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focus

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Contents

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

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Front Cover Picture: This is an L3Harris A320-200 Reality Seven Full Flight Simulator used for pilot training.

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focus
ON COMMERCIAL AVIATION SAFETY

"Own goals"

by Dai Whittingham, Chief Executive UKFSC

The headline figures for safety in 2019 - 20 accidents and 283 fatalities[1] - airlines indicate that it was the seventh safest year ever by the number of fatal accidents and the third safest in terms of fatalities according to the Aviation Safety Network. If we look more closely, we get a slightly different picture suggesting that the industry is actually doing very well on the safety front, and most certainly when it comes to the risk borne by individual passengers.

Cargo flights accounted for 6 of the accidents, and one of the passenger flights was by an operator on the EU (DG MOV) Blacklist. There were 4 accidents involving aircraft built more than 60 years ago (B-17, Convair C-131, Convair CV-440 and DC-3), 4 Cessna 208 were lost, along with a DHC-3 and DHC-6. Five of these accidents occurred in the wilds of Canada and Alaska. Only 7 accidents involved scheduled passenger transport.

Mindful that most of these accidents have yet to be the subject of published final reports, there are some lessons to be drawn from material already in the public domain on 4 accidents that between them generated 213 of the year's 283 fatalities. All appear to have a thread running through them that arguably falls under the training and standards umbrella.

Ethiopian Airlines B737-8 MAX

The most significant accident of the year was the loss of the Ethiopian Airlines B737-8 MAX with all 157 passengers and crew, which led to the grounding that is still in place today. Much has been written about the MAX saga, but what is undisputed is that the aircraft was not airworthy in the strict sense of the word, or it would not have been grounded. Beyond any technical defects or design errors, part of any airworthiness system is the training, preparedness and fitness of the operating crew. All consideration of the MAX crew issues has of course been made in the full glare of hindsight. What may seem obvious to us now clearly did not seem obvious to the men faced with something well outside their experience and expectations.

Whilst it would be easy to point (as many did) to a supposedly poor crew response, there are many more questions to be answered about the structure and content of the MAX differences training and the decision-making processes that drove the eventual solution to be fielded at entry to service. It is apparent from the reported investigations into the certification process that some individuals went to considerable lengths to avoid the need for additional simulator sessions as part of the differences training. Nobody goes to work aiming to make mistakes, but there will have been cultural, political and personal pressures and assumptions that combined to affect the sentencing of risks within the MAX programme in favour of time and cost and in a way that would have disastrous consequences.

There have been numerous reports that Southwest Airlines, the MAX launch customer, secured a deal discounting the price of each aircraft by $1m (less than 1%) if additional simulator training was required; if the allegations are well-founded, this arrangement would have generated $280m in incentives that would have added greatly to the desire to avoid using simulators. Exactly who decided to buy-out the potential training requirement is not germane to the argument. Customer and OEM had to agree, and the regulator subsequently endorsed the position, whereby a bare minimum of training – subsequently shown to have been inadequate – became a major selling point for a new aircraft type. It would be interesting to run the business case again. Would entry to service simulator training really have cost more than $280m for this one operator?

The absence of critical information from the MAX documentation available to pilots has been the subject of much comment, specifically regarding MCAS and its then *modus operandi*. Pilot professional knowledge has come under increasing scrutiny in recent years, but there is nothing a pilot can reasonably be expected to do about understanding how a system works if said system does not rate even a passing mention in the aircraft flight manual.

Because of a mistaken judgment taken during development, namely that pilots would (mis)identify an MCAS malfunction as being a Runaway Stabilizer and handle it accordingly, there was no additional training emphasis placed on the relevant drill prior to the Lion Air first accident. The subsequent FAA Emergency Airworthiness Directive (FAA AD 2018-23-51) also omitted any mention of MCAS, though it did refer to the potential for repeated nose-down trim inputs. Neither the AFM nor AD mention a target airspeed to limit control forces, or the interaction between MCAS and flap position; had they done so, it is possible that training could have been suitably tailored using existing (including non-MAX) simulators. The regulatory decisions on MAX differences training will inevitably be subject to further scrutiny by the courts.

Aeroflot RRJ-95

Lack of familiarity with abnormal conditions was also evident from the interim report on the Sukhoi Superjet accident (Aeroflot) at Sheremetyevo in May 2019. An otherwise survivable accident cost the lives of 41 people after the third runway impact pushed elements of the landing gear into the fuel tanks and the resultant fuel fire consumed the rear of the aircraft. The FDR traces showed clear signs of a pilot-induced oscillation, with side-stick inputs ranging between forward and aft stops during the latter stages of the overweight approach. 'Throttle pumping' also featured. The handling pilot (PIC) had experienced earlier difficulties in controlling the aircraft, the flight control system having reverted to, and remained in, DIRECT MODE after the lightning strike on departure that prompted the air return; the FDR showed larger than normal control inputs prior to the approach, and these inputs became more pronounced as the approach continued.

An analysis of 7 other instances of DIRECT MODE approaches showed that control inputs were typically much larger than normal, though none were as extreme as the accident flight. The PIC and FO had both experienced DIRECT MODE as part of the type rating (3 years prior for the PIC) and the PIC had further been exposed to it in a LOFT exercise 3 months before the accident. The findings of the initial investigation suggest that the handling difficulties presented by DIRECT MODE may not have been adequately explored or given sufficient weight in training; the ongoing investigation is expected to subject certification of the DIRECT MODE regime and associated training to much greater scrutiny.

Atlas Air B767-300F

In February 2019 an Atlas Air B767 freighter crashed during an approach to Houston, Texas, killing the 2 pilots and the occupant of the jump seat. The NTSB Docket shows that the aircraft was deliberately pitched to 49deg nose down over a period of 18 seconds for reasons that are unclear but which may have been an inappropriate response by the FO (PF) to a perceived stalling event. The g-loading on the aircraft during the pitch down reached -1 g. The elevators were split, with the PIC's controls deflected nose-up, until around 3500ft when both sets of controls were demanding nose-up. The aircraft had reached +4g and the pitch attitude was decreasing at the time of impact.

The NTSB investigation considered the training records for both pilots. Of note, the FO had a long history of training failures including failed type ratings on DHC-8, CRJ, EMB-145 and B767, failed oral exams, and failed simulators for loss of situational awareness; his tendency to over-react to stalling scenarios by pitching down aggressively had been well documented. The NTSB is likely to comment on the need for poor training and airborne performance to be more actively reviewed by Part-121 (commercial air transport) operators and the relevant regulatory oversight staff.

In the UK it is permissible to dismiss employees for poor performance (capability) but it becomes an unfair dismissal if the employer does not follow due process, which includes as a minimum the need to document the poor performance, warn the employee properly (verbal then written) and give the individual suitably supported opportunities to improve. This implies that operators should define performance standards, bearing in mind that individual abilities are variable. How far 'below average' does a pilot have to be before their performance tips the risk equation into an unacceptable balance? Can the individual be managed by, for example, imposing strict crosswind limits and restricting crewing to experienced captains? Is that acceptable for the captains concerned? There are plenty of questions, but what is clear is that there comes a time when under-performance has to be tackled, however distressing and difficult it might be for those involved. Not to do so is a failure of management and leadership, and it also undermines the system of airworthiness for the aircraft being operated.

Bek Air F100

The year ended badly with loss of control and a runway excursion leading to the destruction of a Fokker F100 at Almaty on 27 December. Twelve people including the captain died when the aircraft hit a building just beyond the airport boundary, and 66 people were injured. The FO died 33 days later. FDR, video and witness reports showed the aircraft diverging in roll immediately it became airborne. The left wing tip contacted the runway and the aircraft sank back onto its wheels. The FO called for a reject and closed the thrust levers, but the PIC called "no need" and advanced the thrust levers, calling "Let's go. Let's go." Seven seconds later the FO raised the landing gear on the PIC's instruction. The aircraft then contacted the runway 4 times with its tail section and once with a wingtip before settling back onto the ground and veering to the right, passing through a concrete boundary fence.

The investigation is reportedly concentrating on the probability that the wings were contaminated with ice. Almaty's climate is such that air temperatures are at or below freezing for the period December-February; the aircraft had been parked for 2 days prior to the accident and, whilst there had been no precipitation, the temperature at the time of the accident was -11C (dewpoint -12C). Video evidence showed the empennage being de-iced but not the wings. An Airworthiness Directive issued following an icing-related accident at Skopje in 1993 required a tactile check for ice prior to each flight and specified the procedure for conducting the check; F100 operations with ice contamination of the wings and empennage are not permitted. The video did not show the crew or any other person carrying out the tactile check, and review of other video evidence showed that the Bek Air crews were not in the habit of carrying out walk-round checks of any description, despite these being required by the OEM and ops manual. The Kazakhstan CAA has been unable to find a Bek Air winter ops training syllabus or evidence in training records that crews had received any training in the management of risks posed by icing. Bek Air has since had its AOC suspended due to multiple violations of airworthiness processes, including the removal of engine data plates. It would be reasonable to deduce that this operator's training and standards regime did not provide effective barriers to normal operating hazards and that a more rigorous oversight programme may have brought this to light prior to the accident.

