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ON COMMERCIAL AVIATION SAFETY

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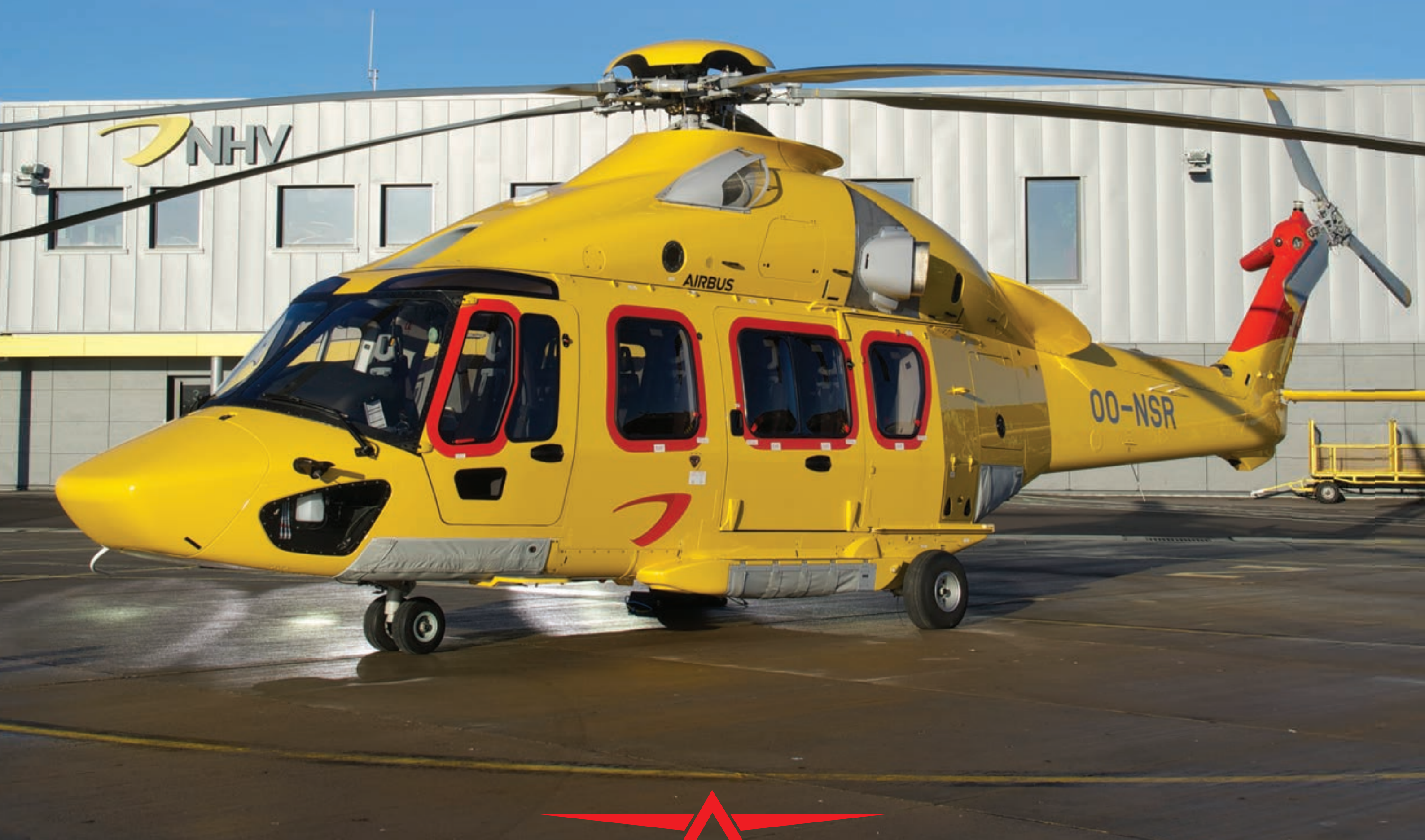

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Contents

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FOCUS is a quarterly subscription journal devoted to the promotion of best practises in aviation safety. It includes articles, either original or reprinted from other sources, related to safety issues throughout all areas of air transport operations. Besides providing information on safety related matters, **FOCUS** aims to promote debate and improve networking within the industry. It must be emphasised that **FOCUS** is not intended as a substitute for regulatory information or company publications and procedures.

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Front Cover Picture: Airbus H175B belonging to NHV Helicopters in Aberdeen

Credit: Bart Cornelisse

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focus ON COMMERCIAL AVIATION SAFETY

The Lessons of 2018

by Dai Whittingham, Chief Executive UKFSC

With the statistics from 2018 now available, the apparent drift from 2017's remarkable record is now on the record. With a significant increase in commercial aviation fatalities it would be easy to conclude that safety has taken a hit, but Flight Ascend's analysis shows that last year was still the 3rd safest ever in terms of the overall accident rate, which was 1 per 4.55 million flights. The 10 airline accidents in 2018 accounted for 515 passengers and crew, of whom 482 were revenue passengers. Compare that with 2017: a similar number of fatal accidents but only 39 fatalities including just 5 revenue passengers. Ascend concludes that the airline industry is about 3 times safer than it was 10 years ago and 10 times safer than 20 years ago. That is great progress by any standard.

Meaningful statistics for helicopters are harder to come by, as many of the accidents occur in domains that do not read easily across to the airline world, even though they are commercial in nature. Accident and fatality rates over the 5 years up until 2018 had more than halved, but attention becomes diverted by high-profile events such as the Leicester AW169 accident. Turboprop hull losses have been consistently running between 4 and 10 times the rate for turbojet airliners on a per million sector comparison – for 2018, this was 0.77 for turboprops, 0.11 for turbojets. As we have previously discussed, the turboprops are where a lot of pilots cut their teeth before moving onto jets, the sectors and destinations can be more challenging than for the wide-body fleets, and the aircraft sometimes lack the protections afforded to their larger cousins. All that said, we are still doing pretty well, but now is not the time to relax.

There are three issues from 2018 that will have particular relevance over the coming year and have safety dimensions stemming from commercial considerations as a common thread: drones, Lion-Air and Brexit. Let us start with Brexit.

We are facing massive uncertainty over the next few months if the 'no deal' scenario materialises. Some operators have already taken the decision to set up separate AOCs within the EU to allow them to operate intra-Europe with the full freedoms available to their continental competitors, but that does not come without costs which can erode financial margins and lead to increased pressure on resources in both cash and people terms. And all this at a time when many operators are already struggling. We can but hope that some of the more lurid headlines about the permissions required and the constraints that will be faced by UK-based operators are simply posturing by Commission officials. It is in no-one's interests for the aviation market to have additional handicaps put in its way, and common-sense should prevail as both sides of the Channel will be affected. But if operators are indeed faced with needlessly difficult operating conditions, pressure on crews and maintenance teams to get the job done as cheaply and as quickly as possible is only to be expected. Whether that pressure manifests as greater use of FTL discretion or in manpower reductions remains to be seen, but the temptation to cut corners will be ever present. And we still do not really know what the impact of a 'no-deal' Brexit will be on the formal side of the business, namely licensing, airworthiness and certification.

Drones have been firmly in the public consciousness since the events at Gatwick before Christmas; the press and social media storm that followed was unedifying, to say the least. Criticisms of the airport operator, police and the regulator are pointless and inappropriate – everyone was doing their best – but the demand for someone to blame (and therefore be a source for compensation payments) was enormous. The real blame of course lay with the individual who decided to fly their drone close to a busy airport either negligently regardless of the consequences or criminally with the consequences in mind.

The decision-makers at Gatwick were in a no-win situation: they were damned for closing, and would have been damned for staying open, especially if a collision resulted. Cheap political points were there to be scored. There were plenty of people happy to fill the airwaves with comment about the failure of the Government to have the right preventive measures in place or the failure of the airport operators to invest in anti-drone technology, even if the technology was neither proven nor readily available. Many commentators failed to grasp the simple fact that equipment designed for disrupting the control system on a drone would almost certainly have an impact on other capabilities that rely on use of the electromagnetic spectrum, such as ILS or GPS - you can't squirt radiation through the air and expect the energy to stop at the target. Military platforms are typically protected from this sort of electromagnetic interference, but it is an expensive business.

Beyond disruption to thousands of passengers, there is another down-side to closing airports or airspace in the event of a drone incursion, namely the straight transfer of risk. On the one side you have the risk of collision with a drone, which may not be as high as the public want to believe (it is actually quite hard to hit a moving object in the air with another moving object, which is why air-to-air missiles require sophisticated guidance systems); added to that comes the damage resulting from such a collision. On the other side of the equation is the known risk arising from late changes to procedures, increased pilot and controller workload, increased airspace congestion, depletion of fuel reserves, unplanned diversions, fatigue, and disruption to networks leading to more pressure on staff for recovery to normal operations. Who should be responsible for balancing those risks and deciding on the best course of action is open to question. There are operators who see the risk of a drone collision as being more acceptable than the known safety impacts from airport or airspace closures, and there are those who see things differently. It is an area that the regulators here and in Europe will have to consider. What the industry needs is a consistent and coherent response to a drone incursion into CAS, because consistency is something you can plan on.

The one bright spot from the Gatwick events was the new focus given to the problem by Government. The result is that the 2018 requirement to maintain 1Km separation from an aerodrome will be extended to the standard ATZ dimension of 2.5nm (4.6Km) with additional 5Km long by 1Km across extensions from runway ends. The new rule will be applicable to all drones weighing more than 250g. Just because there is a law does not mean everyone will comply with it, but the increased separation requirement will certainly help with measures to protect manned aircraft from drone incursions.

