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ON COMMERCIAL AVIATION SAFETY

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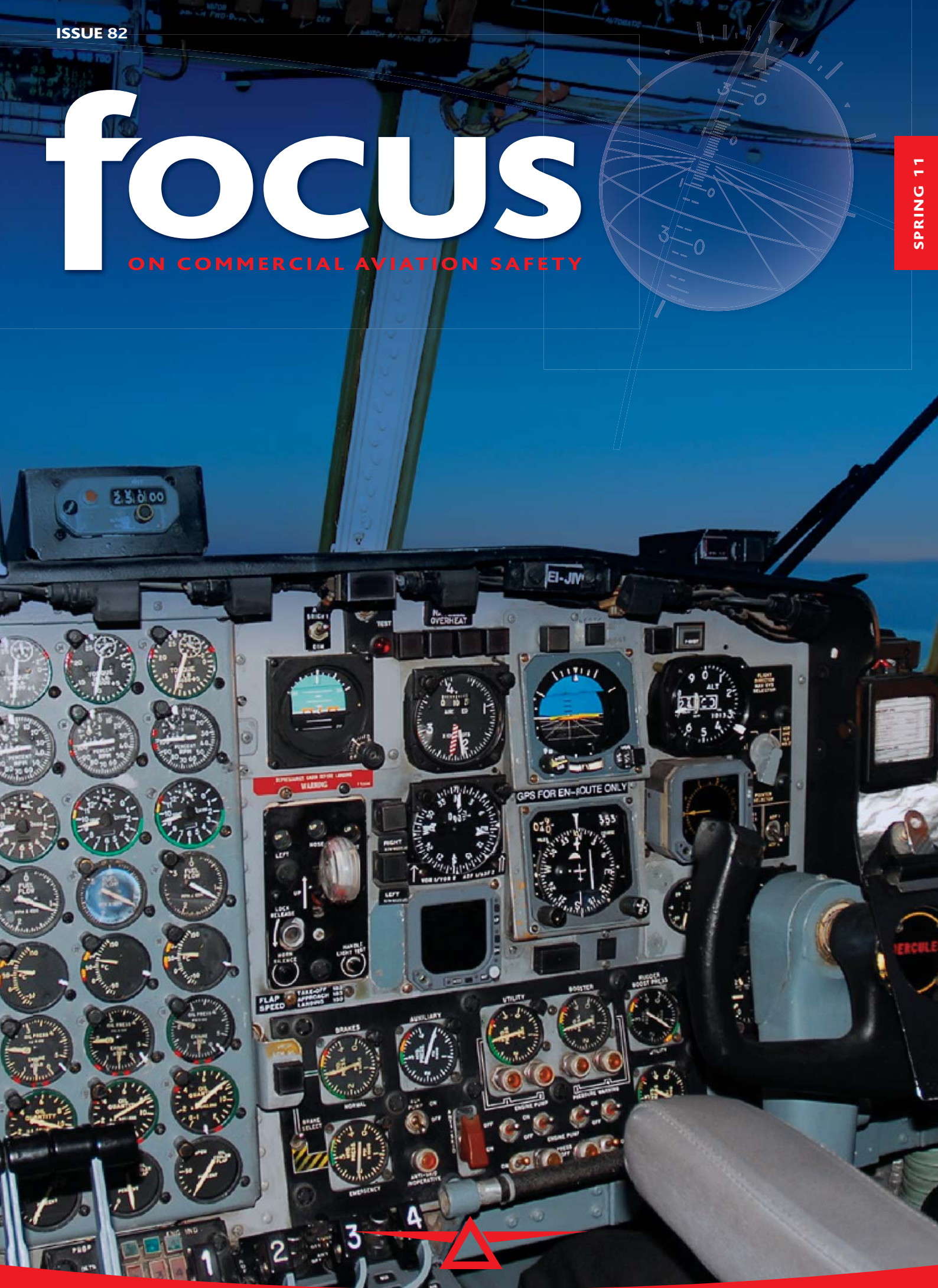

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FOCUS is a quarterly subscription journal devoted to the promotion of best practises in aviation safety. It includes articles, either original or reprinted from other sources, related to safety issues throughout all areas of air transport operations. Besides providing information on safety related matters, **FOCUS** aims to promote debate and improve networking within the industry. It must be emphasised that **FOCUS** is not intended as a substitute for regulatory information or company publications and procedures.

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Front Cover Picture: Flight deck of an Air Contractors Hercules courtesy of Felix Goetting©

focus
ON COMMERCIAL AVIATION SAFETY

Commercial operations in Class G –

Even if you know when you are in uncontrolled airspace, do you have an accurate picture of the threat?

by Rich Jones, Chief Executive UKFSC

I recently accompanied delegates from one of our flight safety courses on a visit around the hangar at the Air Accidents Investigation Branch at Farnborough. My attention was immediately drawn to the remains of eight aircraft which had been involved in four mid-air accidents that have occurred in uncontrolled airspace over the past couple of years. These sad and stark reminders have forced me to reflect upon one of the major aviation safety concerns which we regularly discuss at our Safety Information Exchange meetings: the threats and risks involved in operating in and around Class G or uncontrolled airspace.

With commercial and business airlines increasingly expanding their flying operations out of regional airports which are often adjacent to Class G airspace and with others seeking fuel-efficient routes through uncontrolled airspace in the UK, the need for a thorough understanding of who else is sharing that airspace is absolutely fundamental to achieving an effective and realistic risk assessment and a safe operation. But do we really know?

A number of initiatives have been employed over recent years to try and get to grips with this threat; some have been useful but still have their limitations. For example, about two years ago, a number of commercial operators sat together with the military and air traffic controllers to undertake a joint risk assessment of a short route through Class G airspace. This intense and revealing process did succeed in providing a more comprehensive list of hazards and a reasonable assessment of the threats, all be that the process was somewhat complex, difficult and time-consuming. Of course, the precise risks and the available mitigations can only be derived by each individual business or operator for themselves since each has differing roles, training regimes, equipment and SOPs.

More recently the Directorate of Airspace Policy has just completed a wide-ranging survey amongst users of a small but busy Class G area. The data gathered is currently being analysed in concert with the area radar tapes. The outcome should be one of the most comprehensive analyses of the use and users of uncontrolled airspace, all be it a limited area. Nonetheless, this methodology could be exploited to great effect in other high risk uncontrolled airspace across the UK, from which commercial users could build a much improved risk assessment for their individual operation.

The introduction of ATSOCAS nearly 2 years ago is another recent important initiative which aimed at improving the situational awareness for all Class G airspace users generally, while seeking to clarify the level of control being provided by the controller and to better establish the responsibilities expected from the pilot. Although a concerted investment in education, training and information across the entire pilot and controller communities was undertaken, some misunderstandings on the service being provided demonstrates the need for constant re-iteration and education. Equally, there remains the major challenge of making visiting pilots aware of the services provided under the ATSOCAS scheme.

But there is an equal concern about how well the rules and responsibilities are understood among UK-based commercial pilots when operating in uncontrolled airspace. Whenever aircraft of any type transfer from controlled into uncontrolled airspace, if the pilot listens carefully he or she may just pick up the slight sigh of relief in the controllers voice as they pass over their responsibility for separation to the flight crew. This assumes, of course, that the pilots realises that they have left controlled airspace and are operating in Class G in the first place. Some pilots believe that there is some agreement, either implied or explicit, that regardless of IFR or VFR conditions, commercial passenger aircraft will be getting some form of priority service over other users – nothing could be further from the truth.

Of course, the controller may helpfully ask what type of service the commercial pilot would like from the ATSOCAS menu as he enters uncontrolled airspace – but if not, it is a wise move for the pilot to ask for the best service available. Although the controller may not be able to provide it due to other priorities or constraints, he should always explain why only a reduced service can be offered; even this exchange can contribute towards an enhanced appreciation of the situation from which the pilot can review his priorities and available mitigations.

So what else is being done to address this major safety concern? Well, a working group has formed under the auspice of the NATS Safety Partnership to identify and develop other initiatives. The first move under consideration is for airline operators and the air traffic control service providers to get together with other users of uncontrolled airspace, including the military and GA, to share their respective hazard register from operating in common airspace regions. The aim here is to establish a comprehensive and common knowledge base from which their individual risk assessments can be enhanced. Each stakeholder can then plan and implement their most effective risk mitigations to best suit its own operations and circumstances. Later on in this process, if may be possible to share best practice risk mitigations between operators.

Second, it was thought valuable to produce a single page summary of ATSOCAS which identifies the key features of the system for both pilots and the controllers, particularly for irregular uncontrolled airspace users to reinforce and refresh their knowledge. In addition, NATS has recently produced a useful instructional video on uncontrolled airspace to educate their controllers which is already being used by at least one airline to similarly educate its pilot community. In future, this may be made available to all operators utilising this airspace.

Knowledge of the hazards and consequent risks involved in operating in uncontrolled airspace needs to be regularly reviewed. Numerous useful mitigations already exist and new ones are being developed. But as commercial and business aircraft increasingly use this type of airspace, it is essential that the hazards that lurk within it and the procedures and mitigations involved are well-known and effectively applied. But more work is needed to obtain a more accurate picture of the threats from which a best risk assessment possible can be produced and all available mitigations are identified and exploited.

Changing Times

by Capt. Tony Wride, Monarch Airlines

If you are of a certain age you may remember the singer Bob Dylan and a song called "The Times They Are A-Changin'". It could be argued that this song is quite appropriate in the Aviation industry right now as we face an uncertain future primarily driven by the economic situation and the unrealistic expectations of the public. The financial pressure is possibly the biggest threat to Safety and one I fear will soon prove disastrous, if it hasn't already done so!

The recent tragic crash in Cork has come as a timely reminder that whilst flying an aircraft is generally safer than driving a car, accidents are still happening and people are still being killed. The full details are not out yet but the aircraft crashed on its third attempt at landing in poor visibility and the end result is not a pretty sight. I sincerely hope that once the investigation findings are published there will not be any causal similarities to the Colgan crash of February 2009. Somehow I suspect that pilot error will be cited but if that is the case then hopefully an in depth investigation will also highlight the contributory factors that led to that error. Certainly it was the crew's error that caused the Colgan crash but behind that were a number of other factors that one could argue were definitely contributory in setting the crew up to make the fatal error.

In my 22 years in the Commercial airline environment I have witnessed the gradual shift that has taken place which I fear may be laying the foundation for future problems. Previous experience was something valued by companies and they were prepared to pay for that experience. Nowadays the experienced staff, be they Pilots, Engineers, or indeed any other aviation related role, are viewed more on a basis of the fact that they cost more. It is interesting to note that in most critical management positions companies do value experience. No company is going to put a new University graduate as Chief Executive or in a senior position! The company will want someone with experience and a proven track record. However, take a look at what's happening with the pilot workforce.

New pilots, who have spent close to £100,000 to get their licence and type rating, are employed on short term contracts flying complex airliners and paid peanuts! It could almost be classed as exploitation since these new pilots are desperate to get experience and with no alternative are forced to accept the contract. Admittedly these pilots do end up after six months with the additional experience but all too often it doesn't help them much because next year the airline will take another batch of new pilots rather than hire the ones with the experience. This leaves this group of pilots still with a huge debt and no means of earning enough to pay off the debt. Coupled to this is the fact that the very experienced people, from say the military or for instance a turbo prop commuter airline, do not have a career progression route because they are being leapfrogged by the new pilots. Whatever happened to the more traditional approach where pilots 'cut their teeth' on smaller aircraft doing lots of sectors and gaining the valuable experience before progressing onto a larger jet aircraft. Surely it makes more sense to have inexperienced pilots flying the smaller less complex aircraft and experienced pilots flying the larger ones, but that's just my opinion.

