InterPilot

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Airbus Extravaganza : A350 update, ROP/ROW & BTW & AP/FD TCAS reviewed

Fuel & Airmanship

July - August 2009

Airbus A350XWB Update

Gideon Ewers reports from Toulouse

At the end of May, an IFALPA delegation was invited to join Airbus in Toulouse for an update on the A350XWB programme. The group also had the opportunity fly demonstrations of the company's Runway Overrun Protection/Brake To Vacate and Auto Pilot/Flight Director based TCAS on the A380 test bed (see the articles *"A major contribution to air safety"* and "*AP /FD TCAS: reduced stress RA reaction*" in this edition).

The primary focus of the A350XWB briefing was to give an update on the technical side of the aircraft as well as get feedback on the human ergonomics side of the equation, for example in crew rest areas. The programme opened with an overview of the development principles of the A350 as well as a briefing on progress of the type's development. To begin with, let's look at the programme's development in the commercial sense. The first upgrade of the A330 range was announced during 2005 when Airbus revealed its plans for the original A350. The initial proposal, however, had a lukewarm reception from the industry which felt that, compared with the competing 787, the A350 offered little improvement. Airbus took onboard these comments and went back to the drawing board to reconsider the A350 returning in 2007 with the A350XWB proposal. The upgraded aircraft called for a fuselage which is wider than the competing 787 by 30cm and a significant 33 cm wider than the A330/340 family. The XWB will also feature increased use of composites. The A350XWB programme is centred on three models the -800, -900 and -1000 the first of which the -900 is due to enter service with Etihad in 2014. This will be followed by the -1000 stretch and then finally the longer range -800. There are also plans for a freighter version and a very long range version of the -900 is also under consideration. The company's willingness to re-think the aircraft has been rewarded with just under 500 firm orders (as of June 2009).

Design philosophy

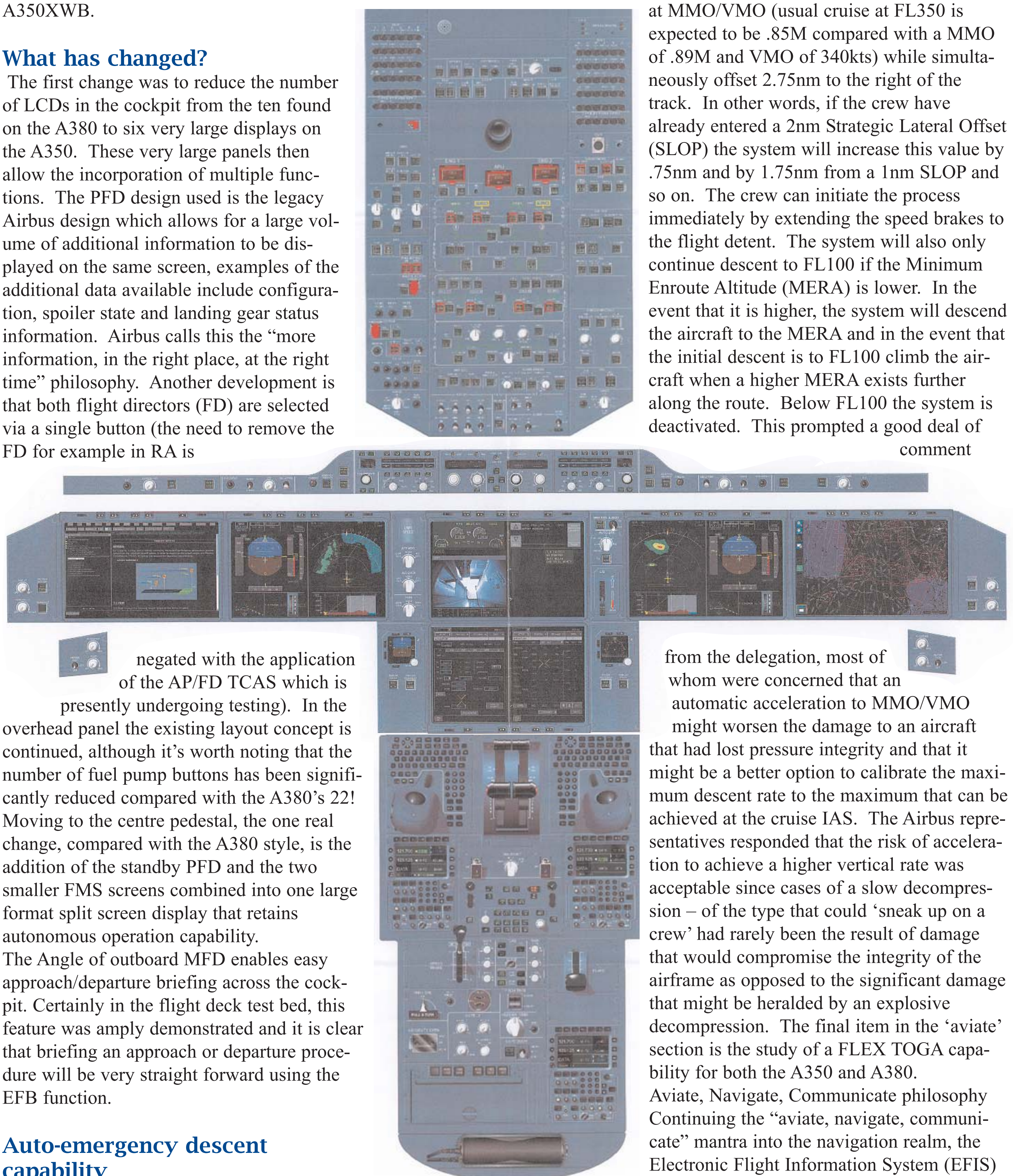
According to Capt. Guy Magrin, lead test pilot on the A350XWB, the main challenge facing the designers has been how to integrate advances in avionics into the cockpit of the new aircraft while maintaining the high commonality of the Airbus cross-crew qualification philosophy on the fly by wire family (FBW). The natural place to start, therefore, was the cockpit of the A380 and then to take into account any advances that have been developed since that flight deck concept was frozen. So what hasn't changed from earlier aircraft? The side stick, rudder pedal configuration that is common with all Airbus FBW aircraft remains as does the thrust lever use concept. The flight control architecture of the A380 is retained – for example, rudder inputs near to the ground are interpreted by the aircraft as crab or de-crab demands and so no differential roll input is required. The standby instrumentation is based on the design first introduced on the A340-600 and retained for the A380 although the siteing of the standby PFD – on the centre pedestal rather than the main panel - attracted comment from many in the IFALPA delegation with a number of alternatives being proposed, including a flip-down from the glareshield. Likewise, the data used for engine power is the ACUTE system first installed on the A380 which expresses

	A350-800	A350-900	A350-1000
Specifications			
Length	60.7 m (199 ft)	67 m (220 ft)	74 m (240 ft)
Wingspan	64.8 m (213 ft)		
Wing area	443 m2 (4,770 sq ft)		
Wing sweepback	31.9°		
Height	16.9 m (55 ft)		
Fuselage width	5.96 m (19.6 ft)		
Cabin width	5.59 m (18.3 ft)		
Maximum takeoff weight	248T(547,000lb)	268T (590,839lb)	298T (656,978lb)
Powerplant RR Trent XWB	334kN (75,000lb)	374kN (84,000lb)	414kN (93,000lb)
Performance			
Cruise speed	Mach 0.85 (at FL400)		
Maximum cruise speed	Mach 0.89 (at FL400)		
Range	8,320 nm	8,099 nm	7,990 nm
Service ceiling	43,100 ft	41,450 ft	
Payload			
Passengers	270 3-class	314 3-class	350 3-class
	312 2-class	366 2-class	412 2-class
Cargo capacity	28 LD3	36 LD3	44 LD3

thrust as a percentage of the maximum available rather than a N1 or EPR value. Single and dual head up displays (HUD) are offered as options. Additionally, a 'taxi cam' found on the A340-600 and A380 will be offered as an option on the A350XWB.

What has changed?

The first change was to reduce the number of LCDs in the cockpit from the ten found on the A380 to six very large displays on the A350. These very large panels then allow the incorporation of multiple functions. The PFD design used is the legacy Airbus design which allows for a large volume of additional information to be displayed on the same screen, examples of the additional data available include configuration, spoiler state and landing gear status information. Airbus calls this the "more information, in the right place, at the right time" philosophy. Another development is that both flight directors (FD) are selected via a single button (the need to remove the FD for example in RA is negated with the application of the AP/FD TCAS which is presently undergoing testing). In the overhead panel the existing layout concept is continued, although it's worth noting that the number of fuel pump buttons has been significantly reduced compared with the A380's 22! Moving to the centre pedestal, the one real change, compared with the A380 style, is the addition of the standby PFD and the two smaller FMS screens combined into one large format split screen display that retains autonomous operation capability.
The Angle of outboard MFD enables easy approach/departure briefing across the cockpit. Certainly in the flight deck test bed, this feature was amply demonstrated and it is clear that briefing an approach or departure procedure will be very straight forward using the EFB function.



