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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: New UKFSC member Hans Airways will shortly take delivery of their first Airbus A330-200 aircraft and intends commencing scheduled services from Birmingham Airport this summer.

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Airspace closures and short cuts

by Dai Whittingham, Chief Executive UKFSC

The plan for this editorial was, like so many other plans in many countries, torn up when the first Russian tanks rolled into Ukraine. While the human tragedies unfold daily on an ever-increasing scale, there are some lessons that we in aviation might well consider.

First is that when politicians become emboldened by a failure to restrain them or hold them to account, the unthinkable occasionally happens. Few would have expected the de facto state hijacking of an airliner exercising its right of innocent overflight per the Chicago Convention, yet this was the case for RYR4978 over Belarus last year. The consequences of that act for Belarus were minor in global terms, but the willingness to casually subvert international norms and breach a treaty obligation was certainly unexpected. With the benefit of hindsight, this action and its associated Russian support might be seen as an interesting 'temperature check' ahead of the current crisis in Ukraine.

The vulnerabilities for commercial operators are evident when it comes to large airspace closures, which are disruptive and costly. It takes a national government to decide to prohibit aircraft registered in its territory from overflight of another state for political reasons or to control risk to the travelling public. Governments can of course also restrict access to their own airspace for aircraft registered in another state. The operators can do nothing about this, other than perhaps lobbying the government concerned – it is *force majeure*, and no amount of commercial angst is going to overturn a wider political requirement.

Where matters become more delicate is the scenario when operators have a choice about overflight of zones of political instability that have the potential to spill over into armed conflict. Again, hindsight would have us convinced that MH17 should have been nowhere near eastern Ukraine; a 'bit of unpleasantness' with militias on the ground would surely not have led to catastrophe. The risk assessments at the time would no doubt have included an assumption that all the quasi-military activity was low-level and therefore not a significant threat to overflying civil traffic. Any assumptions became flawed when Putin allegedly agreed to place a sophisticated SAM system in the hands of irregular forces (the separatists).

That MH17 was shot down was likely to have been a tragic case of mistaken identity made by people operating criminally outside 'normal' military command and control structures. The aircraft would not have been in the area if intelligence assessments had indicated both: the presence of the SAM system in time for that information to be disseminated; and the willingness of the system operators to engage high-level targets. Any threat of this nature comprises a mix of capability and the intent to use that capability. A capability without intent is just a capability, not a threat. So, the key to any judgment about overflight, provided your government approves of it in the first place, is to understand the intent.

Given that the world has just misjudged Putin's intent over Ukraine, that is not always a simple equation to solve; it is often easier to take the easy line. That is how we humans operate – we like things that are simple, and we often do not pay sufficient heed to warnings and indicators. There is also a natural tendency (we all do it) to believe that a risk that has been assessed and mitigated is no longer a risk. There is always some residual risk associated with any hazard, and just occasionally that risk materialises. Think QF32 for a moment – probabilities sometimes don't multiply down to smaller numbers but stack up instead.

Now let's throw commercial pressures into the mix. The people who run airlines have a difficult job to do in balancing the various risks that affect their operation, and there will be times when the financial risks (insufficient revenue) start to affect the appetite for acceptance of other risks.

The second lesson is therefore about risk appetite and judgments. The MH17 disaster has had a lasting effect on the way information about conflict zones is shared, and there is a clear understanding that 'hot' wars are best given a wide margin. And yet there was still civil traffic passing through Ukraine long after the invasion had started, presumably because the operator was convinced nobody would make the same mistake twice, or that they thought they had been guaranteed safe passage.

The problem with operating over and near conflict zones is that the threshold for using a weapon system becomes markedly lower once the shooting starts. When you have a system in place such as the Russian S-400, which is capable of engaging targets out to 350km or more, that threshold deserves careful thought. To put that in context, an S-400 missile launched from under the Eiffel Tower could hit you as you pass the London Eye.

Airspace closures to deal with conflict threats are operationally difficult because of the consequent effects on routing, fuel consumption, alternates and the like. For some, routes will become non-viable without a pit stop, or may even be economically non-viable at all. In the current environment, with Russia, Belarus and Ukraine airspace closed for overflight, reputable operators will make the hard decisions on Polar routes and ETOPS rules for destinations that would otherwise have passed through the area. Less-reputable operators might choose to accept higher risks by squeezing the margins and either going closer to airspace than they should or 'inviting' crews to ignore certain fuel requirements for periods of their flights.

Coming on the back of the pandemic's financial impact, and with surging fuel prices, it would be tempting to take short cuts, something regulators across the globe should be alert for. There also needs to be consideration of the additional system risk arising from choke points and other areas of congestion generated by airspace closures, and by the potential fatigue implications arising from longer re-routed flights. Again, the reputable operators will manage properly through their SMS and do the right thing, but you can bet there will be others who will try to work round or even take advantage of the situation.

As we know, some short cuts can be very helpful, and some can lead you to rushing or an unstable approach. Think twice before you accept a short cut...

Rebuilding Aviation

by Rob Holliday, Chairman UKFSC

Aviation has always been sensitive to geopolitical and economic volatility. So when you see a war in Ukraine following a two year long global pandemic you could be forgiven for thinking that Werner Herzog was correct when he wrote: -*"I believe the common denominator of the universe is not harmony, but chaos, hostility, and murder."* —Werner Herzog, Grizzly Man (2005).

How does aviation rebuild from this? If the answer is that we do it the same way as we did before it is likely to be less than successful. Thinking we were great so we can be great again may be over optimistic and result in a planning fallacy especially with challenged supply chains. How does a safety manager provide a reality check? The challenge is to ensure that safe and sustainable progress is made in incremental steps that target the fastest simplest thing with the highest probability of success and repeat.

What lessons can we learn from the history of aviation to help us?

We know about the risks of bringing aircraft back to service after long periods on the ground. There is an Air Accident Investigation Branch report into a high speed rejected take-off above V1 speed due to a discrepancy between the commander and co-pilot's airspeed indications. The discrepancy occurred because of a blockage in a pitot tube following a long period on the ground.[1]

There is evidence that Safety Culture has been damaged if not disappeared completely. Safety Culture is defined on Skybrary as *'the way safety is perceived, valued and prioritised in an organisation. It reflects the real commitment to safety at all levels in the organisation. It has also been described as "how an organisation behaves when no one is watching".*

Safety Culture is not something you get or buy; it is something an organisation acquires as a product of the combined effects of Organisational Culture, Professional Culture and, often, National Culture. Safety Culture can therefore be positive, negative or neutral. Its essence is in what people believe about the importance of safety, including what they think that their peers, superiors and leaders really believe about safety as a priority.'

Key words in this definition are organisation, behaviour and people. It's almost organic. Can we believe that we had it before, so we will have it again? No. As Professor Reason points out, "if you think your organisation has a good safety culture, you are almost certainly mistaken". Safety Culture has to be continuously cultivated. With most of the people out of the organisation and limited operations it should be no surprise that it no longer flourishes and needs to be cultivated again. This is evidenced in lower rates of operational staff filing safety reports as just one example.

We can start by not assuming anything is as it was before. From an SAS saying that "Assumptions are the mother of all [mistakes]." Haddon-Cave proposed a questioning culture to complement the reporting, just, flexible and learning culture elements: - *'The above four cornerstones underpin the over-arching edifice of a strong Safety Culture. The keystone of a strong Safety Culture is, in my view, however, a vital fifth element, namely a Questioning Culture. At all stages of the safety pilgrimage it is vital to ask questions such as "What if?", "Why?", "Can you explain?", "Can you show me?", "Can you prove it?". Questions are the antidote to assumptions, which so often incubate mistakes.'*

The Haddon-Cave Report, The Nimrod Review, pages 572-576 and chapters 20 to 26 that contain recommendations on how to maintain a healthy safety culture should be compulsory reading at this time.

However, questioning may not be enough if safety culture has been set back almost to square one, we need to consider our operation as a start up, to begin again. As people come back to the organisation this challenge is an opportunity to redefine safety consciousness. This is where leadership comes in.

Haddon-Cave goes on to emphasise the critical role of leadership because in his words: *'the vital ingredient to effecting real cultural change in any organisation is Leadership. It is the thought, word and deed of leaders that most influence the attitudes, behaviours and priorities of employees.'*

The theme of the 2021 Flight Safety Foundation International Air Safety Summit was safety leadership with the line: "A safety culture can't sustain itself without great safety leaders." But all great safety leaders either have a solid understanding of their environment or know where to get the best advice on safety matters. Great leaders coming into safety-critical positions without suitable experience are vulnerable to poor decision-making. The Flight Safety Foundation is therefore establishing a programme called CALM – Core knowledge for Aviation Leaders and Managers – that will allow leaders to gain safety knowledge through a continuous professional development process so that they are better able to balance business, operational and safety risks.

[1] https://assets.publishing.service.gov.uk/media/61bb3040d3bf7f055eb9b8f7/Airbus_A319-111_G-EZBD_01-22.pdf

If we consider our operation a start-up it is also going to be one that is rapidly expanding. This rapid growth is occurring on infrastructure that is gearing up, high training demand, challenges managing and retaining talent. Staff returning to aviation from a difficult two years, with added stress of COVID checks at airports and the risk of testing positive, then not be allowed to go home, but quarantine for up to 3 weeks depending on the location. Regulatory compliance should be a given, but in rapid expansion the need to improvise puts at risk the necessary cultural elements that allows the operation to be flexible, to learn and continuously improve.

Aviation has never had to recover from a pandemic before, but there are examples of the consequences of rapid expansion that we can learn from. In the U.K. the Kegworth Boeing 737 accident in 1989 occurred against a background of an industry rapidly gearing back up after the recession of the preceding years with experienced pilots being recruited by legacy carriers draining others of experience. In recent years more than 80% of commercial air operation fatalities occurred in the developing world, some with a background of very rapid expansion in emerging economies with an immature aviation industry.

In conclusion we consider our operation to be a start-up that is going to expand rapidly with no assumptions or preconceptions we take this opportunity with our leadership to set the tone, and conscience of the organisation, to meet all the challenges that lie ahead with the correct mind-set for safe and successful operations. Take nothing as a given, make no assumptions, prepare as if we are starting from scratch, bring people back into a new organisational culture, with all the elements for success, promoted and led from the top.

