Instrument Pilot

The journal of PPL/IR Europe No. 45 September-October 2004

Jeppesen FlitePro - IFR Flight Simulation "for Serious Pilots". See review on page 18

PPL/IR EUROPE

A "Done Deal"? Single European Sky – Common Charging Scheme for Air Navigation Services

By

Paul Draper

In IP 44 I said I would report back on my visit to the DfT (Department for Transport) Forum on this proposal held 12th August. I also wondered whether I was being too much of a prophet of doom - well, I regret to say that I was not!

Since the meeting we have e-mailed all members asking them to complete and send a response form to Eurocontrol so that we make maximum impact with our objections.

Doubtless however some members will not have seen this or not appreciated the importance of the matter, which will certainly hurt them in the wallet, so here is my report!

On Thursday 12th I attended the DfT hosted Forum on the proposed charging scheme. Others present were representatives of the airlines, ANSPs (Air Navigation Service Providers, aerodrome operators and the Ministry of Defence. The notice and window available for the meeting was short/small, there were 40 people around the very large table but I was the only GA representative there!

It is clear there is going to be charging of all users (IFR and VFR) - the Government has basically agreed (or cannot disagree) the principle of "the user pays" when the enabling legislation went through on 20th April. The DfT is sympathetic to the plight of GA and want to exclude us per the current airways charges exemptions but the regulations don't permit that unless the Government pays the costs thereof to the ANSPs (air navigation service providers) - and they won't! However the devil is in the detail and they are completely lost on all of that and appear not to have considered even the basic options of how the charges might apply to GA and its various sectors. We have offered to help them understand the implications for GA if the rules are adopted as drafted. I undertook to send in a note of my points made at the Forum for them to take up in their representations to Eurocontrol/EEC but we clearly needed, and they wanted us, to also make firm representations direct which we have done. These are shown as our formal submission on page 2; as this is being published the timescale for responding is slipping away and hence the direct email was sent to members.

We have been in touch with many of our colleague organisations in the UK and other States urging them also to make representations. Unusually, only a short time will pass when we shall know if there has been enough understanding of the implications and resolve to alter the proposals. I hope so!

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"The message is clear that the EEC is seeking to establish some form of charging scheme to apply to all sectors of GA to raise more revenue"

PPL/IR Europe Submission on a Common Charging Scheme for Air Navigation Services

1. Background information about PPL/IR Europe:

- PPL/IR Europe started in the UK in 1994 but was founded in 1995 as a European organization to represent the interests of Instrument Rated Private Pilots operating in Europe, to exchange information between members and it operates a website - www.pplir.org . The executive committee currently has representatives from France, Belgium, Italy, Netherlands, Denmark, Croatia and the UK. There is currently a vacancy for Germany. The organization has approaching 500 members throughout Europe.
- Eighty five percent of our members use their aircraft as a means of transport for business purposes. Due to the large amount of controlled airspace needed to meet the needs of the airlines our members are obliged to operate in controlled airspace so as to ensure that their flights are safe and reliable. It is estimated that Instrument Rated Private Pilots in Europe have invested in excess of 500m Euros in purchasing and equipping their aircraft, and a further 50m Euros in obtaining the Instrument Ratings necessary for them to operate in controlled airspace. The operation of these aircraft represents a significant amount of economic activity, but most of our members hold senior executive positions in a wide range of European enterprises, which represent a very much larger level of economic activity.

2. Our responses to the consultation:

- The timescale for the consultation process, preparation of impact assessments on States, ANSPs and airspace users to enable preparation of a final report including draft Implementing Rules by mid October 2004 with an adoption date of January/February 2005 is unrealistically short.
- It is considered the methodology of the consultation does not comply with the spirit of the United Kingdom Government's Cabinet Office Better Regulation procedures.
- We are concerned that whatever the merits of objections by affected parties there will be very little likelihood of influencing the decisions.
- The proposals for charging, as drafted, have not been circulated widely within the G A aircraft owners/pilot community for comment. In any event the proposals are so complex the community will be unlikely to pay due heed to them at this stage.
- General Aviation is a significant contributor to the economy by both business and leisure activities in the UK and mainland Europe. It needs to be able to access airspace, both controlled and uncontrolled as appropriate, without undue hindrance.
- The current charging exemptions for GA using the airways (charges not applying to aircraft with a MTOW of less than 2 tonnes), with no charges applying to VFR traffic in uncontrolled airspace, should be continued.
- Charges should not be applied to GA because the majority of private owners/pilots pay Fuel Excise Duty on fuel, and VAT on it and services provided them, from income that has already been taxed, whereas the Airlines do not pay Excise Duty on fuel, and are able to reclaim VAT and taxation benefits as part of their general business arrangements.
- The current exemption arrangements have been made in the knowledge the costs of collecting the charges would exceed the income from them. That position would likely remain the case unless the aircraft now to be charged bore a disproportionate administration charge; such arrangement would be patently unfair.
- There are approximately 6,100 GA light aircraft (up to 2730 Kg) on the UK Aircraft Register (May 2004). This excludes helicopters, microlights, gliders, balloons and, of course, MOD aircraft. We do not know the number of EEC and non-EEC registered aircraft and EEC light aircraft pilots with JAR or equivalent and non-JAR licences. These aircraft and pilots fly for widely varying periods per annum. Given such a position it is difficult to see how an equitable and economic method for charging all these airspace users could be devised.
- If charges for use of controlled airspace by GA IFR users in controlled airspace is introduced it is, as a consequence, highly likely to drive users out of the airways system (to save them the charges) with consequent safety risks to all users. We would contend efforts should be directed to encouraging more pilots to gain training and skills to obtain instrument licence ratings so that they can use controlled airspace and increase safety in all airspace.
- The GA business community is a provider of many of the future pilots for the airline industry. The businesses within it are very price sensitive and additional charges for use of the airspace within which they operate will inevitably affect their costs and viability. Private customers learning to fly already bear heavy costs to pursue their flying training activities as do private light aircraft owners; most of the costs incurred come from income already taxed.
- GA users of airspace would expect a full service from ANSPs if they were charged. Accordingly, additional demands would be made upon ANSPs to ensure sufficient controllers and equipment are available (including those staffed currently by MOD staff for limited hours). It remains our view that aerodromes protecting their adjacent airspace with TMAs should provide a LARS service in any event. The aerodrome and its users benefit from its existence and part of its provision should require that LARS is provided to assist other airspace users safely to fly within its vicinity.
- Light GA IFR and all VFR traffic has to be equipped with Mode S transponders by 31st March 2005 and 31st March 2008 respectively and will in any event be expecting an improved air navigation service as a result of the considerable expenditure they have been forced to bear. Regrettably, unlike in the USA, there is no provision, within the new radar equipment coming on stream, for the software necessary to enable an automatic traffic information service to be available; the equipment most of GA has to provide is already capable of receiving such information and which, if made available, would be a major contribution to flight safety; efforts should be made to introduce TIS.

Paul Draper
14th August 2004

P.S. Just as we go to print, we have learned that the DfT is not supportive of exempting VFR and IFR under 2 tonnes from charges! I am attending the Eurocontrol final workshop on 7th October to see if there are any changes and will report back in a future edition of *Instrument Pilot.*

Insidious Static

By Clive Francis

The story starts a few days before the flight in question when a previous pilot noticed that the starboard fuselage static vent of the Trinidad was blocked by gunge. To rectify this he set about extracting the gunge with a straightened paper clip, possibly not appreciating that some of the gunge might have fallen back into the static system. Nevertheless he proceeded to enjoy an uneventful flight.

Two days later Tim arrived for a check ride and to collect the aircraft for positioning at Southampton prior to departure for Tangiers. Tim is an experienced CPL power pilot, glider pilot and parachutist. Although he had previously been thoroughly checked out on the aircraft his Club currency had expired. Tim was held up by traffic and was half an hour late: I was conscious of having to hurry to be on time for a meeting that evening.

The check ride was predominantly designed to see if Tim could run through the checklist correctly and then perform a swift circuit. It was a hot, fine, and windless day and the aircraft had full tanks. On the approach Tim left the application of full flap rather late and consequently we were really high half a mile from touchdown which meant closing the throttle altogether. It occurred to me that we ought to throw the approach away but time pressures militated against this.

The indicated airspeed was some 90 knots at this juncture and as speed reduced I became aware of a very nose high attitude. At about 85 knots indicated the stall warning horn sounded, which I thought, was ridiculous as the aircraft's gear and flap stall speed is 53 knots. Shortly after this I became visually aware of a very rapid rate of descent with the ground approaching alarmingly swiftly.

In spite of the nose high attitude and the stall warner blaring neither of us comprehended at once what was happening. In the event I finally shouted POWER - I do not remember whether it was Tim or I who actually bashed the throttle open and checked the huge rate of descent. We then touched down gently in a nose high attitude with the stall warning still sounding.

At the time I put this poor approach and landing to lack of practice in a strange aircraft and as all other parts of the check had been completed immaculately, after discussing the stall warning and in view of his experience, I was content to tell Tim that he had passed the check.

Two days later Tim telephoned from Santander to say that not only had the stall warning sounded on the approach to Santander but that he had found the starboard static vent to be gunged up at Jersey. He had dealt with the obstruction in the same way as the earlier pilot and then the penny dropped on both of us with a pretty heavy clang. There must have been a collection of gunge in the static system that was causing a partial blockage leading to an inaccurate airspeed indication.

You will recall that the movement of the airspeed needle is governed by a diaphragm registering the difference between pitot static plus kinetic pressure on one side against fuselage vent static pressure on the other side. If there is a partial blockage in the fuselage static line the static pressure in the diaphragm chamber will be lower than ambient in the descent and the airspeed indicator will over-read. The higher the rate of descent the greater will be the over-reading.

It then dawned on Tim and myself that we had virtually stalled the Trinidad on finals and could have ended as a blazing heap in the undershoot.

What really astounded me is that I failed to appreciate the excessively nose high attitude of the aircraft and my slowness of reaction to the sound of the stall warning horn. Even after we had landed I did not appreciate that anything was amiss so insidious was the effect of the static blockage.

