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focus

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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: ***CargoLogicAir 747-8*** *– One of the first captured images of CargoLogicAir's brand new Boeing 747-8 Freighter in June 2016*

focus
ON COMMERCIAL AVIATION SAFETY

Safety and luck

by Dai Whittingham, Chief Executive UKFSC

In his recent FlightGlobal comment on the 2017 safety statistics[1], David Learmount suggested that luck might be playing an increasing role in safety performance across the industry. There is no denying that we have just enjoyed a very successful year in safety terms. There were only 10 fatal accidents and 44 casualties, though we should not lose sight of the 35 ground casualties from the Bishkek B747-412F cargo accident. Of the other 9 accidents (40 passengers and crew), all involved turboprops and only 3 were conducting scheduled passenger flights.

Prior to the Moscow accident on 10 February this year, you needed to go back to 28 November 2016 for the last jet passenger accident: an RJ85 at Medellin, Colombia, on a non-scheduled flight. The last fatal jet scheduled passenger accident was the flydubai B737 go-around accident at Rostov on 19 March 2016. The accident rate is now down to almost 1 per 7 million departures and the risk of death to individual passengers is well in excess of 1 in 120 million. We have done well as an industry, and the current safety record is something of which we should be proud. So why does David Learmount raise the possibility of luck as one of the reasons for success?

The answer lies beneath the headline statistics, with all the near-fatal accidents, serious incidents and near-misses that have failed to capture the attention of the world's press. There is no media interest in major upset events that end in a successful recovery, even when such events occur at low altitudes. There is no interest in badly managed approaches that end with a landing, nor in minor runway excursions, nor in non-fatal accidents in other parts of the world unless accompanied by dramatic passenger phone videos. If only the serious (and local) accidents come to notice, this can leave some people with a false impression.

We live in a blame society, which is perhaps why incidents such as well-trained pilots dealing successfully with the failure of a critical engine on take-off are used by the media to point at the airline's 'poor safety record', or at the airframe or engine manufacturer, no matter how rare the event. Some 'news' outlets regularly post videos of perfectly normal and well-handled crosswind landings as evidence of how dangerous flying can be, rather than understanding that the pilots have operated within the demonstrated capabilities of the aircraft to get their passengers safely to the planned destination. Any technical failures or diversions are of course reported on from the passenger perspective, the principal focus being on disruption to passenger lives and alleged poor care from the operator. And then there are the journalists whose software dictionaries recognise the word 'descended' but auto-correct it to 'plummeted', preferably in capitals because that makes it look scary.

The tabloid approach described above ought to keep the need for safety firmly in the spotlight. Unfortunately, it is too easy to dismiss all such tabloid output as sensationalist, and it is also too easy to ignore accidents and incidents occurring in other parts of the world (unless it is a genuinely newsworthy event such as the loss of MH370). As an example of the importance of location, on 27 January this year, a single vehicle-borne bomb in Kabul killed at least 103 people and injured 235 others. There was a flurry of initial reporting but the western press since then has been silent on the matter. Compare the response to the Kabul bomb with that for the most recent terrorist attack in London, which dominated the media almost to the total exclusion of all other events. This is not to take anything away from the horrendous impact the attack had on those involved, it is merely an observation that proximity and personal experience affect how we respond to an incident. We do not need to work very hard to envisage the scene when we have been there or somewhere similar ourselves. It follows that unless you are closely connected to safety work the issues need to be communicated in such a way that there it makes a personal connection for the individual concerned. And even when we are working directly on safety matters, there will always be that tendency to package other operators' disasters neatly into the "It couldn't happen to us" box.

Without wishing to over-beat the resourcing drum, the indisputable fact is that accidents are expensive. Estimates for a single-aisle hull loss with multiple fatalities range either side of the £0.5Bn mark, and you can add significantly to that if a deep-water SAR or recovery operation is required. Whilst that cost might not all fall directly on the shoulders of the operator, it is a cost to the industry. Someone has to pay in the end, and ultimately it will be the customer.

So how do we take that £0.5 Bn from the accident we haven't yet had to pay for stopping it happening in the future? Would that it was that simple, but that sum is at least a good indication of the value that decent safety adds to a business, however difficult it might be to reflect that in a balance sheet.

The answer is likely to lie in marginal gains, not necessarily of the Brailsford/SKY cycling team variety, but in small actions to help

strengthen the barriers that are already in place. Barrier models are a good way of visualising the role that luck (providence) plays in the successful outcome of some incidents, and the alarm bells should be ringing when a safety analysis indicates that you were down to the last barrier – or, worse, that the last barrier failed and providence was all that had kept you from disaster.

The OEMs are constantly introducing new designs and modifications that are engineering some of the traps out of the system, but human performance will always have a part to play in breaching barriers – it's a constant battle and nobody is perfect. General David Hurley, Australian Army (retired), apparently coined the phrase: "The standard you walk past is the standard you accept". He was quite correct, but he could have gone on to point out that "not walking past" is hard work and usually involves tackling human behaviour. You can have the best equipment and training in the world but if people choose to take a different path from the one prescribed for them, a common human performance variable, the equipment and training advantages can be wiped out in a heartbeat.

This is part of the 'work as imagined' versus 'work as done' conundrum. We do need to remind ourselves that 'work as done' is often different from the ideal because it is in response to changing scenarios, technical failures and other constraints which need to be managed on the spot. We rely on humans to get things done, so it should not come as a surprise if there is variation in the outcome. Ann Mills, Head of Health and Safety Management for the Rail Safety and Standards Board pointed out in a recent article[2] that the competence of people in safety-critical roles is a spectrum between novices and experts, and observed: "It is easy to presume that the ... system will become safer and safer as it evolves. However, it can't do that if our thinking about how to manage safety and develop our people doesn't evolve with it."

Despite the excellent safety performance of 2017, we know our system has to get safer simply because current rates mean that numbers of accidents and fatalities will rise as a result of growth to a level and frequency that will become unacceptable to the public, regardless of the risk to individual passengers. IATA statistics show that capacity measured in world Available Seat Kilometres grew on average by 6.4% compared with 2016. As revenue streams increase in line with this growth, operators will need to make sure they allocate enough resources to drive safety performance to new, higher levels. For example, squeezing safety budgets to the point that staff can't be released for external engagement is a false economy if it denies your organisation access to the one piece of information that allowed a barrier to become fully effective. If you can't get access to the right safety information in our data-driven world, the balance will tip inexorably towards a much greater role for luck in the future. And luck should have no place in your risk management strategies.

Notes

1 https://www.flightglobal.com/news/articles/analysis-safety-good-flying-or-just-good-luck-444556/

2 https://www.rssb.co.uk/Pages/blog/future-safety-requires-new-approaches-to-people-development.aspx

focus ON COMMERCIAL AVIATION SAFETY

The drive to carry on – unstable approaches

by Jacky Mills, Chairman UKFSC

The continuation of an Unstable Approach with the inherent risks this incurs has been the subject of many Safety Reports and Safety Articles examining the rationale for the actions taken... It is worth delving into some of these to try to understand why a flight was continued when the SOP and Airmanship considerations clearly called for a Go-around to be flown.

The very real risk of a Runway Excursion after touchdown or touching down short of the runway are just two threats of continuing to attempt a landing following an unstable approach.

There is some evidence that the Human would often prefer to continue down the road to the destination when the goal is close to completion... This can equally apply to a car journey – often the electronic signs on the motorway are illuminated urging drivers to 'Take a Break' rather than to continue driving when they may be feeling fatigued. The temptation to continue driving seems to be compelling – just to get there as soon as possible - but once a break has been taken the advantage of stopping and having a break is obvious to us. Whilst the professional standards executed in the flight deck may be very different both are Human behaviour. So is the same lure apparent when the runway is beckoning, possibly at the end of a long time airborne...

When reviewing a selection of unstable approaches that continued to landing and had undesirable outcomes they had one thing in common as is so often the case – Human Factors were found to be the main causal factor of the accident. These could have been prevented by different Human behaviours and, in particular, by not deviating from the Operator's Standard Operating Procedures (SOPs).

So why would appropriately qualified and usually experienced flight crew operate outside of the SOP? Here are some factors which have been highlighted from some industry safety investigations:

- A focus solely on landing and task saturation mentally blocked any decision to Go-around
- Very late exchange of control – in one case three seconds before touchdown
- Approach continued to long landing following cross wind and turbulence on approach in thunderstorms
- EGPWS Pull Ups Warnings ignored by the Flight Crew
- Operators SOPs were comprehensively ignored, with EGPWS warnings not actioned and AFM limits for trailing edge flap deployment were breached
- Poor performance with fatigued Flight Crew – one report described the length of time the Commander had been on duty led to fatigue which impaired his performance
- Poor flight management and systemic lack of any effective oversight of pilot operating standards
- Pilot Flying lost visual reference but Pilot Monitoring did not - Investigation noted that the Operators' SOPs clearly required that a Go-around should have been flown

So in the following accident why did the flight crew continue, when, with the benefit of hindsight the approach should clearly have been thrown away? Was their decision making flawed? Would the average pilot have made that same decision? Had they received appropriate training? These questions would be asked in any Safety Investigation. But this following story also introduces the scenario of habitual deviation from SOP – discovered through data examined from this Operator.

This event occurred in February 2015 in Canada with the crew of a Bombardier DHC8-100 who continued an already unstable approach towards a landing, despite losing sight of the runway as visibility deteriorated in blowing snow. The aircraft touched down approximately 140 metres before the start of the paved surface. This continued unstable approach was attributed by the investigation to 'Plan Continuation Bias' compounded by 'Confirmation Bias'. Additionally, the Operator's SMS which had been in place for almost six years, had failed to detect the approaches made by this aircraft type were routinely unstable.