It still amazes me that insurance companies are not heavily loading premiums for airlines that employ pilots with 250 hours to fly say an Airbus A320 or Boeing 737. Have you ever tried to get car insurance for a 22 year old on a sports car? Think of the worst case scenario. It's a horrible night flying to a Greek island with limited navigation aids, and on minimal fuel when the captain becomes incapacitated! You now have a young inexperienced pilot with maybe only 300 hours responsible for everybody on board. I think that "Compare The Meerkat.com" would refuse to even quote!

Another area of concern that I have is in regard to the changes in Flight Time Limitations about to happen as the UK CAP371 gets superceded by new EU regulations. BALPA is quite understandably running an intensive campaign to try and change the proposed EU regulations to be more in line with CAP371 since they believe that the new regulations pose a serious threat to safety. Personally I wholeheartedly agree with the BALPA position on this.

CAP371 has been in use for many years and established a realistic set of limits on how much a commercial airline pilot could **safely** work. It was based on some fairly extensive scientific research with the premise that pilots should not be fatigued while operating an aircraft. The sceptics out there would have us believe that pilots have an easy life just sitting in the cruise reading the paper, see my previous Chairman's Column. These sceptics obviously have never tried to do the job or seen the effects on individuals of an intensive flying programme. All too often pilots are required to do multiple sectors or long sectors, sometimes with time zone changes, and still be able to perform safely in the event of a serious problem. It's not just a case of doing that on one day but doing similar things for 5 or 6 days in a row! I have witnessed the effect on work colleagues during the busy summer months who had flown right to the CAP371 limits and they even looked fatigued. There are mechanisms in place, including a Fatigue Risk Monitoring System, and the option to report fatigue via that system. All too often pilots are reluctant to file a fatigue report because for some reason they feel that they are to blame or are frightened to raise their head above the parapet.

Fatigue is cumulative and unfortunately pilots sometimes find it hard to recognise that they're fatigued. Currently no airliner has a 'Fatigue Detection System' unlike some of the modern cars being built, like one of the new VWs. It would present an interesting dilemma if an aircraft did have a fatigue monitoring system because what would you do if ECAM(Airbus) or EICAS(Boeing) suddenly generated a "Pilot Fatigued" warning, pull into the next Service Station!!

Why should we be so worried about fatigue? If fatigue was not an issue why would one of first things that the AAIB look at following an accident be what the crew had done prior to the accident? I can guarantee that it will be considered in the Cork crash. Fatigue is not the sole possession of pilots. Anybody can suffer from fatigue and an Engineer is just as capable of making a serious error whilst working when fatigued as a pilot.

So there you have it. The times are definitely changing and I have highlighted just a couple of areas that concern me.

Making airports safer – Runway incursions

by Eurocontrol

EUROCONTROL'S Airport Programme is having an impressive effect on safety at Europe's busy airports. Jill Taylor finds out what has been achieved so far.

A LOT HAS happened this decade since the fatal accident at Milan Linate in 2001, when two planes collided on the main runway in thick fog. Many of Europe's airports now have a Local Runway Safety Team made up of representatives from that airlines, airport operators and air traffic control. Hundreds of teams have sprung up in the European Civil Aviation Conference area since the European Action Plan for the Prevention of Runway Incursions was approved in 2004, and severe runway incursions are on the decline.

On average, there are three runway, incursions every day in Europe. In 2008, 955 incidents were reported, of which 15 were Class-A (less than 30 metres separation). While this is higher than the 12 reported in 2007 and 2006, it still represents less than 0.001 per cent of traffic and, more importantly, is moving in the opposite direction to traffic growth. "We have succeeded in generating a no-blame culture," explains Philippe Joppart, deputy head of the Airports Unit of EUROCONTROL. "Awareness of incidents and knowledge of causal factors has improved because the reporting of runway incursions has improved."

EUROCONTROL's Working Group for Runway Safety is now focused on making the area where aircraft move about on the ground at airports even safer, in particular by improving situational awareness for pilots and vehicle drivers when approaching a runway. The Single European Sky ATM Research Joint Undertaking launched several projects in mid-2009, and EUROCONTROL is working closely with the US Federal Aviation Administration (FAA) to share programme findings.

The FAA first began trials using Runway Status Lights (RWSL) on runway centrelines at Long Beach and Dallas Fort Worth in 2006. Linked to the surface movement surveillance system, the lights provide automatic visual warnings to other traffic entering the runway. By 2009, the FAA had announced a programme to install the technology at all major US airports. Meanwhile, Paris Charles de Gaulle airport announced plans to install a similar system in the 2010 to 2011 period and the UK's National Air Traffic Services began simulation work on behalf of EUROCONTROL to validate the FAA concept and investigate further potential enhancements. "RWSL provides additional alerts that require no interaction from the controller," says Matthis Birenheide, EUROCONTROL project manager for Advanced Surface Movement Guidance and Control Systems (A-SMGCS). "The aim is to have a similar, global approach to using the system so that pilots do not find different procedures in operation, for example in Europe and the US."

Enhanced lighting is not new, warnings such as flashing amber Wig-Wag lights and red stop bars are used by many airports to alert pilots when they reach the runway. "What does not exist is a harmonised approach to operating stop bars," says Joppart. The International Civil Aviation Organization (ICAO) clearly states that aircraft shall hold at lighting stop bars and may only proceed further when the controller has switched the lights off. While some airports operate red unidirectional stop bars around the clock, others only use them in low-visibility conditions, leading to ambiguity over their usage.

In some cases, the light switches off for a few seconds and returns to red before the pilot has had time to cross. Runway safety manager Yvonne Page says: "Encouraging a pilot to cross a red light only serves to reinforce bad practice that may fail the pilot or driver one day."

Improving situational awareness

The International Federation of Airline Pilots' Associations would like to see runway crossings avoided whenever possible, for example by constructing perimeter taxiways. Airports such as Amsterdam Schiphol and Milan Malpensa have succeeded in removing all crossings, but few European airports have

the space to achieve this. For the majority, improving situational awareness on the airfield is the first priority. "In a 50 per cent of runway incursions, the pilot is unaware that he/she is lost or has not received a clearance to enter the runway," adds Page.

EUROCONTROL is examining ways to use technology and has begun trials to incorporate the alerts generated by the A-SMGCS into electronic flight progress strips on the ground controller's display.The electronic data includes flight-planning information that, in turn, allows pre-tactical de-confliction possibilities. The information contained in the electronic flight strip can be used by the controller to resolve potential conflicts.

A-SMGCS is still primarily a surveillance tool, but its role as a guidance and control system is slowly making headway. In March 2009, ICAO gave its approval for the A-SMGCS synthetic display to be used to identify aircraft, without visual observation, in low visibility conditions. "This is a major step forward to maintaining capacity in Visibility 2 conditions and we are expecting the ICAO approval for Visibility 3 and 4 conditions in the course of 2010 as well," says Birenheide.

Airlines are also looking at new technology, both Air France and Lufthansa have installed Honeywell's Runway Awareness Alerting System (RAAS) in the cockpit. RAAS provides a moving map of the airfield, based on GPS data, to improve pilots' situational awareness. The airlines say the system has reduced ground navigation errors to near-zero.

Cost is an issue at many smaller airports, and EUROCONTROL is examining low-cost

surveillance technology that can enhance controllers' situational awareness without investing in costly A-SMGCS technology. The Agency is validating work being carried out by the DFS to simulate non-cooperative sensors at a generic aerodrome. The aim is to define a concept and investigate whether the use of information from non-cooperative sensors can provide the required level of safety at a small airport. The work includes a range of different technologies, including surface movement radar, optical sensors and induction loops.

Meanwhile, trials at Bordeaux have demonstrated that airfield vehicles equipped with a moving map and radio link lead to improved driver situational awareness. EUROCONTROL is working on a pan-European concept that is designed to alert drivers to location errors and does not rely on ASMGCS data.

"Increasing the situational awareness of only one actor is beneficial for safety," says Birenheide. Furthermore, understanding ICAO standard phraseology is essential for these drivers who need to hear, and be heard by, the air traffic controller.

Keeping the number of driver licences to a minimum has proved a successful way to ensure all drivers adhere to standard practices. At Munich, only 11 licences are in use, while Frankfurt has reduced its licences from more than 2,000 down to 200.This has led to lower training costs and improved airfield safety.

By establishing the main functionality of these low-cost safety nets, smaller airports can opt for the most appropriate technology according to traffic-type and complexity. Joppart adds: "Once the awareness is there, and the understanding of the issues, the local situation may not call for high-end expensive solutions."

Indeed, introducing a basic level of surface movement guidance at Europe's smaller airports would go a long way towards raising safety standards across the whole region.

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Runway Incursions

Captain Graham Croft, Boeing 777 Training Standards Captain, British Airways

The CAA has identified Ground Collision and Runway Incursions as one of seven significant issues in its latest safety plan and the FAA places great emphasis on reducing Runway Incursions in its Next Generation Implementation Plan covering 2012 to 2018.

As part of BA's Safety Management System requirements, the company has developed a Safety Plan for all of the main operational departments. There are six main areas of focus within the Flight Operations section of the Safety Plan, one of which is Runway Incursion risk (both active and passive).

We often fly with passengers who are nervous flyers. Few are likely to be known as 'white-knuckle-taxiers' and most will be unaware, or will have forgotten, that the worst accident in aviation history was a runway collision – 27th March 1977, KLM 747 and Pan Am 747, Tenerife North, with 583 fatalities.

Over the past few years there have been a number of significant incidents which are considered runway incursions and here are just a few:

9th June 2005, BOS, Aer Lingus A330 and US Airways B737
Near collision at the intersection of RW09 and RW15R. Because of an air traffic control coordination error, both pilots were issued nearly simultaneous takeoff clearances. The aircraft passed through the intersection at flying speed with about 170 feet of lateral separation. The A330 was airborne, and only a quick decision by the B737 crew to delay lift-off and pass beneath the Airbus prevented what could easily have been a terrible accident.

There have been 14 runway incursion related events at Logan since October 2004. All of the runways BA uses at Boston intersect with at least one other.

ATC at Logan and elsewhere in the US is equipped with the FAA's Aircraft Movement Area Safety System (AMASS), which is intended to warn of potential surface collisions. The AMASS software is not configured to detect conflicts between aircraft operating on converging runways at Logan or any other airport. It is also worth noting that this equipment suffers from attenuation from water droplets during poor visibility.

6th July 2005 JFK, B767 & DC8
The B767 was instructed to taxi to RW22R via taxiway H, and then turn left onto taxiway B. The B767 did not turn left onto taxiway B and crossed RW22R without authorization. A DC8 freighter, had been cleared for take off on the same runway.

The two aircraft's closest proximity was less than 100 feet (vertical).

AMASS did not alert the controllers to the mistake that was made by the pilot because it was raining heavily at the time. Under such conditions, the radar that supplies surveillance data to the AMASS processor generates excessive amounts of false targets because of the precipitation. To compensate for this, AMASS is placed into "limited mode," which disables much of its conflict detection and warning capability in order to prevent nuisance alarms. As a result, the system was of little use when it was needed most.