The question is why was the airspeed indicator over-reading? You will recall that the previous pilot had found gunge in the static vents and had poked at the blockage with a pin.

In the aftermath the static lines were dismantled and we found that thoroughly cunning insects had invaded both lines. The static vents on each side of the fuselage are both connected via a Y joint to the static side of the airspeed indicator: the Y joint being in the rear fuselage. The said insects, in seeking to make a home for their young, had travelled about 10 inches down each static line to build a little mud wall, retreated a couple of inches and laid the young. Each then retreated further and built another mud wall about two inches from the static vent and then, before pushing off, covered up the static vent itself.

The insect debris removed from the static lines would provide the equivalent of a filling for about a third of a rolled cigarette.

> "I do not remember whether it was Tim or I who actually bashed the throttle open and checked the huge rate of descent"

Moral No 1. There must be a reason for gunge in a static vent and poking at it at is not the way to deal with it. It is but a two-minute task to reach the static lines and these should always be investigated should gunge appear in the static vent itself.

Moral No 2. The stall warning horn is there for a purpose. If you hear it then apply power at once and climb to a safe height to investigate.

Moral No 3. If there's a hole, sooner or later, something will climb into it.

Moral No 4. If you're rushing things you're inviting disaster.

After 54 years of flying I learned about flying from that.

INTELLIGENCE REPORTS

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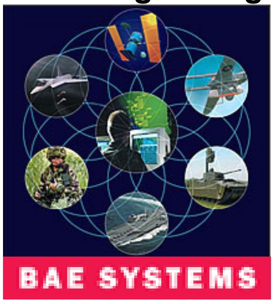
Pitot icing a thing of the past?



There's no two ways about it, aircraft instrumentation is undergoing the greatest period of change, well… since most of it was invented!

Vacuum driven inertial gyro systems are giving way to solid-state based, ring-laser driven glass cockpits, in this drive to reduce mechanical dependence.

So far, however one major system has remained untouched by progress, namely your humble ASI. This fully mechanical system uses a tube (the pitot) to feed dynamic air-pressure to a meter where it is displayed as a difference to static air-pressure, and calibrated as a speed.

The system works, why change it? Actually, it doesn't work very well… at very low speeds, or very high speeds the dynamic information is inaccurate, and the pitot tube itself creates drag, and either air-source can get iced up or otherwise blocked. So enter the Laser Air Speed Sensor Instrument project (LASSI)!

Currently being worked on by four organisations including BAE Systems, and the department of physics at Hull University, LASSI is developing optical sensors based around ultra-violet lasers which will apparently be more accurate at all speeds, have a lower failure rate (no icing or blockage) and require less maintenance. An additional plus will be a small quantity of drag reduction by losing the pitot tube.

AOPA has Instrument Approach Charts

AOPA in the US have a complete set of Instrument Approach Charts (including procedures and diagrams) available online to paid-up members, and updated every 28 days. Members can also store links to frequently used charts in their personal procedures area. http://www.aopa.org/

Jet Kit

So if you have around $600,000 you can now buy (or at least order) the Aerocomp Comp Air kit jet! This eight-seater pressurised jet will do around 320knots with a range of around 1000 miles. The base price is just under $400,000 including the single jet engine, but avionics and other essentials (such as help to build it – don't forget, it's a kit!) bring you up to around the $600K mark.

The company aren't yet taking orders, but it has flown, and they expect to be opening the doors very shortly!

Now, how would the PFA react to that? Of course, in this country you could build a 320 knot jet with full glass IFR cockpit, and then still only be able to fly it VFR… sigh…

More Info: http://www.aerocompinc.com

Jeppesen integrates electronic charts with Avidyne

At the end of July Jeppesen announced that they had completed integration of their JeppView Electronic Airway Manual charts with Avidyne's Flightmax Entregra and EX500 avionics systems. This is particularly good news for Cirrus owners, as now they will be able to have full chart images with situational awareness during all phases of flight! Piper, Lancair, Adam and Eclipse are also among other manufacturers offering the Avidyne systems.

The other advantage of JeppView? No more filing revision pages! Just a new CD every two weeks or an Internet download. Also, a new "trip kit" service means subscribers can purchase an unlock code for limited-time access to charts outside of their regular coverage area.

More Info: http://www.jeppesen.com

Garmin gives up smoking…

GarminAT have started contacting owners of the CNX80 GPS navigator to fix a potential problem with the transformer which could cause smoke in the cockpit and stop the unit from working. Owners should contact Garmin or a dealer to find out it their unit could be affected. If so, the repair will be covered by warranty.

Garmin Glass is popular

In addition to all those already announced including some Cessna and Diamond aircraft, the Garmin G1000 glass cockpit will now be standard issue for 2005 Raytheon Beechcraft A36 and Baron 58 models. These will also include the Garmin GFC700 autopilot (which is still under development) and the Baron's will also include Garmins on-board GWX68 weather radar system.

Cessna have also introduced a G1000 equipped Skyhawk 172R GA, for the training market at just under $200,000 with the higher-spec 172SP at $230,000.

In addition, Mooney is now offering a G1000 option on the Ovation2 GX and Bravo GX aircraft. The option adds $20,000 to the base price.

But Piper go Avidyne

Piper now offer their training aircraft with the Avidyne FlightMax Entregra glass cockpit. The system is now offered on the Warrior III, Archer III and Arrow ranges as well as the Saratoga IIHP and TC, and Piper 6X and 6XT models already announced.

And back to Garmin

Garmin are about to start delivering the new GNS480 which they claim is the first GPS navigator approved for WAAS precision approaches. Garmin say that the GNS 480 uses satellite-based navaids to update the aircraft's position five times a second to provide lateral and vertical guidance similar to ILS operations without the need for ground-based navaids of any kind! The FAA is undertaking approval testing at the moment, but don't hold your breath waiting for the CAA to condone that sort of thing!

Cessna gets BRS retrofit

The FAA have issued an STC to allow a Ballistic Recovery Systems (BRS) rocket-propelled parachute to be reto-fitted to Cessna 182s built from 1964 onwards. The 85 pound system will cost around $18,000-$19,000 fully installed.

Calendar Girls? No, we're paramedics!

The boys from the East Anglian Air Ambulance have bared their (nearly) all to raise money to keep Anglian One flying! Started as a joke at a Christmas party, the calendar will shortly be reality and available from: http://www.eastanglianairambulance.co.uk

East Anglian Air Ambulance's chopper

TCAS II and VFR traffic

By
John Law
ACAS Programme Manager

"For maximum safety benefit from TCAS II, VFR traffic must squawk altitude"

The drive for TCAS II development in the US was from mid-air collisions involving light aircraft - between a B727 and a Cessna 172 at San Diego in 1978, and between a DC9 and a Piper at Cerritos, California, in 1986. In Europe, extensive safety analyses showed that TCAS II systems would provide significant safety benefit in all the airspace. Resulting mandates mean that most airliners and many business jets are now equipped with TCAS II.

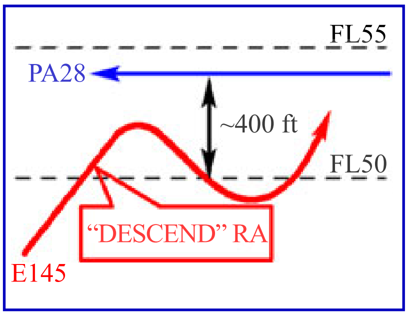
Operationally TCAS has proven to be very effective, and this includes encounters with VFR traffic squawking altitude. However, pilots and controllers often question the value of TCAS where IFR and VFR traffic is mixed:

- Does TCAS only cause problems between IFR and VFR traffic or does it give good protection?
- Does VFR traffic require a transponder for some TCAS protection?
- Although IFR and VFR traffic are "correctly separated by 500 ft", TCAS triggers alerts. Are these false alerts, or are they normal?
- Does TCAS still work when aircraft are flying in the aerodrome traffic pattern?

The objective of this article is to provide answers to these sorts of questions.

Collision between an Airbus A320 and a glider (France, 12 February 1999) An A320 was descending through Class G airspace to FL80 on approach to Montpellier. The ATIS reported gliding activity in this area. Despite keeping a good look out, a G103 glider at FL86 was seen just ahead, at a very late stage. The A320 took vigorous avoiding action. Within 2 seconds the aircraft achieved 36° bank, but the leading edge of the left wing hit the glider's tail. The G103 pilot had not seen the A320. Fortunately, both aircraft landed safely at their destination airport. This collision occurred before the European ACAS II mandate and the A320 was not yet TCAS II equipped. The results of the investigation underlined the need for widespread equipage of TCAS II on passenger aircraft and recommended mandatory use of altitude reporting transponder for all aircraft including VFR. If the glider had had an altitude reporting transponder and if the A320 had been equipped with TCAS II, it is likely that the collision would have been avoided.

Event 1: TCAS resolution between IFR and VFR traffic in Class D



A PA28 flying VFR is transiting a TMA, in Class D airspace. It is level at FL55 (mode C reports show FL54).

An E145 is climbing on departure, on a reciprocal heading, passing 3000 ft.

The E145 is cleared to climb to FL140 by the Approach controller and "to expedite through 5500 ft due to VFR traffic at 12 o'clock, 10 NM, opposite route".

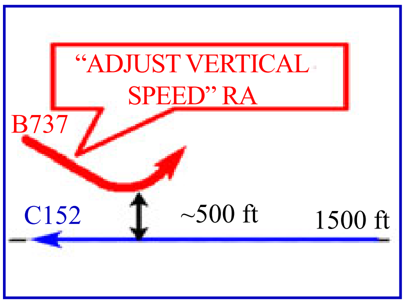
The controller also provides traffic information to the PA28 about the E145, "12 o'clock, opposite route, passing your altitude". Then, he provides further traffic information to the E145 (traffic at 12 o'clock 4 NM). About 15 seconds later, the E145 receives a **"Descend" RA**, when passing FL51. The pilot follows the RA correctly and initiates a descent.