This was a scheduled domestic passenger flight in day Instrument conditions. Following the touchdown 140 metres short of the intended runway it continued and travelled 460 metres along the 1,830-metre-long runway. The subsequent requested inspection of the aircraft by the Emergency Services found no obvious damage and it was taxied to the terminal for passenger disembarkation. None of the occupants was injured but the aircraft was subsequently found to have sustained significant damage and the approach lighting was also found to be damaged.

The flight crew had considerable experience between them and this was not a Line Training flight. They had been aware of the likelihood of marginal weather conditions at the destination when the approach briefing was conducted shortly before the top of descent and the possibility of a go-around was included. When ATC issued descent clearance to 5,000 feet QNH they asked the crew to report when they had the destination airfield in sight for a visual approach. However, when ice crystals subsequently reduced in-flight visibility, the crew requested a VOR/DME approach and were cleared for this. Once below 3,000ft the aircraft cleared the area of ice crystals and the runway could be seen, however, a significant snow shower was also visible approaching the aerodrome and the flight was cleared to deviate as necessary from VOR approach.

The story does not read well from now on... Descent was continued visually on a 3-degree vertical profile and 5nm from touchdown, ATC advised of 'line of weather currently rolling across the runway' which led to the RVR decreasing to 335 metres. At 1,000ft and just inside 3nm from touchdown, landing clearance was given with the recorded RVR now 300 metres. With airspeed at 148 KCAS the flaps were selected to 15 degrees and engine torque which had been at or near flight idle since 1,500 feet, was increased to 25%. The aircraft remained on an appropriate vertical profile with adjustments to engine torque in response to a gusting headwind and by 500 feet, airspeed had reduced to 122 KCAS – noted as still 21 knots above VApp.

At 200 feet, the Captain 'began to reduce torque to idle and, as a result, the airspeed began to reduce rapidly'. Although nose-up pitch 'was gradually increased – the vertical path steepened due to the decreasing airspeed and resultant ground speed reduction' and the aircraft descended below the 3-degree vertical path. The crew reported 'at some point below 200 feet' they had ' lost visual reference to the ground due to the approaching weather system of blowing snow' but had nevertheless continued the approach. When the TAWS auto callout at 20 feet occurred 'torque was increased towards 30%' and two seconds later, the aircraft 'contacted the ground' approximately 140 metres prior to the runway threshold at a speed of 94 KCAS. The ground was covered in approximately 20-30cm of snow. As the aircraft contacted the ground FDR data showed that it had been in level pitch attitude and that contact had involved a peak vertical acceleration of 2.32g.

Following this premature touchdown, the Nose Landing Gear (NLG) struck and damaged an approach light situated 90 metres prior to the runway threshold. Damage to the aircraft was subsequently found which required replacement of the NLG assembly and its bay doors, and since both Main Landing Gear (MLG) assemblies had exceeded load limits, they also had to be replaced.

It was noted that the most recent recurrent training received by both pilots had been three months earlier and had included 'practicing rejected landing and missed approach procedures following loss of visual cues at 100ft' which they had completed 'without recorded difficulty although neither could remember the specifics of the rejected landing training event'.

The Operator's Aerodrome Operating Minima (AOM) stated that 'under normal conditions in visual meteorological conditions, the aircraft shall be in a stabilised approach by 500 feet height above aerodrome' and specified that such approach requires that both forward and vertical speed be stable and that airspeed should be VRef +5 knots to 500 feet and then reduce gradually to achieve VRef at touchdown. The AOM also required 'a missed approach if the runway environment is lost to view below minimums' and indicated that 'failure to achieve or maintain a stabilised condition is the basis for a missed approach'.

It was further found that 'the flight crew's understanding of the appropriate airspeeds for normal operations' at the time of the investigated approach was 150 knots in descent to 500 feet then 120 knots from 500 feet to 200 feet and then VRef + 5 knots to touchdown, to be 'achieved by power reduction as necessary'.

In order to determine if the speeds flown during the investigated approach were an exception to those of normal operations 'the remaining 285 flight recorded on the occurrence aircraft's FDR were examined for similar SOP deviances'. It was found that '84% of recorded flights exceeded the 10 knot allowable tolerance over the required VRef + 5 knots below 500 feet' as measured at 400 feet with the average speed at that point being VRef + 22 knots. This data confirmed that a constantly decelerating approach was

habitual. It also confirmed that although 'the majority of recorded flights were outside of the criteria for a stable approach' none of them resulted in a go-around.

This is a rare example of systemic deviance from an Operator's SOP which their SMS had failed to recognise, and therefore, also failed to correct. It is a very real Human trait that if boundaries are exceeded without being remonstrated, the Human will continue to push boundaries until such an event described here occurs. This Operator had had an approved SMS for six years but had failed to use their FDM data to establish a meaningful Flight Data Monitoring programme on this fleet, due – it was reported - to uncertainty about the longevity of the fleet.

In this case, due to the ambiguity in the guidance and uncertainty as to the required speeds during the approach, the crew did not recognise that the approach was unstable, and continued. Although the loss of visual reference required a Go-around, the crew continued the approach to land as a result of plan continuation bias. If crews do not report unstable approaches and Operators do not conduct an effective Flight Data Monitoring programme, but rely only on Safety Management System reports to determine the frequency of unstable approaches, there is a real risk that these issues will persist and contribute to an accident.

So in this accident there were several known Human Factor phenomenon identified as causal and contributory factors, which could have also been reviewed in the Operators Crew Resource Management (CRM) Training.

The execution of the Go-around is the industry mitigation for the unstable approach; every instrument approach will have a carefully documented Go-around procedure. The Go-around procedure should be included in Approach briefing – there are many other reasons why a Go-around may need to be executed at short notice, FOD on the runway being one example. The Go-around from many possible scenarios will be included in recurrent Simulator Training for flight crew. The profile flown in the Go-around can be reviewed by the Flight Data Monitoring programme to ascertain whether further crew training in this respect would be beneficial for the flight crew.

There is a valuable phrase which I often hear repeated by professional flight crew and is worth having to the fore in any Decision Making process, or Threat and Error Management scenario:

'Where There Is Any Doubt There Is No Doubt...

Vicarious liability – accountability for the actions of others

by Edward Spencer and Chris Birks. Holman Fenwick Willan LLP

Potentially catastrophic liability for the negligent conduct of employees is a fact of life for employers, and few more so than air carriers. In circumstances where members of the crew commit a negligent act or omission which causes loss, carriers will need to be aware of their exposure by way of vicarious liability.

Vicarious liability is a common law principle of strict, no-fault liability for wrongs committed by another person, normally an employee. It is an indirect liability in that it does not involve the attribution of guilt for an employee's negligent act or omission to his employer, but rather the imposition of liability for the employee's negligence on the employer as a matter of public policy. Allowing claimants in negligence to bring a claim against an employer in addition to its employee makes sense from a public policy perspective, because an employer will generally be in a better financial position than its employees and so will be more able to meet the cost of claims.

Whether vicarious liability arises involves a two-stage test, both of which must be satisfied:

1. **Is the relationship between the wrongdoer and the person alleged to be liable a relationship that is capable of giving rise to vicarious liability?** The most common such relationship is an employer-employee relationship, such as the relationship between crew and the air carrier by which they are employed. In such an employer-employee relationship, there is a presumption that the first test is satisfied.

2. **Is the connection between the wrongful act or omission and the employment sufficient to justify holding the employer liable?** This will be the case where a carrier has been entrusted with the safekeeping of passengers, and the employee's act or omission causes those passengers harm by negligently carrying out his duties.

Is there a defence?

Due to the strict liability nature of vicarious liability, it is no defence for a carrier to show that its employee has acted in a way that was prohibited by the contract of employment. Where the negligent act or omission is broadly carried out in the course of employment, such as a Commander failing to ensure the carrying out of a cabin search before authorising boarding, this will be sufficient to engage the employer's liability. In order for an employer to avoid liability for an employee's negligent act, the act would have to be sufficiently outside the scope of the employment. This has been described in English case law as an employee being "on a frolic of his own".

Not all scenarios involve vicarious liability

In the event of an accident caused by an employee's negligence, a passenger would have a number of claims, not all of which would involve vicarious liability.

As a matter of international law, where the Montreal or Warsaw Conventions apply, they do so to the exclusion of other types of claims against a carrier, including any claim in negligence which a claimant passenger might otherwise have. This matters little to the claimant, who will instead benefit from a strict liability regime under the Conventions in which he need only demonstrate that an accident occurred in the course of carriage by air which caused him injury. Once this is established, he will be able to claim up to the cap contained in the Conventions, and even beyond this if the carrier fails to prove that it was not negligent. In a claim under the Conventions, the principle of vicarious liability is bypassed entirely, as the right of action is already directly against the carrier.

Where the Convention is not applicable, which is often the case in with domestic travel, or where the flight is a private or non-ticketed flight, then the passenger's recourse would be in negligence. It is in this scenario in which vicarious liability will need to be established in order to make a claim against the carrier.

There is a third and rarer option, again in which the claim is not covered by the Conventions. A claimant could make a claim directly against a crew member where the crew member is covered by the carrier's insurance. This option is only a desirable alternative to a claim against the carrier by way of vicarious liability where there is a jurisdictional advantage to bringing the claim in the pilot's jurisdiction rather than in the carrier's. This would be the case where the jurisdiction in which the pilot is resident has a more generous regime for the awarding of damages. One example of this was the case of Dana Air Flight 992, in which

the families of the victims of that crash brought a claim in Florida against the estate of American Captain Peter Waxtan instead of against air carrier Dana Air in its home jurisdiction of Nigeria.