Conclusion

Safety performance has continued to improve over the last 2 decades but the overall sound performance in 2019 was marred by 4 fatal accidents which may have been prevented by greater focus on training and adherence to standards. Whilst 2 of the accidents were precipitated by abnormal conditions, the other 2 involved aircraft that were serviceable. All 4 accidents also have implications for regulatory oversight.

Notes

1. There were also 10 ground fatalities resulting from a Dornier 228 accident in DRC.

focus ON COMMERCIAL AVIATION SAFETY

Why is a Stabilised Approach so Important?

by Jacky Mills, Chairman UKFSC

Unstable Approaches are a threat which seem to continue to be a feature in many Risk Registers, so it may be worth looking at why this is, and appropriate mitigations. At first glance it all seems very simple so why does this so often seem to feature on the Risk Picture?

All Operators specify the minimum acceptable criteria for flight crew to continue the approach to land when the flight is considered 'stable' and this criteria is met. The precise criteria will be determined by the individual Operator who specifies the height above runway threshold elevation (ARTE) that this must be achieved by, typically 500ft or 1,000ft, and if not, a missed approach must be carried out.

First of all, and importantly, let's look at why it is vital that the final approach be stable. Why does arriving without the planned flap configuration or at a higher speed than performance calculations stated, for example, have so many pitfalls?

The first threat that comes to mind is the loss of ability to land in the Touch Down Zone (TDZ) which the calculated aircraft performance has been predicated upon.

If the landing is not achieved, or expected to be achieved, within the TDZ then a missed approach must be carried out to mitigate against the risk of a runway excursion; it may well be that the landing aircraft is unable to stop before the end of the designated runway is reached. This could be because of an excessive touchdown speed, crossing the threshold too high, resulting in the touchdown point beyond the normal touchdown zone.

To avoid the excursion, harsh use of braking may have to be utilised placing unnecessary stress on the aircraft systems and elongating the time for brake cooling; the passengers might find this pretty uncomfortable too.

Of course, the risk could be compounded with a malfunction of an aircraft system such as the brakes or spoilers. The runway conditions also can have a detrimental effect with a runway contaminated with standing water inducing aquaplaning with a resulting loss of directional control.

Then there is the possibility that the touchdown is firmer than the aircraft structural limitations specify and may touchdown firmly on one wheel first significantly exceeding those limitations. Again Customer Services may receive a plethora of complaints from some of the passengers. There is also the real possibility of an unstable approach resulting in a tailstrike on landing.

Then the aircraft may not touchdown on the runway centreline, increasing the chances of a runway excursion during the rollout, particularly in gusty crosswind conditions.

An approach would normally be considered to be stabilised when all of the following criteria are met:

- The aircraft is on the correct flight path
- Only small changes in heading/pitch are necessary to maintain the correct flight path
- The aircraft is in the correct configuration for landing with Gear Down and Land Flap set
- The speed must be stabilised within defined parameters
- Appropriate thrust must be set

Note: the exact parameters will be clearly defined in the Operators Manuals.

So why does it happen that so many approaches are not able to meet this criteria (and also do not carry out a go-around but continue to land). I have a few theories.

The crew may have accepted a 'short cut' from Air Traffic Control which has shortened their track miles and saved perhaps a few minutes but has left them less time to achieve the landing configuration.

With the acceptance of less track miles they may be now outside of the conditions briefed between the crew during the Approach Briefing, so the approach profile has become rushed.

Or, the crew may have accepted speed control from ATC perhaps '160 to 4' which they weren't expecting and therefore hadn't briefed for, but they want to try and comply with ATC's request without question don't they...

On a now rushed approach the aircraft struggles to reduce the speed sufficiently to comply with Flap Placard Speed limitations so Pilot Monitoring has to wait to select the requested flap selection when requested by the Pilot Flying. And an unexpected tailwind is also thrown into the mix.

Or the flap is selected without correctly checking of the actual speed against the limitations and flap placard speed is exceeded, or the flaps blowback as the protection system is designed to do, resulting in the approach becoming unstable.

The crew have almost completed a long duty and the overwhelming desire is to continue the approach to land – they are not absolutely certain at what height land flap was achieved but thought it was there or thereabouts within the stabilisation criteria.

Or, the crew are working so hard trying to get the aircraft back on profile, on speed, and configured, that they become oblivious to the fact that configuration was not achieved within the criteria… (phew that was a rush, but we made it…)

Or maybe the weather conditions are not great, fuel whilst sufficient for the diversion is not in abundance, so let's just continue to land whilst we have the opportunity…

Or possibly, ATC at this destination are not great, are they? They always seem to be stating on the ATIS that Controller Training is in progress, the frequency is always jam packed so it's very hard to get a word in, and the crew become focused on ATC threats at the expense of ensuring the stability criteria is complied with. Realising the land flap may have been selected below the prescribed criteria the crew continue, content that required speed was achieved, and surely it is safer to continue than to go-around…

The Training Department would be extremely disappointed in that conjecture, they have devoted much precious Simulator Training time practicing the go-around so this procedure, although not used 'in anger' regularly by most crew, can be carried out seamlessly and safely, whatever the conditions.

Similarly, ATC spend significant time ensuring that their procedures in all scenarios guarantee safety for the aircraft going around, and that their Controllers are well versed in this procedure whatever the circumstances and traffic considerations.

Quite simply, if there is ever a situation where the crew feel it is 'safer' to continue an approach that does not fully comply with their Operator's Stability Criteria as promulgated in their Operations Manuals and trained, then an in depth investigation is required by both the Operator's and Airport's Safety Teams to establish exactly why that was the case.

Yet 'it was safer to land than go-around' is an explanation which is sometimes quoted to explain why the flight continued to land although the crew may have been aware that it was unstable.

Possibly the fact that statistically, 97% of unstabilised approaches are flown to a safe landing can serve to reinforce several 'landing-minded' views, including 'unstabilised approaches are not necessarily all equally risky'.

This could then reinforce a personal view that recovering from an 'unstabilised approach' and achieving a 'safe' landing is entirely possible, and therefore the procedure is too restrictive and should be considered as 'flexible' and 'doesn't need to apply to me right here, right now, in this particular situation'. NO, NO and NO!

Stabilised Approach Gates vary considerably between Operators for entirely justified reasons. However, pilots who change employer may then be faced with differences which they do not feel are explained or justified well by their new Operator. When not given a credible explanation for the SOP the pilot may not be 'on board' with this procedure and, possibly sub-consciously, reluctant to comply.

Stabilisation criteria can also vary in different visibility conditions, or for different types of approach, leading to a 'temptation' to push the boundaries inappropriately.

When subsequently asked to explain their actions the crew may state that they were quite sure that they were capable of continuing safely despite not complying with the criteria… But what about any additional destabilising factors that may come into play, an adverse change in wind speed and direction, do they have the capacity to deal safely with that in an already compromised situation? Or could this compound the extant errors which have been built in to this approach?

An approach is a dynamic process of continuous correction and decision making, so there is always the option to go-around all the way down to touchdown, so there could be a mindset of 'we'll decide later' and then when later arrives – 'oh well it looks alright doesn't it?'

Being visual with the goal (i.e. the runway) is a strong human motivating factor in influencing a decision to continue, after all, seeing the runway and looking at the profile visually is how pilots have historically learned to fly. This is why a laid down stabilisation criteria is so important, this is promulgated in the cold light of day and gives clear boundaries for the crew to follow.

It would be unrealistic to think that Commercial Pressure and Professional Pride won't have any bearing on the pilot's thinking, be it consciously or unconsciously. These can have a significant influence on the decision to continue rather than go-around.

Flying a go-around could be a rare event for a lot of pilots and having the confidence that a go-around can be flown as well as any other flight phase can definitely have a bearing on the decision making. A thorough Approach Briefing with well-defined gates is vital to support timely decision making.

So many factors mentioned here emphasise the real need for effective and repetitive training of the go-around.

Flight Data Monitoring (FDM) is routinely monitoring all flights; FDM is mandated on aircraft with a maximum take-off mass of 27,000 kg or above and recommended on those above 20,000 kg. So this will highlight any scenario which is not operated within the SOP.