The key to a successful rebuild of aviation is to be aware of the risk to learn from the mistakes of the past to be risk sensible. To quote Charles Haddon-Cave one more time:

'There are to my mind four states of Man: Risk Ignorant, Risk Cavalier, Risk Averse and Risk Sensible. My big message is to encourage everybody not to be Risk Ignorant, Risk Cavalier, or Risk Averse, but to be Risk Sensible. It is tempting to parcel risk and the 'safety thing' up into neat packages, PowerPoints or graphs and statistics and, after a committee meeting with all the 'stakeholders present', tie them up and hand them back to the relevant corporate risk department with a pat on the head and a thank you. Risk is Safety, however, it is everyone's personal responsibility. And it starts at the very top – and should cascade right through the organisation. Being Risk Sensible means embracing risk, unbundling it, analysing it and taking a measured and balanced view.'

Before I finish I would like to bring to your attention to the fact that on 6th February Dai completed ten years as the Chief Executive of the UK Flight Safety Committee. I'm sure that you will agree with me, Dai has been a fantastic servant to the industry in his role, tirelessly advancing safety. Here's to the next ten years Dai!!

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Callsign confusion, as seen from the ATCO's side

by Jean-Philippe Rokacz

Those of us who have experience of airline operations over Europe - or beyond, for that matter - and who were trained to observe strict R/T protocol often notice a lack of adherence to ICAO standard phraseology on the part of fellow aircrew.

It could be argued that this is a rather trivial matter when compared to the variable levels of English level proficiency heard over the airwaves, national licensing authorities having obviously different understanding of what ICAO ELP level 4, 5 or indeed 6 actually means in terms of proficiency - but opening this Pandora's box is best left for another study !

ICAO produces a very useful 20-page *ICAO Standard Phraseology Guide – A Quick Reference Guide for Commercial Air Transport Pilots,* which summarizes best R/T practice in IFR commercial operations. This is a valuable resource to refer to every now and then.

But why is it so important to stick to standard R/T when the message is clearly understood? Firstly, it can be considered that aviation R/T is a proper language in itself, with its own rules and uses. Within an inherently international industry, in which many actors are non-native English speakers, it is vitally important to stick to protocol in order for messages to be understood first time around, thus negating the need to repeat or explain, all of which could use valuable R/T time in busy environments such as dense en-route sectors or within TMAs around main hub airports.

Secondly, in standard R/T, each separate piece of information within a message is there for a reason; for instance, a departing IFR flight's standard four-item call to the Departure (or, more precisely, Approach) frequency provides the following data :

- the flight's callsign is obviously intended to identify the radar return on the ATCO's screen;
- reference to the Standard Instrument Departure's name and number confirms the intended departure routing;
- specifying the passing Flight Level (or altitude) will allow ATC to check that their mode S (or C) readout is correct;
- confirming the SID's cleared (or amended) Flight Level will help ATC confirm that the aircraft in question will not exceed its cleared FL.

Likewise, starting an R/T exchange with a flight's full callsign followed by its flight number (or alphanumerical callsign) ensures that no confusion can occur between several flights operating through the same sector. Many of us can probably recall occasions when ATC mentioned to closely monitor the frequency because of similar callsigns.

Still, it is not uncommon to hear fellow aircrew shorten their callsign to the suffix, ie; the flight number or alphanumerical callsign *only*. In order to illustrate why this can prove problematic for ATC, let us refer to actual ATC radar screenshots of en-route Central European sectors.

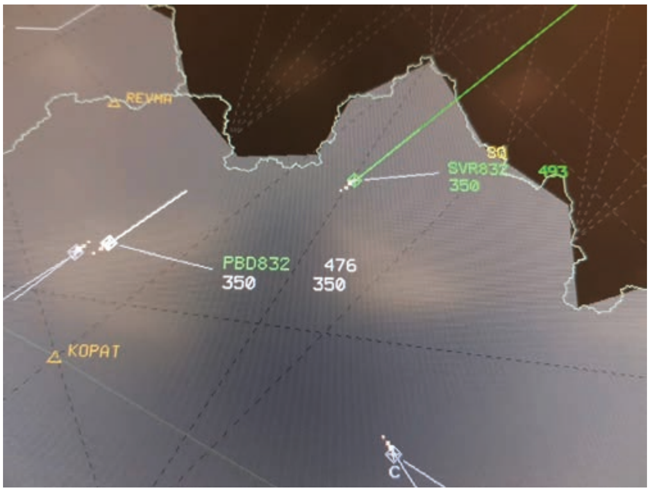
This first screen shows *three* flights with different company callsigns, but an identical flight number crossing through the same ATC sector and therefore on the same frequency, managed by the same radar controller and co-ordinator:

- in the North-East corner is PDB822 (Pobeda 822), routing North-East at FL370;
- in the East part is UT822 (Utair 822), on a similar heading and also at FL370;
- in the South-West corner is ISS822 (Meridiana 822), heading South-West at FL400.

According to the operating radar controller, there was callsign confusion on frequency in this case.

The second screenshot shows in Western Czech airspace:

- ABR2KT (Contract 2KT), routing West overhead OKG (Cheb VOR/DME) at FL200, and
- EZY14KT (easyjet 14KT) climbing through FL233 near RAK (Rakovnik NDB), also heading West.

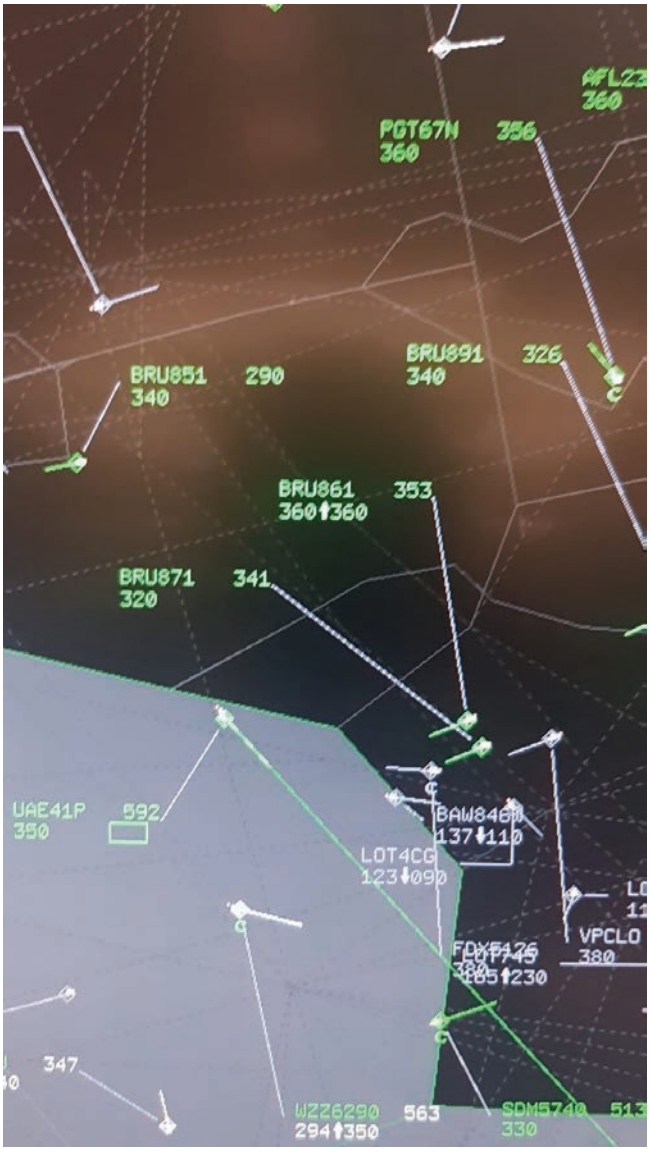


The third screenshot shows on a North-Easterly course :

- PBD832 (Pobeda 832) and
- SVR832 (Ural Airlines 832),

both cruising at FL350.

Here again, there was callsign confusion between both flights.



In this detailed view, one can notice no less than four flights, operated by the same airline, therefore with an identical company callsign, but also with belwideringly similar flight numbers, sharing the same airspace and all heading South-West:

- BRU851 (Belavia 851) at FL340;
- BRU861 (Belavia 861) at FL360;
- BRU871 (Belavia 871) at FL320;
- BRU891 (Belavia 891) just out of view at FL340.

Of course, this raises the obvious question of why would an airline's Operations Department consider planning several simultaneous flights with similar flight numbers, or indeed why the Eurocontrol FPL engine could not be programmed to reject FPLs with similar flight numbers crossing the same airspace simultaneously.

I can recall an occasion a few years ago when the ABR6LY (Contract 6LY) flight from Paris-CDG ended up routinely on the same Lyon-St. Exupéry approach frequency as BEL6LY (Brussels 6LY). After some instances of R/T confusion, the company decided to change our flight's callsign to ABR6ML - the new suffix reflecting Marseille (LFML) as the flight's eventual destination. Likewise, ABR8FA (Contract 8FA) to Rome-Fiumicino and Ancona-Falconara was renamed ABR8CK for « callsign deconfliction » purposes. However, many airlines' dispatch offices are not so diligent, and instances of callsign confusion still routinely occur. As shown above, this can be made worse if crews decide of their own accord to omit their company callsign and only use their flight number or alphanumerical suffix.

Our company's Operations Manual (Part A) specifies unequivocally that « the full company callsign should be used at all times », but it is a fact that this rule is not 100% observed during line flying - although strangely it is during recurrent training and line checks!

Maybe this is another area where we can all as professional aircrew endeavour to observe stricter standards? The aforementioned ICAO Phraseology Reference Guide is a good place to start.

The author is an ATR42/72 freighter captain with 5 years experience as a Flight Dispatcher, and 15 years experience of operating within Europe, North and central Africa on behalf of the major express freight integrators.

Flight deck human factors and digitalisation: Possibilities and dilemmas

A conversation with FAA's Kathy Abbott

While there have been several decades of research on automated systems and human performance on the flight deck, developments in technology are accelerating the potential for change. Steven Shorrock talked to Kathy Abbott, one of the FAA's Chief Scientific and Technical Advisors, about the possibilities for digitalisation, some of the dilemmas we still have to address.

KEY POINTS

- Digitalisation is enabled by availability of big data, and improvements in sensors and data storage. There are many possibilities to improve NOTAMS, CPDLC, safety data, and many other applications.
- 'Reduced crew' long-haul operations are attracting industry attention, but issues of information, control, and responsibility remain critical. Introduction of automated systems may change the kind of staff needed, without necessarily reducing staffing.
- The safety continuum helps the FAA's Aviation Safety organisation to determine the appropriate level of rigour in standards, policies, and processes.
- As well as technical expertise, there is a need for more expertise in operations and the operational environment, human factors, complexity, and systems thinking. Lessons learned from experience, including unintended consequences of the introduction of automated systems, must not be forgotten.
- Pilots, controllers, and other frontline staff can have more of a say in the drive for digitalisation through participation, working through the staff associations and labour unions.