19th August 2004, LAX
A B747 and a B737 nearly collided after the tower controller mistakenly instructed the B737 to taxi onto the runway in front of the landing 747. While on very short final, the 747 crew saw the conflict and initiated a go-around, making a low pass directly over the 737. The AMASS system at LAX activated a warning in the tower about 10 seconds before the two aircraft would have collided; probably too late for effective ATC intervention.

Runway incursions are not of course limited to the US and wherever in the world we operate the potential for error exists.

October 2001, Milan-Linate
Scandinavian Airlines Flight 686, an MD-87 plane carrying 110 people and headed to Copenhagen, collided on take-off with a Cessna Citation II carrying four, heading to Paris. All 114 people on board the two aircraft were killed, as were four on the ground; a further four people on the ground were injured. The accident occurred in thick fog, with visibility reduced to less than 200 m. The Cessna Citation was instructed to taxi from the western apron along the northern taxiway (taxiway R5), and then via the northern apron to the main taxiway which runs parallel to the main runway, a route that would have kept it clear of the main runway. Instead, the pilot taxied along the southern taxi route (taxiway R6), crossing the main runway toward the main taxiway which lay beyond it. The SAS MD-87, under the control of a different controller from the Cessna, was given clearance to take off from runway 36R; 53 seconds later, the SAS aircraft, travelling at about 146 kts, collided with the Cessna.

A British Airways incident:

January 2006, CDG
After landing on runway 27R the aircraft vacated via Z3. The visibility was about

1500m. The Tower controller cleared the company aircraft to cross runway 27L and call ground. The crew were not aware of any aircraft departing 27L. As the aircraft crossed 27L, the crew were aware of an aircraft which appeared to be stopping. The other aircraft (an Air France A340) had rejected its take-off run because of the BA aircraft crossing. The captain queried the situation and the controller eventually admitted that the A340 had aborted its take-off run. It transpired that the Tower controller had cleared the A340 to takeoff (in French) just after clearing the BA aircraft to cross the runway; he then ordered the A340 to stop ("annuler le décollage") and told the BA aircraft to expedite the crossing. The aircraft missed by about 500m

ATC error, pilot error and system shortfall all play a part in these incidents. Flight-deck situational awareness must be at a high level to mitigate potential shortcomings.

Critical phase of flight

The current generation of aircraft are highly automated and complex systems which have allowed preparation and programming of the total flight on the ground. This has resulted in flight deck workload peaks being shifted from the previous critical flight phase to the ground phase of aircraft operations.

Consequently the taxi phase should be treated as a "critical phase of flight".

Consideration could be given to adopting the sterile flight deck concept whilst taxiing.

Sterile flight deck definition:
Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.

Some of our company procedures (for example ACARS Loadsheet late close-out) may conflict with the ideal sterile flight deck and require us to manage distractions during the taxi phase. Handing over control when the aircraft is under motion and confining these tasks to low workload moments are recommended. The taxiing pilot must maintain a good look out.

Planning for taxi operations

The key-point in the prevention of runway incursions, is to apply better preventative measures during the taxi phase.

Airport familiarisation

Departing from or arriving at an airport can be prepared in advance. Planning for taxi operation is essential. This preparation should be done at the gate or prior to starting descent.

- Prepare the necessary charts for taxi.
- Take some time to study the airport layout.
- Use ATIS and previous experience to determine possible taxi routes.
- Review NOTAMs for work-in-progress or taxiway/runway closures. Visualise this information on the charts.
- Standard taxi routes are used more often at busy airports. Review the routes you can expect.
- Some airports publish the location of HOTSPOTS. These are unique or complex intersections and runway crossings where runway incursions have taken place in the past. The next edition of the BOS taxi chart in the EAG Aerodrome Booklet will include HOTSPOTS. In shorthaul, many airfields already publish HOTSPOTS.
- Know which runways you will encounter between where you are and where you are going.
- Plan timing and execution of checklists so that no distractions occur when approaching and/or crossing runways; i.e. all eyes outside during this phase.
- Conduct detailed briefing for all flight crew members, especially during night and low visibility operations i.e. include "extra eyes" where available.

Briefings

The briefing in the Before Start Check-List should be simplified as much as possible. Several taxi items can be covered during the briefing. During taxi attention will need to be drawn to items which have been altered since the briefing. This should also be done during the descent briefing.

The before-start and descent briefing should also contain a complete review of the expected taxi routes with special attention to any HOTSPOTS and work in progress. During this part of the briefing, refer to the airport charts and visualise all available information.

Local knowledge is useful and may be available from other crew members or contained in the Route Information Manual.

A quiet time during the outbound sector might be an ideal time to familiarise yourself with the departure procedures for the return sector.

Our memory is "constructive". That means that we have the tendency to fill in the blanks. Ensure that you follow the clearance or instruction that you actually received, and not the one you expected to receive.

Be aware that the expectations established during the pre-taxi or pre-landing planning can be significantly altered with a different and unexpected clearance.

Clearance

The receipt of any clearance and the taxi phase itself requires the complete attention of all flight crew on the flight deck.

Resolve any uncertainties about your clearance or your position on the surface before the start of taxi.

Consider using the increasingly-common practice of using the FMC scratchpad as a handy way to record taxi instructions as they are received from ATC.

IN CASE OF DOUBT: ASK.

Public address announcements

PA announcements can be a cause of distraction and error. Also calls on the company frequency cause the other pilot to be isolated on the flight deck. These calls and announcements should be avoided when approaching the active runway.

Taxi Best Practices

1. The NHP has the important task of monitoring the taxi and assisting his/her colleague.
2. Postpone checklist activity when crossing and entering runways.
3. Never cross red stop bars unless a plausible explanation is received.
4. When entering any runway, check for traffic using all available means e.g. all eyes, TCAS, ATC exchanges etc.
5. Do not rush. Taxi defensively. Be prepared for others to make mistakes.
6. When you receive a clearance to taxi to a point beyond a runway, this clearance does not automatically include the authorisation to cross that runway. Each taxi clearance beyond a runway shall contain an explicit clearance to cross the runway or an instruction to hold short of that runway.
7. Use your aircraft lights to help controllers and other pilots to see you.
8. Check your audio box and volume adjustment whenever a frequency change is made.
9. Ensure all flight crew are on the appropriate frequency.
10. When the aircraft has vacated the active runway, be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.
11. Anytime you feel uncertain about the location of the aircraft position on the movement area, STOP the aircraft, advise ATC, and ask for clarification. **Take the question out of the flight deck**.
12. If necessary request progressive taxi instructions. Useful at an airfield with which you are unfamiliar when short chunks of instructions might be easier to translate to your immediate surroundings as you progress across the airfield.
13. Never stop on a runway unless specifically instructed to do so.

The following may assist with best practice preparations:

- If necessary write down taxi route
- Ensure all crew members progressively follow aircraft position on chart
- Consider Sterile Flight Deck during taxi
- Be alert for Mandatory Signs / Markings / Stop bars and Runway guard lights
- Look for visual aids (Taxiway location information and destination signs)
- Use STANDARD radio phraseology
- Receive explicit clearance before crossing any runway
- READBACK all runway crossing or hold short clearances using correct phraseology
- DO NOT ALLOW flight crew to be rushed by any party (ATC or Company)
- LISTEN to clearances issued to other aircraft
- NEVER cross red stop bars when entering or crossing a runway unless resolved
- Before entering or crossing any runway CHECK FOR TRAFFIC
- No checklist activity crossing any runway
- Ensure correct understanding of the ICAO phraseology "Taxi to holding position"
- When in receipt of a Conditional Clearance, take particular note of the traffic being the subject of the condition, and positively and accurately identify that traffic before carrying out any further manoeuvres onto the runway. Always read back in full the conditional clearance
- **IN CASE OF DOUBT: ASK**

So you want to be an Emergency Response Manager. (A Simple guide on how not to make a complete idiot of yourself!)

by Ian Marshall, Chair United Kingdom Aviation Emergency Planners Group

London 1 – Crashing here will cause a few problems

When you were little, day dreaming of what you wanted to be when you grew up, you of course disregarded the obvious delights of a career as an engine driver, footballer, or wag. Sorry I'm not sure what the male equivalent of wag is but you can see where I'm going with this! No, not a life of ideal decadence for you, although I can recommend the engine driving bit, but a worthy calling as an aviation Emergency Response Manager. O.K. in reality you probably did not see the task coming and therefore did not duck fast enough. I was minding my own business in Quality when asked to audit our emergency response plan. You can guess the rest!

So here we are, a nice new title, maybe an office, maybe not and the sudden realisation what responsibility has been put on your shoulders. Let's not beat about the bush to quote a well know Sci Fi television programme you are 'the last best hope' of keeping your company in business. Handle an accident badly and in these days of citizen journalists (people with posh phones) the public will not forgive you. Don't be complacent if you work for a small operator, I'll bet you code share with the big boys, or if you're in the corporate jet business, think of the net worth of the individuals you are carrying!! Thanks to alliances I've got two Airbus A380s daily to worry about.

Anyway this is meant to be a cheery guide to the basics of this fab job. So let's begin at the beginning, with the ultimate fundamental - you! Is this your cup of tea, let's find out: Do you honestly, like adults, children, and pets? I fake the children bit but you must like people. Your job is to rescue them from one of the worst possible situations they'll ever experience and attempt to make their lives bearable again. You can plan as much as you like but if you can't be there for these folks, do something else.

Be independent of spirit. Whilst your job is designed to be a sort of corporate safety net, you achieve this delightful result by using your common humanity. Many departments will regard what you do as slightly morbid and often you need to fight for what's right. Once again no shrinking violets need apply. Lastly, but vitally, you must have a good, if not slightly warped, sense of humour. This is your personnel resilience policy. If you go potty under the strain, then you'll be no good to man or beast.

Well that sorted that out so we are all jolly passive extraverts or something like that. What legislation frame work are we working under? Well the predominant laws within the UK are contained within the Civil Contingency Act 2004 and the rest of the world is loosely based on the US Families Assistance Act. The EU has a few ideas which concern supplying a passenger manifest to someone in Brussels within the hour, (not possible) and interim compensation payments (which is!).

The UK Act classes agencies into two categories of responder. Both must have plans and the resources available to conduct the recovery phase. Airlines are not included in either list hurrah!

But before you get too ecstatic and start contemplating that aforementioned 'Life of easy decadence' bear in mind, who is going to be paying for all this and whose reputation is on the line. Not, I fear, a matter that either the police or the local Borough Council will lose too much sleep over? Talking about local authorities, under the Civil Contingency Act they have the responsibility of looking after your passengers and crew not to mention any individual you may have landed on. Be nice to these people they could pull the rug from underneath your feet before you ever get started!

Under the US legislation you have to prove that you have the wherewithal in country to handle all aspects of the aftermath including cleaning up the mess. In reality unless you have this level of resource available wherever you fly, you are not going to have many destinations!

One last complication, within the UK local authorities contingency planning departments tend to operate up through the Department of Culture, Media and Sport. No I don't know why, but they do. The aviation

ERC 1 – Some people have nice Emergency Response Centres

community works with the Cabinet Office Civil Contingency Department, Cobra and all that' which sounds oh so much more manly, confusing isn't it! Oh and while we are here let's throw in the Association of Chief Police Officers: As any accident is a scene of crime, Mr Plod rules and you will be a fool to forget it! Having said that at one major UK airport's annual exercise, the incident commander commented to me that he did not see what the fuss was all about. He stated that as everyday at EGXX was a disaster what difference would a plane crash make!! I'd love to tell you where this was along with the location of an airfield whose operations manager said he'd block his runway if he knew a crippled aircraft was coming in!

