one fatal aircraft accident.

Hangovers and Cures

Post Alcohol Impairment (PAI) has been defined as 'performance impairment after alcohol is no longer detectable'. This technical definition is the equivalent of the lay term 'hangover'. PAI has been observed 14 hours after alcohol ingestion (to 0.08% and 0.1% blood alcohol concentration) in simulated flight tests. A further, longer period danger is Positional Alcohol Nystagmus (PAN) which results in rapid, oscillatory eye movements when the head is placed in specific positions in the absence of angular acceleration. This condition may result in impairment of vision as well as spatial disorientation and has been measured 34 hours after alcohol ingestion, long after there is any measurable alcohol in the blood. PAN has also been reported 48 hours after alcohol intake during long duration radial acceleration. The condition has been proposed as the cause of some aviation accidents where there are no detectable blood alcohol levels.

Other studies have failed to demonstrate any hangover related performance deficits and conflicting evidence and opinions exist as to whether there is proof of any consistent hangover effects that could adversely affect aviation safety.

There are many 'old wives tales' that purport to reduce or eliminate hangovers. Black coffee is the most favoured but in reality coffee does not affect BAC. The caffeine will act on the nervous system as it would despite the alcohol and may cause a short-term rise in alertness but nothing else. A cold shower has little effect. The liver processes alcohol at the same rate regardless of whether you are warm and dry or cold and wet. A cold shower merely results in a cold, wet pilot with a hangover

Abstention offers the only 100% safety net

One study concludes "... that serious problems may be encountered by the pilot who drinks lightly and who considers flying, especially at night." At any level of BAC, increased altitude, high noise levels and accelerations on the body intensify the effects during aircraft manoeuvres. The 'Aviate, Navigate, Communicate' hierarchy that many pilots are taught during their flying training also figures in the order that the abilities degrade, in reverse order of importance. Communication falls off first, then navigation, and then aviation. A conclusion to one Australian report stated: **"Any concentration of alcohol in the living pilot is unacceptable and can contribute to aircraft accidents**."

The eight hours bottle to throttle rule is proven to be inadequate. To be clear of the effects of alcohol a man of average build needs to allow one hour after taking his last drink plus one hour for each half-pint or single whisky. On this basis, five pints in an evening means at least 11 hours before acting as a pilot should be considered. For women and men of slight build even more time should be added. Sobering eh?

Acknowledgements: The author thanks the following for their contributions and assistance: Dr Dougal Watson, Senior Research Officer, Institute of Aviation Medicine. Australia. Dr Ken Edgington, Brian Cuzner and Chris Mason of the UK CAA. 'Snark' USA. I B Ushakov and S V Egorov of the State Scientific-Research Experimental Institute of Aviation and Space Medicine MO RF. Russia. Emma Maxwell, M.Sc. and Don Harris, B.Sc, PH.D. Cranfield University.

What is height in aviation?

A simple question perhaps but as with all things in aviation there is no simple answer. This applies to height to such an extent that the following précied report was commissioned and submitted by the Chairman of the Eurocontrol Navigation Sub Group and prepared with the support of Nottingham Scientific on behalf of Eurocontrol Aeronautical Information and Airspace Management & Navigation Units

> "Annex 15 defines the accuracy requirements for the runway-crossing altitude to be 1 ft"

Pressure Altitude

The main source of height in aviation has traditionally been derived from barometric altimetry. The displayed height is derived from the external pressure. For operations above an altitude defined for each airport, the height is referenced to a pressure setting of 1013.2hPa (sea level pressure for International Standard Atmosphere) and the height displayed is termed the Flight Level. The altitude of the flight level depends upon the local sea level pressure, but as all aircraft are similarly affected, this is acceptable for aircraft operation. The Level information displayed to the pilot will be subject to errors caused by inaccuracies in the pressure sensing mechanism, as well as pressure variation at the static ports of the aircraft due to airflow. These errors are to be contained within limits set for the altimetry system. An example is provided by the requirements set by the European Joint Aviation Authorities (JAA) for aircraft approved for operation in Reduced Vertical Separation Minimum above FL 290 (29,000 ft) which states:

The criteria to be met for the basic envelope are:

(a) At the point in the envelope where the mean Altimetry System Error (ASE) reaches its largest absolute value, that value should not exceed 25 m (80 ft);

(b) At the point in the envelope where absolute mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 60 m (200 ft).

This is not appropriate for operation below the transition Flight Level, since adequate clearance has to be maintained from terrain (and obstacles), and as a result the height needs to be referenced to the actual pressure setting. The normal pressure setting used is termed QNH where the pilot sets the area sea level pressure and the height displayed is relative to the mean sea level. It is also possible to define altitude relative to the airport the aircraft is arriving at or departing from, and this is termed the QFE. With QNH set and the aircraft on the runway the altimeter will read the airport height above sea level. If QFE is set the altimeter will read zero.

Pressure settings are reported by the meteorological observers to a resolution of 0.1 hPa with the operationally desirable accuracy of the pressure measurement being defined as 0.5hPa.

A pre-flight operational test of the altimeter should be carried out. For an operational altimeter the difference from zero + the height of the altimeter above the airfield reference (QFE) or the difference from the height of the airfield reference point above sea level plus the height of the altimeter above the reference point is defined as:

- less than 80ft for an altimeter with a test range of 50,000ft
- less than 60 ft for an altimeter with a test range of 30,000ft.

Other Height Sources

It can be seen from the above tolerances that significant errors can accrue in using barometric altimetry. For most operations, height is used to ensure a sufficient clearance is obtained from other aircraft and from terrain. Landing is an exception to this, since it is necessary to deliberately approach the terrain.

Approaches made using barometric altitude, termed non-precision approaches, require a minimum descent altitude above the local terrain that ensures that there is no risk of collision with the terrain. However, instrument landing system approaches provide a more accurate path to fly than is possible using rate of descent referenced to a barometric altimeter. For such "precision approaches" a radio (radar) altimeter is used to obtain a direct reference of the aircraft height above the obstacle-free zones ahead of the runway and the Decision Height (Altitude) is referenced to the radio altimeter height.