In the world of flight deck human factors, few names are better known than that of Dr. Kathy Abbott. Dr. Abbott is the Chief Scientific and Technical Advisor for Flight Deck Human Factors in the Federal Aviation Administration. Along with the FAA's other Scientific and Technical Advisors, she applies her expertise to the promotion of safety-enhancing innovation, policies, and practices in the FAA's regulatory, certification, and oversight programmes. In short, Dr. Abbott is the most senior technical person in the FAA when it comes to flight deck human factors.

Dr. Abbott's expertise spans aircraft certification, equipment design, and flight standards, through operations, pilot training, safety investigation, and data analysis. In other words, *"anything that touches the pilot"*. Starting her education in mathematics and information science, she went on to study computer science up to doctoral level, before spending 16 years at NASA as a research engineer. With over 26 years at FAA since then, there are probably few in the world more qualified to talk about digitalisation and human performance in the flight deck.

Enhanced capabilities

Digitalisation is nothing new, either in the flight deck or on aviation more generally. There are thousands of research articles and reports in human factors, and many applications already. So I was curious about why it is a trending topic now. Why are we hearing more about automated systems, autonomy, and artificial intelligence? Dr. Abbott reflected that several enablers that may be fostering this. *"One key enabler is the availability of big data, with improvements in sensors and data storage."* Developments in these technologies bring a realisation that we can get more value from these enhanced capabilities, that we can do more than we could do before, via technological applications.

One example is what Dr. Abbott described as *"a perennial problem"*: NOTAMs, or notices to airmen. *"Hopefully, digitalisation will help us do a better job of putting NOTAMs in a usable form for pilots and for other people that need to use those data."*

A second example application is controller pilot data link communication (CPDLC). *"This is changing the way that pilots and controllers communicate. And there are consequences because we're not eliminating voice – it's a mix of digitalisation and the way that we've done it by voice."*

Then there are applications for safety data, and the ability to process big data to take advantage of the data that we have. *"We have more data than we can really process right now from different data sources. And of course, the interest in the safety side of things is to use that. Can we find the risks and mitigate them before they become an accident?"* Dr. Abbott noted the potential to use data also to analyse what people do well, though in some ways this can be more difficult in practice.

Single pilot operations and the pilot role

Such applications are significant, but with burgeoning digitalisation come new concepts of operation that are even more fundamental, and controversial. There has been some interest from airlines, as well as airframe manufacturers, in 'reduced crew' longhaul operations, where a sole pilot is in the flight deck for much of the time. A primary motivation is cost saving, along with airline flexibility, partly achieved via reduced staffing. The topic has been subject to intense commentary and increasing research over recent

years. I was curious about the key issues for human performance, but also for safety more generally.

We began with the most fundamental consideration: that the pilot in command is responsible for the safety of flight, and as long as you hold that person responsible, you have to enable them to do the job. With increasing automation and autonomy, issues of information, control, and responsibility become inseparable. *"At what point can the pilot no longer be held responsible?"*

Issues of liability are also likely to become much more complicated. *"You can't hold a piece of equipment responsible from a legal point or regulatory point of view. I think we need to have fundamental considerations of how responsibility and liability get distributed in some of these new concepts."* This could be complicated further by differences between legal jurisdictions that pilots may enter.

Another issue concerns the safety contribution of the second crew member. Without that crew member, *"how do we know that we have fully mitigated the risks that may be involved?"*, asked Dr. Abbott, *"and what assumptions were made and how would those have to be changed?" An 'obvious' topic concerns pilot incapacitation. "If you only have one pilot, are you essentially requiring a pilotless aircraft capability?"* Then there are licensing implications, such as the potential effects on medical requirements because of the risks of incapacitation. There are many other fundamental questions and concerns, also depending on whether one is considering the modification of existing aircraft or the design of new aircraft.

These are some of the considerations that affect whether it is possible to achieve the level of safety required with a single pilot for public acceptability. The FAA 'safety continuum' can help to focus its safety resources in line with the public's expectations. *"We refer to the safety continuum as a way of characterising that acceptable levels of safety and certitude differ for different groups or categories of aviation, and different levels of risk. Public transportation has to have a higher level of safety than private transportation."*

The safety continuum is integral to the FAA's standards and oversight. It helps the FAA's Aviation Safety organisation to determine the appropriate level of rigour in standards, policies, and processes. For newer concepts such as advanced air mobility, this raises questions such as 'What is the risk that's acceptable for that operation?' and 'How does it interact with others in the aviation system?'

Returning to reduced staffing, in many cases, even this is not so straightforward. Referring to work by the United States Air Force, Dr. Abbott revealed a counter-intuitive finding: with unmanned aircraft systems, staffing needs increased. Experience in other

parts of the military has found that the introduction of automated systems changes the kind of staff that you need, without necessarily reducing staffing. "*If you're not reducing staffing, are you really reducing costs or are you just shifting cost around? And how do you assure that you've achieved the same level of safety or better?"*

Dr. Abbott sees opportunities, but also risks if we don't manage those opportunities properly. *"We want to leverage the benefits of new technology, but just because it's new technology doesn't necessarily mean it's an improvement, or that the cost benefit from a safety point of view is as imagined. It's important to be realistic."* There can be crucial differences between claims and operational reality.

Digitalisation and the varieties of human expertise

With the drive for more digitalisation, there is an obvious need for technical expertise. This finding mirrors experience in air traffic management, where the need for technical expertise is outpacing other forms of expertise. Often, the expertise is highly specialised, concerning specific technologies. There is much human factors research and practice in the design and engineering of aviation systems, especially in terms of aircraft certification. But the lion's share of attention is on operational actors such as air traffic controllers, with very few studies on engineers responsible for software development (and engineers in air traffic management generally).

Dr. Abbott noted that engineers who are designing systems often don't have extensive knowledge of operational work and the operational environment, and how technology is (or will be used) in reality. *"I personally have heard design engineers say that they don't understand why it's a problem, that it works exactly as designed. So that's one of the challenges. It does work exactly as designed."* Technology may work from the point of view of doing what the designers intended it to do. But from operational perspectives, there are often considerations that the designers either didn't or couldn't know about, concerning the variability and complexity of operations.

While this is familiar territory in human factors engineering, it is often not 'part of the curriculum' for those many engineering roles, such as software engineering, who do not always require specific formal qualifications, even in aviation. *"It doesn't mean that every single person has to have all that knowledge, but they certainly need to be working as part of a multidisciplinary team so that it gets addressed."* Now and over the coming years, there is a pressing need for more expertise in operations, human factors, complexity, and systems thinking, when it comes to technical development.

Unintended consequences

One of the concerns about digitalisation, automation and autonomy concerns the understanding of engineers – especially those who are relatively new to aviation – who may be unaware of the findings of human factors research, and the lessons learned from experience. *"It's important for the human factors community to make sure that those lessons get communicated so that we don't have some of the same mistakes because we have systems now that are going to be even more capable."*

One of the lessons learned is that new technology often introduces unintended consequences. *"All of that needs to be looked at from a broad and integrated perspective, not just in isolation for the one specific kind of system. We've seen so many cases where there are side effects that were not expected."*

The problem, said Dr. Abbott, is not a lack of willingness to consider unintended consequences, but that people in technical roles lack of the knowledge of how to do it, or haven't brought in the people who can help do it. Predicting so-called 'emergent properties' of new technology is notoriously difficult, and even more so when expertise in individual technical systems, or even technical system architecture, is not matched by expertise in systems thinking (including systems engineering), complexity science, and human factors.

Integrating human factors expertise

The need for human factors research and practice in the context of digitalisation and automated systems has been known for decades. But the issue has more recently come into sharp focus via the recommendations of reports on the B737 Max accidents by the National Transportation Safety Board (NTSB), the FAA's Joint Authorities Technical Review (JATR), the US Department of Transportation Special Committee, and Indonesia's Komite Nasional Keselamatan Transportasi (KNKT). These recommendations refer to many aspects of the integration of human factors in design and certification, including system safety analysis. Some of the legislation since has also highlighted these points. One of the critical points is ensuring that assumptions about pilot responses are reasonable, so that there's not a mismatch between design and line operations.

Assisting human work

I wondered what developments in digitalisation with significant positive potential are of most interest to Dr. Abbott at the moment. Looking back at the history of some of the big improvements in aviation safety since digitalisation, Terrain Awareness and Warning Systems (TAWS) and the Airborne Collision Avoidance System (ACAS), she noted that we can take it to the next step to enhance the way that people in operational roles contribute, *"not just stopping them from doing things wrong"*.

But once again, we must be mindful of complexity. *"One of the things that digitalisation enables is flexibility, but one of the potential side effects, is that complexity can increase with flexibility. Sometimes flexibility for one player in the system makes it more complex for the pilot and vice versa."* Managing in the face of complexity requires systems thinking.

What can front line staff do?

Throughout the conversation, operational staff were at the front of our minds, but pilots, controllers, and other front line actors may well feel that decisions are being taken by people – whether manufacturers or regulators – who may be far from the operational environment. So what can pilots, controllers, and other frontline staff do to have more of a say in the drive for digitalisation? One answer is through participation. *"Working through the staff associations and labour unions, frontline staff can have a voice in a number of groups that are making some of these kinds of decisions, such as standards groups, regulatory groups, and research projects. Front-line actors can have a stronger voice than any individual would have."*

Dr. Kathy Abbott is the FAA's Chief Scientific and Technical Advisor (CSTA) for Flight Deck Human Factors, with over 40 years of work on human performance and human error. Dr. Abbott has led the integration of human engineering into FAA/international regulatory material and policies for flight guidance systems, avionics, all-weather operations, Required Navigation Performance, crew qualification, data communication, instrument procedure design criteria, electronic flight bags, electronic displays, organisational culture, design-related pilot error, flight crew alerting, manual flight operations, and other areas. She has been involved extensively in accident, incident, and other safety data analysis.

Dr. Abbott came to the FAA from the National Aeronautics and Space Administration (NASA), where she was responsible for leading analytical, simulation, and flight studies with the specific objective of improving aviation safety and operational efficiency. She is a Fellow of the Royal Aeronautical Society, an Associate Fellow of the American Institute of Aeronautics and Astronautics, and a Member of the Livery of the Honourable Company of Air Pilots. She is a certificated private pilot, with familiarisation training in several large transport aircraft. Dr. Abbott earned her B.S. in Mathematics and Information Science from Christopher Newport College, an M.S. in Computer Science from George Washington University, and a Ph.D. in Computer Science from Rutgers University.
https://www.faa.gov/aircraft/air_cert/design_approvals/human_factors/

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Balancing Act: High Court restates the fundamental principles relating to disclosure of cockpit voice and image recordings

by Ashleigh Ovland, Holman Fenwick Willan LLP

The full inquest into the tragic events at the 2015 Shoreham airshow will take place later this year. A Hawker Hunter aircraft crashed on to the A27, killing 11 people on the ground. The pilot, Andy Hill, survived and was acquitted of manslaughter in March 2019. In preparing for the inquest the Coroner, Penelope Schofield, applied to the High Court for permission to view footage from Mr Hill's personal GoPro, which was mounted in the cockpit. The application, supported by Mr Hill himself, was denied. This highlights how seriously the Courts take their duty to protect such material.