Vicarious liability is not, therefore, always relevant to a passenger's claim against a carrier arising out of the negligence of its employees. Its relevance will be determined by the circumstances of each case, particularly with regards to the applicability of the Conventions and any jurisdictional considerations there may be.

Can a carrier claim a contribution from a negligent employee?

Vicarious liability does not replace the liability of the negligent employee. As such, where a carrier suffers a loss as a result of being vicariously liable for an employee's negligent acts or omissions, the carrier may bring a claim against the employee to recover that loss.

A negligent act or omission committed in the course of employment would normally be a breach of an employee's employment contract, so the first port of call for a carrier would be to consider a claim for damages for breach of contract.

Where this is not possible, a claim may be brought under the Civil Liability (Contribution) Act 1978, enabling the carrier to recover the amount that is, in the words of the Act, "just and equitable having regard to the extent of that person's responsibility for the damage in question".

Conclusion

The concept of vicarious liability is informed by the principle that those who carry on a business should bear the loss caused by the risks associated with the business, including the risk of an employee acting negligently. A better understanding of the link between an employee's conduct and an air carrier's exposure to the risk it can present should facilitate a greater dialogue about how to continue improving safety and training in the aviation industry.

Last Week I Had Prostate Cancer (written on the 8th Feb)

And now I don't, or at least until a blood test proves otherwise

by Richard Lotinga

It seems particularly appropriate to write this article with news headlines being peppered with articles on prostate cancer. On the 2nd Feb the Daily Telegraph announced that prostate cancer deaths exceeded breast cancer deaths for the first time in the UK. The figures were from 2015 and 11819 men died from prostate cancer that year.

I am 64 and younger than the 65-69 age group that is the most likely to suffer from the disease, the third biggest cancer killer in the UK. Now, some of you will have already turned to another article working on the 'it will never happen to me' premise. That might work when you are in your twenties or female but you might be partnered with, or have father or friend who might be prevalent to the disease.

So how come it has gone already? Prostatectomy (prostate removal) is the simple answer, the process to it being a little more complicated.

The symptoms can creep up on one, a desire to go to the loo and little or nothing dribbles out, or having been, still a feeling that you want to return to the urinal. This is because the prostate is enlarged and is pressing against the bladder. If you have these symptoms get off to your GP immediately because it is possible that cancerous cells have enlarged your prostate and it may well be advanced. But be aware that you may not have any symptoms, I didn't and was convinced that I was fine. Another method of detecting the disease is from a blood test that detects one's PSA (Prostate-specific antigen) count. Although a count above 4 will indicate that you probably have cancerous cells, that in itself is not a moment to panic as it is likely that all men have some cancerous cells in their prostate but they do not cause any major issues. However, if there is a change in the number then there may be cause for concern.

In my case a PSA count of 6.5 (taken in 2010) rose to 14.9 in September 2017 after my excellent GP, Dr Paul Woods, insisted that I take a blood test having been typically male and couldn't be bothered over a few years. An appointment with a consultant shortly followed but after a physical check (not the end of the world guys, the ladies have far worse) he seemed unconcerned but thought that a short course of targeted antibiotics might kill off what might be a minor infection. The next blood test indicated a PSA count of 15.46, so it had gone up, not down. This was now late November and now the process started to accelerate.

From the last results the consultant recommended a biopsy which takes samples from the prostate. There are 2 current methods, one takes a few samples, the other many and the latter is done under general anaesthetic. It is known as a 'template prostatic biopsy' and in my case took 44 samples. There is no doubt I felt sore after the biopsy, 12th December, but recovered in a couple of days and of the 44 samples 11 were confirmed cancerous. I officially now have cancer. Oh deep joy, not. Both my parents died of cancer, my mother at 51 from cancer of the womb and my father at 56 of pancreatic cancer so I cannot say that I was overjoyed by the diagnosis. However, I am part of a profession that gets on with life; the job has to be done, a pilot's way, so shrug shoulders and go on to the next stage. The actual result was a Gleason sum 7 adenocarcinoma. I won't describe what that means, go onto the internet and have a look-see. When it was proven that I had cancer I was given a gamma scan to ensure that the cancer had not transferred to the bone structure. It hadn't, big phew!

However, it does mean that something needs to be done to get rid. Three options, targeted radiotherapy, chemo or radical prostatectomy. In my case the latter was chosen. The other decision was to announce to my AME and therefore the CAA, was that I had cancer. Although, up to the result of the biopsy, I had a small number of cancerous cells, the biopsy confirmed the disease truly existed so the CAA has to be informed. Physically, I felt fine but my belief is that the CAA is concerned with the psychological side and rightly so after the Germanwings accident in 2015. So, on the 18th December the CAA suspended my licence until my cancer was eradicated.

Up to the biopsy I had utilised the private healthcare offered by my company, it may have accelerated the process, but post-biopsy I turned to the NHS. The consultants and surgeons would have been exactly the same and the speed of the final surgery, under the NHS, could not have been bettered. The 31st January was set as the day of the operation. Of interest, the operation was costed at about £10,000. The medical insurance company,

who were very good, would only pay out if the NHS could not complete the operation in under a month from the decision to go for the prostatectomy which was taken on the 4th January.

A pre-op mini-medical at the Royal Surrey Guildford, and pre-op phone call gave great confidence in the process. The operation was to be done by robot (a surgeon controls the robot), requiring several (6) small incisions on the tummy and a catheter to drain the bladder, that in-place for a further week post-op. The usual no eating and drinking preceded the op, due at about 1300 which was the case. Surprisingly (to me) I was given an epidural, normal for caesareans, gently weird, followed by the normal anaesthetic. Four hours later I didn't have a prostate. Two hours in post-op and into the ward with 4 other guys having similar operations. The night in the ward was disturbed, from the others and probably me too. Just codeine and paracetamol were the only drugs required and 21 hours after the op I was released.

I'll repeat that, 21 hours after a radical prostatectomy I left the hospital. Amazing! Sure, I have spent a fair amount of time in bed at home, stomach muscles being one of the main issues for the first 3 days. Very little pain, just the nuisance of being very careful with the catheter and not pulling on the tube, do it once and you don't do it again. A week after the op and the catheter is removed in 5 minutes flat. Biggest problem after that is the re-training of the bladder muscle, hence the equivalent of 'panty liners' for males until the muscle is re-trained. Get over it.

So here I am tapping away on the computer feeling ok-ish. Tired, yes, able to fly, not a chance for quite a few weeks hence. The criteria of the cancer being eradication is a PSA result of less than 0.1. Without a prostate how can one have PSA? It seems that some micro cells might be left behind. That blood test is due 3 months after the operation and then your own AME followed by the CAA's approval will get you back to flying. In my case it seems with my retirement due on the 15th May I may have flown my last flight in December. Disappointing if that is the case but clearing the cancer was somewhat more important.

All the staff in both private and NHS were superb, cannot fault in any respect. The only difference, perhaps, was the initial speed in appointments but from a friend who is going through a similar experience solely through the NHS the timings seem similar. If you have any doubts, see your GP and get a blood test.

Before the operation I asked how the prostate (the size of half a coke can) was removed? It seems it is cut up into little slices, put into a plastic bag that is positioned close to the prostate and pulled out. How cool is that!

Pilot Mental Health - "The Lived Experience"

by Capt. Paul Cullen, Dr. Joan Cahill & Dr. Keith Gaynor

How are we managing risk associated with Mental Health?

Back in the 1950's aircraft were crashing into mountains at an alarming rate. The industry's response was not to bulldoze mountains, nor was it to stop flying into mountainous regions. Instead, attention focussed on ensuring pilots either flew above or between the mountains. This was done by;

1. Ensuring pilots knew where the mountains were, and
2. Ensuring pilots stayed away from the mountains.

In other words, improved situational awareness reduced the likelihood of CFIT events. This was preventative, or proactive, risk management. However, it didn't work all the time, and CFIT events continued, albeit at a reduced rate. Alas, Ground Proximity Warning Systems (GPWS) were developed. This technology radically reduced the number of CFIT incidents. GPWS is an example of reactive risk management.

In aviation, we don't eliminate risk. Instead, we manage it using a combination of proactive and reactive risk management practices. We identify hazards, assess the risk and implement mitigations where deemed necessary.

The mental health of pilots has come under close scrutiny in recent years. It could be argued that the vast majority of the focus has been on the detection and treatment of mental health issues, and also on ensuring that pilots with mental health issues are removed from cockpits. As an industry, we are purely reacting to a hazard.

It could also be argued that the focus is solely being placed on preventing the re-occurrence of a catastrophic, but extremely rare event. Instead, perhaps focus needs to be placed on the work-related causes of mental health/wellbeing issues for pilots, the impact of such issues on pilot wellbeing/health more generally, and the impact of sub-optimal mental health on day to day operations (i.e. flight safety).

Mental Health & Everyday Performance

In the aftermath of the "Miracle on the Hudson", Capt. Sullenberger highlighted a number of key performance shaping factors (PSFs), that led to the successful outcome. The fact that the crew had a combined experience of over 150 years, and that the crew had an opportunity for adequate rest were cited as positive internal PSFs. External PSFs in this case may have been the good visibility, and the availability of a nearby river with little traffic and few bridges.

PSFs can also be negative, such as fatigue, intoxication or inexperience. A pilot's state of mind can also be a negative internal PSF, and one that probably receives little or no attention in the investigation of many low to medium-level incidents. If a pilot is suffering with a baseline level of anxiety or stress that is higher than normal, and he/she is faced with a challenging event in the cockpit, he/she may well reach the limit of their mental capacity earlier than if they had normal levels of anxiety or stress. Pilots intuitively understand that factors such as anxiety, depression, fatigue, burnout, stress, reduced coping mechanisms, sense of isolation, decreased sense of self-worth, lack of peer support, loneliness, poor social network or marital discord can all negatively impact on a pilots' ability to perform their duties. These are all examples of negative PSFs.