Auto-emergency descent capability

Another innovation planned for the A350 (which may be offered later as a retrofit to other aircraft in the FBW family) is an auto-emergency descent capability. The idea that drove the system's development is that in the event of the flight crew being incapacitated as the result of hypoxia it is vital that the aircraft descends to FL100 as soon as possible. In its present iteration, the system will work as follows; If an unsafe cabin altitude is detected, i.e. above FL100, the caption "AUTO EMERGENCY DESCENT IN XX SECONDS" will appear on the PFD and, if there is no crew intervention within the time allotted, the aircraft will begin an emergency descent at MMO/VMO (usual cruise at FL350 is expected to be .85M compared with a MMO of .89M and VMO of 340kts) while simultaneously offset 2.75nm to the right of the track. In other words, if the crew have already entered a 2nm Strategic Lateral Offset (SLOP) the system will increase this value by .75nm and by 1.75nm from a 1nm SLOP and so on. The crew can initiate the process immediately by extending the speed brakes to the flight detent. The system will also only continue descent to FL100 if the Minimum Enroute Altitude (MERA) is lower. In the event that it is higher, the system will descend the aircraft to the MERA and in the event that the initial descent is to FL100 climb the aircraft when a higher MERA exists further along the route. Below FL100 the system is deactivated. This prompted a good deal of comment from the delegation, most of whom were concerned that an automatic acceleration to MMO/VMO might worsen the damage to an aircraft that had lost pressure integrity and that it might be a better option to calibrate the maximum descent rate to the maximum that can be achieved at the cruise IAS. The Airbus representatives responded that the risk of acceleration to achieve a higher vertical rate was acceptable since cases of a slow decompression – of the type that could 'sneak up on a crew' had rarely been the result of damage that would compromise the integrity of the airframe as opposed to the significant damage that might be heralded by an explosive decompression. The final item in the 'aviate' section is the study of a FLEX TOGA capability for both the A350 and A380.
Aviate, Navigate, Communicate philosophy
Continuing the "aviate, navigate, communicate" mantra into the navigation realm, the Electronic Flight Information System (EFIS) on the A350 also includes terrain information in the vertical profile and weather information in the horizontal plane. Additionally, an airport layout can be displayed when on the ground or on short final (the latter a key element in the ROP/BTV technology which will be covered elsewhere in this edition). The pilot interface with the navigation system is via a keyboard and cursor control unit (KCCU). Airbus is also


The IFALPA team with check out the A350 engineering flight deck mock up.

planning for enhanced navigation concepts and is involved with both Single European Sky ATM Research (SESAR) and the FAA NextGen initiatives and is consequently working on a number of research and development projects based around three goals; enhance capacity, reduce fuel burn and improve safety. In order to declinate the work, Airbus has divided development into three phases; the near - now to 2013, the medium -2013-2020 and long – 2020 and beyond. In the near term, or in other words by the time of service entry the navigation suite is expected to include Link2000+ and PRNAV. In addition, the suite will have the moving map 'own ship' positioning. Going into the medium term these capabilities are expected to be joined by ADS-B which will give other aircraft and ground traffic monitoring capability and an initial phase of 4D flight profiles.

4D Flight Profiles

The addition of the fourth dimension to the flight profile mix will offer significant improvements to traffic flows and reduce fuel burn and delays. This introduction of a time component will give very precise ETAs at given points along an approach (to an accuracy of +/- 1-2 seconds). In the example below, the use of 4D navigation will enable ATC to manage flow very accurately by knowing exactly when aircraft A will arrive at the various points along the approach, including the expected runway occupancy time. Aside from delivering the ability for traffic to approach the airport at the most efficient speed and configuration, more of the time will also reduce the likelihood of late or low go-arounds due to a runway being blocked by a late vacator ahead. Airbus estimates that for an A320 the fuel savings are significant 40kg per approach in low traffic density environments and 110kg per approach at busier airports. Naturally, this will be exponentially greater for the larger (and thirstier) family members.

WX radar enhancement

The effectiveness of the weather radar, which is normally viewed on the Navigation Display (ND), will have additional alerting capability adding an aural cue and enhancing visual cues. When the system detects significant weather on the projected flight path (which is defined as in an area within two minutes flying time of the present position and 2nm either side of the current track and 4,000ft above or below the present altitude) a text warning will appear on the N/D "WEATHER AHEAD" backed up with a aural "WEATHER AHEAD" warning which sounds twice. The system will remain active even when the weather display has not been selected "ON" on the ND giving additional back up.

What if capability

The final segment in the 'Navigate' phase enhancements is the ability to programme a second flight plan and run 'what if' scenarios if various diversion cases are required. Clearly, this system could take much of the sweat out of planning for diversions and other contingency planning.
Communicate
A350 has an integrated Radio Control Panel which deals with all radio and comms functions Transponder, VHF, HF, Satcoms on the VHF side and you can pre-programme up to five frequencies. Furthermore, the information delivered via Controller Pilot Data Link Communications (CPDLC) will be displayed in a 'mailbox' format intended to give crews an intuitive additional information interface.

Comfort and Ergonomics

As you would expect from an aircraft aimed at the long and ultra long haul markets, a good deal of thought is being given to the design and siting of the crew rest facility. Airbus is working on an overhead rest area concept for flight deck crews which will allow access to the rest area and washroom without the need to open the flight deck door. At the time of the visit to Toulouse, Airbus had completed a mock up of the proposed layout and the IFALPA delegation had the opportunity to check out the form and feel of the rest area. While overall the feedback was positive, questions were raised over the likely level of airframe noise in the crew rest area. Although, with recent reports from crews that the crew rest areas in some A380 layouts are 'too quiet', Airbus may be hard pushed to please everyone.
Summing up it is clear that, while the A350 XWB is a late entrant into the A330/767 replacement market, the revisits to the drawing board have resulted in an aircraft which, in its latest guise, promises to deliver far more when compared with the original concept proposed in 2004. The ongoing development issues with the rival 787 have also given Airbus a breathing space allowing it to close the development time-line gap that existed between the two aircraft. With a firm order backlog of just under 500 aircraft, it appears that Airbus have wasted little time in capitalising on the opportunity. That said, and as history has proved, there is a long way between a healthy order book and an aircraft that is certified to enter service.

Firm Orders (June 2009)

A350-800	183
A350-900	236
A350-1000	75
Total	**494**

Setting up and leading a

Technical & Safety Committee

3 - 4 September 2009
Prague

Most members associations (MAs) are small or medium sized. This means that they have limited financial and human resources. There is a temptation to try to mimic the technical and flight safety structure of the large MAs or only to focus on a few areas. This course offers guidance on how to use those resources more effectively to organise and run a flight safety/technical committee. It provides practical workable models based on those used in other MAs. It provides specific guidance on where and how to participate with the airlines, the authorities and the membership and how to interact with the MA's board. It gives the participants a briefing on the current key technical and safety issues affecting IFALPA and its Member Associations. It covers the essential points in developing and implementing an accident preparedness plan. Finally, it provides leadership training for those that chair or one day may chair a MA's Technical and Safety Committee (or indeed an IFALPA Technical Specialist Committee) and shows how to run effective meetings. The concluding Committee exercise combines all of this knowledge and skill set. It can also be viewed as Safety School 2, as it follows on from the IFALPA Safety School and is the "techies" equivalent of the ALERT course.

Who should attend

Actual or Potential Technical and Safety Chairs

Those aspiring to become IFALPA Elected Officers in the technical area

Those wishing to set up or improve their TASC

Pre-requisites

Actual or Potential Chair or members of a MA's Technical and Safety Committee Actual or Potential IFALPA Elected Officer working in the technical/safety area

Demonstrated motivation to lead a Technical and Safety Committee

Approval of the Member Association (MA)

Complete the E-learning pre-course study.

Attendance Costs

IFALPA makes no charge for attendance for individuals nominated by their Member Association wishing to attend the TASC training. Students are responsible for making and the cost of their travel and hotel arrangements. Special rates have been secured with the venue hotel.

Act Now!

Places at the Seminar are limited and will be allocated on a first come, first served basis. To register please contact Keeley Phillips keeleyphillips@ifalpa.org

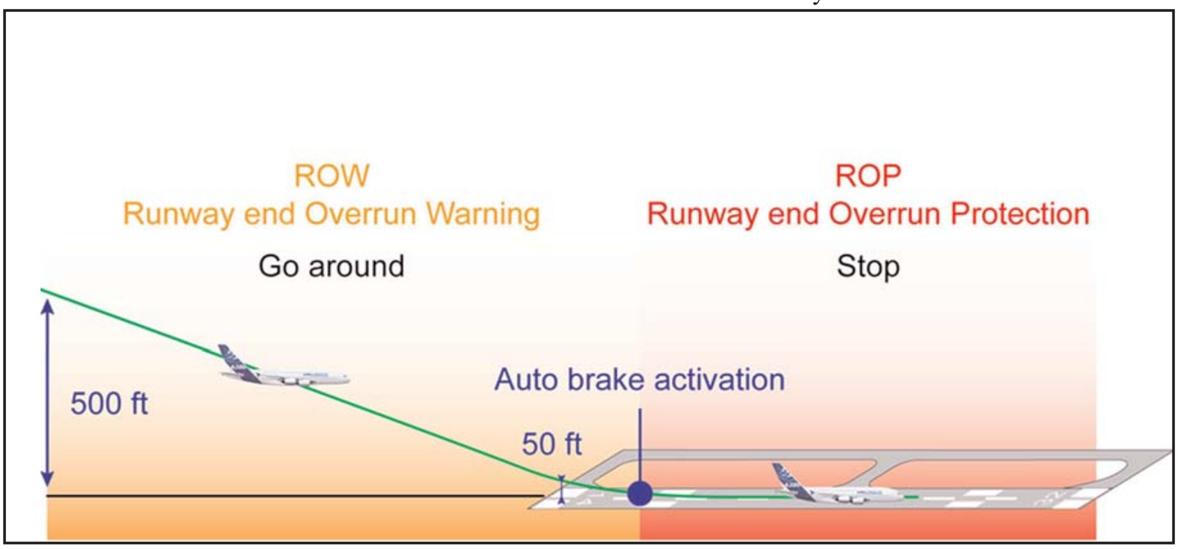
A major contribution to aviation safety –