What are the new requirements in aviation?

The trend will be for a transition away from ground based precision approach systems (ILS/MLS), where the path is defined by the radiated signal, to space-based navigation (GNSS).

In a GNSS Landing System, aircraft will obtain their 3D position in space from the GNSS system. This will need to be related to a path in space to be flown. Whilst the actual glidepath will be set by local circumstances, the normal path will be defined as a 3-degree slope along the extended runway centreline with a threshold crossing altitude of 50ft.

As a result of the need to ensure the aircraft is delivered to its decision height with sufficient precision, Appendix 7 of ICAO Annex 15, defines the accuracy requirements for the runway-crossing altitude to be 1 ft. Annex 15 also states that in addition to the elevation (referenced to mean sea level) for the specific surveyed ground positions, Geoid undulation (referenced to the WGS-84 ellipsoid) shall also be published.

This directive, which is aimed at introducing a height system for aviation that is compatible with GNSS derived heights, does not in itself provide a complete and coherent solution. At present the heights of ground features in AIPs and other databases are defined in terms of the relevant national height system and associated datum. It should be appreciated that applying a Geoid undulation value from a Global Geoid model to a height expressed in a specific national height datum, does not lead to a corresponding height above the WGS84 reference Ellipsoid, as required for compatibility with GNSS.

The issue is how to convert existing heights, expressed in terms of national systems, to a common reference system. What is therefore required is not a global Geoid model, but appropriate high accuracy local or regional Geoid models, where these exist, in order to turn local heights to heights above the WGS84 reference Ellipsoid. The concern is that the adoption of a standard global Geoid model (e.g. EGM96), as proposed in EUROCAE ED98, does not provide an appropriate solution. In fact, the application of this Geoid model is likely to further complicate an already confusing issue.

The accuracy of the ellipsoidal heights derived using this approach, will depend on the accuracy of existing height information in the local system, and on the accuracy of the available Geoid model. Even the best available global Geoid model, currently EGM96, will not provide Geoid undulations that meet the 1 ft requirement stated in Annex 15, in all regions. The correct conversion from a national height system to height values with respect to the WGS84 reference Ellipsoid also requires specialist geodetic expertise.

This document addresses the geodetic issues associated with meeting the requirements for a suitable vertical reference system in support of GNSS precision approach and landing systems. This position paper proposes a simple approach, which will lead to a globally consistent geodetic heighting-system fully compatible with GNSS derived height values.

Proposed Solution

Definition of Heights in Geodesy

In Geodesy, height may be defined in a number of ways. Figure 1 shows the most commonly used height systems and the corresponding reference datums.

The Topographic surface is the physical surface of the Earth.

The Geoid is "the Equipotential surface of Earth's gravity field, which best fits mean-sea-level, as sampled over the global oceans". The Geoid is not a geometrically definable surface.

A Reference Ellipsoid is an ellipsoid of rotation which best fits the Geoid (e.g. the WGS84 reference ellipsoid)

Mean-Sea-Level (MSL) on a local or regional scale is defined by the average of the sea surface measurements carried out at one (or several) tide gauge(s) over a period of time (e.g. 5 years).

Based on these reference datums, one can define the following systems of height.

Orthometric Height (H) is the linear distance of a point on the physical surface of the Earth above (or below) the Geoid, measured along the gravity vector.

Levelled Height (HMSL) is the height of a physical point above the local or regional MSL Datum, as measured by spirit levelling. This is the height conventionally used by Civil Engineers and Surveyors.

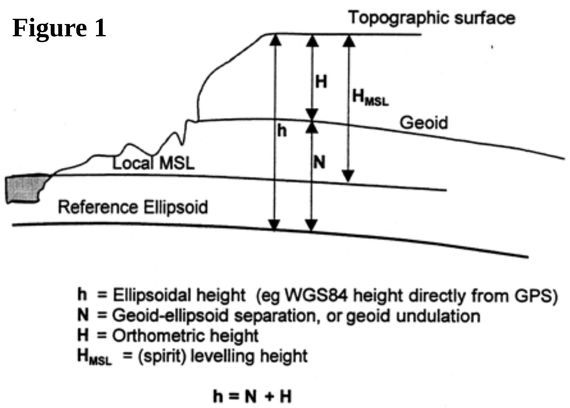
Ellipsoidal Height (h) is the distance of a point above (or below) the reference ellipsoid, measured along the normal to the ellipsoid. This is the height derived from GNSS measurements, and is therefore of importance for RNAV.

Ellipsoid-to-Geoid Separation (N) at a point (also called Geoid Undulation or Geoid Height) is the elevation of the Geoid above the reference Ellipsoid at that point.

Different National Height Datums

National surveying and mapping organisations are the main suppliers of heights to users on land. These include civil engineers, surveyors, hydrologists and others. All these users have a very specific requirement, namely that "a height difference between two physical points is not simply a vertical distance, but is a difference of gravity potential, which will cause the flow of water from the higher to the lower point". Consequently, national geodetic organisations provide more

Figure 1



precise "Geopotential Heights above the local or regional MSL". These are quoted either in geopotential units (geopotential heights) or in metres (Orthometric heights). The latter are obtained by dividing the geopotential units by a value of the true gravity g, or the normal gravity. Nearly all geodetically advanced countries express their high precision heights in a variety of so-called "orthometric height systems". These include normal heights, orthometric heights and normal orthometric height. The International Association of Geodesy (IAG) Sub-commission for Europe (EUREF) brings together all national mapping, surveying and geodesy organisations in ECAC and other countries in Europe. It is conducting several programmes aimed at unifying national heighting systems throughout Europe.

As mentioned above, GNSS surveying leads directly to heights above the WGS84 Ellipsoid. Subtracting the value of N, the ellipsoid-to-Geoid separation (figure 1) provides the value of the corresponding orthometric height. The accuracy of this orthometric height depends not only on the accuracy of the GNSS derived ellipsoidal height, but also on the local accuracy of the corresponding ellipsoid-to-Geoid separation. In Europe, this is achieved by using high precision local (national or regional) Geoid models. These are based on high-density gravity measurements, in combination with data from a global Geoid model. To summarise, local Geoids lead to more precise orthometric height values than global Geoids, but clearly these are only available in geodetically advanced countries.