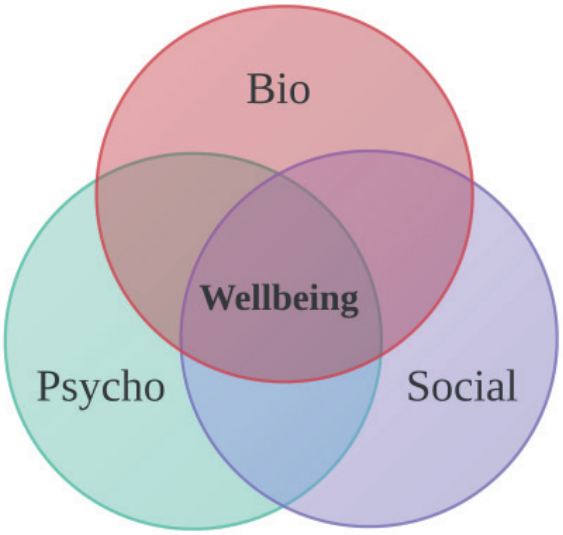
The Evidence of a Problem

Several recent studies have reported the levels of mental health issues among pilots. In 2012, Dublin City University conducted a study of over 700 pilots flying for Irish registered airlines. The authors reported that over a 12-month period, 54% of respondents reported suffering feelings of being depressed or anxious. Of this same sample of pilots, 78% reported suffering feelings of being burnt-out or exhausted. In 2016, Harvard University studied over 1,800 pilots, and of these, over 12% displayed symptoms that met the threshold for Clinical Depression, or a major Depressive Disorder, within the previous 2 weeks. Over 4% reported having suicidal thoughts within the same period.

In 2016, as part of the EUROCONTROL Future Sky Safety Project, the London School of Economics conducted an Airline safety culture study. The authors of this European Commission funded study reported that of over 7,200 participants, only 17% believed their company cared about their wellbeing, and 21% felt that fatigue was taken seriously within their organisation.

Despite the perception of pilots supposedly "Living the Dream", and being made of "The Right Stuff", there is mounting evidence that Pilots are suffering with the same Mental Health issues as the general population, and possibly to a greater extent. Unfortunately, very little focus has been placed on trying to determine why these issues are occurring, and on what measures can be taken to protect the mental health of pilots. As a society, we take pro-active steps to protect against physical ill-health, and adopt an attitude that "prevention is better than a cure". Surely the same approach should be taken with the mental health of pilots. Mental health issues are a normal part of health and need to be treated and/or managed accordingly.

What is Health & Wellbeing?



Let's start of by defining what exactly is meant by Health & Wellbeing. The World Health Organisation (WHO) have defined Health as *"a state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity"*. The term Wellbeing can be used to describe the overall health of our body, mind and soul. According to the *BioPsychoSocial model of Wellbeing*, the cause, manifestation and outcome of wellness and/or disease, are determined by a dynamic interaction between Biological, Psychological & Social factors.

Our physical, mental and social health do not exist independently of each other. Just like safety, no single factor is sufficient to lead to an outcome, whether that be safety or an accident, or wellness or disease. Instead, it is the inter-relationships between all three pillars that results in a given outcome. We can think of our Wellbeing as a 3-legged stool, with each leg representing one of the pillars of our wellbeing (Physical, Mental & Social). We can only stabilise the stool if we strengthen all three legs. Weaken one leg and the stool is more likely to collapse. Reinforcing two legs while ignoring the third is of limited benefit. All three legs need attention.

So, what factors affect the pillars of wellbeing? The *Biological Pillar*, which relates to our physical health, is influenced primarily by our diet, sleep, hydration and activity levels. The *Psychological Pillar*, which relates to our mental health, is influenced by our mind-set, attitudes, beliefs, and stress management and coping techniques. Finally, our *Social Pillar* is influenced by our social network and the quality of our relationships.

Why are we all talking about Mental Health?

We've probably all noticed that in recent times our awareness of mental health has increased. Nowadays, there's a strong chance that if we are not suffering with a mental health issue, we at least know somebody who is. Experts tell us that, 30% of us will suffer with a mental health issue in our lifetime. The latest figures tell us that in the western world, right now 16% of us are dealing with a mental health issue. This figure of 16% encompasses the entire spectrum of Mental Health issues, such as depression, anxiety, suicidal thoughts, psychosis, addiction etc. It is worth highlighting that the previously mentioned Harvard study reported that over 12% of pilots met the threshold for clinical depression alone.

This is not a statistical glitch, nor is it that we are just more open as a society in talking about mental health. The incidence of mental health issues is in fact on the rise, and the experts reckon they know why. There's a multitude of complex factors involved, but they can be simplified so as to give an idea of some of the causal factors at play.

Diet – Over 2,500 years ago Hippocrates advocated "Let food be thy medicine, and medicine be thy food". We are regularly told that "we are what we eat". Diet not only affects our physical health, but it also affects our state of mind.

Shift work & Long Duties - The world is now operating on a 24/7 basis, with shift work becoming more and more common. Many of us are working when our bodies are telling us to sleep, and trying to sleep when our bodies are saying get up and go. A lot of us just aren't getting enough sleep.

Inactivity - Studies have shown a direct link between physical activity and the quality of our mental health. As a species, we are not designed to be sedentary, yet with increased automation, life is becoming more sedentary. Studies have branded sitting as the new smoking, and have demonstrated that the negative effect of prolonged sedentary periods are not necessarily offset by exercise later in the day.

24-Hour Connectivity - Not only are we working around the clock, but also, we never really get a chance to switch off. Thanks to mobile devices we are almost always contactable. Sometimes we just need a break.

Financial Strain - The effect of the global recession over the last decade has been well documented, and there is no shortage of evidence to demonstrate that people's mental health has been put under enormous strain due to financial worries. During the global recession, year on year the number of suicides in Ireland increased.

Now that the Irish economy is in recovery this trend has reversed. 2016 saw a marked reduction compared to previous years.

Complex Roles - Many people now have complex, multiple roles, such as parents juggling parental and professional responsibilities, and potentially - also caring for elderly parents. Add all this to the fact that people's expectations of life satisfaction/quality of life are greater nowadays.

Lack of Religion - As more and more people in the western world turn away from organised religion, it has been observed that an increasing number of people are experiencing a lack of philosophical understanding/acceptance of life, death & suffering.

Social Interaction & Supportive Networks - We are now more connected than ever before. It might be termed social media, but is this real social connection and interaction? We all need a shoulder to cry on. However, studies have repeatedly shown that it is equally important for us to be that shoulder to others. We need supportive 2-way relationships.

But pilots are resilient. Aren't they?

There is a perception among some people that airline pilots are cut from the same cloth as astronauts, and as such possess "The Right Stuff". Some people believe that pilots are more resistant to the mental health problems encountered by mere mortals. Unfortunately, some pilots believe this too. When a pilot experiences mental health issues, and assuming he/she seeks help, very often his issues are dealt with great sensitivity and confidentiality. The down side of this is that it does little to normalise what is in fact a normal aspect of our overall health. A mental health issue is no more a sign of weakness than a broken bone or a strained muscle.

As a result of this "Right Stuff" perception, a pilot who is suffering with a Mental Health issue is;

1. Potentially less likely to admit to themselves that they are suffering (i.e. awareness).
2. Potentially less likely to seek a diagnosis and treatment.
3. Potentially less likely to confide in a colleague.
4. Potentially less likely to offer non-judgemental support to a colleague who is suffering.

Flying Blind

Very few detailed empirical studies have been carried out specifically on pilots. The studies cited above highlight that a problem exists, but to date, very little research has been carried out to determine why this is the case. The aviation industry has changed dramatically over the last 15 years. Pilots are working longer hours than ever before, and many are operating under atypical forms of employment. It could be argued that today's pilots are participants in an open ended social experiment, and nobody really knows what parameters are to be measured, and what the expected results are going to be.

Understanding Pilot Mental Health

Imagine if our doctors told us not to worry about what we eat! Don't bother exercising! Drink and smoke all you want! It just wouldn't happen. As a society, we proactively manage the hazards to our physical health.