So we have looked at you and touched on the law, so what are you going to most need to handle an accident? Friends that's what! Not Monica, Rachel, and Joey or whatever they were called but other airlines, airports, senior fire, police and ambulance officers as well as your own team of volunteer care givers. That's just a start, government in all its forms, the Red Cross, the charitable sector, mental health professionals, legal and insurance folk and regrettably mortuary and undertaking operators will all feature highly in your consciousness.

I told you that you had to be a sociable sort! Luckily within Britain the United Kingdom Aviation Planners group can help with a lot of these relationships. I'm chair of this seriously useful organisation so you did not think I wouldn't get a plug in somewhere!

Now let's look closer at some of these friends, starting with the unpaid ones. Within your company you will find some fantastic people who will readily volunteer to be care givers. Why, when economics require us to squeeze our staff until they sing, these folks come forward I really can't say, but they do! With them come precious skills; languages, first aid, administration, leadership, and enormous amounts of compassion will all be found within the ranks of your team.

The charitably sector can help. The Salvation Army have a great mobile canteen and the

BMS Global 2 – Paid Help – Someone has to clean up the mess

Red Cross has enormous man power. The only issues are command and control and indemnification. There will be hell to pay if a voluntary organisation accidently re traumatises victims by perhaps a well meaning act. Crashing into a tree whilst ferrying victims or their relatives around in volunteer cars is a good one! Apart from anything else their car will not be insured for this work nor will yours. Oh Joy!

Now we need to think about wicked capitalism with the introduction of paid friends. That is emergency response service providers not ladies and gentlemen of the night! Vendors can and will save your bacon. Services you may need range from the provision and equipping of hotels to house survivors and their families, to the organisation of travel and logistics, the provision of call centres, and the establishment of passenger reconciliation facilities. In addition you are going to need help with crisis communications, the identification and restoration of personnel effects, care of the mentally traumatised and body identification and repatriation.

I am frequently asked which disaster management company I would recommend. Well frankly they are all pretty good people. Some are stronger in training and others are better at logistics. In my dream world, in which I prefer to live, I would hope that in the event of an accident they would forget commercial differences and all work together for the common good, i.e. me the client. Anyway the vendors all know each other well so it's not quite such a pipe dream. But once again I must emphasise that for heaven's sake maintain control of your own accident response because it is your company at stake.

Oh well where shall we go next? I know, how about a little technology? As in all parts of society there are folks within the emergency response community obsessed with digital stuff. So how far you should go down this route is really up to how much technology you think your corporate culture will take. What you really really need is an automated telephone/text call out system! If you think you can get your team together using a manual phone cascade you are only fooling yourself. I know because that's how we were

A380 – Due to alliances I have to worry about two of these a day

Unpaid help company volunteers

for three years. Get a system that is cheap enough to use on a day to day basis and can handle conference calls. The price per call is vital as if it's too expensive you will never test the thing. Use the system to handle everday management calls as well as business continuity. If the balloon does indeed go up at least someone in your organisation will know how the blooming thing works!

The problem of user currency is also the major factor if you employ an emergency response IT tool. Unless you can figure out how to integrate any such system into the company's technological infrastructure then the first act upon activation will be reading the hand book. The other slight snag is none of these digital wonder systems talk to each other, so sooner or later someone will have to revert to e-mail or fax - I know we can go to the moon but!

Survivors 1 – Never forget what it's all about...

The Media are your friends - honestly. What's the point of being a good and kind caring organisation if nobody knows about it? Also it's a brilliant method of distributing basic information, comforting those not involved and directing others down the correct path into the humanitarian care program. So set up a media call centre. Have some press release templates ready, and be ready for a joint press conference with the airport and emergency services. Oh by the way having a TV or two in you Crisis command centre is a pretty good idea.

What are you going to do with the dead? You can't exactly pour them a nice cup of tea and tell them things will get better! Post air crash bodies tend to be just a trifle yuck! Sub contract out victim identification and body repatriation as quickly as possible. You may well have to explain to grieving relatives why identification takes so long but please do it gently. Sorry but your brother is in fifteen pieces is perhaps a little insensitive and DNA processing is a lot slower than on CSI!!

Finally write your plan. Keep it as short and as concise as your organisation will allow. Much to your surprise you will find your fellow managers are somewhat reticent about using their brains in an emergency. Where is my check list and what shall I do, you will hear them cry! The total abdication of their responsibilities as senior managers to you and whatever you have conjured up as a plan is a bit of a shock at first. Mind you, have they read your step by step guide to all things gruesome? Have they heck! In one exercise wash up a Director wrote the comment 'I had to use my day to day knowledge to complete my tasks' If I didn't need his skills base sure as hell he wouldn't have been there. Still all this allows you to boss the CEO around for a bit and fun like that doesn't come often!

Please Please Please persuade someone to keep running the airline whilst all this nastiness is going on. One aircraft down is a horror but the others have to be kept flying. You would be surprised how often this rather basic concept is forgotten.

Well if you have gotten this far then well done! How about a few anecdotes to finish on? How about the airline who forgot about a care giver, leaving her living with a family for six months? Or the airline crash where the survivors were nearly drowned in a nearby river by the rescuers (it pays to know which gears are forward and backward in a bus!). Or indeed the police who would not feed passengers stranded in a terminal for over nine hours because, you never know one of them may have been a terrorist!

Come to one of my lectures sometime and maybe I'll name names and expose the guilty. I'm sorry I haven't covered everything. Training, command and control, team selection, and crisis centres will have to wait for another day. The title of this piece of nonsense promised that you would not look a complete idiot in your new career. Drop some of the info mentioned in this article into your conversation and you're sure to be walking the walk and talking the talk. Enjoy the role, honestly it's the best job in the aviation, and I do hope we don't ever meet professionally!

TCAS II on Helicopters

by BALPA Flight Safety Department

The Helicopter Study Group explains why it's not fixed-wing aircraft that can benefit from traffic collision avoidance systems.

A traffic collision avoidance system (TCAS) II has been standard equipment on fixed-wing aircraft for many years and is justifiably regarded as a safety enhancement. Larger helicopters often operate IFR and until now have not been afforded the same protection as the general belief was that TCAS II would not work on helicopters as they were too slow and lacked the required climb performance.

FAA Initiative

A TCAS II is one implementation of the system that is generically known as an aircraft collision avoidance system (ACAS). It is a system designed to reduce the occurrence of a mid-air collision, by monitoring adjacent aircraft fitted with transponders and alerting the crew if certain thresholds are breached. The system is independent of air traffic control or other ground-based systems.

TCAS began as an FAA initiative and was developed from the 1950s to the 1970s. In the early 1980s the USA Congress issued a mandate for an aircraft collision avoidance system. The FAA developed the standards for TCAS for regulators via ICAO and for manufacturers via the Radio Technical Commission for Aeronautics (RTCA).

In an attempting to reduce the risk of collision, a number of manufacturers and operators fitted TCAS I.

A TCAS II system provides both traffic advisory (TA) information and resolution advisory (RA), the former being a warning to the crew of adjacent traffic, the latter being guidance on avoiding a collision by commanding a manoeuvre in the vertical plane. TCAS I systems currently fitted to some helicopters can only provide TA information.

In 2006, Bristow fitted a trial installation of TCAS II onto a Super Puma Mk1

TCAS II fitted to fixed-wing aircraft has proved to be a significant safety enhancement and TCAS II v 7.0 is now mandated in Europe for all public transport aircraft weighing more than 5.7 tonnes or carrying more than 19 passengers. Version 7.1 is in the process of being introduced.

Background

There was a general perception, supported by some in the Regulating Authorities that TCAS II would not work on helicopters and in fact could be detrimental to fixed-wing TCAS II systems. Some of the arguments raised were:

- TCAS II algorithms would not cope at low airspeeds (less than 100 knots).
- The main gearbox and rotors would degrade the TCAS II antenna patterns.
- Helicopters are incapable of meeting the RA profiles, in particular the requirements of a climb RA.
- If a large number of helicopters were operating in an area, this would increase the traffic density and possibly degrade the range of fixed wing TCAS II systems.
- Helicopter profiles, such as winching and underslung load work are incompatible with TCAS II.

The Problem

Helicopters, particularly those operating in support of oil and gas exploitation around the world, have been subjected to a large number of AIRPROX in recent years.This is due to the operating environment, normally in unregulated (class G) airspace with limited or non-existent radar services. In an attempt to reduce the risk of collision, a number of manufacturers and operators fitted TCAS I, as it was generally believed that TCAS II would not work on helicopters. Additionally, the operational regulations governing commercial air transport helicopters in Europe, JAR OPS 3, specifically stated that TCAS II would not work on helicopters. Unfortunately TCAS I systems mandate that the crew sight the intruder aircraft before

manoeuvring in accordance with the rules of the air and so are not suitable in IMC, at night or where the intruder comes from a blind arc, such as the rear.

AIRPROX Report 008/04 was a catalyst for a number of safety initiatives, including the investigation of fitting TCAS II to helicopters. In this case a Super Puma returning from an offshore installation came very close to colliding with a Tornado. The Tornado approached from the rear and so TCAS I would not have prevented the AIRPROX.

AIRPROX Report 154/06 showed the need for TCAS II even when operating under a radar service. In this case a Super Puma and Nimrod aircraft were only separated by 200 feet vertically when their radar returns merged on the radar screen. This AIRPROX occurred due to a breakdown in coordination between two ATC units which resulted in conflicting clearances being given to the two aircraft involved.

Trial Installation

After a feasibility study in 2006, Bristow Helicopters fitted a trial installation of TCAS II onto a Super Puma Mk1.

The TCAS II system monitors the airspace surrounding the aircraft by interrogating the transponders of other aircraft. Replies to the interrogation enable TCAS II to compute the following information:

- Range of intruding aircraft from own aircraft.
- Relative bearing to the intruder.
- Altitude and vertical speed of the intruder, if it is reporting altitude.
- Closing rate between the intruder and own aircraft.

Using this data, TCAS II predicts the time to, and the separation at, the intruder's closest point of approach. Should TCAS II predict that certain safe boundaries may be violated, it will issue a traffic advisory (TA) to alert the crew that closing traffic is in the vicinity.

If the intruder continues to approach, TCAS II will issue a resolution advisory (RA) to obtain or maintain safe vertical separation between your aircraft and the intruder. TCAS II bases the alarms on a five second crew reaction time to begin the separation manoeuvre: increase or reversal of an RA requires a reaction in two and a half seconds. Time to go to the closest point of approach is normally used to trigger TAs and RAs. When the closure rate is low or less predictable, a distance modulation function ensures an appropriate alert when certain range boundaries are crossed: this is why TCAS II can work on helicopters even if they have a slow closure rate.

Using this data, TCAS II predicts the time to, and the separation at, the intruder's closest point of approach.

The specification of TCAS ll requires that it provides reliable surveillance out to a range of 14 nautical miles, but longer ranges are usually provided in low traffic densities. For en-route airspace,the maximum intruder relative closing speed for TCAS II is 1,200 knots, which is ideal for protecting against even the most energetic military jets. TCAS II provides reliable aircraft collision warning in aircraft densities up to 24 transponder-equipped aircraft within five nautical miles of the TCAS II aircraft. With traffic densities greater than 0.3 aircraft per square nautical mile TCAS II provides protection from other aircraft having a closing speed up to 500 knots: with an aircraft density of 0.06 transponder-equipped aircraft per square nautical mile or less protection from relative closing speed up to 1,200 knots is provided.