4 seconds before passing the E145, the PA28 pilot reports visual contact.

As a result of following the "Descend" RA, the E145 passed about 400 ft below the PA28. Simulations indicate that **without TCAS the separation between the aircraft would have only been about 100 ft and 0.04 NM**.

The E145 pilot, **who never saw the VFR traffic**, filed an Airprox report because IFR separation was not provided against the VFR PA28. The controller remarked that he had provided the appropriate and correct traffic information. The controller reported that the Airprox was unjustified because the PA28 had visually acquired the E145 and reported that it had passed clear.

Event 2: VFR traffic penetrating Class A



In Class A airspace, a B737 is descending on the glide path for the final approach.

Due to a navigation error, a C152, flying VFR and level at 1500 ft QNH, is crossing the ILS axis at 4 NM from the runway threshold instead of at about 10 NM. The C152 has **an active altitude reporting transponder**.

The controller, who is not in radio contact with the C152, provides traffic information to the B737 pilot.

The B737 pilot gets visual contact

on the VFR traffic and continues the approach. As it passes through 2000 ft, the B737 receives an "Adjust Vertical Speed" RA.

In response to the RA, the pilot stops the descent and then initiates a go-around. The vertical distance between the aircraft is about 500 ft.

Simulations show that if the B737 had continued the descent, **the separation would have been less than 300 ft and 0.08 NM**.

Separation of IFR traffic from VFR traffic

IFR traffic is separated from VFR traffic by ATC in Class B and C airspaces only (VFR is not permitted in Class A).

In the other classes of airspace, "own separation" between IFR and VFR traffic is the responsibility of the pilots concerned and is usually based upon visual acquisition (Note: ICAO Annex 2 states that an aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard).

A 500 ft vertical offset applied by VFR traffic from IFR flight levels does not, in itself, ensure separation from either IFR traffic or other VFR traffic. It should be considered as a basic strategic organisation aimed at reducing the risk of collision.

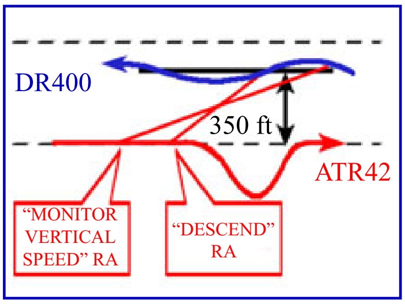
The application of this offset does not absolve pilots from maintaining a good look out at all times as the flight path of other aircraft can be unpredictable (climbing, descending or manoeuvring aircraft).

Event 3: IFR and VFR traffic crossing at 500 ft

In Class D airspace, an ATR42 is held at FL60 after departure, heading east, against a VFR DR400, on a reciprocal track, supposedly "level" at FL65.

The DR400 is not maintaining level flight and its altitude is actually **oscillating** between FL63 and FL64.

Shortly after levelling off, the ATR42 receives a **"Monitor Vertical Speed" RA** to prevent further climb when the DR400 is 2.20 NM ahead and 400 ft above.



Subsequently, the RA is strengthened into a **"Descend" RA** when the vertical separation between the aircraft becomes less than 350 ft. The pilot follows the RA and descends to FL57 before climbing back to FL60.

TCAS ensured that there was no risk of collision resulting from poor altitude keeping of the DR400.

Type of RAs between IFR and VFR traffic "separated" by 500 ft.

In the normal operating altitudes of VFR traffic, RAs will be caused if VFR traffic operates in the close proximity to IFR traffic with 500 ft separation.

Depending upon the TCAS II altitude thresholds and the current vertical separation between the IFR and VFR traffic, different types of RAs can be generated

In both Class D and Class E airspaces, a frequent encounter between IFR and VFR traffic is when **both aircraft are level and "separated" by 500 ft**. In these encounters, TCAS will generate a "Monitor Vertical Speed" RA, which does not require a vertical deviation.

Operational experience shows that **VFR traffic sometimes do not maintain level flight perfectly**. If there is a significant vertical deviation, Climb" or "Descend" RAs will be generated on-board the TCAS-equipped aircraft.

Is TCAS useful in the pattern?

Event 4: VFR in the aerodrome traffic pattern

An E145, on approach in Class D airspace, is cleared to descend to 2800 ft QNH and to intercept the glide path.

A TB20, flying VFR and in radio contact with another controller, is crossing the runway centreline cleared at 2000 ft QNH. However, the pilot has entered the wrong altimeter setting and is actually at 2500 ft QNH.

The controller instructs the E145 to stop its descent at 3500 ft and provides a traffic information about the VFR. Because the pilot reports visual contact on the VFR, he is cleared to continue the descent on the glide path. However, the E145 then receives a "Climb" RA triggered by the TB20, which is crossing directly underneath his track.

The E145 pilot responds slowly to the RA, reducing the rate of descent. Although not achieving a rate of climb, he passes the VFR traffic at 650 ft and no more than 0.2 NM.

In this event, the high risk of collision resulting from an undetected altimeter setting error was resolved by TCAS, even though the pilot of the E145 did not achieve the vertical speed required by the RA.

> "The TCAS II safety net is effective both on approach and at low altitude"

TCAS and aerodrome traffic pattern

Feedback from controllers and pilots shows a perception that RAs generated in the aerodrome traffic pattern are unnecessary and sometimes disruptive.

However, the TCAS alert time in this environment is only 15 seconds before a possible collision, the aircraft are in very close proximity (less than 1 NM) and the time for an effective avoiding manoeuvre is very short.

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Air-ground Communication Safety Study

An analysis of pilot-controller occurrences compiled by David Bruford

Within the Eurocontrol Safety Improvement Sub-Group (SISG), Air-Ground Communication Safety has been proposed as a potential subject for a Safety Improvement Initiative. For this purpose a total of 444 incidents related to air-ground communication between controllers and pilots were analysed. The identified incidents occurred during the years 2002-2003 (August) in Europe. The study was limited to commercially operated aircraft with a takeoff mass of 5,700 kg or higher but the problems incurred and recommendations made are just as applicable to private pilots. This report provides an analysis of air-ground communication between controllers and pilots. Significant safety issues, hazardous scenarios, causal factors, and potential prevention strategies concerning air-ground communication safety are also provided in this report.

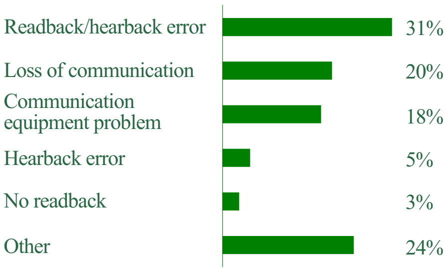
Voice communications between controllers and pilots will always remain a vital part of air traffic control operations despite the introduction of data link systems. Communication problems can result in hazardous situations. For instance, miscommunication has been identified as a primary factor causing runway incursions. It is therefore important to have an understanding of the problems and factors associated with voice communication problems. The importance of communication in an air traffic system was emphasised by the Linter and Buckles report of 1993, who stated that "*Regardless of the level of sophistication that the air traffic system achieves by the turn of the century, the effectiveness of our system will always come down to how successfully we communicate*".

The 444 occurrences encompass 1% of all reported occurrences and 23% of all ATC related occurrences. The air-ground communication problem occurrence rate is low at an estimated rate of 1.4 per 10,000 flights. This does not mean that air-ground communication problems between a controller and a pilot are low risk events due to their apparent low frequency of occurrence. The consequences of communication problems can be such that associated risks are potentially high.

Generic communication problems & consequences

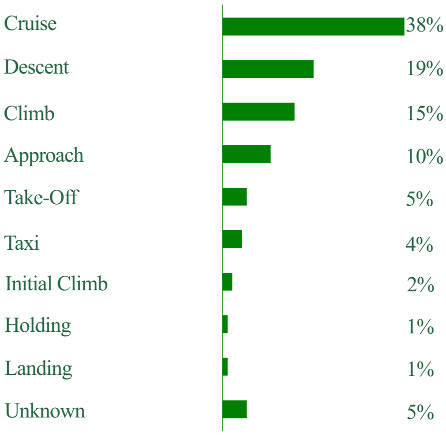
Figure 1 shows that readback/hearback errors were the most common type of generic communication problems found in the data sample. Similar results were reported in previous studies using ASRS (Aviation Safety Reporting System) data.

Fig 1. Distribution of Communication Problems



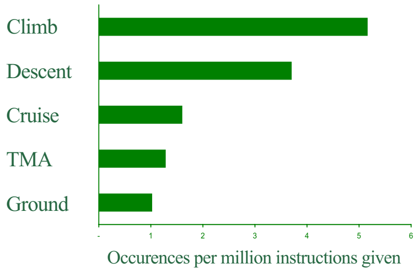
In Figure 2 the distribution of air-ground communication occurrences by flight phase is shown. The data suggest a positive relationship between the rate of communication-related occurrences and the distance between the aircraft and the destination/departure airport. The reduction in pilot alertness to RTF instructions when flying further away from the destination/ departure airport could be a factor in this relation.

Fig 2. Distribution by Flight Phase



Studies conducted in the early 90s of day-to-day pilot-controller communications using voice tapes showed an extremely low error rate. It was shown that less than one percent of all voice communications examined resulted in a communication error. The controller or pilot corrected the majority (60-80%) of these errors. It was estimated that for the analysed period and fleet of operational aircraft, a total of 183 million instructions/ clearances were given to the pilots. With the total number occurrences of 444 this results in a rate of 2.4 communication related occurrences per million instructions/ clearances given. It becomes clear from these numbers that only a very small fraction of all communications errors actually result into reportable occurrences.

Fig 3. Frequency of communication occurences by instructions given per flight phase



In Figure 3 the communication occurrence rate by operational phase is presented. The number of reported occurrences per flight phase are divided by the estimated number of instructions/clearances given in each of these phases. During the climb and descent phase more communication occurrences have occurred than during the cruise phase and the operations in the TMA and on the ground. This is somewhat surprising as it is often assumed that due to the larger number of instructions given to the pilots and the higher workload during the operations in the TMA or on the ground more occurrences would occur.