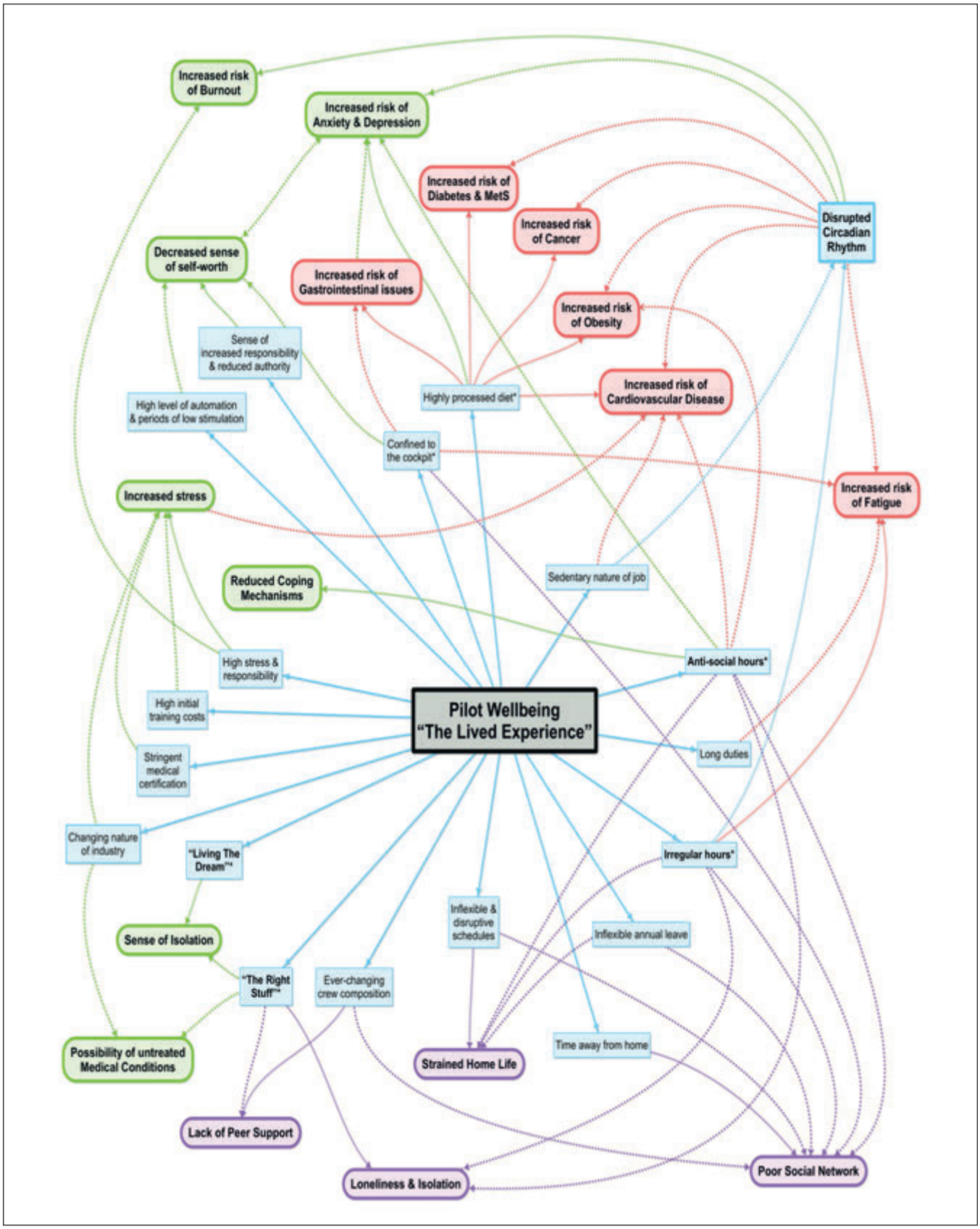
What if pilots solely relied on GPWS? What if pilots no longer concerned themselves with minimum safe altitudes, or bothered flying the published vertical profile of an instrument approach? What if we just flew blindly until we heard the warning "Pull Up! Pull Up!" What if we just reacted to hazards, rather than tried to predict or avoid them? This would not happen either. As pilots, we also pro-actively manage in-flight hazards/internal PSFs.

In investigating any accident or major incident, the purpose of the investigation is to identify and understand the causal factors, so as to understand not only what happened, but also why it happened. We do this to reduce the likelihood of reoccurrence. Given this, the industry's response to the mental health crisis among pilots is surprising.

We all know what happened in the wake of the Germanwings tragedy. EASA set up their task force and issued a list of recommendations. While these measures are to be welcomed, it could be argued that EASA's response has fallen short of what is actually required (i.e. EASA response is reactive and not proactive). The measures are focused purely on preventing pilots with serious mental health issues from being at the controls in cockpits. Either pilots put up their hands and seek help, or EASA will find them, and make them get help. Why were no efforts put into trying to understand why pilots may be developing mental health issues in the first place (i.e. work-related factors), and could some of these be prevented?

The Lived Experience

Despite pilots starting off their careers *possibly* possessing "The Right Stuff", somewhere along the line something is causing the mental health of pilots to suffer. In an attempt to understand and explain why this is happening, we have developed "The Lived Experience" model. This model was initially advanced following


Increased risk of Burnout
Increased risk of Anxiety & Depression
Increased risk of Diabetes & MetS
Increased risk of Cancer
Disrupted Circadian Rhythm
Decreased sense of self-worth
Increased risk of Gastrointestinal issues
Increased risk of Obesity
Sense of increased responsibility & reduced authority
Highly processed diet*
Increased risk of Cardiovascular Disease
High level of automation & periods of low stimulation
Confined to the cockpit*
Increased risk of Fatigue
Increased stress
Reduced Coping Mechanisms
Sedentary nature of job
High stress & responsibility
Anti-social hours*
High initial training costs
Pilot Wellbeing "The Lived Experience"
Long duties
Stringent medical certification
Changing nature of industry
"Living The Dream"*
Irregular hours*
Inflexible & disruptive schedules
Sense of Isolation
Inflexible annual leave
"The Right Stuff"*
Ever-changing crew composition
Possibility of untreated Medical Conditions
Time away from home
Strained Home Life
Lack of Peer Support
Poor Social Network
Loneliness & Isolation

interviews/feedback from over 100 pilots, in which sources of Work Related Stress (WRS) were identified. Using the *BioPsychoSocial Model of Wellbeing*, along with an extensive review of relevant scientific literature, plus input from a significant number of medical professionals, "The Lived Experience" model was further developed into its current form.

"The Lived Experience" model allows potential pathways to be plotted between sources of Work Related Stress (WRS), and negative Performance Shaping Factors (PSF).

A simplified overview of "The Lived Experience" is shown in the attached map - linking sources of WRS with the resultant PSF. The sources of WRS are shown in blue, and the PSF are shown in Red (Bio), Purple (Psycho) and Green (Social). The map illustrates how aspects of life as a pilot may be negatively impacting on each of the 3 wellness pillars (i.e. pilot wellbeing).

This model **(see page 13)** has been further elaborated in terms of a safety case – that is argumentation demonstrating the relationship between sources of WRS for pilots and their impact in terms of (1) pilot wellness, (2) pilot performance and (3) flight safety.

The evidence suggests that pilots are experiencing Mental Health problems, and that the risk for developing such issues is potentially greater than previously thought. There is also evidence that pilots are no more resilient than the general population to mental health issues such as, but not limited to depression, anxiety and suicidal thoughts. What is possibly most alarming, is the finding from our own research that aspects of a pilot's job are contributing to these health problems.

Since the advent of aviation, an extremely low number of lives have been lost due pilot suicide. However, considering there are hundreds of thousands of commercial pilots flying worldwide today, there are possibly many thousands of pilots flying right now with untreated mental health issues, such as depression, anxiety, low self-esteem, sense of isolation, exhaustion, burn-out, embitterment, suicidal thoughts, etc. The list goes on, and the potential impact on performance, professionalism and flight safety should be obvious.

The Next Steps

If the wellbeing of pilots is being negatively affected by the nature of their work, this needs to be identified and measured, and the associated risks managed accordingly. We cannot manage what we cannot measure. The *BioPsychoSocial Model of the "Lived Experience"* of a pilot and the associated safety argument provides a useful starting point for this research. This is preliminary research, and was first presented at the "Human Factors in Aviation Safety" conference held by the Chartered Institute of Ergonomics & Human Factors in London in 2016. This model was further developed and presented at the Flight Safety Foundation's "International Air Safety Summit" held in Dublin in 2017.

This preliminary research will be further advanced through participatory/co-design research with commercial pilots. So as to get a true picture of pilot wellbeing, including the causes leading to wellbeing issues, it is envisaged that in 2018, a detailed General Health Questionnaire will be distributed to pilots throughout Europe.

Can Mental Health of Pilots be protected?

Absolutely yes, is the answer. Pilots and airlines are jointly responsible for managing pilot wellbeing issues. As with air accidents, to prevent re-occurrence, we need to understand the causal factors that ultimately lead to the outcome. A first step in this process is to identify the challenges that pilots are facing. If we can identify and understand how the Biological, Psychological and Sociological pillars of pilot wellbeing is being impacted by the job, we will be better placed to design and implement mitigating strategies to better assist pilots in maintaining optimum wellbeing. This includes strategies at a self-management level (pilot level) and an operational and organisational level (i.e. airline level).

If the true picture of pilot wellbeing (including the causes for wellbeing problems) were to emerge, this may very well help reduce, or even remove the current stigmatization of mental health issues among pilots, thus enabling open disclosure and increased support. In time, perhaps airline management might reconsider their duty of care to their employees and regulators may implement measures that not only protect the safety of the travelling public, but also the wellbeing of the crew operating aircraft.

Captain Paul Cullen has been an airline pilot for over 20 years, and has accumulated over 13,000 hours flying the A320, A330 and B737. Paul is an accredited Air Accident Investigator, and previously held the position of Director of Safety & Technical with the Irish Air Line Pilots Association. His interest in the mental health of pilots was borne out of interactions with pilots who had sought assistance from the Pilot Assistance Group.

Dr. Joan Cahill is a Human Factors professional based in Trinity College Dublin. Joan has a long-standing research interest in aviation psychology, and would like to understand this problem and identify a path to addressing this at different levels (i.e. pilot self-management, airline etc.). Joan's specific interest is in the advancement of toolkits to support pilot self-management of wellbeing and in airline performance and safety management processes relating to this.

Dr. Keith Gaynor is a Senior Clinical Psychologist at St John of Gods Hospital, Dublin. Keith is a Consultant in the area of mental health, and much of his work concerns developing strategies for managing mental health in high stress work environments.

CHIRP
Air Transport FEEDBACK

Descent below designated altitude

Report Text: We were on arrival into [an airport in the London TMA] from Belgium. While on arrival we were with London Control and given an assigned heading which took us off the assigned STAR. This is not unusual as we rarely stay on the assigned Arrivals and Departures when with London Control. I was given a descent on our present heading to FL100. I set 10000 in our altitude selector and continued an approx.1500 fpm descent. During that time my Co Captain, Pilot Monitoring, was off frequency communicating with [handling agent] in preparation for our arrival. We were issued a frequency change to a new sector and we checked in. We were next issued a turn direct to [ ] and were continuing to descend to FL100. Around FL103 the controller called and asked what we were doing. My colleague responded, going direct to [ ]. The controller said, no you were assigned FL110. Our response was to ask if he wanted us to climb. He responded no continue descent to FL90.