So it can be difficult to explain the rationale for not executing the missed approach knowing that the Operator has to monitor all flights and will have to follow this up.

In a significant number of these cases the weather has been good – certainly visual conditions – does that encourage the continuance of the flight?

If the crew were acutely aware that the Stability Criteria was not complied with then it becomes even harder to explain... Absolutely FDM programmes should not be seen as the 'spy in the flight deck'; however, there is, of course, significant evidence to support the improvement in air safety in the wake of flight data monitoring.

FDM does also monitor fuel consumption and allow airlines to review all data collaboratively to ensure best possible operations fiscally, but it is first and foremost a safety tool to support flight crew, to enable the Operator to monitor their flights and to enable the crew to review in slow time what occurred on the approach which may have become too rushed to feel comfortable. It is also a tool to allow a nominated experienced Company pilot to debrief the crew members on how to protect themselves from an undesirable situation occurring in future.

Poor Situational Awareness which has become degraded for a number of reasons, overload, distraction, or fatigue for example, is often found to be a contributing factor following an unstable approach which continues to land. This inevitably results in inadequate Decision Making under 'compromised' conditions.

One accident which demonstrates this occurred at Lorient, France, in October 2012. The Bombardier CRJ 700 landed long on a wet runway and overran the runway by 200 metres. Fortuitously none of the passengers or crew were injured on this occasion, but an emergency evacuation took place and the aircraft sustained significant damage.

The investigation found the root cause of the accident was poor decision making by the crew whilst showing signs of complacency and fatigue. Passing 1,000ft ARTE the applicable stabilised approach criteria were satisfied and the crew became visual with the runway at approx. 800ft. However, they failed to maintain a sterile flight deck or to conduct a go-around when the approach became unstable,

with the speed gradually increasing and reaching more than 10kts in excess of Vapp 'without the crew seeming to notice'.

The investigation also found deficiencies at the Airport and with the Operator. It was concluded that the landing was at night in good visibility but with a significant crosswind and aquaplaning occurring on touchdown. Contributory factors were found to include Ineffective Monitoring and Plan Continuation Bias.

The pilot flying subsequently reported having difficulty in estimating the altitude of the aircraft because of the absence of runway centreline lighting, with the FDR showing that multiple inputs had been made on the controls at this time in an attempt to keep the aircraft on the runway centreline. He stated afterwards that he had focused on control of the aircraft 'as he did not know how far from the threshold he was landing'. The crew subsequently stated that they were unaware that the landing was long and 'at no time did they consider a go-around'.

The CVR also revealed that non-standard conversations were held below FL100 in contravention of the Sterile Cockpit, which had affected flight deck monitoring and the effective use of the Checklists. There was also evidence of fatigue on the fifth and final sector of flying duty for both flight crew.

The Operator's training of Threat and Error Management was found lacking; it had recently been introduced into pilot recurrent ground school, but not into the simulator sessions.

Additionally, although it was clear that there had been water on the runway at the time of the landing the depth of the water was not determined. It was also concluded that the landing distance required on a wet runway was less than the landing distance available (LDA), however the landing distance required for a contaminated runway was greater than the LDA. Given the late touchdown it was concluded that that the actual landing performance of the aircraft was compatible with a water-contaminated runway.

So, in conclusion, hopefully this look at the Unstable Approach at least highlights the need for focus on the Stability Criteria on every approach. And raised awareness of the many possible threats to consider in Threat and Error Management in the approach briefing. And if it does not feel comfortable the Go-Around is always there...

The Application of Ground Power to Live Aircraft

1. Introduction

For the purpose of attaching ground power (whether for an inoperative Auxiliary Power Unit (APU) or a standard arrival), it is recognised and accepted that at some airports, aircraft operators and ground service providers require a process during the arrival phase of the turnaround, whereby ground handling personnel need to approach the aircraft whilst the engines are still running and the anti-collision lights are still illuminated.

The UK Civil Aviation Authority, via the Ground Handling Operations Safety Team (GHOST), has developed detailed guidance and procedures in accordance with regulatory obligations and industry best practices. This information, which should form the basis of any related risk-based conversation and/ or assessment, can be found together with a Bowtie safety risk template, in CAP642 and published on the CAA website.

2. Background

The Health and Safety Executive (HSE) set out their position on the subject matter in an open letter to industry in 2011, after an incident in 2010 at Edinburgh Airport. A prohibition notice was subsequently served on the ground handling organisation to "prevent persons approaching aircraft with engines running and anti-collision lights illuminated" which made it clear that health and safety management systems required additional mitigation to protect workers on the ground.

3. GHOST Review

A subgroup of GHOST comprising representative members from industry and regulators (CAA, IAA & HSE) reviewed this practice and identified a number of widespread concerns, namely:

a) Inadequate stakeholder engagement;
b) Lack of industry standardisation;
c) Familiarity with procedures;
d) Inconsistent prior notification;
e) Inadequate compliance monitoring.

a. Inadequate Stakeholder Engagement

Generally, ground service providers were not consulted during the formation and agreement of airline risk assessments and were simply instructed to adopt the procedure in accordance with agreed handling contracts. Evidence suggested that some risk assessments were even being completed without involvement of the airport/ aerodrome operator and with no consideration of human behaviours/ performance or of other organisations that operate on the ramp.

b. Lack of Industry Standardisation

As with many activities in the aviation industry's ground handling community, different organisations have determined different ways of conducting the same process. The lack of standardisation can add ambiguity and lead to confusion to what is a safety critical task.

c. Familiarity with Procedures

Familiarity with any procedure, or the lack of, can result in very different outcomes:

- Familiarity with a routine procedure often dilutes the safety critical nature of the task and breeds complacency;
- The lack of familiarity with a procedure will result in a reduced level of safety for all involved in the process;
- Whereas, total awareness of an 'unusual' situation may provide all involved with a heightened level of awareness.

d. Inconsistent Prior Notification

In the case of an inoperative APU, there are currently various methods of communicating the need for ground power on arrival but it was recognised that none were particularly robust.

If an APU unexpectedly fails before aircraft arrival, prior notification may not be possible and therefore the receiving ramp team will not be able to properly plan and prepare. This scenario emphasises the importance of use of clear and robust standardised hand signals/ communications between the flight deck and ground crews whenever ground power is required on arrival.

e. Inadequate Compliance Monitoring

Practical drift, as defined in ICAO doc 9859, occurs when the baseline performance of any system "drifts" away from its original design when the organisation's processes and procedures cannot anticipate all situations that may arise in daily operations.

Effective management and supervision of any safety critical activity is imperative, so the agreed process must be included within all of the stakeholder's compliance monitoring programmes. Whilst a desktop review of the risk assessment and procedures must be periodically conducted, it is essential to observe the actual process in all weathers and visibilities, day or night.

4. Procedural Principles

As a minimum, the following safety critical elements are expected to be incorporated within any related policies and procedures.

All persons not responsible for the following aircraft chocking and ground power actions **must not** approach the aircraft until this process has been fully completed:

1) All Ground Support Equipment (GSE) and personnel must be positioned clear of the aircraft path, outside the Equipment Restraint Area (ERA) (IGOM 4.1.1)

2) After the aircraft has come to a complete stop, receive confirmation from the flight crew that the parking brakes have been set (SERA 923/2012 Section 4 - Marshalling Signals)

3) Respond to the crew before positioning chocks at the nose landing gear wheels. Once the chocks have been positioned, notify the crew using the "chocks inserted" signal. This is the first action to take place around the aircraft, and shall be completed before any other activity (IGOM 4.1.2 & 4.2.1)

4) Position and connect the ground power to enable the flight crew to shut down the engine(s) (IGOM 4.1.2.2)

5) Only when the engine(s) have spooled down and the anti-collision lights have been switched off, is it safe for ground service providers to approach the aircraft and commence servicing tasks. (IGOM 4.1.2.2).

5. Summary

In a factory environment, physical barriers can be placed in the form of safety nets or shields to deal with close proximities and/ or abnormal situations but these do not exist when working in close proximity to live aircraft engines.

Due to the severity of the potential consequence, the robustness of mitigations and strict adherence to agreed procedures is vital. Therefore, using Safety Management System principles and duty of care obligations, aerodrome operators, airline operators and ground handling service providers should ensure that the policies and procedures relating to this activity are widely promulgated and understood by flight crews, handling staff and all other personnel working or intending to work on or around the aircraft.

