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focus

ON COMMERCIAL AVIATION SAFETY

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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: Boeing 737-3T0(SF) flying out of Coventry Airport in the new livery for West Atlantic UK

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ON COMMERCIAL AVIATION SAFETY

Closing the stable door……

by Dai Whittingham, Chief Executive UKFSC

Much has already been written and spoken about the recent Germanwings A320 tragedy. Some contributions have been thoughtful and measured, others most certainly have not. Some of the media coverage was outrageous, sensationalist and inaccurate nonsense, but that is the world we live in. Shortly after the news broke that the aircraft appeared to have been crashed deliberately, I had cause to express to a journalist my distaste about the footage then being shown of the home of the co-pilot's parents. Her answer was: "But it's on our doorstep!" Her observation was accurate but that did not excuse the media frenzy taking place. When I suggested to her that the same event in Africa or China would not have generated such a fuss, she was forced to agree.

The difference with this event was of course the fact that it was in Europe, with a European carrier and mainly European passengers and so it was a scenario most people could envisage without difficulty. The rarity of the occurrence was therefore lost in the immediacy of breaking news and personal tragedies. In this country at least, the election has forced the story off the front pages and the media frenzy has moved on for all but those most closely affected. For aviation the consequences will be with us for many years to come.

There is little doubt that, deliberate action notwithstanding, the loss of the Germanwings aircraft was an unintended consequence of the installation of armoured flight-deck doors in the wake of 9/11. But there is more to it than that. A single terrorist attack led to global changes in security arrangements which ultimately made the Germanwings event possible, even though the scenario had been envisaged from the outset and had already played out elsewhere. A single instance of pilot suicide – albeit with horrendous accompanying loss of life – is now likely to lead to other changes in security and safety despite evidence that an open door, or two pilots on the flight deck, is no real bar to someone bent on suicide. The game-changer was probably the presence of two ashen-faced heads of major European states at an accident site, with both having not only the desire to see things done to prevent a recurrence but also the political clout to force action on the international stage. The pressure to bolt this particular stable door will be enormous.

We need to be very careful to ensure that any changes are properly thought through and proportionate to the threat of an occurrence or there will be further unintended consequences. There is no evidence to show how many security events have been prevented by the armoured doors, though there are occasional reports of people attempting unsuccessfully to gain access to the flight-deck. The difficulty here is the same one that all nuclear-capable states face: how do you prove that a deterrent actually works? The fact that your state has not been attacked by another could owe as much to trade or treaties as to the presence of a nuclear deterrent. We will never know how many hijackings there would have been if the flight-deck doors been absent but we do know that one route to a further 9/11-style attack has been closed down, so the doors will stay. And that is simply because there are more terrorists out there than pilots who decide to use an aircraft to end their own existence regardless of 'collateral damage' in the form of innocent lives lost. We must also not lose sight of the fact that pilot suicides using aircraft are incredibly rare events.

So where do we go from here? A former member of the UKFSC wrote to me recently with some suggestions for dealing with the door lock over-ride issue; these included a requirement for both pilot's seats to be occupied to enable the lock function, using the same sort of weight sensors that most cars now have for seatbelt warning purposes. That seems sensible, though it does not cater for the scenario where one pilot needs to lock the other out of the flight deck because he believes the second pilot is a threat – you may recall a sad occasion in the USA in 2012 when a JetBlue captain suffered a mental breakdown in flight and was locked out of the flight deck before being restrained by passengers. However, that scenario too is mercifully rare. There was also a suggestion that the loss of power from certain busbars should unlock the door, which would cater for events where fire crews need to gain access to the flight deck in an emergency; use of crash switches to release the door lock would certainly appear to have some merit. But we do need to ensure that any measures addressing the door lock issue do not inadvertently introduce a weakness in flight-deck security arrangements. The short paper discussing the problem is available on the UKFSC website.

In his regular column, our Chairman discusses some of the issues raised by the Germanwings event and calls for a more enlightened approach to health problems. His suggestion that people with certain mental health conditions should be permitted to operate under supervision is viable provided that operators 'walk the walk' when it comes to Just Culture and that medical authorities do not become too protectionist. Happily, attitudes in this area are changing – witness recent developments in the approach to the management and treatment of Diabetes, where the CAA has been leading the field in keeping pilots flying who would simply have lost their licences in an earlier era. This enlightened view shows that some risks can successfully be quantified and mitigated where medical limitations are concerned, though there will always be conditions that present too great a risk.

Besides the impact of loss of licence at an individual level, there are clearly economic benefits to be gained from keeping people flying for as long as possible. Ensuring outflow from the pool of trained pilots is kept to an absolute minimum will provide better conditions for growth, especially given the various predictions of pilot shortages in the coming years. It means experience levels across the industry are not needlessly diluted and it helps ensure that training organisations do not have to over-invest in capacity. And that brings us to the age question.

I have never been comfortable with the idea that on Day X a person is fit, healthy and capable and yet on Day X+1 the risk they present has risen to such a level they can no longer be safely employed. We see this now with 'no single pilot over age 60' for complex operations; is the rise in risk really that stark? Is the system risk of pilot incapacitation really greater than that of employing a younger and less experienced pilot on, say, air ambulance or police helicopter operations? What a difference a day makes. Why is it OK to test an aircraft structure or component and agree it's good for another 1000 cycles when the same can't be said of the person that operates it?

The age decisions are based on empirical data drawn from the general population which indicate when the incidence of incapacitating medical conditions increases beyond a set limit. The trouble is that the data is by necessity historical but is also in some areas stale. We are being told via the media that today's 50-year old is as healthy as yesterday's 40-year old, life expectancy is increasing to the point where pensions need to be enhanced, and so on. The probability is therefore that the age coinciding with unacceptably increased risk of incapacitation is also moving to the right. It may not have moved by a full five years, but there is no reason why any increase in pilot age limits should have to move in 5-year increments. Why not try a one-year increase and see what happens?

The mitigation for any increase in the age limits would almost certainly be an increased level of health monitoring, just as we would increase the inspection frequency for an aircraft component. The first step in all this would be to increase health monitoring in general, but here I mean health in its widest sense and not in a narrow medical definition – I am not arguing for more medicals! Instead, I suggest the industry thinks hard about improving the way the wellbeing of safety-critical personnel is routinely monitored.

One of the key elements of military command and leadership is getting to know your people sufficiently well that you can, for example, identify signs of stress in them. That is of course easier in small teams and it would be almost impossible in the way larger civil operators currently work, where you might meet your FO for the first time in ops and not see them or fly with them again for months. But would there be mileage in establishing a loose mentoring system outside the normal training regime? Perhaps an arrangement where you establish small, informal groupings that would allow a mentor to fly more frequently with others in the group? You might then have the opportunity to spot where individuals were being troubled by professional or life events and provide support where required. A further advantage from a company perspective would be in offering people-management experience to mentors before they become managers in a more formal sense. Would a mentor system prevent another Lubitz? Possibly not, but definitely maybe, and it would certainly be better than in today's environment where you sink or swim on your own.

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ON COMMERCIAL AVIATION SAFETY

Fit to Fly?

by Chris Brady, Chairman UKFSC

I write this column just a month or so since the tragic Germanwings accident. The evidence points towards a deliberate act by the First Officer.

I am sure that we will look back on this event in years to come as a game changer. Pilot suicides, although very rare, have occurred before; Egyptair, Silkair and the Mozambique accident are the most well-known, although ASN lists 13 events and suspicion remains about MH370. But, as with most things, there is nothing like it happening on your doorstep to convince you that they are not just things that happen to other people, from other cultures, in other parts of the world. We are after all, all human.

In the days that followed this event, it turned from a simple tragic accident into something much more sinister. Now the travelling public realises that pilots, like an estimated 1 in 4 of the general population, can suffer from mental health problems and even suicidal tendencies at some point in their lives.

What must now follow is an in-depth review of how we as an industry deal with pilots' mental health. No press-fuelled, knee-jerk reactions but a serious meaningful study that will benefit pilots and passengers alike.

Most airlines only screen for mental health during initial selection. This testing is usually psychometric and tries to measure intelligence, aptitude and personality to estimate how well applicants can handle stress and the intellectual demands of the job. It is not an effective way of determining depression, mental stability or any other life pressures that may be going on at home. Even if it were, it would only be a snapshot which was valid at the time of assessment and would be out of date as soon as the next life event occurred. Screening is therefore not the golden bullet that some are claiming but it may be part of the solution.

In my flying career I have flown with many pilots who have confided in me some of their personal and health problems (I have had some myself!), none of which they would dare to raise with their AME for fear of having their medical revoked. The more wary would not even see their own GP for fear that the information will somehow get back to the AME/CAA with the same result. Why does this happen? The perception is that the annual medical is seen to be a rigorous test, beyond the control of the pilot, that could at any point identify a condition to which the response of the AME/CAA would be to instantly revoke your medical and leave you with a long, slow, expensive and very uncertain path to proving that you can get it back with no guarantee of success. In the meantime your hitherto high income has reduced or even ceased, bills and other financial commitments continue inexorably, your recency is decaying which will make any possible return to work more difficult and your whole future is turned on its head. This perception has been generated over the years by various stories about a colleague or friend of a friend to whom this happened. As in all rumours we tend to only hear one side of the story and often the most sensational side. However, these stories do have some basis in truth.