Last, but not least, is the Lion Air B737 MAX accident of 29 October 2018. In the absence of a final accident report we are left with deductions drawn from the limited facts made available to the public so far, but we know the crew lost control of the aircraft and that it impacted the sea at high speed with the loss of all 189 souls on board. The preliminary report indicates that there had been a technical problem on the previous flight, probably generated by a faulty AOA sensor, that had triggered the stick shaker on rotation and, later, activated the Maneuvering (*sic*) Characteristics Augmentation System (MCAS) which applies nose-down stabilator movement as part of the aircraft's stall protection. The aircraft commander on this flight used the Stab Trim cut-out switches and continued the sector using manual trim; he did not record the stick-shaker activation in his tech log entry. Despite the AOA transmitter being replaced and the pitot-static system being flushed, the problem recurred on the accident flight; the DFDR showed repeated periods of nose-down trim being countered by the PF but the overall trim position moved eventually to the point where the crew was unable to stop the nose-down pitch.

Whilst the investigation will no doubt determine the most probable chain of events, the exact cause is less germane than the larger questions raised by the accident itself. Let us set aside the ongoing dispute about how much knowledge of MCAS was passed to the Lion Air crews by Boeing, and about whether the crew had the knowledge or skills to deal with the abnormal event they were faced with. The more significant questions are about certification and training.

In expanding these questions it is important first to note that Boeing gained certification for the 737 MAX from the FAA in accordance with the standards laid down in 14 CFR Part 25 (or CS 25 for EASA). The certification question is not about Boeing, the MAX or the FAA, but about the standards, and the question is relevant for all manufacturers and regulators across the globe. Developing and certifying a new aircraft is challenging and costly, and we should not be surprised when a manufacturer takes action to drive costs down. It is normal business, inextricably linked with the price the customer pays, the volume of business to be expected and the returns to the shareholder.

But have we gone too far in setting the baseline for certification? Is it right that an aircraft with a new fuselage, new wings and different engines is treated as if it is simply an upgrade of the original platform? Compared with earlier versions, the stall characteristics that required installation of MCAS on the 737 MAX will have been affected by changes in the planform and positioning of the engines. When do such changes become sufficiently significant to require certification to start from scratch? How much stretch or increase in wing area or increase in power is too much where grandfather rights are concerned? And how far can you reduce seat pitch before the evacuation demonstration carried out years before on a different size of aircraft becomes invalid?

The demand for the lowest possible price is also reflected in the training requirement. We now have a race to the bottom, where every aircraft is sold with a package of training that is deemed to be the minimum needed for safe operation – for example, the differences training package allowing you to extend your Type Rating to the MAX can be as little as 4 hours of CBT. Do we really think, given the complexity of modern aircraft, that we should be training to the bare minimum standard? Is the Type Rating system fit for purpose? Do manufacturers end up retaining handling peculiarities in new designs simply to reduce the training bill? Do you stick with a system that has been in use for years when there are better, modern alternatives?

In all the above there are commercial realities at play; if aircraft are too costly to procure and train for, the orders will simply not be forthcoming. Someone has to pay for it in the end (the passenger), and the operators must of course ensure they don't price themselves out of the market. The bottom line is that operations need to be efficient and safe. If the demands of the shareholder mean that safety is in any way compromised, we have the wrong shareholders engaged in our industry. The Lion Air accident is likely to become seminal in safety terms and, hopefully, the questions it poses will be given serious consideration.

Taking Responsibility

by Jacky Mills, Chairman UKFSC

In today's increasingly busy world with multiple pressures and responsibilities facing us each day, it is perhaps unsurprising that colleagues may keep their heads down and concentrate on doing their own jobs efficiently, without taking time to look at the bigger picture of what is going on all around...

This is not driven by an uncaring or unprofessional attitude, but more likely by colleagues working towards tight deadlines and feeling therefore, that priority cannot be given to any tasks which are not near the top of their 'essential tasks' list.

Commercial pressures are undoubtedly common place in airlines and achieving good statistics for OTP (on-time departures) is what keeps aircraft flying (punctually) around that world. Whilst we applaud efficient operations an important part of the job relies on colleagues managing that commercial pressure, so as not to miss any safety checks inherently required in everyday operations.

League tables are continually published so that travellers, especially the corporate and business passengers, can favour the airline with the best OTP results. Credit should be attributed to the sterling efforts of the ground handling team and other colleagues who attend to the aircraft during the departure and turnaround phases, alongside the great efforts of the flight and cabin crew. Good OTP results being achieved hand in hand with a good safety record is a very worthwhile team goal.

Operational efficiencies can be attributed to how the airline treats the issue of safety and their safety program; an attitude of 'Safety First' led from the top down and which permeates through the airline. Adopting strategies which have safety as their focus and which effectively manage potential risks will certainly contribute to their overall performance.

The importance of all colleagues involved in the dispatch of a flight working together as One Team is highlighted in a serious incident which occurred at Auckland New Zealand in October 2017.

The Airbus A320 was being operated on a scheduled international passenger service from Auckland to Sydney. After departure whilst climbing through FL150 ATC advised the flight crew that they believed a misplaced clipboard and paperwork may have been ingested into the right engine. They were also advised that a piece of sheared metal had been found near their earlier parking position. It was decided to return to Auckland where an inspection found paper throughout the engine and minor damage.

An investigation was carried out by the Australian Transport Safety Bureau (ATSB). The investigation found that about 10 minutes prior to departure from the parking gate, an employee of the airline's Ground Handling provider, the Loading Supervisor, who was responsible for supervising the loading of the aircraft hold, had put the clipboard with the paperwork attached to it, in the right engine inlet. He had done so after putting the last container onto the aircraft to avoid the clipboard getting wet and blown away by the wind, intending to retrieve it later. However, he had subsequently gone to the flight deck, given some paperwork to the flight crew and then prepared for the imminent pushback.

Simultaneously, the Dispatcher had cleared the ground and servicing equipment from the vicinity of the aircraft and carried out a duty of care walkaround. During this walkaround she had noticed the clipboard residing in the right engine but took no action, assuming that the Loading Supervisor would return to collect it.

The subsequent engine start was completed normally, but as the aircraft started to taxi the Loading Supervisor realised that the clipboard and paperwork were missing but thought initially that the Dispatcher had it. When this was found not to be the case, they returned to the aircraft's stand and found paper debris on the ground.

The Dispatcher and Loading Supervisor then asked their Operations to contact the flight crew of the departed aircraft, but 12 minutes after the Loading Supervisor realised he could not locate the clipboard the aircraft took off.

As the aircraft was climbing through FL150 with no abnormal aircraft indications, a call was received from the Auckland Approach Controller asking the flight crew to contact the Auckland Ground Controller direct. It was then that the Captain was told that the ground crew had lost the clipboard and paperwork which had been placed in the engine inlet and that paper debris had been found on the apron where the aircraft had stood after starting their engines.

Following a call to the Company Engineer and learning that a piece of sheared metal had been found in the vicinity, the Captain decided to make a precautionary return and landed back after an

hour airborne. A subsequent inspection by Company Engineers found minor damage had been caused to one engine fan blade and to the fan case attrition liner.

The investigation found that the Loading Supervisor would normally use a metal box on the pushback tractor's loader for sheltering such paperwork in case of adverse weather, but on this occasion the pushback tractor had not arrived when the Supervisor placed the clipboard on the engine nacelle.

The Loading Supervisor subsequently stated that he had not felt any pressure to rush the departure. The Dispatcher stated that she had not viewed the clipboard as a 'foreign object' as it belonged to the Loading Supervisor and the assumption had been made that he would retrieve it prior to engine start-up.

There was no guidance found in the Operators Manuals on how paperwork was to be prepared and managed by the ground crew during adverse weather conditions.

The contracted Ground Handler also conducted their own internal investigation which found that the Operators Manual detailed the Dispatcher's responsibilities when conducting a duty of care walkaround. There was no explicit requirement to check the engine cowlings/intakes for foreign objects, but the Manual did state that all Ground staff operating near an aircraft which was due to depart, must constantly be on the lookout for abnormalities, which must be reported to the Supervisor prior to departure of the aircraft.

It was also found that there was no documented procedure by which the Ground Crew could contact the flight crew in the event of a non-normal or emergency situation, either before or after the aircraft had departed.

The Operator took several Safety Actions following this event by updating the aircraft dispatch procedures, which included: a specific warning about not placing items in the engine cowling, improved detail around checks and responsibilities, a section on emergency and non-normal procedures, and details of methods for re-establishing communications between ground crew and flight crew.

This Serious Incident could have culminated in a far worse outcome with the potential loss of an operating engine. The root cause was Human Error – an inadvisable act – placing the clipboard in the engine inlet - followed by a lapse of concentration by a Ground Crew member – forgetting that the clipboard had been left in the engine. Unfortunately, the error was not trapped when there was an opportunity to do so - the Dispatcher assumed the Loading Supervisor would retrieve it – so the final barrier was not effective.