the Airbus Runway Overrun Warning & Protection System

As any regular reader of InterPilot will be able to attest, one of the core campaigns of the Federation is the drive to reduce the frequency and severity of runway overruns and with good reason, a quarter of all incidents and accidents in air transport operations are runway excursion events, a figure that rises to 96% if only runway accidents are considered. Clearly, the importance of developing effective mitigation for overruns cannot be overstated. Accordingly; much of the work of the IFALPA Aerodrome & Ground Environment Committee has repeatedly called for ICAO's 300m runway end safety area (RESA) recommendation to be upgraded to a Standard, and the backing for alternative overrun protection systems like EMAS. While these mitigations are potential lifesavers, there is an old saying however that "an ounce of prevention is worth a pound of cure". The Runway Overrun Warning/Runway Overrun Protection (ROP) system currently under development by Airbus may provide that "ounce of prevention".

Explaining the rationale behind the system and its application, Airbus' Brake To Vacate & Runway Overrun Prevention Project Leader, Fabrice Villaume (whose PhD thesis provided the foundation of the system) told the IFALPA delegation that in order to develop an effective counter strategy to overruns, you must first consider the reasons why they occur. As the result of studying a number of overruns, the following factors were regular features;

- No approved and defined realistic operational actual landing distance data for different runway conditions
- Approach unstable below 1,000/500ft
- Windshift or shear at low altitude
- Approach becoming unstable at low altitude
- Long flare
- Long de-rotation
- Late selection of reverse thrust
- Autobrake setting too low
- Late or weak manual braking
- Cancellation of reverse thrust at 70kts
- System failure affecting landing distance
- Contaminated runway



During the demonstation flight all landings were made using rwy 32L at Toulouse

What is interesting is that, in the case of the first four points, it can be argued that a go-around should have been initiated and, for whatever reason, wasn't (see the Sept/Oct 2008 InterPilot article *"Why don't crews go-around"*). The fifth item may have been the result of excess airspeed from an unstable approach and, with the exception of one item, the remainder may be the result of certain behaviours being accepted as normal while other more basic reactions could have been 'adapted out' by SOPs or training regimes. Taking these factors into account, the development team focussed on a system that would help crews to anticipate and recognise elevated overrun risk. Essentially the ROW/ROP system computes required

In the event that the aircraft approach path means that the DRY stop line moves beyond the LDA then the track line changes to red and a red "RWY TOO SHORT visual cue is displayed on the PFD combined with a "RUNWAY TOO SHORT" aural cue

breaking distances and compares them with the landing distance available (LDA). The function is available in all autobrake modes (including brake to vacate, of which, more later). In the air on final approach the ROW element delivers a phased warning system. If the crew has selected the ND to "PLAN" mode "ZOOM" range, and the planned landing runway has been entered into the Flight Management System (FMS), two red lines "WET" and "DRY" will appear on the on the runway if there is enough LDA. If the predictive WET line moves beyond the end of the LDA the WET line changes to amber on the ND and the ROW will trigger the amber "IF WET: RWY TOO SHORT" visual cue which is displayed on the PFD. In the event that the aircraft approach path means that the DRY stop line moves beyond the LDA then the track line changes to red and a red "RWY TOO SHORT visual cue is displayed on the PFD combined with a "RUNWAY TOO SHORT" aural cue. Naturally, these warnings should, in the first case, heighten crew awareness of the potential for overrun and, in the second, prompt a go-around. The key element is that the system is dynamic and will react to rapidly changing elements that may alter the aircraft approach path or speed. The system is also able to adapt to changes from the charted runway LDA; for example, there may be maintenance works which reduce the LDA and this can be entered manually. Another example might the Land and hold short (LASO) operations common in the US which can again be used to modify the runway LDA.

During the landing roll, the ROP element of the system comes into play either on nose wheel touchdown or five seconds after main landing gear touchdown. As with the ROW phase, the ROP detects the rate of deceleration and compares this with the runway remaining. If the indications are that an overrun is probable, then the system will apply maximum breaking – to rejected take off (RTO) values and simultaneously deliver the visual cue "MAX REVERSE" caption on the PFD and the aural cue "MAX REVERSE" will sound and repeat until maximum reverse thrust had been selected – it will also sound if maximum reverse is de-selected.

As the 'WET' line passes the runway end on the ND the caption "IF WET RUNWAY TOO SHORT" will appear on the PFD

In a number of overrun incidents research revealed that, despite the poor deceleration and the rapidly approaching end of the runway, crews have on reaching 80kts either cancelled or reduced reverse thrust to idle in accordance with standard procedures rather than accepting that they are being presented with a non standard situation – an understandable scenario given the stress involved and the human tendency to revert to trained responses when under duress. The ROP system takes

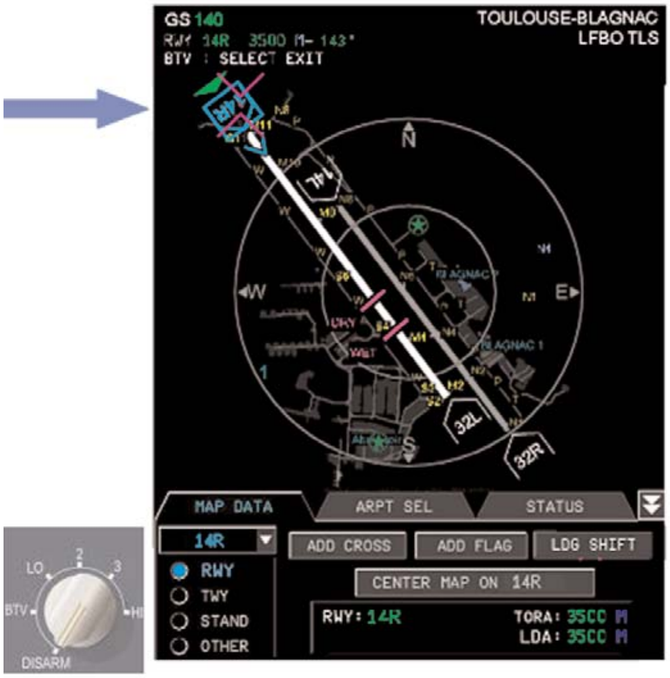
this into account accordingly as aircraft velocity reaches 80kts the aural cue "KEEP MAX REVERSE" is triggered and this cue too will repeat at any time reverse is not at maximum.

Brake to vacate

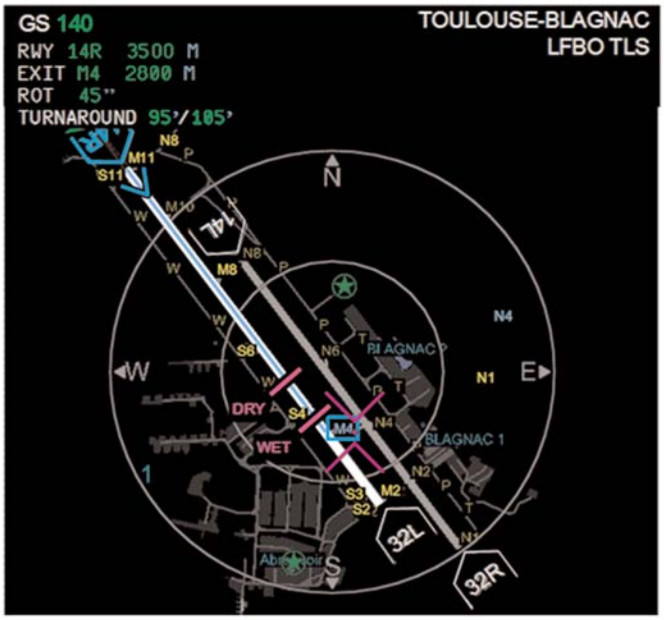
While the safety breakthrough of the system is the ROW/ROP element it can be thought of as a by-product of the development of a "brake to vacate" BTV system aimed at reducing pilot workload and improving runway capacity. BTV is, in effect, the natural successor to the basic autobrake system. On Airbus aircraft the existing autobrake architecture (in common with those found on other advanced aircraft) will reduce pilot workload providing deceleration at a set rate. Naturally, this has limitations. Firstly it is not possible for the basic settings (LOW, MED, HI on 320 family and 330/342,343 or LO, 2, 3, 4, HI on the 345 and 346 or LO 2, 3, HI on the 380) to take into account all the variables of aircraft performance, runway conditions and taxiway configuration and, therefore, brakes may be heated excessively and runway occupancy extended. Secondly, since the braking is at a set rate to achieve a set value the initial braking maybe rather harsh. Thirdly, in cross-wind operations asymmetric braking may increase turnaround times due to uneven heating of the aircraft brakes. There is also the risk of inadvertent disconnection of the autobrake while applying rudder input.