"This installation of TCAS II brings the proven safety benefits enjoyed by fixed-wing aircraft to the rotary sector, further enhancing safety by significantly reducing the risk of airborne collision," says Denny Helgeson, Vice-President and General Manager, Business and Regional Systems for Rockwell Collins. "The safety and operational benefits this brings will be appreciated by all rotary wing operators, especially those operating in IFR/IMC situations. We look forward to working together with Bristow and Shell Aircraft to apply TCAS II capability to other helicopter types."

The next step

TCAS II has been operating successfully on the Super Puma Mk1 for a few years now. Other types will shortly be equipped with TCAS II, and manufacturers are looking at installing TCAS II during manufacture, in a similar way to EGPWS and other safety systems inherited from the fixed-wing world. So, it does work on helicopters after all!

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Leadership Skills of the Airline Captain

While the captain is generally recognized as the leader in an airline crew, the concept of leadership skills in an aviation context is poorly understood. Guest author **Katherine Senko** explains how captaincy training is an important part of all pilots' career development, but airlines differ in the approaches taken to meet this goal.

Leadership is about earning trust, setting a vision and applying boundaries. Image credit: Lufthansa/Martin Jehnichen.

A problem exists in that there are many different definitions of leadership. An even bigger problem is the failure to define captaincy as a set of trainable leadership behaviors. This article reviews the current understanding of leadership, describes work undertaken to develop a matrix of observable leadership skills and suggests training options for airlines when training pilots for the role of airline commander.

Skills

Regulatory guidelines loosely point to a leadership skill set. For example, both FAA and EU-OPS guidelines make reference to concepts such as authority and assertiveness, providing and maintaining standards, planning and coordinating and workload management. While these attributes will qualify one to be a safe and efficient captain they hardly establish a great leader. The question remains, what does the airline captain need in the way of leadership skills to successfully lead the crew to accomplish the mission?

A search of the academic literature found no specific study where pilots were asked about the skills of leadership: the perceptions of those active in the field were missing from published research. We set out to address this shortcoming. Questioning captains on leadership begins to build a foundation of expertise in the aviation leadership field.

To find out what makes one a great leader as opposed to just a good pilot, flight managers from five airlines provided a list of captains whom they considered exemplary leaders. Volunteers from this sample were interviewed. Characteristics such as stable, relaxed, confident, practical, outgoing, easy to get along with, natural, conscientious, realistic and spontaneous were all used to describe leadership. These attributes are similar to general leadership characteristics mentioned in descriptions of charismatic and transformational leaders. Social factors form the "character" of a person and are considered a core value of leadership. These social factors are important for airline captains, but as the captains expressed their leadership perceptions several other themes and skills emerged from the data. The results revealed five core areas: (a) communication, (b) teamwork, (c) knowledge, (d) self-awareness, and (e) leader as mentor.

Communication

The most widely mentioned leadership theme mentioned was not surprisingly, communication. Specific skills included ensuring clear and precise information is given and active listening is practiced. Verbal communication included asking for and receiving feedback. In addition to explaining procedures sharing information communication was used to foster a relationship, establish roles and to motivate the flight crew. Features of communication include tone, standard wording and style. The effective leader incorporates all aspects of communication altering tone and style when necessary.

The second strongest theme was teamwork. In this category "people skills" were mentioned repeatedly. People skills included willingness to accept information, having a non-judgmental outlook and openness to both information and critique. While these social skills facilitate a sense of ease and belonging to a team, heavy emphasis was placed on creating a team early in the flight process.

Literature differentiates between teams, a small number of people with complimentary skills and a common goal, and working groups, an assemblage of people with individual functions and no common goal. Although at times the captain and the rest of the flight crew do have independent duties and seemingly do not have a common goal. The flight attendants have the passenger duties; the first officer has specific seat duties. The leadership skill was to ensure all flight crew shares the common goal of a safe and efficient flight. The captains stated it is the commander's duty to set goals and communicate during the pre-flight briefing so all have a shared vision rather than allowing each crew to carry on their duties independently.

Knowledge

The third theme is categorized as knowledge. Obviously the captain should be knowledgeable. However, responses here indicate that technical, regulatory and systems knowledge is as important as the ability to use and apply that knowledge to different situations. The captains also said knowledge of company goals and visions were not adequately trained. Because company goals were not

clearly defined the captains' felt burdened by making incorrect decisions for the company For example, in a situation where a malfunction in the airplane leaves the pilot the choice of landing or continuing on with some discomfort to the passengers, the captain must know if the overall goal of the company is passenger service or cost savings. The observable skill here can be considered the broad actions necessary during flight deviations.

Self-awareness, or emotional intelligence, is ones' awareness of his or her behaviour on others. Interestingly, self-awareness in the airline captain is probably one of the most misunderstood or least acknowledged, yet was something all the captains interviewed mentioned. In addition to being aware of one's demeanor other attributes mentioned include confidence, having a"presence", enthusiasm, energetic, visionary and continuously focused on improvement. Also various leadership styles must be employed, so in training a little looking into oneself would be needed. Emotional intelligence is one way to describe this theme.

Specific skills falling under the self-awareness theme include, genuine concern for others, professional demeanor, flexibility, calm attitude, confidence and self-efficacy. While some may consider these descriptors and not skills, the pilots described the observable behaviors associated with each. Concern for others was described in all examples; putting the crew, the company, and the passengers before self shows it. Professional demeanor is how the captain carries him or herself, the appearance and bearing of the person. Flexibility permits a control change empowering the crew. Calm attitude helps manage situations and confidence assures others of knowledge and skill.

The skills of self-awareness are more subjective than other leadership skills. Concern for others and professional demeanor is difficult to pinpoint and express, and therefore they are difficult to set as objectives. Throughout the interviews stories of concern, demeanor, dress and behaviors were described a leader. The frequent occurrences of these stories stipulate inclusion in a leadership definition. The significance to leadership is that appearances and actions matter for the leader. All are watching the leader therefore one must look and act the role of leader.

Teaching

Finally all of the pilots interviewed mentioned how important it was to teach others. Advice repeated by several captains included "tell the first officer why you are doing something" and most mentioned they tell the FO to "take what you like about me and discard the rest; build yourself on the best of those around you". The captains mentioned that it was important to teach first officers and indicated that avoiding mentorshlp meant lessons would not be learned. Several times the captains cautioned that leadership behaviors were not taught in the classroom but only on the flight line.

When airline captains were asked what leadership training they have had throughout their flying careers, responses suggested leadership training is lacking. While they all admitted technical flight training was adequate or very good, most expressed a wish to have more meaningful crew resource management or human factors training. The pilots did not criticize training idly and most acknowledged the airline dilemma of limited resources. However, most still thought non-technical training could easily be incorporated into existing training methods and processes.

Leadership training is currently considered to be part of CRM or human factors but possibly needs to be incorporated in all parts of the training footprint. Developing leadership skills for the airline captain initially should involve defining an overall concept of leadership including the airline's mission. The theoretical aspects can be delivered in, for example, computer based training courses. The context of leadership is, however, more easily shown through demonstration and example. The information should then be discussed using case studies, accident report analysis and videos. Finally, practical application of leadership can be demonstrated through the simulator LOFT sessions.

When a pilot upgrades from the first officer to commander position, additional responsibility is incurred. Therefore additional preparation is needed. Leadership training should be incorporated into all aspects of the captaincy upgrade training. An ongoing assessment of real or simulated situations focuses awareness and fosters the emotional intelligence needed for leadership.

The findings from this study showed that airline captains consider leadership to be much more than establishing roles and communicating appropriately. The findings indicated that differentiating between assertiveness and aggression are not the only skills for effective leadership. A leadership definition more appropriate for aviation contains the nuances of dealing with the people, examining oneself, establishing goals and caring for the crew.

Captaincy training must contain the pilot practicing interacting with others and should include self-evaluations. Captaincy training should have the pilot establish and communicate flight goals and provide various examples of communication styles. Overall leadership is about earning trust, setting a vision and applying boundaries. It involves ensuring action, motivating and caring for others. These leadership skills can form the structure for better captaincy training throughout the airline industry.

About the Author

Dr. Katherine Senko has specialized in aviation training for over ten years. She specializes in instructional design. She holds a masters degree in education and a doctorate in leadership. Dr. Senko has worked with several aviation companies throughout the world auditing and designing training programs for pilots, maintenance technicians, flight attendants and gate agents. She is based in the United States.

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Atlantic crossing

by Captain Dirk Böhme, FFSO

Quite a number of us have crossed the Atlantic as operating flight crew a few times now.

Usually it all seems to be rather straight forward, although there are a few traps lurking in the background. Checking, cross-checking, double-checking, and re-checking is the motto of each flight, but mistakes will of course always be a possibility - we're only human after all. This article will discuss some points about Trans Atlantic crossing, namely Gross Navigational Errors (GNEs), Large Height Deviations (LHDs) and Strategic Lateral Offset Procedures (SLOP).

Gross navigational errors

The ICAO definition of a GNE is A Gross Navigation Error with a lateral deviation of 25nm or greater from cleared route.

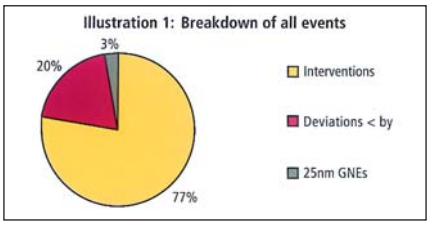
In our day and age of safety as much data as possible is being collected, shared, analysed and presented in pretty graphs of real and statistical value. Same with GNEs; when a position report –either CPDLC or voicecontaining a future position differs from the flight profile held, the appropriate report is submitted.

There are three different kinds of reports: a 'GNE' report will be filed when an aircraft has actually deviated more than 25nm from its cleared track; an 'Intervention to Prevent a GNE' report when the error was picked up in time and corrected before any off-track situation was allowed to develop; and 'Another' report will be filed for actual lateral deviations of less than 25miles.

Who is collecting then? There are 2 key information sources

- STAR-The NATS internal reporting system (Safety tracking and regulation)
- NATCMA-The CMA, the Central Monitoring Agency, analyses incident data NAT-wide (NY, Santa Maria, Reykjavik, Gander and Bodo). The CMA is part of ICAO.

In 2009 STAR recorded a total of 68 events ***(Illustration 1)*** which is an improvement on the previous year where there were 73 events (NATCMA had 97 events in the same period). November for example -the worst month last year- had 11 Shanwick interventions to prevent GNE/Lat deviations, and 2 Lateral deviations of less than 25nm. No trend is attributable to this however.



Of the westbound events 50% were actual lateral deviations (14 Lateral deviations /14 interventions/2 GNE's), eastbound there were very few actual deviations and no GNEs. The majority of events were ATC interventions which did not develop into a deviation as time factor allows for Controller to act upon receipt of any erroneous position report received. By the way, CPDLC reporting accuracy is not affected by the Strategic Lateral Offset Procedure (SLOP); the waypoints are reported as entered into the FMC, not the 1 or 2 mile abeam position. Or in other words CPDLC does not report the offset as a deviation, but because it reports the next position you are going to as per the FMC, ATC can detect when you are deviating or are about to deviate. More about SLOP later.