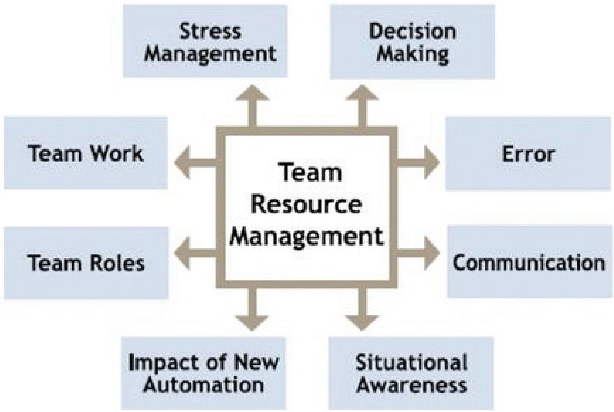
The investigation found a weakness in Ground Operations procedures, particularly in communications. But would the enhanced procedures prevent this, or a similar event, happening in the future? I fear not. Perhaps a procedure explicitly stating that no items should be placed in the engine inlet would have prevented the offending items being left there, but somehow, I doubt it. Does it really need to be spelt out that items should not be left on an engine inlet just prior to it being started? Sharing this incident with colleagues and industry as a whole may help prevent a repetition, a great example of how everyone can learn from another's unfortunate (and undoubtedly embarrassing) error.

The important barrier which could have prevented this incident was, of course, Teamwork. Working as One Team, supporting other team members. In aviation, as in other walks of life, many operations are team affairs with no one person being responsible for the safe outcome of the task – dispatching an aircraft is a good example of this. Team members must rely on their colleagues and often other contracted personnel and of course, give others their support. Teamwork consists of many skills that each member of that team needs to understand and employ for a safe and efficient outcome.

Some teamwork skills are obvious – others not quite so. Leadership and followership, effective communication, building trust, motivation of one's self and others, and encouraging other team members are all important. To create an effective team, it is necessary that issues are discussed, clarified, agreed and understood by team members, hence the importance of a comprehensive but easily understood Operating Manual, as the start point for each team member's responsibilities. The team goal must be clearly defined, how to communicate – not always straightforward when headsets and personnel sat way above in the flight deck comes into play.

Each team member's limitations and boundaries are important, as well as individual expectations and concerns, memorised Emergency Procedures are invaluable on the day when they are required. Does everyone know what a successful outcome looks like, or is there some misguidance caused by perceived or actual commercial pressure? Do debriefings take place so that all team members can learn from the little things that affect their working life every day? Do team members feel they can ask for clarification when not sure, or do they feel 'they should know that...' Is the team's effectiveness improved by thoughtful selection of team members to provide a good range of skill sets, and importantly, experience? Or is the team made up of whoever was available, in which case teamwork training becomes even more important?

Great teams don't just happen, a great deal of thought and behind the scenes effort goes into successful teamwork. But it is inherently possible and so worthwhile.



Aviation has for a long time now delivered Crew Resource Management (CRM) training to its flight and cabin crew members, with great results. There is a lot of evidence that these programmes have been successful in reducing accident and incident rates. A number of Operators have realised that extending similar training to all colleagues as Team Resource Management (TRM), will also deliver great results. Embracing these principles in the wider context of Safety Management, defends aircraft operations against common causes of system failure.

TRM is defined as 'Strategies for the best use of all available resources – information, equipment and people – to optimise the safety and efficiency of the operation' – just like the CRM principles. TRM is based on the realisation that many operational incidents could be traced back to failures in human performance and teamwork. Effective TRM utilises the best use of all available resources in support of a safe and efficient operation which reduces both the incidence of error and, importantly, the consequences of residual error.

A focus on TRM will improve the functionality of any team – it inherently increases the awareness and understanding of interpersonal behaviour and human factor capabilities as they are likely to affect operational safety. All big words for understanding how we can all make the day safer by watching each other's backs. Which affects everyone of us whatever the role may be.

TRM also has some benefits which may not be immediately seen as safety related – enhanced efficiency – enhanced stability of the team – enhanced sense of working as part of an efficient team and, therefore, increased job satisfaction. Win, win, win.

Successful teamwork is often referred to in CRM training as when the output of the team is greater than that which would be achieved by the individual output of team members acting in isolation – this is known as synergism. This is achieved by the interaction of team members where each individual is both empowered and encouraged, to contribute in the most effective way to the overall task of the team. This is only likely to be achieved of all team members fully understand their role in the group, and how this may change depending on different circumstances; which relies on effective communications along with a high degree of situational awareness.

Which brings us to ask are the team members acting as a 'Safety Presence' or a 'Safety Passenger'?

We have already looked at how beneficial it is to work as a team to keep ourselves and everyone else safe in a potentially hazardous environment. But it is also important to guard against the onset of the 'Normalisation of Deviance' which is defined as undesirable or 'short cut' actions becoming routine because 'it makes the day easier'...

It is important that if we see a short cut being made or evidence of that 'normalisation of deviance' something should be said. It is easy to assume that the other team members knows what they are doing, as we have just seen in the serious incident of the misplaced clipboard. However, at this potentially crucial moment, it is vital not to surrender our responsibility for safety to someone else. This opens up the risk of becoming a 'Safety Passenger'.

Every team member brings their own unique perspective on safety, whether this is done consciously or not. Everyone counts when it comes to safety and each team member understanding how important they individually are, makes that team so much stronger. Each and everyone of us can make such a difference, being present and taking responsibility, can halt that deviant behaviour that may have become commonplace without other colleagues even thinking about it.

It is so worthwhile being an effective team member, and in doing so, earning the respect of all of that team. It is also seriously worthwhile for the management to invest in their teams, arrange for them to experience Team Resource Management training, open everyone's eyes to the obvious that is going on around them, and enjoy the rewards of a great safety culture. Everyone likes to know that someone has their back!

Human-Machine Collaboration: Fight Or Fly?

by Giusy Sciacca

The interface between humans and machines is critical in all aspects of work and life, and so it is in air traffic control and aviation. Rapid changes in technology require more of controllers than ever, in operation and in design. How should controllers approach this new age? Giusy Sciacca discusses some of the issues.

Key Points

1. Technology is here to stay, and will become increasingly sophisticated.
2. There is a need to address controllers' and other users' concerns about technology.
3. Technology and people are interdependent and need to work in collaboration.
4. The involvement of users in design and development via system integration is needed to optimise human-machine cooperation.

In the last few decades, aviation has undergone a process of automation, which has transformed human work irreversibly and improved system performance, including both efficiency and safety. As a result, the topic of automation is still widely debated at all levels during conferences and workshops, and in many publications.

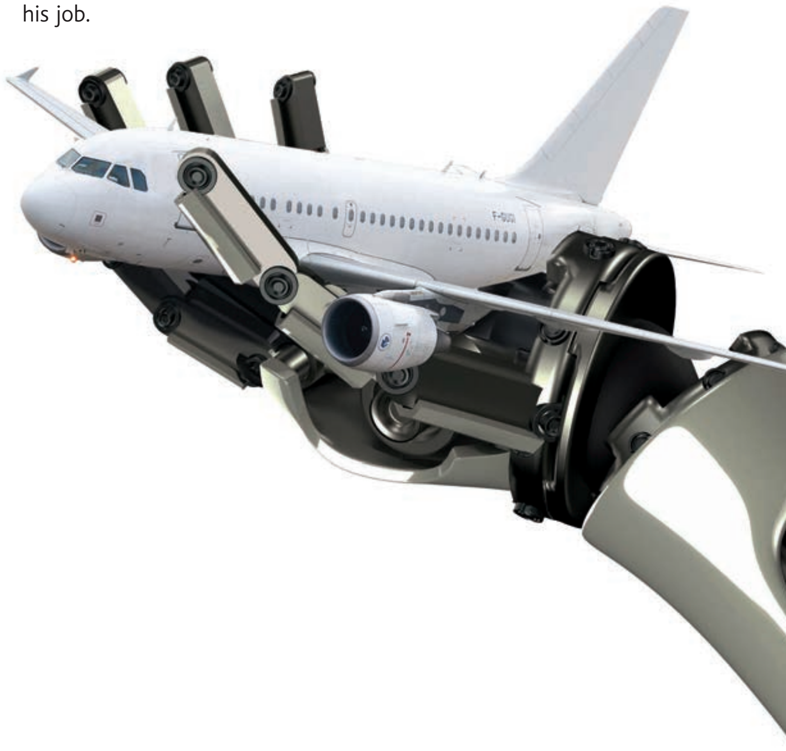
As for air traffic safety – the focus of HindSight magazine – we must continue to discuss the future of automation, including the impacts on users: air traffic controllers, pilots and other personnel. What do users and other stakeholders need from automation tools? How is automation designed and introduced? What is the reaction in the ops room when new technologies are introduced?

Often, in the process of introducing automation, reluctance and resistance emerge, along with general and specific concerns. In amongst these fears is the fear of unwanted changes to the job, and even fears of loss of the role of air traffic controller, at least in a form that we would recognise today. How can this be mitigated? The answer could be to help controllers overcome some of the myths related to automation, to dispel fears, and to underline the importance of the human role. This might help to move forward from polarised 'user-centred' vs 'technology-oriented' philosophies, toward a new paradigm.

The first question is, what is technology and why do we need it? "The word 'automation' as a noun captures a complex blend of technology interacting with human operators, each carrying out a wide range of tasks, in support of human goals". This is how automation is defined in the UK CAA guidance document *ATM Automation: Guidance on human-technology integration* (2016). Complex technology is not just a machine. It is more like a living organism, which adapts to the context. It should not be seen as a tool to remove humans from the system, but instead to empower them, ensuring that controllers are always in the loop.

The digital revolution has changed our lives and the impact of technology has been disruptive. Just as Facebook and Amazon are changing the old business model, we could look at ATM in the same light. In the old days, air traffic controllers used to carry out their jobs using a clock, a pen and a piece of paper. Now, we are moving towards remote towers implementation, virtualisation, immersive technology and augmented reality, and intelligent approach.