The situation with pilots health reporting appears to me to be directly analogous to safety reporting. With safety reporting in pre-just culture organisations, staff would not report for fear of retribution. In organisations where a more enlightened "just culture" exists, there is an atmosphere of trust in which staff can report openly and honestly without such fears, unless of course their acts were deliberate, thereby giving sight of the safety issues to the organisation allowing them to address the problems. A similar framework is required for medical reporting at both the organisational and the regulatory level. This would take a less risk-averse (draconian) approach to physical and mental conditions with the aim of curing and/or rehabilitating pilots back to health, preferably without any associated loss of licence and hence income, perhaps whilst allowing them to continue their flying, under the necessary supervision. We fly aircraft that are less than perfect under the MEL on a temporary basis, so why not pilots?

We know that statistically a significant number of pilots, like everybody else, will have some form of mental illness. If they all came forward now, the system would collapse. And, Germanwings aside, very few incidents have had pilot health as a contributory factor. Knowing that pilots have mental health problems does not suddenly make flying more unsafe, quite the opposite, it would give us the opportunity to address the problem, hopefully in a compassionate way, the net result of which will be a healthier, safer pilot workforce.

Thoughts on Mental Health

by Forbes Craig RGN,RMN

"No amount of pre-employment screening will prevent you employing people who go on to develop depression."

In this article, Forbes Craig, a mental health practitioner working as a therapeutic team manager with Blake Emergency Services, notes that pilots with suicidal tendencies are very uncommon. While the hazard of having aircrew with stress and affective disorders may not be so uncommon, the risk to the flying public is from these is vanishingly small. She also offers some of her personal thoughts on the matter of mental health awareness and care in the aviation industry.

The Germanwings aircraft tragedy was, and continues to be, distressing. When a tragedy happens human beings empathise: even when we don't know the people on board, we identify with the bereaved. No-one wants to be bereaved. It hurts, and when humans are hurting they often seek someone to blame. It is really easy to blame the pilot, especially if that pilot apparently has a mental disorder history. One can see that it may be easier for the industry to blame pilots than to take a deeper look at its own systems.

I have thought about the issue of the mental well-being of aircrew for some time now. Professionally, I have delivered care to traumatised individuals, groups and businesses in private and public sectors for more than 25 years. I have responded to many fatal accidents: deaths at work when someone slipped off a roof, or killed themselves, murdered a colleague, or chose suicide elsewhere under the wheels of a public service vehicle. And as part of my work I deliver mental health care following fatalities or potential fatalities (life-threatening incidents) in aviation. All the tragedies leave those behind asking questions: What should have been done to prevent this? Who can I blame/sue? Where will I take my business? Or, hopefully, how can we help ameliorate the risk of this hazard occurring again?

One question that runs true throughout both public and private sector businesses is how you function in a team. It is often the team around you that notices when one's behaviour changes. But when differing from one's norm, someone has to know you well enough to notice. Being less scrupulous with personal hygiene, less attentive to performance standards or more irritable with colleagues will show to other members of your team, and they may connect with appropriate provision that may save lives.

One of the things that truly surprised me when I began working with aviators is that cockpit/cabin crews are not actual teams as I would recognise them. They may know each other slightly but, for many, the first time they meet the colleagues they are flying with on any one duty turn, is in the pre-flight briefing room. It is a high stress job. It costs a lot of money to train and retain aircrew, plus pilots are naturally extremely keen to keep flying. So perhaps it is not surprising that, in a relatively macho culture with responsibility for others' lives, along with phenomenal costs involved with aircraft scheduling etc, psychological care for aircrew only extends so far. Pilots themselves may collude with a non-disclosing atmosphere because they wish to keep their hard won, high status jobs. Mental ill health is one of those last taboos that is only now being broken down, slowly.

The Germanwings pilot, if one can believe the media reports, had a high level of emotional investment in continuing to fly. It may be that he believed he was about to lose his medical category and hence his career in aviation. In that, he is no different to you or me. We all want to continue to live our own lives as we wish. It is just that, for some, ill-health gets in the way. What is different is that this man killed so many others at the same time. That to my knowledge is very rare.

Forms of mental distress

The most common forms of mental distress are depression and anxiety disorders (there are of course others). Many people go about their professional and personal lives with one or both of these affective disorders without it being noticeable to people outside of their intimate circle, and many are capable of hiding the true level of their distress even from those closest to

them. A further factor is that individuals with these disorders may have also lost insight to their own mental state. Some articles discuss a state of denial as if it is always a choice: that is not so, it can be a feature of the disorder itself.

Depression can be as a result of intolerable pressures in one's everyday life; this is known as a reactive disorder. Many will find this embarrassing as they had hitherto regarded themselves as in strong control of things. Or it can come from nowhere, an endogenous event. For some, it is a one off event like any other illness; for others it is cyclical, like repeated doses of very bad flu, although worse. No amount of pre employment screening will prevent a company employing people who go on to develop depression.

So if your partner in life did not know you were about to kill yourself, how could your employer? I know from my own professional experience that one can assess a patient as safe to leave hospital, only for them to go on to complete a plan made months before. Do remember most of those with depression or anxiety DO NOT go on to kill themselves. It is a hazard, but the risk factor is limited.

Rationally the public knows this, otherwise the figures would be a real cause for concern when flying. But fear is not always rational. Whilst flying is still a little regarded as exciting, it can be anxiety-provoking. Pilots also still carry a whiff of hero status, since their job is seen as special.

Then such over-hyped concern does enable a certain amount of puerile screaming in the media - selling news is their way of making money. However, I am of the opinion that this awful tragedy gives the aviation business a period of grace to look at how the psychological well-being of staff is managed. Since the 1974 Health at Work Act came into force, all UK businesses have a duty of care to their employees, including for their psychological well-being.

Work-related stress depression and anxiety is defined as a harmful reaction people have to undue pressures and demands placed on them at work. The latest estimates from the Labour Force Survey for 2013/2014[1] show:

- Stress, depression or anxiety account for 39% of all work-related illnesses
- 11.3 million working days were lost in the UK due to stress, depression or anxiety, an average of 23 days per case.

The main work activities suggested as causing work-related stress depression or anxiety reported to general practitioners (THOR-GP 3 year average 2011-2013) are:

- Workload pressures including scheduling, shift work and other organisational factors;
- Interpersonal relationships including difficulties with superiors and bullying or harassment; and
- Changes at work including reduction of resource or staff and additional responsibilities.

It is not cost-effective to ignore mental health as an issue in any business. But when you add public safety to the factor of public perceptions, who would you choose to fly with? A company that is known to care for its staff, or one that effectively operates a blame culture and discards its mental health casualties?

In terms of mitigating the risks, it might be that work practices can be improved or new routines instigated. It might be that more supportive management is a better way to go. Maybe if pilots flew more often with the same colleagues, then more collegiate support could be effective. The onus is always on one's self to report sick or unfit for duty in many workplaces; aviation goes one step further and makes it unlawful to operate when knowingly unfit. But if one is seen to be a wimp or possible fodder for downsizing, who is going to risk taking a day off?

So are commercial aircraft pilots that unusual? No. Is it relatively common for pilots to be stressed or have an ongoing affective disorder? Yes, it is across all workforces. When one looks at the numbers, is it a serious hazard to the flying public? No. But should the aviation industry doing something about it? Of course it should.

Mental health problems are common

Mental health problems are quite common in the general population. 1 in 4 people in the UK will experience a mental health problem in any one year, and 1 in 4 families worldwide will have at least one member with a behavioural or mental disorder.[2] Every seven years a survey is done in England to measure the number of people who have different types of mental health problem each year. It was last published in 2009 and reported these figures:

- Depression
  2.6 in 100 people
- Anxiety
  4.7 in 100 people
- Mixed anxiety and depression
  9.7 in 100 people

Some problems are asked about over a person's lifetime, rather than each year:

- Suicidal thoughts
  17 in 100 people
- Self-harm
  3 in 100 people

So what does this tell us about the risk of a fatal air accident with a suicidal pilot? The percentage of pilots in the UK population is about 0.033%*, so the risk of a pilot having had suicidal thoughts at some stage in their life is 0.001942% - which is not statistically significant. And remember that suicidal thoughts rarely translate into the act itself. So should we still care? Yes! Not only does it make good business sense, is ethical and adds to the value of the business by public perception but it is a lawful requirement. As the Royal College of Psychiatry points out:

"When recruiting staff, employers have a legal requirement to ensure they are not discriminating against anyone who has a mental health problem..."

Given that one in five employees already has a mental health problem and one in three of the working-age population may be experiencing some type of mental health condition, the answer isn't to avoid hiring people who may have a mental health problem now or in the past.

Disclosure

But is it realistic for the pilots to be very wary of disclosure? Robert Bor writes: "there are very clear exclusions for airline pilots who might have psychological problems, a history of self-harm, personality problems, major depression etc... you will never be able to hold a pilot's licence. You will be excluded forever. It is not as though you can get better and start flying again".[3]

I take exception to the severity of his statement about not "getting better", as the majority of those with mental health issues such as depression or anxiety do get better. However, in applying for any job everyone is assessed as whether or not they are able to do the task without prohibitive costs to the business. Since safety in aviation is paramount, it is obvious that being capable means more than doing the maths - it is also about dealing with the stresses involved. A pre-existing condition of obvious psychoses should exclude people at the initial pre-employment screening, but that screening won't automatically find a disorder that has yet to develop.