P 14 ▶

> "Aviation is interested ideally in the "true vertical geometrical separation" between two aircraft: or between an aircraft and the ground"

Desirable Destinations

By Charles Strasser

Monet's famous gardens at Giverny, about 40 miles from Pontoise (LFPT) or 50 from the centre of Paris

Paris for general aviation

Most aviators think immediately of Toussus Le Noble as a destination airport for a visit to Paris.

I have used Pontoise (Cormeilles-en-Vexin) (LFPT), many times in the past and recently renewed my acquaintance with it. The airport is owned by the Paris Airport Authority (ADP) like its bigger brethren of Orly and Charles de Gaulle, but there the similarity ends. It is a GA friendly airport, without scheduled services, with lack of formalities and very low landing fees. I paid 14 Euros for my 1999kg. Seneca II. Provided you park on the grass, you pay no parking fees however long you stay. To visit, just send a fax or AFTN message giving your proposed arrival and departure from date and ETA, departure to date and ETD, Call Sign, type of aircraft and number of SOB, twenty-four hours before intended arrival and also put "request customs" and that's it.

> "Provided you park on the grass, you pay no parking fees however long you stay"

By the way, I have been to Pontoise many times and never seen Customs yet, but you have done your duty in requesting them.

The airport is just to the west of Paris and easily accessible either VFR or IFR. It has two long hard runways both over 1600 metres long. Runway 05 has an ILS and 23 a VOR/DME procedure. It has an ATIS on 124.12 and tower on 121.2. On my last visit on handover from De Gaulle approach, Pontoise approach on 118.8 gave me radar vectors to runway 05 to space me behind a Danish Beech single engine aircraft.

After landing I asked to be parked on the grass area by the tower. The office in the base of the tower is where I paid my landing fee. Since I invariably file my return flight plan in Jersey before departure and get my weather on the Internet, I have no need to see anyone again on departure and just call the tower for start-up.

Right by the tower, like on many French airfields, is an excellent restaurant called "Le Concorde". It is open Monday to Thursday from 09:00 to 15:00, on Friday from 09:00 to 15:00 and again from 18:00 to 24:00 and on Saturday from 09:00 to 15:00 and from 18:00 to 02:00 and closed on Sunday. The restaurant phone number is +33(0)1 34 20 09 25. It is a restaurant that I can recommend which does a particularly nice trolley buffet and it also has a Creole menu.

You can arrange a rental car for the duration of your stay with the local Europcar agency in nearby Pontoise. However, as we found whilst reasonable in rental charge with aircrew discount, it turned out to be an expensive option with the high parking charges in central Paris. It is therefore much more convenient to get the landing office or the restaurant to phone for a taxi to take you to Pontoise-Cergy railway station, about 10 minutes by taxi. There you get a train right into the centre of Paris, which takes 30 - 35 minutes. These trains are at a reasonable cost and run about every 20 minutes. Use this same procedure in reverse to get back to your aircraft.

Enjoy your trip!

The garden at Vesrailles, Paris

Welcome to Morlaix Airfield in Brittany

Many of the smaller, but never-the-less well equipped, airfields in France are owned and operated by the local Chamber of Commerce and Morlaix is no exception to this.

Morlaix is a town full of history – Mary Queen of Scots passed through in 1548 on her way from nearby Roscoff to Paris and stayed at the Jacobin convent. It has a famous viaduct and the town lies in the valley beneath it. It also has a wonderful assortment of shops, a Saturday market in the centre and a multitude of very good restaurants. We had a delicious meal at a "Lebanese-style" restaurant. It is on the north coast of France between Brest in the West and Lannion and Dinard in the East. Pilots coming from the UK can pick up low cost duty and tax-free fuel in Jersey on the way there or back.

The airfield (LFRU) has one hard runway (05/23) 1617 metres and two grass runways (16/34) 900 metres and (10/28) 610 metres.

A phone call or fax 24 hours before intended arrival to, phone +33(0)2 98 62 16 09 or fax +33(0)2 98 62 65 36 with your intended dates and times of arrival and departure, your airport of departure and return destination, SOB and "request customs", is all that is needed. Once you have done this you can even land there during the extended French lunch hour and other times when the airfield is not manned. When the tower is operational on 118.5 it is "information only". Other times make blind transmissions when overhead, downwind, base and finals, preferably in French and listen for other traffic. Go to www.webvivant.com/aero-andaines/vocab-radio.html for the French phrases for these calls. Additionally for any flying in France you might also find http://flyinfrance.free.fr/ useful.

The old streets in Morlaix

After landing, park by the tower and enter the bar in the terminal building. Do not forget to close your flight plan on the phone (+33 8 10 43 78 37). Whilst you have a coffee they will order a taxi for you to take you the four kilometres into the town. The return trip including a visit to the Geant Hypermarket cost us 16 Euros and we arranged the pick-up place and time of the return trip with the driver on the way in. We used the taxi belonging to Guy Laviec on +33(0)2 98 88 35 43.

The landing fee at Morlaix is only 5 Euros for a PA28 and I paid 10 Euros for my PA34 Seneca and there are no parking charges.

The airport and bar are run by the manager, Michel (who speaks good English) and his wife Chantal, who are both most helpful and keen to welcome more GA visiting aircraft, both VFR and IFR. For the latter, there is a Locator DME or Locator procedure available for runway 23.

It is a charming town, and as well as the shops and restaurants aforementioned, there are quite a few museums as well, and other places of historical interest.

Night Ratings – the position updated

by David Bruford

In the last issue of Instrument Pilot we asked:

a) What year did you first obtain an IR?
b) Have you ever obtained a separate night rating?
c) Do you think that the IR entitles you to fly at night?

