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Contents

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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: SaxonAirs brand new AW109SP Grandnew.

A surfeit of democracy?

by Dai Whittingham, Chief Executive UKFSC

A rapid swing to the right is, for most pilots, usually the first indication that the right-hand engine has failed. In these heady days of Brexit and Trumpery, a rather different swing to the right is likely to affect the way we all conduct our business, one way or another. Operators have certainly faced some complexity when it comes to which passengers could be carried and the issues raised by the recent Presidential Executive Order will - if it is eventually upheld by the courts - have significant ramifications for the wider international system. Whether you agree with the new US immigration policy or not, it will place additional stresses and strains on airports, ground staff and operators, never mind on those would-be passengers who are affected by the change, and it adds another layer of complexity to an already complex scenario for those who operate in the area. And it will remain to be seen whether a protectionist approach to the aviation industry will have an impact on manufacturers, MROs and on some operations into the USA.

Following that other swing to the right on this side of the Atlantic, the CAA has advised the Government that remaining with EASA post-Brexit is its preferred option, so there may be an element of stability in prospect. Hopefully the regulatory model the UK appears to be seeking will be acceptable to our current European partners, and that the final agreed model will be the one the CAA envisaged. On commercial arrangements, we can perhaps expect that some operators will choose to move their business headquarters into an EC county, which may alter the landscape slightly, but the perceived wisdom for now is that not much will change. Let us hope so. But change is an inevitable function element of democracy.

Democracy is a noble thing but it does require that the electorate engages in the process - there is no point complaining about a majority decision if you did not get out and vote in the first place. Australia gets round that particular problem by making it illegal not to vote, though such a policy is unlikely to gain traction here in the UK. So where do we stand with one of the under-pinning strategies in a successful democracy, namely the consultation process? We are fortunate in this country that the Government chooses to ask the community for its views on a wide range of issues. That extends to the CAA, which conducts regular consultation exercises, most commonly on airspace issues.

The UKFSC responds on behalf of the membership to most airspace consultations because it is consulted specifically as a member of the National Air Traffic Management Advisory Committee (NATMAC). There are of course occasional conflicts of interest when it is clear some UKFSC member organisations are likely to hold opposing views, in which case a neutral (or even nil) response is required. We have raised objections when necessary in consultations, normally when the Airspace Change Proposal (ACP) asks for a disproportionate volume of new controlled airspace. While the outcome of an ACP is decided by the CAA, which acknowledges that this is not a democratic process, there is a statutory duty on it to ensure that the needs of the consumer, the various operators and affected third parties are properly balanced; you can see this aspect reflected in the various CAA decision letters published in response to all ACPs.

Be in no doubt that most ACPs generate thousands of responses from concerned local citizens, almost all of which are understandably trying to protect their own perceived quality of life. Earlier in this decade, a trial of new RNP routes by one of the London airports generated a massive response from the public. On the first published trial day alone, over 18,000 noise complaints were lodged. It was unfortunate that the trial had actually been delayed by a few days, so there had been no change at all, but it served to show that the public could and would respond if people thought they were going to be adversely affected. The bottom line here is that 'stakeholders', which includes the operators, need to get involved in consultations if they want to have a balanced view put forward to the regulator. Indeed, one could argue that the operators have a duty to respond where ACPs affect them.

The same is true of other consultations and requests for engagement from the professional aviation community. For example, there is a significant consultation ongoing with regard to the Government's strategy on drones (you can read more in the article from Holman Fenwick Willan in this issue of FOCUS). Whilst there has been industry involvement in generating the drone strategy, it is not always the case. If you want to have your say on something that obviously affects your future, you need to put in your own responses whether that be as individuals or as operators.

Frequent requests are also made for participation in academic surveys, often on topics of mutual interest such as fatigue, nutrition and human factors in general. Your information may prove crucial to someone, but it is useless if you keep it to yourself. If you want things to change, you have to work at it. Eventually it comes down to professionalism – and this is not intended as a criticism. The widely shared academic definition of a profession hinges on formal, specialised training, a recognised qualification, a commitment to quality and standards, and ethics or an accepted code of behaviour. ATPLs fall pretty neatly into that definition, so if you consider yourself to be a professional, get involved!

One example of how a professional community can effect change is the recent Government announcement that laser offences will be extended to all forms of transport. The UK Laser Working Group has been able to use the statistics on aviation laser attacks to prove that current legislation is ineffective, and this has only been possible because most people have been professional enough to report attacks when they occur, regardless of the personal inconvenience that often follows. The statistics formed the single most powerful piece of evidence for our case and, with added anecdotal evidence of attacks on vehicles and trains (anecdotal because there is no reporting system for vehicles), allowed us to push for more far-reaching legislation.

Crucially, the simple fact that a laser attack will be an indictable offence – they will attract jail sentences of up to 5 years – means that we will no longer have to prove aircraft endangerment because the attack itself becomes the crime, not its effect. The authorities will have a choice of prosecuting in the Crown Courts or as a summary offence by magistrates, but serious or persistent attacks should end with culprits being jailed, which will in turn start to have a deterrent effect on others. We can also expect to see a more consistent treatment of laser offences by police forces and regional Crown Prosecution Service offices.

With the proposed change to the law making its way through Parliament, the next steps will be to persuade the Government to introduce power limits and import controls on high-power devices, which will limit the potential for permanent eye injuries for all parties as well as reducing the safety impact when aircraft are attacked. We may also see laser pointers being added to the list of offensive weapons, which would give the police some additional powers in tackling the problem. The argument is straightforward: if a laser attack is a crime, why would you not also act to reduce the severity of the crime? To reiterate, none of this progress would have been possible if people had not reported the laser attacks in the first place, and success has also relied on sustained support from individuals and operators.

There is one other area of our business where active engagement is still required and that is the normal safety reporting system. The fact that a particular event is supposed to be reported under the MOR system is no bar to it actually going unreported. As always, humans are fallible: we can forget to do something and we can deliberately omit the same action if we think it is not serious or, more usually, because it is "too difficult" and "nothing will happen anyway". The new ECCAIRS-compliant reporting system is admittedly not very user-friendly at the moment, and there is every prospect that a number of reports will end up falling into the "too difficult" category. Hopefully, work to improve the interfaces will help make occurrence reporting much easier. In the meantime, we need to make sure that we make the effort to put information into the system.

The absence of reports can be a good thing, but not if people draw the wrong conclusions about risk as a result. For example, you could argue that there is not a problem with extraneous chatter on 121.5 MHz because there are hardly any reports to the contrary, whereas the truth would have you reporting on most sectors. Of interest, we were able to use known under-reporting to show that the incidence of laser attacks (an MOR item...) was 35-40% greater than the reported figures suggested - the evidence for this conclusion came from a reputable survey carried out with the assistance of members of the pilot community who took the time and trouble to respond to the request for information. And so we come full circle to the points made earlier in this piece about professionalism and engagement in matters that affect us all. As aircraft become ever more reliable but ever more complex, and while small scraps of information start to assume ever greater importance in understanding the risk picture, we need people to report occurrences and act on their observations, however minor these might appear to be. Don't be the one to walk on by.

focus ON COMMERCIAL AVIATION SAFETY

How Safety Management Systems Work Their Magic

by Jacky Mills, Chairman UKFSC

Are Safety Management Systems (SMSs) pulling safety together in a cohesive, effective manner and making a real difference or are they sometimes just full of great words? Are they safety structures that really work or, sometimes, an example of Emperor's New Clothes? Simple cornerstones integrated into the business or the modern day equivalent of manuals gathering dust?

There is no doubt Commercial Aviation has a safety record to be proud of. In recent years more fatalities have occurred due to intentional acts than due to aircraft accidents. Statistic for 2015 was 2.8 aircraft accidents per million departures; this is thought to be the lowest accident rate ever for commercial aviation. Commercial Air Transport (CAT) accidents over the past four years have remained pretty static whilst the number of flights has continued to increase. So how much is this due to operators engaging with ICAO Annex 19 – Safety Management Systems?