The rules governing disclosure of cockpit voice recordings and airborne image recordings are a matter of international law. They were established by the Chicago Convention, the 1944 treaty which sets consistent worldwide safety standards for civil aviation, and embedded into EU and UK law by domestic legislation. Annex 13 of the Chicago Convention deals with Aircraft Accident and Incident Investigation. The starting point is that such recordings should never be made available to anyone other than the official accident investigation team - in the UK this would be the AAIB - because to permit wider access might mean that, in future, such information would no longer be openly disclosed to investigators for fear of incrimination. The explanatory manual accompanying Annex 13 explains the reasoning succinctly:

"The recordings usually contain some of the most critical information which help investigators understand how an accident or incident occurred. Any action that jeopardizes the future availability of this information jeopardizes aviation safety."

However there is a public interest caveat to this prohibition – the recordings can be disclosed outside of the intrinsic confidentiality of the official accident investigation process if the benefit of their disclosure or use *"outweighs the likely adverse domestic and international impact such action may have on that or any future investigation"*. It was this balancing act that the High Court was called upon to perform in relation to Mr Hill's GoPro footage.

This was not the first time that an application had been made for disclosure of this particular footage. Access had previously been granted to the West Sussex police for the purposes of the criminal investigation and trial, and denied to the BBC for the purpose of reporting the trial.

The law as to how an AAIB investigation and a Coroner's inquest interrelate can be summarised as follows: in the absence of evidence that the investigation into the Crash was "incomplete, flawed or deficient", a Coroner should not consider it necessary to re-investigate matters covered by the AAIB in its investigation.

A very unusual aspect of this application was that the owner and subject of the footage was asking for it to be made available to the Coroner. Mr Hill had successfully defended the criminal allegations on the basis that he may have been suffering from a "cognitive impairment" at the time of the accident. However, there had been no positive finding that this was indeed what had happened, even after the AAIB re-opened their investigation after the criminal proceedings came to an end. Mr Hill submitted new medical evidence to the Coroner in an effort to persuade her to consider it as part of the inquest. Her application was based on the assertion that the AAIB's published report was "silent" on the medical expert's theory.

The potentially damaging consequences of a disclosure order for aviation safety in general were highlighted by the intervention of BALPA as an interested party. BALPA emphasised the importance of not damaging the trust in protection of sensitive material, and warned of the wariness that pilots would have in cooperating with the AAIB if they knew that material could be disclosed further.

Ultimately, the Court reached the conclusion that the balance weighed against allowing the Coroner access to the material. In this particular case they had serious doubts as to the credibility of the medical expert. The judge commented that it will always be possible to find experts who disagree with the AAIB's findings, but this does not automatically amount to credible evidence that the AAIB's investigation was incomplete, flawed or deficient. Access to the protected material sought could not resolve the matter any more finely than had already been achieved in an 18-month specialist investigation by the State Authority, dedicated to that purpose.

This case is the latest in a line of solidly-reasoned authorities in which the High Court has upheld the fundamental principles of Annex 13. There is undoubtedly a tension between these and the desire of families and those involved in accidents to reach some understanding as to why the events occurred. However, compared to other types of incidents, aviation accidents are unusual in terms of the level of thoroughness and expertise brought to their investigation by the statutory investigation body. Looking at this judgment it is difficult to envisage circumstances in which a Coroner could meaningfully add to the AAIB's findings and, as such, we predict that inquests will be of diminishing scope and significance in the aviation context.

Addressing Mental Health Issues In The Pilot Community With Peer Support

How can pilots raise concerns about their mental health and receive confidential support to work through such issues? Pilot peer support programmes offer one method, as the European Pilot Peer Support Initiative Board reports.

"After extensive research and surveys, it has been proved beyond doubt that pilots are, in fact, only human." Dr Ries Simons, European Society of Aerospace Medicine.

Pilots are perceived by the general public as intelligent and strong characters who are independent problem solvers and set high personal standards. They are accustomed to high workload and occupational stress, and indeed train regularly in techniques to stay proficient and calm in unexpected and high-pressure scenarios. So people may think that pilots can and should be able to cope with whatever life throws at them, because that is what they are trained to do.

The reality, however, is often very different. Problems and stressors on the flight deck are time-limited (or gravity-limited) and the professional skills, procedures and knowledge pilots use to deal with them do not necessarily work with the stresses of personal life. Furthermore, normal coping mechanisms can sometimes be overwhelmed by the traumatic effects of being involved in a flying incident or accident.

Pilots are also generally seen as high-achieving professionals with high standards. A perceived failure to cope can negatively affect their mental wellbeing and can negatively impair their professional performance.

Studies have shown that pilots suffer similar levels of mental health issues to the general population. One study (Wu et al, 2016) has shown pilots have a high incidence of depression (over 12%) and some have suicidal thoughts (4%). For comparison, Wittchen et al (2011) showed that 27% of the adult EU population aged between 18 and 65 had suffered at least one mental disorder in the past year. These included anxiety (14%), depression (7%) and insomnia (7%).

Unfortunately, the acceptance of help, such as employee assistance programmes (EAPs), is relatively low amongst pilots. The BEA accident report into the Germanwings D-AIPX crash cited possible reasons for this: *"EAPs are sometimes under-utilized resources for reasons such as these: employees question the confidentiality of the service; they perceive a stigma attached to asking for professional help with personal matters; or, they are unaware of the programme and its capabilities"*. A key reason is the common belief and fear amongst pilots that, if known to the outside world, mental health or psychological issues will have the immediate consequence of removal of their flying licence or medical certificate, with the consequent possible loss of livelihood. We can add to that the stigma attached to 'mental health' issues in society.

While these issues have been present for decades, they have largely been ignored until Germanwings flight GWI 4U9525, which crashed in March 2015, with the loss of all 149 passengers and crew on board. This turned the nondisclosure of pilot mental health issues into a matter of urgent priority.

Amongst the multiple solutions that have been identified by a dedicated EASA Task Force in 2015 to address the issue of pilot mental health and wellbeing, the most promising is the set-up of peer support structures by operators. For many years, peer support has been successfully used to allow people to address issues of mental wellbeing, both in aviation (e.g., Stiftung Mayday, Project Wingman) and beyond (e.g., law enforcement and firefighters). The term 'mental wellbeing' covers many areas, such as life stresses (e.g., divorce, financial pressures), training performance or professional standards issues, substance abuse and addiction issues, and concern over medical and licence issues.

Whilst operators may have internal processes for dealing with these issues, these avenues might not appeal to pilots due to confidentiality issues and fear of potential loss of licence and livelihood, or other repercussions.

This is where peer support comes in. Pilot peer support programmes (PPSPs) provide a way for pilots to raise concerns in these areas and receive support and help to work through them all within a 'safe zone', which is protected by confidentiality.

Trained peers are essential. Experience has shown that a pilot is more likely to 'open up' about their problems and issues to a fellow professional; someone who does the same job and understands first-hand the unique stresses and demands that go with it. The barriers to 'opening up' are both historical and societal, but in the specific case of pilots it is important to note that the ability of a pilot to carry out their job is dependent on the external agencies of the licensing authority and the aviation medical authority. Fear of losing either a licence or Class 1 medical can lead to behaviours which are not compatible with exercising the privileges of the pilot's licence. It is important to note, however, that evidence shows that in the vast majority of cases pilots will retain their medical and licence after declaring a mental health issue (in the US, denial of medical certificates for mental health issues in 2017 was 0.08% of cases reported; Berry, 2018). The peer has a significant role in reassuring the pilot that they can seek assistance for their issues in a non-punitive way.

Peers are trained to signpost the pilot towards appropriate help, and by having them operate under the close guidance and support of the mental health professional, this allows the 'best of both worlds': speaking to a peer who intimately understands the job and its peculiarities while still having access to high quality psychological advice via that peer.

As EASA regulation 2018/1042 is the first time that such support programmes are regulated, the implementation of these will certainly present regulators and operators with several challenges as well as opportunities to learn.

Nevertheless, peer support is a concept that we hope will allow us to support the mental wellbeing of front-line staff and make a real difference in the lives of the concerned people.

In that context, a non-profit initiative was formed in 2016 to gather the existing expertise on peer support programmes within Europe. It consisted of pilots (European Cockpit Association - ECA), aviation medical doctors (European Society of Aerospace Medicine - ESAM), and aviation psychologists (European Association for Aviation Psychology - EAAP), together with the Stiftung Mayday Foundation in Germany and elsewhere, and the Pilots Assistance Network programme from British Airways. Given the name EPPSI (European Pilot Peer Support Initiative), its aim is to provide best practice and guidance for operators, regulators and interested stakeholders in the field of pilot peer support programmes. EPPSI has produced resources aimed at assisting airlines and employee representative organisations in the creation of their programmes.

Note

For a more detailed examination of the pilot's professional and personal situation from a psychological perspective, see the British Psychological Society (2017) position statement on pilot mental health and wellbeing. http://www.bps.org.uk/news-and-policy/aviation-and-aerospace-psychologypilot-mental-health-and-wellbeing or http://bit.ly/2I7ZUCM

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For the European Pilot Peer Support Initiative Board:
Captain Paul Reuter, Captain Dave Fielding, Captain Uwe Harter, Dr Ries Simmons, Professor Robert Bor, Gunnar Steinhardt Dipl-Psych, Captain Dr Gerhard Fahnenbruck, Captain Hans Rahmann, Francesca Bartoccini, Dr Ir André Droog, and Dr Aedrian Bekker.
www.eppsi.eu

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CHIRP
Reports for FOCUS

Airline grossly under-crewed

Report Text: [Airline] recently made multiple pilots redundant. They claimed this was due to an issue of over-crewing. Within 2 weeks of making pilots redundant, they were trying to remove leave from the remaining pilots and compel them to work multiple off-days. I believe this to be a deliberate policy to use less than minimum crewing levels and use pilots' off/rest days to plug the serious gaps. I believe that this is leading to severe fatigue, multiple minor, significant and one serious incident. [Airline] crewing levels on the [Aircraft type] fleet are woefully inadequate. It is an extremely questionable employment practice and somehow they now have managed to have the correct crewing level but by decimating the remaining employees' terms and conditions.