Most members came back with b) Yes and c) Yes - which is of course correct. However, several (mostly with a) prior to 1991) replied b) No and c) Yes; which, up until a few months ago was my opinion until instructor/member Richard Bristowe donned his Sherlock Holmes disguise and delved deeply into the matter.

To clarify the situation. If you have not taken a separate night rating or, at the time of your application for the IR, demonstrated and an instructor confirmed, that you had flown the required hours and landings that could have resulted in the issue of a night rating, then the IR does NOT entitle you to fly at night. If you have a separate night rating, or an IR that was issued with complete night rating complete night training course taken into account, then having a current IR exempts you from the night rating currency requirements.

Under current rules an initial IR will not be granted unless the applicant has a night rating. It would seem that the rules changed around 1990 as many members have valid IRs granted before this date and have never taken a night rating. The ratings remain valid but they have no night flying entitlement. I recommend that as next winter approaches they sign up for some training.

Richard Bristowe commented. "*In the halcyon days of the UK licensing system the night rating currency stood alone. The JAR requirements for night rating currency of having made a takeoff and landing at night in the last 90 days before you could carry passengers was unworkable for aircrew, so the currency is achieved by having a current IR. As you have to have had night training before a JAA IR can be issued the training part was fulfilled anyway. It therefore seems to me that where one holds an old and bold IR and has not held a night rating (or the mandatory training) the implicit night currency of the IR is academic as there is no rating to make current.*"

I piled into LASORS 2004 in great depth and taking into account comments from Richard and other members, I concluded:

a) It is not - currently - possible to obtain an IR without having 5 hours of certified night flying. However, many members hold valid IRs and do not have this.
b) It must have been 'normal' to issue an IR without this requirement at some stage.
c) IR holders that once held a night rating (even a military version during wartime) do have night flying entitlements if that was taken into account by their licensing authority when it issued the IR.
d) LASORS does not deal with any of these anomalies.

Height in Aviation
Continued from **Page 11**

The Solution for Aviation: WGS84 Heights

Unlike nearly all other user communities, aviation is interested ideally in the "true vertical geometrical separation" between two aircraft: or between an aircraft and the ground. Ellipsoidal heights above the WGS84 Ellipsoid best meet this requirement in a single, globally consistent and pure geometrical system, which is fully compatible with GNSS derived height. This was recognised by ICAO in March 1997 when it adopted amendment 29 to Annex 15, which mandated the use of the vertical component WGS84 with selective applicability from 5 November 1998.

The provision of Ellipsoidal heights

Ellipsoidal heights of ground features can be provided globally, either directly by GNSS ground surveying, or by converting from existing height values. Since the advent of GNSS land surveying is relatively recent, only a small number of airports outside Europe and North America have been fully surveyed by GNSS. As it is unlikely that all remaining airports, on a global scale, will be ground surveyed using GNSS in the near future, conversion of existing height data to ellipsoidal heights may prove to be the best solution in such cases. Once this is done, the resulting database of airport ellipsoidal heights would best meet the requirements for full compatibility with GNSS, on a single and consistent global scale.

The adoption of ellipsoidal heights above the WGS84 Ellipsoid solves nearly all the theoretical and practical problems, but leaves one issue unresolved, namely "the difference between GNSS derived high precision ellipsoidal heights and barometric altimeter heights". The latter are derived from atmospheric pressure readings and therefore are not directly related to GNSS derived heights that are pure geometrical quantities. There is a solution to this problem of making these two types of measurements compatible, without significantly affecting their respective accuracies. This solution is based on subtracting ellipsoid-to-Geoid separations provided by a global Geoid model, from the database of high accuracy ellipsoidal heights. With certain provisos, this will transform the "heights above the reference ellipsoid" to "heights above the Geoid (MSL)".

Practical Implementation

How can the proposed solution be implemented?

As explained above, all the heights of features of interest, eg the aircraft, aerodromes, obstructions, land topography and GNSS reference stations (WMS and LMS) can be expressed in terms of height above the WGS84 Ellipsoid. However, there are a number of difficulties in trying to put this solution into practice.

The main obstacle to be overcome is that the heights of ground features (aerodrome, obstacles and terrain) are not currently expressed in terms of ellipsoidal heights globally. At present, the height of ground features of interest to aviation are provided in terms of "elevations", where elevation is defined as "the vertical distance of a point or a level, on, or affixed to, the surface of the Earth, measured from mean-sea-level (MSL)". As noted previously, in practice these elevations are based on a local definition of MSL, but are often treated as though they were true "orthometric" heights with respect to the Geoid (H). As already mentioned, different countries use different height systems and corresponding datums.

The existing data available at an airport will dictate the best means of providing ellipsoidal heights. Airports can therefore be divided into the following categories.

a) **Airports with GNSS height data available.** Nearly all of the important airports in Europe and North America have already been surveyed by GNSS during the programme of "WGS84 implementation" as mandated by ICAO. So it should be relatively simple to provide the relevant ellipsoidal heights provided the ground survey data is available in its original form.

b) **Airports with high accuracy orthometric heights and a correspondingly accurate local Geoid model.** In this case it is possible to transform existing orthometric height values to ellipsoidal heights by applying the appropriate ellipsoid-to-Geoid separation. It should be noted, however, that even the best available global Geoid model cannot provide sufficiently accurate ellipsoid-to-Geoid separations to meet all requirements for aerodrome survey data, in all areas.

c) **Airports with high accuracy orthometric heights, but no correspondingly accurate Geoid model.** If sufficiently accurate values for the ellipsoid-to-Geoid separations cannot be obtained from a Geoid model, a survey of selected points could be undertaken. By determining the ellipsoidal heights (using GNSS) of a point, or points, at an aerodrome with known orthometric height values, a local value for the ellipsoid-to-Geoid separation, N, can be determined. This N value can then be applied to the orthometric heights of all other features to convert then to ellipsoidal heights with no further surveying.

d) **Airports with no orthometric or ellipsoidal heights of sufficient accuracy.** In this case all points of interest should be surveyed using GNSS techniques.