Lessons Learned - Well the obvious answer is to always check and double check altitude assignments. In this case ATC had several chances to catch the mistake, if it was a mistake. I repeated what I thought to be our assigned altitude to two different controllers. ATC also has the capability to see what I have in my altitude selector so it shouldn't have been a surprise that I was descending to FL100. The Arrival phase into the London Area is an extremely busy and complex time. We always need to be vigilant to maintain a high level of situational awareness. In the US, ATC has adopted much less of a "positive control" concept for arrival flow. Aircraft are metered using the arrivals which aids in reducing errors and increasing flow. It would be great to see a more effective arrival airway system in the UK.

***CHIRP* Comment:** We are grateful for this honest account of an incident from which there are several lessons for the benefit of other pilots. In essence, a simple error was not detected or corrected by the barriers which might otherwise have prevented a level bust. The RT tapes record that the crew was instructed to descend to FL110 to be level by [ ]. This was correctly read back but FL100 was selected in the autopilot and the aircraft began to descend. The incorrect level was challenged by ATC as the aircraft was descending past FL103. No other aircraft were affected by this level bust and the controller immediately cleared the aircraft to FL90.

The erroneous selection of FL100 selected altitude was a typical and common example of a human performance error: a correct read back but an incorrect action. One of the barriers for catching this type of error is monitoring by the other pilot. Unfortunately he was speaking to the handling agent when the ATC descent clearance was issued and read back correctly by the handling pilot. Although FL100 is typically the level below which flight decks go sterile, many operators use FL200 for operations into the London TMA because the airspace is so busy and complex. If it is essential for one pilot to go off the operating frequency below FL200 and a descent is instructed while they are away, on their return they should ask ATC to confirm the altitude cleared; this is not uncommon and controllers would prefer to be asked for confirmation than risk a level bust.

Another potential barrier was the downlink of the altitude selected in the aircraft FMS. However, the controller did not detect the incorrect altitude selected by the pilot and pilots should not expect them to do so. Controllers are not mandated to check the selected altitude because it would be impractical given the amount of traffic in the TMA and the variable delay that occurs between clearing aircraft to descend and the altitude being selected. If controllers do see a discrepancy they will try to resolve it, but it is not currently practical to expect them to do so routinely. In future controllers will increasingly make use of electronic flight strips (rather than the paper ones) and these, in some situations, will alert the controller if there is a discrepancy between the cleared altitude and the Mode S indication. Unfortunately, the utility of the selected altitude function may not be compatible with RNP procedures and step-climb SIDs. Therefore, while technical solutions will be welcome and beneficial, from a human factors perspective the old adage – 'never assume, check' – comes to mind in circumstances such as occurred here.

Once again, kudos to the reporter for providing the opportunity to highlight some important lessons.

Fatigue

Report Text: I was rostered for a series of early morning starts with report times varying from 0505 to 0555 LT. I live one hour from the crew car park and it generally takes 20 minutes to park and get the bus to the crew reporting point. With the best will in the world and the most efficient preparation, I still need to set the alarm to 03:30 to make the earliest report.

I did my best during this series of duties to manage rest, taking some catch up naps during the afternoon after getting home and going to bed at a reasonably early time. By the evening before the last duty I was so tired that I went to bed and fell asleep at 8pm, waking at 0400 having had a full 8 hours sleep.

For the first time in this series of duties I felt well rested; but the events of the day were to show that this was merely an illusion.

I made series of small mistakes, starting with such things as reading the wrong line on the performance figures, then omitting to delete a redundant stop altitude from the FMC; things got worse as after take-off during flap retraction I was first asked, as is normal, to select flap 1 and then later flap Up. When I came to make the selection to Up, I discovered that I had already selected flaps Up when asked for

Flap 1, despite the fact that there is a mechanical gate at the Flap 1 position designed to prevent exactly this happening. Fortunately the aircraft was light and accelerating so fast that the lift margin was never compromised. I had no recollection of doing that at all. Further minor errors occurred throughout the flight (no lights on as we descended) and I arrived back at base feeling very unprofessional and embarrassed.

The lesson here is that your level of fatigue is not necessarily a function of how fatigued you feel! I have noticed this effect before when awaking for an early and feeling great, but not actually performing so great. Oddly when I feel very tired I think my brain subconsciously makes sure I try harder!

It was for this reason I stopped using one of those clever smartphone apps (sleep cycle) which monitors your sleeping cycles and only wakes you at the peak of a cycle; correctly claiming that you feel better having woken at a state of light sleep. You might well feel better, but that doesn't guarantee you will perform better. In my opinion it seems that sometimes fatigue can be insidious - rather like hypoxia. You think it's going well, but it isn't!

I'd be interested if there is any research along these lines to confirm this idea?

***CHIRP* Comment:** We are pleased to be able to print this honest report about the insidious nature of fatigue. EASA FTLs require operators to conduct fatigue management training but the recognition of fatigue is not specifically included:

ORO.FTL.250 Fatigue Management Training

(a) 'insert airline name' shall provide initial and recurrent fatigue management training to crew members, personnel responsible for preparation and maintenance of crew rosters and management personnel concerned.

(b) This training shall follow a training programme established by 'insert airline name' and described in the operations manual. The training syllabus shall cover the possible causes and effects of fatigue and fatigue countermeasure.

However, AMC1 ORO.FTL.250 states the FRM training syllabus should contain the following:

(b) the basics of fatigue including sleep fundamentals and the effects of disturbing the circadian rhythms" and "the effect of fatigue on performance.

Some operators do include training about recognising fatigue in oneself and others but the reporter has correctly highlighted the practical difficulty of reliably recognising fatigue in oneself on a day-to-day basis. There is research about fatigue that includes observations about its insidious nature. "The Cumulative Cost of Additional Wakefulness: Dose-Response Effects on Neurobehavioral Functions and Sleep Physiology from Chronic Sleep Restriction and Total Sleep Deprivation" (Van Dongen et al; "Sleep2 Vol 26 No 2 2003.) examined the effect of sleep deprivation on cognitive function. Its conclusions include, *"... it appears that even relatively moderate sleep restriction can seriously impair waking neurobehavioral functions in healthy adults. Sleepiness ratings suggest that subjects were largely unaware of these increasing cognitive deficits."* This conclusion appears to provide scientific evidence to support the reporter's contention that the effects of fatigue are insidious.

EASA Rostering

Report Text: Over two weeks and 2 days I had three single days off. That period included a two day simulator, SEP, a 5 day long haul trip, and two east coast US two crew trips. All sectors featured MEL items to deal with or minor failures; however, at least there were no weather issues. Then I had two days off, a third east coast, three days off and then a late report east coast to complete the month. This was all allowable under EASA, however I believe work patterns like this are flawed and ultimately will contribute to an incident. One issue is that the fatigue isn't necessarily clear until well into your duty day, far too late on a long single sector to stop.

I keep fit, eat reasonably etc., however, I felt desperately tired on approach to home base, briefly fell asleep driving home (half hour commute), had memory issues and disrupted sleep from over tiredness. Generally felt run down all month, and suffered irritability etc.

I have been long haul for 20 years; I know 'tired' and the normal feeling of being 'Long-haul', this is beyond that. Nobody likes EASA FTLs amongst those working them. 17 hours FTL if you are three crew no matter what start time/acclimatisation? Coming back from a three day east coast US at midnight local, two crew, 11 hours allowed?

That last late report east coast had delays on both sectors. My colleague admitted to me that on departure on the last sector back to UK he was praying nothing went wrong as he worried his tiredness might be a factor. I felt the same.

I won't work a roster like that again, I will have to go fatigued.

***CHIRP* Comment:** The report clearly demonstrates again that duties that are legal under EASA FTLs can be fatiguing. It also illustrates the difficulty for hard working and well-motivated pilots of knowing when to say, 'enough is enough'. The reporter did not submit a fatigue report because he did not feel it was appropriate after completing the duty. We have heard other pilots express a concern that admitting to having felt fatigued during flight could result in punitive action. Assuming that no one would commence a duty when knowingly fatigued, flight crew should not be concerned about punitive action. If a crew member commences a FDP in good faith but subsequently feels sufficiently fatigued during the duty that they consider their performance was, or might have been, impaired, a post flight fatigue report is appropriate and correct.

It is also worth considering, when assessing the fatigue potential of a planned roster, that a simulator duty can be at least as tiring as an airborne duty.

The Use of Commander's Discretion – Understanding of the Regulation

Report Text: The SCCM asked us in addition to our standard SEP and Security checks to check the toilet packs and headphones onboard the aircraft as we have had problems with the cleaning company not loading enough stock. Having checked this, there were not enough toilet amenities to enable us to depart so we had to call for more stock to be delivered. This took quite a while and after about 4 hours, the flight crew reached their maximum FDP and the Commander was not happy to use discretion from home base in case they needed to use it later on.

New flight crew were called from standby. After speaking to the original Commander, they expressed that they would not use any discretion from home base because it should be used in 'extenuating circumstances' or words to that effect. We checked the maximum FDP and use of Commander's Discretion and there was some confusion as to whether you could use three hours of discretion from home base with three flight crew or whether you could only use two hours of discretion. These confusions were never addressed and still remain.

The departing Commander advised that it would be up to the new Commander to decide whether or not to use their discretion to extend our FDP to cover the duty. When the new Commander arrived, they asked how the crew were and the SCCM explained that a number of the crew felt tired and as if they would rather leave. Their response was something along the lines of, if the crew want to offload themselves then they can.