The four pillars of SMS establish structures of policy and accountability – including putting in place people who know about, and have experience of, aviation risks (suitably qualified and experienced personnel). Management of safety risks are formalised in identifying hazards – both those which have hurt us already and those which might (potential and actual). Risks must be reported both to reduce the chance (likelihood) of these happening and the impact (severity) if they do. Potentially removing risks altogether or at least to ALARP – making the risk as low as it is felt the organisation can live with when further reduction of risk would not be proportionate or worthwhile.

Furthermore, there must be assurance that operations are being conducted safely – performance indicators need to be established and maintained to measure performance. If this drops then the previously mentioned policy comes into play to bring the safety

performance up to previously high standards. This also includes ways of managing the changes which every successful organisation goes through – an inherently risky time if not monitored carefully – as well as achieving continuous improvement along the way. And finally is the promotion of safety which must be delivered to all parts of the business; training programmes, communications through leaflets, safety bulletins, email, social media and, importantly, the role modelling of the Just Culture.

So does this all actually happen and is it widely accomplished to the high standards we would wish? Or, do previously aspired to, and achieved, heights have the potential to diminish in time?

So how about Performance Based Regulation? Does this mean throwing all the reports in a database? As long as there are lists of trends, going hopefully in the desired direction, then 'the SMS is taking care of the risks'? Compliant? Maybe. Good enough – no, possibly not, if industry wants to do this properly, instead of box ticking and living in an illusion that all is well.

Databases can be pretty dangerous things if not used intuitively. The thought that a great safety culture is measured by the increasing number of reports being received. Or the thought that compliance is achieved by responding to reports and not throwing them all in the bin. But wouldn't a database which just stored data be very similar to a bin? Yes, feedback is given to all reporters but what does that feedback say? Do the safety professionals actually trawl through and dig deep or look at the obvious concerns and get the rest closed off in the prescribed time limit for closure? It is always worth asking these questions, making a sense check from time to time and looking closely at quite simply what is actually being done and what has been achieved. Self-audits can be the most probing and effective.

For me, 'Emperor's New Clothes' is worthy of further discussion. How many of these systems are put in place and actually do astonishingly little to really improve safety? How many look good, postulate great words but do not actually put these into practice? How many have such a safety culture that makes it hard to see what is really going on in the business? It all looks good and sounds good so it must be catching the risks the business suffers. The business has put their trust in the SMS.

How is this judged? How is it known that the culture is robust enough for all sectors of the business to speak up when they

have made an error? Some sectors of the aviation industry have been used to submitting reports for many years now. For the past 25 years' human factors training has been mandated for some colleagues, which has evolved and taken safety a long way. Those have developed understanding of the benefits both to themselves, and the business, and a positive culture has evolved which other industries envy.

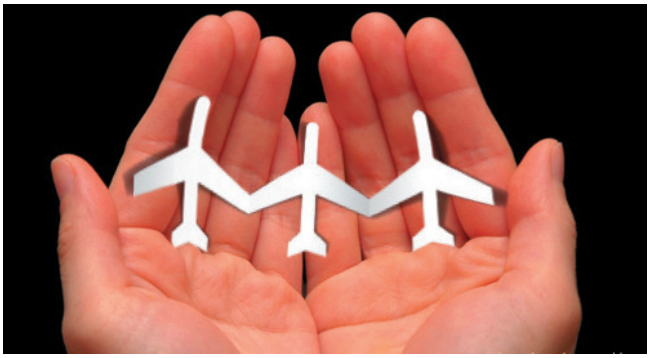
But how can it be proved that the Company's considerable investment in their safety departments have prevented an accident? Often it can't. Can proof be provided that a serious and costly incident has been prevented? Near Miss reporting, those precursor risks can provide statistical evidence but how many near misses are actually reported? Not enough without doubt. Not everyone will spend time submitting a report about something that they 'got away with'.

Trends are reviewed and have been addressed from reports, and from flight data, in accordance with the SMS. Issues that were trending high have been addressed and these have reduced so all looks good. So everything is fine then...

Industry statistics show that reports for Laser attacks in Europe have reduced; however, compare that to discussions held with stakeholders in some states and it can be seen that actually the number of events have increased. Similarly, the reports received for Drone encounters, although these have increased very significantly over the last year in Europe, when compared to reports published in the press and on social networks, the number of drone events is actually much higher. In both cases the misuse of equipment by the end user is the consequence of lack of proper legislation addressing the production, distribution and use.

So perhaps understandably, reporters get weary of taking the time to submit information when little is seen to change as a result of this effort. I am told that when submitting safety reports directly from the crew EFB is introduced the number received increase exponentially. I don't doubt this; human nature dictates I am sure. So how to make the SMS robust enough to actually be an integral working part of the business, to keep the flow of safety information coming in, to analyse this and to channel it in the optimum direction? All businesses will start with regulatory compliance, and that is a good start but only a start. From there if the SMS is in place, and functioning, safety hazards will be identified which will lead to a clear view of the risk picture. Then benchmarks can be laid down and measured, giving the business the opportunity to see which safety risk warrants their focussed attention. Management of change will be addressed as an integral part of the evolving business. Importantly, safety promotion can be targeted in a way that is effective – an aspect of SMS that is often missed by ticking the regulatory box that safety promotion has been carried out without actually measuring its effectiveness. There is so much technology out there these days it should be used and SMS becomes smarter!

Great words! But just more words? For me, this could be hidden in a safety culture and channelling resources in this direction could be where benefit may be seen. Can the enormous source of information be unleashed from all those who work on the front line, to produce a more comprehensive view of the risks. These can then be addressed in a transparent manner. Is the workforce proud to work for the brand? Do they find 'workarounds' in the mistaken belief they are helping the business? This is not necessarily about money. It is a well-known fact that people who feel motivated work



so much better, they take more care, they feel they belong and so they speak up. Simple stuff that can easily be missed in our fast paced, technology driven world today.

It seems very common for aviation businesses still to concentrate their efforts on flight safety. Why? Well that is where the accident happens so why didn't the pilots stop it happening. Are their manual handling skills rusty? Did they not follow procedure? Are they suffering fatigue? Quite possibly any of these may have played their part in the event and need investigation, and yes pilots do indeed make mistakes, but this may be missing the point. The event on the aircraft is the last link in the chain. There were probably countless other opportunities to capture the error before it even pushed back. This sounds obvious of course. But perhaps not quite so obvious; safety professionals still often seem to discuss 'the holes in the cheese lining up' during the Safety Investigation.

Did the Engineers who worked on the aircraft last night have the right environment to carry out their tasks? Was the Dispatcher who compiled the Load Sheet fatigued because he had been working back to back shifts to cover colleagues' sickness? Were the loaders motivated enough to concentrate on and then implement their training? Did the Flight Planner who compiled the OFP have peace, quiet and time to concentrate when putting the flight plan together? And. .. The list is potentially very long of those who play a vital part in getting the flight to Push Back and, as we know only too well, any human element has the potential to fall victim to Human Error. Human Factors investigations really do help to complete the picture. No, of course we don't live in a perfect world but focusing on some of these factors is a great start. These are great questions for the SMS to address, not the easy wins but the whole arena of errors which potentially feed into each and every flight.

Every error that is highlighted is a step towards the solution. How many times do inventors get it wrong with their prototypes before finding the best way? Usually hundreds! Every mistake we know about gives us the opportunity to improve our systems. Just asking the question is a great start.

Cruise Level Wake Vortices – risks and mitigations

by Robert Lunnon, Royal Meteorological Society

1. Introduction – wake vortices at low level and cruise level

Wake vortices are generated by aircraft in flight as a result of the lift caused by the generating aircraft. If/when a following aircraft encounters an unexpected wake vortex, the result is an instantaneous loss of control – the following aircraft experiences a significant roll and/or a significant normal acceleration. For an aircraft at low level, particularly on final approach, loss of control could lead to an accident, and therefore the risk of an encounter has to be addressed. For an aircraft at cruise level there is adequate opportunity for control to be recovered and therefore the risk of an accident involving the ground or another aircraft is rather small. However an encounter can result in injuries to flight crew and/or passengers and some damage to the aircraft so it is worth considering how large the risk of such an encounter is and what mitigations are possible.