CAA Comment: The CAA Oversight Teams conducted targeted audits in FTL/Fatigue Management for this operator both pre and during the pandemic and will continue to do so to ensure appropriate safety standards are being maintained. The management of the prescriptive FTL limits within the approved FTL scheme, and evidence of the management of any FTL exceedances are required whilst also managing the fatigue hazards using the SMS processes in place. Standby coverage and the utilisation of crew on days off (overtime) formed part of these oversight activities as well as the management of roster disruptions (under Subpart FTL), which required the operator to ensure robustness of rosters and have appropriate metrics established to measure these.

The UK Retained Regulations do not define what is the legal minimum number of crew to operate a fleet of aircraft. However, rostering practices and the level of the fatigue reporting rate could be indications of a potential hazard on the rise. The CAA Oversight Team will always conduct a focused oversight in any cases where insufficient crew levels are being raised as safety concerns such as these.

***CHIRP* Comment:** The CAA conducted an extensive investigation of the issues raised but were unable to share any of the detailed findings or headlines due to confidentiality. Although we have no details of the findings, CHIRP welcomed the CAA's comment that they will continue to conduct ongoing oversight activities focused on ensuring appropriate safety standards are maintained by the operator. The risks associated with airlines attempting to fill schedules from depleted crew numbers are clear; stress on FTL and fatigue management systems can soon become an issue in themselves, and a leading indicator of potential safety problems elsewhere. In this respect, roster stability can be an important indicator of airlines operating with too few crews as they attempt to mitigate normally occurring gaps due to illness etc from an already stretched crew complement. Although roster stability can be adversely affected by many factors, the CAA informs CHIRP that they are keeping an eye on company rosters as a loose indicator of overall safety performance. The issue is topical in that other airlines are no doubt also trying to fill schedules with reduced numbers of crews during the COVID return-to-flying period and are also potentially subject to short-notice roster changes.

Insidious effects of fatigue

Report Text: This report has been submitted to the company as an ASR with a request that it should be sent to the CAA as an MOR. Whilst it references a particular flight (as required by the company's system) it relates to a series of flights leading up to the report.

I have become increasingly aware over the last few months of the intensifying effects of fatigue, an experience also related to me by all of my colleagues with whom I've flown over the last few months. Most recently, whilst operating back from [Far East], I was very aware of how this was affecting my ability to operate effectively and I am greatly concerned about the ultimate detriment to flight safety. Further to those submitted on previous flights, a company fatigue report was filed regarding fatigue and the disrupted sleep and pre-flight rest at the hotel in [Far East]. It should be noted that all three pilots were evidently extremely tired throughout the flight. To illustrate this point, whilst briefing for the arrival and approach into [UK Airfield] I briefed that a hold at [holding point] might be required due to the amount of traffic toward [UK Airfield]. This is an arrival that is very familiar yet, even whilst looking at the Jeppesen plate, I briefed the hold as "inbound xxx°, right hand turn" [the wrong direction]. I subsequently programmed this into the FMC however, whilst clearly a significant error on my part, both pilots were so tired that this did not 'register' with either of us. During further descent on the arrival I felt uneasy that something was wrong but could not recognise what this was. With about 3 miles to run to the holding fix I realised that I had briefed and programmed the wrong direction of turn, I immediately corrected the error, programmed the correct turn (left) and the hold was entered and flown correctly - a very near miss.

The next event was during the approach when instructed by the Approach Controller to fly "160 knots to 4.0 DME." The appropriate flap setting was selected and speed reduced however, again an error on my part occurred whereby after calling for landing flap setting I reduced the speed to final approach speed (this was at approximately 6-7 miles). Approaching 5 miles I realised this further error and increased the 'bug speed' back to 160 knots - this was of course more of a token gesture rather than anything effective. Given the use of Mode S at [UK Airfield] I am sure the controller had seen this but they are all very aware of how tired and exhausted [Airline] pilots are on arrival into [UK Airfield] and they did not comment on my error and let it pass. Another error caused by the fatigue I was experiencing.

During the final stages of the approach and landing I also had the extraordinary sensation and feeling that I was not 'connected' with the aeroplane - something I have never experienced before. The landing, rollout and taxi-in were all satisfactory but I was extremely unsettled by these three closely connected events, all of which I attribute to the cumulative fatigue I was (am) experiencing.

Following the events described, I had only two rest days before starting an extended block of standby, (prior to which a duty was allocated and changed twice, together with calls, messages and e-mails from crewing to check the crew web portal which, without putting too fine a point on it, meant my days off were disrupted by this intrusion into them). Yet again I reported for the next duty feeling extremely tried. Whilst no significant errors or events to report occurred during this next duty, I again felt very much 'on the back of the drag curve throughout'. [Airline] has (relatively) recently introduced working and scheduling practices that combine minimum rest periods with the maximum number of duty periods so I do however sympathise with the crewing department over the pressure they are under from the company management to do this.

As a postscript, after submitting the ASR to the company, I was contacted by a manager who had been instructed to call me to discuss the report. During the discussion, an attempt was made to put pressure on me to withdraw my request that the report be submitted as an MOR; something to which I did not agree.

Lessons Learnt: Because of the events described here I have fully realised just what the insidious effects cumulative fatigue has and the detriment to flight safety it is. I know I am not the only [Airline] pilot suffering from and experiencing this. I have also been made aware that the company now [apparently] regularly ignores individual fatigue reports unless an accompanying ASR/MOR is submitted.

***CHIRP* Comment:** This report gives a very good insight into how things can catch up with you as a result of tiredness/fatigue. It's also very topical because we're seeing a number of airlines maximising FTL regulations as they try to satisfy schedules from a reduced compliment of crews after COVID layoffs etc. Although such long-duty, minimum-rest rosters might comply numerically with FTL requirements, it's not good practice to regularly work FTLs to the maximum allowable because the limits were originally devised only to be approached for occasional, managed, rather than routine use.

Humans find it difficult anyway to discern in themselves a gradual accumulation of fatigue and a corresponding erosion in performance, but pilots are perhaps more susceptible to accumulated fatigue because of their default 'can do' attitude. This weakens the safety barrier of pilots declaring themselves unfit through fatigue, and it is further undermined when operators do not respond appropriately when pilots do declare themselves too fatigued to operate or report fatigue after a completed duty. Commercial pressure will undoubtedly continue to drive some operators to regard FTL numerical limits as an acceptable baseline for rostering unless the adverse effects of doing so can be measured. A previous study by the Norwegian Accident Investigation Board (AIBN) correlated self-reports of flight crew sleepiness (as measured on the Karolinska Sleepiness Scale) with FDM data; there was a tendency for sleepy pilots to fly slower on the approach (down to Vref -10), had more hard landings, were later in decoupling the Auto Pilot, had more fuel at shutdown (i.e. had carried more), taxied more slowly and had a higher fuel burn whilst doing so. The safety risks associated with fatigue and tiredness are evident in this report, but there are also commercial imperatives for ensuring flight crews are alert.

Karolinska Sleepiness Scale

1. Extremely alert
2. Very alert
3. Alert
4. Fairly alert
5. Neither alert nor sleepy
6. Some signs of sleepiness
7. Sleepy, but no effort to keep alert
8. Sleepy, some effort to keep alert
9. Very sleepy, great effort to keep alert, fighting sleep

Engine maintenance practices

Report Text: I am writing to you to report on serious safety breaches at [Organisation] in relation to engine overhaul and maintenance. I believe I have been constructively dismissed for threatening to whistleblow on things I have witnessed for many years whilst working at that site. I will list below some of the incidents that happened and are continuing to take place.

1. Managers breaking into engineers' lockers to obtain their stamps to clear repair cards to get engines out quicker.

2. Multiple deviations from the engine manual in respect of turbine shaft overhaul. One example is painting the internals with a house brush.

3. Multiple deviations from the engine manual in respect of the overhaul of engines whereby corrosion was being found on the fan case itself when the fan blades were removed from the case which meant the case was scrapped and replaced but, in order to put profit before safety and compliance, the blades were not removed and repaired in accordance with the engine manual. This means that a) The corrosion is still present and not dealt with and b) The fan blades were not repaired correctly. This repair and overhaul process is still going on, which is continuing to endanger the lives of passengers.

4. Multiple repairs including exhaust and combustion cases being repaired in situ with these components missing up to 90% heat resistant enamel and were being touched up with house brushes to replace the enamel; the engine manual clearly states that if more than 5% of the enamel is missing then the case is to be stripped from the module and fully repaired with the removal of the existing enamel and then go through the full overhaul process before being reassembled. This was not being done as the company were more concerned about turnaround times on engines and considered the disassembly of the module as not cost effective, despite this being a serious deviation from the engine manual.

These are some of the incidents that I and others have witnessed and, because I reported these incidents to Quality through the company's reporting system, I have been victimised and bullied ever since. These incidents have been occurring over the past decade and I have always been threatened with the sack if I dared mention it to the aviation authorities. Now that they have decided to dismiss me, I feel I can now report it without any fear of repercussions.

CHIRP Comment: The CAA were contacted with the reporter's consent and the reporter was asked to resubmit his report to them as a Whistleblower Report. The CAA informed CHIRP that the organisation was to be audited at the beginning of Autumn 2021. Post-audit the CAA reported that, "the information from the reporter was useful during the audit and actions are ongoing with regard to any issues identified". The report contains some concerning issues in respect of deviations from the Approved Data. The internal reporting culture seems highly questionable and created fear in the reporter, rather than being open and objective. The report of personal Authorisation Stamps being used by others without the knowledge of the holder demonstrates a violation - the 'hero' that does so and gets the flight or the product away on time as a result should bear in mind that if a serious incident occurs, it will be them in the firing line, not the company or OEM. Overall, if reporters don't feel able to report issues through normal company procedures for whatever reason then it's important that a confidential report is made either directly to the CAA through their whistleblowing facility or through CHIRP; it's always incredibly difficult to resolve things months or years after an event, and any latent safety issues can surface at any time in the meantime. Timely reporting and doing the right thing are central to effective safety management; wilful disregard for procedures undermines safety for everybody.

Sanctioned company violations

Report Text: The helicopter industry is suffering from a slow implementation of RNP procedures and gradual withdrawal of numerous legacy Instrument Approach Procedures (IAP). Despite our modern fleet being able to fly highly accurate internal GPS approaches, these procedures do not exist in any recognised way and no formal training exists for their use. Rumour suggests that the practice of conducting non-published IFR approaches is common, there is even suggestion that collusion exists at the regulatory level. My company ops manual does not sanction their use unless as part of a published IAP, but many pilots feel pressured into doing them and there is a culture that the business would not survive without breaking certain rules so, if pilots don't like it, they should leave. There is sense to the use of the 'VFR approach mode' - used correctly it can have great accuracy, but with no training or published standards it becomes the Wild West. I have heard pilots describing its use to 300' agl when IMC!