The BTV system is designed to address these issues by allowing crews to select the taxiway they wish to use to vacate the runway. This is achieved by setting the ND to PLAN and ZOOM modes. The desired runway is selected via the FMS. The next step is for the crew to enter the aircraft's weight, runway condition and consider additional factors like the taxi to gate or how much time is planned for turnaround. The crew then selects an exit taxiway with a cursor click on the appropriate taxiway label. Additional data concerning runway occupancy time and the time that will be required for brake cooling may also help the crew in the selecting the taxiway they want to vacate on . Of course there may be other factors like temporary restrictions on runway use, for example a reduction in LDA while runway re-surfacing work is carried out. This can be factored into the system by 'shortening' the runway available on the system.

The final step is to cross check the displayed LDA with charts and arm the system by selecting BTV on the autobrake rotary switch. The system will then display on the ND the caption BTV. The WET & DRY stop lines are alive at 500ft as part of the ROW/ROP function and continue to be so throughout the roll out. ROP activates on nose gear touchdown (although if a ROP – RWY TOO SHORT alarm is triggered then it will activate in that mode five seconds after main gear contact) and will modulate braking as required to bring the aircraft to safe taxi speed by the required taxiway. Disconnection of the system is either by manual operation of breaks overriding the system to use a high speed exit or the disconnection button on the thrust levers or by stowing the reverse thrust. So, for example,



BTV configuration must be done in PLAN mode / ZOOM range. The FMS runway is 14R. Runway selection with click on QFU. note the magenta cursor overlaying the runway identifier.



The QFU cursor is again used to select the desired taxiway to vacate on

if a high speed exit is to be used a crew may elect to disarm the system at an appropriate speed (but less than 50kts) either by manual operation of the brakes,
or using the disconnection button on the thrust levers.

of braking capability. Noise too can be reduced satisfying airport curfew requirements.

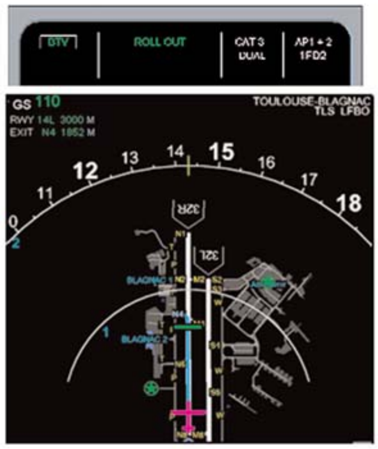
A long development

As was mentioned earlier, the system was first proposed in the PhD thesis of Fabrice Villaume. In 1998, Airbus sanctioned the research phase tasked with translating the theory into a workable test model. This work was completed in 2001 and flight testing using an A340-600 test bed – and a very basic system a laptop giving inputs to the flight - and braking control systems got under way in April of 2004. By March of the following year, the system had developed to a stage where it could begin operational testing (carried out at Paris – CDG). By September of 2006, the system tests had been completed and the work to include operational variants of the system had been given the go-ahead by the company and had attracted it's first customers in the form of Air France and Lufthansa who had selected the system for their A380s. In 2007, production variant testing began using an A380 test aircraft.

The way forward

The schedule for the roll out of the system calls for certification on the A380 and this is expected shortly. The next stage will be to extend the availability of the system as an option on the A320 family next for certification (during 2010) followed by a version for the A330/340. The system will be standard on the A350. In addition, a version of the ROW/ROP which will work in manual braking modes has been given the go-ahead and should be available for the A320 and A330/340 families in the 2011-2012 timeframe and available for retrofit on the A380 in 2011. In the opinion of the IFALPA team, with the BTV & ROW/ROP system, Airbus have created a system which will inevitably, become a life saving addition to the safety system.

Below 500 ft, DRY/WET lines are "alive"



BTV activation

BTV arming by ABRK rotary switch.
The Runway LDA must be cross-checked with charts

If there is no input by the crew the system will deactivate at 10kts. According to Airbus use of the BTV reduces break energy on landing by between 20-30% and up to 75% in a full runway length scenario. Airbus argues that crews should use at least idle reverse on all landings, because the reverse doors are already open, there will be no delay in maximum reverse being used if suddenly required. They will also act as a backup if ground spoilers fail to deploy. That said, it is possible to cut fuel consumption and gaseous emissions by the management

On the follwing pages please find a summary of the BTW & ROW/ROP demonstrations

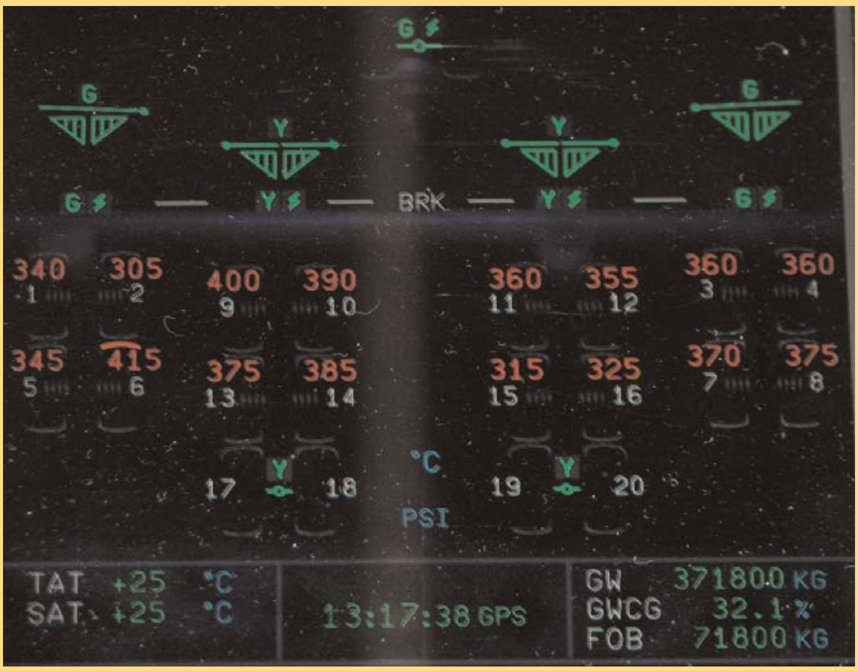
The proof of the pudding

Together with the aural cues a big red RUNWAY TOO SHORT on the PFD is an unmissable warning

As always, it is interesting to see the examples given in briefings demonstrated in the real world and even better if you can see the effects hands on. In order to achieve this, Airbus put the first prototype A380 (F-WWOW) at the disposal of the IFALPA delegation together with a flight test team led by Capt. Terry Lutz former Vice Chairman (Design) of the Aircraft Design & Operation Committee. (Despite leaving airline operations for the flight test world, Terry remains a valuable member of that Committee as the Airbus representative). Also on board from Airbus Capt. Armand Jacob who is the lead pilot on the BTV-ROW/ROP programme.
The briefing for the sortie called for a demonstration of the BTV capability using a variety of scenarios, then departing to the south west of Toulouse to examine the AP/FD TCAS system before returning to see the ROW/ROP in action. In order to get significant data, the aircraft was ballasted for a ZFW of 661,386lbs (300,000kgs) with 185,188lbs (84,000kg) of fuel the ramp weight was within 15,500lbs (7,030kg) of maximum landing weight (MLW).
All the landings were performed on runway 32L at Toulouse.

Test 1 - For the first landing, taxiway S10 was selected which would shorten LDA by 500m. Later examination of the flight data revealed that the aircraft (being flown by IFALPA President, Capt. Carlos Limón) had main gear touch down some 663m deep with nose gear touchdown at 872m. As expected, the BTW system activated on nose gear contact but, interestingly, little break energy was applied initially with idle reverse thrust taking care of initial speed attenuation. Peak braking value was recorded as 25 mega joules (MJ) this compares with maximum breaking energy of 120MJ. As advertised ,the aircraft was approaching taxi speed at the S10 taxiway so BTV was disconnected and we started to taxi back for the next test and a PF change.

Test 2 - Called for the BTV system to be set as before but with taxiway S8 (LDA -1,200m) selected as the exit point and maximum reverse used. On this circuit, the main gear touchdown came 780m into the runway with nose gear touch down at 864m. Using maximum reverse until 80kts the aircraft once again was brought to taxi speed at S8. Interestingly, due to reverse thrust taking a greater share of the speed attenuation, the maximum energy value only rose by 1MJ to 26 even though the landing roll was 745m shorter – although it has to be conceded that this value was sustained for longer during roll out.



Even with the aircraft ballasted to just under MLW brake temperatures remained far below the 800C maximum

Test 3 - Once again the desired exit was S8. On this evolution, main gear touchdown was at 568m with nose gear touchdown following a slow de-rotation at 963m. However a combination of max reverse and braking values of 51MJ brought the aircraft to taxi speed at the required exit.

Test 4 - Required a further shortening of the

LDA (by 1,850m) to exit at S6. A touchdown at 681m with a brisk de-rotation combined with a peak braking value of 55MJ and max reverse again brought the aircraft to taxi speed at the desired exit.