Crew navigational errors are predominantly located at the eastern landfall and boundary position. RESNO seems to be a 'popular' one and gets mentioned in 14% of events; Human factors might play a role there as those eastbound re-routes take place in the early hours of the morning, and it is a busy exit point. The area south of SOMAX is another hotspot: approximately half of all GNEs/ Interventions occur there. An explanation might be that it is the interface between Santa Maria, Madrid and Brest which requires many re-routes for traffic to fit.

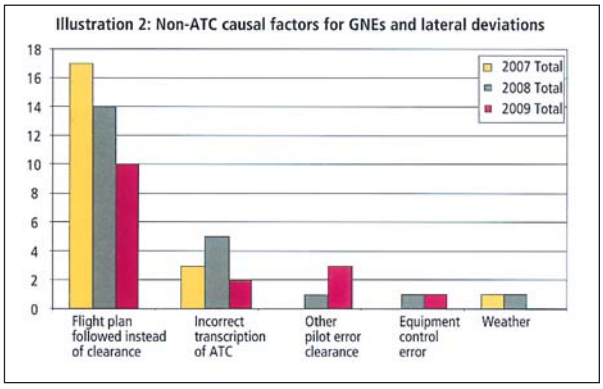
Illustration 2 shows a breakdown of some of the most common pilot causes for GNEs.

Where are we (as in 'You' and 'I') most likely to commit mistakes? As there is no definite answer to this question the way forward is to try and avoid them- stick to SOPs religiously especially when it comes to re-clearances and re-routes. CPDLC is a brilliant tool in this respect as well. With its automated position reporting potential errors can be picked up, queried and corrected a long way before you would head towards a wrongly entered lat/long position. You'd still make it into the statistics, but luckily only the 'Intervention to prevent a GNE' one.

Large height deviations

A large height deviation is an altitude deviation of 300 ft or more from the cleared level.

Although some Oceanic LHDs are included in the existing level bust statistics they are not exactly handled the same way, e.g. aircraft entering Shanwick at an incorrect flight level will be recorded as a LHD but not a level bust. Similarly aircraft that are at an unexpected or an uncleared level in Shanwick will be included in the LHD data but may not be included in the level bust data as the aircraft has not technically bust its level.



Q: Where does the Shanwick Oceanic Clearance begin?

A: At the Shanwick OCA boundary (entry) point.

Q: Where does the Oceanic clearance end for an eastbound flight?

A: Eastbound flights are cleared to landfall position (not to a Shanwick eastern boundary point, unless Shannon re-route on 1st contact).

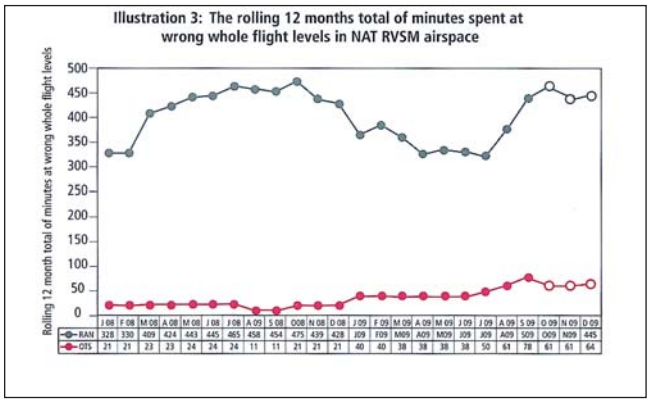


Illustration 3 compares the total minutes aircraft spent at wrong whole flight levels. The blue curve represents random tracks, the red one OTS. Data collected was from a similar number of aircraft on the Organized Track as for the Random Track System (as random tracks are 24 hours where NAT tracks have a set validity time). The rolling total from May 08 to May 09 was 335 minutes to 38 minutes. This means that we are more than 10 times more likely to fly at a wrong level on a random route than on an OTS one! And because we are operating on random routes only we are subjected to a greater risk of being involved in a LHD.

According to NATS these are mainly ATC errors as random flights require more level co-ordination compared to OTS flights (especially concerning Oceanic interface with Brest airspace and Madrid). These are often 'sandwiched' together at a higher density with less opportunity for climbs.

Causal Factors identified are:

- ATC Coordination errors (System/Human)
- Crew misinterpretation of clearance (System/Human)
- Contingency manoeuvres (Emergencies and MET)

How can flight crew help reduce the LHD risk

Before entering Shanwick OCA from a domestic agency

- Ensure you are in receipt of an Oceanic Clearance
- Ensure the Oceanic Clearance Flight Level is being maintained prior to OCA entry
- If unable to reach Oceanic Cleared Flight Level prior to entering Shanwick advise domestic agency as soon as possible and make a new request for an Oceanic Clearance.
- Request for Ocean clearance to be made between 30 and 90 minutes from the OCA boundary
- If in receipt of an Ocean clearance, however have not been given clearance to climb to the cleared oceanic level -Advise Domestic agency (in good time... at least 5 minutes prior to Boundary). This will act as a safety net... the domestic controller may have failed to issue the level expected by or hold different details than Shanwick.
- **Never** enter the OCA at a level other than the Oceanic cleared level.

INFO POINT
15Wests

Some clearances include a 15West position, which predominantly affects the latitudes 48-45N.

For example two flights –BEDRA to 49N02OW and ETIKI TO 48n020W – are not laterally seperated unless a 015W position is included.

HOW WOULD YOU INTERPRET THE FOLLOWING CLEARANCE?

1129 FANS CPDLC \\WILCO – DHK919 – CLIMB TO REACH (F390) BY REPORT LEVEL (F390)

Flight DHK919 has been cleared to climb to FL390, at pilot's discretion, to be level before it reaches 20 West. The flight can commence its climb clearance immediately upon acknowledgement (WILCO). Alternatively the pilots can elect to delay the climb so long as the cleared level FL390 is attained before reaching 20 WEST. And this might be yet another trap; in case due to aircraft performance it is not possible to climb to FL390 straight away upon receipt of the climb clearance, pilots must have something in place to remind themselves of this clearance for when they are able to climb. Possibilities are the /FL390S entry against the appropriate line on the LEGS Page, or a time entry in the FIX page.

Controllers expect acknowledgement of a CPDLC clearance within five minutes of receipt, and for the flight to initiate its manoeuvre so that the clearance limit is complied with.

Illustration 4: Use of SLOP by all ADS reporting aircraft in NAT for April – June 2010

Total traffic	% Centreline	%1NM Offset	% 2NM Offset	%Other	%Left
32535	52.6%	32.3%	14.8%	0.0%	0.2%

How SLOPPY are you?

The Strategic Lateral Offset Procedure (SLOP) allows pilots to fly centreline or 1NM or 2NM to the right of the centreline within North Atlantic (NAT) Oceanic boundaries without informing ATC. It is designed to be a standard operating procedure specifically used to spread aircraft out laterally about their tracks, in order to minimise the chance of collision given an operational error or contingency procedure (wake turbulence avoidance plays a role as well). SLOP may be used by aircraft capable of being programmed with automatic offsets and applies to both OTS and non-OTS flights.

To calculate SLOP usage at mid-ocean waypoints (30°W) the reports at 20°W, 30°W and 40°W are linked in order that the latitude changes before/after 30°W can be taken into account and thus offsets classified using thresholds applied to aircraft with the same latitude changes. For example, one would expect that aircraft with zero latitude change between 20°W and 40°W would pass directly over the intended 30°W waypoint, but aircraft with large lateral changes between waypoints are legitimately seen further from the waypoint.

On behalf of the ICAO NAT Mathematicians' Working Group, the UK regularly analyse the proportion of ADS-equipped aircraft using SLOP since its introduction in 2004.

The use of lateral offsets in mid-ocean by ADS-reporting aircraft has improved steadily, with around 47% of these aircraft now choosing to fly to the right of track centreline **(Illustrations 4&5)**.

If aircraft were to be distributed evenly across the three offset options, this would achieve the optimal reduction in the probability that two aircraft which are on the same track are in lateral overlap; a further increase in routine SLOP usage is needed to derive the optimal safety benefit.

Illustration 5: SLOP usage for ADS equipped NAT aircraft since 2005

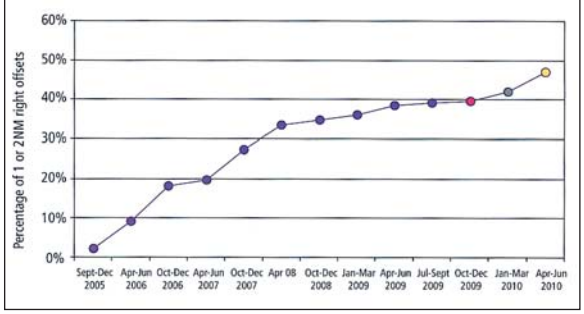
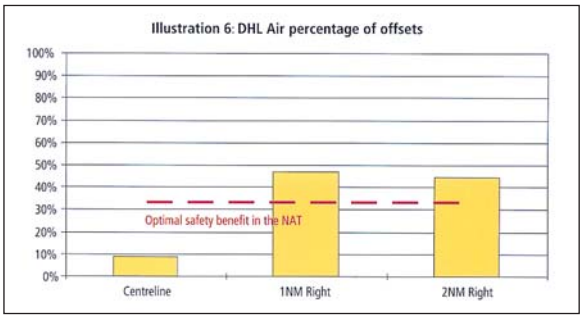


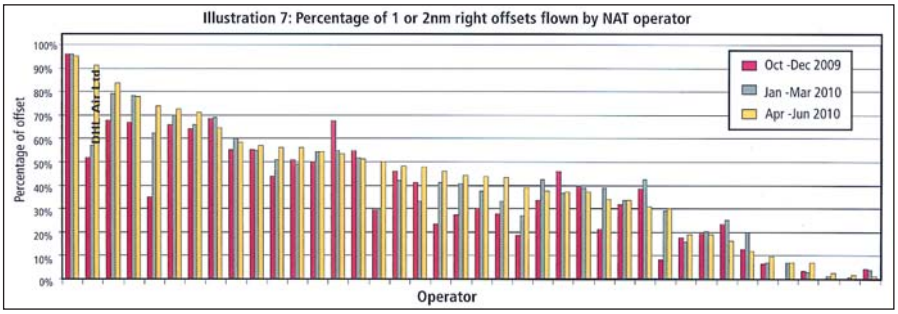
Illustration 6: DHL Air percentage of offsets



An important feature of SLOP is that the offset is chosen so as to randomise the offsets across the NAT population.

Data is taken from the Oceanic Gateway system which contains non-rounded current and predicted next positions of ADS aircraft (e.g. 5458.1N, 2958.6W).

Illustration 7: Percentage of 1 or 2nm right offsets flown by NAT operator



But now, towards the end of this article, it gets interesting yet again - how does DHL score?

Compared to our past performance where more than 50% of flights remained on the centreline this has reduced to 9% during the period April/June 2010, with 47% 1nm and 44% 2nm right of centreline; an excellent SOP compliance and welcome trend!

Illustration 7 compares us to our fellow crossers. Our compliance has increased from just over 50% at the end of last year to over 90% by the end of June in the SLOP statistics, placing us number 2 in the overall rating!

Although crossing the Atlantic does seem rather straight forward during most of the times, there are traps mainly in the form of Gross Navigational Errors, Large Height Deviations a incorrect SLOP procedures, and it is not that difficult to fall victim to any of them. Although we are frequently tired especially on the westbound sectors, try to stay alert and, most of all, stick to the SOPs which are in place to guard you against those potentials.

As always, happy and safe flying!