If the system is safe to use could the CAA not authorise it? In the meantime, aircrew operating on AOCs (Air Operator Certificates) and beholden to their licence are expected to violate published regulations placing many of us under ever-increasing stress. We are forever being told that accidents are 80% human error but the system is working against us when we cannot utilise available technologies designed to make our lives safer. There is certainly scope to make these approaches safe, or at least safer than flying low-level in marginal VFR conditions.

CAA Comment: There are two elements in this report that the CAA would like to address. With regard to descent below Minimum Flight Altitude (MFA) with the intent to land, the CAA is reviewing the guidance (for both meaning and intent) of the flight alleviations in UK Standardised European Rules of the Air (SERA), with a planned delivery date of Q2 2022. Point in Space (PinS) descent procedures are available to be developed, but the take-up has been slow due to a combination of perceived cost issues and lack of both industry and CAA resource. This potential has been discussed with industry, and the CAA will continue to engage with the onshore operators to see how we can facilitate procedure take up. The CAA has no remit or capacity to design such procedures.

***CHIRP* Comment:** The specific operational issues in this report refer to SERA 5015(b) which states that:

(b) Minimum levels

Except when necessary for take-off or landing, or except when specifically authorised by the competent authority, an IFR flight shall be flown at a level which is not below the minimum flight altitude established by the State whose territory is overflown, or, where no such minimum flight altitude has been established:

(1) over high terrain or in mountainous areas, at a level which is at least 600 m (2 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft;

(2) elsewhere than as specified in (1), at a level which is at least 300 m (1 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft.

The legislation effectively provides alleviation for descent below MFA when IFR provided the aircraft is intending to land (which for a helicopter could be anywhere). The helicopter industry reports that this practice is commonplace and causing considerable concern within the responsible elements of the sector because of pilots apparently routinely descending to 500ft or below in IMC on unapproved let-downs. The Onshore Helicopter Review Report (CAP1864, November 2019) mentions IFR GPS let-downs at Para 14.18-14.20 and includes Action A14 which states that: "The CAA will review SERA 5015 and consider implementing a national position so that all IFR take-offs and landings are conducted in accordance with either notified or approved procedures". Whilst the use of PinS would provide a tool for such IMC descents, CHIRP understands that, at present, the development of PinS procedures requires a CAP1616 airspace change process to be invoked, and any measures that the CAA can take to reduce this burden would be very welcome in encouraging their introduction; the CAA have responded favourably to this suggestion as a potential way of accelerating PinS airspace changes.

However, the concerns are bigger than just the specific issue at hand, and relate to unofficial practices being conducted in contravention of company operating manuals and wider regulations. In Human Factors terms this is referred to as 'normalised deviance', which describes procedures and processes that have become accepted over time as 'the way things are done' in order to achieve a task. Some CHIRP members commented that they had anecdotal evidence that IMC descents were accepted to the extent that sometimes they were included in flight checks; this was an example of 'normalised deviance' infiltrating into the very core of safety and cannot be condoned at any level. Whilst there may be understandable pressures to break rules for operational benefit, many such rules have been developed through hard lessons written in blood and lives lost. CHIRP provides one way of reporting such concerns if reporters feel too vulnerable to put their heads above the parapet; the CAA also provides a whistleblowing service that is available to anyone and allows the CAA to engage directly with industry and reporters to resolve issues in a timely manner.

Punished for mistakes

Report text: I was forced to sign for an inspection that I did not carry out because the [Authorised Manager] had missed a duplicate inspection and had issued a Form 1 on the component. Months later I assembled a component incorrectly, which resulted in removal of my Inspector authorisation, a CV review, and being called useless and unskilled while being expected to carry out the same level of work and supervise. Any mistakes made in this hangar result in complete ridicule and aggression.

***CHIRP* Comment:** The reporter's Quality/Compliance Manager was contacted with the reporter's consent. The organisation took these matters very seriously and reported back to CHIRP that senior staff changes were pending when their investigations were concluded. It is gratifying that the report progressed to a satisfactory conclusion, no doubt improving the organisation's safety culture, but a little disheartening that there are still some individuals in our industry that struggle to grasp the fundamentals of Human Factors, a Just Culture and open and transparent reporting. The work of CHIRP is never done and we all must play our part in identifying and highlighting unsafe old-fashioned cultures.

Charging oxygen systems on the ramp

Report Text: I have noted that [Operator] at [Location] still charge crew & portable O2 bottles. This procedure was removed from the AMM many years ago and the [Aircraft] doesn't have an external charging point. The AMM procedure has been for many years to replace the Crew/Portable O2 bottles when they are below minimum levels. The Oxygen bottle is on a towable trolley that sits out in the open next to where the passengers queue prior to boarding. I haven't actually seen them recharging bottles but the rig has been in use for years. I haven't seen a designated toolbox for the same reason stated above, there isn't any fire extinguisher in the area and there isn't any kind of cage to place a bottle in during re-charge. I am not aware that they have a workshop/clean room at [Location]. My biggest concern is for the guys working for [Operator] as I suspect they feel they cannot complain.

***CHIRP* Comment:** This report has great merit because it was a case of 'something is not quite right here'. The reporter carried out a subconscious risk assessment and took appropriate action in contacting CHIRP and we approached the operator's NAA with the reporter's consent. It transpired that the practice was allowable under a 'Local Agreement' with the NAA, which had been in place for approximately fifteen years whereby the operator's Part 145 'Component Rating C15 Oxygen' could cover all their outstations. The NAA were satisfied that the Maintenance Organisation Exposition/Procedures, Dedicated Approved Tooling, Explosion Protection and Fire Extinguishing were all in place. The paperwork for the recording of work was by an internal document, which is also permissible. Local agreements do have a place in making regulations work until they can get up to speed with industry changes and needs. The question therefore must be, does a local agreement show that the regulation (and/or the AMC or GM) is inadequate in the first place, and for how long should they be allowed to be in place? When maintenance personnel use a work-around based on a local agreement, is the organisation assuming it will be addressed properly at a later date?

Ordinarily a C15 Approval would require a facility designated for the purpose, which would of course have to be free of dust and oil. As you would expect, this local agreement also relies on the training, authorisation and competence of the individuals carrying out the work. The one requirement missing from the checklist in this case however is the facility! The lack of a facility demands a bit of common-sense of these individuals. We don't normally get to use much common-sense in aircraft maintenance anymore because aircraft, procedures, approved maintenance data and Human Factors training all try to pre-empt any likely errors. One must assume that in this case the individuals involved have the common-sense not to attempt to carry out this practice in any sort of bad weather. How many potential Human Factors issues have just crossed your mind that might make it seem like a really good idea to ignore the weather just this one time to get the flight away?

A further question raised by this report is whether an engineer should query the practices of others in other organisations? We as engineers would hope they do every time something looks amiss; any engineer should challenge what they perceive as a safety issue or a breach of regulations. It is great to think that one day you might be the engineer that saves lives with a 'good spot' that everyone else has overlooked but, unfortunately, (Human Factors yet again) it is often a balance between our safety conscience and looking foolish. Would you call the Tower to inform them an aircraft taxying out is covered in ice, or would you possibly hope it might be taxying to a remote location for de-icing? A Just Culture protects against being thought of as foolish – after all, there is no such thing as a silly question.

Captain's Authority

Report text: I was, as a line training captain, assigned on a 4-sector training flight ending late at night. At crew briefing I was informed that the cabin crew No.1 was also under training and checking by an experienced Purser. In this configuration the Purser would seat as No.4 close to the No.1; thus leaving the two less experienced cabin crew members seated in the rear galley as No.2 and No.3. Those two cabin crew members were considered inexperienced (having only between 10 and 20 preceding working days). I discussed with the Purser the issue of having two inexperienced crew members at the back alone. I checked the manual, and our operator doesn't currently have any restrictions so I then contacted operations who quite impolitely berated me for raising a non-pertinent issue, saying that the cabin is not the Captain's business. We therefore maintained the configuration with me wondering if the two at the back really understood the importance of their role. It is company policy that the No.1 asks 3 tech questions per cabin crew member at the briefing. On this particular day, I decided to make a specific briefing to the No.2 and No.3 addressing the case of an aircraft technical failure causing communication breakdown between the front and rear galley; I also gave them a few suggestions without evaluating their technical knowledge. I included a non-standard instruction to call the flight deck even during sterile phases of flight for anything that might have occurred. With this done, I asked the No.1 to "leave them relaxed for today" and not to ask questions. However, being under check, the No.1 apparently misinterpreted my request and still gave standard tech questions to the both of them. The flight was uneventful but, at the end of the day, some crew members left without waiting for the Captain, which is the normal procedure. I later learned that we landed (at night) with the light at the rear galley at maximum brightness because none of the rear galley crew were able to dim the lights. Although the event is of minimum relevance in itself, I felt that the Captain's authority as perceived by the cabin crew and Company was much less than what I believed. I wasn't happy with this situation and even more disappointed with the Company's position. What happened in the cabin demonstrated that SOPs took precedence over a Captain's instructions; I wouldn't have minded delaying the approach while the Purser dimmed the rear galley lights, but nobody called me because of the sterile flight deck.

CAA Comment: The operator meets the regulatory requirement under AMC1 ORO.CC.100 for rostering of cabin crew with at least three months experience. Experience should be a consideration of the SCCM when allocating working positions in order to ensure, as far as practicable, an even distribution of experience in the aircraft cabin. A robust process should be in place to manage reduced operating frequency and the effect this may have on knowledge and performance. The most significant concern regarding this report is that fact that the Captain advised the SCCM to deviate from published procedures, for which in these circumstances there is no justification.

CHIRP **Response**: AMC1 ORO.CC.100 states – Number and composition of cabin crew (b) – When scheduling cabin crew for a flight, the operator should establish procedures that take account of the experience of each cabin crew member. The procedures should specify that the required cabin crew includes some cabin crew members who have at least 3 months experience as an operating crew member.

Captains have primacy at all times during an aircraft's operation, but SOPs should be followed unless there are clear reasons not to do so. If the No.1 under a check flight had failed to ask crew tech questions they would not have been following the company SOPs and most likely would've failed their check flight.