People who recover from a mental disorder can usually be returned to work without limitations, and it makes every sense to try to retain the economic and time investment in a pilot's training and experience. Automatic and permanent exclusion will lead to people hiding their condition and their failing to get the help needed for recovery. Aviation therefore needs to have a mechanism that will allow people to disclose an episode of distress or existence of a mental disorder without fear of immediate loss of employment and career.

How frequent is suicide?

We cannot know if the young man who piloted his plane into the ground was in the grip of a florid episode of mental distress but it looks likely. If he was able to hide any history of mental health disorder then it is likely that he could dissemble well enough to continue to function well enough to complete his day to day

**Approximately 20,000 UK professional pilots, population of 61.4 million.*

role. The possibility is that he had already made the decision to kill himself some time before. This is not uncommon for those who, once they have made up their minds and have a plan in place to end their life, as they can behave outwardly in a comparatively normal manner. That means evidence would not be visible, especially not to someone he has never met before, never mind not being observable to a mental health professional. This leaves me with a big question: as moderate to severe depression often means low mood, low energy and poor concentration, how then did this pilot complete his necessary tasks?

According to the Federal Institute for Population Research[4], 13,900 people in Germany took their own life in 1990, falling to only 9,900 in 2012. About 73% of all people intentionally killing themselves are aged 45 or older, whereas for people under 25 the rate is only 6%. "Among all causes of death, self-murder plays a minor role anyway: only about 1% of all annual deaths are suicides."

In the case of suicidal ideation only about 3% of those with active illness think about self-harm. Not everyone with a diagnosis has florid symptoms all the time. The actual risk of someone choosing to kill themselves in a full blown moment of such angst is uncommonly rare. In the UK the suicide rate is just 0.12%[5]. Killing others at the same time is very rare indeed. It is ineffably sad that while completing self-murder (as Germany describes it) he also murdered the other 149 people. It would be unreasonable to consider the Germanwings event as a significant risk factor when flying? This suicidal pilot was highly unusual - unusual in Germany, unusual as a pilot, unusual as a younger person, and unusual in choosing to kill so many others at the same time.

That being said:

- Customers need to know that those flying the aircraft are well enough cared for that the risk factor is infinitesimally small
- Pilots putting themselves forward for multi engine rating need to be confident that their colleagues are unlikely to want to kill them
- Cabin crew need to know that the risks of being killed by the pilot or co-pilot is low enough that doing yet another safety task does not overwhelm their level of recompense
- Media hype needs not to be potentiated by reactive statements increasing the flying public's apprehensions
- Businesses need assurance that extra compensation costs will not be prohibitive

Would a screening process over time help? Perhaps, but it must be conducted by qualified mental health professionals and coupled to a more thorough acceptance of the ebb and flow of mental distress. A more informed and helpful stance on support, with improved access to mental health user friendly staff, can only do good across the board of the aviation world.

Finally, as someone who flies frequently for work and pleasure, will I continue flying? Yes... the hazard exists BUT the risk is statistically insignificant.

Thanks to Steve Hodgson for his help with statistics in the preparation of this article.

Notes

1. www.hse.gov.uk/statistics/cansdis/stress/index.htm
2. The fundamental facts at www.mentalhealth.org.uk
3. Robert Bar, 'A nations mental health' Ashgate, 2008
4. Federal Institute for Population Research, Germany 2015
5. Office for National Statistics

When Birds Strike

by Zoe Reeves, BALPA Flight Safety Officer

A bird/wildlife strike is a collision between an airborne animal (most often a bird, but sometimes another species) and a man-made vehicle, mainly an aircraft. Bird/wildlife strikes constitute a serious hazard to aircraft safety and have caused a number of fatal accidents throughout history.

Bird strikes cost the aviation sector significant sums of money each year, in terms of damage and delays, and are a very real problem.

In the past I have been in the unfortunate situation of having to clear the runway of remnants of a bird strike and it's not pleasant for the bird or the aircraft. Luckily, all the situations I have been involved in first-hand have not had serious effects on the aircraft they encountered. I have never experienced a bird strike or near miss in flight, only a near miss with a glider (but that's a story for another day!).

Prevention against bird strikes at a small airport I know consists of a Very pistol (also known as a flare gun) which is a device that can shoot flares or cartridges that emit a loud bang; a bio-acoustic device which emits many different distress noises from common airfield birds; and my personal favourite, many men jumping around waving fluorescent tabards in attempts to move the birds on.

Many techniques exist to control bird numbers at airports but they are applied at varying levels. Some of this variation may be due to differing levels of strike risk but much of it is due to lack of resources.

Last November I was invited to the CAA's annual bird strike committee where discussions on bird strikes, the reporting of them and mitigating against them were discussed. Various stakeholders were present from across the aviation industry.

Reporting a strike

When you encounter or suspect you have encountered a bird strike you are duty-bound to report such an incident to the CAA in accordance with Article 143 of ANO if the aircraft was in flight within UK airspace. An industry-wide definition of what constitutes a confirmed/unconfirmed bird/wildlife strike or near miss occurrence had not previously existed pre-2004. Many aerodrome operators have therefore established their own set of definitions in order to facilitate a consistency of reporting and measurement of aerodrome bird strikes, which are often used to measure key safety performance indicators, as part of their aerodrome SMS (safety management scheme).

Agreed definitions

In order to assist aerodromes, and to aid standardisation and consistency, the CAA, together with stakeholders, has agreed a set of definitions. These give guidance for the determination of confirmed and unconfirmed bird strike occurrences (shown in tables 1 and 2). The definitions shown in table 1 are based on the best practice standards produced by the International Bird Strike Committee (IBSC) and those adopted by the International Federation of Airline Pilots' Associations (IFALPA).

TABLE 1: BIRD STRIKE DEFINITIONS – TYPE OF STRIKE		
CONFIRMED STRIKE	**UNCONFIRMED STRIKE**	**SIGNIFICANT EVENT**
Any reported collision between a bird/wildlife and an aircraft for which evidence in the form of a carcass, or other remains are found on the ground; or damage and/or other evidence is found on the aircraft. Bird/wildlife remains or complete carcass found on an aerodrome where there is no other obvious cause of death should be treated as a confirmed strike and reported as such accordingly.	Any reported collision between a bird/wildlife and an aircraft for which no physical evidence is found (i.e. no damage to the aircraft is evident upon inspection, and no bird remains, carcass or blood smears are evident on the airframe).	Incidents where the presence of birds/wildlife in the air or on the ground resulted in an effect on a flight, but where no physical evidence of an actual bird strike exists. This includes near miss occurrences, rejected take-off and go-arounds.

TABLE 2: BIRD STRIKE LOCATIONS		
ON-AERODROME BIRD STRIKE	**AERODROME VICINITY BIRD STRIKE**	**EN–ROUTE BIRD STRIKE**
Any bird strike occurrence reported by the commander of an aircraft, where the aircraft is believed to be at a height of up to 1,000ft during climb out from, and/or below 200ft during approach to the aerodrome.	In the vicinity (within 3km) of an aerodrome, any bird strike occurrence reported by the commander of an aircraft, where the aircraft is believed to be between 1,000ft and 1,500ft in the climb and between 1,000ft and 200ft on approach.	Any bird strike occurrence where an aircraft is believed to be beyond 13km from the aerodrome radius in the climb or not below 3,000ft on approach.

It is important for bird strikes to always be reported as soon as possible. They can be reported in the following ways:

- Online bird strike reporting (preferred method). Reports should be submitted at: www.caa.co.uk/birdstrikereporting.
- Completion of form CA1282 – bird strike occurrence, or form CA1673 – occurrence report.
- Submitting an ASR.

Reducing the risk

Aircraft manufacturers test to current aircraft certification standards, which include requirements to demonstrate both airframe and engine resistance to bird impact. The standards which apply are those in place at the time of introduction of a new aircraft type or engine. Experience of accidents and incidents has led to progressively tougher requirements, although as with most certification standards, grandfather rights are applied so that new requirements are not retrospectively applied to in-service aircraft and engines.

The standards established by both the FAA and EASA are essentially similar but are not yet fully harmonised. However, new aircraft and engine types have to meet both so the more demanding of each applies in each instance. Assurance that certification standards have been met is achieved by various means, including ground testing using dead birds of specified weights and quantities, at representative impact speeds.

Airbus explained how it has come away from using dead birds on testing its airframes and now uses computer simulation. It does, however, still use them when testing its engines' parameters. Rolls-Royce cultivates its own ducks to use in testing.

One of the most effective control measures at airports is by introducing the 'long grass policy'. Short grass provides security by enabling smaller birds to see over the wider spaces of the aerodrome for early warning of approaching dangers. It also increases the populations of invertebrate animals on which many birds rely for food. Long grass makes it more difficult for birds to locate prey and reduces the populations of soil invertebrate food sources.

Other effective techniques include avian radar, Very pistol/flare gun, falcons, dogs, bio-acoustic devices, repellents and one of the newest deterrents on the block: lasers.

In some cases the airlines have stepped in to help, particularly easyJet which has assisted a number of airfields within its European routes.