2. Behaviour of wake vortices at cruise level

An important aspect of the behaviour of wake vortices at any level is that initially they will move downwards. For a generating aircraft on final approach, an important additional effect is so-called ground effect, meaning that at low level the downward movement of the vortices will be stillborn by the interaction with the ground. However, at cruise level this is not the case and the initial descent speed of the vortices is worth consideration as it will be a factor in the risk of encounter by another aircraft. It is noteworthy that if the initial descent speed is expressed effectively in feet per minute then the initial descent speed at a particular flight level is a function only of characteristics of the generator aircraft. Specifically the initial descent speed depends on the wingspan, weight and airspeed of the generating aircraft. Table 1 below gives minimum and maximum initial descent speeds for an aircraft at FL390, for assumed minimum and maximum aircraft weights, for the current Airbus and Boeing aircraft types. As can be seen the result is effectively rather sensitive to the aircraft weight. The minimum aircraft weight used in the calculation is the minimum empty weight of the lightest member of the class, for example, for the A320 family this is the minimum empty weight of an A318. Similarly the maximum aircraft weight used in the calculation is the maximum take-off weight of the heaviest member of the class, for example, for the A320 family this is the maximum take-off weight of an A321.

In table 1 it can be seen that of the minimum descent speeds, the maximum is 217 feet per minute for an empty 747/400 whilst of the maximum descent speeds, the minimum is 352 feet per minute for a 787 at maximum take-off weight. Thus the dominant factor determining initial descent speed is how heavily laden an aircraft is, given which model within the particular family, i.e. whether the aircraft has just reached top of climb or whether it is at top of descent.

3. Behaviour of wake vortices during descent

Although the initial descent speed depends on characteristics of the generating aircraft, thereafter the behaviour depends on atmospheric parameters, specifically wind, turbulence and lapse rate (rate of change of temperature with height). Wind will cause the vortices to move sideways, turbulence will cause the vortices to dissipate and lapse rate also affects the lifetime of the vortices. It can be expected that there will be some appreciation of wind and turbulence in the cockpit and therefore flight crew should be able to estimate the risk of an encounter with a wake vortex based on their awareness of these two parameters (together with some appreciation of the characteristics of the aircraft generating the vortices).

A/C type	Wingspan(m)	Min weight(T)	Max weight (T)	Airspeed (km/hr)	Min descent speed (ft/min)	Max descent speed (ft/min)
A320	34	39.5	93.5	829	185	439
A330/340	60.3	108	380	871	153	540
A350	64.75	115	308	903	136	366
A380	80	277	575	903	216	448
B737	34	36	85	838	167	394
B747/400	64.4	187	482	933	217	419
B757	38	52	124	854	189	452
B767	48	82	204	850	188	468
B777	64.8	135	351	892	162	422
B787	60	120	254	903	166	352

Table 1. Show minimum and maximum initial descent speeds of vortices for an aircraft at FL390.

4. 1000 foot minimum vertical separation

Minimum vertical separation of aircraft at cruise level has been reduced from 2000 feet to 1000 feet, initially over the North Atlantic and later over Europe (including the UK). A critical issue then is whether vortices can descend 1000 feet before dissipating. The key parameter here is the level of turbulence. For vortices to descend 1000 feet unscathed requires unusually low levels of natural turbulence. Flight crew will have some awareness of low levels of turbulence (well below the level at which seat belts would be needed): the levels necessary for vortices to descend 1000 feet are such that the aircraft will feel completely stationary, i.e. it will feel the same as it does when stationary on the tarmac. Such levels of turbulence are rather rare although are relatively likely over the sea and/or at night.

5. Judging the effect of the horizontal wind

The only effect of the large scale horizontal wind is the move the vortices horizontally. A relatively simple technique is available to flight crew to estimate the effect of wind on vortices. Imagine a situation in which two aircraft are 1000 feet apart vertically and the wind (speed and direction) is uniform in the layer of air between the two aircraft. [Non-uniform wind is likely to be associated with significant levels of turbulence]. If there is a crosswind relative to the ground track of the following aircraft, then the aircraft heading will reflect that (the aircraft will be pointing in the upwind direction relative to the ground track). Relative to the direction in which the aircraft is heading, the aircraft will drift downwind. The vortices from the generating aircraft will also drift downwind. It can be shown that if the generating aircraft appears to be directly ahead of the following aircraft, then in the horizontal there is maximum risk of encountering the vortices. By directly ahead we mean that if there was a telescope in the cockpit of the following aircraft which was fixed so that in the horizontal it was exactly parallel to the fuselage of the following aircraft, then the risk would be highest if the generating aircraft could be seen in the telescope.

6. Quantitative measures of the overall risk

In a study of wake vortex encounters over the USA, Schumann and Sharman (2015) estimated the overall frequency of "significant" events as 26 per day. An earlier study, which was part of the EU funded FLYSAFE project, generated a figure of 88 "dangerous" encounters per day over Europe (this was for medium weight aircraft encountering vortices from heavy aircraft). The criteria and methods were very different in the two studies. The frequency of encounters can be expected to increase as the density of air traffic increases.

Note that these studies both consider both encounters where the generator aircraft was 1000 feet above the affected aircraft and encounters where the vertical separation was much smaller and the significant separation was horizontal.

7. Mitigations

If an encounter with vortices is expected, the obvious mitigation is to ensure that all on the aircraft (passengers and crew) are wearing seatbelts. If the aircraft track direction is essentially the same as the generator aircraft then it should be possible to offset the track by a few nautical miles which, if the diagnosis of wind is correct, will reduce the risk to zero.

Appendix 1. The derivation of Table 1.

The formula used to calculate table is that the initial descent speed is

$$(2W)/(\pi^2 b^2 pV)$$

Where W is the aircraft weight, b is the aircraft wingspan, p is the air density and V is the aircraft airspeed. It will be recalled that the minimum descent speed is calculated using the minimum aircraft weight as found in the table and that the maximum descent speed is calculated using the maximum aircraft weight as found in the table. This formula gives a descent speed in units LT^{-1}. Note that the geometric separation of two flight levels depends on the density of the air between them. Consequently the minimum and maximum descent speed expressed in flight levels per unit time depends only on the density in the standard atmosphere at that flight level rather than the actual density. An air density of 0.32 Kg/M^3 was used.

Of course if an aircraft took off at maximum take-off weight then some fuel would be burned in reaching FL390: similarly if an aircraft landed at minimum empty weight then it would be expected to have had some fuel on-board when last at FL390. However this was not included in the derivation of table 1.

Reference

U.Schumann and R.Sharman (2016) "Aircraft Wake-Vortex Encounter Analysis for Upper Levels" Journal of Aircraft **52** No 4 p1277-1285

Runway Safety Alerts: How Fast Can We React To Them?

by Gerard van Es

On March 15 2011 an A320 (with callsign SWR 1326) was cleared for take-off on runway 16 of Zurich airport. The crew of SWR 1326 acknowledged this clearance and initiated their take-off roll. Another A320 (with callsign SWR 202W) on runway 28, also received clearance for take-off from the same controller. The crew of SWR 202W acknowledged this clearance and immediately initiated their take-off roll on runway 28. Runway 16 and runway 28 intersect each other about half way along runway 16 and about two-thirds of the way along runway 28. At the time the take-off clearance was being issued to SWR 202W, SWR 1326 had already started its take-off. During the take-off roll, the crew of SWR 202W noticed SWR 1326, which was coming from the right on runway 16, and immediately aborted their take-off. A few seconds later, the air traffic control officer gave the crew of SWR 202W the order to immediately stop their take-off. SWR 202W came to a standstill on the runway just before the intersection with runway 16. The crew of SWR 1326 had not noticed the incident and continued their flight to their destination. Well before the crew of SWR 202W decided to reject their take-off, the air traffic control officer received an alert from the runway Runway Incursion Monitoring and Conflict Alert System (RIMCAS) that was operational at Zurich airport. It took nine seconds for the air traffic control officer to give the stop instruction to SWR 202W after the alert was generated. At that time the crew of SWR 202W already rejected the take-off so this instruction had no effect.