6. Actions

In consideration of the above, respective stakeholders should conduct a review of their operational policies and procedures to ensure that:

- All stakeholders are involved in the evaluation of the specific activity and work together to ensure that all associated risks are identified and managed to an acceptable level;
- Related procedures, documents and training plans are fully and regularly reviewed for detail and accuracy;
- All Flight and Ground Operations Manuals align;
- Related supervision and monitoring activities are in place that ensure that this topic is appropriately checked for performance and compliance;
- Personnel, working within a just culture, understand the importance of reporting related incidents and concerns, including near misses, and;
- Stakeholders work together during any related safety investigations, to understand why they occurred and build the lessons learned into procedural reviews and future training.

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

GHOST
GROUND HANDLING OPERATIONS SAFETY TEAM

A full version of this article is available on the UKFSC website. (ukfsc.co.uk/safetybriefings/groundhandling)

Managing Goal Conflicts In Flight Operations

by Capt. Brian Legge

Not only do we each have to balance multiple goals, our goals can be in conflict with others' goals. Captain Brian Legge explains how we might not always realise how our goals diverge, nor the risks involved, but that we need to take time to understand each others' perspectives.

KEY POINTS

- Goal conflicts are not limited to an internal pursuit of multiple goals simultaneously. Different people operating within the same system can view conflicts differently from inside their own operational reality.
- If not managed successfully, goal conflicts between actors can create a tug-of-war as different groups work to satisfy their own demands.
- To solve problems effectively, we need information, expertise that includes a systematic way of making decisions, and time to complete the process.
- It is impossible to maximise efficiency and thoroughness at the same time. However, we operate on a continuum that allows us to shift from one end of the spectrum to the other. Our movement from efficiency to thoroughness should not be driven by time or available resources alone, but also our assessment of risk.

Nothing that a bit of oil or duct tape can't fix!

"Is that fuel pouring out the bottom of our airplane?!", the First Officer asked. I remember my heart sinking as I rounded the corner and saw fluid flooding out from nearly every vent and opening in the bottom of our shiny new jet.

Airline pilots, like air traffic controllers, make thousands of decisions in the course of their workday. Most of these are mundane or easy to resolve because they require previously acquired knowledge and expertise, recall of common experiences, or else the trade-offs are inconsequential. Nevertheless, to make these and many of the more challenging decisions we are faced with, people need the same thing: data. Data not only provides the contextual cues we need to interpret situations but also contains the technical knowledge, policies, procedures, and other resources needed to resolve conflicts. The work of airline pilots has changed significantly over the last 30 years. Whereas our biggest challenge was once the limited access to accurate, reliable data (such as weather, NOTAMs, aircraft status information, and company policies) the most frequent shortcoming now is the time we have available to make sense of it all.

For long-haul pilots and cabin crews, the efficiency-thoroughness trade-off (ETTO), as characterized by Erik Hollnagel, is particularly problematic. Aircrews are expected to be efficient processors of information; after all, on-time performance is a metric that drives passenger satisfaction, a key goal of airline management performance.

However, we are also expected to be thorough, as the safety of our system often depends on our ability to proactively detect and mitigate problems either within the data or our operating environment. As a result, there will always be pressure, either experienced directly, or as a byproduct of contradictory messages received from managers who oversee the system. The message is to be efficient, but if something goes wrong that message can shift to one that blames crews for not being thorough enough. Psychologist Dietrich Dörner remarked, "Contradictory goals are the rule, not the exception, in complex situations."

To illustrate the ETTO concept, consider a flight from Toronto to Hong Kong. On the flight today, pilots must review a 17-page flight plan, eight pages of weather information, and 104 pages of NOTAMs! In his investigation of an Air Canada flight that nearly landed on a taxiway in San Francisco, NTSB Chairman Robert Sumwalt expressed his frustration with the process, referring to NOTAMs as "just a pile of garbage that nobody pays attention to." But pilots are expected to pay attention to, and make meaning of, these data, as there might be an important piece of information buried deep within.

The amount of time allocated to this task varies but averages only 10-15 minutes before crews need to move on to the flight preparation phase. In addition to this, the flight duty clock starts once the crew arrives at dispatch or the aircraft. On a long-haul flight that approaches 16 hours, there is typically less than one hour of 'fat' available for contingencies. There is an opportunity to extend the crew duty period, known as Commander's Discretion, but the risks of increased fatigue and future demands of the flight must be considered. These are the constraints of a 'normal flight', before any mechanical or passenger management problems surface.

Returning to our leaky aircraft, we were scheduled to operate the flight from Toronto to Hong Kong in the evening. The aircraft had arrived less than two hours prior to the start of our duty. The mechanic approached us straight away and told us what happened. Here is how the conversation unfolded:

Mechanic: *"Prior to landing in Toronto, a pipe connecting the potable water tank to the aircraft galleys and lavatories burst. But you don't have to worry. We've already repaired it, so you won't be delayed."*

Me: *"What about the water?"*

Mechanic: *"The water tank has already been refilled and confirmed to be free of leaks."*

Me: *"Not that water, I'm referring to the water that was pouring out the bottom of our aircraft."*

Mechanic: *"Oh, I can't fix that, I'm afraid. Once you get back to Hong Kong they will deal with the mess."*

As a crew, we were conflicted. The mechanic said the aircraft was safe to fly yet his response did not instill confidence and we still had many unanswered questions! How much water was still pooled at the bottom of the aircraft? We were already near maximum takeoff weight, would the extra weight from any additional water invalidate our takeoff performance? Where did the water go and what damage could it have done? Did it reach the Main Equipment Center (MEC), which houses the 'brains' of the aircraft where most of the electronic components are supported? What impact would the pooled water have if it were pooling up against the outermost layer or skin of the aircraft?

It was at this moment I realised that our goals had diverged. It's not that the mechanic was unconcerned with our safety. Rather, he didn't appreciate the risks that his decision, which favoured efficiency, exposed us to. We didn't realise it at the time, but the mechanic had other conflicting goals as well. There was another aircraft arriving in less than an hour that needed his services and our parking bay. Moreover, he had only one apprentice to assist him and limited resources to complete the task, which should have included pumps, fans, dehumidifiers, and a large supply of towels. The design of the aircraft also made it difficult to determine the extent of the damage as the metal walls of the cargo area have a thick insulation lining to assist the heating system to regulate temperatures, as we operate in temperatures in below -50° Celsius at altitude.

Water did not reach any electrical components but a squishy walkthrough of the cargo area told us the insulation and areas around the metal skin were saturated. Water had pooled up against the outer skin layer under the insulation meaning it would be exposed to very cold temperatures as we transit through the polar region to reach our destination; as water freezes it expands and can

damage surrounding structures. Unfortunately, the risk was lost on our engineer, so I turned to an analogy. *"Have you ever put an aluminum can of soda in the freezer to get cold quickly and forgotten about it? We are the can!"*, I exclaimed.

Now that the mechanic understood our dilemma, the final task was to secure the resources necessary to do the job effectively. This required a frank discussion with operations that included the phrase, *"We aren't going anywhere until this is fixed properly."* Faced with the alternative of securing 300 hotel rooms, the company agreed to remove some of the insulation, which came at a cost of payload as cargo had to be offloaded. In addition, our ground staff was able to obtain the necessary tools, including a large supply of towels and blankets, and recruit several extra hands from around the airport to assist in getting the job done and the plane back in the air without too much delay.

We did what was necessary to ensure a safe outcome and the flight was completed without exceeding our flight time limitations. The most valuable lesson I learned from this experience was the need to take the time to understand and empathise with the challenges faced by other stakeholders in the same system. Only by communicating our needs and challenges effectively, and actively listening to understand those of our mechanic, could we find a resolution. In this case, the resolution involved the getting extra resources to satisfy both of our goals.

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Ensure Airworthiness: Give us workable procedures

By Simon Al-Karghuli

Aircraft maintenance is characterised by an uncountable number of procedures and rules. They are thought to be of paramount importance for aircraft's airworthiness and in consequence flight safety.

However, there is growing evidence that procedures are fairly frequently not followed – but interestingly, flying is as safe as never before. There certainly is a plethora of explanations for any failure to follow procedures, and well-meaning incident investigators supply the maintenance world with a never-ending list of findings.

In consequence, this article does not attempt to summarise these explanation attempts, and it will not try to evaluate them. Instead, it will focus on the one reason, which is widely ignored, but which constantly gives aircraft technicians headaches or triggers more or less appropriate responses: Instances, in which it simply is not possible to 'work by the books'.

Some readers may now start to uncomfortably shift in their seat, feeling the urge to object. So please let me elaborate with a little story:

I consider myself to be a highly responsible aircraft technician. I am very proud of having delivered work holding up to highest standards, and I have always put flight safety above all else. But when it comes to having failed working precisely following rules and procedures, I am as guilty as charged. Even worse, I would even claim that my adherence to procedures is still exemplary in aircraft line maintenance, especially in everyday ramp and transit business.