Having reported at 1220 for the duty with an original departure time of 1340, our actual departure time was 1827 with a flight time of 9 hours. This meant a duty of 16 hours and 7 minutes.

On the crew transport, the Commander informed us that we'd gone into discretion by 2 hours and 37 minutes and thanked us for our hard work.

When at breakfast the next morning, the Commander explained that if we had stood ourselves down and not used discretion, there would have been no other crew to call from standby as they were all currently being used. With this in mind, there would have been no other option but to cancel the flight completely.

My main points to make in this situation are:

1. The Commander did not come and speak to us all as crew and make an informed decision, they took a rather blasé approach to the use of discretion.

2. Being at our home base, is it ethical to use Commander's Discretion when there should be crew on standby ready to re-crew the aircraft?

3. The Commander allowed an external situation - no crew to call from standby and the possibility of having to cancel the flight - to impact their decision making when deciding whether or not to use discretion.

In this situation, the Airport Duty Manager was dismissive as to there being a situation regarding cabin crew duty period extension and once the situation was explained, the company expected the Commander to use their discretion in order to support the operation.

Lessons Learned – Commander's should be impartial and not allow external factors to impact on their decision making. Crew - if they have concerns should voice them/express their concern to extending the duty.

***CHIRP* Comment:** The Use of Commander's Discretion is a subject that has been raised several times in cabin crew reports submitted through the CHIRP programme. Since the EASA FTL implementation, these reports have increased, which could be due to a misunderstanding of the regulation.

EASA FTL states that the conditions to modify the limits on flight duty, duty and rest periods by the Commander in the case of unforeseen circumstances in flight operations, which start at or after the reporting time, shall comply with the following;

i The maximum daily FDP may not be increased by more than 2 hours unless the flight crew has been augmented, in which case the maximum flight period may be increased by not more than 3 hours;

ii If on the final sector within an FDP the allowed increase is exceeded because of unforeseen circumstances after take-off,

the flight may continue to the planned destination or alternate aerodrome; and

iii The rest period following the FDP may be reduced but can never be less than 10 hours.

The regulation states that the Commander 'shall consult their crew' on alertness levels but does not specify how this should be completed. Depending on the size of the aircraft and the amount of cabin crew onboard, it may be hard for the Commander to complete this so they often liaise with the SCCM or they could make a PA to the crew to advise by how long they are likely to go into discretion. The decision to use the discretion period should not be made by the scheduling department and if cabin crew are not content to do this, they should advise the SCCM and the Commander before departure.

In the situation reported, the cabin crew could operate into two hours discretion as the flight crew was not augmented. Commander's Discretion should only be used for unforeseen circumstances which are out of the operator's control; departure from home base using discretion should be avoided as the company should have sufficient standby crew available to cover delayed flights if needed.

Flight Crew Controlled Rest

Report Text: Three flight crew operating with one flight crew member in the bunks. The other two flight crew informed me that they were taking controlled rest. At the end of the controlled rest period, I entered the flight deck and saw the mattress from the spare bunk had been taken off and was on the floor in the flight deck behind the flight crew seats, along with pillows and blankets. I did not witness anyone laying/sleeping on it but it appeared that it had been used during the controlled rest period. Therefore, one flight crew member was in the bunks and possibly a second flight crew member on the floor on the mattress on the flight deck with one flight crew member in the seat operating the flight.

Lessons Learned - If this practice was the case, it needs to be made clear whether this is acceptable re: safety of the aircraft and passengers and crew. If not, communication should be sent to all flight crew to be advised. A message to all cabin crew to monitor and report such practice.

***CHIRP* Comment:** Controlled Rest is sometimes referred to as 'in seat napping' and is used by most UK operators. It is the process where the flight crew can take short periods of sleep whilst temporarily being relieved of operational duties in accordance with company prescribed 'controlled rest' procedures. It should be used during periods of reduced cockpit workload i.e. during cruise and has been proved to increase the levels of alertness during the critical stages of flight (take-off and landing).

Some longer range aircraft have designated rest areas for the flight crew to use - as mentioned in the previous report - and they should only be used when there are more than two flight crew rostered to operate the flight. This primarily occurs when the maximum allowable flight duty period requires an additional pilot to complete the flight. The rest periods will be planned between the flight crew and should be communicated to the cabin crew before the flight.

'In seat napping' and bunk rest should not be conducted at the same time; unless the company procedures state otherwise, as when there are three flight crew rostered on a flight, two flight crew should always be present in the flight deck. The procedure for Controlled Rest is detailed within the company Operations Manual and should the procedure not be adhered to, this should be reported to the company for further investigation. There is a health and safety implication with moving the mattresses and pillows from the bunks into the flight deck; if the flight crew become incapacitated during flight, the mattress would hinder the cabin crew providing medical assistance to them.

Using Aircraft as sensors to measure runway condition

by Daniel Percy, Logan Jones & Fabien Moll

Many hull loss accidents occur on runways where braking performance is degraded by runway surface contaminants. Airbus and its subsidiary NAVBLUE is helping to enhance real-time awareness of runway conditions, via aircraft data shared in real time to better understand, anticipate and mitigate runway conditions.

Key Points

1. Runway excursions are a top cause of accidents; 35% occur on contaminated runways.
2. The way braking action is identified today is primarily via pilot reports, but such assessments can be difficult to make.
3. In 2018, Airbus and NAVBLUE will commercialise a new service that will address the request from national safety bodies for a viable technology to collaboratively and objectively measure and disseminate runway braking action.

Background

In the world of commercial jets, it is well known that Runway Excursions (RE) are one of the top three causes of accidents. Airbus's own accident statistics show that RE caused 35% of hull-losses and 14% of fatal accidents between 1997-2016 (Airbus, 2017). Given this status, Airbus and other manufacturers are investing in the development of technology to reduce RE accidents.

Product features such as Airbus's ROPS (Runway Overrun Prevention System) are already in service and providing real time, energy and landing performance monitoring information to flight crews. However, with IATA identifying in their 2016 Safety Report that 35% of RE accidents occur on 'POOR' or contaminated runways (IATA, 2017), a clear case can also be made for the need to improve pilot awareness of runway surface conditions. Indeed, national Safety bodies including the NTSB of the USA and the UK AAIB have identified the need to develop "an operationally feasible airplane-based braking ability/runway surface condition measurement and communication system" (NTSB, 2007, p. 13).

Today's means of measuring runway surface conditions

Today, there are typically three methods available by which runway surface conditions are evaluated:

- runway contaminant type and depth observations
- ground surface friction measurements
- braking action reports from pilots.

Contaminant type and depth observations are, in general, conducted physically by airport personnel on the runway surface. The conditions are assessed through a combination of visual observations and spot-checks. However, it can be a difficult task to consolidate what may be differing conditions across the entire width and length of the runway into a succinct runway condition report. In addition, during active precipitation and/or freezing/melting conditions, the validity of the information may become outdated soon after it is issued Ground surface friction measurements provide a more qualitative approach to taking measurements along certain points on a runway. However, as noted by the NTSB, they are useful for identifying trends in runway surface condition but are not recommended for use in predicting aircraft stopping performance. This is due to the lack of correlation with aircraft braking performance, as well as variability in equipment design and calibration (NTSB, 2007).

While the airport operator is responsible for generating the Runway Condition Codes for a runway, pilots are responsible for providing accurate braking action reports. Indeed, providing braking action reports is a significant role that pilots play in preventing runway excursions for all airplanes. Braking action reports contain the pilot's assessment of the manner in which an aircraft responds to the application of wheel brakes. The terminology for these reports is defined within ICAO Doc 4444 PANS, as illustrated in Table 1.

Reports should be provided by pilots whenever requested by ATC, or if the pilot has assessed braking action is less than previously reported. ATC receives the pilot reports by voice, and will disseminate them to other pilots on approach. ATC will also disseminate the current runway condition code.

If runway surface conditions deteriorate enough that two consecutive reports of 'Poor' conditions are received, the airport has to re-assess the runway conditions. If 'Less Than Poor' braking action is reported, the runway will be closed to further operations until the airport operator can improve the runway's condition.

These reports thus play an important part in the cycle of runway surface condition assessment and reporting.

Difficulties involved in making braking action reports

Aeroplane deceleration results from several forces: aerodynamic drag forces, generated by the airframe and in particular the ground spoilers; reverse thrust, if available; and, wheel braking.

In general, a braking action report should characterise the availability (or lack thereof) of wheel braking. The difficulty for a pilot is in differentiating in real-time which portion of the total deceleration is coming from the wheel-brakes. This difficulty is compounded by the typical use of autobrakes on contaminated runways. As the autobrake commands an overall airplane deceleration rate, the pilot is able to detect a lack of wheel-braking when the target deceleration is not achieved, however it is still difficult to differentiate how much each component is contributing to the deceleration.

Pilot report of runway braking action	Description	Runway Condition Code (RWYCC)
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain	0

Table 1: *Runway Condition Codes (RWYCC) as per IACO DOC4444 PANS*

Once the aircraft decelerates to lower speeds (generally below 60kt), pilots often use manual braking and at these speeds the aerodynamic drag and reverse thrust forces are negligible. It is often in this zone where pilots are able to more easily 'feel' the runway by using the brake pedals to understand the braking action.

Given these complexities, making an accurate report can be a difficult task for a pilot, and braking report quality can become subject to differences of subjectivity between different pilots. To resolve this and provide objective and consistent braking action reports, Airbus has developed technology that will use aircraft data recorded during the ground run to identify the available braking action.

Using the aircraft as a sensor to identify runway condition

Airbus has been developing a new technology to address the need identified by the NTSB and other national aviation safety bodies, for 'an operationally feasible airplane-based braking ability / runway surface condition measurement and communication system'.