Contributing Factors

When causal factors are analysed, 'Similar call sign' and 'Sleeping VHF receivers' are the two most commonly cited factors in the study. 'Similar call sign' was cited in 20% and 'Sleeping VHF receivers' in 12% of the analysed air-ground communication occurrences.

Readback/hearback errors were the most common generic communication problem found in this study. The vast majority (65%) of all readback/hearback errors occurred during the climb and descent phase. Another large part (18%) took place during the cruise phase. By far the most common cited factors were 'similar call sign' and 'incorrect readback'. This last factor is of course somewhat trivial in the category of readback/ hearback errors. Also interesting are the use of non-standard phraseology by both the controllers and the pilots. 'Altitude deviation' and 'Wrong aircraft accepted clearance' are the most common consequences of readback/ hearback errors. In many cases the 'Wrong aircraft accepted clearance' consequence was followed by an 'Altitude deviation' (an occurrence can have more than one consequence assigned). In a typical case the controller issues a clearance to an aircraft, which is then accepted by another aircraft with a similar call sign. Subsequently the controller fails to hear that the wrong aircraft accepted the clearance. In some cases the transmission was blocked or the pilot did not mention his call sign so that the controller could not determine that the wrong aircraft accepted his/her clearance.

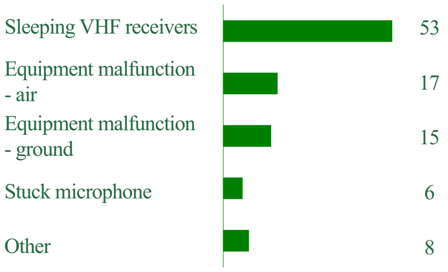
Loss of communication

The 'Loss of communication' category is a rather general one. For instance, it covers those occurrences in which there was a clear loss of communication, which could not be assigned to any failure of communication equipment. The vast majority (53%) of all 'Loss of communication' occurrences occurred during cruise phase. 'Radio interference' and 'Frequency change' are the most common factors found. Radio interference often comes from music stations on the ground. These occurrences are very annoying to pilots, which can make communication with controllers difficult or even impossible. ATC receivers are usually not affected by this kind of interference, since their antennae are close to the ground. The 'Frequency change' factor occurs when the pilot forgets to change the frequency or uses a wrong frequency. Normally this would not necessarily result into a problem unless the old frequency (unchanged) gets out of range.

In many cases (43%) there were no serious consequences. However in 40% of the cases there was a prolonged loss of communication. Prolonged loss of communication can be particular hazardous when the aircraft is flying in a busy airspace, into another sector or into a restricted airspace.

Communication Equipment problem

Fig 4. Communication Equipment Problems



'Communication Equipment problem' occurrences cover those in which it is clear that a problem (e.g. failure) with some kind of communication equipment in the aircraft or on the ground has occurred. In many cases the actual reasons for the problems with the equipment were not known or reported. Most of these occurrences took place during the cruise phase.

Figure 4 shows the distribution of factors that contributed to 'Communication Equipment problem' occurrences. 'Sleeping VHF receiver' is the most common factor cited. It is possible that some of the 'Radio equipment malfunction - air' could actually be a 'Sleeping VHF receiver'. Airlines, radio & aircraft manufacturers, air traffic service providers, and regulators are studying the problem of sleeping VHF receivers. So far these studies have found no correlations between the problem of sleeping VHF receivers and for instance aircraft type, radio type, use of headsets, airline, and sectors. Also the data sample examined during the present study does not show any correlations or trends. The distribution of sleeping VHF receiver occurrences is in line with the time spent in each phase. Therefore there are no flight phases in which there are relatively more 'Sleeping VHF receiver' occurrences. Prolonged loss off communication is by far the most common consequence.

After the '9/11' events, a 'silent' aircraft has become an unacceptable security risk. Indeed in some of the analysed occurrences, fighters were sent out to intercept the 'silent' aircraft.

No readback

In some cases a 'Roger' or 'Wilco' is given by the pilot whereas a full readback would be required. Such cases would also be considered as 'No readback' occurrences. Only 14 occurrences (3% of total) were coded as 'No readback'. Any conclusions from such a small sample should be interpreted with great care. Distributions of flight phase, factors and consequences have only limited value. The factors that were cited the most in the 14 occurrences were pilot distraction and pilot expectation. The pilot distraction factor can easily be linked to giving no readback. However, the pilot expectation factor cannot be easily linked to 'no readbacks' occurrences.

Prolonged loss of communication

'Prolonged loss of communication' is always a hazardous situation and even more after the '9/11' events. 'Sleeping VHF receivers' and 'Frequency change' are the most important factors which contributed to 'Prolonged loss of communication'. 'Sleeping VHF receivers' has become a serious problem in which the VHF transceiver appears to go to 'sleep'. The frequency becomes silent until the microphone is keyed and a transmission is made. (*Have any readers experienced this? If so please tell us what happened)* Normal reception is usually restored after this action. The problem of 'Sleeping VHF receivers' is being studied by several aviation organisations such as airlines, air traffic control organisations, and radio manufacturers. When a pilot notices that the radio has gone unnaturally quiet in a busy sector, a receiver might have gone to 'sleep'. The pilot should then recycle the Push-To-Talk Switch or conduct a radio check. Another important cause of 'Prolonged loss of communication' might be that the pilot has used or received the wrong frequency. Again the pilot should also check this when the pilot notices that the radio has gone unnaturally quiet in a busy sector. During the cruise phase however this might not be practical, as it is not unlikely to have longer periods of no radio traffic during this phase.

Altitude deviation

'Altitude deviation' is a hazardous consequence in busy sectors. Three important contributing factors have been identified in this study; 'Incorrect readback', 'similar call sign' and 'Controller non-standard phraseology'. The 'Incorrect readback' factor is directly linked with the readback/hearback errors. Observational studies conducted in the US have shown that readback errors are very rare (less than one percent of all readbacks made contains an error) and that most of these errors (60-80%) are corrected by the controller. Controllers should always actively listen to the readback and pilots should be aware of any expectation that they might have regarding a clearance/ instruction. The 'similar call sign' problem is well known and has been studied for many years now. Whenever there are similar call signs on the frequency the controllers should inform the pilots about this. The pilots should always use their full call signs in their readbacks. The controller should be aware that a transmission could be blocked when two or more aircraft are responding to the same clearance. Typically the controller would hear a partial or garbled readback. The use of non-standard phraseology by a controller can result in confusion with the pilots. Non-standard phraseology is typically used when the workload is high and the frequency congested. The controllers then tend to condense the message to reduce the time that they are transmitting. Controllers (and also pilots) should always use standard phraseology when communicating to

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Just one button?

A mystery described to Alan Toogood

What the pilots thought they saw, but the editorial team couldn't reproduce this on the simulator - we had to fake this display

The flight was IFR in a Socata TB20 Trinidad from Carlisle to Exeter. Exeter's weather was overcast with a base of 800 feet topping out at 6,200. No other weather factors were relevant in this report. The pilot and his passenger were PPL holders with current IRs. Obvious read backs have been omitted from this text.

> "Something is wrong - we have opposite sense indications"

"Exeter Radar, this is Golf XX with information Juliet 1016 on handover from Cardiff, squawking 4662, Flight Level 75 looking for vectors to ILS and a Radar Information Service."

"G-XX Juliet current, take up a heading of 180 for vectoring to runway 26 and descend initially to 5,000 feet on the Exeter 1016. Radar Information Service."

The flight has been using the 'direct to' setting from BCN via a Garmin 430 and following the 'purple line' inbound to Exeter. On receipt of the radar heading the pilot set up his No. 1 box for the ILS and correctly idented it. He then pressed the PROC, procedure button on the GNS 430 and selected - Select Approach - ILS 26 - Vectors - Load - and 'activated' it. On box 2 he selected the ILS for 26 and idented it and he selected the ADF to the EX NDB and idented it. As he levelled at 5,000 feet in IMC he checked and cross-checked the QNH and everything felt very right.

"G-XX you are No. 2 for approach No. 1 is a 737 on a straight in and will be passing below you. I will be putting you through the centre line and bringing you back up to maintain separation."

As they passed through the localiser they both 'think that they noticed' the No. 1 localiser needle go right to left (in simulation it does this if set to 109.9 or 112.05 on GPS but if set on VLOC it stays centred) and the No. 2 localiser needle go from a full-scale fly left deflection to a fly right but both agree that their primary navigation interest was on the Garmin screen and neither could remember it meaning something that they should consider as strange.

"G-XX, the No. 1 traffic is now past you, turn on to heading 305 to intercept the localiser. Descend to 2600 on the QNH. QFE is 1013".

As the aircraft approached the purple line on the Garmin display the No. 1 and 2 localiser needles started to move and the pilot commenced an interception heading combined with a controlled 'rapid' descent. The No. 1 HSI localiser needle centralised on the runway heading of 260. It was noted that the No. 2 localiser needle was also centralised at that point. 260-degree was held and the No. 1 localiser giving a fly right indication was 'chased'. The 'chasing' heading reached the edge of the heading bug but the localiser continued to give a fly right. At this point the pilot held a heading of 280 as the glide path was captured. He stopped his descent, flew level and spoke out loud to his passenger that: "Something is wrong - we have opposite sense indications." No. 2 localiser was showing a full-scale deflection of fly left whereas No. 1 was showing fly right. The ADF was showing a 20-degree left offset.