What makes me think that? Imagine, you turn around a long-range airliner in one-and-a-half hours and you need to change a brake. That is a problem, you face quite regularly. You know how it is done, the job is simple and straight-forward, even the applicable procedures are readily available, and the subsequent paperwork is no magic trick to do.

Although it may look like there is not too much of a problem in this story, let me show you that there in fact is: Aircraft maintenance manual (AMM) tasks including all their subtasks and referenced tasks may easily amount to a number of A4 pages well in excess of one hundred – in case of my main aircraft type, I counted 167 pages! So, despite me being very interested in following the correct procedures, it simply is not possible to read it all and be sure. And still I sign off having read and understood every single page in the latest revision – while I clearly have not. Nobody does, because nobody possesses the super-human ability to change a brake and read a full-grown book in half an hour (a book, which by the way is far less exciting than your average novel). And no airline or maintenance provider will ever accept their transit crews delaying departures by hours to read through a triple-digit number of instruction pages.

Unfortunately, given the fact that it is impossible to read it all, many technicians rely solely on their experience and some technical values, they know by heart. This is where people like me become shiny examples, being dark grey amongst a flock of black sheep, because we at least look up tightening torque values every time we do the job. This makes it safe(r), but does not make things hold up to legal scrutiny. The example hopefully showed, how following rules and procedures can be a real problem in the real world.

It is understandable, that maintenance companies shift liabilities towards their frontline personnel; the same applies to aircraft manufacturers. It is even possible to argue that it is a responsibility for publicly traded companies to protect their businesses by having 'water-tight' rules and regulations in place to keep shareholders from harm. And as the aviation industry's safety record soars at an all-time high, this approach seems to have its right to exist.

However, shifting liability to frontline technicians, making sure that they can always be blamed if things go wrong, puts staff into adverse situations. It can be debated how this is a problem for the individual being put in harm's way, and that there should be some duty of care on the manufacturers', maintenance organisations' and airlines' side. But a purely selfish view on all sides can still be beneficial, as there is a pressing issue, which does not require any compassionate view on the persons dealing with impossible rules and procedures every day: Shifting liability to individuals endangers flight safety and in consequence the trust put in the entire aviation industry.

In a world where frontline technicians cannot work by the rules, but are judged by these exact rules, we are prone to learning helplessness. We are taught, that it is impossible to control our own working situation, and many of us accept being powerless. Technicians learn how they cannot work by the books and probably everybody knows of a case where a technician was made the scapegoat for not following procedures, even in cases where an incident was not caused by such failure. The message received is clear: If 'they' need someone to blame and you signed it off, then it will be on you. You cannot help it; you cannot avoid it – you have to live with it.

Having such a blame automatism in place, people can easily be tempted to ignore procedures and rules altogether, as negative consequences seem unavoidable. Or they have to find workarounds like the omnipresent 'cheat-sheets' presumably ensuring that the gist of rules and procedures can still be followed – at least making sure that technicians face their sentence with a more or less clear conscience, should things go wrong.

The argument here is, that aviation has created a faulty system originally intended to ensure airworthiness and safe flying. A system, in which airworthiness is often mistaken to be an exemplary paper trail, and in which safety is misunderstood as being legal security.

Aircraft maintenance staff must be able to ensure high levels of safety. Freedom from harm is what the flying and general public expect us to deliver; carefree – as 'secure' translates literally – business not so much.

Despite all the criticism, solutions are realistically achievable. This is not a single technician's job, though. Having developed a documentation system for maintenance procedures for flood protection barriers – complex and highly safety critical machinery not second to aircraft – I strongly believe, that it is possible to do something similar for aircraft maintenance. It surely is possible to provide the end users with documentation of procedures and rules, tailored to their needs, if we acknowledge, that technicians' requirements develop with skills and demands put on them by their working environment.

Helpful documentation would provide highly trained and skilled technicians with only the most important information, like up-to-date torque values, tooling and consumable data, and those special 'tricks' making sure the job is always done correctly. Helpful documentation would not lecture a technician who has done the job a hundred times on how to tighten a nut or on installation practices for wire locks and cotter pins – while still having this information available for less experienced staff or for bad days. Helpful information would furthermore be identifiable in the paperwork, lifting a heavy legal burden from frontline technicians' shoulders, while not placing it anywhere else.

This certainly is not a call to ditch comprehensive documentation – it is quite the opposite: Providing new staff with detailed information cannot be over-rated. It ensures that jobs can be understood and learned correctly. My call is for documents which help us technicians grow and excel in what we do best: Ensuring outstanding safety standards and making sure that every plane in flight operation is and stays airworthy. Allowing us more leeway doing our work means ending learned helplessness and empowering technicians. It means responsibilities and liabilities we can live up to.

So how can we get there? In our highly formalised industry, common ground is not often seen, but it is there. Every party involved needs very high working standards, and every party needs legal security. We should stop making things unnecessarily complicated as that serves neither side. And while a 'clean reset' is unrealistic, supplementing existing documentation could be the path to a solution. Moving away from the current one-fits-all approach towards making experience usable and documentable. Modern times we work in hold many possible solutions which could be adapted for aircraft maintenance. Why not provide frontline staff with an AMM app that allows us to tick a box, stating "I know what I am doing – show me a condensed version of my document"? An app then taking us to a task only containing the gist of what has to be done? For documentation purposes, the shortened document could have a unique 'dash number' indicating that the 'expert' version of a task was used. This could be as simple as supplementing an AMM task, for example AMM 32-42-27 PB 401 for the earlier mentioned brake change by a '-C' task for the condensed version.

Just like technicians are required and trusted to pick the applicable dash number of a bolt or a line replaceable unit, we could be required and trusted to pick the applicable dash number of a task. This would not only relieve us from undue responsibility and liability, but from pretending having read dozens of pages, when we have not. Having acknowledged that I know the basics, I would not be bothered with my task pointing me towards standard practices like how to install a castellated nut. I would, however, still be held accountable if I install it incorrectly, say with the 'battlement' facing the contact surface.

Having presented a problem and touched upon a solution, I hope to stir some discussion amongst airworthiness professionals and hope to get aircraft manufacturers thinking, whom I would dare that I can condense your brake change tasks (sticking to my previous example) into an expert version fitting on a single smartphone screen.

Editor's note: AAIB Bulletin 1/2020 contains a report into an A319 incident (G-DBCD, EW/G2019/04/05) that features some of the issues raised by this article.

To Regulate, Or Not To Regulate?

By Anders Ellerstrand

Many years ago, one Saturday in October, I went to work to do an afternoon shift as a Watch Supervisor at the ATC Centre. I was to be the only supervisor there but expected a calm day at work. That day did not turn out as expected.

It is 14:20. I am in a bit early and, as the ATC centre supervisor, I send my colleague home from his morning shift. As I'm preparing for the afternoon briefing, one of the controllers points out that one colleague is on the roster, although he is sick. I am lucky to have an extra controller on the shift for the first few hours but after that, I will need to find a replacement. The missing colleague is also on the roster for Sunday morning, so I must find a replacement for tomorrow as well. Finding staff for a Saturday afternoon and a Sunday morning is never easy and to add to that, this is in a period where the union is in negotiations with our employer. I also must prepare for a dataset change coming the same night. That includes informing the Network Manager of a change of configuration and setting up traffic regulations, sending out information to surrounding flight information regions, and printing checklists.

Only 30 minutes after the briefing, sector 5 calls and tells me that the 'Probe' function is not working. There are no checklists or routines prepared for that kind of error, but my assessment is that it shouldn't affect the capacity of the sector. I get no system warning and assume it is a local problem, so I call the technical supervisor to discuss a restart of the MMI for the position that is handling sector 5.

Then I get a call from sector 8, saying that sector 9 needs to be opened. I do the arrangements but when sector 9 is open they also report that the probe function is not working. Soon after other sectors call in and I realise, the probe function is now out of service for all sectors. I also get a few other reports of strange system behaviour.

I am still trying to find a replacement for the missing controller and finally manage to find a controller who is now on his way. However, I still have a vacancy for the next day and keep on making my phone calls. I now get a call about the need to open sector 6.

I realise I am too busy and have not followed up on the 'occupancy' graphs presentation from CFMU. The controller says he had to handle too much traffic and decides to write an incident report. In the report is a complaint concerning the technical problems we're having:

I should have regulated traffic to 50% of capacity. The controller is referring to another problem where we have a checklist, which includes a missing probe function, but also the medium-term conflict detection (MTCD). For that problem we regulate traffic to 50% of our capacity. My assessment is different, since the MTCD is working and I do not have any system alarm.