This leaves the continental terrain data, which could be provided by national surveying and mapping agencies, after suitable transformations from local/national height systems to consistent WGS84 ellipsoidal heights. All these tasks could be performed by national mapping organisations, in consultation with national civil aviation authorities. The accuracy of the existing height data and the local accuracy of the Geoid model used will dictate the accuracy of the derived ellipsoidal heights. In geodetically advanced countries (particularly in Europe) where high precision local Geoid models are available, these would be the best means of converting existing heights to ellipsoidal heights. Applying a lower accuracy global Geoid model would unnecessarily degrade the accuracy of the resulting ellipsoidal heights in such countries. Clearly, in areas where a high precision local model is not available, the best available regional or global model must be used.

The adoption of WGS84 ellipsoidal heights produces a single consistent vertical datum, i.e. the WGS84 reference ellipsoid. Once height information based on national datums is transformed to ellipsoidal heights, it is by definition in the same single, consistent global system. This eliminates problems and ambiguities inherent in the current situation, in which individual countries base height values on national definitions of mean-sea-level.

Should these panels consider that the issues here raised warrant further evaluation, an evaluation of flight deck requirements, by simulation or otherwise should be included in the Navigation Programme work plan to be undertaken in co-ordination with the GNSS Programme.

Helpful, clear & correct VAT advice

Dear All

Since my aeroplane was imported in a group of others by a UK company, put on the G register, sold to me and transferred to the N register, the VAT trail is anything but obvious. Following a close call with French Customs over Easter, Paul Draper advised me to call HM Customs and Excise in Southampton. This I did last week, all prepared for a bureaucratic marathon and lo and behold, this week I received a Certificate of Free Circulation within the EU!

The reason I am writing, is to pass on the contact details to anyone else who may require this certificate and also to heap praise on a Civil Service Department who were most helpful, gave clear, correct advice and responded by return. Rare indeed!

Their details are:

General Aviation Centre of Operational Expertise
Compass House
Ordnance Survey Site
Romsey Road
Southampton
SO16 4HP
Tel: 023 80 797450
Fax: 023 80 797090

Best regards
Phil Wadsworth
MEMBER 488

PPL/IR Europe website upgrade

Dear PPL/IR Europe member

Over the past several weeks work has been underway to upgrade the PPL/IR Europe website. While many of the modifications were purely administrative and transparent to the membership, some functional changes were made to enhance the "user experience" as well. The most obvious change is of course related to the forums. We have upgraded the forum software which allows more functionality and flexibility whilst at the same time, we hope, facilitating the use of the forums by our members, especially the login process. The new system also allows such additional items as "polls" or online votes, and the creation of user groups and specific forums for those groups.

In addition to the forums, other enhancements include a more readable menu with a larger font and increased spacing between menu items, as well as joining information and membership services being easier to locate on the site. The site content is more easily manageable with a new content management system which allows greater flexibility in the ordering of articles as they appear in the site's sub-categories as well as cross-linking these articles to other site areas.

I would like to thank those members who have identified small "bugs" in the system during the transition, all of which should now have been corrected. Should you have any queries or require assistance, then please do not hesitate to contact me and I will do my best to help. I have also added a specific forum called "Comments and Suggestions" where you may provide feedback for the site, as well as any suggestions, which you might like to see added in the future.

Best regards,

Leland Vandervort
PPL/IR Europe Website Secretary

Portable Oxygen Systems

Dear Editor

Referring to Dirk DeJonghe's article on portable oxygen systems in the March/April issue of 'Instrument Pilot', he is not correct when he says that all oxygen is the same, medical aviation or welding. The critical thing is the moisture content, because it is not a good thing if your oxygen delivery valve freezes at high altitude as a result of water in the breathing gas.

Industrial grade oxygen has a specification of 98%, with a water content <10ppm. Medical oxygen is 99.5%, with <10 ppm water, while aviation oxygen is also 99.5%, but with a water content <5 ppm.

I would also exercise caution with relying on pulse oximetry for giving an absolute indication of arterial oxygen saturation. These instruments are only suitable as screening tools rather than as absolute indicators, requiring regular calibration in situ at altitude as well as being sensitive to ambient skin temperature and moisture. You can get misleading readings if cold or damp.

Finally, you are at risk of decompression sickness (bends etc) if you fly above 18,000 feet cabin altitude (i.e. unpressurised) and at serious risk of developing decompression illness above 25,000 feet. (See Human Performance & Limitations in Aviation by Campbell & Bagshaw, published by Blackwell Science).

Best wishes

Dr Michael Bagshaw
(Consultant Adviser in Aviation Medicine, British Airways)
MEMBER 346

Dirk DeJonghe replies…

I think the doctor is right that there is a difference in the specifications for welding, medical and aviators breathing oxygen where ABO is most critical regarding the specs for water content for obvious reasons given. However, I am also right in the way that the oxygen plants only make one kind of oxygen that meets the specs for all three oxygen types. Since oxygen is filled into the gas containers by boiling off liquid oxygen (LOX) that has a boiling point of -182°C, it is very unlikely that water content will present a problem with modern production methods. So if you ask for a refill of welding oxygen, medical or ABO, you will get THE oxygen.

I haven't used pulse oxymetry so far but will start from July onwards after the modification of an aircraft I fly. The equipment will provide a comparison at altitude of your oxygen requirements relative to your normal living conditions and will compare altitude performance of your 'total oxygen system' (lungs, breathing technique, canulla or mask, regulator, etc). It will warn of any deficiencies before they become noticeable. This equipment is certainly not a scientific absolute measurement but a helpful warning device that is safer than having nothing at all.

I fully agree that unpressurized flying is best limited to 18,000ft and below. In cases of bad weather avoidance one risk may be traded for another by flying higher for short periods with proper masks and oxygen equipment.

Dirk DeJonghe
MEMBER 251

By
David Bruford

My IAOPA Party Piece

> *"Of course, as a member of PPL/IR Europe, I only fly on airways up with the big boys"*

The BBQ season is an interesting time in our village. For reasons never explained to me; probably because, as newcomers of only 25 years standing we are still considered outsiders, the season starts in early May, when it is still far too cold for BBQs. During this period we invite, and are invited, to the patios of the same group of people whose qualification to visit our house is based simply on their geographical location. Admittedly the more obnoxious neighbours have, over the years, ceased to invite us on the basis that we never invite them back, but this is a form of evolution in village social life where, in Darwinian terms, only the pleasant survive.