The second question is, what is an operator and why do we need operators? The operator can be defined as a human being with technical and non-technical skills to utilise data (partly derived by technological systems) in order to accomplish the tasks of her or his job.



To operate these systems, the systems must be easy to understand and reliable. Operators should be able to understand not just how to operate technology, but also underlying system logic, functions, modes and design. This might involve customisation and adaptation in response to pragmatic needs.

In many cases it is not possible to think that one solution fits all. One suitable example could be radar surveillance interfaces or remote towers. When a radar interface is introduced, colours and labels play a significant role. During the remote towers live trials all over Europe, controllers reacted, conveying those adjustments and features they considered useful to work in accordance with their 'conventional' experience. Sometimes, for instance, the use of speakers to provide the sound of aeroplanes was considered helpful to enhance their virtual presence in an airport remotely located.

technology and humans do not work alone and neither can work independently.

Understanding the mutual adaptation and interdependence between technology and controllers would help to overcome some of the myths about automation. Bradshaw, et al (2013) elucidate 'The seven deadly myths of autonomous systems':

- **Myth 1:** 'Autonomy' is unidimensional
- **Myth 2:** The conceptualization of 'levels of autonomy' is a useful scientific grounding for the development of autonomous system road-maps.
- **Myth 3:** Autonomy is a widget.
- **Myth 4:** Autonomous systems are autonomous.
- **Myth 5:** Once achieved, full autonomy obviates the need for human-machine collaboration.
- **Myth 6:** As machines acquire more autonomy, they will work as simple substitutes (or multipliers) of human capability.
- **Myth 7:** 'Full autonomy' is not only possible, but is always desirable.

Several of these are of particular relevance to collaboration. Technology and humans do not work alone and neither can work independently. They both perform collaboratively to the same purpose. No agent, whether machine or human, can perform all functions all of the time without implying some interdependencies with another agent. Automation changes the nature of work.

For instance, inevitably, automation fails at same point. In such 'extraordinary' situations, which tend to be unpredictable by nature, human reasoning and problem solving is irreplaceable. Through both technical and non-technical skills, the operator plays the role of a creative strategist who – within the regulatory framework – is able to provide the flexibility needed to keep the system going. During radar failures, which have occurred in Europe in recent years, controllers faced challenging moments with a remarkable effort and competence using all the means at their disposal to preserve safety.

Referring to Rasmussen's (1983) S-R-K theory of performance, human activity is based on skills, rules and knowledge. Our conceptual and physical performance at work is then based on professional education, continuous training, knowledge of codified procedures plus additional experience, deriving from our cultural and personal background, judgement and our non-technical skills (NTS). The human component of the system makes the system resilient. Via continuous interaction with the automated systems, operators employ both standard rules to achieve a level of standardisation in certain defined situations, and reasoning and cognitive strategies to manage variability through flexibility.

This is what we do every day in our operational rooms, where we operators face minor or major unpredictable events. Inaccurately, we tend to think about major failures only, disregarding the everyday adjustments and actions that we take. For example, if as a controller you work in a paper strips environment and your strip printer or the Flight Data Processor (FDP) breaks down during the peak of traffic, you have to copy the flight data manually. Or in the case of bad weather conditions, predictive tools, such as mid-term conflict detection (MTCD) and tactical controller tools (TCT) may not be sufficient to solve potential conflicts.

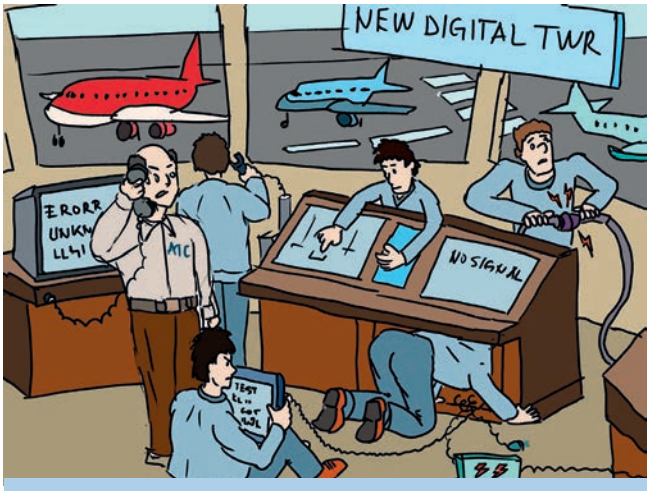
Consider also the extended arrival management (E-AMAN) concept, developed as an automated sequencing tool, especially for busy terminal movement areas (TMA), relying on target times. Again, in bad weather conditions, such planned operations would be inapplicable in the operational reality. Likewise, operational opinion must be taken into account by the industry about the future optimisation of controller-pilot data link communication (CPDLC) in the effort to find a long-term solution to the issues of the current system based on Link2000+.

So, to reduce the distance between advanced automated systems and human operators, especially during out-of-the-ordinary situations, automated systems and interfaces must be understandable and accessible. An interactive and iterative cycle for software engineering and interface design is needed, involving manufacturers, engineers, users and also legal experts, with reference to legal liability. This must ensure that tools meet user needs. Only via cooperation between these worlds can the air traffic control system achieve optimum performance.

Interdependence is therefore needed, to encourage a cohesive approach where humans and automation are conceived holistically, as an integrated system engaged in joint activity. Our professional life is not immune to change, and indeed we need to adapt to the technological evolution in order to survive as controllers.

How can we face this disruptive change? The conventional approach might lead us to the perception of change as loss, and to resistance or passive acceptance. The alternative option is to see change as a continuous evolution of already acquired skills and the development of new ones. Such an approach is crucial in the process of technological implementation in ATM, because the active participation of operators enables innovation from regulatory, procedural and design (including human factors and ergonomics) points of view.

If we controllers are to survive as a species, we must help to co-design the human-technology collaboration through the design and development process, and play an active part in system integration. As Charles Darwin reminded us, survival depends on being responsive to change.



"Another technician?! Put him into the hold!"

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CHIRP
Reports for FOCUS

Stopbar Usage

Report Text: I have been operating intermittently over the last 6 months in and out of [airport], being based elsewhere. I have noticed there is little or no use of the stop-bars by ATC, with no NOTAM to indicate they are inoperative. This has been observed on multiple occasions with multiple different controllers.

There have been numerous times I have been sat at the holding point with no clearance to enter the runway and the stop-bar not illuminated, for example one occurrence - with an aircraft on the runway waiting to take-off, one on final, with us at the holding point and no usage of the stop-bar.

Another example, potentially more serious, being given a conditional clearance to line up 'behind the landing 737 line up and wait behind' with again no usage of the stop-bars.

Although I have seen it over the last few months in [airport], it is the height of summer and the airport is very busy, so it is concerning me more.

Although I am not aware of a stop-bar not being on at [airport] contributing to a runway incursion I feel it is only a matter of time.

Lessons Learned - I would like to know if it is [airport] procedure not to use stop-bars what the reasoning behind it is or perhaps an issue with their training/checking.

ANSP Comment: The ANSP advises that stop-bars are used at the airport in runway safeguarding conditions, LVPs and at night. It is not policy to use conditional clearances associated with aircraft using the runway i.e. they don't issue conditional line-ups but these are not a significant safety hazard as conditional line-ups are used at other airports, with or without the use of stop-bars.

Airport Operating Authority (AOA) Comment: The AOA advises that it is not its policy to operate stop-bars 24 hours a day. The airfield infrastructure does not include stop-bars at every runway hold and this was a big factor in the decision making as to whether to implement the policy as it would first require a large scale investment in stop-bar installation. It has been considered through the Local Runway Safety Team (LRST) and safety governance committees but when combined with other mitigating measures such as LVP policy and Runway Incursion Monitoring and Collision Avoidance System and when considered against our record of runway incursions and associated contributory factors, the risk has been assessed as acceptable. This is kept under continuous review.

***CHIRP* Comment:** Airport Operators have a responsibility to manage their risk and this Operator has clearly made its risk assessment. The rationale behind the selective use of available safety barriers should be recorded in the Unit's SMS to provide an audit trail. CHIRP's view is that the installation and 24-hour use of stop-bars at all runway access points is good practice and should be the aim of all airports operating commercial air transport. This view has been communicated to the Operator.

Pressure to extend Duty Time when away from base

Report Text: I completed a four sector shift at my home base and was rostered for ground transport to another base for a duty the next day. My company failed to organise me appropriate transport despite me having requested it 3 days earlier, then again 1 day earlier. I was offered a 5 stage public transport journey which would have given me over 14 hours duty which I did not take. After keeping me at the airport for several hours I was asked to get into a hire car and drive to the other base which would have again given me a duty time easily in excess of 14 hours. I questioned the safety of the drive but was told that it was all within limits and it had to be done. Eventually delays at the hire car centre meant that I would not have been able to operate early enough the next day so I was stood down. During this process I was contacted by two senior managers who put me under significant pressure to make the journey and had no issue with the extended duty time.

Lessons Learned - Out of base operation is becoming more commonplace and driving (either your own car or a hire car), is the normal method of ground transport. Due to the aggressive management style it would be very difficult for any pilot to refuse to drive between bases after a long duty even if he or she might feel that they are too tired to safely make the journey. How can a pilot who would be considered unsafe to operate an aircraft after exceeding Flight Duty Time limits, be expected to drive a car and risk his own safety and the safety of other road users. My suggestion would be to introduce some duty time limits for self-drive ground transport.