Key Points

- In a messy environment, goal conflicts are harder to understand and manage, and trade-offs often involve ambiguous alternatives.
- Getting extra resources is a good mitigation for many problems, but the request needs to be made in good time.

With traffic going down (it is a Saturday evening), and with my assessment that this is a minor system problem, I decide not to regulate traffic. One reason is that regulating traffic now will push traffic towards the night shift and produce new problems. I decide though to regulate traffic for the night, because of the coming new dataset to be implemented.

Still, I worry about the situation. The ATM system is not performing as normal and I'm still too busy. I need help and call a supervisor colleague. While waiting for him to arrive, I write an incident report on the failing probe function and I handle four other reports being filed; an error on technical transfer for a flight, the high load on sector 6, a missing conflict warning, and another one for conflicting call signs.

My colleague arrives. It is now two and a half hours since I started on the shift. Half an hour later there is an unexpected request to open sector W. The reason is high traffic volume in combination with the missing probe function, which according to the controllers is reducing their capacity. Now, all controllers of that rating group are in position. My newly arrived colleague has a valid rating in that group, so I let him work there instead of helping me out. I also file a report for having all controllers working with no-one in stand-by.

No, we don't need flow control. The situation is normal.

I realise I have to change my assessment of the situation and start preparing to regulate the traffic. The technical supervisor has been trying to solve the problem by rebooting one of the system servers in different ways. This must be timed to avoid reboots during traffic peaks. Another system expert has arrived and is saying we might get worse technical problems if we are not able to sort this out. Coordination is made with the neighbouring centre's Watch Supervisor and with other system experts. One of the issues is if the problems could affect the coming change of dataset on the same night.

Sectors are kept open and I ask one controller to stay on overtime while also having my supervisor colleague still working as a controller rather than supporting me. I finalise the change of configuration and regulations for the night shift.

Finally, the technical supervisor tries a reboot of our flight data processing system. This suddenly solves the problem! Five and a half hours after arriving to the shift we are back to normal operations.

A few incident reports were written during that shift and I was worried about being criticised for my decisions, which is why I made memory notes. This is what made it possible to write this story. Nothing too bad happened and I heard nothing about it afterwards. Still, I have looked back to that day many times and I also have my own hindsight bias, realising there could have been another outcome. I hope I learned something from it: don't wait to call for help when you need it.

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Anti-Collision Warning Beacons
- A View From The Ground

You're on final approach into a Category B airfield in IMC after an uneventful eight hour flight. You have control of the aircraft, whilst your vastly experienced and capable First Officer handles the radio communications and monitors the approach. The winds are light. The cloud base is slightly lower than first advertised but the approach is nothing but routine, up until now. You request *"Gear Down"* followed by the *"Landing Checklist"*, almost immediately after which you are alerted to both an unexpected audible and visual warning. The Master Caution flashes red. It does exactly what it is supposed to do - draw your attention to something that requires immediate action, to prevent further possible consequence...

Now consider that scenario in a different but familiar environment.

You're in the final phase of dispatch after an uneventful turnaround of this narrow body twin-jet. As the designated Team Leader, you are joined by a vastly experienced and capable team you know well. Whilst the number of hold bags for the outbound flight was more than expected for this time of the year, it's been a well co-ordinated and routine turnaround, up until now. As you are conducting your final pre-departure under-wing duty, you are alerted to an unexpected visual warning. The anti-collision warning beacon flashes red. It does exactly what it is supposed to do - draw your attention to something that requires immediate action, to prevent further possible consequence...

In both scenarios, personnel have been trained to understand what these warnings mean and what to do.

Have you ever switched on your anti-collision warning beacons but have not been ready to initiate the pushback? It is at this final phase where both your attention and the attention of the ground crew needs to be focussed on the specific items. Just as a master warning may cause you unwanted and unexpected distraction right at a time when maximum focus is needed the same extends outside the flight deck environment. Have you ever thought about how your Ground Crew will, or are supposed to react? What are you trying to tell them? Are you expecting them to stop what they are doing and move away from the aircraft because something that may harm them is about to happen, or are you just expecting them to hurry up, so that you can meet your scheduled departure time?

The Ground Handling community frequently experiences occasions when Flight Crew switch on the beacons whilst the aircraft is still in the hands of the turnaround team, even when lower cargo hold doors are still open, loading equipment is still in place or sometimes when there is no pushback vehicle at the front of the aircraft. The industry standard for ground operations can be found in the IATA Airport Handling Manual 617 (4.2.):

"With arriving aircraft, all personnel and vehicles should remain clear of the propellers, engine inlets and exhausts until the engines have spooled down as indicated by the nose cone spinner or propellers stop turning and the anti-collision lights have been turned off.

On departure, as soon as the anti-collision lights are turned on, all personnel and vehicles should remain clear of the propellers, engine inlets and exhausts. Personnel must never position themselves or equipment in the aircraft danger zones before or during aircraft arrival or departure."

Ground personnel are also warned in the IATA Ground Operations Manual (3.1.2.1):

"Vehicles and personnel must remain clear of aircraft danger areas when aircraft engines are running and/or the anti-collision lights are on."

This consistent and simple message is replicated in many organisations' policy/procedure manuals and related training courses.

Switching on the beacons, without prior communication, could encourage short cuts or even apply pressure to the point where a specific safety related task is not completed at all, in order to expedite your departure. This action contributes to the erosion of a well established industry safe working practice and has the potential to endanger your flight, as there are a number of related consequences to consider:

Pre-departure safety checks

Anti-collision warning beacons are often switched on whilst a member of the dispatch team is conducting a pre-departure safety walkround. It could be seen as a well-intended action as we all strive for on time performance as this is important to our industry however the outcome of unwanted distraction may lead to a process not being followed or a critical step being missed and tht doesn't help flight (or ground) safety. Due to the continued challenge of unreported aircraft damage, the Ground Handling Agent is tasked with checking for significant damage which may have occurred during the mid or latter stages of the departure. It must be remembered that the Flight Deck and/or Ground Engineer walkrounds might be completed up to one hour before departure. That leaves a lot of time for aircraft/ground support equipment interaction and the potential for damage to occur.

Historically, this check was purely a 'holds & hatches' check but due to the aforementioned reasons, it has developed into a far more thorough exercise. It will typically require the person responsible to walk around the silhouette of the aircraft, checking door areas, leading/trailing edges, engines, the undercarriage and of course for any FOD that may be in the vicinity of the pushback zone. The Agents are not qualified engineers but have been trained to be able to identify damage, or even question anything that doesn't look right. Over the last few years, the following examples will show just how important this often, last line of defence, is:

- The headset operative noted damage to the fan blades and cowling of number 2 engine. It was duly inspected and confirmed as being a bird strike. The aircraft was grounded. He was later advised that the engine would not have survived the stresses of take-off thrust.
- Damage was noticed to the inner wing (port side). The flight deck was informed and the aircraft was subsequently offloaded and taken offline for maintenance.
- XXX noticed that engine number 2 was leaking with what he thought was fuel. Subsequent ground runs revealed that it was leaking oil and there would have to be an aircraft change.
- A hatch was identified as not properly secured and required engineering assistance to rectify the fault. This would certainly have affected cabin pressurisation during flight.
- XXX noticed a piece of FOD was embedded in the tyre. The engineers were informed and checked the tyre, which had to be replaced before departure.
- A leak from the nose leg strut was brought to the Captains attention. It transpired that the strut had failed and had actually collapsed.
- The team leader noticed a loose screw sticking out from underneath the number 4 engine. On closer inspection by the engineers, the lower engine cowling was almost detached and had the aircraft become airborne, would have likely separated.

In order to reiterate the importance of identifying similarly hazardous situations to those listed above, the majority of Ground Handling Agents have established schemes to officially recognise individuals who have done so. Whilst it could be argued that they are "just doing their job", it serves a greater purpose of encouraging an open reporting culture.

In light of the above, would you want to distract your Agent whilst they are in the process of this check? There is a good chance that this person will be your headset person, so how will they react if halfway around this check, the beacons are switched on... Are you changing their focus during a safety critical duty?

Ground Crews can also assist with this situation - As visibility of all ground activities from the Flight Deck is extremely limited, they should inform Flight Crews that they will be 'offline' whilst they conduct this safety check.

Communication is even more important if ground to aircraft systems are not available and hand signals are used. If the person responsible for oversight of the engine start/pushback also conducts the safety walkround, it is recommended that another member of the Ground Handling team remains in visual contact with the Flight Crew, in order to maintain continued communications and prevent any frustrations that may lead to the inappropriate use of the beacons. On completion of the safety walkround, the person responsible should clearly indicate to the Flight Crew that this duty has been completed.