Considerations for crew

The topic of damage limitation whilst crews were flying final approach was raised at the CAA Bird Strike Committee. A couple of scenarios to think about:

Scenario One
An aircraft is hit by birds while on final approach to land – should the pilot continue the approach or initiate a go-around/missed approach?

Having encountered birds, the question to be answered is: 'What is the damage to the aircraft and what effect will this have on the safe conduct of the flight?'

The full extent of any damage, to the engines and/or the control surfaces and landing gear, may not be apparent until applying power, re-configuring, or manoeuvring the aircraft. It might therefore be the case that, if a goaround is initiated, the pilots rapidly find themselves in a situation where the runway is disappearing beneath them but the aircraft cannot safely fly a missed approach.

Scenario Two
A pilot sees a flock of birds ahead of him on final approach – should he continue the approach or initiate a go-around/missed approach?

Having seen the birds ahead, the question to be answered here is: 'If a go-around is initiated, how likely is it that the aircraft will avoid a bird strike?'

There are two matters to consider. Firstly, the behaviour of birds towards an aircraft in flight is highly unpredictable and varies greatly by species: some waterfowl species typically dive but such behaviour is not consistent and the birds may fly upwards, potentially into the path of the aircraft initiating a go-around. Secondly, the greater the engine thrust, the greater the damage caused by ingesting birds – it is probable that less damage will be caused if the birds are hit while the engines are at low speed or idle.

Crews should always follow company approved emergency procedures and manufacturers' guidance regarding the conduct of the flight and management of aircraft systems, when such an event as a bird strike occurs.

If you ever encounter a bird/wildlife strike I hope the comments above give you food for thought. Figures from the CAA show that the sizes of birds in the vicinity of an aerodrome are increasing and that they are flying at higher altitudes. Also, around airports the volume of birds is increasing, which is thought to be down to their habitats changing as a result of climate change.

If you have any comments please contact me at: zoereeves@balpa.org

Original article by Zoe Reeves published in BALPA's The Log Magazine, Spring 2015 edition.

Climatic Change in the Regulatory Environment

A regulation is a legal norm intended to shape conduct that is a byproduct of imperfection. At least, that's how Wikipedia defines it. In any case, it is an authoritative rule on how an act shall be carried out.

by Sunjoo Advani, PhD.

Simulators are not perfect. They never will be, and they don't need to be. Instructors and evaluators are not perfect. However, they do have the responsibility to ensure that the candidates using simulators are developing the right skills and knowledge, and not inappropriate behaviour. Training pilots in developing and maintaining proficiencies, resilience, understanding and mitigation of threats, and operating aircraft in a professional, safe manner under all circumstances is the real key.

In this article, we will look at the range of regulations that govern this industry - how they evolved, where they are headed, and where the ultimate focus of our training and simulation industry lies: maintaining high standards for instructors and evaluators.

Training is a highly critical component of aviation safety. Regulations are developed to ensure that the training system meets a high standard, so that both the systems we use, and the pilots who go through that training, are capable of operating with efficiency and proficiency. However, are today's regulations adequately ensuring that the instruction provided, tools we use, and inspections yield resilient, reliable and competent pilots? Are the standards of today the wind in our sails that lead us to a robust training for the future pilot? Or are they the anchor dragging behind our boat, impeding us whichever way we choose to sail? Are standards giving us the ability to define training devices and their use based on competency, or are we still in a never-ending cyclone of regulations that in futility are trying to catch up with technology? Most importantly, how can future regulation and training standards provide industry with the greatest service in establishing a minimum yet significant training objective in light of current safety initiatives?

Core Issues

Simulation regulations continue to evolve and transform from technology-centric capability specifications to training driven functionality-based guidelines. As flight simulation became a valuable asset for pilot training, it was also clear that there were differences between technologies. In order to define an acceptable norm, industry and aviation regulatory authorities developed minimum criteria for simulator qualification. By looking at what was technologically possible, standards were established. For example, only after cross-cockpit collimating visuals were introduced by Rediffusion Simulation in 1982 did the regulations start to reflect the tests associated with these, in

order to ensure the technology was meeting a minimal standard.

However, different regions around the world began to develop their own standards (their airline and simulation providers came with improvements, and there were other priorities). By 2005, we had 26 device standards around the globe. Many devices were required to undergo multiple regulatory checks in order to satisfy different authorities. This is still the case, and the QTG's and related testing have become a burdensome challenge, particularly when they need to be repeated out of formality. Strangely enough, the pilots, the training, and even the instructors in many cases are the same.

In 2005, Dr. Ed Cook, then the Manager of the National Simulator Program of the FAA, signaled to the Royal Aeronautical Society (RAeS) the urgency in developing a common standard - not simply by amalgamating the current standards, but by taking a top-down approach to defining the training needs. The RAeS summoned the world's experts in training and in simulation, to work in parallel to what became ICAO 9625 Manual of Criteria for the Qualification of Flight Simulation Training Devices, Edition 3.

According to Dr. Cook, "It's all about checking the competency of the final product: the trained pilot. While the regulator's responsibilities include setting minimum standards, it is also true that if the regulator has done the job correctly and completely, anyone meeting those 'minimum' standards should be plainly seen to meet any/all appropriate safety requirement". Standards must be written such that anyone meeting the standards described will have the knowledge and the skills to apply that experience so as to satisfactorily accomplish any task in a complete and competent manner that results in the expected outcome. If something were to occur that is unanticipated, the level of knowledge and skill application will be immediately brought to bear so as to, again, satisfactorily resolve whatever circumstance was presented.

So where has this led us? Why then do we still have so many standards for the same device? Why are there differences between operators?

There are many answers to these questions, some of them legitimate, but all worthy of consideration. Let's examine the underlying process.

Todays's Realities

If you think airlines are the low-cost leaders in industry, think again: National aviation authorities operate on even tighter budgets, relying on volunteer work forces of external experts and straining their staff with high and often inefficient load factors. Yet these regulators are tasked with knowing all about the current trends, and defining the rules that will influence the industry for years to come. Furthermore, while it is expected that regulators apply identical standards between regions, the truth leaves much to be desired. The interpretation of a specific test by one regulator may differ completely with another's, and even with the intended purpose of the test.

It should come as no surprise that the demands placed on regulators are high, as they are tasked with defining operational safety standards in a challenging environment. Creating meaningful standards in the complexities of today's environment within the constraints of the regulator's environment is already a challenge. What we need are not just standards for the training devices in which the training takes place, but training and competence standards for instructors and evaluators. If we are to make a difference in safety, much lies in the hands of the instructor and the evaluator.

Instruction – A Fading Art

To be an instructor in the past, one had to be selected for the job. You were considered the crème de la crème of the pilots, of "top gun" caliber, and highly skilled in your ability to transfer knowledge and experience to the trainee. Selection of instructors was a rigorous process defined by the airline or training organization.

Now, in today's budget-strangled environment, there are few benefits to becoming an instructor. It means a major change in lifestyle, working hours, and it means being constrained to a less exciting job. Some airlines allow only their captains to instruct. A few choose first officers to give instruction, while inspections and proficiency checks are performed only by captains. These proficiency checks are rigorously fixed programs, established by regulatory minima. All pilots are exposed to the same failures and conditions (some now barely relevant) in order to achieve a basic standard in the training. Again, we point to the importance of regulation based on actual needs rather than meeting a plain vanilla basic minimum.

A good pilot is not always a good instructor. It takes a special set of skills to transfer knowledge to the aviator, and to emphasize the correct priorities. Instructor training

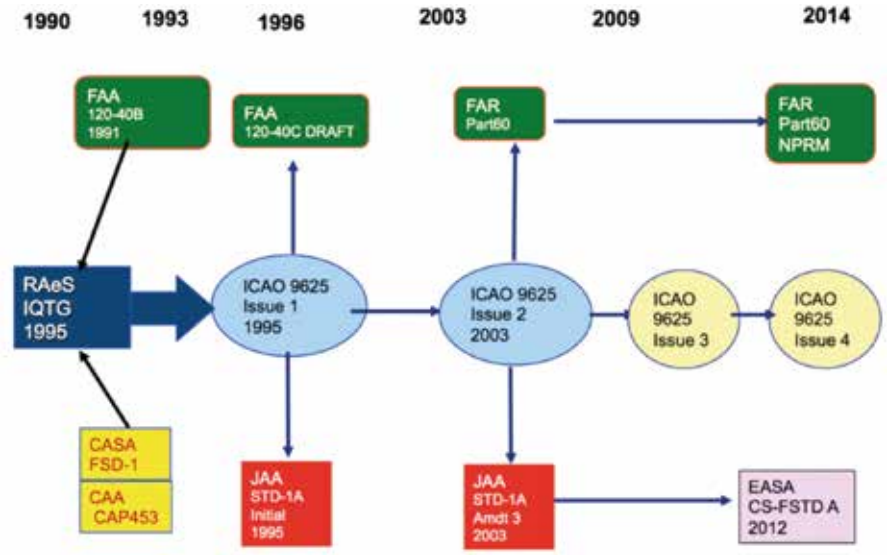

Figure 1 The time line of ICAO 9625. Source: Author.

is therefore an incredibly important aspect of our system - an aspect that seems to vary between airlines, and it's a fading art.

In today's economic reality, many airlines are forced to employ absolute minimum training, and to rely on their regulator to define what that minimum is. As a result, the responsibility is then shifted to the regulator. Ironically, the quality assurance can NEVER be handed over to the regulator as this is not their responsibility; they are not trainers and instructors. It would be a false sense of safety.