***CHIRP* Comment:** The reporter's suggestion of time limits for post-FDP self-drive ground transport could be impractical as the nature, duration and complexity of the duties could vary enormously. Although this reporter considered the public transport option to be inappropriate in the circumstances, public transport or taxis should be options for those occasions when pilots feel too tired to self-drive. If the public transport option does not permit the individual to arrive at the deployed base in time to achieve adequate rest, he/she would be unable to commence the duty for which they had been positioned. Although there are no regulations limiting 'awake time', under EASA FTLs, 'all time spent on positioning shall count as duty period'. This means the operator has a responsibility for the safety of the employee; this responsibility lies in addition to the employer's duty of care under Health and Safety Regulations. Elsewhere in the industry there are examples of good practice. Some operators do not permit self-drive positioning after a FDP. Others, notwithstanding the clear distinction between self-driving to one's home/chosen place of rest and self-driving at the behest of an employer, go as far as providing hotel accommodation for employees who declare themselves too tired to drive home on their normal commute. Under any circumstances it is inappropriate to pressure anyone to drive if they declare themselves too tired to do so safely. This information has been conveyed to the operator concerned.

Inappropriate Operational Flying Training

Report Text: As PM in LHS under command training I was monitoring the approach. At an intermediate stage it was obvious the Training Captain was getting high on the Approach. I pointed out the divergence and suggested some action to get us back on profile. We eventually got back on the Glideslope with an intercept from above required. The divergence was around 5000ft to 2500ft AGL, but on an approach with significant terrain constraints, although good VMC on the day. The worst case deviation was 1 and a half dots high on the Glideslope. The approach was stable again probably around 2000ft. On the ground it was explained that the Training Captain was seeing if I'd intervene and how I would do it. I found it uncomfortable that he had deliberately flown a poor approach just for training value with a full load of passengers and crew. I realise there has to be an element of intervention training and assessment in the course, but we cover this in the simulator and during our ground training, so why are aircraft being flown in this manner with passengers on board?

Lessons Learned - I'm now very wary on every approach being flown by a Training Captain to see if there's an attempt to distract me or see if I don't update the Crew SA in relation to the progress of the approach. I suppose to that extent the training has been successful, but I question whether this is the appropriate environment for that element of the training. I feel all of this type of training should be done in the simulator and on the ground with case studies.

Operator Comment: We thank the reporter for raising the issues, although we would have been equally receptive to a direct approach where we might have learnt more about the specifics of his/her concerns. As the reporter points out, the instance referred to was conducted in VMC and above 2500 AGL. The Training Captain responded to the reporter's intervention and recovered the glideslope with an appropriate technique.

[Company] policy states that the trainer should act as a competent, friendly co-pilot lacking in initiative. No deliberate errors should be made however if the aircraft is positioned high on the approach the recommendation is to give the trainee time to notice and give guidance to resolve the issue. This allows the trainee to demonstrate effective monitoring and intervention.

The skills of effective monitoring and intervention are indeed trained and assessed in the simulator phase of a command course and discussed prior to the commencement of the course, as suggested by the reporter.

To be successful during a command course, a candidate must be able to demonstrate an ability to monitor, intervene and manage the operation within the normal range of scenarios that will naturally be encountered in normal line operations. It is made clear to our trainers during their line training course as detailed in the [Ops Manual - Training], that they should avoid excessive role play or in any way jeopardising a safe operation.

***CHIRP* Comment:** The question of how far an instructor/check pilot should go in role play is as old as aviation and it is hard to be certain whether minor deviations are deliberate or inadvertent.

For a historical perspective, we recommend reading 'Fate is the Hunter' by Ernest K Gann which describes the author's own pilot experiences beginning in the 1930s flying DC-2s and DC-3s. One Captain, keen to test his co-pilot's ability to operate under pressure, would strike and hold lighted matches in front of the co-pilot's face while the poor sweating co-pilot flew instrument approaches in IMC. I wish we could get hold of that Training Manual!

Airspace Restrictions

Edited Report Text: Commercial revenue flight being conducted within Heathrow and Thames CTRs during Restriction of Flying Regulations with permission to enter RA (T) received the evening prior to flight. Relevant notice of Restriction of Flying Regulations included a limit line for arrivals and departures to/from EGLW (London Heliport) running North/South through Battersea Bridge (para:5g) giving an unreasonably small area for aircraft to avoid high cranes and buildings on both banks of River Thames whilst manoeuvring to final for EGLW unless excessive descent rates were used.

Lessons Learned: Consultation and planning with reference to restrictions imposed for such an event with regard to actual aircraft limitations and obstructions that would conflict with flight safety when adhering to restrictions.

***CHIRP* Comment:** Battersea Bridge is the 'normal' eastern extent of a SW approach to the pad (whether restrictions are in place or not). A formal restriction to go no further than this should not be that unusual. Depending on conditions, the approach can certainly be demanding and definitely requires forethought to avoid embarrassment; however, the risks associated with this are mitigated by the requirement for all pilots using Battersea to have completed familiarisation training before being added to an approved list (held at the heliport).

The CAA advises that the Airspace Restrictions were put in place on the grounds of National Security as are many others that employ these restrictions such as Trooping the Colour and Remembrance Day events. This specific caveat has been in place for many years and has been retained to enable London Heliport at Battersea to continue operations without impacting on the security operation that is in place for each of the events for which RA(T)s are implemented. London heliport ATC is copied in to the documentation and has never questioned the criteria nor has the heliport operating authority. In all events it is the aircrafts' Captains that are responsible for adhering to the airspace restrictions and if they cannot safely operate in compliance with the conditions then they should not allow mission creep to compromise safety. Obviously the restrictions do not apply to HEMS, NPAS and, now MCA so emergency and security agencies are not limited to such conditions.

The British Helicopter Association advises that the restriction leaves sufficient manoeuvring room for an average pilot to pass abeam the Heliport at 1000ft and decelerate prior to commencing a descending right teardrop onto the southerly approach heading. The secret is to decelerate first so a reasonably tight turn radius is achieved to keep within the bounds of the river. It has the additional bonus of reducing any 'blade slap' and therefore decreasing the noise footprint.

Although this report will not result in any changes to the airspace restrictions imposed for security reasons, periodically reviewing long-standing procedures is good practice and we are grateful to the reporter for raising this issue.

Abuse of the Distress Frequency

[Note this report has already been published in FEEDBACK Edition127; it is reprinted here because further information is available from the Distress and Diversion Cell and Eurocontrol]

Report Text: It is now a regular occurrence when monitoring 121.5, particularly (for example) in Holland, France and Germany that individual(s) are transmitting obscenities and disgusting noises on 121.5. One can only assume that they seek attention. It has occurred in several different geographic areas indicating that it is flight crew. Anecdotally colleagues have indicated that it is only a few individuals and that they are single pilot commercial operations.

The writer has reported this to the area control frequency being worked at the time but our European ATC colleagues seem unwilling to take action.

We are instructed to always monitor 121.5 by company but this is extremely distracting not to mention dangerous behaviour when someone genuinely in distress will be deprived of immediate contact.

All agencies must act to identify such unprofessional behaviour.

***CHIRP* Comment:** In addition to blocking the channel for distress messages, abuse of 121.5 prompts pilots to turn down the volume and thereby removes a safety barrier in the event that communications are unknowingly lost with ATC. French authorities have been heard admonishing someone for transmitting inappropriately on 121.5 but it is not clear whether the inappropriate transmissions were being made from the air or the ground. Transmissions from the ground are unlikely to be heard by ATCUs unless the transmitter is close to an ATC receiver. NATS controllers do not receive reports from pilots about abuse of the frequency and NATS does not monitor 121.5 as this is done by the military-run Distress & Diversions (D&D) Cell, co-located with NATS at Swanwick.

The D&D Cell does not hear foul language on 121.5. Occasionally – less than once per week - there is horseplay, requests for football scores or music. The ability to triangulate the sources allows the D&D Cell to advise perpetrators that they have been identified, which normally results in the transmissions ceasing. The D&D Cell also hears pilots expressing frustration at the use of 121.5 for practice emergencies including, in a recent example, attempts by pilots in the Paris area to block the Practice Pan transmissions.

EASA and Eurocontrol are aware of the reported issues on 121.5 and Eurocontrol periodically publishes reminders about the need for self-discipline; it will do so again in response to the CHIRP report. However, Eurocontrol regards the issue as one that requires action by individual nations. Unfortunately this is appears to be one of those issues that everyone knows about and has learned to live with. Occasional reports will not raise the profile sufficiently to prompt action by national authorities; it will require pilots to report abuse and distraction each and every time it occurs.

The tendency of pilots to turn down the volume on 121.5 to minimise the distraction of practice emergencies, increases their vulnerability to prolonged loss of contact by ATC and, in extremis, interception. It would be desirable to have a VHF practice emergency channel similar to the one on UHF (243.8). Should the associated infrastructure (for triangulation etc) prove too expensive, an option worthy of investigation would be transferring the UHF/243.8 infrastructure to a spare VHF frequency; this should not unduly inconvenience the military users since all military aircraft were equipped with both VHF and UHF radios. CHIRP will write to the Military Aviation Authority.

Restricted Zones: A Game of Drones

by Chris Birks and Edward Spencer, Holman Fenwick Willan LLP

For 36 hours between 19 and 21 December 2018, the Christmas travel plans of 140,000 passengers were thrown into chaos by a series of drone sightings at Gatwick Airport. Due to the threat that drones pose to commercial aircraft, all flights at Gatwick were grounded in the biggest UK flight disruption since the volcanic ash incident of 2010.