Loading Error

Does the pressure applied by the premature switching on of the beacons, influence the way that the dispatch/loading personnel behave? It is very possible that the last of the cargo loading system floor locks, the bulk load restraint nets and/or the final supervisory check of either, may not be completed prior to pushback for the same reasons stated previously.

BEFORE START CLEARANCE
Applicable to: **ALL**

SEATS, SEAT BELTS, HARNESSES, RUDDER
PEDALS, ARMRESTS ..... **ADJUST**
MCDU ..... **IN TAKEOFF CONFIGURATION**
EXT PWR ..... **CHECK OFF**
BEFORE START CHECKLIST DOWN TO THE LINE ..... **COMPLETE**

AT START CLEARANCE
Applicable to: **ALL**

PUSHBACK/START UP CLEARANCE ..... **OBTAIN**
GROUND CREW CLEARANCE ..... **OBTAIN**
BEACON ..... **ON**
SIGNS ..... **SET**

Aircraft Checklists

One UK operator, after experiencing an increase in related reported incidents, conducted an in-depth investigation into some of the causal factors and found that the pre-start checklists contributed to the problem. As the manufacturer's checklist places *"beacon"* directly after *"ATC clearance"*, pilots were getting ahead of the game by completing the pre-start checklist as soon as they were ready to go, as they needed to get in the queue for ATC start clearance.

Therefore, 'ATC clearance' was the trigger for the beacons, whether or not ground crews were actually ready. As a preventative measure, the operator split it into *'before'* and *'at'* Start Clearance and added a requirement to obtain ground clearance before switching the beacons on. The ground clearance is now the trigger for the beacons:

Personnel Safety

Many Ground Handling organisations are experiencing concerning incidents of ground personnel not staying clear of aircraft whilst engines are running and/ or beacons are switched on, despite it being one of the first rules covered in training for personnel working in the ramp environment - so why does it happen? Personnel are also trained to leave the under-wing area of the aircraft when the beacons have been switched on - so why don't they?

Clearly there are a number of reasons for these behaviours, one of which could be the inappropriate use of the beacons. The practice of using the beacons as 'attention getters' could be devaluing their purpose to the point where, in the eyes of the Ground Handler, they just become another flashing light rather than an indication of potential danger. Safe systems of work can easily become eroded if custom and practice tolerates contradictory behaviour.

If the aircraft is parked on a stand that has roadway behind it, all passing traffic should stop when the beacons are switched on. If it becomes common practice for the beacons to go on and yet the pushback doesn't start for a prolonged period of time, people may start to ignore them and continue to drive vehicles behind the aircraft. This behavioural drift has the potential to result in a very serious incident.

Other Causal Factors

Another reason as to why behavioural drift is apparent may be due to the actions of other influential personnel that regularly work in and around the aircraft. For example, a Ground Engineer's confident manner can sometimes deviate into a disregard for procedure. On occasion, the post arrival walkround of the aircraft (predominantly long-haul) has been seen to be initiated before the aircraft has even parked. In the past, this practice has unfortunately led to serious injury.

It is also understood that some airlines' procedures require Ground Engineers to establish contact with the Flight Deck on arrival, to be able to communicate any potential brake serviceability issues. This procedure has been adopted for operational purposes, must be recognised as such and should not be open to any interpretation by other operational personnel.

Whilst the anti-collision beacons are almost always associated with the moments before pushback, they also have another purpose - They also warn of other possible risks to those in the vicinity of the aircraft. For example, an engine ground run, a slat and/ or flap extension or even a regeneration test of a repaired hydraulic system, etc. Whilst any Ground Engineers in attendance would no doubt do their utmost to warn those in the immediate vicinity, the beacons will also warn those who may not have received any initial cautionary brief.

If the anti-collision warning beacons are to be tested as part of a routine daily engineering type inspection, for the reasons stated above, it is recommended that the Ground Handling Agent is made aware.

Summary

Please reflect for a moment on how your attention focus changes when the Master Caution Warning light illuminates in the flight deck and give a thought to how someone on the outside of your aircraft will have their attention focus changed by the "Master Caution Warning Light" they recognise - the Anti Collision Warning Beacons.

Hopefully this article will provoke a few thoughts, provide a few explanatory considerations and most importantly remind all that safety is the number one priority. Therefore, in the interest of best practice, GHOST and the UKFSC recommend that stakeholders consider the following actions:

- **Aircraft Operators**
  - Through training and monitoring, ensure that flight crews do not use these beacons as a 'ready message' to ground personnel whilst they are conducting final pre-departure preparations
  - Encourage, or even introduce procedures that require Flight Crews to establish communication with the Ground Crews, before switching on the beacons
  - Conduct a review of the pre-start checklist, to see if the aforementioned issue exists, with a view to revision
  - Engage with Engineering organisations and/ or departments to reiterate related procedures/ behaviours

- **Ground Handling Agents**
  - Through training and monitoring, ensure that ground crews stay/ walk away from aircraft that have engines running and/ or anti-collision beacons illuminated
  - Inform the Flight Deck that you intend to conduct the pre-departure safety walk-round
  - Use enhanced communications for this procedure if hand signals are to be used
  - Report any related incidents of inappropriate beacon use

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

GHOST
GROUND HANDLING OPERATIONS SAFETY TEAM

CHIRP Reports for FOCUS

Violation of Fatigue Management

Report Text: I am a line manager for engineering at [Company]. I have learned that a competitor has been utilising engineers contracted to [my employer] during their off-crew days.

The first concern is that this is a true report. Engineers are knowingly violating the company fatigue management policy with [the competitor company] aware, yet seemingly unconcerned. Engineers work a 7 day on, 7 day off roster. Company policy restricts them to only 8 consecutive days in work and a maximum overtime of 3 days. As a line manager I have no awareness of an engineer's actions during his/her off-crew days.

The second point that has been highlighted is that, as an employer, we are unable to enforce a safety policy should an individual decide to secretly work for another employer during their time off. There doesn't seem to be a mechanism for ensuring that a person receives sufficient rest. We are reliant on the integrity of an employer to recognise a person may not be suitably rested prior to work and an employee to inform his/her employer of extra employment commitments.

***CHIRP* Comment:** Licence holders have responsibility to be fit for work. Employers can require full-time employees to declare any other work they do but are reliant on their employees' cooperation. There are many other off-duty pastimes that can be equally fatiguing (e.g. training for marathons) and managers need to be vigilant to identify employees who are fatigued. Dismissal is an option for persistent fatigue and/or failure to disclose supplementary employment but this is only a realistic option if there are replacement staff available for recruitment. UK CAA, CAP 716 provides some useful guidance on the working time directive and calculation of shift patterns for aviation staff but if staff are working elsewhere managers will struggle to maintain any fatigue management control.

Future legislation regarding Safety Management Systems will contain provisions for fatigue management based on European working time regulations. The UK should also learn from good practice abroad, such as managed sickness. For example, engineers in Holland can be declared 'partially unfit' for work by a doctor; i.e. they are permitted to work only a percentage of their normal shifts for a period until they are fit to resume full-time working. In addition, a cultural change is required such that it becomes unacceptable to work when fatigued oneself or with colleagues who are fatigued. Engineers need to be conscious of their moral obligations when working in a safety critical industry with lives dependent upon the quality of their work.

In submitting this report, the reporter wished to draw attention to a problem that many organisations face – the shortage of engineers.

No night landings for new FOs during Line Flying Under Supervision (LFUS)

Report Text: I am a Line Captain. Occasionally I fly with new First Officers who have just come through line training following initial conversion onto the [] who have not conducted any night take-offs or landings. This is due to a general company policy to conduct all LFUS training on early sectors and therefore during daylight hours.

The result is a newly qualified F/O being released to line operations without having operated the aircraft in any capacity during night. I feel this puts unnecessary pressure on regular Line Captains who are not qualified in a training capacity, and also extra pressure on the new pilot as it reduces their confidence levels. The landing technique is obviously the same during day or night, however for a new pilot the visual perspective can initially be a bit disorientating, and I feel it would be safer to experience this first in the line training environment.

There is also the possibility that a Captain could become incapacitated, and the First Officer could be experiencing their first night landing on their own, potentially to a challenging airport. The company are very pro-active in Threat and Error Management, but I feel this a threat that has not been mitigated for a number of years.