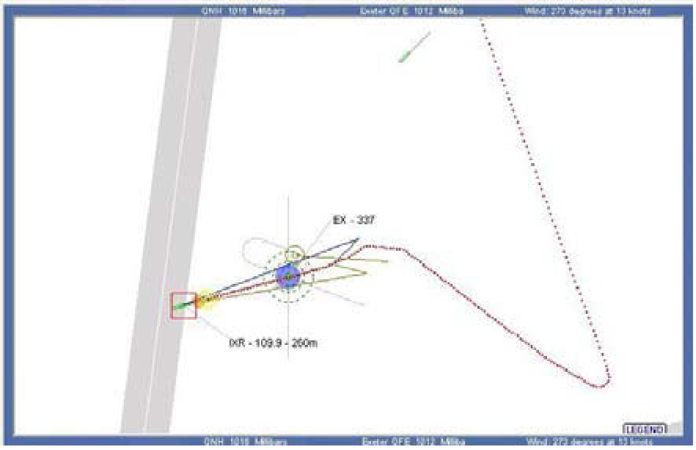
The pilot announced his intention (to his passenger) that he was going to ignore box 1 and intercept the localiser indication on box 2 as it was confirmed as a sensible heading by the ADF. As he lowered flap and gear he asked his passenger to double check every Navaid setting and ident while he continued the approach but at this stage he was still maintaining level flight as he was unsure of how far off the localiser he was.

"G-XX is experiencing navigation problems and requests a monitored ILS." As he spoke he recaptured the heading of 260 as the No. 2 localiser needle centralised and the ADF needle pointed directly to 360 degrees at the outer marker 'EX'.

"G-XX copied. I see you as on the localiser but high. Your approach will be monitored."

The aircraft maintained heading and a rapid descent to capture the glide path. During this time the No. 1 localiser continued with a full-scale fly right indication.

As the pilot called "Outer marker" and was given landing clearance the 'passenger' completed his idents and checks and said. "The only thing I can see is that the Garmin 430 button marked CDI (this changes the mode indicated just above it from GPS to VLOC) was indicating GPS.



The route flown by G-XX. Reproduced courtesy of Proflight 2000 Aviatrix Software

Pressing it and selecting VLOC did not change the display.

Unlike most stories, although this has a happy ending it doesn't have a moral. The pilot and passenger have no idea what the problem was although they are convinced that it was pilot induced. The Navaids have worked perfectly well and in the correct sense on every subsequent flight and ILS so what went wrong?

It is possible to start a procedure without the ILS frequency set, however, the Garmin has safety backups. If you select a procedure (for instance, vectors to an ILS at Exeter) it warns you that you don't have the right frequency set. It even tells you what should be selected. A separate message tells you to select VLOC by pressing the CDI button if you haven't done it. If the pilot had been given and ignored both warnings then the GPS would have continued to give the direct route (fly right) to recapture the course line north of the localiser, but that didn't happen. The matter remains a mystery but reader's theories are welcomed.

Sky Watch

Two little girls killed by a train whilst playing on a countryside rail bridge was the catalyst that started Sky Watch. A pilot who regularly flies over the Yorkshire countryside started to keep a lookout for similar situations - to be relayed to the emergency services through air traffic control on 999 calls - and hopefully prevent incidents turning into tragedies.

Other pilots offered to help. The initiative came to be called "Sky Watch" and now has 160 aircraft making voluntary air observation flights over England, Wales and Scotland. Light STOL aeroplanes (Austers, Piper Cubs, small Cessnas, micros and autogyros) are best suited to the work. Sky Watch pilots also uses eight helicopters.

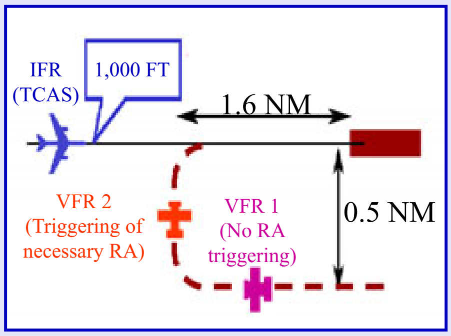
Although it has serious objectives Sky Watch flying is still "fun flying". Specific air observation sorties over areas that have the potential for incidents are most productive and these make up the major part of Sky Watch flying. The pilots are flying locally anyway so rather than just having the usual "jolly" they can turn it into something useful.

Guidance has been given by professionals in the military and civil emergency air services so that Sky Watch pilots have a manual about how to go about air observation. Some pilots have formed into units so that specific areas and training can be better covered.

It works. The list of incidents called in by Sky Watch is growing all the time. Reports from aircraft have been acknowledged by emergency services as helping to secure the "Golden Hour" - the vital first sixty minutes when saving of life or control of a fire or other incident is most effective.

There are no minimum qualifications. Anyone with a pilot's licence can join, although Sky Watch has a substantial core of very experienced pilots in its membership. The only commitment is to do about half an hour's air observation or training inside about every ten hours of your normal flying. Joining is easy via the Sky Watch web site [www.skywatch.org.uk.](http://www.skywatch.org.uk)

TCAS II and VFR Traffic
Continued from **Page 7**



In the example shown in the diagram above, provided that the lateral distance between the final approach path and the downwind leg is at least 0.5 NM, the VFR traffic on the downwind leg (VFR 1) will not trigger an RA on board the TCAS-equipped IFR traffic on the final approach. (In addition, TCAS does not generate any RA below 1000 ft.) If the IFR on the final approach receives an RA, this confirms that the separation with the VFR traffic on the base leg (VFR 2) is inadequate.

Conclusion

ACAS monitoring programmes have highlighted a significant number of TCAS events involving TCAS-equipped IFR traffic encountering VFR traffic. In these events, **the day was saved because the RAs were followed**!

Where IFR and VFR traffic are not separated by ATC, e.g. in Class D and Class E airspace, and where VFR traffic operates in close proximity to the IFR traffic (often at vertical separation of 500 ft or less) there is a high probability that RAs will be generated. Monitoring RAs significantly enhance safety.

RAs generated in the aerodrome environment **should not** be dismissed as unnecessary and disruptive. They demonstrate that a risk of collision exists.

Pilots must maintain a good look out, not relying on TCAS to prevent an unsafe situation from developing. **TCAS provides last resort collision avoidance**, not normal separation standards.

To trigger RAs, **TCAS needs intruders to squawk altitude**. VFR traffic should be strongly encouraged to operate an altitude reporting transponder in all classes of airspace as TCAS II provides safety benefits to both IFR and VFR traffic.

Finesse is Best

By Barry Schiff

I recently read a letter from an instrument flight instructor to the editor of an aviation publication that really got my attention. In it, the CFII said that he approved of using only rudder to make small heading changes while tracking a localizer during instrument approaches.

This got my attention for two reasons. First, it is a sloppy, unprofessional technique and is not the way an airplane should be flown. Second, the letter reminded me that I, too, once approved and recommended such a technique in an article that I wrote many years ago. I was wrong.

The writer said that he had never had a passenger complain about the use of such skidding turns in more than 25,000 hours of airline flying. My response to this is that I never had anyone complain about a lousy landing either, but that does not mean that I have not made some of my passengers wince during occasional arrivals that probably registered on the Richter scale. Passengers typically do not complain about such things even when they do make them uncomfortable.

Whether passengers complain or not should not be the point. They can feel skidding turns no matter how small (especially when seated in the back of the airplane), and airplanes should be flown so that passengers perceive as little aircraft motion and behavior as possible.

If you think about it, most pilots are perfectly capable of making such small heading corrections and demonstrate this during every visual approach. Can you keep the airplane aligned with the runway centerline during a straight-in approach? You probably do it easily and without thinking about it even when the crosswind component changes during descent. If a pilot can make a 1- or 2-degree heading correction in the conventional manner during visual flight, he should be able to do it just as well during instrument flight. After all, the airplane does not know whether it is in a cloud and behaves the same irrespective of ceiling and visibility.

When coupled to the localizer, autopilots make incredibly precise approaches using banked turns, not skidding turns. Flight director indications result in the same. (The only difference between an autopilot and a flight director is that autopilots command servos to move the flight controls; flight directors command pilots to do the same thing using human muscles.)

Furthermore, a pilot who makes small skidding turns to keep the localizer centered can develop a habit that leads to making larger heading changes in the same way. If 2-degree heading changes can be made this way, why not 5- or 10-degree changes? Using the rudder to turn seems to me to be a concession by the pilot that he does not have the finesse to do it properly. This is perhaps the result of a tendency to over-shoot during small heading changes, something easily corrected with practice. Either that or the pilot is lazy.

Speaking of letters, some years ago I received one from a reader who was highly critical of using the best-angle-of-climb speed (V_x) after liftoff. He claimed that an accident is likely to be the result of an engine failure that occurs once the aircraft is stabilized in such a relatively steep climb even when there is sufficient runway ahead upon which to otherwise make a safe landing.

The reason for this, he claimed, was that there is not enough time for the aircraft to accelerate and gain the airspeed needed to arrest the high sink rate that develops when the pilot lowers the nose to achieve normal glide speed, which, of course, is what pilots are taught to do immediately following an engine failure.

I never knew what to do about this letter because I could neither confirm nor reject the author's claim. A few weeks ago, however, I decided to see if the claim had merit.

Using a moderately loaded Cessna 172, I lifted off from a very long runway and stabilized in a climb at V_x (59 knots), 14 knots below the best-rate-of-climb airspeed (V_y). At an arbitrarily chosen altitude of 300 feet agl, I retarded the throttle and waited a few seconds, the time that the FAA says it takes for a pilot to react to an engine failure. I then lowered the nose abruptly to stop the airspeed bleed and accelerate from what was then about 50 KIAS to the best-glide speed of 65 knots.

Whoa, Nelly! The runway began rushing toward me at an unexpectedly dramatic rate. Nor did I have enough airspeed to arrest the alarming sink rate in time to make a safe landing without risking an accelerated stall. The safest and only option was to apply full power and extricate myself and the aircraft from harm's way. Such an option obviously would not have been available had the engine really failed. I concluded that such a flight most likely would have ended with bent metal.

I later tried the same thing at altitude and encountered similar results. A major difference was that I could not perceive rapidly rising terrain through the -windshield; the imperative need to recover was not as obvious. These experiments convinced me that climbing at V_x presents an unanticipated hazard that is not widely recognized and should be at least kept in mind when climbing at V_x looming obstacles or not.