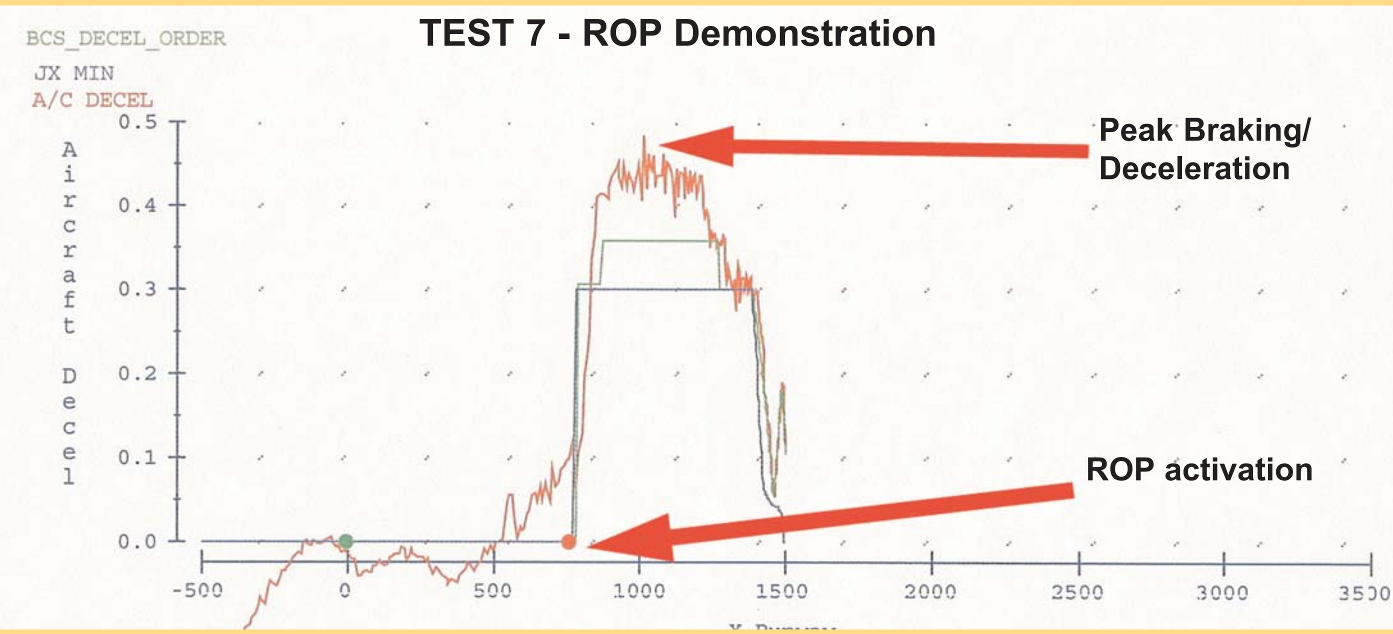
Test 5 - Revealed an interesting characteristic of the system with the S8 exit again selected an extended flare (touchdown at 1063m and nose gear contact at 1,303m) meant that even with the BTV system supplying high braking values and maximum reverse (to 80kts) reaching taxi speed by S8 would not be possible – the BTV system assed that there was no overrun risk and so as we passed the taxiwayand reverted to braking at a value equivalent to Autobrake 2 until 10kts when the system automatically de-activated.

At the conclusion of the fifth test, we departed for a demonstration of the AP/FD TCAS system (for more about this see the article "AP /FD TCAS: reduced stress RA reaction" in this edition). The return to Toulouse called for two tests which would demonstrate the ROW/ROP element of the system. As you might expect, the Test 6 would look at the ROW element and finally, Test 7 the ROP system.

In order to facilitate brake cooling between landings the gear was left down for much of the circuit

Test 6 - In order to trigger the warning system, the runway preparation phase of the BTV the runway LDA was "shortened" by 1,850m (just beyond S6) with the exit selected as runway end this was in order to get the "dry" line to appear shortly before the runway end. Passing 500ft as expected the amber "IF WET: RUNWAY TOO SHORT" caption appeared on the PFD. At this point an early shallow flare was initiated to move the "dry" line beyond the runway end and with this the red "RUNWAY TOO SHORT" cue appeared on the PFD and at 200ft AGL this was backed up by the aural "RUNWAY TOO SHORT" warning. With that a go-around was carried out climbing into the 4,000ft and the visual circuit we had used earlier.

Test 7 - In order to demonstrate the ROP system, the same runway configuration data was entered as with Test 6 and a similar approach profile with the exception that the visual and aural "RUNWAY TOO SHORT" cues were ignored and the approach continued to touch down. Interestingly, as the correct procedure is to execute a go-around, the usual "RETARD" aural cue is inhibited though the radar altitude calls are still made. On nose gear touchdown, the cues changed to MAX REVERSE and the ROP system delivered maximum braking. In order to protect the engines from needless damage, the KEEP MAX REVERSE cue at 70kts was ignored (as briefed) which also provided a demonstration of the repeated "KEEP MAX REVERSE" aural cues which continued until the 10kt cut off of the system. To say the deceleration was dramatic would be an understatement. Consider this, the aircraft still close to maximum landing weight, was brought to a halt from a touchdown speed of 130kts to 10kts in less than 40 seconds (in fact total runway occupancy time was 47 seconds) in around 1,000m. Even so, the peak braking energy was 51MJ.



AP /FD TCAS: reduced stress RA reaction

The the VS is bang on the optimal avodance rate indicated by red/green zones on the VSI and all you jave to do is follow the FD.

Since its inception, the Traffic Collision Avoidance System (TCAS) has significantly reduced the risk of mid air collisions; especially as the world's airspace has become more congested and navigation systems increasingly accurate.
However, the system in its present form is not without flaws. There is, for example, the problem of the crew reaction to TCAS Resolution Advisories (RA) which have, on occasion, led to become overreactions. To be honest, this is understandable, the surprise and stress that results from the RA can lead to a lack of communication with ATC, excessive aircraft attitude and airframe loading which have, in turn, led to injuries being sustained in the cabin.
It is against this background that Airbus engineers have been studying methods to improve the response to TCAS Traffic Alerts (TA) and RAs. As a start point, the team led by Paule Botargues considered the way the TCAS system interfaces with the crew and the procedures employed to respond to RAs & TAs. To achieve this, the team considered the views express by pilots, data from human factors studies into the reaction to RAs as well as various recommendations from regulators.
They found that the stress created by an RA and its accompanying aural cues is increased by the fact that the present procedure, which calls for the disconnection of the auto pilot and FD in order to follow the follow the red/green indications on the vertical speed indicator (VSI), is a non standard operation. This elevated stress contributes to the potential for overreaction which, in turn, can lead to the problems mentioned earlier as well as the generation of secondary RAs. An example of this type of event is the scenario where the crew of an aircraft in level flight receives a 'Climb' RA which requires a VS of 1,500fpm (designed to deliver a maximum vertical displacement of 300ft 15seconds after RA initiation) instead a climb of 3,500fpm is initiated (generating higher positive G) and the vertical displacement of course is far greater leading especially in the RVSM environment to an elevated chance of a secondary RA calling for a descent (and the possibility of significant negative G during the pitch over).
Another frequent scenario that was revealed by the study was the case where two aircraft (one in the climb) are brought into conflict by an incorrect response to an RA. In this case, aircraft 1 is in level flight at FL270 while aircraft 2 is in climb toward FL260 at

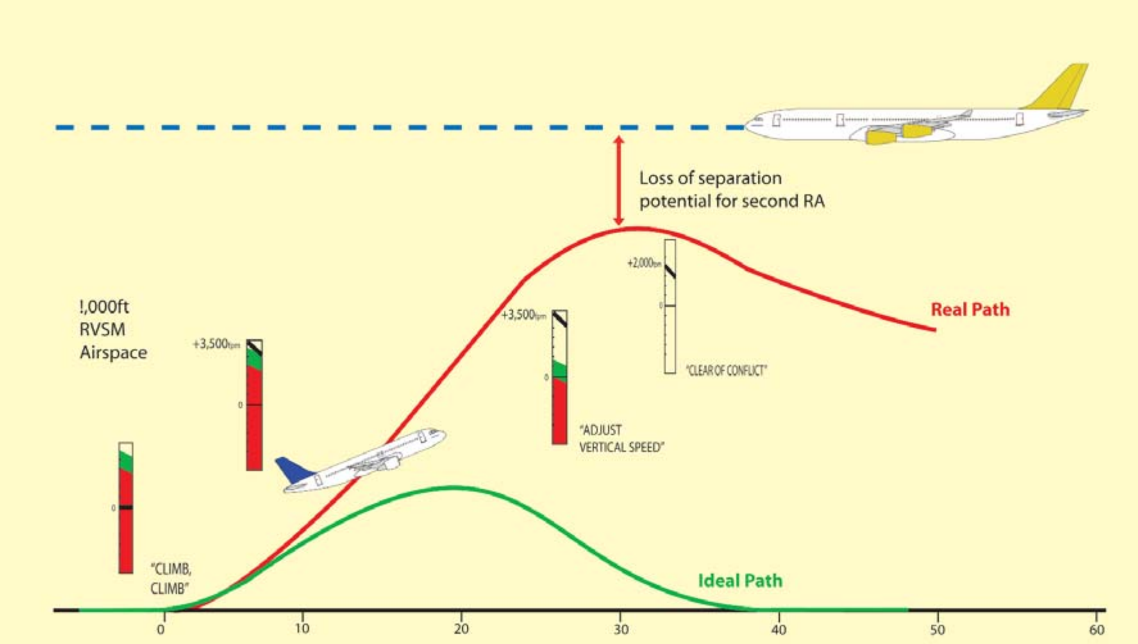


Fig 1 Overreaction to an RA crew flies 3,500fpm advoidance profile compared with the correct value 1,500fpm increasing the risk of cabin discomfort or injuries as well as the possibility of a seondary RA being generated worsening the situation.