The air traffic control officer was surprised by the runway incursion alert and believed in the first instant that it was a "false alarm with a vehicle"[1] . The SWR 1326 was no longer present in the controller's mental plan at this point in time. The air traffic control officer checked whether a vehicle was close to the runways or whether a landing aircraft was on runway 16. The controller then finally realised that two aircraft were simultaneously taking off on runway 16 and runway 28.

Many airports have runway safety systems in order to avoid collisions due to a runway incursion. Such systems have a sensing/surveillance part that determines the position, direction and speed of aircraft and ground vehicles; a safety logic part which consists of rules and algorithms to interpret these data; and a human interface in which the information is passed on to the aircraft traffic controller or pilot. All systems currently in operation at airports are so-called tower-based systems in which the information from the runway safety system is passed on to the controller only. After receiving an alert from the runway safety system the controller has to make an evaluation of the situation and based on that outcome make a decision of the course of action (e.g. give instructions to the flight crew). This process of evaluating and decision making can take a lot of time as illustrated in the example at the beginning. This single example however does not give us a clear picture on what typical response times are (the response time is the time span between the onset of the alert and the response of the controller). There are a number of variables that influence the response time like age of the controller, experience, workload, environmental conditions (e.g. visibility, light conditions), complexity of the runway layout and trust in the runway safety system. This last variable is influenced by the rate of false and nuisance alerts generated by the runway safety system.

On top of the response time there is also the duration of the controller response which is the total time of the verbal communication with an aircraft or ground vehicle (e.g. giving a directive warning). Human-in-the-loop simulations conducted by the MITRE Corporation give us some idea of what the typical response times and response durations can be. These experiments were conducted using a tower simulator and a flight deck simulator. A group of tower controllers was asked to work several scenarios. In some of these scenarios a runway incursion was simulated and alerts were generated by a runway safety system. Of course such an experiment can never fully simulate the real world as the participants were more or less prepared for an alert to occur. Nevertheless the results of the MITRE experiments give us an idea of what you can expect in terms the typical delays of getting an important message to a flight crew or a vehicle driver. The MITRE experiments showed that the mean response time of the controller to an alert was 4.6 seconds with a maximum of 8.1 seconds. The mean response duration was 2.3 seconds with a maximum of 5.3 seconds. By simply taking the averages together, an average time from the alert to instructing the pilots takes about 6.9 seconds with a maximum of 13.4 seconds! These results illustrate that the time the air traffic controller officer in the incident example took (9 seconds) is nothing out of the ordinary. But the story does not stop here because now the pilot or vehicle driver must take action.

Let's focus on the pilots a bit more. Just like the controller, the pilot needs some time to respond and act to the instruction given by the controller. However, the pilot just needs to react most of the time whereas the controller needs to assess if the alert is true or not and decide on the best option to resolve any issue. Of course this takes more time for the controller than for the pilot. The experiments by MITRE showed that the time span between the onset of the controller's instruction to the pilot and the start of the action by the pilot can take up to 5.3 seconds with an average of 2.3 seconds. If we assume that the controller has given a stop instruction, the pilot still has to initiate the rejected take-off procedure. Once it has been started, it still takes time for all the stopping devices available to become effective. For instance it can take about 2 seconds before the brakes are fully effective and the lift dumpers fully deployed (if installed). If it is a jet aircraft, and thrust reversers are available, it can take 4 to 8 seconds to get full reverse thrust after reverser deployment. Meanwhile the aircraft is using up runway distance and may be getting closer to the conflicting aircraft or vehicle.

Although runway safety systems can be very effective in avoiding runway collisions, there are cases in which these systems are less effective due to the long time it takes from the activation of the alert to the actual action taken by the pilot or vehicle driver. Runway safety alerts could be send directly to the pilot or vehicle driver, but then they would still need to assess the situation and make a decision. This would take additional time (although less if the air traffic controller was in the loop). Such additional decision time could be avoided by using directive alerts (or advice as in the case of TCAS 2) that tell the pilot or vehicle driver what action they should take, but this would require that the users have a high level of trust in the system. But taking the controller out of the loop could also introduce new problems if both the pilot/driver and the controller were to react differently to the same event with different solutions.

[1] Runway safety systems like RIMCAS may provide false alerts if the quality of the surveillance data used by such systems is not optimal. In addition to false alerts, nuisance alerts are generated by runway safety systems. Finally untimely alerts can also occur due to the safety logic design. A high rate of false, nuisance, or untimely alerts may hamper the effectiveness of any warning system. It can change the user's attitude and belief about the warning system. As a result they may lose confidence in the system.

About the Author: *Gérard Van Es works as a Senior Advisor flight safety and operations for the NLR-Air Transport Safety Institute - Amsterdam, the Netherlands.*

He is currently involved in the European working group for the prevention of runway excursions.

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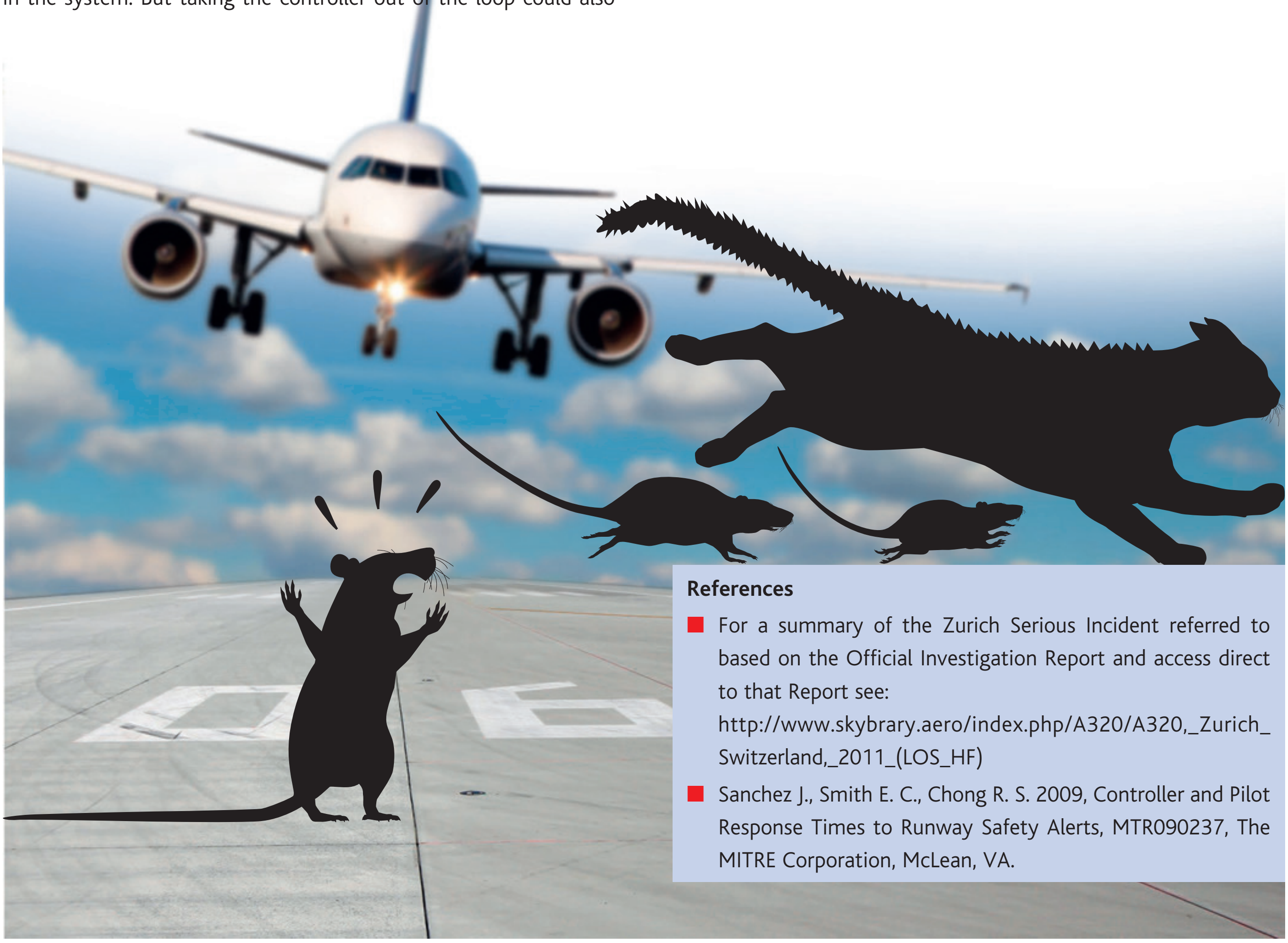

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TOP 10 TIPS

FOR CONTROLLERS

AVOIDING COMMUNICATION ERROR

Communication error is a major causal factor in both level busts and runway incursions in the UK. The following tips for controllers will help improve RTF standards in UK airspace.