Rather than the Captain directly raising issues with the crew concerned a conversation should've taken place between the No.1/No.4 and the Captain. With the Captain making a specific briefing to the rear crew members this most likely increased their nervousness. The rear crew then received the standard briefing from the No.1. Did the inexperienced crew members possibly then fear contacting anyone to ask how to control the rear lights? The CABIN READY signal implies that all checks (including lighting) have been done and that clearly wasn't the case here. If the rear crew didn't dim the cabin lighting, then that should've been spotted by either one of the two Purser's at the front.

Many operators have a procedure in place where they would not permit inexperienced crew to operate at the same end of the aircraft together. Although the company will rightly dictate how operations will be conducted, the Captain is not there simply to fly the aircraft. Nevertheless, the Company response was particularly disappointing, the Captain had every reason to take the cabin crew experience into account during his threat & error management (TEM) deliberations, and this is recognised in the fundamental ICAO and EU regulations concerning the safe operation of aircraft.

This was a good example of pro-active reporting by the Captain in raising an issue of concern with the operation of the flight to the controlling body. To then receive a berating and curt response from operations for doing so was completely counter-productive and against the ethos of a positive safety culture; the Captain may well be hesitant to raise concerns in future, thereby reducing safety effectiveness overall.

The messy reality of working in the cabin

by Patricia Green

When we think of aviation safety professionals, do we also think of cabin crew? If not, then we need to learn more about their work, as Patricia Green explains.

Our aim in aviation is to keep our skies safe and ensure every flight is as safe and efficient as it can be. We all have our individual roles to play, as cabin crew, engineer, dispatcher, pilot or air traffic controller. We all use crew resource management (CRM) to ensure effective communication, teamwork and decisionmaking processes. We try to understand human factors in operations, and use our CRM and threat and error management skills to mitigate risks every day.

Safety and service

There is a perception that cabin crew are not safety professionals, but rather service providers. This is perhaps because most people only 'see' the service aspects of our everyday work. They don't see what we are trained to do. It would surprise most people that service is about 2% of our training. We are trained to deal with any emergency within the cabin, including fighting a fire to landing on water, handling a decompression, evacuation on land, and medical emergencies.

We have to know everything in our cabin; the emergency equipment, the communication systems, the oxygen systems as well as knowing all the associated procedures. With experience, we develop an intuitive approach in the cabin and become sensitive to our environment and the situations that unfold on each flight. We become sensitive to movement, sounds, smells and anything non-routine.

The ICAO website for cabin safety states:

"Cabin crew members also play an important proactive role in managing safety, which can contribute to the prevention of accidents."

The Contribution of CRM

There is no doubt that since the introduction of CRM training, aviation safety has improved. Communication between the flight crew and cabin crew is much better. We have more of an understanding of each other's work and there is less of a status barrier. Cabin crew are now actively encouraged to report to the flight crew anything they think is suspicious or potentially abnormal, and we are their 'eyes and ears in the cabin' at all times.

The effectiveness of CRM can be seen in such accidents as United Airlines 232 in 1989 in Sioux City, where there were many survivors and the crew handled the emergency well without conventional controls. United Airlines 811 in 1989 is another example, after an explosive decompression occurred causing considerable damage to the aircraft. British Airways 5390 in 1990 is another case, where a windshield was fitted incorrectly and the captain was blown partially out of the aircraft and the crew's actions saved his life.

However, this is not always the case. One such example (often used in CRM training) is the Kegworth disaster in 1989. BMA 92 tried to make an emergency landing after an engine issue – the cabin crew reported a fire in the wrong engine, and the flight crew shut down the working engine. The cabin crew "Didn't feel it was their business..." to report anything further. Another example is Air Ontario 1363 in 1989, where there was snow on the wings on take off. A passenger, who was a pilot, asked the flight attendant to tell the flight crew but she didn't. One of the training managers said that "The flight attendants were trained not to question the flight crew's judgement regarding safety issues."

Since then, basic knowledge of the aircraft and flight are taught in cabin crew training, as it was found that greater technical knowledge would improve communication in an emergency.

Even as recently as 2019 in Stansted, UK, an incident occurred on a Lauda Air flight where the senior flight attendant initiated an unnecessary emergency evacuation on the ground. There was an engine problem and she was overwhelmed, misunderstood the flight crew's command and was having difficulty communicating with other crew members. She stated "For me, if the door was closed, I have nothing to do with them..." The investigation showed flaws in training and the senior flight attendant's lack of flying experience.

Challenges to Effective CRM

So, what have we learned about the difficulties we may have with CRM in our everyday work life? There are regulatory barriers with the sterile cockpit procedure and the locked cockpit door, so it can still be difficult to communicate efficiently. Once the cabin door and cockpit door are closed, we are essentially sealed off from the rest of the aviation community and often there will be little understanding of what is going on in the cabin.

Outside of the aircraft, there can sometimes be issues organisationally, with a 'them and us' attitude, where there is a lack of respect towards the cabin crew and a lack of trust towards the management. Rules and procedures are often enforced by non-flying managers or people who do not work in the cabin, so dissatisfaction issues occur across all levels. Reports are not always responded to, even though we are on the frontline, dealing with these issues. This could be resolved by managers taking time to understand everyday work for cabin crew.

A small cabin crew complement is also an issue (one per every 50 passengers for most countries, but one per every 36 passengers in Australia).

Other issues affecting good CRM on a day-to-day basis can be the practicalities of working in the cabin. Long hours and often numerous sectors can result in fatigue, which affects our health and performance. Stress, workload and the potential threats that may be encountered such as an unruly passenger, medical emergency or other events, can make daily work more difficult. There are also worries regarding air quality and now, of course, COVID-19.

The cabin design and ergonomics also affect our day-to-day work. This includes the design of the galley, the width of the aisles, seat pitch, and access to safety equipment in an emergency. Cabin safety focal groups can help to improve cabin design and effectiveness.

Learning as One Team

So, what can we take from a cabin crew perspective? You might not see us, but we are right at the heart of aviation safety, every day. There needs to be greater learning about our everyday work, and learning together between professions, for safety as well as service. It is essential that we all work and learn as one team, no matter what barriers there might be (physical or mental). We are all safety professionals.

Patricia Green has been cabin crew for major airlines in the UK and Middle East. She has also worked as a VIP Flight Attendant for high profile clients and world leaders on their private jets. Most recently, Patricia was Head of Cabin Crew and Cabin Safety Focal Point. She has a Postgraduate Diploma in Human Factors in Aviation.

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Automation Events

by Dai Whittingham, Chief Executive UKFSC

The events described below involved confusion over approach plates, poor knowledge of automation, and CRM breakdown.

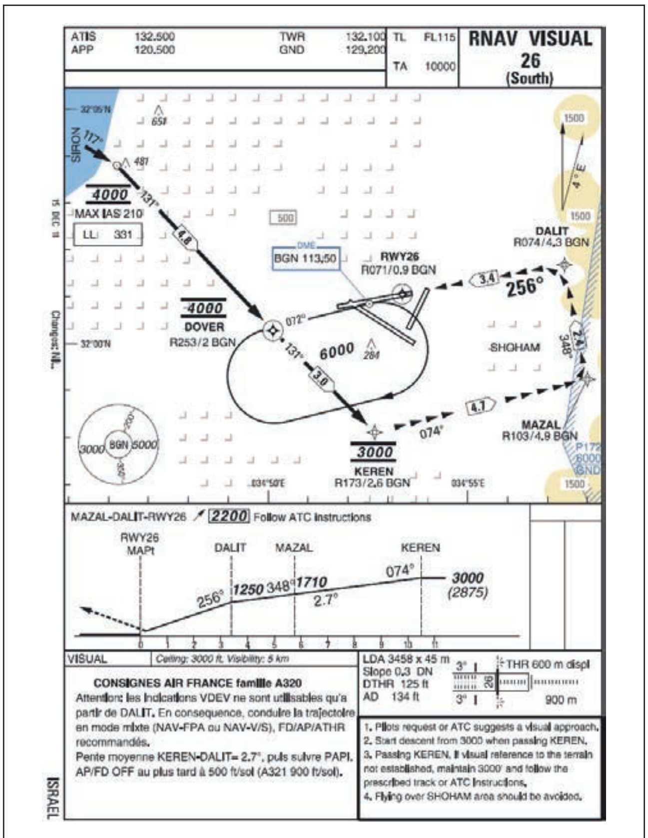
Air France A320, Tel Aviv, April 2012

On 3 April 2012, an Air France (AF) Airbus A320 routing Paris CDG to Tel Aviv made an RNAV VISUAL approach in day VMC to runway 26. The commander (PM) had almost 10,000 hrs experience on the A320/330/340, including 1800 hrs as PIC on the A320; the co-pilot (PF) had a total of 500 hrs, of which 200 were on the A320.

During the approach a low-speed condition triggered flight envelope protection and the crew's recovery action led to an overspeed warning. A second and uneventful approach was subsequently made. The Investigation identified significant issues with crew understanding of automation - especially regarding the use of FMS modes and operations with the AP off but the A/THR on - and highlighted the operator's inadequate provision of RNAV VISUAL procedures and pilot training.

Investigation

The crew briefed for an ILS to RWY 26 at Tel Aviv but made passing reference to the possibility of an alternative RNAV VISUAL approach (see the AF chart below).



The RNAV VISUAL 26 Approach Chart used by the crew (reproduced from the Official Report)

When ATC offered the RNAV VISUAL approach, it was accepted without further briefing, despite the PF never having flown one. Neither pilot had received training on this type of approach and there was no reference to it in the AF 'Technical Use Manual'. The recommended descent on the AF charted procedure used FD + AP + A/THR to achieve a mean slope of 2.7° between waypoints KEREN and DALIT, then VASI guidance until selecting AP/FD OFF below 500 ft agl.

The descent to 3000 feet QNH downwind had been made in DES/NAV mode. Halfway along the downwind leg the vertical mode was changed to OPEN DESCENT, which resulted in thrust being reduced to IDLE. (In OPEN DESCENT mode, the A/THR maintains IDLE thrust and the FD indicates the pitch attitude required to maintain speed.) Shortly after this, managed speed was selected and the aircraft fully configured for landing, though this was earlier than the recommended "just before lining up on final". The effect of the new configuration and IDLE thrust was a rapid reduction of the speed towards the Vapp of 138 KIAS.

The speed was already 3 knots below Vapp at the start of the turn onto final approach. However, instead of following the FD pitch command per the OPEN DESCENT mode, the PF "made a pitch-up input for ten seconds". Speed dropped to Vapp-16 knots and the angle of attack increased from 5.5° to almost 11°. The 'SPEED, SPEED, SPEED' aural warning sounded and, with no call from either pilot, the PF attempted to go around by selecting TOGA thrust.