How does it work?

AP & FD engaged: The AP/FD system engages TCAS mode in the autoflight computer and gives that system the necessary guidance to fly the optimum avoidance profile.

AP Disengaged FD engaged: TCAS mode automatically engages as the new FD guidance system, the Pitch guidance, centres on a value which will deliver a vertical speed in the target zone (the green zone of the VSI)

Both AP & FD are disengaged: The FD bars will automatically appear on the PFD with the TCAS guiding pitch as above.

At any time the crew has the ability to disengage the AP and FDs in order to respond manually to the RA using the conventional TCAS procedure (flying out of the red)

In case of a TA: The system is automatically armed in order to raise crew awareness that the TCAS mode will engage if the TA turns into an RA.

In the case of corrective RAs: The TCAS longitudinal mode engages in order and delivers pitch guidance so that the target VS appears on the red/green zone boundary in order to minimise vertical speed deviation.
As a result the following occurs in all modes:

- TCAS longitudinal mode engages delivering pitch guidance to a vertical speed target +/-200fpm within the green zone with pitch authority increased by 0.3g.
- All previously entered vertical profile modes are disabled with the exception of ALT which is designed to prevent undue altitude excursions. In a corrective RA a VS of 0fpm is considered as safe and is, therefore, never within the red zone and consequently the system will allow ALT capture.
- Autothrust engages in the SPEED/MACH mode to ensure a safe speed throughout the manoeuvre
- The lateral navigation modes remain unaffected

In a Preventative RA: (i.e. and aural "MONITOR VS" alert): – Since the aircraft vertical speed is outside the red zone the requirement to follow the RA is to maintain a profile that remains outside the zone.
Consequently:

- The TCAS longitudinal mode engages to maintain the current safe vertical speed target.
- All previously armed vertical speed modes are disabled with the exception of ALT mode. As with the corrective RA, a vertical speed of 0fpm will always fall outside of the red zone and therefore the system will allow ALT capture
- Autothrust engages in the SPEED/MACH mode to ensure a safe speed throughout the manoeuvre
- The lateral navigation modes remain unaffected

Once clear of conflict: Vertical navigation is resumed as follows:

- The AP/FD reverts to vertical speed mode with ALT mode re armed for the ATC cleared altitude and a smooth transition to towards the FCU target altitude.
- If an ALT capture occurred during the course of the RA, once clear of conflict the AP/FD vertical mode reverts to ALT capture or ALT hold mode.
- The lateral navigation mode remains unchanged.

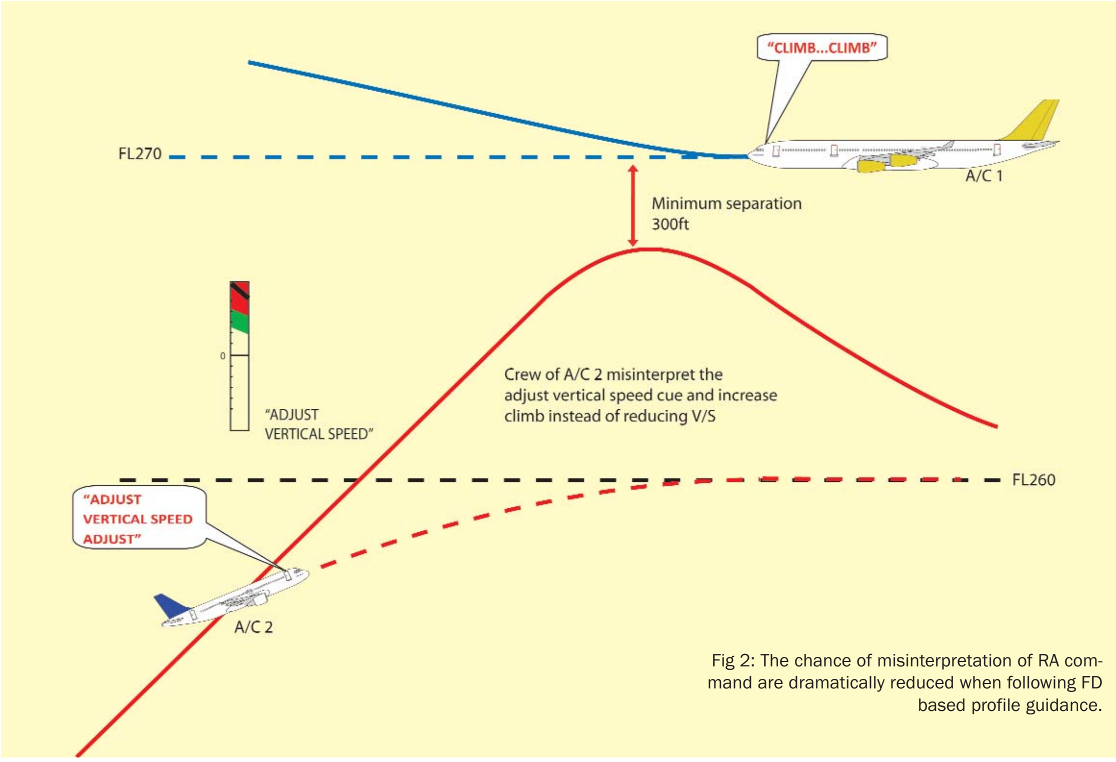


Fig 2: The chance of misinterpretation of RA command are dramatically reduced when following FD based profile guidance.

3,000fpm. The system assuming a continuation of present VS values generates an "ADJUST VERTICAL SPEED" RA to aircraft 2 – the intention is that the aircraft would reduce VS to 1,000fpm. However, the crew of aircraft 2 interprets the RA as an instruction to increase climb and responds accordingly thus triggering a Climb RA in aircraft 1, the potential for a Domino effect is obvious.

A further element revealed by the research was crews failing to respond to RAs. Research performed as part of Eurocontrol's SIRE project found that in Europe around 30% of RAs below FL50 (5,000ft) are ignored while 10% of these events above FL50 generate no response from crews. US data has shown the problem to be more acute in the USA.

Finding a better way

With the findings of the research showing that much of the problem appears to be in connection with the human reaction to the problem, it was clear to the team that a solution would be to either allow the response to an RA to happen while remaining in autopilot and or a system which in manual flight would allow pilots to continue to use familiar procedures and techniques to follow the RA. This led to the development of the AP/FD TCAS. The system is built into the architecture of the autoflight computer and if the autopilot is engaged will alter the aircraft's vertical speed to follow the collision avoidance profile generated by the RA. In manual mode the handling pilot simply follows the guidance given by the FD to fly the profile. This is in addition to the existing RA aural and VSI visual cues.

As well as monitoring aircraft systems and performance the Engineering station on F-WWOW can generate phantom TCAS targets for test and evaluation purposes.

AP/FD in practice

Cleared into the Airbus Flight Test block located between Toulouse and Pyrenees we were able to use the target generator used for testing the AP/FD TCAS system in order to fly a number of RA types. These included RA in level flight, in climb, descent with single and multiple targets. All of the pilots in the IFALPA delegation declared the system to be intuitive and logical to use with no real issues raised. Some concerns had been expressed about the potential to be 'left out of the loop' if the aircraft responded to an RA while in autopilot mode, yet these proved to be unfounded during the flight.

Timetable for implementation

Airbus expect the system to be certified across its fleet on the following timetable:

A380-800	Certified
A320 (CFM56-5)	end 2009
A320 (IAE V2500)	July 2010
A330 (PW/RR)	Early 2010
A340 (CFM56)	End 2010
A340-500/600	End 2011

Packing right

By Gavin McKellar

I love travelling. When I was young, one of the reasons that I wanted to become as pilot was to travel, to see different fascinating and challenging cultures, to try the local cuisine and drinks, meet new and interesting people. In my job I've been blessed to be in a position to enjoy these things. As frequent travellers we know that one of the important elements for a successful trip is to ensure that I've got the right things with me, that I've "packed right".