Less than a month later, flights were temporarily halted at Heathrow Airport due to another drone sighting.

Such widespread disruption, and the threat of the same thing happening again, have many passengers wondering what their rights are in relation to flight delay and cancellation due to drones. Those rights are set out by EU Regulation 261/2004 and corresponding caselaw.

Compensation

The most well-known remedy in the Regulation is fixed compensation pursuant to Article 7. However, this is currently not payable where a delay or cancellation is caused by a drone because a drone incursion would inevitably constitute "extraordinary circumstances", for which there is a carve-out in the Regulation. The reasoning is that such an event is outside of airlines' control and is not inherent to the normal exercise of the activity of an air carrier.

Care and assistance

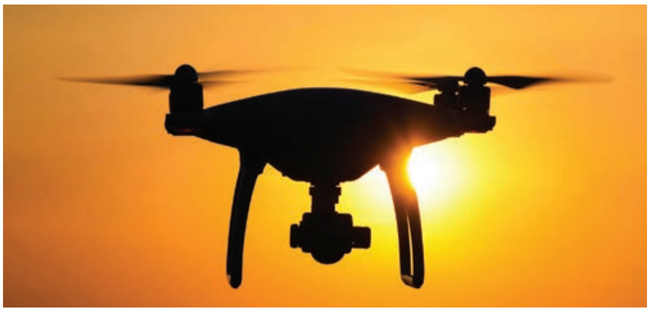
Nevertheless, under Article 9 of the Regulation, airlines must provide care and assistance to passengers affected by cancellations and delays, regardless of what has caused them. The obligation is triggered after between two and four hours' delay, on a sliding scale depending on the distance to be flown.

Whether a flight is delayed or cancelled, airlines must provide meals and refreshments in relation to the waiting time, and, where a stay of one or more nights becomes necessary, both hotel accommodation and transportation to and from the airport and hotel. Passengers must also be offered two telephone calls, telexes, fax messages, or emails, free of charge. There is no monetary or temporal limit to this obligation, and care and assistance must be provided to passengers until they are able to depart. Complying with this obligation was very costly for airlines during the volcanic ash chaos in 2010.

Reimbursement or re-routing

In addition to care and assistance, passengers whose flights are delayed for longer than five hours are entitled, under Article 8 of the Regulation, to reimbursement of the full cost of the ticket and a return flight to the earliest point of departure at the earliest opportunity. Again, this entitlement arises regardless of the cause of the delay so it would be available to passengers in the event of drone disruption.

If the flight is cancelled, then in addition to care and assistance, the passenger will be entitled to choose between reimbursement along the lines set out above, or re-routing under comparable transport conditions either at the earliest opportunity or at a later date at the passenger's convenience. Passengers must be given both options. When offering re-routed flights at the earliest opportunity, this should be the next available flight to the passenger's final destination, in the same class of cabin, regardless of which airline is operating the re-routed flight. If airlines can re-route passenger on the same day, then it can use its own services. Where this is not possible, they must look at available options with other airlines. If a passenger chooses to be re-routed at a later date that is convenient to him/her, then the airline's obligation to provide care and assistance ceases.



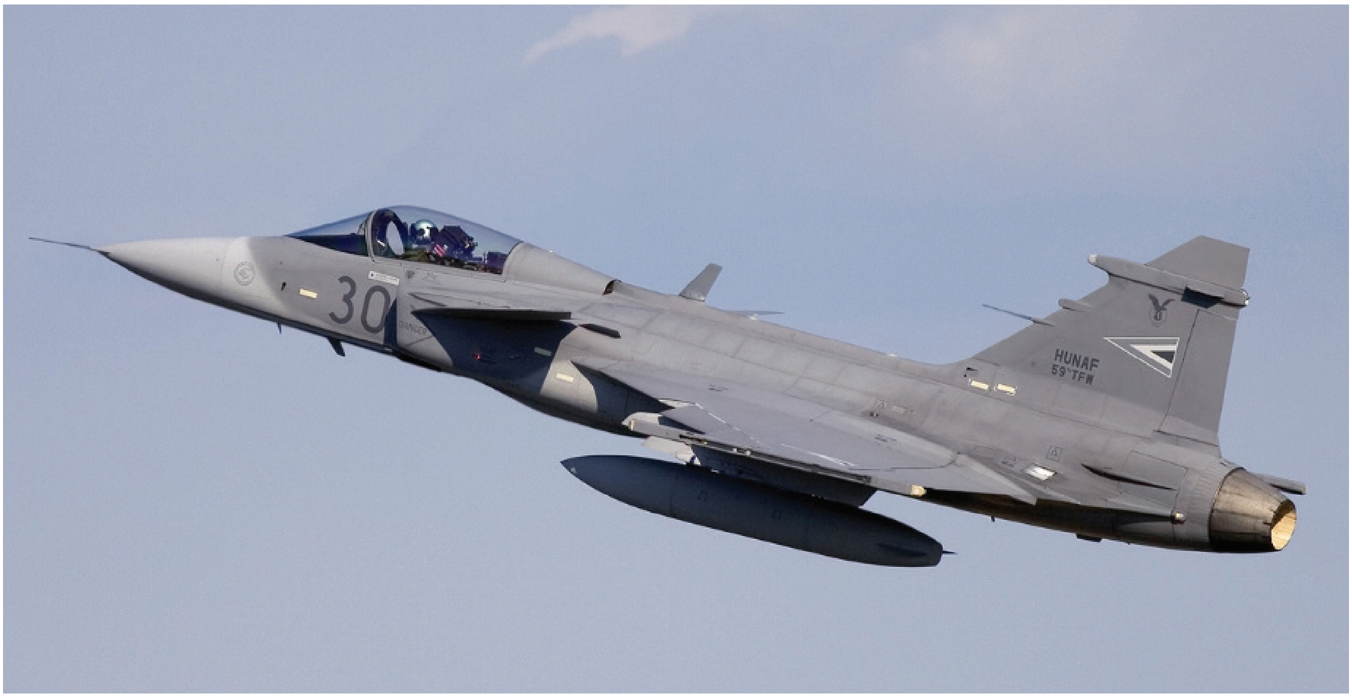
Where next?

With the soaring popularity of consumer drones and the difficulty of monitoring and preventing drone activity around airports, this is probably not the last the UK has seen of disruption to commercial aviation due to drone incursions.

On the other hand, both UK airports and the UK government are devising ways of slowing the rise of drone incursions. UK airports are rapidly adopting state-of-the-art detection and interdiction technology, some of which is already in use by the military. Meanwhile, in response to the 'Future of drones in the UK' public consultation published in late December last year, the government has announced its intention to introduce legislation that increases the exclusion zone around airports from 1km to 5km, and hand the police new powers to land, seize and search drones. The increase in the exclusion zone is an important step forward because aircraft landing using an average three-degree glide slope would be below the maximum 400ft drone height outside of the current 1km restriction and therefore at risk of a mid-air collision with a drone. From November 2019, drones weighing between 20g and 250kg will have to be registered, and operators will have to complete an online drone competency test.

That said, where drone use is malicious (as seems to have been the case at Gatwick), legislation will do little to deter those intent on causing disruption.

Hungary to Talk - A Captain's Account



It's the height of Summer and you're heading through central Europe. We all know what the airspace can be like heading that way, you pass from one ATCU to another, and not necessarily at the boundaries that coincide with the airspace charts. It can be quite hard to keep track of at times and the frequencies are busy. You've been with your current ATCU for a short while, they issued you a climb to your final cruise altitude a little while ago, but no further communications have been directed at you. Suddenly your peripheral vision catches movement on your LHS & you turn to look out the DV window. Your heart skips a beat as you realise that a fighter jet has just pulled up alongside you. Firstly, your brain hopes that it's a drill that you have not been made aware of, but it quickly becomes apparent that you have somehow lost contact with the correct ATCU unit.

This was the situation that developed recently for myself and a very experienced First Officer. It was subsequently found that we hadn't been handed over by the previous ATCU unit and so had crossed an FIR boundary without checking in with the correct ATCU unit. Although we believed we were monitoring the appropriate frequencies including 121.5MHz, the fighter was alongside us less than 20mins after entering their airspace. We swiftly re-established communication and the flight continued normally with the interceptor aircraft stood down.

How can we help mitigate the risk?

1. Make sure all audio panels have an appropriate volume set, paying particular attention to 121.5MHz. We know that sometimes we turn it down/off due to a rogue ELT or the 'Non-Standard RT' that can be heard on it, so be disciplined with yourself.

2. HF, if available and appropriate, set to Stockholm radio.

3. Use the tools available to you. mPilot is loaded with features to help, load the route and utilise the device GPS position. FIR boundaries are clearly shown here and on the OFP, so if you are not handed over prompt ATC approaching these. Also, a long press anywhere on the mPilot route chart will give you quick access to communication frequencies for that location. It doesn't necessarily have to be the correct frequency first time, ATC are usually happy to help.

4. Have an idea of the intercept procedure and know where to find it quickly after your initial actions.

5. Be wary of distractions. The Cabin Crew have already become more aware regarding access to the flight deck in the climb/descent phase. Be wary of busy airspace and try to schedule your comfort breaks accordingly.

If you are unfortunate enough to find yourself in a similar situation, reach out to the Company as soon as practicable. Inevitably the passengers will have been taking photos or posting on social media. An early heads up helps to prevent what is usually a fairly uneventful story landing in the tabloids the following day without their knowledge. Operations or the Duty Management Pilot should always be available for this.