Solutions – Where to Next?

Maintaining regulator and instructor competence go hand-in-hand. Simulators are training tools used to impart knowledge and skills to both pilots and instructor, and one needs to understand how to get the most out of them. An instructor must know how to use the device, appreciate its strengths and weaknesses, and know where it does and doesn't mimic the aircraft. The instructor provides the training, and the simulator is a great tool - not the other way around.

A good example is Upset Prevention and Recovery Training - clearly, a focal point as industry tries to reduce Loss of Control In-Flight accidents. The ICATEE working group identified that most UPRT may be conducted in flight simulators in combination with "back-to-basics" aerodynamic knowledge. A simulator instructor needs to therefore impart confidence to pilots in recognizing and immediately preventing a developing upset. Or, if all else fails, the pilot must know how to recover from that situation.

Most pilots including instructors will scarcely, if ever, have seen a high pitch/bank angle excursion, or have experienced a full aerodynamic stall. As line pilots, we are rarely exposed to such events, due to the several wonderful technology safety nets protecting us from going there. Ironically, it is during those extremely rare circumstances that we do not seem to have consistent skills on how to get out of such situations.

It should therefore come as no surprise that some astute airlines are placing emphasis and investment on training their instructors and evaluators on UPRT first. Some, like South African Airways, have received substantial financial support from their insurers. In this area of training, regulation is aggressively trying to catch up in order to ensure that the instructors of these "train-the-trainer" programs are adequately qualified, and that the evaluators of these are also appropriately skilled in making their assessments. Developing this tiered safety process, within the existing framework of regulation, and maintaining consistency between member states will be a challenge. However, this approach is what is needed to ensure quality and safety throughout the system.

Simulators cannot do everything, and particularly when dealing with upsets (see CAT Issue 6, 2014, pg. 34), and this is where an instructor's understanding of the limitations and capabilities becomes crucial: Use the simulator properly to develop awareness, enforce the correct strategy, pay attention to the right cues, appreciate the type-specific interfaces and the training will have a better chance of prevention or recovery from upsets. An instructor that is unable to explain the shortcomings of the device, including the differences that would be encountered in reality, could propagate inadequate or negative transfer of skills. Accidents like American Airlines 587 in November 2001 are considered to have been the products of negative training transfer, despite the best intentions of the airline.

ICAO 9625

After the massive industry effort to rewrite ICAO 9625, the end result,

Edition 3, was an astounding 680-page manual (the original 53-page version was like a leaflet by comparison). Seven device levels were created, Type 1 (lowest) to Type 7 (highest, like Level D + ATC). It was ready for the taking.

The time line of ICAO 9625 is shown in Figure 1 on page 13.

Slowly this document has started to see its implementation, though it has not fully aired on prime time of simulation guidance: Russia, Singapore, South Africa, Australia and China have indicated their plans to embark upon its incorporation. The FAA has taken elements of ICAO 9625 Edition 3 into its recent Notice of Proposed Rulemaking. EASA, on the other hand, intends to await Edition 4, which will incorporate:

- Alignment with ICATEE's Upset Prevention and Recovery Training (UPRT) recommendations for stall modelling, buffet matching near stall, and Instructor Operator Station feedback tools
- Alignment with Simulated ATC Environment recommendations
- Objective Motion Cueing Tests including tolerances
- Clarificationsonlight-pointtolerances, transport delay, grandfathering rights, and consistency with the rotorcraft edition, 9625 Vol. II

ICAO has indicated that Amendment 4 will be published in 2015. The on-line version is already available.

Future Needs

Looking at the current status of our industry, there is a need for practical training & testing standards for pilots. Regulation needs to develop not only a baseline requirement, but to encourage higher standards. According to former FAA inspector Arnab Lahiri, currently heading ZenSim, "The available instructions, tools inspections are not necessarily inadequate - it is the spirit in how these are applied that seems to be often a problem".

Standards for instructors and evaluators need to be sharpened. Instructors should not lose sight of maintaining their own basic skills and enforcing these within their students. For example, if an approach is unstable, why was it that way? Programs like AQP or Evidence-Based Training rely on data derived through feedback from instructors. That statistical "data mining" is dependent on what the instructors have interpreted and observed. If instructors are not trained, they cannot always judge accurately. However, when properly established, training should indeed be evidence-based or AQP-oriented, instead of fulfilling rigidly and less relevant routines.

Maybe there will come a day when instructors are evaluated by the bestqualified examiners, and regulators will have the resources to develop and enact rules in a time-effective way. Perhaps future simulator qualification will be based on type (like aircraft type-certification), rather than onerously performing multiple checks on each device, several times a year. Mutual recognition of standards from the first step would reduce latent discussion on implementation. Rethinking outside the box will enable our industry to move out of the "back-side of the power curve", and streamline its processes. Simulation and training imperfections need not be an impediment, but an opportunity for pilots, instructors, evaluators and regulators to develop an even safer, more resilient training system.

There was a time when pilots became pilots because they were genuinely interested in airplanes. They developed a deep understanding of aeronautics, and when something unusual happened, they reacted not just from training experiences, but through that fundamental understanding. After all, aviation is - and should remain - about the passion of flight. Let's never allow our self-created and formidably complex rules and systems to overshadow the need to pass on the beauty and wonder of this industry, from the regulators right down to the future pilot.

About the Author

Sunjoo Advani, PhD., is a graduate aerospace engineer with 33 years of experience in flight simulation. He founded ICATEE under the Royal Aeronautical Society, which led to the creation of international guidelines for UPRT. Currently, through his company International Development of Technology, he supports industry globally in UPRT implementation and other training and simulation matters.

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Illusions of safety

By Dr Rob Hunter – Head of Flight Safety, British Airline Pilots Association (BALPA)

One of the most significant changes in the management of risk in the aviation industry is the increasing reliance on safety management systems (SMS). In their elemental form, these 'systems' consist of a tailored risk assessment undertaken by the organisation that generates the risk. This assessment relies on the identification of hazards and then the gathering of, and interpretation of risk data. Mitigations for the risks identified are put in place, so that a more or less, defined level of safety is maintained. Hence, SMS is a kind of over-engineered common sense. The regulatory oversight of a SMS generally involves the inspection of practices and documents held by the organisations that are taken to be the evidence that the procedures are being applied in practice. SMS — in so far as they are tailored to particular hazards — are generally contrasted with rule sets that determine what may be allowed (prescription), or may not (proscription).

"I believe that it does not serve the Flight Safety agenda to have the SMS arena filled with too many cheer leaders and not enough critics."

All of these types of rules are often misleadingly referred to as 'prescriptive' regulation or even more misleadingly as 'one-size-fits-all regulation' as, in practice, these rules are rather more discriminating.

There may be different rules for different levels of risk, such as commercial versus private aviation and so, in practice, the rules are typically 'a-number-of-sizes-fits-all'.

The number-of-sizes-fits-all approach generally has a desired level of safety that is prescribed by a body that is independent of the operator. However, the SMS approach may have a desired level of safety that is, in effect, determined by the operator; an example is the risk assessment for the overflight of conflict zones. However, there are also regulations that appear to have an independently determined level of safety but they are written in a way that is so open to interpretation, that they are, in effect, also determined by the operator. Examples are fatigue risk management rules where key terms have no precise meaning and fundamentally there is no definition of 'how tired is too tired to fly'. It is possible that the vague language of such regulations is by intention rather than accident. Regulators may be fearful of producing rules that leave operators hamstrung for years, yet otherwise regulators have to regulate; writing rules that place a firm requirement to actively do something nebulous can seem like a good compromise.

Lowest common safety demoninator

As part of the growing adoption of the SMS method; levels of safety are actually, or covertly, commonly at the discretion of the operator. One of the drivers for the move towards this concept of self-determination of risk is the bluntness of independently-described levels of safety as a safety instrument. For

Contrary to CAA statistics of two reported instances over 30 years of pilots falling asleep in the cockpit, BALPA believes that such incidents may be happening at least once every day.

example, the motorway speed limit does not mean that all cars travelling at the maximum speed limit have an equivalent level of safety, because among many other factors that determine safety at speed, cars with modern braking systems have shorter stopping distances. In this regard, a better level-of-safetybased maximum speed limit might be the maximum speed at which it has been demonstrated that the vehicle can stop within say 300m. However, despite the fettering limitations of the independentlydescribed safety limit, this approach taken in setting speed limits, blood alcohol limits, aircraft weight limits and so on, can be a pragmatic cost effective approach to safety assurance.

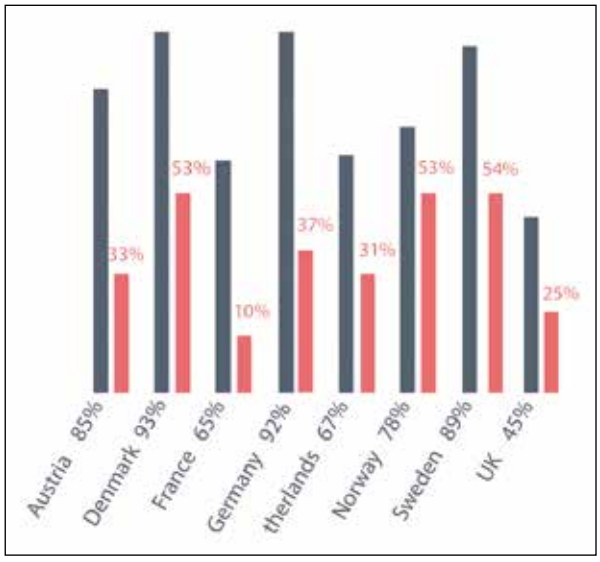
Moreover, having the level of safety determined by the operator is not without its problems. In assessing overflight risks on 17 July last year some airlines considered it safe to fly over Eastern Ukraine, others did not. The shooting down of MH17 has thrown into stark relief the variable output of the SMS method, yet there are many more features of the SMS method that deserve our critical attention.