1. Use clear and unambiguous phraseology at all times.
2. Avoid issuing more than two instructions in one transmission.
3. All frequency changes should be kept separate from other instructions.
4. Use standard phraseology in face-to-face and telephone coordination.
5. Monitor all read-backs carefully; avoid distractions – especially the telephone!
6. Keep RTF delivery measured, clear and concise, especially when the frequency is congested.
7. If it's urgent, **sound urgent!**
8. Insist on complete and accurate read-backs from pilots.
9. All executive instructions relating to headings ending in zero **MUST** be followed by the word 'degrees'.
10. If you are unsure, **always check!**

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TOP 10 TIPS FOR PILOTS

AVOIDING COMMUNICATION ERROR

Communication error is a major causal factor in both level busts and runway incursions in the UK. The following tips for pilots will help improve RTF standards in UK airspace.

1. Maintain RTF discipline – use clear and unambiguous phraseology at all times, especially when reporting ACAS events.
2. Both pilots should monitor the frequency.
3. **Do not** read back a clearance as a question, and avoid asking confirmatory questions on the flight-deck (eg “They did say flight level 110 didn’t they?”)
4. Ensure you pass all information relevant to your phase of flight.
5. On frequency change, **wait and listen** before transmitting.
6. Take particular care when issued with a conditional clearance. When reading back a conditional clearance, make sure you state the condition first.
7. **Check** RTF if there is a prolonged break in activity on the frequency.
8. Set the clearance given, **not** the clearance expected.
9. Always use the correct callsign. Abbreviated callsigns are only allowed under certain conditions.
10. If you are unsure, **always check!**

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Cyber Security – A Borderless Threat

by Zoe Reeves, BALPA Flight Safety Officer

We live in an age of innovation and increasing technological advances which has its advantages but also its disadvantages. Most of us rely more and more heavily on our devices to stay connected to the modern world on so many levels, and while our backs have been turned, a threat that has no face has been emerging, getting bigger and making us vulnerable. It has been hitting some users hard, the repercussions of which can be far-reaching.

The UK National Security Risk Assessment (NSRA) classes cybersecurity as a tier one risk alongside three others: international military crisis between states, international terrorism, and a major accident or natural hazard. These are judged to be the highest priorities for UK national security over the next five years, considering both likelihood and impact.

A cyberattack could be stealing data, disrupting and denying services, or carrying out fraud. But a much more worrying trend has been observed recently where perpetrators use extortion, blackmail and/or demand ransoms to carry out an attack. Not only can an attack cause much disruption to the users as a collective, but a system that may not have been directly targeted can be taken down as a result elsewhere, becoming a victim of collateral damage.

Twenty-three percent of private sector companies in the UK have experienced a cybersecurity event in 2014 (results based on the current policy of non-mandatory reporting), creating an estimated annual worldwide cost to business of $400 billion (with $3-4 billion just in the UK). Commonly, companies are not aware an attack has taken place for around 100 days on average, in the meantime racking up huge losses of revenue.

Now, if we look at this with an aviation interest, many systems are potentially hackable. For example: reservation systems, air traffic management systems, access control management systems, departure control systems, passport control systems, cloud-based airline data storage, cargo handling and shipping, or a commercial flight operation. If we look specifically at a commercial flight operation, this system generates and requires large amounts of data that is critical to the safe operation of that aircraft. This data is normally stored on computers and transmitted across networks to other computers, both on the ground and on board the aircraft. The transfer of data is critical and integral to an operation of a modern aircraft.

Some of the leading ways a cyberattack could be carried out currently are perceived to be:

Phishing attacks

Phishing attacks have already been successful against victims employed in the aviation industry. In 2014, CIS (Centre for Internet Security) reported that 75 US airports were the targets of advanced persistent threats (when unauthorised groups or individuals gain access to an organisation's network). A public document listing email addresses of the targeted airports was listed as the root cause of the attack.

Spoofing Attack

A situation where a forged (but valid) signal is crafted to trick the receiver. For example, via GPS, SSR and ADSB signals.

Remote hijacking

Security flaws in communication technologies used in the aviation industry could possibly enable hackers to remotely attack and control in-flight and on-board systems. A hacker (Hugo Teso) has shown how the flight management system (FMS) can be compromised via ACARS or through firmware remote modification. However, there is no definitive proof of concept regarding FMS post – exploitation currently.

DDoS and botnet attacks

Distributed-denial-of-service attacks have grown in popularity to carry out a range of malware injection activities. Within such attacks, hackers use botnets of compromised networks to flood air traffic control and other critical systems with traffic, which results in a disruption of service.

WiFi-based attacks

Vulnerabilities have been highlighted amid an aircraft on-board WiFi system that could allow hackers to use the on-board WiFi signal or in-flight entertainment system to hack into the plane's avionics equipment and disrupt or modify satellite communications.

Much of the technology and communication protocols currently in use were developed at a time when aircraft were relatively unconnected to the outside world, resulting in most of the systems not being designed to protect the information they carry. Although there have been some initiatives to improve the cyber threat situation, most airborne systems are still inherently insecure.

Back in early 2015, Chris Roberts was detained by the FBI following a United Airlines flight to Syracuse, New York, after officials saw a Twitter post he made discussing hacking into the plane he was travelling on.

During FBI interviews, Roberts told investigators he hacked into in-flight entertainment systems aboard aircraft. He claimed to have done so 15 to 20 times from 2011 to 2014. He also claimed that once he had hacked into the systems he could then overwrite code, enabling him to issue a climb command to the aircraft he was travelling on.

Boeing and Airbus have strongly disagreed that the IFE (inflight entertainment system) is capable of being hacked and it does seem unlikely that Roberts got as far as he claims. One thing does remain, though, is that this behaviour where a passenger connects to something under their seat that they're not supposed to connect to is a bad thing.

An article written by Ruben Santamarta, Principal Security Consultant for IOActive entitled 'SATCOM Terminals: Hacking by Air, Sea and Land' has shown the vulnerabilities of satellite communications (SATCOM) which plays a vital role in the global telecommunications systems within aviation. IOActive evaluated the security posture of the most widely deployed Inmarsat, Iridium, and Thuraya SATCOM terminals. IOActive analysed the firmware of these devices, and found that malicious actors could abuse all of the devices within the scope of the study. The vulnerabilities included what would appear to be backdoors, hardcoded credentials, undocumented, and/or insecure protocols. These vulnerabilities have the potential to allow a malicious actor to intercept, manipulate, or block communications, and in some cases, to remotely take control of the physical device.

We know that cybersecurity incidents in aviation increase in number and magnitude year on year. The following is a sample of what has occurred over the last few years and gives you a flavour of the problem:

- A cyberattack on the internet in 2006 that forced the FAA to shut down some of its air traffic control systems in Alaska.

- A cyberattack on an FAA computer in February 2009 where hackers obtained access to personal information of 48,000 past and present FAA employees.

- A cyberattack that led to the shutdown of the passport control systems at the departure terminals at Istanbul Atatürk and Sabiha Gökçen airports in July 2013, causing many flights to be delayed.

- In June 2015, a cyberattack grounded around 1,400 passengers when the flight plan system of 10 planes went down for around five hours at Warsaw's Chopin airport. Hackers used a distributed denial of service (DDoS) attack. This took many by surprise, including the affected companies concerned.