At this point the Captain made a pitch down input on his sidestick without pressing the takeover pushbutton (dual input), because "he still had (it) in mind to continue the approach". Flight envelope protection activated, which automatically engaged the ALPHA FLOOR and TOGA LOCK modes; the PF did not recognise that TOGA LOCK was active, and the PM "did not identify the ALPHA FLOOR mode".

Configuration 3 was selected and an altitude of 3,000 feet set, although the MAP stop altitude was 2200 feet. As the speed increased, the PF retarded the thrust levers to 'CLIMB' but this had no effect because the (un-noticed) TOGA LOCK mode was still engaged. As the aircraft approached 2,000 ft, the crew selected that altitude, re-engaged the AP, retracted the landing gear, selected Config 1 and, with the speed at 208 KCAS, selected a new target speed of 188 KIAS. As a result of inertia and with full thrust still selected, the speed continued to increase towards the Config 1 VFE of 215 KIAS, which activated the overspeed warning. The PF promptly selected the thrust levers to IDLE, which disengaged A/THR and TOGA LOCK modes, but the aircraft still reached a speed of 223 KCAS and an altitude of 2500 feet.

Shortly afterwards, the crew re-engaged the A/THR and recovered full control of the aircraft. The second approach was completed without incident.

Analysis

The BEA investigation noted that AF's RNAV VISUAL approach procedure involved only lateral guidance from the FMS. Further, "the concept of an RNAV VISUAL approach does not appear in the EU-OPS regulation". At the time, the use of the procedure "was not clarified in the AF Technical Use manual" and Tel Aviv was the only AF short/medium haul destination.

The BEA commented on CRM aspects, observing that the PIC/PM had not anticipated the difficulties the PF might experience and had not briefed the key points of this unusual approach. The PF had felt uncomfortable with approach from the start of the downwind leg but did not share these doubts with the PM. The crew admitted that during the turn onto finals, "they focused their attention on the flight path and were no longer monitoring the flight parameters".

Five days after this event there was a similar occurrence involving a different AF A320 crew flying the same approach at Tel Aviv. However, the crew had responded to the low-speed warning by immediately increasing thrust and had continued the approach without the ALPHA FLOOR protection engaging.

The BEA identified several elements common to both events:

- The approach was conducted in OPEN DESCENT mode
- The flight was conducted with AP off, A/THR and FD on
- The guidance provided on the approach procedure chart in respect of the NAV-FPA or NAV-V/S modes was not followed
- The PM, occupying the left seat for a left turn, was not monitoring the speed
- The PF did not follow FD commands
- The aircraft had been prematurely configured on the downwind leg

Conclusions
The BEA report identified the causes of the upset as follows:

The indiscriminate offering of an RNAV VISUAL approach by Tel Aviv ATC to all airlines; departure from the initial approach concept; the absence of training in RNAV VISUAL approaches at AF; and the short preparation for the approach made by the crew "did not allow the Captain to anticipate the PF's difficulties in performing this unusual approach."

In addition, there was a poor understanding of A/THR operation and of the importance of following the FD in OPEN DESCENT mode, which led the crew to believe that A/THR would ensure that speed was maintained. Failure to identify the risks associated with the selection of FULL configuration at the end of the downwind leg in OPEN DESCENT mode and inadequate monitoring of the flight parameters led to the deviation below manoeuvring airspeed.

The second event(s):

Vueling A320, Birmingham, August 2019

After an uneventful flight from Barcelona, the aircraft positioned for an RNAV2 approach to Runway 33 at Birmingham. Both pilots were experienced on the aircraft and the co-pilot was acting as the handling pilot. The weather at the time was good with light winds reported and no cloud below 5,000 ft agl.

The aircraft was at 4,000 ft, 11 nm south of the airport when ATC cleared it to descend to 2,000 ft and carry out the RNAV approach (Figure 2). The pilots read back the clearance but, thirty seconds later, they contacted ATC to request descent. ATC again cleared the aircraft to descend to 2,000 ft. The aircraft was 10.5 nm from the runway when it started descending and 1 mile later was still 1,000 ft above the correct profile.

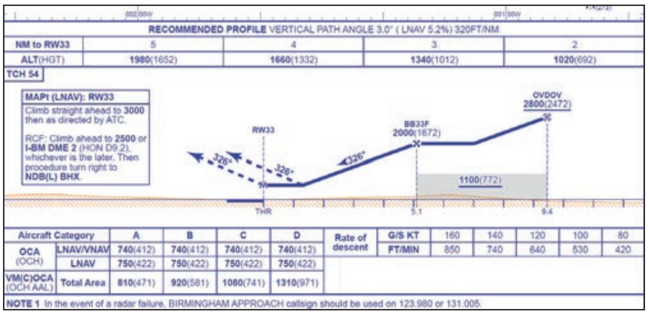


Figure 2. Vertical profile of RNAV approach to Runway 33 at BHX

At 3 nm from the runway, the aircraft was 660 ft above profile. The pilots continued the approach, but at about 0.3 nm from the threshold they announced they were going around. ATC cleared the aircraft to climb to 4,000 ft and gave radar vectors.

Shortly after the aircraft began climbing, the commander took over as PF and requested a LOC/DME for the second approach. On base leg, the aircraft was cleared to descend to 2,000 ft but the crew mistakenly read back the clearance to descend only to 3,000 ft. This was not corrected.

The aircraft descended to 3,000 ft whilst positioning to establish on the localiser, during which it was given further clearance to descend with the approach. The aircraft began its final descent from 3,000 ft, about 7 nm from the runway, and was 200 ft above profile when it crossed the final descent point at 5.1 nm.

The crew discontinued the approach 2.5 nm from the threshold, descending through 1900 ft and began to follow the ATC instruction to turn left 240° and climb to 4,000 ft. At the same time, they selected a climb to 4,000 ft using the OPEN CLIMB mode, leaving the landing gear down and full flaps set but did not select TOGA. This caused the aircraft to pitch to 10° nose-up and decelerate; the crew changed to the VERTICAL SPEED mode, reducing pitch to about 1° nose-up. However, the ALPHA FLOOR protection activated, automatically setting TOGA and causing the speed to increase.

The commander then set the thrust levers to prevent the aircraft exceeding the full flap limiting speed. With pitch reducing, the aircraft continued to descend and ATC again instructed the crew to climb. The crew selected a climb of about 900 ft/min still using the VERTICAL SPEED mode and the aircraft, having descended to 1,300 ft (about 940 ft agl), then started to climb.

The aircraft climbed to 4,000 ft and ATC gave further vectors for another localiser/DME approach. The aircraft then landed without incident.

In December 2019 there was a further occurrence (same operator, aircraft type, different crew) during a LOC/DME approach to the same runway. The pilots had been cleared to descend to the platform altitude of 2,000ft and, when established on the localiser, to descend further with the approach. The crew had been unsure of the correct decent point when ATC had cleared them for the approach, but from a higher altitude than the platform altitude for the approach depicted on their chart. They had then attempted to calculate the correct descent point though descended too late and were above profile, leading to a go around.

During the second approach the aircraft was again high and correcting, but at 6.5 nm from the runway, the aircraft had descended 700 ft below the correct approach profile to 1,300 ft. The aircraft then climbed 500 ft before descending again and was 360 ft above the correct approach profile at 3 nm but continued the approach and landed.

The AAIB investigation noted differences between the descent profile for the RNAV approach published in the UK AIP and that from the operator's chart provider. Whilst the former had a platform altitude for the approach of 2,000 ft with final descent starting at 5.1 nm from the threshold, the operator's approach charts showed a continuous descent starting from 2,800 ft at 7.6 nm (Figure 3). This led to confusion by the pilots when initially they were cleared to 2,000 ft on the first approach, causing them to delay their descent and to ask ATC again for the descent instructions. This had served to compound the issue of the late configuration of the aircraft for the approach whilst trying to slow down, resulting in the aircraft not establishing on the correct approach profile and leading to the missed approach.

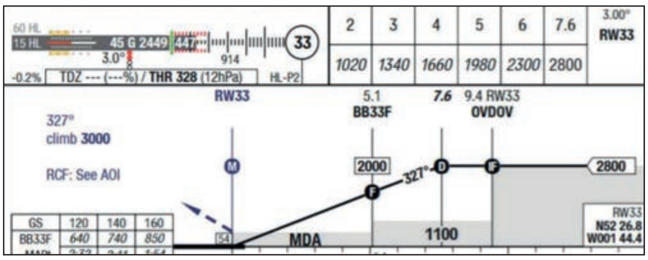


Figure 3. Vertical profile, operator's chart.

The approaches were continued whilst not meeting the stable approach criteria and go-arounds were carried out late in the approach.

In the August incident the commander chose to change the type of approach, which placed additional pressure on the pilots in setting up the aircraft and re-briefing. Because the aircraft was not reconfigured for a go-around (nor TOGA selected) when ATC instructed the aircraft to climb, the result was further descent and an increase in angle of attack which activated ALPHA FLOOR protections. Even when the climb was initiated, the crew continued without changing the aircraft's configuration, indicating the startle and high workload likely to arise from this unintended situation.

The pilots of the aircraft involved in the December occurrence chose to conduct a localiser/DME approach on both occasions. The aircraft did not maintain the correct profile on either approach. When ATC vectored the aircraft for an RNAV approach this caused the pilots to doubt that they were conducting the correct type of approach.

The December incident involved a high rate of descent being selected to regain the appropriate approach path, the pilots managing the vertical profile manually using an umfamiliar flight control mode.

The operator's own investigation suggested the crew may have overlooked the fact that there was no glideslope for the aircraft to capture, resulting in it continuing its descent below the correct approach profile. Unlike the first incident, this occurred whilst the aircraft was in IMC, which removed any visual cues for the crew and resulted in a significant departure below the correct profile, taking the aircraft below the minimum safety altitude for that part of the approach.

Different chart providers have different ways of depicting approach profiles. However, the AIP remains the source document and ATC will naturally rely on this, rather than individual operator's charts, when managing air traffic. Where differences exist, it is desirable for operators and ATC to ensure their effect is understood.

Conclusion

The aircraft did not maintain the correct vertical profile because the pilots were not sure when to commence the final descent. The depiction of the descent profile on charts provided by the operator may have contributed to this uncertainty.

In the first event it is likely that the increased workload of an unplanned missed approach contributed to the pilots not configuring the aircraft correctly for the go-around, resulting in the aircraft entering the alpha floor protection mode. In the second event, having also commenced the final descent late, the pilots did not maintain the correct profile thereafter because the type of approach required them to manage the vertical flight path manually, and they were not familiar with the flight mode they were using.

The operator's safety department has recommended improvements in approach training and strategies to assist situational awareness.

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