Critical evaluation

In this article I preferentially focus on some of the problems of SMS, as elsewhere these systems are heavily and largely unquestioningly promoted. SMS are here to stay and I believe that it does not serve the flight safety agenda to have the SMS arena filled with too many cheer leaders and not enough critics. To make SMS work participants in the SMS need to be able to critically evaluate the design and operation of their SMS.

In principle, the SMS method is sound, in so far that the system has the ambition of identifying and managing all hazards appropriately. However, in practice, SMS do not generally consider that the SMS itself could be a hazard. The factors that may turn a SMS into a house of cards generally arise from conflicting interests in the human designer/s of the SMS. Such human factors can act at individual and organisational levels in both the operator and the regulator.

An individual, such as a manager, can contrive the design of the system to serve their own needs or the design can be contrived to suppress the reports of individuals who may be fearful of the consequences of their reporting action. For example, some pilots say that they are fearful of reporting fatigue because they will become embroiled in company investigations that have a quasidisciplinary tone. It is less fatiguing to put up with fatigue than to report it. An example of the likely scale of under reporting was illustrated following a Freedom of Information (FOI) request to the Civil Aviation Authority (CAA) in 2012. The request had been to ask for the numbers of occasions on which pilots had reported involuntarily falling asleep in the cockpit; such occurrences are required



A European Cockpit Association survey showing percentages of pilots stating that they have either fallen asleep without planning (grey) or experienced 'micro-sleep' episodes while on duty (red)

in law to be reported to the CAA. The response revealed that there had been two such reports in a 30-year period. Working from models of sleepiness and knowing pilot rosters, it is likely that this actually occurs at least every day (if not every hour, indeed, in the window of circadian low, in the early hours of the UK morning, this could be happening more or less continuously). Notwithstanding the sociopolitical disincentives to fatigue reporting, microsleeps of less than two minutes generally occur without awareness and additionally drowsiness with associated performance decrement can also be without subjective awareness.

"If an operator is financially challenged, it may produce an 'Economical' SMS that may be no more than a copy-and-paste of written material that talks the talk but does not walk the walk of any substantive safety practice."

At the organisational level, the fundamental conflict is between productivity and safety. Statements such as 'safety is our number one priority' and 'if you think safety is expensive try having an accident' are aimed at having us think that this conflict is unlikely to be anything more than a theoretical possibility. However, these statements warrant closer consideration because 'trying to have an accident' in so far as it can mean running a greater risk of having an accident, has a different meaning to 'having an accident'. For a small airline, at current fatal accident rates, if the airline were to maintain an industry average level of safety it may not see a fatal accident for 80 years or so. Hence, if the airline CEO did think that safety was expensive and that, by reducing the airline's spend on safety to, so to speak, try having an accident, the CEO could well find that, by halving the safety budget, the airline would still not see the attributable accident for decades, by which time the CEO would be long gone.

Hence, if you think safety is expensive, you could well find that it was true and that, from the point of view of the financial survival of the airline, trying to have an accident was a great idea because it was still unlikely to actually happen, yet you get all the immediate benefits of the cost saving. The management guru Drucker's famous statement was: 'The first duty of an organisation is to survive'. In this regard, claims by some operators that 'safety is our number one priority' may be disingenuous. If spending on safety would put an airline out of business, it is generally better to save the money today, so that tomorrow you can think about being safe.

Beyond prescriptive regulations

So-called prescriptive regulation is frequently portrayed as being the first form of safety assurance and that the 'new' systems of safety management are a superior evolution in safety assurance. The part truth of this is that safety management in the aviation industry has concentrated on accidents that have occurred and on making recommendations to ensure that they do not happen again. Now that accident rates are so low, it is reasonable in order to seek further safety improvement, to concentrate on safety process which is a forte of the SMS method.

However, the effectiveness of this approach is difficult to measure and there is plenty of evidence of safety failures in SMS-rich environments.

'You've got to draw the line somewhere'— a memorial to Samuel Plimsoll who campaigned in the 19th century for load lines on ships to enhance safety, against the interests of the commercial shipping industry.

In this regard, the shift in regulatory strategy towards SMS is much more experimental than is commonly portrayed. Notwithstanding this, there are many cases in which originally-existing forms of self-managed risk assessment and mitigation, an SMS by any another name, which failed often in some very public catastrophic way, was then replaced by a number-of-sizes-fits-all regulation at the behest of Government. In this way the trend towards SMS may be not an evolution but a reversion.

An illustration of this is the Plimsoll load line on ships. Prior to the 1876 Merchant Shipping Act, ship owners were judged to be best placed to determine how heavily loaded their ships would be. Seamen and ship's captains that attempted to refuse to go to sea in overloaded ships were coerced into doing so. Despite the losses of overloaded ships at sea,

it was argued that safety was the paramount interest of ship owners and, on this basis, regulation was unwarranted interference. The MP, Samuel Plimsoll, campaigned against fierce commercial interest to obtain a load line on ships. At first this load line, known as the Norwood line, was to be determined by the ship owners. This self-determination of risk that could so obviously be biased by the commercial interests of the ship owners was ridiculed at the time. One ship's captain famously sniped that he would paint the line on the funnel of his ship! It was the combination of the sustained efforts of Plimsoll, the continuing loss of merchant seamen's lives at sea and the political pressure of public sentiment that led to the load line position being determined by an independent body. The expression "You've got to draw the line somewhere" was coined during the Plimsoll parliamentary debates that were extensively covered in the media of the day.

Who knows best?

SMS that identify the wrong expert to design and populate the system hazards, risks and mitigations are vulnerable. Although managers are commonly held to best know the risk, this may not be the case in reality. In fact, it may be the worker in the field that has the best appreciation of a particular risk. Sometimes the person who is well placed to assess the risk may not be best placed to manage that risk. For example, in the moments before their death, drivers killed by falling asleep at the wheel generally know that they are sleepy but still continue to drive. This is because their fatigue impairs their ability to appreciate the risk. It can also be the case that the person who best knows the risk is also the most able to conceal the risk should they be so minded.

SMS have a component of Board level accountability and this can be a good thing. The Board are seen as the owners of the risk because they generate the risk and because they have some jeopardy for the risk. However, the Board does not have as much jeopardy as the occupants of the aircraft who may be killed if the aircraft were to crash. The problem with having the risk owner (the airline Board) as being someone different from the person that has the substantive jeopardy for the risk (the crew and passengers) is that it facilitates the creation of a system which is, in effect, not an SMS but a 'BMS' – a blame management system. This is because the principal risk for a Board is not that they are killed in one of their aircraft, but whether they are blamed for someone else being killed in their aircraft. A blame management system may not have safety as its primary goal because its primary goal is the prevention of blame.

Airbus A350 MSN3 cockpit.

Owned science

The SMS method is vulnerable to the problem of 'owned science'. Earlier I likened SMS to 'over-engineered common sense'. The 'engineering' is largely the application of scientific method to the gathering and interpretation of data. A principle of scientific work is that of peer review. This is a system which exposes conclusions to greater scrutiny and, through careful description of the methods involved, allows reproduction of the experiment and verification of findings. In situations where organisations are commissioning science to support an industrial practice of high commercial value, because they own this data, they can conceal or choose not to study what is not in their interest to expose and promote what is in their interest.

"In situations where organisations are commissioning science to support an industrial practice of high commercial value, because they own this data, they can conceal or choose not to study what is not in their interest to expose and promote what is in their interest."

SMS may reasonably allow operators to take into account their 'operational experience' to support new safety practices or amend old safety practices of no proven value. However, 'operational experience', where it is allowed to be relied upon in regulation, is generally not defined, Rather than having some firm statistical basis, it may amount to little more than anecdote, a feeling that something has been

gotten away with so far, so it must be safe. Worse still, a feeling that something has been got away with so far, so it must be too safe.

The SMS method is also vulnerable to a form of reverse engineering in which the SMS designer, having already decided a set of outcomes that are desired, contrives a process that apparently leads to an unbiased finding of the desired outcome. For example, managers that are required to provide metrics of their own performance will generally know which metrics will make them look good and which metrics will make them look bad.

SMS are strongly promoted by regulators. The regulators stand to gain from the SMS approach because the approach transfers some responsibility from the regulator to the airlines. This is potentially an important regulatory human factor. Regulators that mandate an explicit quantifiable level of safety are potentially liable if that level proves insufficient to prevent an accident. SMS can appeal to regulators because the SMS as a blame management system puts regulators at arm's length from accidents. Further regulatory self-interest is met, in so far that there may be an overall cost reduction to the regulator if there is a move towards getting the regulated bodies to take ownership of more of the risk.