Air Ground Communications Study
Continued from **Page 9**

pilots. Pilots should not accept instructions, which are not clear due to the use of non-standard phraseology. Frequency congestion often leads to controllers issuing message – BREAK – message to other aircraft, i.e. readback is not allowed. Also, controllers tend to pack more instructions into one message (more than two instructions in one message can really be too much for pilots to store in their short-term memory). Pilots should read back instructions in the same order as the controller issued them. This improves the recognition of incorrect readbacks by the controller.

Wrong aircraft accepted clearance

'Wrong aircraft accepted clearance' is a consequence that is clearly associated with 'Similar call sign' and 'Blocked transmission' factors. The background of the similar call sign problem is already discussed in the previous paragraph. The 'Blocked transmission' factor is closely connected to the 'Similar call sign' factor. A pilot who acknowledges an instruction intended for another aircraft might very well block the readback by the aircraft for which the instruction was originally intended. These multiple simultaneous transmissions are not always detected by the controller or the pilots involved. Although not an official rule, any pilot hearing that two transmissions block each other calls out "Blocked", after which all transmitting parties try once more to pass their message. A busy frequency can also lead to blocked transmissions. A 'stuck mike' can also lead to blocking a transmission. The fitting of so-called anti-blocking devices has been recommended by several agencies responsible for accident & incident investigations. For instance Britannia Airways has such a system installed on their aircraft.

Runway transgression

The consequence 'Runway transgression' can lead to runway incursions. The use of nonstandard phraseology by controllers was found to be the most important factor regarding 'Runway transgression'.

Conclusions

Based on the results of this study the following conclusions are made:

- Incidents involving air-ground communication problems between controllers and pilots are rare and encompass about 1% of all reported incidents and 23% of ATC related incidents.

Table 1. List of problems and prevention strategies

Problem	Prevention strategy (potential mitigating factor(s) / action(s) required / recommendations)
Blocked transmission	Whenever there is a busy frequency or there are aircraft with similar call signs on the same frequency both pilots and controllers should be aware of blocked transmissions. Stuck microphone can lead to blocked transmission and can be prevented by the use of anti-blocking devices
Expectation	Pilots should be aware of any expectation that they might have regarding a clearance/instruction
Frequency change	Pilots should check the selected frequency whenever the radio has gone unnaturally quiet in a busy sector
High speech rate (controller)	Controllers should be urged always to speak slowly when communicating with pilots
High workload	During situations of high workoad both the controllers and pilots should be urged to use standard phraseology and should not clip any message to save time at any time
Inaccurate/incomplete message content	Pilots should never readback an ATC instruction if in doubt about its accuracy or completeness
Incorrect readback	Controllers should be urged not to use readback time to execute other tasks. This will help in detecting readback errors
Language barriers	Particular caution should be exercised when language difficulties exist between the controller and the pilot. Communications between the controllers and pilots should always be conducted in a mutually agreed language
Non-standard phraseology	Controllers and pilots should be urged always to use standard RTF phraseology
Similar call sign	Airline opertaors should follow the recommendations given in ICA Annex 10 and ICAO Doc 8585 for allocating call signs as much as practically possible
Sleeping VHF receiver	The initiative taken by a sector working group, comprising airlines, manufacturers, regulators and air traffic service providers, should continue their task in investigating the problem of sleeping VHF receivers. In the meantime pilots and controllers should be made aware of the problem of sleeping VHF receivers by means of a brochure, through pilot and controller unions and other communication means (airline safety magazines).

- The majority of the analysed incidents took place during the cruise flight phase (38%), followed by the descent (19%) and climb phase (15%).
- Despite the low frequency of occurrence, air-ground communication problems can still be high-risk events due to the seriousness of the associated consequences.
- The top-six of most frequently cited factors in the analysed incidents involving air-ground communication problems are: similar call signs, sleeping VHF receivers, frequency change, incorrect readback, radio interference and use of non-standard phraseology by controllers.
- Many of the air-ground communication problems identified are not new and have been reported in older studies. However due to the present scale of aircraft operations these old problems (such as similar call signs) have become more evident than 20 years ago.
- Potential prevention strategies for a number of air-ground communication problems have been identified.

For the PPL/IR pilot the problems shown in Table 1 will be very familiar. However there are lessons to be learnt from this report if only that we should try and perfect our RT, not settle, as we all must admit to occasionally, for an RT exchange that is less than perfect. 'Say again after…' or 'Speak more slowly' should be as natural a response to an unclear message as a go-around is to a poor approach but both can be just as life threatening. To quote Dr. Sue Baker in Focus on Commercial Aviation Safety, Summer 1996 - *"Communication is not a one sided process and it is essential that pilots and controllers understand the need for clear and unambiguous communications so that normal situations are not turned into incidents and incidents to not become something far more worse."*

In-Formation Topics from the Forum

TECs & PECS

In-Formation is a new feature that brings you essential information from the PPL/IR Europe member's forum. The following recently appeared on the forum and is reproduced here for those that missed it. Our thanks to all that contributed:

> "PEC is Position Error Correction and is a correction for the possible inaccuracy of pressure instruments due to aircraft configuration"

The books and regulations say that PEC (Position Error Correction) must be added to OCH to create the DH for a precision approach. But neither Jepp nor Aerad do so, and all (four) of the AOCs I have flown for have accepted either Jepp or Aerad DHs, without adding PEC. So what's the story? Is PEC just swept under the carpet? Does anyone use it? If they do use it do they take the standard 50' or do they use the published PEC for their aircraft?

I use a PEC of 50 feet on any precision approach, and add that to the DH/DA found on the chart. So if the chart says 250 feet DA, I use 300 feet as the DA. (I do all my instrument approaches on QNH, so use DA rather than DH).

Failing to set the QNH on a missed approach go around is the most common reason for failing an IRT. So why ever use QFE?

What is the definition of a PEC? More generally, when I look at a Jepp according to Pan Ops 2 or 3, I see a Jepp published DA(H) and I see an OCL(H). Various people talk of defining their own DA(H). For TERPS approaches it's easy - DH or MDA on the chart is your legal minimum, if you want something higher, that's up to you. So, my question, what is the relation between the obstacle clearance limit and the DH? (and yes, where does PEC come in?). Is the DH the legal limit, or are there other legal factors that play a role.

PEC is Position Error Correction and is a correction for the possible inaccuracy of pressure instruments due to aircraft configuration. The "standard" rule is that PEC should be added to to OCA(H) to calculate the DA(H) for a precision approach (unless the system minimum is higher, in which case you take that instead. If the PEC is not known for a particular aircraft in a particular configuration, the rule is to assume 50'. Thus an OCH of 100' would suggest a DH of 150', which is less than 200' (Cat I system minimum) so the DH is 200'.

OCH of 170' would suggest a DH of 220'. But, as you say, the DH published by Jepp and Aerad do not *seem* to include an allowance for PEC, and I have not come across a commercial operator which adds the 50' or any other PEC. This may be that the aircraft I have flown professionally have been determined to have a PEC of zero (unlikely as I have flown a range) or there is an AOC dispensation, or the companies simply didn't know that PEC wasn't included.

Hmm.. this brings to light another question then... for the UK IMC rating syllabus, they teach to add the PEC onto the published DA/DH rather than the OCA/OCH. So if what you are saying is true, and that it is added onto the OCA/OCH, then potentially the DA/DH can in some circumstances be the limit stated on the chart rather than the limit +50 feet?

My understanding from memory is (a) you add PEC to DH/DA not OCH, and (b) operating procedures for Seneca I add 25' and Aztecs add 60'. I was taught (under CAA rules) to apply PEC (Pressure Error Correction) to the published DA/H (which is normally the same as the OCA/H). I was taught not to do so with MDA/H because non-precision minima already give more clearance over obstacles and therefore do not need the relatively small correction. Approach charts cannot include these corrections as they vary from aircraft to aircraft (and for each aircraft they vary with speed and altitude).

I have never heard of PEC in FAA training and believe (but am not absolutely sure) the reason is that US approaches are constructed to TERPS criteria while UK (and most other) approaches are made to PANS-OPS criteria. I don't think Peter is right when he assumes the absence of PEC from FAA training is proof of its alleged inferiority. You should find your PEC in the Performance section of your aircraft manual. If you cannot determine a PEC from your manual, you must add 50 feet to your DA/H. Well, that's what I was taught (and what I do - which isn't onerous as my PEC is only 10-20 feet in most circumstances) but I can't actually find it written down anywhere. Can anyone point me to the chapter and verse?

*The PEC is, in effect, an instrument calibration error, which is dependent on the aircraft. So it can't be "incorporated in the MDA" by anyone's rules. I too was spun the "more clearance on an NPA" story. But does it really make sense? On a Cat I ILS, you fly the glide slope, which keeps you clear of obstacles. The altimeter simply indicates at what point on that glide slope, usually 200 ft, you should go around if you're not visual. Provided you're on the glide slope, obstacle clearance is guaranteed, whether you're at 200 ft, 250 ft or 150 ft. The altimeter is altogether less important on an ILS -- for most approaches in Europe there's a DME to threshold against which you can crosscheck anyway (200 ft is 0.5d). On an NPA, the margin of minimum obstacle clearance is 75m (246 ft). Your altimeter is the **only** thing that's keeping you from hitting the obstacles. If I **know** the altimeter over reads by 50 ft, I'm not sure I want to ignore that and take a reduced obstacle clearance on an NPA.*

...But this is only addressing half the story. I have flown with four different AOCs, flying Aztecs, Chieftains, C404s and HS125s. All of them had Ops Manuals approved by the CAA and all of them flew all four types down to Aerad or Jepp DH. PEC was never mentioned. How can this be? Incidentally, to take the last point, someone, somewhere has created an edict that Cat 1 ILS is not safe below 200'. Therefore the argument that it doesn't matter if your altimeter is inaccurate, it is safe, does not hold water. (Though, of course, we know that he is right from a *practical* point of view, Cat 1 can *in practice* be flown to and along the runway, but that's not the legalistic point of this question.)