The vulnerability of the aviation system is no longer a secret and will significantly increase with the implementation of new technologies and interconnected air transport and traffic management systems. However, it's not all doom and gloom. The problem has started to be tackled in force with numerous organisations (ICAO, IATA, ECAC, Eurocontrol, EASA) developing their own cybersecurity strategy. Further to the EASA conference on cybersecurity in aviation held on 22nd May 2015 in Brussels, the European Commission tasked EASA to develop an action plan in consultation with aviation stakeholders. Furthermore, on 9th July 2015, EASA participated in the cybersecurity session of the Justice and Home Affairs Council, during which the proposal to set up an aviation Computer Emergency Response Team (AV-CERT) was supported. AV-CERT will help understand the nature of the threats, collect evidence of previous cyberattacks, identify security flaws and vulnerabilities, and analyse and develop responses to those cyber incidents or vulnerabilities – whether that be workarounds, recommendations, or technical solutions.

Those European efforts mirror recommendations by the high-level advisory committee set up in June 2015 by the FAA. The aim of this committee is to identify risk areas and reach a consensus on international design and testing standards to counter cyberattacks with the overall aim to ensure an open and free cyberspace and to protect it from incidents, malicious activities and misuse.

The aviation security landscape is fast changing and becoming more challenging with an emerging new frontier of cyber threats appearing. While many stakeholders in the global civil aviation community are aware of the seriousness and catastrophic consequences that can come about from cyber threats, many are still grappling with these challenges and are not necessarily ready or equipped to deal with such threats confronting them, at both the individual and national system-wide level.

However, the use of more advanced and sophisticated IT and computer-based systems in civil aviation operations will continue and expand even more in the future. This will percolate down to even the most basic functions such as data collection and processing, where heavy reliance on the security of IT systems will become critical. The cyber frontier is massive and there are numerous inroads where terrorists and malicious persons can use to conduct a cyberattack on civil aviation service providers and other critical systems.

It is crucial that EASA, ICAO, international organisations and associations, and all civil aviation stakeholders, work to raise the level of awareness and recognition of the cybersecurity threat, and undertake actions, even if at an incremental pace, to protect and mitigate against cyber threats that could seriously impair and cripple the global civil aviation system.

Published in The Spring 2017 edition of The BALPA Log.

Unstable Approach And Hard Landing
Air Canada Rouge A319, Montego Bay, Jamaica

by Dai Whittingham, Chief Executive UKFSC

Lord of the Wings©

On 10 May 2014, an Air Canada Rouge Airbus A319 (C-FZUG) departed Toronto for Montego Bay, Jamaica, with 131 passengers and 6 crew members on board. During a non-precision approach to Runway 07 in visual meteorological conditions the approach became unstable and the aircraft touched down hard, exceeding the design criteria of the landing gear. There were no injuries and no structural damage to the aircraft, but both main landing gear shock absorbers were changed per the manufacturer's recommendation.

The event

The aircraft departed Toronto Lester B. Pearson International Airport with the captain in the left seat as pilot flying (PF); the first officer was the pilot monitoring (PM). The captain had 10,000 hrs, 4500 on type, of which 500 were as PIC; the FO had 12,000 hrs, 475 on type as FO. The aircraft climbed to FL370 for the cruise portion of the flight. Prior to descent and approximately 30 minutes before touchdown, the PF gave the approach briefing for the instrument landing system (ILS) approach to Runway 07 at Sangster International Airport, Montego Bay, Jamaica. The briefing did not cover go-around and missed-approach procedures.

Mid-way through the descent ATC asked the crew which specific approach they preferred, offering the RNAV or the VOR/DME5 for Runway 07. At this point, the flight crew became aware of the NOTAM specifying that the ILS 07 was unavailable. The NOTAM had been included in the company flight release documents before departure but had not been noticed by the flight crew. The crew opted for the VOR/DME Runway 07 approach.

Twelve minutes before landing, the PF re-briefed the VOR/DME approach but, as with the earlier briefing, did not discuss the go-around and published missed-approach procedures. The PF announced that a managed approach would be conducted, meaning that the aircraft would be guided along the FMS lateral and vertical Flight Plan and speed profile using modes and targets inserted via the flight control unit (FCU), the crew's primary interface with the auto-flight system. He briefed that they would cross the FAF at 2000 feet asl with a flight path angle (FPA) of 3.2 degrees.

The flight crew held a short non-operational conversation while the aircraft was descending though 10 000 feet. An earlier 3-minute conversation had taken place during the initial descent from FL370. Company policy required a sterile flight-deck from top of descent.

Six minutes before landing, ATC asked whether the flight crew could proceed directly to LENAR (the IAF) and then cleared them to do so. At this point, the aircraft was being flown using the autopilot and autothrust systems. A short while later the PF selected a target speed of 190 knots on the FCU and the aircraft began to decelerate from 250 knots. The aircraft was now level at 3000 feet and closing with the final approach track; the track was intercepted, with Flaps 1 selected, at approximately 9.6 nm from the threshold, contrary to the company SOP which required a minimum of Flaps 2.

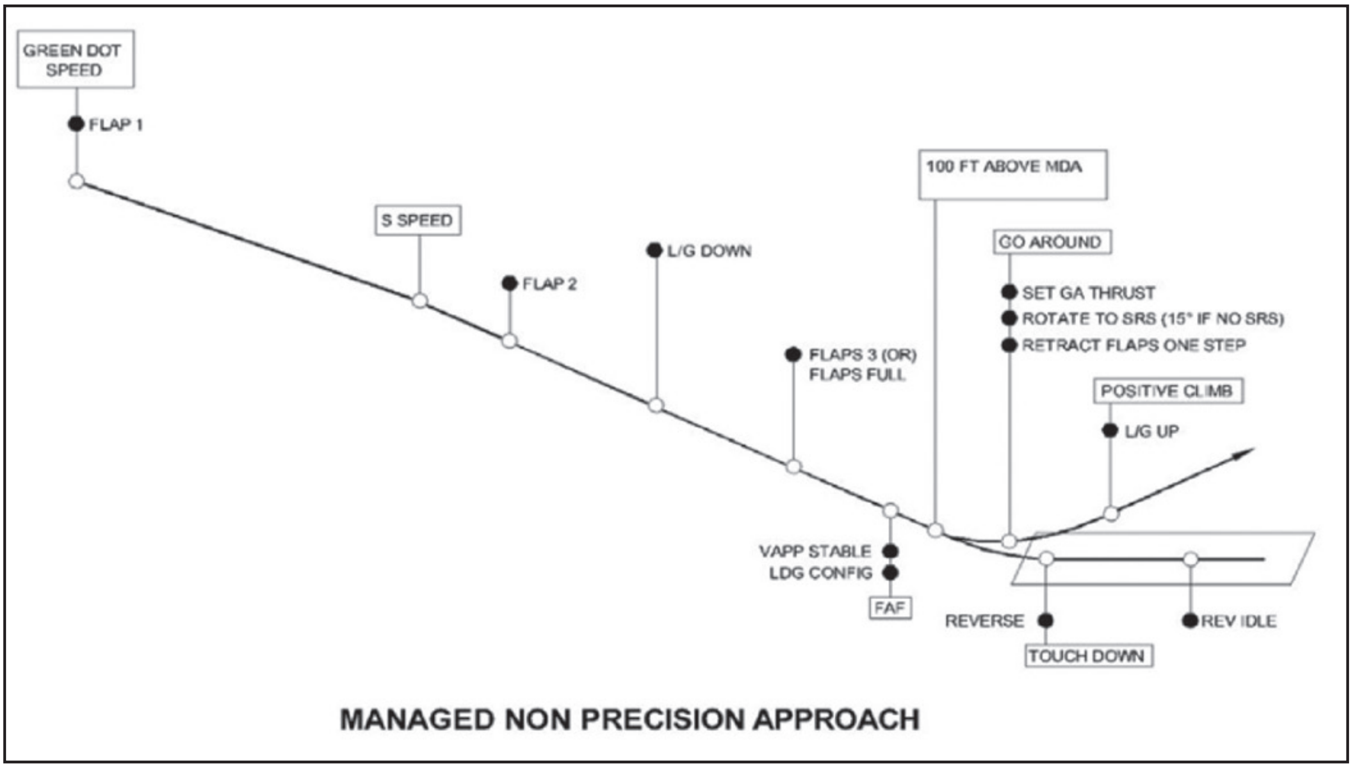
Four nm before the FAF, AP and autothrust were still active, the airspeed was around 200 knots decelerating, and the aircraft was slightly above the 2.95-degree precision approach path indicator (PAPI), but below the 3.2° FPA. As the aircraft began its final approach descent the flight mode annunciator (FMA) lateral and vertical modes changed to NAV and FINAL DES, the flight path being managed by the flight management and guidance system (FMGS). The selected airspeed was still 190 knots.