The fundamental principle of the technology is, post landing, to use the data recorded by the aircraft during its deceleration roll to identify the braking action level. By using the aircraft performance model the technology can differentiate the part of deceleration coming from either aerodynamic, thrust reverse, or wheel-braking. Subsequently, by comparing the actual wheel braking performance to models of wheel-braking performance under different runway conditions, the algorithm can compare and determine the runway state that most closely resembles the experienced deceleration.

As illustrated in **Figure 1**, after landing the information is simultaneously disseminated in two ways:

- The result is displayed to the pilot to assist him or her in making an objective report, to be provided to the ATC
- The result is sent by ACARS message to Airbus subsidiary NAVBLUE, which will collect and display the results on a web-service platform for use by ATC, airports, and airline operational centres

This technological approach is collaborative by nature. It resembles the various mobile traffic applications which share traffic data in real-time to allow drivers to see and avoid traffic jams. Indeed, the goal of this new Airbus-NAVBLUE technology is to provide a

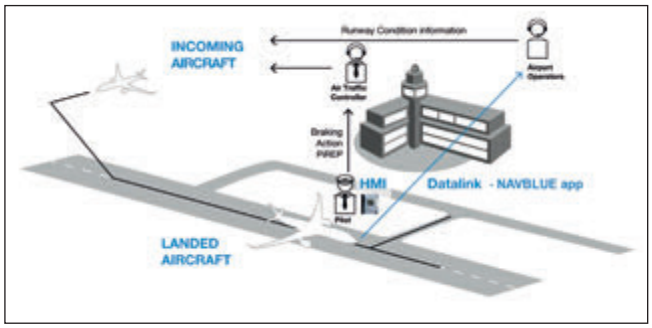


Figure 1: *Principles of data connection providing runway condition reports to incoming aircraft from landed aircraft*

platform where airspace users are sharing reports in real-time to better understand how the runway condition is trending, and to allow the airport to anticipate and mitigate slippery conditions. The more aircraft that participate in the sharing, the better the real-time map of conditions becomes.

This technology has now been thoroughly tested via comparison with historical flight data, flight tests as with on board operational trials with participating airlines. Airbus and NAVBLUE have therefore launched the commercialisation of the function, details of which will be provided to the industry during 2018.

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What else could possibly go wrong...?

by Dai Whittingham, Chief Executive UKFSC

On the night of 5th January 2014, 361 people in India narrowly avoided being added to that year's aviation death toll in two separate but related events. One aircraft landed significantly below its final reserve fuel and the other sustained major damage during a runway excursion. Both aircraft were inbound to Delhi but the weather had been steadily deteriorating and there was traffic congestion as a result. Both aircraft diverted to Jaipur within a few minutes of each other, only to find that the weather had deteriorated there as well, which is when the problems started to mount up for both crews.

Air India

The Air India A320 (VT-ESH) was on a 4-sector day, the last of which being Guwahati to Delhi. The first 3 sectors were uneventful. The aircraft left Guwahati with 12.7 tonnes of fuel, including a 500kg uplift at the captain's request because of the time of arrival, Delhi weather and expected congestion. The aircraft was flown on managed speeds and the crew were monitoring progress against the Operational Flight Plan (OFP), which showed a marginally higher consumption than planned. En route, the crew had taken the Lucknow weather and, when in range of Delhi, the ATIS weather was also obtained. The aircraft was not fitted with ACARS and the substitute HF system was inoperative so they were reliant on VHF comms; there was no flight following and the crew made no attempt to obtain the Jaipur weather until shortly before their diversion decision, even though it was their nominated alternate if Lucknow was unavailable. The METARs for all 3 airports had been provided at Guwahati.

Lucknow visibility at the time of departure was 2000m, with temperature and dew point of 18°C & 13°C respectively. The weather at Delhi (11:05 UTC) was RVR 500m for runway 29, general visibility of 150m, with both temperature and dew point at 12°C. A SPECI was issued at 1130 UTC for Jaipur with winds 04kts, visibility 3000m and haze, no significant cloud (NSC), temperature 18°C & dew point 13°C.

On approaching Delhi, the crew were instructed to hold, and were advised that runway 28 RVR had dropped to the lower end of CAT I ops; runway 29 was already below CAT I minima. After a period in the hold, the crew commenced their approach to runway 28. Shortly after intercepting the localiser, the RVR dropped below CAT I minima and they discontinued the approach: contrary to Air India's fog plan, which required both pilots to be Cat III qualified for their scheduled time of arrival, the FO was only CAT I qualified.

On inquiring, company dispatch advised that Jaipur visibility was 2000m, but the crew did not check the full weather.

Because Jaipur was closer than Lucknow and both were reporting 2000m visibility, the captain elected to use his second alternate of Jaipur and set off with 3.1 tonnes of fuel against a planned minimum of 2.9 tonnes.

The Jaipur ATIS was contacted at 68 DME, when the crew discovered that visibility had dropped to 900m, dewpoint and OAT were both 13°C, and the RVR was only 1000m. The crew spoke with Jaipur ATC at 60, 55, 50 and 42 miles range; at no time did they ask for weather, nor was it offered by ATC. At 30nm range, ATC passed weather of RVR 1000m, visibility 400m and reducing. At 25 miles, the crew was told cone through the overhead for the ILS but that the weather was deteriorating rapidly. With 2.6 tonnes of fuel remaining, the crew advised that they were committed to land at Jaipur., having checked they did not have the fuel required to divert to Ahmedabad (291 miles away). By this time, RVR had reduced to 550m.

Figure 1

On the VOR/DME arc, ATC transmitted that RVR was now 200m and visibility 50m. The flight ahead of them conducted a missed approach and diverted to Ahmedabad. ATC reported an RVR of 50m and cleared the aircraft to land, subject to minima; both pilots later reported that they had seen the runway lights. The captain flew an ILS with dual AP down to 200ft RA before disconnecting for a manual landing. The aircraft deviated left of the centreline and landed on soft ground, continued to deviate left and then struck a tree 73m from the runway axis before recovering back to the paved surface, coming to a halt on the left side of the runway. The left MLG had run along the boundary of a storm drain for some distance but had fortunately not entered the drain itself. (Fig. 1) Neither of the pilots saw any visual references from touchdown until they regained the runway. The captain had opted for a manual landing because he was unsure whether he was permitted to auto-land on a CAT I runway in zero visibility.

With the extensively damaged aircraft (Fig.2) obstructing the runway, all flight operations at Jaipur ceased. Unsurprisingly, there was no damage to the runway or lighting systems. There were no significant injuries to anyone on board.

Figure 2

Spice Jet

Spice Jet's B737 (VT-SGU) was scheduled to operate Delhi-Goa-Delhi with an ETA at Delhi of 1445UTC and, like the Air India aircraft, was holding Lucknow and Jaipur as alternates. The captain was CAT II qualified (with a CAT IIIA FO) whereas the company fog plan required him to be CAT IIIA. The 9.5T fuel load included 500Kg for holding at destination and a further 300kg requested by the captain. When the aircraft was handed off to Delhi at 50nm they had about 700kg of fuel in hand.

They too joined the hold and were advised they were 13th in the arrival sequence. They were asked to fly 2 orbits and were then cleared down to 7000 ft. At this stage fuel remaining was 3.4T. While the aircraft was being vectored for runway 28, the roll-out RVR dropped to 50m and the captain decided to hold at 7000ft in the expectation that the visibility would improve per the TAF.

After 26 minutes in the hold, the 28 RVR had not improved, runway 29 was already below minima and they were approaching minimum diversion fuel. On checking the Jaipur weather, it was reported as 900m reducing to 800m and RVR 1500m. Fuel quantity was 3100kg and fuel required for Jaipur was 2575kg, whereas Lucknow required more; distances from Delhi are 130nm and 240nm respectively. The crew also considered but rejected Ahmedabad (408nm) and set off for Jaipur.

On the descent into Jaipur, ATC advised that visibility had dropped to 50m and RVR 200m for runway 27; the crew informed ATC that they were committed to land at Jaipur because of their fuel state, and planned for a 2-channel auto land.

There were 2 aircraft in the pattern ahead of them, but the first missed its approach and diverted to Ahmedabad. The second aircraft was the Air India A320. At 5nm finals, ATC informed the crew that the runway was blocked and the Air India crew made a similar transmission. The Spice Jet crew initiated a missed approach with their total fuel having reduced to 1715kg and the captain decided to return to Delhi irrespective of its reported visibility.

On contacting Delhi, the captain declared a fuel MAYDAY and asked for the shortest vectors for the runway 28 ILS. During his approach, RVR was reported as 375/900/50m; a 2-channel auto land was carried out. At touchdown, total fuel was only 400kg; when the aircraft was shut down on stand 17 minutes later, FDR data showed just 150kg remaining.

The investigation, having already noted that the captain had uploaded an additional 300kg at Goa, found that the fuel margin provided by the timely diversion from Delhi made it possible for the aircraft to return. It also concluded that even though the crew was not properly qualified the direct auto landing into Delhi was the safest course of action.

Organisational factors

The investigations into both the Air India accident and Spice Jet's low fuel event listed lack of operational supervision, ground support and oversight of flight operations as part of the probable cause determination. The choice of alternates was seen as being driven primarily by commercial considerations which saw both aircraft divert the shorter distance to a deteriorating Jaipur rather than accept the additional fuel consumption for Lucknow, where the weather was acceptable for the crews' qualifications. A wide range of safety recommendations covered resourcing, fuel policy, decision making, flight crew training, flight following and communications, weather reporting and the use of trending information, and weather minima.

The full reports can be found at http://dgca.gov.in/accident/reports/VT-ESH.pdf and http://dgca.gov.in/accident/reports/incident/VT-SGU.pdf

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