CPDLC, when available, will help to further reduce the regularity with which this occurs over Europe. I hope these this acts as a reminder that it can occur to any of us – I certainly didn't think it would be me!

Use of Erroneous Performance Data

by Dai Whittingham, Chief Executive UKFSC

Accident reports and studies have frequently raised the use of erroneous aircraft mass and take-off performance data as a causal or contributory factor in accidents and serious incidents across the globe, involving multiple aircraft types.

In February 2016, EASA issued a Safety Information Bulletin (EASA SIB 2016-02[1]) noting that errors induced by flight crew when entering data in the Electronic Flight Bag (EFB) or Flight Management system (FMS) during the flight preparation phase had led to take-off initiation without adequate thrust, or attempted rotation at an airspeed which is too low for the actual aircraft mass, or with insufficient runway length remaining. Errors included the use of an incorrect runway intersection having correctly calculated the data for a different, planned take-off point. In some of the cases investigated there were no further consequences but, in many, the errors resulted either in a tail strike, a collision with obstacles, a runway overrun following an aborted take-off or, in the most severe situations, loss of the aircraft. Intersection departures would appear to be a key precursor for generating erroneous data.

The safety risk arising from the use of erroneous take-off data is widely recognised by regulators. The CAA has established a working group within which the major operators were sharing SOPs, and an education and awareness campaign is being developed. The working group has been reviewing monitoring practices, planning and their link with actual take-off performance.

The incidents summarised below are a sample of the many performance-related events in recent years.

TAP A343, Rio de Janeiro, Dec 8th 2011

A TAP Portugal Airbus A340-300 was departing Rio for Lisbon at night with 255 passengers and 11 crew. Due to WIP the first 1270 metres of runway 10 was unavailable; the threshold had been displaced accordingly. After landing at Lisbon a post-flight inspection found an approach light embedded in the right main landing gear and other minor damage. A subsequent check at Rio showed the aircraft had overrun the runway end and had also hit the ILS localiser antenna.

NOTAMs and ATIS had not offered guidance on taxiway routes for large aircraft and it was not possible for the A340 to enter a taxiway which would have led directly to the displaced threshold. The WIP was shown on the aerodrome charts but the crew did not challenge their taxi clearance or request a change, nor did they recognise their incorrect position when they lined up.

The crew prepared their take-off calculations based on the NOTAMs, using the take-off distance available of 2730 meters. The FO calculated a flex take-off setting with an assumed temperature of +34C, the captain cross-checked and put the data into the FMS.

[1] *https://ad.easa.europa.eu/ad/2016-02*

The crew was cleared to taxi to runway 10 via taxiways EE, M, T and BB. While taxiing along taxiway BB the crew saw taxiway AA crossing, but it was marked with an X, leading them to believe the displaced threshold was at the intersection with taxiway BB. Acceleration was normal but some increased vibration during the last 3 or 4 seconds of the take-off roll was attributed to surface irregularities. Once airborne the crew received a temperature alert for the right main gear and left the gear down for a while to permit the gear to cool down. The remainder of the flight to Lisbon was uneventful.

There was no error in the crew computations and the aircraft was correctly configured, but the investigation found that the crew commenced their rolling take-off about 600 m past the displaced threshold, giving them 2095 m TODA. Airbus later calculated that a flex take-off was not possible from entering the runway via taxiway BB and that TOGA thrust from the start of the roll would not have prevented the runway excursion.

Belair A320, Porto, Oct 1st 2013

A Belair Airbus A320-200 departed Porto runway 17 for Palma Mallorca having lined up for take-off from the intersection with taxiway F but using take-off power settings computed for a full-length departure (TODA 3480 m vice 1900 m from the intersection). The aircraft became airborne without incident and continued to destination.

The (Swiss) investigation found the commander was distracted by external circumstances during take-off preparations and that the operator's procedures meant the take-off data was not fully examined during "before start" checklist; some essential checks were performed in silence.

The crew planned for a full-length FLEX take-off but during the briefing it was observed that the take-off mass was lower than expected and the captain opted for an intersection F take-off. The performance was recalculated and recorded on paper, but entry into the FMGS was postponed as the captain was distracted by a missing passenger issue and had to leave the flight deck to resolve it, returning about 10 minutes later. ATC then provided push back and engine start clearance; the re-programming of the FMGS did not happen even though the FO believed the correct data had been entered.

During take-off both pilots noticed the remaining runway appeared unusually short but no power adjustments were made. V1 occurred 700 m before the runway end and the aircraft became airborne with 350 m of pavement remaining. Near the end of the flight the commander recognised there had been a mistake and reported it accordingly. The investigation noted that the company SOPs did not provide suitable barriers to trap errors of the type experienced by the crew.

Qantas B738, Sydney, Aug 1st 2014

A Qantas Boeing 737-800 departed Sydney runway 34L in gusting conditions rotating at the computed 146 KIAS and was climbing through FL110, when a member of the cabin crew informed the flight deck that she had heard a squeak noise during rotation. The crew levelled the aircraft off at FL280 and initiated the checklist for suspected tailstrike on departure. In the absence of any abnormal indication and after consultation with the airline's maintenance the crew continued to Darwin; an after-landing inspection revealed some paint had been scraped off the tail skid assembly.

The immediate crew review revealed that performance calculations had been made using 66,400kg TOM rather than the correct 76,400kg, a 10-ton error which resulted in a Vr of 146 KIAS instead of 155 KIAS. The resulting early rotation was sufficient to overpitch the aircraft, resulting in the tailstrike.

Both flight crew members were required to enter their data independently into the Onboard Performance Tool (OPT) and ensure results were within 1 knot of each other. On this occasion the captain inadvertently dropped the leading 1 from the fuel figure resulting in a TOM of 66,400kg instead of 76,400kg. The FO computed the TOM correctly at 76,400kg but when transferring the result to the OPT made a transposition error and keyed in 66,400kg. The results matched, hence the errors were not detected.

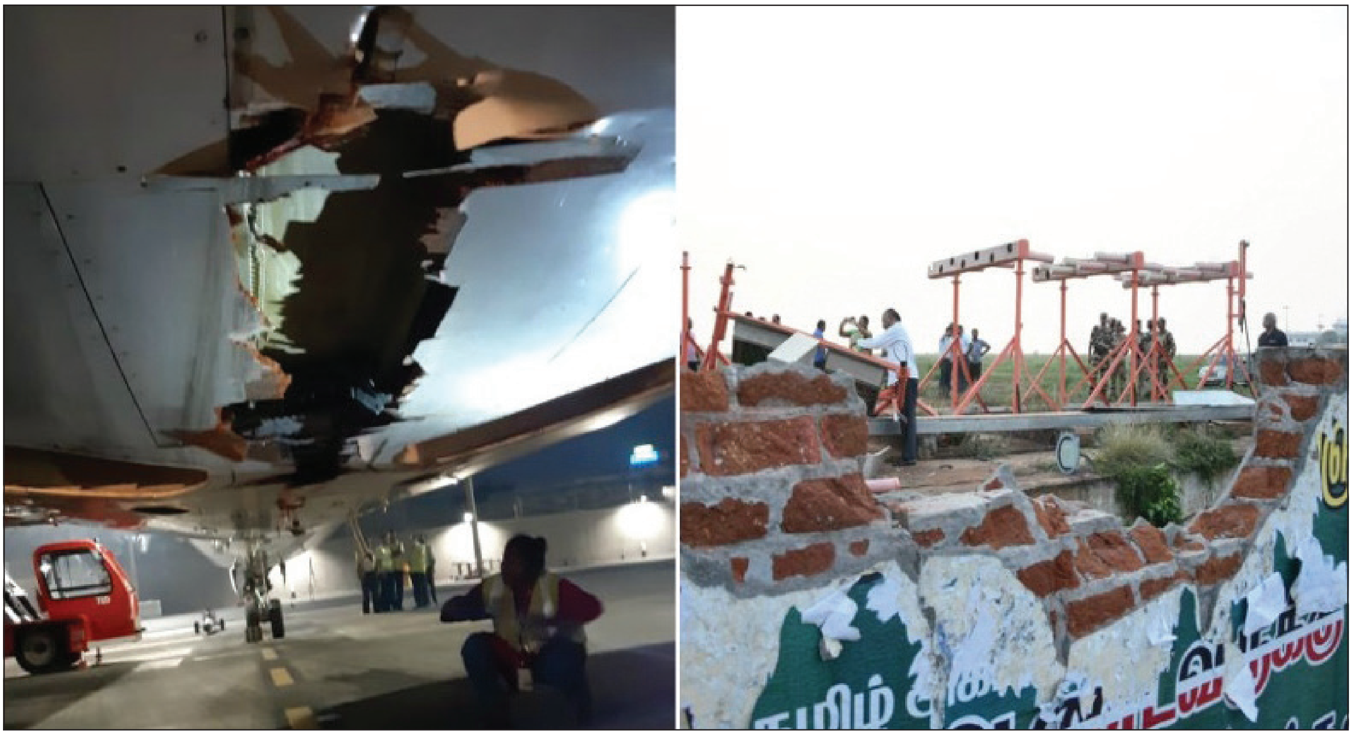
The ATSB found that a further barrier failed when the crew compared the OPT computed performance figures with the FMC computed figures. While the OPT computed a Vref40 of 139 KIAS, the FMC had computed the correct figure of 149 KIAS. Because the values needed to match within +/- 1 knot, it had become normal practice to compare only the last digit of those figures only, in the expectation that any error would show in this digit; this time, the last digit unfortunately matched.