"Not only might trust-based SMS not work if there are conflicting interests, they might make things much worse."

In practice, the regulatory strategy for oversight can be to audit the airlines' SMS. If this is taken to be a more process-based task, then the auditors can be administrative staff rather than more expensive technical staff. This is not to say that regulators should not seek the most economical method of regulating. Rather, it is to argue there is a potential vulnerability that this economic interest may compromise the quality of the regulatory practice.

Diminishing technical resources

A potential disadvantage of a shift in the balance of administrative and technical capability is that the technical resource of the regulator as an asset for the industry may diminish and the airlines may then have greater potential to mislead a less expert regulator. Additionally, SMS, if properly executed, may place less economic burden on the regulator and more on the industry. The vulnerability is that, if an operator is financially challenged, it may produce an 'economical' SMS that may be no more than a copy-and-paste of written material that talks the talk but does not walk the walk of any substantive safety practice.

The uncertainty of interpretation of regulation and the 'system' part of safety, management can work together to belie the common sense that an SMS really is and turn it into something of such impenetrable techno-bureaucratic complexity that it becomes an area of specialisation that requires an expert. Airlines can outsource this expertise to an SMS commercial consultancy. In this regard marketable features of such a product, such as the protection of the Board (the customer) from blame and the claim that the SMS can allow a greater level of productivity for a given level of safety compliance, become potentially biasing factors that undermine the intent of the SMS.

A further disadvantage is the formation of commercial bandwagons. Here the vulnerability is that the commercial providers overemphasise the need for their service such that safety resource is misappropriated within the industry because airline managers have been persuaded that their greatest risk lies in the area promoted by the commercial band wagoneers.

Because the effectiveness of an SMS depends so much on the will of the operator, we can see how a SMS may make safe operators safer and other operators less safe. Conflicting interest is a fly in the ointment of SMS. The control of such conflicts is too often assumed to be sufficiently safeguarded by vague, easily coerced, aspirational factors such as 'trust' and 'safety culture'. In general, not only might trust-based SMS not work if there are conflicting interests, they might make things much worse. If instead of policing traffic speeds, we relied on drivers' self-reports of their speeding violations, not only might we expect drivers to not report their speeding but also that they might speed more often. SMS, if not sufficiently safeguarded against conflicting interest, can be a naïve approach that may undermine flight safety.

Article originally published in April 2015 Edition of Aerospace.

What is he doing?

The circumstances surrounding this safety event were no different to many others; time pressures, distraction and complacency crept into what had become a very repetitive process... all contributory factors for what happened that afternoon.

Despite being just under twenty minutes behind schedule, the turnaround had gone well and now the aircraft was being pushed back for its mid afternoon departure. Air Traffic Control had made a request to the flight crew for them to pull forward, adjacent to stand three, to allow for another company aircraft to access stand five. This request was passed to the headset operative, which was verbally confirmed and duly completed.

As the combination of pushback tug, towbar and aircraft came to a halt after the pull forward manoeuvre, the "brake set" declaration was exchanged. This was followed by the request and subsequent permission to start engines. At the same time, the familiar request to disconnect the tug/ towbar was also heard.

Headset Operative; "as the number two engine was spooling up, I disconnected the tug from the towbar and then went under the nose to disconnect it from the aircraft. Sometimes the mechanism can be a bit tricky to release, so you need to get it straight and give it a firm pull, whilst remembering not to hit your head on the landing gear doors! As I got a good grip on the lever, I suddenly noticed the aircraft starting to move toward me! I just managed to get out of the way of the towbar as it rotated toward me and shouted "STOP! STOP! STOP!" into the headset... What is he doing?

Captain; "as the number two engine was spooling up, both of our heads were 'down' in the flight deck, monitoring the various instruments required for engine start... Oil pressures, rotation speeds, fuel flow, temperatures etc. When I flew this aircraft a few days ago, the start valve had been problematic but today, all appeared well. Once the number two engine had stabilised, my hands went back up to the overhead panel to select the start switch for the number one. As I turned the selector anti-clockwise into position, I suddenly heard shouts of "STOP! STOP! STOP!" in my ears... What is he doing?"

Headset Operative and Captain; "It was lucky nobody was killed!"

Background

Over recent years, many safety reports have been submitted relating to aircraft moving and/ or starting to taxi whilst ground personnel and their equipment are still under the nose of the aircraft. A selection of examples follows:

- Shortly after giving permission to start engine number one, the aircraft began to taxi forward. I immediately advised the flight crew that I was still in position and the aircraft stopped immediately;
- After removing the bypass pin, the operative bent down to take the chock away from the nose wheel. It was a bit stuck but as it came free, the aircraft started to roll forward. He jumped back to get out of the way. The tug driver also stepped back and quickly signalled to the flight deck, who applied the brakes immediately. The aircraft had moved forward about three feet;
- The pilot gave the headset man permission to disconnect. Before he could remove the bypass pin, the aircraft started to taxi, with the headset man still attached and the pushback tug sitting in front of the aircraft;
- The headset man asked for the parking brake to be set. He noted the parking brake light

illuminate and started the towbar disconnection process. As the tug reversed back in readiness to re-attach the tow bar, he noticed the aircraft moving forwards with the towbar still attached. He quickly asked the Captain to reset the parking brake - The Captain informed the headset man that he had not given permission for the towbar to be disconnected.

The subsequent investigations believed there were a number of reasons why. Flight Crews had:

- Verbally reported that the parking brake had been set but had not done so, possibly only applying the foot brakes;
- Inadvertently released the brakes whilst performing pre-flight procedures;
- Attempted to taxi the aircraft before ground crews and/ or equipment had vacated the danger area.

⚠ Forward movement can be easily achieved without any increase in thrust, especially if the taxiway is sloped or the aircraft is at a light weight.

A number of reports stated that the flight crew had not given permission for the ground crew to go under the aircraft to disconnect the equipment but they had done so anyway...

When analysing the reasons why this type of event occurs, there are many factors to consider. It is obvious that a number of challenges face both flight and ground crews during this phase of the departure. Despite those challenges, all related communications must be clear and concise, and strict adherence to standard procedures is required at all times.

Contributory Factors

Time pressure is certainly one of the most predominant behavioural influences. In order to achieve schedules, or make up lost time, personnel will often do what they can for the perceived benefit of the operation. Unfortunately, this can sometimes stray into the realms of rushing, which can leave individuals extremely vulnerable to error.

⚠ If you are being rushed, politely ask the other person to 'stand by' whilst you complete your task

Communications must be clear and concise as headset conversations can be a challenge at the best of times. Instructions and confirmations relating to the disconnection process are typically given whilst engines are starting or running. This creates significant background noise, which can mean that it is quite difficult to actually hear what is being said at both ends of the wire. The numerous national and international accents within our industry can also add to that aural complexity.

Repetitive communications can lead humans to hear what they want to hear, rather then what was actually spoken. This can trigger 'standard' responses and actions, even if what was said was different or even incorrect.

⚠ If you are in any doubt as to what was said, ask for verification, every time

During this phase of the departure, there are many **distractions** to

manage. For the flight crew, there are instruments to monitor, checklists to complete and clearances to be sought. Often, the 'thank you and goodbye' message is passed all too quickly but caution must be exercised, as it is possible the ground crew may still be disconnecting the pushback equipment and have not yet vacated the aircraft foot print.

Flight crews must wait for positive verification that all equipment and personnel are at a safe distance, before any attempt is made to release the parking brake and taxi the aircraft. Never assume that because you are ready, your colleagues on the ground will be.

⚠ In addition to any verbal conformation that the ground crew is clear, a visual check must be conducted

Industry Standard Communications

An obvious but often overlooked cause of communication errors and/ or misunderstanding is alignment between Ground and Flight Operations manuals. This includes the checklists used by the flight crew during the departure process. The IATA Ground Operations Manual (IGOM) provides an industry standard for headset communications between ground staff and flight crew. This can be found in Chapter 4/ Aircraft Handling Procedures/ 4.12.7.2:

Phase	Task	Ground Staff Action
Departure Preparation	GPU removal	When instructed by flight crew, remove GPU.
	Towbar/Towbarless Tractor connection	(a) Get confirmation that the aircraft's parking brake is set. (b) Get confirmation that the nose wheel steering is depressurized or advise flight crew that the bypass pin is inserted (if applicable) (c) Connect the Towbar (d) Connect the Towbarless tractor.
	Chock removal	(a) Get confirmation from flight crew that aircraft parking brakes are set. (b) Remove chocks
	Pre-departure check	Advise the flight crew that the pre-departure check has been completed or communicate any discrepancies.
Engine Start	Starting engines	When requested by the flight crew, advise when the engines may be started and the start sequence
	ASU	When requested by the flight crew, signal to the ASU operator to supply the required pressure.
Pushback [and engine start]	Brakes	Get confirmation that aircraft's parking brakes have been released.
	Movement of the aircraft (pushback/pull out)	Get permission from flight crew, to commence the pushback.
	Direction of push/nose	If applicable, ask in which direction the aircraft has to pushed/ in which direction the nose should point after pushback.
	Engine start	When requested by the flight crew, advise when the engines may be started.
Pushback completed & engine start completed	Towbar/Towbarless Tractor disconnect	(a) Get confirmation that the aircraft's parking brake is set. (b) Disconnect the towbar. (c) Remove the steering bypass pin - where applicable.
	Headset removal	(a) Get permission from flight crew to disconnect the headset. (b) Advise flight crew to hold position and wait for visual signal at left/right of the aircraft.
Departure	"All Clear" Signal	(a) Display the steering bypass pin–where applicable. (b) Give the "All Clear" signal when the path of the aircraft is clear of all obstacles. (c) Get acknowledgement of "All Clear" signal.