Reprinted with kind permission of DHL Safety Digest Autumn/Winter 2010

Safety and Service: Cabin Crew Training Priorities

Saying the right words in the right manner is one of the most important skills a flight attendant must have. The safety onboard the aircraft can depend upon it. Guest Author **Terence Gerighty** explains.

The professional training of cabin crew/flight attendants is dominated by the priority of safety at all costs, and the high standards of service and communication skills are inter-dependent on safety procedures. Proficiency in using English for cabin crew must reflect this strong priority. ICAO has established a testing and certification process for all pilots and air traffic controllers because of safety concerns in international travel. Nothing less should be demanded of cabin crew.

The Hudson River incident - among many others - showed the real priorities for cabin crew training. The three flight attendants onboard had less than four minutes to seize the urgency, hold the attention of the passengers, dictate action, execute it, and ensure a safe evacuation as the plane landed on water.

Too often the public perception of 'the best' depends on the uniform, the smile and the ready and friendly manners of flight attendants. In fact, they are there to ensure passenger safety and to care for the general wellbeing of all inside that pressurised metal tube travelling at 39,000 ft. That's why Crew Resource Management (CRM) has become so important. It's all about ensuring smoother communication between crews on board, improving the efficiency of care, sharpening leadership and decision-making under pressure and establishing crews as the safety professionals of the skies.

Standards

Service standards of the highest quality are a must, but should never be at the expense of safety. They are clearly important, but passenger security should be uppermost in dictating a safety culture on all flights. Welcoming passengers on board, hitting the right note between insisting on regulations and helping people relax in an often stressful environment calls for careful training to say the right word in the right way.

Airlines have shown lots of ingenuity to get passengers attention throughout the pre-takeoff safety instructions. Image credit: WizzAir

The topic of the size of hand baggage and storing it in the smallish overhead lockers (especially on short haul 737s) is a perfect example. Safety dictates that bags must be in the lockers or underneath the seat in front of the passenger. Both are often impossible and the flight attendant is in the middle, wanting to help but aware of the safety implications.

What the flight attendant says and how it is said can make the difference between aggression and resentment at these stressful moments in the boarding process. 'Let me help you', 'Could you put it here', 'Let's try putting it this way' rather than 'You can't do that' or 'It's far too big, we can't accept it'

It's the same with the pre-takeoff safety instructions. This is the key announcement of the whole flight and airlines have shown lots of ingenuity to get passengers attention throughout what is a long list of safety guidelines. Sometimes it's a video presentation, sometimes a straightforward PA announcement with flight attendants demonstrating exits, floor level lighting, life vests and masks, and sometimes it can even be a zany, rap-style show, anything to get the passengers' attention. But we still have to ask - are passengers aware of the safety culture on board? Are they aware that all those nagging checks and controls and more checks again carried out by the cabin crew (fasten your seatbelt, tray table up please, armrest down, bags in the lockers, nothing on the floor and so on) are all in the interests of the safety of everyone?

Why don't airlines make an announcement something like this to start with:

"Ladies and Gentlemen, this is most important. Please listen carefully Yes, stop talking or reading (Pause Thank you. We, the cabin crew, are here for your safety and all we tell you now is for that reason. We will certainly check and double check things from time to time during the flight. Please understand, this is for your safety."

This will help to create a culture of safety among the travelling public which seems to be lacking. How many know where the nearest exit is in case of an emergency? Do

we really know how to put on a life vest? Do we even know where it is? And what about the oxygen mask? How many know how to release the flow of oxygen? In fact, how many read the all-important safety instructions card in the pocket in front of every passenger?

Communication

Cabin crew training for safety is known as excellent, right down to sliding into cold water and swimming to dinghies to practise ditching. Flight attendants can even expect to be asked questions about safety features in pre-flight briefing and when they are seated, strapped, and waiting for take-off, landing or during turbulence, they are advised to 'think safety', what first actions to take in an emergency, etc. What is perhaps not so excellent are their skills in communicating to passengers the importance and urgency of safety features onboard, and the challenge for many is doing this in English.

Communicating on international flights where English is the dominant language (even though multi-lingual cabin crew is increasingly the norm) is also considered a must. Yet the language is codified, stereotyped, an amalgam of set phrases and expressions. Or is it?

What happens when there is a medical crisis, excessive turbulence, a violent obnoxious drunk, sudden decompression or lots of other minor events calling for the ability to simply say the right thing - always with the wellbeing and safety of everyone in mind. Everything that happens onboard impinges on safety. Safety is the controlling factor at every level of training and if communicating in English is so important, it is because it is linked inextricably to safety factors relating to the general good. 'You can't do that', 'you have to', 'you must', 'not now' are not intended to spoil life onboard, but fit into the overall perspective of ensuring safety.

But above all, it's the ability of cabin crew to deliver those instructions and crisp commands spoken in safety related moments:

- During turbulence: remain seated please, sorry, you'll have to wait
- With disruptive passengers: stop now, don't shout, sit down and calm down, enough
- During a serious medical incident: sit down please, make room, help me lie him down
- During a decompression: pull down the oxygen mask, put it over your nose and mouth
- In the last 10 minutes before normal landing: sorry, not now, wait till we land
- In an emergency landing: stay in your seats, remain calm, get ready for Brace position, leave everything

These are all potentially key safety moments when crew communication should be clear and unambiguous, when firm orders must be delivered without aggression with everyone's safety in mind.

There are plenty more occasions where flight attendants need to use simple, clear English:

- Settling people in the flight: Is everything alright? Don't worry, you'll be fine
- Dealing with passenger problems: Leave it with me, I'll get one for you, I'll see to it
- Demonstrating: This is how it works, first you... then... is that OK?
- Treating sickness: Are you feeling dizzy? Where's the pain? Are you on mediation?
- Saying sorry: I do apologise, I'm afraid not, sorry about that, I'm really sorry
- Handling complaints: I do understand, You're quite right, What can I do to help?
- Serving meals: Here you are, Bon appetite, What would you like to drink?

It is doubtless true that cabin crew training is also concerned with teamwork skills and passenger behavioural patterns, but in the face to face world of passenger contact there is no area of such importance as saying the right word in the right manner - all within the general culture of safety onboard. This is the key to the cabin crew / passenger rapport which all airlines are seeking to establish. It guarantees good relations and ensures the correct climate and awareness of the importance of safety onboard.

About the Author

Terence Gerighty, author of 'English for Cabin Crew' (Cengage), co-author of 'English for Aviation' (OUP).

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Jet fuel contamination with FAME (Fatty Acid Methyl Ester) – World jet fuel supply

by Marie Froment, Fuel Systems Engineer, Airbus Customer Services Engineering

This article explains the impact of FAME contamination in jet fuel, the on-going studies for aircraft clearance with higher levels of FAME concentration and the operational recommendations. FAME fuels are manufactured from biomass and have properties that are similar to petroleum diesel. This fuel makes a good fuel for road transportation means but is not appropriate for air transport, due to lower energy content and higher freezing point.

For a few years, the awareness of the human impact on climate change and ways to reduce it, have been identified. One of the key areas being pointed at is the use of fossil fuel-based energy sources. This, added to the global increase of fuel prices and the threat of oil depletion has led a drive to develop and use alternate fuels in the transport industry. Worldwide, governments are regulating the introduction of bio-fuel components in ground transportation fuels. For example, Europe has mandated that automotive diesel must include a 5% bio-fuel component (Directive 2003/30/EC). Similarly, in the U.S.A., bio-diesel use has been increasing (following Energy Policy Act of 2005). The bio-fuel component usually added to diesel fuels are Fatty Acid Methyl Esters (FAME).

What are the bio-fuel components?

The term 'bio-fuel' is used for any fuel derived from a biomass source through a conversion process which can be biological, thermal, chemical, or a combination of these, to form one or more products. The most common bio-fuel components currently available in the transport industry are: Bioethanol, bio-diesel from transesterification of vegetable oils and fats, and bio-gas from anaerobic digestion.

The bio-fuel component, Fatty Acid Methyl Ester (FAME), is manufactured using a chemical process called transesterification.

This reaction for bio-diesel component production is shown in figure 1. In this reaction, one molecule of oil or fat reacts with three molecules of a low carbon number alcohol in the presence of a base catalyst. Three molecules of fatty acid esters and one molecule of glycerine are produced. The low carbon number alcohol is usually methanol, but can also be ethanol or higher alcohols. The 'R' represents the fatty acid carbon chains associated with the natural oil or fat.

Manufacturers have the methanol react with an oil (triglyceride) such as vegetable oil (typically derived from sunflower or rapeseed oil), animal fat or used cooking oil to produce FAME and glycerol. The final properties are similar to petroleum diesel, which makes them good alternate fuels for road transport.

The blends (mixture) are commonly referred to as 'Bx' where 'x' designates the volume percentage of FAME. As an example, B5 contains 5% FAME and B10 contains 10% FAME.

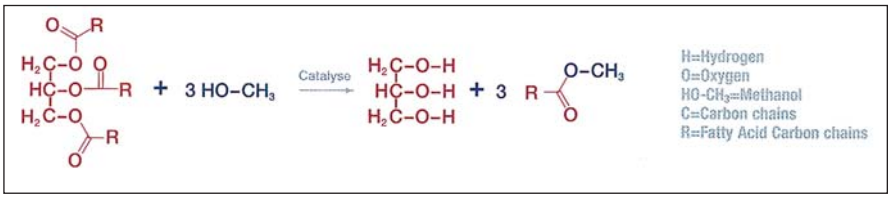

Figure 1: Example of the FAME manufacturing process by transesterification

Rapeseed

Sunflower

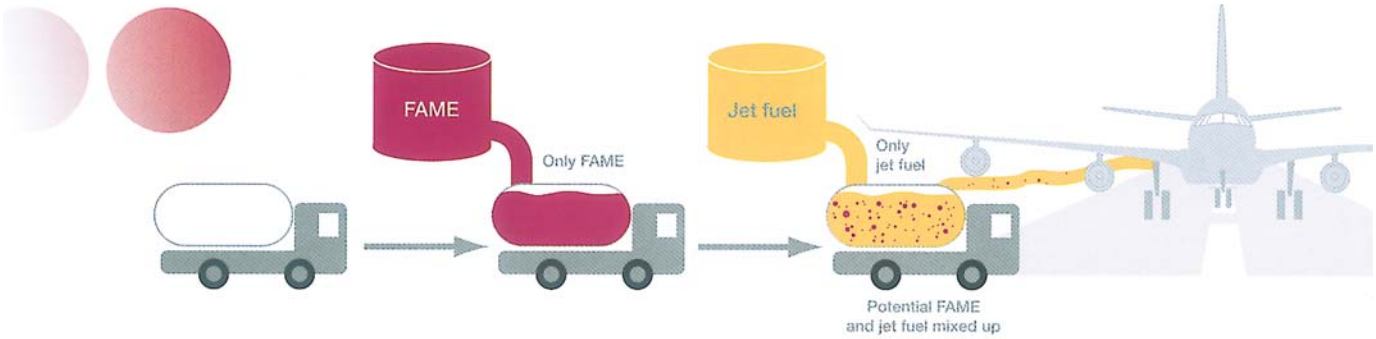

Figure 2: Multi-product transportation

Notes
In organic chemistry, **transesterification** is the process of exchanging the organic group R" of an ester with the organic group R' of an alcohol. These reactions are often catalysed by the addition of an acid or base catalyst.