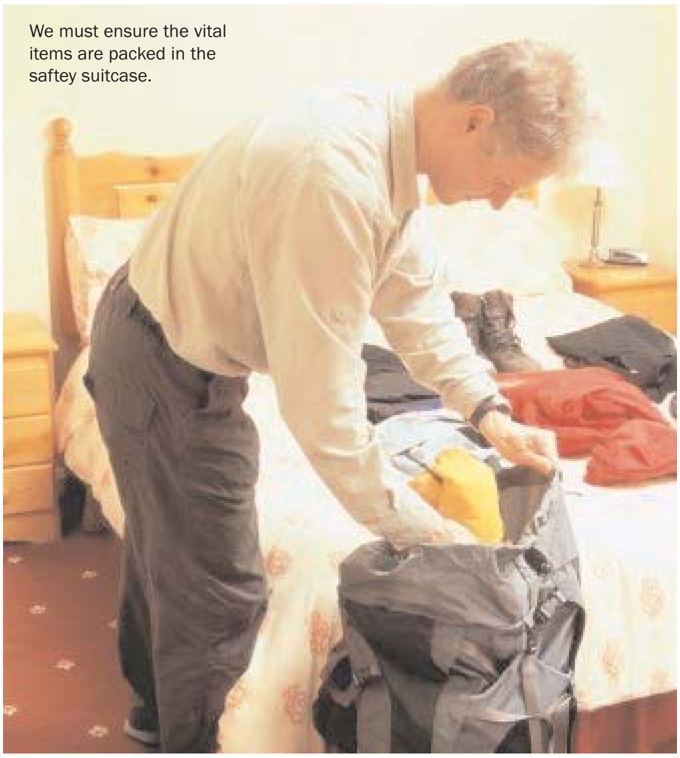
To do that I must think ahead, check the weather, consider what I'll be doing on the trip, assess the needs and then get on with the job of actually packing remembering those essentials (i pod, camera, walking shoes, shades) of course! But there are times when I'm tired from my flying and air safety work, when I'm no longer thinking ahead or in a proactive mode but rather just in a managing or reactive mode and as a result I don't do the planning element. As soon as I arrive at my destination I see the results of course. Because I was fatigued and didn't really care about packing and decisions were difficult to make I've packed too much, and a lot of it is the wrong stuff and I'm also missing things too and all because I was too tired to make the required effort.

Reading that first paragraph you might say "OK this is all very interesting but what do your packing habits have to do with air safety?" Well I argue that building a successful safety system is like "packing right" you must make sure that you have assessed the safety needs that your system is designed to satisfy , and then ensure that the elements that you need to make the plan work are included in the accident prevention suitcase.

Packing the safety suitcase

So then, what do I believe are the vital items to include in the suitcase? First you must think ahead, plan for the bleak day when you are confronted with dealing with the realities of a crash and the ensuing investigation. You must ensure that you have all the right things with you. But where to start? The beginning seems a good place to me.

Each Member Association must become involved in accident prevention activities and strategies and not just on the flight deck. Get your pilots qualified to be prevention advisors and get them involved in prevention activities like Safety Management Systems (SMS), Aviation Safety Action Programme (ASAP), Flight Data Analysis (FDA) and Flight Operational Quality Assurance (FOQA). Send nominated members to the IFALPA Safety School (ISS) which gives safety volunteer pilots the grounding they will need to become involved in accident prevention work. To improve accessibility, the ISS is usually run two or three times a year in a number of venues. You can find out more about the ISS its content and schedule through the IFALPA website. Build a cadre of pilots who have attended not only the ISS but have benefitted from



We must ensure the vital items are packed in the saftey suitcase.

advanced training on an accident investigation course. This will cost money but find a way to fund this training since you can use the experience and knowledge of the pilots involved on the course to train others. You must negotiate an agreement with the airlines your members fly for, that fully trained investigators and prevention advisors can be used in the event of an accident investigation be it an internal one looking into an incident or an external one with state investigators looking into the factors that lead to a particular accident.

Send a representative (or representatives) to IFALPA Technical & Safety Committees. I know that new members are welcome to take part on all of the Federation's Standing Committees. I chair the Accident Analysis & Prevention Committee and I can attest that the relationships that we build with fellow pilots together with the additional training days that we have as part of our meetings will directly benefit the work of the individual Member Association. Our meetings enable us to keep focused on the issues at hand and what elements need to be implemented at home.

Work to have just culture legislation enacted

A just culture is a key part of an effective accident prevention plan. A just culture is one in which although we are accountable, error is not a crime. Where we can report risk without fear of sanction or reprisal. Where we can do what is necessary to improve the system and reduce risk. In other words, a just culture is one in which we are free to recognize risk, identify risk and remove risk. It is important that this is protected by law. Work to ensure that legislation is introduced that ensures that a just culture is protected in accident investigations and that all investigations are carried in accordance with the Standards and Recommended Practices (SARPS) set out in ICAO Annex 13 and specifically Attachment E. Even with this legislation in place there will be issues of interpretation and application which will arise after an accident and you must be prepared to deal with them.

Be a professional member of the profession

As part of the just culture matrix you and I are professional pilots and as such we must always act in accordance with what it means to be a professional in this industry. Do you have a code of ethics about what it means to be a professional pilot? If not perhaps it might be an idea to draw one up. We must at all times be trustworthy, honest and accountable in our work, we must be ever mindful of the risks inherent in aviation and create an environment where we can work efficiently and safely. Define your professional pilot culture and pass on this culture to new pilots as they enter the profession.

We motivate ourselves

I cannot motivate you - this has to come from within. The tools are available but it remains that it is up to the individual to take those tools and use them. To take all the reference materials, manuals, SARPs and guidance materials and study them. It is up to the individual to create a culture that includes all the items in our safety suitcase. In other words, to implement change so that risk is kept to an acceptable level, every day, every departure. As Mahatma Gandhi observed "Be the change you want to see in the world".

Why do these things? Remember that in the post accident environment there will be a great deal of pressure, from the media, the company, lawyers, prosecutors, victims' families and local and national authorities. By preparing we may actually prevent an accident from occurring and, if the worst happens, and the chips are down, if you have taken the time and trouble to having the safety suitcase packed right, a task that would have been impossible becomes achievable.

To 'pack right' I must think ahead, check the weather, consider what I'll be doing on the trip, assess the needs and then get on with the job of actually packing remembering those essentials (i pod, camera, walking shoes, shades) of course!

Gavin McKellar is a Captain with South African Airways flying 737-800s. He is also the chairman of IFALPA's Accident Analysis & Prevention Committee. He has previously flown the Airbus A300 and Boeing 747 with SAA. He was Manager of the SAA Flight Data Analysis Programme and Domestic Fleet Safety Officer and is presently the Gatekeeper for the SAA FDA Programme.

Tuninter Flight UG1153 – An injustice perpetuated

The plight of Capt. Chafik Gharbi and F/O Ali Lassoued, the crew of Tuninter flight UG1153, should strike fear into the heart of professional pilots everywhere because what has happened to them can happen to you. They have been indicted, tried and convicted in a trial that was based on a flawed and incomplete investigation. They have been pilloried in the media and subjected to racist and sectarian abuse. They have been subjected to invasions of privacy and Capt. Gharbi remains suspended and unable to carry out his chosen profession. And why this deplorable state of affairs developed? Because they did their jobs and carried out their duties in accordance with the best information they had available in the lead up to the accident.

To get an accurate picture consider these 10 facts;

1. Capt. Gharbi reported equipment failures in the proper manner.

2. As far as the crew were concerned the broken fuel gauges had been repaired before they left Tunis and that therefore the gauges could be regarded as accurate.

3. The only indicator that something may have been amiss would have been a fuel slip which would have shown unusually low fuel uplift figures. Since this slip did not exist it is impossible to imagine how they would be able to deduce that the uplift was less than expected. (In reality, the only way to confirm the actual quantity of fuel in the tanks would have been to carry out a 'dipping' procedure. Since there the crew was presented with no evidence that anything was wrong with fuel data they were presented with it is hardly surprising that this would not be requested).

4. The flight crew was confronted with an engine failure that evolved rapidly into a failure of both powerplants. They identified the failures correctly and the applicable procedures were initiated. Since the crew had no way of knowing that they were faced with fuel starvation as the cause of the double engine failure the execution of the in-flight engine restart procedure is completely correct. The crew had every reason to expect that by following the mandated procedure the engines would restart.

5. Despite misinformation and assertions to the contrary the crew set up the aircraft for its best rate of glide. In fact radar traces show that the aircraft was by the time it had descended to 6,000ft reveal that it had performed close to what is theoretically achievable given the glide ratio for this type of aircraft. The deviations from the theoretical 'best glide' were as the result reasonable 'real world' factors.

6. Passing 6,000 ft the crew re-assessed their original plan to attempt a landing at Palermo and elected instead to attempt to ditch the aircraft. They chose to carry out the attempt close to ships in the area that may be then able to render assistance after the ditching. The crew have been pilloried for electing to discontinue the attempt to reach Palermo. These assertions are flawed since the experiments to support this hypothesis are in themselves flawed carried out as they were with the 100% clarity of hindsight and the security of the knowledge that it is a simulator and not a real aircraft or real terrain and more than one attempt possible.

7. The fact that the crew did not complete all of the emergency procedures had no effect on the site of the ditching which as has just been stated was selected in order to be close to surface traffic.

8. Ditching in the open sea is a hazardous undertaking. In the history of aviation there have been no completely successful attempts to ditch a turbine airliner.

9. There is no way to train for ditching

10. While tragically lives were lost in this accident the fact remains that the crew's actions saved the lives of most of the people on board.

Capt. Chafik Gharbi and F/O Ali Lassoued preformed their duties well above normal levels. The critics of their performance do so with the benefit of hindsight and knowledge which this crew on that day were denied. The critics rely on simulation data to support their arguments. Data that for all scientific purposes is without any value and unusable since the key elements of the re-creation are absent. F/O Lassoued has been returned to flight status and it is only right that Capt Gharbi as an outstanding member of the profession is accorded the same courtesy.