In my flying in Australia we either use the PEC listed in the Flight Manual or add 50FT. An example is Melbourne's Essendon Airport (YMEN) the DA for ILS on RWY 26 is 490FT so I just add 50FT to it. I think we are ICAO complaint and the rules are listed in the Australian AIP in the ENR 1.5 section under Aerodrome Operating Minima. The relevant sentence is: Operators may apply Pressure Error Correction (PEC) or, alternatively, add at least 50FT to the published DA. Compensation for Aircraft Pressure Error is not required when determining Aerodrome Operating Minima (AOM) for non-precision approaches.

The following is published in the RAF Flight information handbook - known as 'the yellow book' - under the heading 'procedure minima and additional allowances - Specific to aircraft type:'

Pilots need to take into account the following, where applicable, in order to convert the true height/altitude of DH/DA or MDH/MDA into an indicated cockpit value:

- Pressure error correction (PEC)
- Temperature error correction (TEC)
- Standby pressure instrument allowance
- Helicopter type allowance (HTA).

Because these allowances have no bearing on the true value of DH/DA or MDH/MDA, they should not be declared to ATC. (Service pilots are asked to state their minimums at service airfields). Although TEC is not, strictly speaking, specific to aircraft type, it is treated as such for simplicity. Where the sum of these allowances is 20ft or less it may be ignored. As an aside, I reckon TEC is just as (if not more) important to be aware of than PEC, and should be added not just to DH/MDH but also to all published MSAs. 4ft error per 1000 per deg C difference from ICAO can mean adding 1000 ft to published figures in mountainous terrain in a cold climate.

*There is also mention in the UK AIC AD 1.1 (3.1): 3.1 Altimeter Error: 3.1.1 When calculating DH, account must be taken of the errors of indicated height which occur when the aircraft is in the approach configuration. Details of the Pressure Error Correction (PEC) should be available from the aircraft flight manual or handbook. In the absence of this information, a PEC of +50ft has been found to be suitable for a wide range of light aircraft and should be used. This addition of 50ft need **only** be applied to DH.*

I can't say I found much evidence of a standardized practice on PEC. Altimeter error is certainly something to worry about, especially if it's reading too high. Very low temperatures seemed to be more of a worry though as a source of error. What I did find is that there are significant differences between TERPS (USA) and PANS-OPS (Europe, with modifications) in approach design. This was attributed as a factor in the crash of a B767 in Korea and is a topic of ongoing concern at the British CAA's Safety Regulation Group. One difference is that the circling radii are much smaller and the obstacle clearances in the circling area are lower under TERPS than under PANS-OPS. What are the other differences? Given the high level of N-reg flying in Europe, perhaps this is a subject for the newsletter or perhaps someone from the SRG would like to talk to us about the subject at future fly-in?

Good point about Temperature Error Correction. I recently came across an interesting report in KLM's in-house mag "In for Safety". According to the report, ATC in Norway (where TEC is crucial during winter because of low temperatures) do NOT apply TEC to clearances, so if they clear you down to, say, FL100 and the temperature is ISA-30, you would be 1,200 feet lower than you think and may not clear terrain! The pilot is expected to apply TEC and determine if the clearance jeopardises MSA in which case he would have to reject the clearance to FL100 and request FL120.

The TEC point is a good one, but because it is proportional to height above datum and PEC is absolute, TEC is more of a worry for MSAs while PEC often dominates for DAs. True 200 ft at ISA-20 indicates as only 215 ft.

Don't forget that FAA pilots flying outside US airspace must comply with all FAA rules AND all local rules (FAR91.703). Therefore, the application of PEC applies to N-registered aircraft as well as European aircraft.

The bits in the UK AIC AD 1.1 (3.1 Altimeter Error) also cover TEC. 3.1.3: Pressure altimeters are calibrated to indicate true altitude under International Standard Atmosphere (ISA) conditions. Any deviation from ISA will therefore result in an erroneous reading on the altimeter. The altimeter error may be significant under conditions of extremely cold temperature and appropriate corrections should be applied. It goes on to show a table of the corrections against the source elevations and temperatures. I don't know of many places in the UK where it reaches -20 degrees at 200 feet though (resulting in a 20 foot error), and more drastic errors of -50 degrees at 1000 feet resulting in 240 foot error. So for practical purposes, within the UK at least, I think most of the TEC figures can be taken as zero.

In the one case I read, it seems that PANS-OPS is more conservative than TERPS (larger circling radii, 396 vs. 300ft obstacle clearance in the circling area, at least for C/D). Perhaps there are other areas where more caution is required for a TERPS trained pilot. This is why I am thinking a differences training would be a good idea.

If this discussion gripped you, it continues on http://www.pplir.org/pplir/viewforum.php?forum=2&58

> “Don’t forget thet FAA pilots flying outside US airspace must comply with all FAA rules AND all local rules”

EUROSTUFF 45

By

Jeppe Sørensen

Mode S date approaching

The 31st of March 2005 may seem to be far away. But if you have to install complex avionics that are in short supply and the installation has to be approved by the authorities, the time is very short.

Moreover some important questions regarding Mode S remain unanswered:

- Whether an aircraft falls into the category requiring Enhanced Mode S?
- If it does what is the exemption policy?

The first question can be answered by knowing if the aircraft has a total take off mass in excess of 5,700 kg or a maximum cruising true airspeed above 250 kts. While the first condition is well defined, information regarding the latter condition is often not available. Some authorities take the Vne (never exceed speed) and convert that to true airspeed at the maximum certified ceiling of the aircraft. Very few aircraft can reach this speed in cruising condition, so this is not a proper way to calculate maximum cruising true airspeed. As high performance GA aircraft may or may not be eligible for Enhanced Mode S depending on the interpretation of “ maximum cruising true airspeed” a definition of the term and a way of obtaining the number is important.

A Mode S Exemption Coordination Cell (ECC) has been set up by EUROCONTROL to deal with Enhanced Mode S exemption applications. The ECC has developed a database and a rather complex application form, but an exemption policy has not been announced and many GA aircraft owners are in a very uncertain position.

P-RNAV delayed

As you will remember B-RNAV (Basic-RNAV) was introduced for en-route navigation some years ago in order to improve airspace capacity and take advantage of modern navigation equipment – mainly GPS. Today we use lots of waypoints that are RNAV waypoints. These only appear in our GPS database. With B-RNAV you navigate from one waypoint to the next waypoint although you have to stay on airways in periods of high traffic intensity. More and more often a direct routing is provided and very long direct legs at night – the longest I recorded was almost 1,000nm.

P-RNAV (Precision-RNAV) takes this technique of navigation a step further by using modern navigation equipment for terminal area navigation. The precision is 1 nautical mile as opposed to the 5 nautical miles for B-RNAV. Navigation is on preplanned routes constructed by a service provider and loaded from a database. Very strict integrity checks and verification of portions of routes below MSA (Minimum Sector Altitude) are required.

EUROCONTROL has developed the P-RNAV concept in order to reduce the proliferation of all sorts of RNAV procedures. They would like to see only P-RNAV, B-RNAV (above MSA, designed according to en-route principles) or Conventional procedures. Their ideal option would be for a P-RNAV only solution.

The introduction of P-RNAV is planned for November 2004. But P-RNAV has a number of problems or outstanding issues.

First of all the Data Supplier for the navigation databases are not approved according to the standards set up by EUROCONTROL or rather the JAA team that wrote the requirements for the airworthiness approval for P-RNAV. A battle is going on about who is to blame - the Data Suppliers say that the authorities are not doing their part. Maybe the requirements are too complex. EASA is joining in and has launched a Notice of Proposed Amendment (NPA 3/2004) consultation on the approval of database providers. The consequence being that database providers like Jeppesen will not be approved by November 2004. Given that this issue has been on the agenda for two years it might take a long while before the situation is remedied if everybody is waiting for other actors to take on some responsibility.

The second issue is that some stakeholders are not positive towards the use of P-RNAV procedures. In the London terminal area these procedures might reduce the capacity.

EUROCONTROL reports that 62% of flights are already carried out by those operators that are prepared to commit to P-RNAV. Well EUROCONTROL is only looking at the Top 100 operators. In addition EUROCONTROL does not believe the delay caused by unavailability of approved database should delay of the implementation of P-RNAV as P-RNAV is optional and not required for navigating terminal areas.

EUROCONTROL ought to consider promoting P-RNAV for smaller airports. P-RNAV is a concept with a potential for improving terminal area navigation at these types of airport and a concept that could also benefit General Aviation.

EUROCONTROL is working for you

EUROCONTROL is an enormous organisation. As of 1st of august it employed 2,136 staff members from 36 different nationalities at seven European locations. The total external headcount was 820. The number of Working Groups, Programme Steering Groups, Task Forces, Focus Groups etc. is impressive as is the number of papers produced.

Air Traffic Control is big business and of course the transport category aircraft and operators are the core activity at EUROCONTROL. Sometimes you

would like to see the points of view of General Aviation taken into account and sometimes you wonder if any activity is directed towards General Aviation at all. Of course military aviation has to be considered, but it is hard to find traces of other branches of aviation.

But the "Surveillance Domain Action Plan" paper in the "Development of Technical Concepts" section contains an activity "Traffic Information Service (TIS) advisory service for General Aviation".

The subsection explains:

"TIS employs an enhanced capability of the terminal Mode S radar system, which contains the surveillance data, as well as the data link required to up-link this information to suitably equipped aircraft (known as a TIS client). TIS provides position, altitude, altitude trend, and ground track information for up to 8 intruder aircraft within 7 NM horizontally and +3,500/-3,000 feet vertically of the client aircraft.

In 2004, no resources or budget are available in the Surveillance Domain. The primary deliverables are:

- Study report on the feasibility of TIS – 2005
- Technical and operational concept document for TIS – 2006."

With this timescale General Aviation will have to wait many years for TIS. I wonder if they have to reinvent the wheel. The FAA has years of experience with TIS and it must be possible to adopt the system developed by the FAA.

EASA walking

At the 4th of November 2004 EASA will move to Cologne in Germany. EASA is building its organisation and by now counts about 100 employees.