***CHIRP* Comment:** The reporter is correct that conducting a first night landing at a difficult/challenging airport would be an undesirable and worst-case scenario. Continuing to such a destination could happen if the incapacitation occurred when the aircraft was close by, but problems occurring en route would likely result in a diversion to the nearest suitable airport. There is no regulation requiring a night landing during type rating training but trainees will have completed a night landing in the simulator. Prior to this they will have gained a CPL with Instrument and Night Ratings. Clearly it is desirable from the trainees' and the Line Captains' perspective for trainees to have completed a night landing on type during training but in practice this can be very difficult to manage.

Medical Incapacitation

Report Text: Just after take-off on my first flight on this aircraft, as I was Zero Flight Time, qualified, I found it hard to focus on the Primary Flight Display and had tingling in my left hand. I started rubbing and shaking it gently. The Type Rated Examiner in the right seat questioned me, was everything ok. I responded yes, all good. Approx. two months later, after coming back from [], I felt exceptionally tired and found I could not manage simple domestic tasks like wrapping my wife's birthday presents. I reported to the local hospital. An MRI followed and showed I had had three moderate to major strokes. I believe the first one was on take-off on my first flight with a new company on a new type.

I had put the symptoms down to stress an early start and spending too much time over the previous months looking at computer screens whilst doing Computer Based Training.

The background was that the strokes were caused by artery damage from an RTA years previously; scar tissue was breaking free. This was not diagnosed at the time of the accident.

***CHIRP* Comment:** We are indebted to this reporter for sharing his experience and condition. Strokes or transient ischemic attacks do occur in the pilot age population and their underlying causes are numerous and varied. Many of these can be detected

and effectively managed. AMEs are trained to look for and seek management of these conditions and you are encouraged to seek the advice of your AME or doctor early if you are concerned.

Tech Log Documentation Procedure

Report Text: The current system we use on turn around servicing is the technician who has fuelled the aircraft, goes into operations control and signs for the fuel and oil level in the tech log. In order to streamline the turnaround time, the company is proposing a change in procedure.

The new procedure would be as follows. The technician would fuel the aircraft, then radio in the fuel and oil levels and the operations controller would fill in the tech log and initial the fuel and oil entries on behalf of the technician. The technician would at no time see the aircraft tech log.

The tech log is a legal document. With this in mind, my question is, 'can the tech log be initialled by someone else on their behalf, or is there a legal requirement for the technician who has carried out the turn to sign the tech log themselves?'

Your comments would be very welcome on this issue.

***CHIRP* Comment:** The reporter had taken action to address his concerns internally with no success. Rather he was told to, "fall in line and do as [you are] told". This type of response is unacceptable for any organisation that claims to have a safety-focussed culture. CHIRP could not identify any breach of the regulations. It is not unusual for non-qualified staff to enter fuel/oil uplifts in the tech-log as they normally sit outside the Certificate of Release to Service (CRS). However, comments within the report raised concerns on the process being used in this instance and therefore the disidentified report was passed on to the CAA for further investigation. The Authority took appropriate but unspecified action that satisfied the reporter. CHIRP's view is that when using traditional paper tech logs, technicians should sign for their own work. The advent of electronic tech logs and remote data entry will require the development of alternative procedures to maintain an audit trail while minimising the scope for error.

Possible Ice on wing on Take-Off

Report Text: I am a [] Captain on the [aircraft type] and regularly fly into []. On this day I was a passenger on an [airline] flight [on the same aircraft type that I operate]. I boarded the aircraft and, although dark and the lighting was poor, I noted a discolouration all along the trailing edge of the left wing. On taking my seat I could see the right wing and in better light and it looked like ice or condensation again all along the trailing edge. The OAT was 1 deg C.

The cabin was filling up with passengers but the middle was clear with two cabin crew chatting so I approached in a friendly way as any passenger would and said, "I was wondering why the wing was that colour at the back?". They looked through the window and said, "Oh yes, I don't know." After a pause I then asked, "Could it be ice?" To which the female cabin crew member said, "Well maybe, but I'm sure the Captain's checked it and I'm sure it's fine." That wasn't the response I was hoping for, so I said, "Do you mind checking with the Captain and letting me know what he says?", I sensed she wasn't very happy!

After boarding was complete the cabin crew member came back and said, "It's been checked and it's fine." I looked out at the wing and replied in a surprised way "Really?" At that point, my friend next to me who was closer to the cabin crew member said quietly, "Just to let you know he is a [] Captain." She replied "Oh!" turned around and walked straight back to the flight deck. A short while later the Captain did his welcome aboard PA and finished it by saying "To the passenger who asked about ice on the wings we've checked it and there isn't any!". Not how I would have handled it I thought but at least it was resolved. Maybe it was just condensation after all.

On disembarking at [] the Captain was at the flight deck door. The cabin crew singled me out and the Captain invited me into the flight deck. I was expecting a friendly handshake. Instead I was subjected to an encounter like a headmaster berating a pupil for daring to talk in class! Without me able to get a word in I was looking at a pointed finger whilst he ranted "Who do YOU think you are? Why were you demanding a second check?". You could have knocked me down with a feather! I was literally stunned! In fact, I was concerned he had actually flown an aircraft in that state of mind. After taking it on the chin a while, I put my hand in front of his pointing finger and said, "I think you're being very defensive." I then attempted to give my side of the story. Fortunately, the First Officer who had been quietly observing in his seat then suggested maybe there had been a miscommunication. A good call as that seemed to calm the Captain. The Captain was then quite clear; a tactile check had been carried out by the refueller with steps. With that I was informed by the ground crew that the passenger bus was outside and I had to go so I did.

I'm still not sure if the photos I have show ice on the wing. Did the flight crew even see the discolouration? I have the Captain's word that the wing was checked by the refueller. Did the refueller check the front AND rear edge? I don't know. But I do know that rather than experiencing an open safety culture what I experienced was very worrying. I thought to myself, next time a passenger raises a concern I'm not going anywhere until I've spoken to them personally.

***Operator's* Comment:** The operator was very disappointed to learn of this alleged report. If accurate, the behaviour is concerning as the attitude of the Commander appears combative which is the opposite of what we would have expected. To a lesser extent, there are also learnings for the cabin crew community as this scenario gives the impression that the passenger comments were dismissed as it was assumed the Captain had checked. A reminder has been sent crews to highlight the risks of winter operations.

***CHIRP* Comment:** Nothing further to add.

Drones: New powers to protect the UK's airspace

by Edward Spencer and Matt Rickett, Holman Fenwick & Willan LLP

On 10 February 2020 the Air Traffic Management and Unmanned Aircraft Bill reached the Committee stage of its journey through the House of Lords. Broadly, the Bill's stated aim is to *"provide for the effective and efficient management of the UK's airspace"*.

A key feature of the proposed legislation is the protection of the UK's civil aviation from the unlawful use of drones (referred to as "small unmanned aircraft" in the legislation). It seeks to do this by introducing new offences and police powers designed to make it harder for criminals to operate and conceal drones. Specifically, the police will be given the authority to:-

1. Require someone flying a drone to land it and to allow the police to inspect the drone; and

2. Stop and search a person or vehicle if they suspect they will find a drone that was involved in the commission of a drone-related offence; and

3. Use net guns, firearms and signal jammers to disable drones without being subject to charges of unlawful interference with property.

While these measures are targeted to some degree at preventing the use of drones to smuggle contraband into prisons, their primary purpose is the protection of civil aviation. This is illustrated by the Bill's library briefing which highlights the significant increase in cases of drones coming within unsafe distances of manned aircraft in recent years. Just six incidents of this were recorded in 2014 compared to 126 in 2018.

The widespread disruption and huge expense caused by a drone at Gatwick airport in December 2018 is also referred to as justification for the new powers. This high-profile event, that ruined the travel plans of thousands of passengers, has been a catalyst in demonstrating to law-makers and the wider public that the measures proposed in the Bill are necessary.

These proposals mark the latest development in the British government's effort to regulate the preponderance of drones in the UK's airspace. They follow the *Air Navigation (Amendment) Order 2018* which banned drones from flying higher than 400ft or within a kilometre of protected airport boundaries.

Last year these restrictions were updated by the *Air Navigation (Amendment) Order 2019*, which extended the restricted zone around airport boundaries to a distance of between four and five kilometres.

Non-exempt operators of drones weighing between 250g and 20kg have also been subject to mandatory registration of their drones with the Civil Aviation Authority since 30 November last year. They are also required to complete the CAA's online drone competency test.

Despite the tightening of regulation in this area, the government is keen to point out that it is not opposed to the growing use of drones. The Bill's explanatory note praises the valuable contribution that drones have made to the emergency services, the oil and gas industries and to generally increasing the UK's productivity.

Looking ahead, new EU rules on the operation, certification and technical requirements for drones are due to come into force in June 2022. It obviously remains to be seen whether the UK will align itself with these rules.

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