At 9.2 nm from the threshold the airspeed had reduced to 195 knots and the PF selected a new target speed of 180 knots, the autothrust system reducing the engine thrust to idle in response. Half a mile further on, the PF requested landing gear down to expedite the descent. This was not the expected configuration sequence (Flaps 2 before landing gear), but the landing gear can be lowered at any point during the approach for energy management purposes.

Twenty-five seconds after the previous FCU speed selection, the airspeed had reduced to 188 knots but the selected target speed was changed from 180 knots to 190 knots, then to 200 knots, resulting in increase in thrust, airspeed and descent rate (which reached 2000 fpm). At around this time the landing gear indicated down and locked. The aircraft was then 7.7 nm from the runway and 1.7 nm from the FAF, with Flaps 1 selected. At this point, the aircraft should have already been configured at Flaps 3 to comply with company SOPs.

At 1.6 nm from the FAF the crew changed the FCU target speed from 200 knots to the managed target speed of 134 knots, equivalent to the final approach speed (VAPP) as calculated by the FMGC. The aircraft was 198 knots, descending through 2440 feet and beginning to decelerate in response to the change in target speed. The FAF was crossed at the appropriate height (2000 feet) but with an airspeed of 188 knots (VAPP +54), landing gear down and still at Flaps 1, whereas the SOP expected the aircraft to be stable at VAPP with landing gear down and flaps 3 selected.

During the FAF crossing, the PF selected 3.2° FPA via the FCU, and the FMA lateral and vertical modes changed to track mode (TRK) and to FPA, respectively. The flight crew did not make any call-outs or complete SOP actions as they passed the FAF, so the appropriate missed-approach altitude was not set in the FCU. Shortly after crossing the FAF, the PF disengaged the autopilot as the aircraft descended through 1780 feet; airspeed was 186 knots. The remainder of the approach was flown manually by the PF.



Air Canada Rouge standard operating procedures for a managed non-precision approach (Source: TSB Canada report)

Descending through 1690 feet, 5 nm from the runway, with an airspeed of 187 knots, the PF requested Flaps 3. The PM responded by selecting Flaps 3 but then quickly retracted the control to Flaps 2, presumably because the airspeed was above the Flaps 3 limit. The PM did not call out either the speed limit lever or the flap position he had selected, though the investigation found that the PF believed that he had requested Flaps 2.

Eight seconds after the Flaps 3 call, the crew pulled the altitude selector (ALT/SEL) knob on the FCU. However, because aircraft was already below the FCU-selected altitude of 2000 feet, the vertical mode changed from FPA to open climb (OP CLB) mode, and the autothrust changed to climb thrust (THR CLB) mode. The autopilot was off, so the aircraft did not climb, but the autothrust increased the engine thrust from 34% to 87% and the airspeed increased accordingly. Three seconds later, now 4.5 nm from the runway, with an airspeed of 185 knots and at an altitude of 1530 feet, the aircraft briefly levelled off and then began to deviate above the 3.2° FPA.

The PM then selected Flaps 3 a second time, again without communicating the selection or observing that the speed was correct for the flap setting. Because of the THR CLB activation, the airspeed increased to greater than the 185 knots maximum speed for Flaps 3 selection, reaching 193 knots and triggering a master warning and flap overspeed chime. Almost immediately, the flight crew changed the FPA on the FCU from 0° to 3.2°, the FMA lateral and vertical modes returning to TRK and FPA, and the autothrust reverting from THR CLB to SPEED mode.

Six seconds after making the Flaps 3 selection, the PM again briefly retracted the flaps to Flaps 2 and informed the PF of the new configuration. The PF then disengaged the autothrust using the instinctive disconnect pushbutton and moving the thrust levers to idle. After a further 6 seconds, the PM again selected Flaps 3 and advised the PF of same. The aircraft was now descending at 300 fpm through 1420 feet, at 182 knots, thrust levers at idle, and autothrust off.

The PF called that they were high on profile and that he was correcting, then stated that the autothrust was off, but the PM did not hear the autothrust statement. The rate of descent increased to 1400 fpm as the aircraft began to converge on the 3.2° FPA. Just inside 4 miles from touchdown, the PM called out "autothrust," the first callout item on the final landing check. The PF did not immediately respond but then interrupted the checklist with dialogue about the missed approach, asking the PM to dial in the missed-approach track and altitude. The pre-landing check was not completed, the autothrust remained off, and thrust levers remained at idle. During this exchange the aircraft continued to descend and decelerate, reaching 670 feet at 160 knots. The aircraft also descended through the operator's 500-foot arrival gate (100 feet above MDA) used for the stabilized approach criteria, which should have prompted the stabilized approach check called for by SOPs.

With the aircraft 1 nm from the runway, at 370 feet and 146 knots (VAPP +12), the PF made the 500-foot stable approach call, which included "a hundred above, stable, minimums, runway in sight." The engines were at idle thrust, with autothrust off. Company stabilised approach criteria were not met: the airspeed was high, the thrust setting was at idle, and the landing checklist was still incomplete.

At 0.5 nm from the threshold, the airspeed was decreasing through 134 knots (VAPP), the aircraft was descending through 200 feet at 570 fpm, with 5.6° nose-up pitch, and at idle thrust. At 80 feet, the PF applied a nose-up input consistent with the landing flare; airspeed had reduced to 123 knots (11 knots below VAPP) and the rate of descent had increased to approximately 650 fpm. By 40 feet the aircraft was in a low-energy state (the audio-warning is inhibited below 100ft): airspeed was decreasing through 115 knots (VAPP -19), pitch was stabilised at 9.8° nose-up, and the rate of descent had increased to 860 fpm.

When the FWC issued an alert of "thirty," the thrust levers were briefly advanced to TOGA power but the thrust had only increased by 4% at touch down. Full nose-up side-stick was used in the final flare but the input was moderated by activation of the alpha protection system and the pitch attitude began to decrease slightly. The aircraft touched down hard at 108 knots, with a vertical load factor of 3.12g, approximately 125 feet past the (300 feet) displaced threshold. Ground spoilers and autobrake activated normally and the aircraft cleared the runway without any further incident.

Analysis

The Transportation Safety Board of Canada (TSB) found no aircraft failures or system malfunctions that could have contributed to the occurrence. In the analysis phase of its investigation, TSB concluded that a series of operational and non-operational events drew the crew's attention away from the execution and monitoring of a stable non-precision approach and resulted in their lack of awareness of the aircraft's low-energy state before touchdown.

Of note, the crew was not under any time pressure and this was not a factor in the overlooking of the active NOTAM on the non-availability of the ILS nor in the omission of the go-around procedures and published MAP from both approach briefings. Non-operational conversations during the descent and prior to the final approach may also have been a source of distraction, and company policy was to prohibit such conversations during critical phases of flight.

The TSB investigators observed that primary procedure "errors can be trapped with the robust use of checklists and monitoring" and that "errors can occur because of competing task demands, poor procedure habits and CRM failures". TSB also commented on the importance of adherence to SOPs and the use of briefings as known mitigation strategies for unstable approaches. The omissions from the flight planning process and the approach briefings meant the crew might not have had a shared understanding of the plan or its associated priorities, and this may have resulted in reduced crew coordination.

The operator had stabilised approach criteria and policy, a no-fault go-around policy, an occurrence reporting policy and an established SMS. However, TSB found an inconsistency between company stable approach criteria and its SOPs, in that the aircraft was technically stable as it crossed the FAF arrival gate – its approach profile, vertical speed and lateral tracking were all appropriate, but its speed and configuration were not in accordance with SOPs.