At a recent "US/EUROPE INTERNATIONAL AVIATION SAFETY CONFERENCE" in Philadelphia, Pennsylvania some industry experts compared the start-up of EASA in the timespan since September 2003, to the birth and growth of a child taking its first steps. EASA has managed to hold meetings with the industry and establish a website.

The industry is concerned about fees and charges and hopes that these will be in line with international practice and not impact the competitiveness of the industry.

As users who will eventually pay some of the bills, we hope the child will not grow into an expensive teenager.

N registration aircraft under European control

I just read the latest Instrument pilot, and write to say that I think you are on the right track. On the specific issue of N-reg, both the UK & European authorities should stop and think very carefully about bringing N reg aircraft under European control.

While in the software industry in California I gained my FAA PPL and IR. While I hold a UK passport, I also hold a US green card. I subsequently returned to the UK and started a software company here, creating valuable employment and skills for the UK economy. To be blunt, I'm an international guy and could easily move back to the US. In fact I would do so if I were unable to exercise the privileges of my FAA license in Europe, flying my N reg aircraft (both business and pleasure). The issue of aircraft registration comes back directly to pilot licensing: it's too hard to convert an FAA IR to JAR IR so lot of people are moving onto N reg. Making the JAR IR more accessible is undoubtedly a good thing, and begins to get to the heart of the matter. But banning N reg in Europe will just drive business out of the Eurozone. In the UK think of all those non-domiciled tax residents, that bring their millions to the UK economy. Many have their own aircraft – nearly all are on N-reg.

I'm sure that I am not alone in being able to move country with ease. Let our local and European governments think carefully about the economic consequences of their plans.

To a Brit that learned in the US system, it seems that Europe just doesn't want GA IR. And this is so short sighted: increasing the diversity of points of travel will reduce congestion, not increase it.

Charles Nicholls
Member 576

What we really happen to the regulation of N-registered aircraft based in Europe as a result of the introduction of EASA?

Jeppesen FlitePro

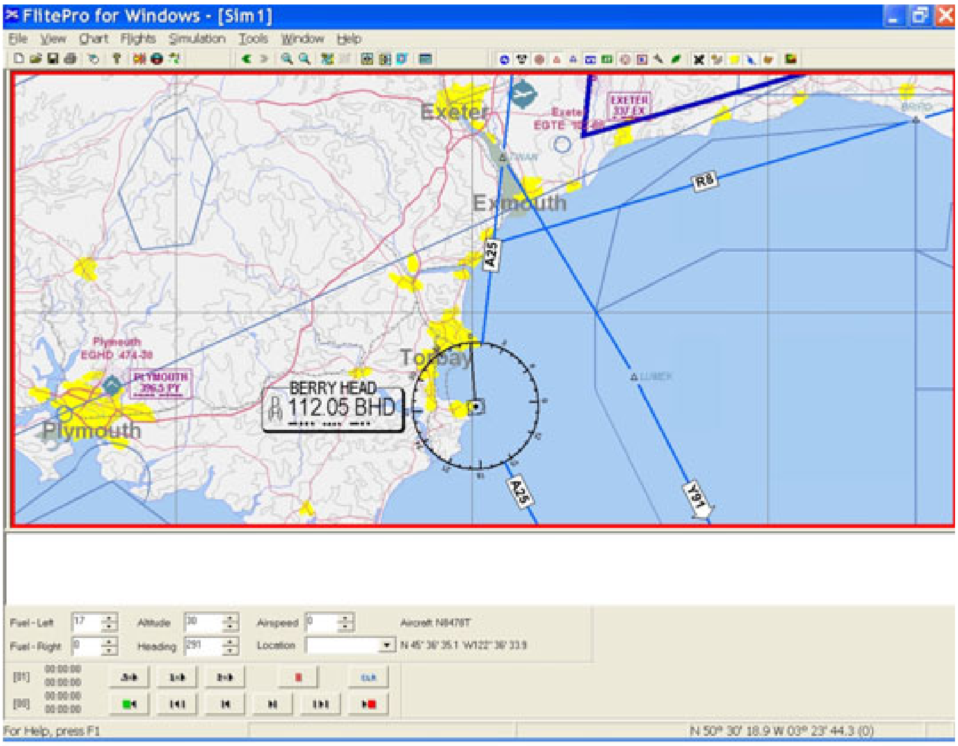
Review by Mark Edworthy

Jeppesen FlightPro is a basic IFR Proficiency Simulator and should not be confused with products like Microsoft's Flight Simulator which has extensive scenery and ground features for VMC "flying". FlitePro is designed to enable Instrument Pilots to practice instrument flight on an inexpensive PC and unlike some similar programs it will run on almost any PC. It will even run satisfactorily on older PCs such as those using Windows 95 or 98, subject only to a minimum video memory of 2 Mbyte.

Jeppesen FlitePro comes with only two aircraft types; the Cessna C172 Skyhawk, and the Beech Bonanza A36. The C172 has a fixed instrument panel, with DG, RBI, and twin VORs. VOR #1 is enabled for ILS/Glideslope.

The A36 has a choice of two instrument fits: the first is similar to the C172 using a DG and RBI, while the second uses an HSI and RMI. It is not possible to add other aircraft types or to modify the instrument panels. However, when viewed on all but the smallest monitor screens, the instruments are clear and legible.

The radio navigation instruments all give convincing displays, although there is no ADF "dip". The DME frequency cannot be set independently and is slaved from either NAV #1 or NAV #2. When using an airport's ILS, the DME distance appears to be calculated from the centre of the runway and not offset to read zero at the threshold as in real life. This causes the DME values displayed to be typically 0.7 nm more than those expected from the approach plate. This is more of an irritation than a problem when practicing approaches using FlitePro. Apart from this, most of the navigational errors that were present in earlier versions of FlitePro seem to have been fixed. Unfortunately it is not possible to either update or edit the database that has an effective date of 20 April 2000.



It is possible to set the cloud ceiling to either a fixed height, or to have the computer randomly vary this above and below the selected height so that it is not known in advance whether or not the runway will be visible at Decision Height or before the Missed Approach Point. Similarly, the program allows the wind, turbulence and visibility to be pre-programmed.

I did not test FlitePro with rudder pedals, but the flight characteristics using a simple joystick seemed entirely satisfactory for its intended purpose of instrument practice.

Perhaps the most useful feature of the program is the ability to either print-out or display on-screen both the plan view and the altitude profile of the flight to see how accurately it was "flown".

As a bonus, FlitePro comes with a second CD that contains an abridged version of the Jeppesen FliteSchool Instrument Course.

In conclusion, Jeppesen FlitePro is fairly basic and lacks flexibility but it does come with the complete Jeppesen world database of airports and navaids even though this is becoming dated. It is available in the UK from Transair, Harry Mendelssohn and other aviation stores for less than £50 pounds Sterling, which has to make it the lowest cost IFR simulator around.

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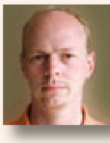

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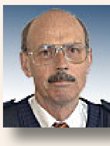

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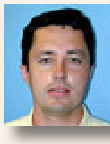

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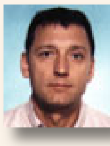

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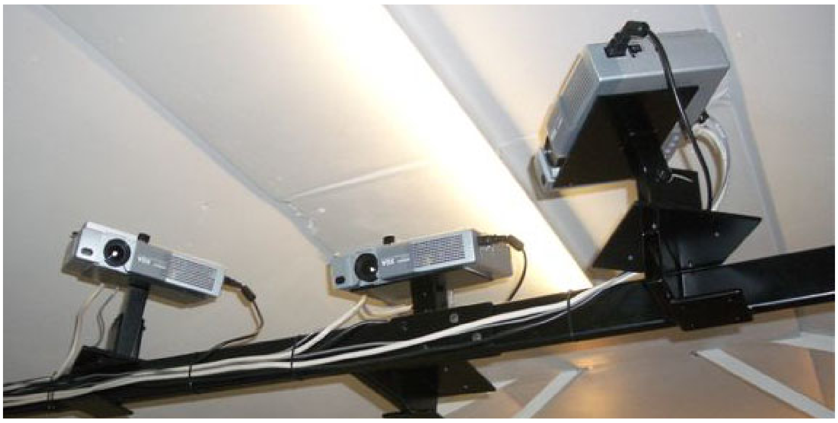
TruFlite Simulator

By David Bruford



A new company, Simulator Flight Training Ltd has set up at Exeter (EGTE) to offer training time on a Frasca TruFlite Simulator. The new company is owned in part by two PPL/IR Europe members; Richard Bristowe & myself, so to prevent accusations of bias I'll try and make this a purely factual review and not rave on and on about how brilliantly realistic and financially viable it is for pilots. Developed specifically to meet the requirements for JAA FNPT devices in Europe and throughout the world, the Frasca is a re-configurable device loaded with features for training in both single and twin-engine aircraft. Using Frasca's computer generated instrumentation and realistic overlays with bezels, screws, glass and knobs, (plus a real Garmin GNS 430), the Frasca can be converted between a twin-engine general aviation aircraft and a single engine aircraft in minutes.

So what does a simulator offer to pilots? Well, cost savings and convenience. Lower operating costs than a real aircraft and no cancellations due to the weather being below minima. Probably of most interest to our readers is that this particular simulator is approved for IR renewals (but not the initial exam). For those working towards an IR on the 50 or 55-hour course, only 15 *must* be done in a real aircraft, all the rest could be done in a simulator but according to Airways Flight Training's CFI Brian Marindin. "We suggest that students are limited to 30 hours maximum on the simulator to ensure that they get enough real hands-on aircraft time and maximise the chance of passing the exam first time"

For those students doing a CPL or PPL course five hours can be logged on the simulator and for those going further and starting Multi-Crew Cooperation courses, up to 15 hours can be 'flown' in the Frasca.

Simulator Flight Training's Frasca has CAA approval for the BE76 Duchess (Twin) and PA28R Arrow, complex single.

Bookings or enquiries should be made to Pauline on 01392 364216.