Running on empty: Fuel and airmanship

By Peter Beer and Gideon Ewers

Over the last few years much has been made of the cost of fuel and its impact on airline operating expenses. Especially in the economic gloom of the last 12 months we hear that the price of fuel together with the downturn in premium fare travellers is responsible for much of the industry's present problems. While there is no doubt that sales of premium fare tickets still slump, fuel prices are slowly returning to values consistent with the last year of the most recent boom cycle. Taking the figures published by IATA we can see that in 2007 fuel was responsible 25% of airline operating cost peaking at 32% in 2008 during the oil price bubble and falling back by the first quarter of this year to 29%. While the has been a secondary price spike during Q2, current oil futures data indicates that fuel prices will continue to fall for at least the remainder of this year as demand continues to be weak in other fuel hungry centres.

Naturally, with fuel such a significant element in an airline's fortunes its cost and use remains an item of concern to airline managements.

Is this a concern for us as pilots? According to Ascend data during the period January 1990 to August 2008 there were 137 fuel related accidents which resulted in injury or property damage, an average of 7.82 per year or about one every six weeks. The situation becomes more acute when looking at ICAO figures which indicate that globally there are an average 469 fuel 'incidents' annually which translates to nine per week.

Naturally, this is a concern since each of the incidents recorded has the potential to become an accident and as fuel policies are tightened the risk of fuel related incidents and accidents may rise.

Against this background, a small scale survey of pilots about fuel policy at their respective airlines was carried out. A summary of these initial responses (de-indentified) is set out below. The intention is to expand that survey to a wider sample in order to build a better picture of the situation. Therefore I encourage you to complete the questionnaire which is available in the member's area of the IFALPA website.

Results summary

Question 1: Is fuel saving a structured process in your airline?

The overwhelming majority of the respondents' airlines (73%) have some form of fuel saving policy in place. Of the remainder either pilots are 'encouraged to save fuel in general terms' or fuel saving is considered as part of everyday operations or the airline has no specific fuel saving policy beyond the use of cost index to vary fuel consumption. Although one respondent noted that his airline instituted a fuel policy which had yielded significant savings during the peak of the fuel price spike, this had fallen out of use with the drop in prices.

Question 2: How is fuel price information in your airline published to operating crew?

From the responses received it appears that at a significant number of airlines (67%) while having a fuel saving policy do not pass on fuel price data to pilots. It appears that in these cases the data is not shared at all, or if it has been, then "only as part of the CEOs speeches to shareholders or the press". Those airlines that do provide such information appear to take an active role in supplying pricing information, including one respondent whose airline gives crews the fuel price at both the departure and arrival airports?

Question 3: What is the role of the dispatcher in fuel load choices?

By and large at respondent airlines the role of the dispatcher is to prepare and advise but the decision on fuel remains with the PIC. It appears also that 'in person' dispatcher briefings are only given in the case of long haul flights or flights where the destination requires some special consideration. Other flights are carried out by self-briefing and planning usually with the aid of a computer based flight planning system. However, in some cases, pre-dominantly in the US, dispatchers are also tracked on the take-off and landing fuel of the aircraft they

have dispatched. At another carrier, dispatchers are told to plan with minimum fuel figures whenever possible.

Question 4: Are there complaints regarding the fuel policy in your airline?
This question prompted a more even spread with 46% saying there had been complaints while the same percentage reported no problems at their airline. In the remaining 8% no preference was expressed because the airlines in question were either in the process of or had just changed their policy and respondents thought it 'too early to comment'. The issues raised by those who had problems with their airlines' policy included selection of alternates, a lack of risk assessment of the fuel saving procedures and airline management pushing crews 'to dangerous or risky fuel decisions'.

Question 5: Are you required to fill out mandatory reports of extra fuel carried?
Nearly 75% of respondents indicated that there was no mandatory reporting of extra fuel at their airline, however, a significant number qualified the statement noting that while there was no specific reporting method, the extra fuel data would be picked up from ACARS, ACMS or other reporting systems. At those airlines where there was a requirement to report additional fuel uplift at the majority only a short explanation reason for the uplift was required and in most cases would be reported on the operational flight plan master. However other respondents noted that pilots had been called into explain their decision and that at others any additional fuel was tracked. Although one respondent related that while there was provision in the flight plan for extra uplift to be recorded many crews did not and that further this was not being monitored by airline management.

Question 6: Do you as a pilot think you should have more or less authority over the amount of fuel loaded?
This question prompted the widest range of answers within the survey with most indicating that they were happy with present level of authority they have over fuel load. However many respondents said that they believed that this part of the decision and planning process was and should remain part of the authority of the PIC and expressed concerns that this authority could be under threat. Although it was also conceded that if a pilot abused the authority and 'added fuel no matter what' that there would be concern by the airline.

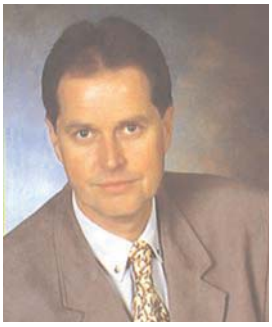
Question7: Could you relate one or more fuel related incidents that you have knowledge of?
Happily only three respondents were able to pass on details of fuel incidents that they had had knowledge of In one case a respondent related the story of a flight into London Heathrow where they had dispatched with 30 minutes reserve. On arrival in the Heathrow area they were instructed to take up the hold where they remained for the next 30 minutes before starting the approach, an approach which lead to a go-around due the an aircraft ahead being late to vacate the runway. On the go-

around, that they would have had to divert if an immediate return to the approach was not possible. Although they received a direct clearance to the alternate on arrival they were held again while ATC dealt with an aircraft with a hydraulic emergency. When they finally landed the crew found that they were 100kg below final reserve.

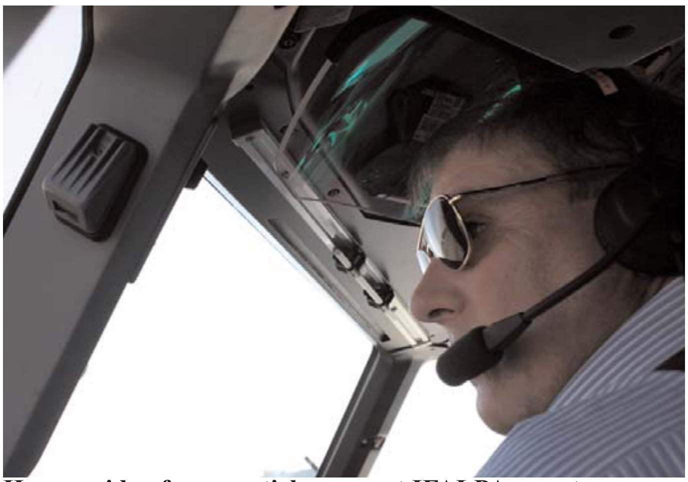
In the second case, a new Captain refuelled the aircraft in accordance with the OFP without further reserve. During the early part of the flight they were restricted to a lower flight level by ATC due to faster traffic resulting in a higher than expected fuel burn. This in turn led the crew to declare minimum fuel and request priority to land at the destination due to their fuel state.

In the final case, the airline in question had issues on a particular route. The route in question was at the extreme range for the aircraft type employed. On the return leg strong headwinds would make it impossible to reach the destination with minimum fuel even with full fuel tanks. Therefore, in most cases an en-route tech stop would be required when the conditions required. The problems arose when crews elected to continue in marginal conditions, which lead to fuel emergencies due to miscalculation or unexpected changes in weather conditions.

On the basis of this small sample there is clearly a need to examine the issue with the benefit of a wider sample for this reason I urge you again to complete the short questionnaire found on the website. All data gathered will be used for analysis by IFALPA's Accident Analysis & Prevention Committee only and any report of the findings will only contain de-identified data.



Peter Beer is a Captain with Austrian Airlines flying B737-800s. He is a member of IFALPA's Accident Analysis & Prevention Committee.



Have an idea for an article or want IFALPAnews to cover your story? Contact Gideon Ewers, IFALPA Media and Communications Officer Tel. +44 1932 579041 or email gideonewers@ifalpa.org

Dates for your Diary

September

28-30
Helicopter Committee Meeting
Montreal
Contact: Sacha Whitehead sachawhitehead@ifalpa.org

29-1 Oct
Security Committee Meeting
Pretoria
Contact: Arnuad du Bedat arnauddubedat@ifalpa.org

October

1-3
Africa & Middle East Regional Meeting
Pretoria
Contact: Carole Couchman carolecouchman@ifalpa.org

5-6
Legal Committee Meeting
Marrakech
Contact: Donna Fogden donnafogden@ifalpa.org

7-8
Administration & Finance Committee Meeting
Marrakech
Contact: Heather Price heatherprice@ifalpa.org

9-10
Industrial Committee Meeting
Marrakech
Contact: Donna Fogden donnafogden@ifalpa.org

14-16
Air Traffic Services Committee Meeting
Las Vegas
Contact: Carole Couchman carolecouchman@ifalpa.org

26-28
Dangerous Goods Committee Meeting
Playa del Carmen
Contact: Sacha Whitehead sachawhitehead@ifalpa.org

29-31
Human Performance Committee Meeting
Playa del Carmen
Contact: Sacha Whitehead sachawhitehead@ifalpa.org

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