However, if all you have in common with these people is a parish boundary, conversation can be somewhat constrained. After the mutual offspring's respective education progress has been competitively compared and exaggerated; the fact that Dick / Tom / Fred has died and "Didn't look at all well when he was here last year"; the bored pilot will eventually allow the subject of aviation to be dragged from him. This provides an opportunity to bore others for several hours and probably prompt the wife to leave, even if she was hosting the party.

Talks of recent flights are recounted as a small encircling crowd gathers. A mental Captain's uniform has begun to form over your body when an eavesdropper says: "So you're a pilot are you? I suppose that was you on Wednesday circling for twenty minutes in and out of the cloud at 100 feet frightening the horses."

Naturally, on that particular Wednesday you had flown two perfect SIDs and STARs separated by en-route airways segments where your altitude had been at all times within 50 feet of your assigned level and heading within five degrees – despite the autopilot being U/S. The 'pilot' scud busting at 480 feet was in fact an acne ridden idiot with a one week-old licence who was circling over his parent's house to impress his 16 year-old girlfriend while remarking that the village where he grew up looked amazingly different from the air and how inaccurate the map was. The fact that his parent's house was ten miles due north still eludes him to this day.

This brings me to the purpose of my introduction. The general public have a total misconception of any flights that do not contain 50 suited businessmen or 300 bucket and spade equipped sardines. To remedy this, IOAPA has issued a paper with some facts and views that should be shared with anyone who will stand still long enough to listen. A précis of this follows:

"General aviation, when mentioned to most members of the public conjures up a mental image of a small, single-engine piston powered aircraft, operating out of a small rural aerodrome for pleasure. This image is correct for only about one-quarter of worldwide general aviation and aerial work activities. The other three-quarters of the roughly 40 million annual general aviation (GA) and aerial work (AW) flight hours are occupied with flight instruction, business travel, agricultural application, emergency medical services and other gainful pursuits. In sheer numbers GA/AW is impressive: Approximately 350,000 aircraft and 700,000 pilots are involved in these activities worldwide. On balance, roughly 60,000 aircraft and 400,000 pilots are employed in commercial air transportation (including cargo and charter). The significance of GA/AW becomes greater when it is realized that every airline and military pilot must begin his or her journey to professional competence in the cockpit of a general aviation aircraft. Further, the essential services provided to the public by GA/AW for police, emergency medical services and search and rescue make all of our lives safer and more productive. Aerial survey, agricultural application and pipeline/power line patrol add significantly to many aspects of the economy. And, for the many remote areas of the world, life and civilization would not be possible without the benefits provided by GA/AW operations. GA/AW activities globally create hundreds of thousands of jobs and tens of billions of dollars for the countries these activities serve.

The majority of airline travellers begin and end their journeys at a small fraction of available airports, as few as one percent of available airports in some countries. In doing so airline travellers are subjected to lengthy ground trips to access major hub airports; lengthy delays are often associated with operations at these airports. Conversely, GA/AW operators enjoy a variety of conveniently located small airports from which to operate. But, if GA/AW operations are to take advantage of their unique utility and flexibility they must occasionally use metropolitan area airports. In doing so they share the increasingly scarce resources of available runways and overlying airspace. The complexity of operations in these areas also requires a variety of expensive equipment to be installed in all aircraft, not just airliners. The combination of scarce runways and airspace combine with expensive equipment to create access barriers for GA/AW. In reality, the special performance characteristics of GA/AW aircraft and their ability to stay beneath tightly controlled airspace allow these aircraft to avoid constraints imposed on larger, higher performance aircraft. For instance, a single-engine piston-powered aircraft can easily operate out of a 1,000 by 15 metre runway, one-third the size required by airliners. And, by staying low and within carefully designed corridors expensive surveillance and navigation equipment may be omitted from small aircraft. In essence, GA/AW operates at the margins of an infrastructure designed specifically for the airlines. The smaller aircraft take advantage of the unused capacity of the larger system, effectively increasing the *overall efficiency of a complex infrastructure.*

Many countries of the world fund their aviation infrastructure development through user charges. While airlines pass these costs through to passengers, GA/AW must bear this burden as a direct operating cost. More importantly, most countries levy taxes associated with fuel consumed; yet few of these monies flow back to the aviation infrastructure. Therefore, GA/AW is often double-charged for the services they receive. Additionally, a hidden "tax" is imposed on small aircraft in the form of expensive equipment mandated for operations in increasingly complex airspace.

Air travel has become an accepted feature of the modern world; this acceptance ensures its future growth. While commercial air carriers have not reached their capacity limits, each additional flight, especially in or near major cities, meets with increasing uncertainty about its on-time performance or viability. Delays at hub airports have become a way of life and will likely be aggravated as air travel growth continues. General aviation and aerial work offer an alternative to this bleak picture of future airline travel. The ability of small aircraft to operate at suburban and rural airports in airspace not used by the airlines presents enticing alternatives. The promise of future intercity transportation lies in alternative forms of transportation; general aviation operations open a door to but one form of fast and efficient transportation. For this to become a reality, enlightened governments must accept and embrace general aviation as a credible and attractive transportation alternative. In doing so they must enact fee structures favourable to small aircraft operations, ensure that smaller airfields are protected and encouraged and provide for fair and equitable access to airspace and infrastructure resources. The extraordinary advantages provided by GA/AW place it in a category that defies the adjectives "general" and "aerial." Because these unique forms of transportation contribute significantly to national economies and provide much needed flexible transportation, they deserve a more descriptive term – how about "special" or "utility" aviation?"

