The RAF Total Safety Magazine

Issue 36

AirClues

Climate Injury - Cold

Performance Based Navigation

Operational Events Analysis

ROYAL AIR FORCE Safety Centre


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Additional information can be found in the following locations:

RAF Safety Centre SharePoint Site:
https://modgovuk.sharepoint.com/teams/23116

RAF Safety Centre Internet Site:
Due to a recent software upgrade please go the RAF website and search for "Safety Centre"
https://www.raf.mod.uk/

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Foreword

by the Inspector of Safety (RAF) Air Cdre Sam Sansome

Welcome to the 36th edition of Air Clues. After a summer that seems to have disappeared into the rear-view mirror without so much as a last hurrah, the nights are drawing in noticeably. At the same time, we seem to have entered the next phase of the COVID-19 pandemic; we are transitioning from COVID running our lives to just getting on with things and managing the risks of living with it.

Normally at this time of year we would be thinking about the increase in risks due to the darker evenings, the cold and wet weather and maybe even the annual reminder to be 'drink aware', but there is an additional concern this year. 'Currency' is usually only an issue for aircrew, but this year – as we return to 'nearly normal' operations and working practices, or to the 'new normal' – currency could be an issue for all of us. Not only are we likely to find we are driving more than we have for a while as we return (at least in part) to face-to-face meetings, working from the office etc. but we might also be going back to exercise or military training after a longer than normal break. Whether that means the first visit to the range for a while, the first game of football for the section or the first long drive to visit another station, we need to be very conscious that we might be out of practice – or in my case out of shape too! Clearly, we all have an individual responsibility to keep ourselves and those around us safe – and we also need to protect our outputs because they are important. If we are going to satisfy that responsibility then we have to be aware of the new risks; not only the changes brought about by living alongside COVID measures, but also our lack of currency in all the things we used to do.

Earlier this year the Chief of the Air Staff recognised that the return to activity after the prolonged lockdown was going to be a safety issue not only in the air, but also in terms of sport, adventurous training and even just in commuting to work. He has asked his Senior Leadership Team to keep an eye on this as activity levels ramp up and this is doubly important now as we enter winter and other risk factors increase. We all have a part to play in safely navigating this next phase – whether that is not expecting too much too soon from our teams or from ourselves.

Safety Awards

Safety Centre Safety Trophy

The Safety Centre Safety Trophy is presented to the RAF Station, team or individual that has demonstrated an outstanding or enduring achievement, or cumulative set of achievements, that has significantly enhanced safety on the unit and/or across the wider RAF. The 2020 winner was RAF Valley Whole Force. Air Cdre Sam Sansome, the Inspector of Safety (RAF) made the announcement at the Air Safety Management Conference, which was held online on Teams on 16 Sep 21. There were twelve submissions from across the RAF. To submit for 2021, use the Safety Trophy Submission form, available on the Safety Centre Comms Site on Modnet: https://modgovuk.sharepoint.com/teams/23116.

IFS presents Safety Trophy to RAF Valley Whole Force

L G Groves Awards

The LG Groves Award Ceremony was held on 10 Sep 21 and marked the 75th anniversary of the start of the awards. Presented annually since 1946, they were established in memory of Sergeant Louis Grimble Groves, RAFVR, No 517 Sqn Coastal Command, who lost his life while flying on a meteorological sortie on 10 Sep 45. In 2016, a Memorial Stone was dedicated to the crew of Halifax MET Mk III X9-N tail number RG380; this was placed at the site of the crash on the Quantock Hills, Taunton to mark the 70th anniversary of the start of the awards. Preceding this year's award ceremony a Service of Remembrance delivered by Padre (Wg Cdr) A Jones was held at the Memorial Stone.

The awards were presented by Air Mshl Mayhew (DCom Ops) at The Crowcombe Hall, Crowcombe. In support of the event were the RAF Salon Orchestra and members of the Queen Colour Squadron. The event was attended by Inspector of Safety (RAF), Air Cdre Sansome (Inspector of Safety RAF) and approximately 80 guests, including members of the Groves family, past winners, Navy and Air Force personnel.

Wg Cdr Elaine Rutland (RAFCAM) – Winner of the Air Safety Prize 2021

Flt Sgt Michael Trigg (RAF Waddington) - Winner of the Ground Safety Award 2021

Dr Joanne Robbins (Met Office Exeter) – Winner of the Meteorology Prize 2021

Professor Rob Allan (Met Office Exeter) – Winner of the Meteorological Observation Prize 2021

2022 L G Groves Submissions - 1 May 22

The LG Groves 2022 awards will be held on 9 Sep 22 at the Fleet Air Arm Museum, RNAS Yeovilton. The prizes and awards are open to all personnel from the Royal Navy, Army, Royal Air Force, their civilian support staff and DE&S. The awards comprise a £1000 Air Safety Prize and a £500 Ground Safety Award. Nominations will be judged by a 3* panel and a Groves family member and will be presented at the Fleet Air Arm Museum, RNAS Yeovilton on 9 Sep 22. Citations are to be submitted not later than 1 May 22; completed forms are to be sent to the Proj O, Sqn Ldr Morton <Carey.Morton402@mod.gov.uk> using the template as described in AP8000, Leaflet 8011. Further details of the awards can also be found at: www.lggrovesawards.com.