Air France B772, Paris, May 22nd 2015

An Air France Boeing 777-200 freighter was accelerating for take-off from Paris CDG runway 26R when the crew detected the aircraft wasn't accelerating quickly enough and the PF selected full power; the aircraft got airborne safely but passed the runway end at 172 ft. The crew subsequently discovered their TOM had been programmed 100 tons below actual (243 tons vice 343 tons).

The rotation was initiated at 154kt. The crew immediately felt the airplane sink and five seconds later the tail-strike protection activated with maximum authority. The main gear was still in contact with the runway and the pitch established at 9° to avoid a tail strike. Full power was applied 8 seconds after the activation of the tail strike protection; the aircraft accelerated rapidly and the commander called for gear retraction as the vertical speed reached +1500 fpm.

The first officer had used mental arithmetic to calculate the TOM and erroneously arrived at 243 tons, which he entered in his EFB. The captain correctly computed a TOM of 343 tons but made a typo



India Express B738, Tiruchirappalli, Oct 12th 2018 (under investigation) and instead entered 243 tons in his EFB. As the EFB calculations not surprisingly agreed, the results were entered in the FMS.

The BEA analysed that the correct performance data for departure would have been: V1=167kt, Vr=175kt, V2=179kt, Flex Temp of 37°C, Flaps 15° and 98.5% N1 thrust, while the crew actually used: V1=143kt, Vr=152kt, V2=156kt, Flex Temp 58°C, Flaps 5° and 89.3%N1.

Multiple barriers had failed, but the BEA observed that there was no system available on the B777 to alert crews to weight discrepancies and that the airline SOPS for cross-checking performance tool and FMS weight entries were ineffective.

Cobham B712, Canberra, Jun 20th 2016

A Cobham Aviation Boeing 717-200 crew was preparing for departure. The captain computed take-off performance and prepared the FMS for a flex take-off based on an assumed outside temperature of +40C resulting in a planned EPR of 1.38. The FO computed the assumed temperature at +39C which was then entered in the FMS. An amended load sheet led to the crew recomputing the performance and deriving a new assumed temperature of +34C, resulting in an EPR of 1.41. Distraction (head count confirmation, ACARS message and ground handler comms) meant the new assumed temperature wasn't entered in the FMS. On take-off, the FO noticed the engines stabilized at 1.38 EPR instead of the expected 1.41 EPR and moved the power levers up but the autothrust system returned the thrust levers to 1.38 EPR about 4 seconds after the first officer's intervention. During initial climb the FO noticed the FMS still showed the original assumed temperature of +39C. The aircraft landed safely at destination.

easyJet A319, Malaga, Apr 14th 2016

An easyJet Airbus A319-100 crew was preparing for departure from Malaga runway 31 with the (training) captain as PF. The FO asked to use the "Multiple Runway Computation" (MRC) available on the electronic flight bag computers (EFB) in case the departure runway changed. After the FO had completed the computation the captain cross-checked the critical data, noting checking that runway 31 was displayed in the menus and that the aircraft configuration and runway length were correct. When the data was entered in the FMGS, the captain realised the speeds were lower than he was used to but assumed the operator had changed some of the performance data for operational reasons.

To validate his observations, the captain decided to recheck the first officer's EFB in the cruise and discovered runway 13 was selected in a small drop-down window that differed from where the selected runway would normally be verified.

The AAIB found that the departure had used data for the wrong runway; the crew had not detected this because of an EFB software anomaly that allowed detailed runway information for one runway to be displayed alongside takeoff performance data for another runway. The flight crew, operator and manufacturer were unaware of the anomaly at the time of the event.

The operator has disabled the MRC function and amended its SOPS. The manufacturer has advised other operators of this anomaly and recommended disabling the MRC function. The latest versions of the software do not exhibit this MRC function anomaly.

B773, London Heathrow UK, Aug 30th 2016

A Jet Airways Boeing 777-300 lined up on Heathrow's runway 27L at the S4E intersection, about 1200 m/4000 ft down the runway, leaving 2400 m/8000 ft remaining for take-off. The aircraft departed for Mumbai but crossed the airport boundary at 13 feet AGL and an adjacent road at 30 feet AGL. Rotation had commenced with 556 m/1823 ft of runway remaining and the aircraft did not break ground until 97 m/318 ft from the runway end.

The S4 intersection departure was not performance-limited given the correctly loaded TOM of 296,885 kg. After receiving the final load sheet both flight crew ran their performance computations independently. The captain selected "First 4" into the option for the intersection, the FO selected "SW4" into the option but, when the crew compared their results, she changed her intersection options to "First 4", to match the captain's selection.

The "First 4" option did not, as its name implied, compute performance for the 4th intersection but defaulted to an output based on a full-length TODA of 3,349 m/10985 ft (whereas only 2,589 m/8492 ft was available from intersection S4). The crew therefore used an assumed temperature of +45C for a de-rated take-off that was about 10% below max available thrust. Computed V1 was 163 KIAS, Vr 167 KIAS and V2 171 KIAS. The crew did not appear to become aware of the short distance remaining and there was no attempt to increase power.

The aircraft would not have stopped in the remaining runway in the event of a near-V1 RTO, nor would it have got safely airborne in the event of an engine failure above V1. The operator has since changed its SOPs.

Accident and Serious Incident Reporting

Under Regulation (EU) 996/2010, Regulation (EU) 376/2014 and The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018, it is a legal requirement that when an accident or serious incident occurs in or over the UK or occurs elsewhere to an aircraft registered in the UK, the commander of the aircraft involved at the time of the accident or serious incident (or if killed or incapacitated, the operator of the aircraft) must notify the AAIB by the quickest means of communications available.[1]

- It is NOT sufficient to submit an ASR or MOR, only notifying the AAIB satisfies the legal duty to report.
- The 2018 UK regulation also includes a legal duty to report an accident to a police officer or constable (in Scotland) in the area where the accident occurred.

All 3 pieces of legislation use common definitions which can be found in (EU) 996/2010 and are outlined below.

ACCIDENT

'Accident' means an occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked...in which:

- **a person is fatally or seriously injured as a result of:**
  - being in the aircraft, or,
  - direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or,
  - direct exposure to jet blast,

(except when the injuries are from natural causes, self- inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew); or

- **the aircraft sustains damage or structural failure** which adversely affects the structural strength, performance or flight characteristics of the aircraft, and would normally require major repair or replacement of the affected component *(except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes) or minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike, (including holes in the radome));* or

- **the aircraft is missing or is completely inaccessible;**

INJURIES

'fatal injury' means an injury which is sustained by a person in an accident and which results in his or her death within 30 days of the date of the accident;

'serious injury' means an injury which is sustained by a person in an accident and which involves one of the following:

- hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received;
- a fracture of any bone (except simple fractures of fingers, toes, or nose);
- lacerations which cause severe haemorrhage, nerve, muscle or tendon damage;
- injury to any internal organ;
- second or third degree burns, or any burns affecting more than 5 % of the body surface;
- verified exposure to infectious substances or harmful radiation.

[1](EU) 996/2010 Article 9: "Any person involved who has knowledge of the occurrence of an accident or serious incident shall notify without delay the competent safety investigation authority of the State of Occurrence thereof."

SERIOUS INCIDENT

'Serious incident' means an incident involving circumstances indicating that there was a high probability of an accident and is associated with the operation of an aircraft...

Examples of serious incidents

The incidents listed are typical examples of those likely to be regarded as serious. The list is not exhaustive but should be considered as guidance on the definition of 'serious incident':

- a near collision requiring an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate,
- controlled flight into terrain only marginally avoided,
- aborted take-offs on a closed or engaged runway, on a taxiway, excluding authorised operations by helicopters, or from an unassigned runway,
- take-offs from a closed or engaged runway, from a taxiway, excluding authorised operations by helicopters, or from an unassigned runway,
- landings or attempted landings on a closed or engaged runway, on a taxiway, excluding authorised operations by helicopters, or from an unassigned runway,
- gross failures to achieve predicted performance during take-off or initial climb (Note: this includes use of incorrect performance calculations),
- fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents,
- events requiring the emergency use of oxygen by the flight crew,
- aircraft structural failure or engine disintegration, including uncontained turbine engine failures, not classified as an accident,
- multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft,
- flight crew incapacitation in flight,
- fuel quantity requiring the declaration of an emergency by the pilot,
- Category A runway incursions (see ICAO Doc 9870),
- take-off or landing incidents. Incidents such as undershooting, overrunning or running off the side of runways,
- system failures, weather phenomena, operation outside the approved flight envelope or other occurrences which could have caused difficulties controlling the aircraft,
- failure of more than one system in a redundancy system mandatory for flight guidance and navigation.

PRESERVATION OF EVIDENCE

In the event of an accident or incident, operators should take all necessary steps to preserve critical information and documents relating to the aircraft and crew. In particular, procedures should be established for the immediate protection of CVR and FDR data (normally involving electrical isolation of recorders) to prevent data being overwritten or otherwise lost, and these procedures should be readily available to flight crew, maintenance and third parties across the operation.

Further information on reporting, preservation of evidence and the subsequent investigatory process can be found in the AAIB's "Aircraft Accidents and Serious Incidents: Guidance for Airline Operators", available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/375880/Guidance_for_Airline_Operators.pdf

Tel: +44 (0)1252 512 299 (24 hours)

AAIB Air Accidents Investigation Branch

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