The operator did not provide simulator training in recognising unstable approaches (nor was it required to do so by regulation), which may have led to the crew not recognising multiple deviations in airspeed and thrust settings, or deficiencies in coordination and communication. The operator was providing training for autothrust-off approaches during initial type training but not during recurrent training; there was no regulatory requirement for manual thrust scenarios as part of the recurrent programme, merely that all initial training syllabus items should be covered during over a defined period of time (36 months in this case). There was no autothrust-off training included in the PF's captaincy upgrade training, and there was no regulatory requirement for its inclusion; the PF had completed autothrust-off training in 2008.

TSB made the following specific findings as to risk:

- *If flight crews do not conduct thorough briefings, including missed-approach briefings, they may not have a common action plan or set priorities, resulting in reduced crew coordination, which might compromise the safety of flight operations.*

- *If flight crews are distracted by other operational and non-operational activities and do not follow standard operating procedures, critical tasks associated with flying the aircraft may be delayed or missed.*

- *If flight crews do not adhere to standard procedures and best practices that facilitate the monitoring of stabilized approach criteria and excessive parameter deviations, there is a risk that threats, errors, and undesired aircraft states will be mismanaged.*

- *If an air operator's standard operating procedures (SOP) are not consistent with its stable approach policy, there is a risk that flight crews will continue an approach while deviating from the SOPs, resulting in an unstable approach.*

- *If standards for flight crew training in relation to automation proficiency are not explicit with regard to frequency, there is a risk that air operators will exclude critical elements from recurrent training modules and that flight crews might not be proficient in all levels of automation.*

The operator has taken the following safety actions:

- Simulator training for unstable approaches leading to a go-around has been incorporated into the syllabus for flight crew recurrent training and this will be extended to initial type training.

- The recurrent training syllabus has been modified to include more manual flying, including controlled flight into terrain (CFIT) recovery, steep turns, approach to stall, upset recovery, autothrust disconnection and reconnection, and operations with autothrust off.

- The company stable approach policy has been refined and the changes reflected in SOPs.

- The annual recurrent training programme now has new and/or improved modules on dealing with distractions on the flight deck; leadership and professional standards, focusing on open communication; and dealing with non-compliance with standard operating procedures by the other flight crew member.

Source: TSB Canada Report A14F0065 - Airbus A319, C-FZUG – released 09 January 2017.

Getting to Grips with UAVs: Government Consultation Nears Completion

by Edward Spencer, Christopher Smith and Sammy Beedan, Holman Fenwick Willan LLP

The issue of unmanned aerial vehicles and their interaction with conventional airspace users continues to be a cause for concern. That said, the UK Government recognises the wide and varied application of drone use and, in particular, the potential value of the drone market and its benefits to UK industries more generally.

The UK Department for Transport is currently undertaking a consultation on the safe use of drones which appears to be geared towards how to embrace this emerging technology without compromising on safety. The consultation, which relates only to civil and not military use, commenced in December 2016 and will end on 15 March 2017. Notable proposals under consideration are as follows:

- The establishment of a clear and developed framework of standards of pilot competency and qualifications for all operations, that reflects varying levels of complexity in drone operations. Evidence is being sought on the levels of pilot competency required and what the new standards and qualifications should be.

- Improving drone user awareness of the law, by mandating that drone manufacturers and/or vendors issue official guidance on safety and legal flying requirements at point of sale and/or drone activation.

- Ways to improve the effectiveness of the official guidance are also under consideration, including whether there is a need to produce age-related guidance (to improve awareness of risks to safety amongst parents and adults responsible for children when flying drones), and whether there should be knowledge or situational awareness tests that leisure users of drones would have to undertake (akin to a driving theory test).

- Reducing the complexity of altitude limitations for drones, in general and when near licensed aerodromes and heliports.

- Improving deterrents by increasing the current penalties for breaking laws relating to drones, in order to deter misuse and incentivise compliance with safety and privacy laws.

- The creation of no drone flying zones, restricting flying in sensitive or dangerous areas, along with the empowerment of enforcement of safety, security and privacy at a local level. This includes looking at improving current technologies, such as geo-fencing, as well as endorsing other approaches such as raising safety awareness. The government believes more needs to be done to enforce current flying restrictions, given the number of breaches occurring.

- Introducing a registration scheme for all owners and their drones weighing 250g and over, with the intention of setting in place a future framework for drone regulation.

- Ensuring appropriate insurance cover is in place for any incidents that may occur.

The proposals advanced in this consultation are neither ground-breaking nor controversial. What is clear is that the government does not believe that a single solution will provide adequate protection, rather a number of measures will need to be deployed, together, in order to mitigate any risks to an acceptable level. As with any emerging technology, the framework will need to be structured so it can evolve in line with technological developments. Either way, the government appears to be prepared to embrace drone technology, along with the financial and operational benefits it will bring.

A full copy of the consultation is available at:

https://www.gov.uk/government/consultations/benefits-of-drones-to-the-uk-economy

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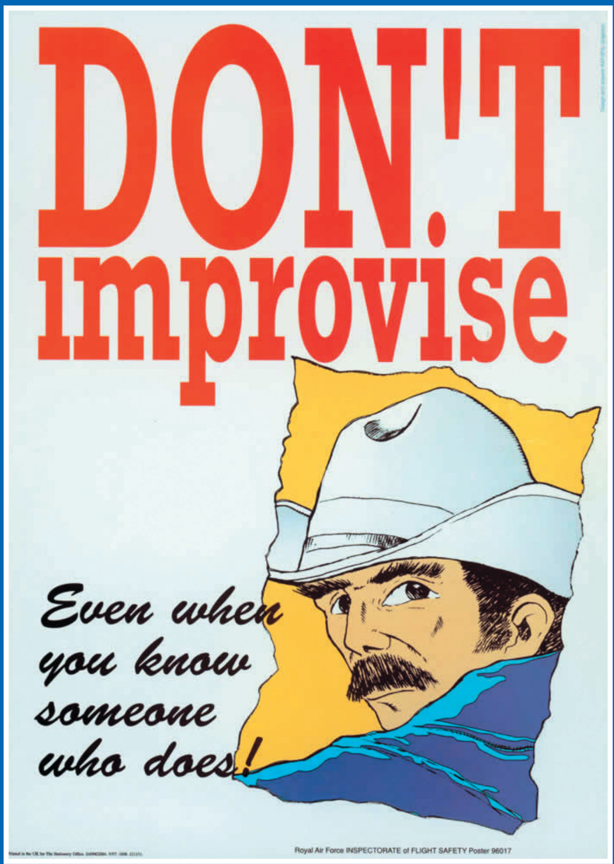

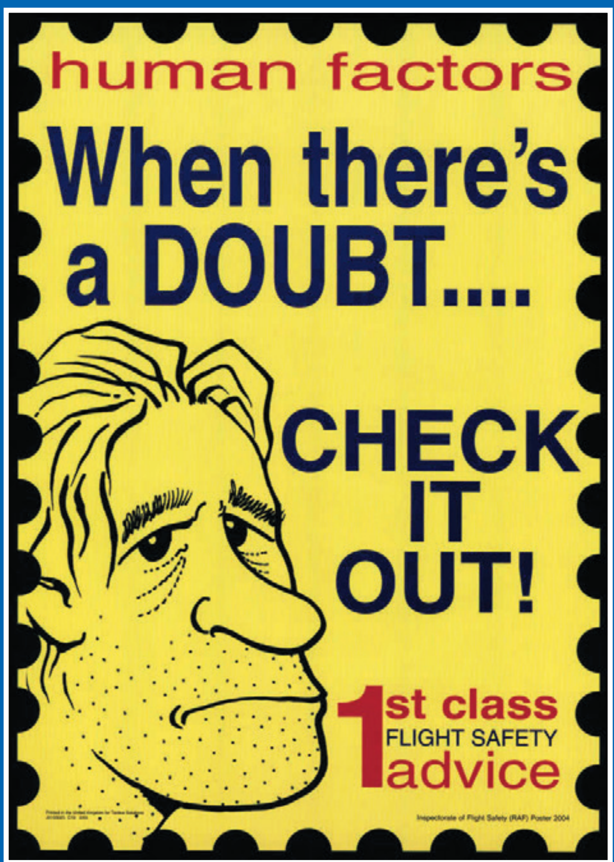

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