Just in case you were not aware, The International Council of Aircraft Owner and Pilot Associations represents the interests of more than 400,000 pilots and aircraft operators who are members of 53 national affiliates around the world. The principal objectives of the association are to promote and protect the interests of general aviation and aerial work operators engaged in international aviation. PPL/IR Europe strongly recommends that every pilot supports their countries AOPA and becomes a member.

I seem to be the only villager who has even bothered to memorise this speech. I wonder why I stand alone at the end of every BBQ?

IAOPA Participates in ICAO Medical Certification Meeting

A review of ICAO Annex 1 medical requirement was undertaken by a working group of 14 state and industry representatives during January in Montreal, Canada; Frank Hofmann represented IAOPA. A number of important issues were discussed and recommendations made to change or retain existing standards. Of greatest significance is that the existing interval for Class 2 medical exams (for private pilots) may be extended to five years for persons under age 40, up from the existing two-year period of validity. This important move was fully supported and assisted by Mr. Hofmann, who commented, "There is little evidence to support retaining the shorter period of medical certification validity imposed on private pilots. There is little evidence that would indicate that pilot incapacitation is a problem."

Other items of interest include the following recommendations:

- The spoken word test for hearing evaluation will be retained instead of having to use expensive audiometry equipment.
- Insulin-dependent diabetes, cardiac interventions and arrhythmia, blood/lymphatic diseases and AIDS should continue to be disqualifying conditions.

These recommended changes must be reported to the Air Navigation Commission and ICAO Council before they can be incorporated into Annex 1 as either standards or recommended practices.

Galileo

The Eurocontrol Galileo project is costing us 3.6 billion Euros. You would think that a bunch of people would be asking a lot of probing questions. Nope. On Eurocontrol's own Frequently Asked Questions web page there is just one enquiry, dated 14.05.02. This is from a chap named John Storey who actually works for Eurocontrol and it would appear that he is still waiting for an answer.

Cirrus SR22 BRS
Continued from **Page 8**

another plane, he answered quickly, "ABSOLUTELY... another Cirrus. I wouldn't fly anything else."

As Ippoliti becomes the third pilot to experience what all Cirrus flyers prepare for (and hope never to use), he joins the "informed unanimity" that has developed from each of the survivors... a strong belief in a safety system that was once looked down-upon by much of the rest of the GA industry…an industry which is now beginning to understand that this technology has saved six lives so far and will, undoubtedly, keep doing so far into the future.

Observers at the scene tell ANN that N916LJ seems in "Very good shape... not as good as Lionel Morrison's aircraft (the first Cirrus to use the CAPS system)... the leading edges of both wings scraped trees as it came down but it looks like the landing gear never actually got to the ground, since it was hung up in the trees."

ANN reached Cirrus CEO, Alan Klameier, just as he was returning from the impact site, who was very pleased to be talking about incidents in which no one came to harm. "First, in terms of preliminaries, no one knows what really happened until NTSB makes final determination... but obviously the whole purpose of the parachute was to give pilots one more choice when they run out of options... and that sure appears to be the case (in these incidents). These were tough situations for these guys and we're glad the chute was there to give them a second chance."

This article first appeared in The Aero-News Network, The Aviation World's DAILY News Service, http://www.aero-news.net

The wreckage of N916LJ

The Truth about True Airspeed
Continued from **Page 3**

assuming you can work the flight computer at wave-top heights without plunging into the sea to become Shamu food. Climb to 1,000 feet, though, and fly at 100 KIAS and your true airspeed will have rocketed up to a blistering 102 knots. Meanwhile, your non-turbocharged engine will be making less power and, as a result, burning less fuel. Hey, a free two knots.

Step on up to 10,000 feet and maintain that same 100 KIAS and your true airspeed will increase to about 120 knots.

It's easy to estimate true airspeed if you know your altitude and indicated airspeed. As a rule of thumb, true airspeed increases over indicated airspeed by about two percent per thousand feet. If you're cruising at 10,000 feet at 140 KIAS, take two percent of your altitude in thousands of feet. In this case, that means two percent of 10, which equals 0.2. Multiply that by the indicated airspeed of 140, which yields 28 knots. Add that to the indicated airspeed to learn that the true airspeed will be about 168 knots. Remember that anything other than normal lapse rates for pressure and temperature will change the results, your mileage may vary, past returns are not a guarantee of future performance, and parking is prohibited in the red zone.

> "As a rule of thumb, true airspeed increases over indicated airspeed by about two percent per thousand feet"

Meanwhile, because there is less oxygen at 10,000 feet, your normally aspirated engine won't be able to burn as much fuel as it could in the denser air down low. As a result it produces less power. Since the engine can't burn all that fuel, there's no sense dumping in the same amount that you did at sea level, so lean the mixture to reduce the fuel flow.

Save gas, go faster. What a deal. But wait, there's more: Order before midnight and we'll send you this Amazing Turbocharger that allows you to continue making 75-percent power all the way up to 25,000 feet! You heard right, ladies and gentlemen, twenty-five thousand feet! Slip on your oxygen mask, crank up the pressurization, glide along at breathtaking speeds above the weather — leaping entire continents in a single bound (well, OK, maybe two or three single bounds).

If you have a need for speed in a piston airplane, nothing will do like a turbocharger. By compressing the air going into the engine, the turbocharger makes it more dense, much like it is at sea level. With more oxygen molecules to aid in combustion, the engine can make more power all the way up into the flight levels. However, more power demands more fuel, so you won't see the decrease in fuel flows that you do in a normally aspirated engine. But without turbo-charging, your engine begins making less than its rated power as soon as you leave sea level; if it's warmer than 59 degrees, you won't even see 100-percent power at sea level. By 7,000 or 8,000 feet, you'll be down to just 75-percent power. It is at about that altitude where the turbocharged airplane starts to become more efficient. From there on up, the turbo airplane takes the lead in speed because it can maintain that power level to a much higher altitude. As the airplane climbs, the less dense air causes less drag, allowing the aircraft to go faster and faster. Meanwhile, the indicated airspeed falls because there are fewer air molecules entering the pitot tube and striking the diaphragm that moves the airspeed indicator needle.