Other Considerations

Physical Barriers

In order to mitigate the associated risks during the disconnection process, the majority of Ground Handling Agents require their personnel to position the pushback tug in front of the aircraft, as a visual indicator to flight crew and also place a 'safety' chock just forward of the nose wheel. The chock is there to protect them from unexpected and unintentional movement by providing a deliberate barrier in front of the aircraft... its value being proven on many occasions.

This use of a chock as a barrier is not completely without danger. There is a possibility that if the chock was poorly positioned and struck with enough force, the aircraft could jump it and with the steering by-pass pin still installed, skew the nose landing gear wheels around. This is even more likely if the surfaces are contaminated or there is a downhill slope.

A number of airport operators have expressed concern regarding the risk of FOD, from chocks that might get left out on the live taxiway during this process. Whilst the removal and retrieval of the chock should be an obvious action, it cannot always be guaranteed.

At night-time, this process becomes even more important as many chocks are nicely camouflaged against their natural backdrop! During this phase of operation, the area under the nose of the aircraft becomes very poorly lit. Especially once the pushback tug has turned away from the aircraft and the light from its headlights are no longer available. However, a number of chock manufacturers are starting to produce brightly coloured products that will hopefully assist visibility issues.

Ground handling agents and airport operators must consider appropriate stowage for chocks, particularly where agents have to 'hot stand' with other agents. For control and convenience purposes, chocks are often seen to be stored on the top

of pushback tugs. It only takes one decent bump and FOD, in the shape of a chock, will materialize.

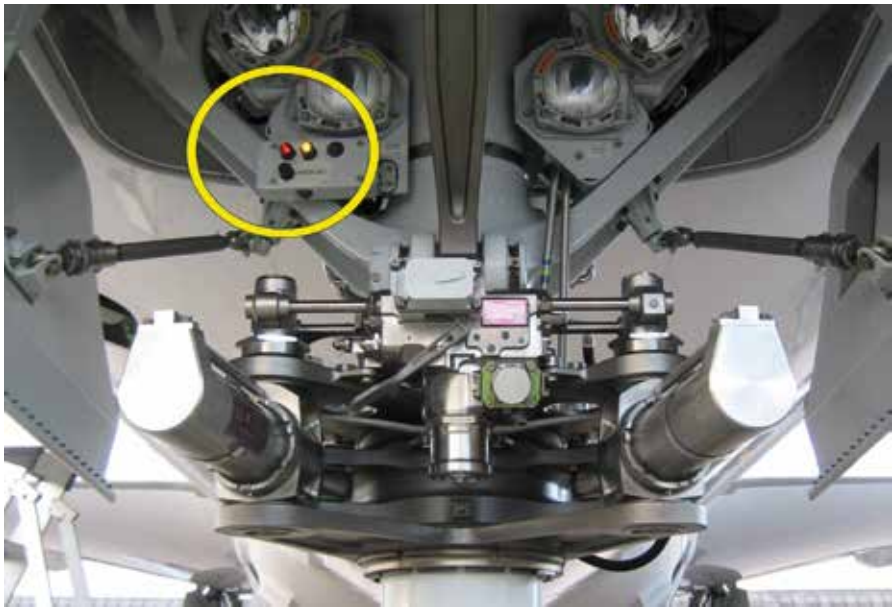
Visibility

Flight and ground operations personnel must be also be fully aware of any aircraft type restrictions that may hinder visibility from the flight deck to the ground and vice versa. The aircraft manufacturer can provide this information. **See page 25 opposite for an example of related data**:

Indicator Lights

Some aircraft types are fitted with an indicator light on the aircraft's nose landing gear strut, which illuminates when the parking brake is set. There have been a number of occasions when the extinguishing of this light has indicated to the ground crew, that the brakes have been prematurely released and would therefore appear to be a robust warning. However, it would be unreasonable to expect the ground operative to conduct all of his/ her under-wing responsibilities and duties, with one eye constantly on the light. There is also the possibility that the bulb is not functioning, after all it is only an indication light.

Regardless, unless it has been established that the light is inoperative, Ground Handling Agents could still require headset operatives to conduct a visual check of this light, when the "Brakes Set" request is given. If the light is not illuminated, the request to set the brakes should be repeated.



Summary

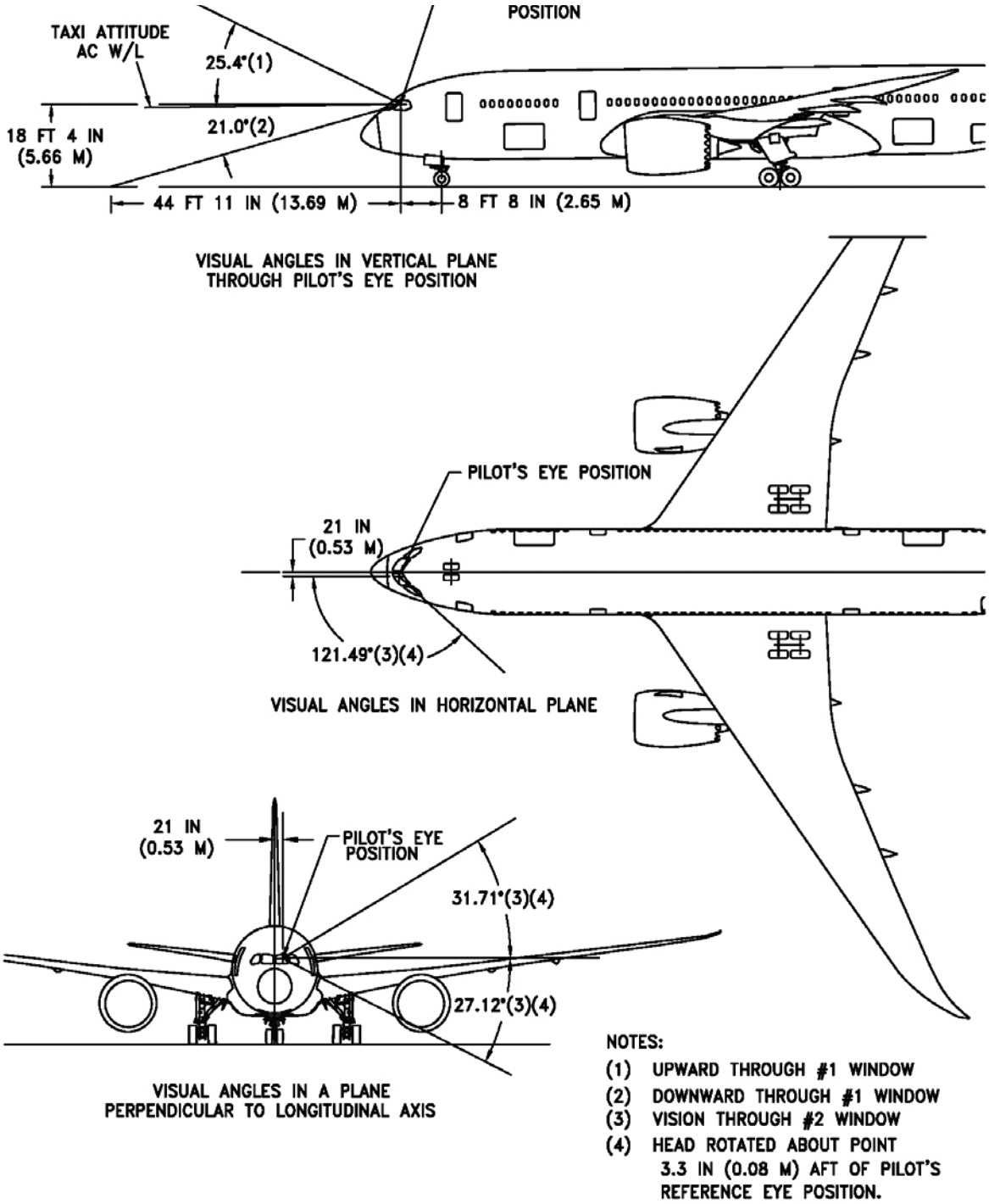
It is very easy for repetitive procedures to lose their significance over time. The consequences related to this safety critical activity, which consists of people working in the proximity of a live aircraft, are unthinkable.

Hopefully this article will provoke a few thoughts, provide a few explanatory considerations and most importantly remind all that safety is the number one priority.

Therefore, in the interest of best practice, GHOST and the UKFSC recommend that stakeholders consider the following basic actions:

- Ensure that related procedures, documents and training are fully reviewed for depth and accuracy.
- Specifically check that all Flight and Ground Operations Manuals align;
- Conduct a review of related monitoring activities to ensure that this topic is appropriately checked for compliance;
- Encourage personnel to report related incidents, including near misses, and;
- Work together during the subsequent investigations, to understand why they occurred.

For any related comments, feedback or information please contact GHOST@caa.co.uk



Visibility from cockpit in static position Model 787-8. Graphic: The Boeing Company.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