Worldwide, multi-product supply systems such as pipelines, trucks, trains and ships often transport different grades of fuels and fluids, using protective measures that are designed to minimize cross-contamination. However, as FAME has the property to 'stick' to surfaces, small traces of FAME can be found in jet fuel; this contamination having been picked up by the jet fuel when following a batch of fuel containing FAME in the same transport system. There is also the possibility of carry-over of bio-blended-diesel (containing FAME) at the product interfaces, which occur in multi-product pipelines (refer to figure 2) which can then lead to jet fuel (JET A1) contaminated with FAME.

The most common bio-fuel types, currently in use in road transport, are not suitable for use as aviation fuels because they do not meet jet fuel specification requirements (e.g. freezing point, thermal stability, etc.)

The current situation for air transport

In response to concerns about FAME contamination of jet fuel and the possibility of airport supplies becoming contaminated, both, EASA (SIB N°2009-1) and FAA (SAIB NE-09-25) have issued information bulletins on this issue.

Operators have been informed about the potential issue of jet aviation fuel being contaminated by FAME and that limited FAME contamination of airport fuel supplies has occurred.

FAME (from bio-blended-diesels) in jet fuel can have the following issues which are of concern for aircraft operations:

- Corrosion - formic and acetic acids, glycerine, water and methanol can be present,
- Cracking or softening of Elastomer seals,
- Presence of alkaline earth metals with an effect on engine components,
- High freezing point (freezing at -5C),
- Thermal stability polymerisation can occur, leading to a filter blockage.

To minimize the potential impact of FAME contamination on jet fuel supply, the global jet fuel specification Defstan 91-91 was amended to permit up to 5mg/kg (5ppm - parts per million) of FAME content, being the lowest detection limit of current measurement methods (refer to the 'FAME current existing measurement methods' paragraph). For example, one litre of B5 in 10,000 litres of jet fuel renders the jet fuel 'unfit for use'.

As the use of bio-fuel components increases, the current level of 5ppm will be difficult to manage. Consequently, if contaminated fuel (above 5ppm) is detected on an aircraft, then at the present time operators have to defuel, then refuel the aircraft, to ensure no FAME contamination of aircraft systems. As a result of this risk, engine, APU (Auxiliary Power Unit) and aircraft manufacturers, have agreed that up to 30ppm, FAME contamination may be permitted, subject to stringent limitations. There is a limitation allowing two subsequent fuel uplifts reaching up to 30ppm (operation with two refuels allowed at airframe level). After these two fuel uplifts, then the fuel on-board will have to be below 5ppm of FAME.

Current testing with FAME in aviation jet fuels

A specific programme has been put in place in order to provide emergency clearance of 100ppm contamination of FAME in jet fuel. This programme is led by the Energy Institute and is sponsored by airframe, engine manufacturers,

oil companies, pipeline companies, government ministries, bio-fuel producers and military agencies. The aim is to perform and analyze all the testing requirements in order to confirm the compatibility in terms of the specification of jet fuel with FAME contamination up to 100ppm.

For example, an engine endurance test has started at the beginning of September 2009 and has completed several hundred cycles. It is expected that the testing will be analysed by the middle of 2010.

No significant differences at 100 and 400ppm levels have been noticed in the fuel freezing point with either the manual freezing point method (ASTM D2386) or any of the automatic methods.

Similar results have been noted regarding the effect on the water solubility properties.

The testing showed no incompatibility problems between FAME and approved biocides or additives (such as anti-icing).

The influence of FAME on microbiological contamination development (refer to FAST 38) has also been studied. The impact linked to concentration (increased up to 400ppm) have been tested and preliminary conclusions show it does not have a significant impact to any additional microbiological development.

The programme includes the FAME material compatibility with an exhaustive list of materials.

The results of this testing will determine the clearance of 100ppm due to the impact of FAME on aircraft systems. If any results are not suitable, maintenance plans would need to be introduced, or other contingency measures taken, on a material by material basis.

Testing results should be available by the end of 2010.

Notes

Due to effects on exposure of the engines and APUs to high FAME concentration, further recommendations, as provided by the appropriate engine and APU manufacturer, will also need to be applied to allow the aircraft operation.

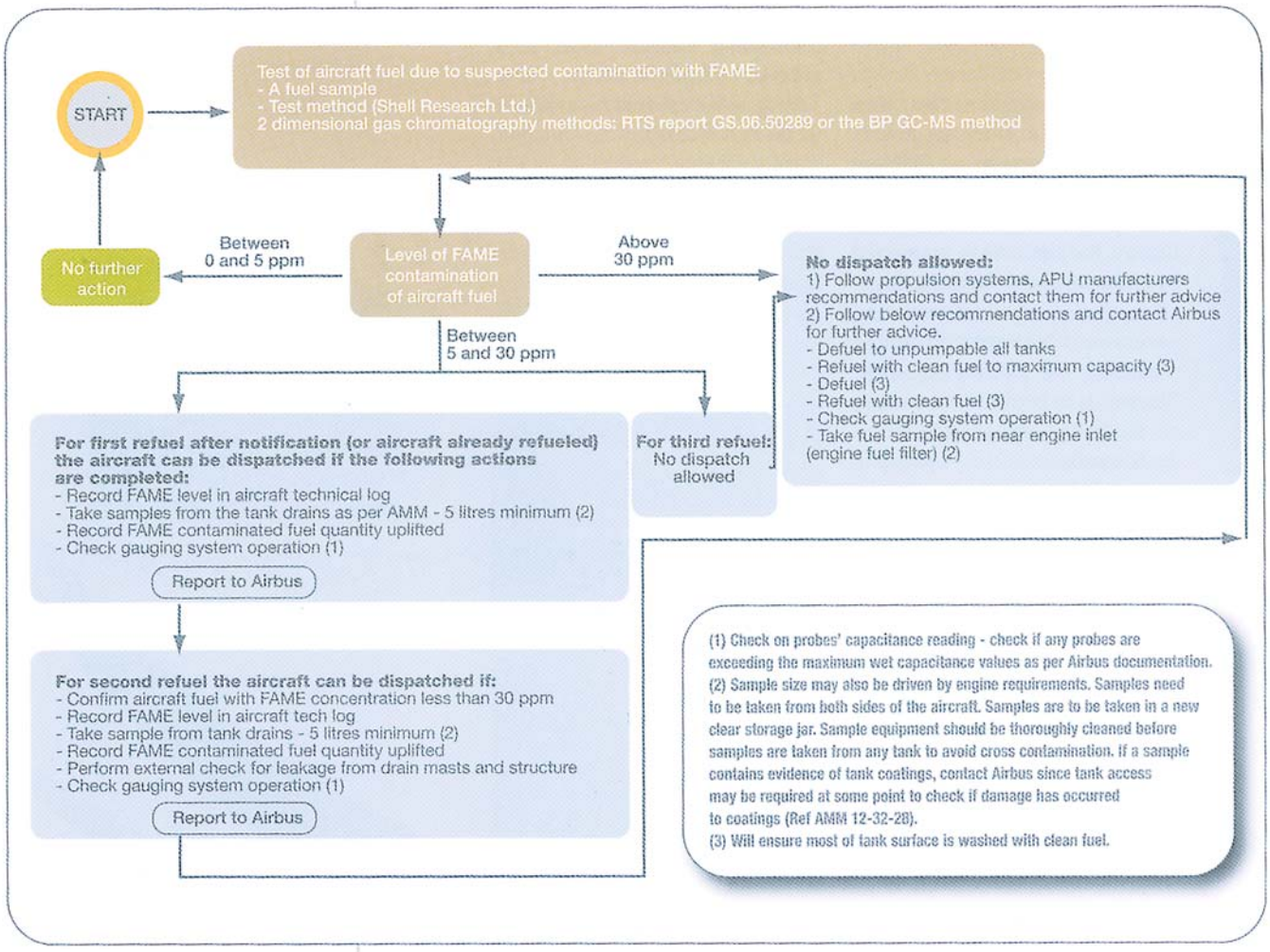

Figure 3

Notes

ASTM International is the industry organisation that defines the consensus on fuels. ASTM standards are the minimum accepted values for properties of the fuel.

AIRBUS recommendations in case of jet fuel contamination when FAME is detected

In the event of a fuel uplift of jet fuel, where FAME contamination with a concentration higher than 5ppm is detected (refer to paragraph 'Current testing with FAME in aviation jet fuels'), then it is advised that Airbus be contacted for further dispatch.

The dispatch limitations detailed below and the test requirements are still being refined and reviewed as further data becomes available from industry testing.

Operation with aircraft fuel contamination levels up to 30ppm is allowed at airframe level for up to two refuels but would require:

- Samples of fuel to be taken in the aircraft tanks (sample volume in the order of 5 litres)
- Confirmation of gauging system operation (due to potential deposits on the probes) by verifying the max wet capacitance values (confirmation of correct gauging),
- Lack of external fuel leaks.

After the two refuels, if the aircraft fuel is contaminated with FAME above 5ppm, the aircraft would then have to be defueled down to 'unpumpable' before refuelling.

If uplifted fuel still contains more than 30ppm FAME, then no dispatch will be accepted and the tanks must be flushed by defuel/refuel operations. This may involve more than one defuel/refuel cycle, before the dispatch will be allowed **(refer to figure 3)**.

FAME current existing measurement methods

One of the current difficulties encountered, linked to the 5ppm limitation, is the ability to test for the presence of FAME at this level. Since 5ppm is barely detectable, only very sophisticated laboratory instruments are able to detect such levels.

A specially configured gas chromatograph (GC-MS method) is currently used as one of the industry accepted methods for detection. The development of this test method was coordinated by the Energy Institute, however, it is a difficult and expensive process and there are only a few laboratories in the world which are able to run this analysis.

One part of the programme, being led by the Energy Institute, is to develop a rapid detection method that can be used in the field. One method, under study, is based upon the Fourier Transform Infra-Red (FTIR) technology and might become an adapted method which could be adopted if a higher FAME limit is introduced.

Globally, there are four means of testing under development (GCMS, SPE-FTIR, SPE-NMR and HPLC) to meet the objective to have rapid and portable means of testing.

Information test methods under development

- GC-MS method IP PM-DY/09: selective ion monitoring/scan detection method - precision at 5 mg/kg (5ppm)
- Flow analysis-FTIR rapid screening method IP PM-DT/09: Flow analysis by Fourier Transform Infra-Red spectroscopy method - precision down to 20 mg/kg (20ppm)
- HPLC-ELSD method IP PM-DV/09: HPLC Evaporative light scattering detector method
- SPE-GC method IP PM-EC/09: Solid phase extraction and gas chromatography method

Information

Laboratories carrying out the GC-MS method IP PM-DY/O9 test: for FAME down to 5ppm level

- Intertek - Sunbury (UK)
- Intertek - Thurrock (UK)
- Intertek - Antwerp (Belgium)
- Intertek - Le Havre (France) Intertek - Sydney (Australia)
- Intertek - Singapore (Singapore) SGS - Rotterdam (Netherlands)
- SGS - Le Havre (France)
- SGS - Lavera (France)
- Petrolab - Speyer (Germany)

Conclusion

Due to the increase in the potential of FAME contamination occurring in jet fuel, above the currently allowable limit of 5ppm, Airbus is actively supporting the industry work on several aspects to minimize the potential impact of higher levels of FAME contamination.

Areas of research include the increase of the clearance levels up to 100ppm, the development of a quick means of field testing to determine the levels of FAME contamination and operational recommendations in the event of uplift of jet fuel contaminated with FAME. Updates and findings of the research are documented (Airbus SIL 28-091) and it is expected that additional recommendations will be available by the beginning of 2011.

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