You can dazzle your pilot friends at the next cocktail party by reminding them that it takes a pressure of about 34 pounds per square foot entering the pitot tube to cause the airspeed indicator to read 100 knots at sea level. As you climb, it still takes 34 pounds per square foot to show 100 knots, but with fewer air molecules available as you climb, the airplane will have to go faster and faster to gobble up enough of them to create that pressure in the pitot tube. No doubt, such fascinating trivia will endear you to all of your friends who happen to be physics professors; everyone else will be rolling their eyes and leaving you for the drink line.

Be assured that turbine airplanes are not immune to the laws of physics. Like a normally aspirated engine, turbine powerplants also begin to lose power as they climb. However, their enormous amounts of horsepower allow them to propel their airplanes to much higher altitudes where, once again, triple-digit true airspeeds and lower fuel burns save the day. The 700-shaft-horsepower Pratt & Whitney engine in the Socata TBM 700, for example, burns a sheik-pleasing 30 gallons per hour idling at sea level. But, at 26,000 feet the fuel burn is only about 55 gph, yet the airplane is tooling along at 300 KTAS. You can see why it's important to get to altitude fast in a turbine airplane.

So, remember the next time you plan a cross-country flight, higher is usually better. Also, remember that what sounds too good to be true usually is, unless it's true airspeed.

2004 AGM
Continued from **Page 1**

questions although it was clear that the LBA are taking a much more realistic view over the implementation of enhanced Mode S than our own CAA; a point which was not lost on your Committee and will be forcibly made to the CAA on your behalf.

After some welcome cold drinks, which my wife and the airport representative 'found behind the bar', we set off on a very interesting tour of the base. We were driven round the perimeter of the airport, moving barriers and temporary fences whenever they got in our way and shown the old hard hangars which were opened for us, the Safe Secure Area where nuclear weapons had been stored and many interesting facts and figures given by our guide.

Finally we arrived back at the terminal just half an hour behind schedule for those departing that day. The coach then took 16 of us to our hotel in Kevelaer a short distance away. That evening we enjoyed a meal together where we reminisced and debated how on earth we were going to beat a mobile AGM in 2005! Maybe the big dipper at Blackpool?

Ian Chandler
Meetings Secretary

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The Perils of User-Defined GPS Waypoints

By Mike Grant

My engineer telephoned me one day, whilst he was doing some engine runs on our aircraft, with news of an interesting problem that he had discovered – he informed me that the GPS was erroneously telling him that the aircraft was parked at Bovingdon VOR (BNN), when clearly it was sitting on the ground at Elstree.

He cross-checked with our second GPS (from a different manufacturer), and the second GPS was showing correctly that it was at Elstree (EGTR). On zooming in on the map, it was apparent that the position on the map was correct, but the map labels were incorrect, ie BNN was superimposed on the runway where EGTR should be, and EGTR was South East of where it should be! We both assumed that my latest update from Jeppesen had an error, until I checked the update on the computer simulator, where it was correct.

A few days later, I went to Elstree to investigate, and saw immediately that the engineer was correct, as shown in the first two pictures here:

BNN is shown incorrectly centred on the runway, whereas it should be 9.4 nm north west!

The picture above shows Elstree ATZ, but again incorrectly shows BNN. The correct map should have looked like this:

Note that EGTR is now correctly displayed, centred on the runway. Zooming out shows the ATZ and again EGTR is in the correct position:

To investigate further, I pressed the "Direct To" button, entered **EGTR,** and got the following display:

Note the tiny square next to EGTR which is not the airport symbol.

This was very strange, because normally, I would have expected to see the word **Elstree** display below **EGTR** and also see the airport symbol; I then pressed the **ENT** key and got the following:

Note that there are two alternatives for EGTR. The second one had the airport symbol.

This picture was the real clue as to what was wrong - it alerted me to the fact that there were **two** waypoints called **EGTR**, one was a user waypoint and the other was the airport.

I cancelled what I was doing, and went to the User Waypoints Menu and saw that there were several User Waypoints that had been input by persons unknown (I have my suspicions!!) of which EGTR, BNN and DTY were the most prominent. All had been entered with the wrong coordinates!

All User Waypoints were deleted from the unit and then the map reverted to the correct display again.

What had happened to cause this?

Someone who was not very familiar with this GPS had probably tried to enter a flight plan and incorrectly thought that entering User Waypoints was the way to do it. They had then compounded the error by not checking either the Latitude and Longitude or the VOR Radial and DME Distance, when confirming the entry - a very easy mistake for the less experienced to make, and even easier to do when preoccupied with flying the plane! This had resulted in duplicate waypoints: the original and an incorrect version.

Lessons to be learnt

The obvious comment from many of ***Instrument Pilot*** readers would be that GPS is only approved as a backup and that the primary navigation of Mark One Eyeball and Map, and of course the use of conventional VORs, NDBs and DME should be paramount.

This is a view that I totally agree with, but the reality is that many pilots get seduced by today's gadgets and rely on them more and more. And from my own observations, some pilots have come to rely on them in preference to conventional equipment and are neglecting to practice using radio navigation equipment, and very often do not confirm what the GPS is showing them, by cross-checking.

To become proficient at using anything, we need plenty of training and practice, and this is certainly also true of today's very powerful but potentially complex GPS Units.

When we learn to fly, we quickly master the relatively simple functions of the Radios and Navaids, and this has lead many pilots to expect to master the basic functionality of GPS without too much effort. The reality is different, and to use them properly means time spent on the ground reading the manual and using the GPS simulator (where available) and/or viewing a training video. It also means time in the air, with a safety pilot, concentrating on the fundamentals, whilst the other pilot practices what he has learnt on the GPS, and cross-checks with other equipment and the manual!

One of my pre-flight checks in future, will be to delete any spurious user-defined waypoints from the GPS! One of my checks in the air will be to continue to ensure that the radio navigation equipment and my map agree with what the GPS says.

This problem was discovered on the ground where there was plenty of time to resolve the issue, with no distractions (such as flying the aircraft!!). In the air, perhaps in poor weather/visibility, this could easily have caused navigation problems or even worse.

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