Safety Awards

Fg Off Hugh Pierce – 1AEF – 6FTS - Green Endorsement

On 20 Nov 19, Flying Officer Pierce, of 6 FTS, was the Aircraft Commander of a Grob Tutor 115E aircraft conducting solo General Handling staff continuation training to the North West of Porthcawl. This sortie followed 2 previous 30-minute AEF cadet flights and was to maintain his general flying mandatory currency drills. After approximately 20 minutes of flight, including 2 spins and a brief period of aerobatics, he set up the aircraft at approximately 5000ft for a Practice Forced Landing (PFL). He selected RPM to Low and carried the appropriate engine handling and practice emergency drills, whilst descending to an initially normal low go-around at approximately 300 feet agl. However, during the recovery, the engine ran very roughly, could not achieve full RPM and the aircraft was unable to achieve anything other than a slight climb.

Flying Officer Pierce continued to climb the aircraft, declared a PAN to air traffic control and steered for St Athan, while carrying out the 'rough running' emergency drill actions. Unexpectedly, these had the effect of making the rough running worse, and the aircraft now had insufficient power to maintain climbing or even level flight. He upgraded his PAN to a MAYDAY, selected an appropriate field and prepared for a forced landing. Noticing the fuel flow was abnormally high (off the normal scale), he leaned the engine fuel mixture from the 'Rich' setting as suggested by the drills - this improved engine performance such that a slight climb could again be achieved. Keeping the field option available, he maintained a slow climb to a point where he could achieve a recovery to base. Levelling below cloud at 2500 feet, he then completed a PFL profile and glide landing at St Athan. Throughout the transit he had continued to diagnose the problem, monitoring his under-performing engine continuously and keeping a meticulous record of all indications to aid subsequent investigation. Although a career helicopter pilot with some 7500hrs (4700 as Captain), Flying Officer Pierce had only 150 hours on the Tutor since becoming an Air Experience pilot in 2016.

Mr Jason Skinner – Northrop Grumman - RAF Waddington – Good Show

On the morning of 29 Sep 20, at RAF Waddington, Mr Jason Skinner was tasked to conduct a Before Flight Servicing on a Sentry aircraft which was scheduled to undertake a post maintenance flight test later that day. As part of that activity, he conducted a visual inspection of the No.1 engine from the rear looking forward down the high by-pass section between the engine core and thrust reverser structure. During this inspection, Mr Skinner's attention was drawn to something that appeared unusual relating to the inboard thrust reverser strut located at the 9 o'clock position, which he felt appeared to be slightly out of alignment in comparison to other struts. Although the misalignment was marginal, with the added difficulty of being out of reach and deep within the dark high by-pass section of the engine, he immediately reported his suspicion that something may be wrong.

On further inspection with the thrust reverser opened, it was established that the thrust reverser strut upper attachment clevis assembly had sheared allowing the strut to detach from the thrust reverser structure. Subsequent assessment of this structural failure has identified that the associated stress placed on the lower strut attachment would have likely resulted in the total detachment of the strut assembly. The loss of the strut on a running engine would result in the expulsion of the strut at high speed with the potential of contacting the lower wing structure or flying controls and associated socio-reputational damage and risk to life associated with a falling aircraft component from height. Subsequent fleet-wide inspections of thrust reverser strut attachments identified multiple cracked strut attachment assemblies necessitating immediate rectification before the next flight.

SAC(T) Jack Chittim – 14 Sqn – RAF Waddington - Well Done

On 4 June 20, at Royal Air Force Waddington, Senior Aircraftman (Technician) Chittim was preparing his 2nd aircraft see-off of the day. Whilst carrying out his duties pre engine start and awaiting pilot direction for start clearance, Senior Aircraftman (Technician) Chittim identified Foreign Object Debris (FOD) blowing across the ALPHA taxiway. At this time a Sentinel aircraft was taxiing down the ALPHA taxiway from behind his position. Quickly realising the hazard, Senior Aircraftman (Technician) Chittim informed his supervisor of the situation and rapidly handed over his duties to a colleague and requested a slow or stop of the approaching Sentinel. He then set off to recover the item of FOD which turned out to be litter.

SAC(T) Lee Reeves – 51 Sqn - RAF Waddington – Well Done

On 13 August 2020, at Royal Air Force Waddington, Senior Aircraftman (Technician) Reeves discovered a crack in the nose undercarriage door locking system of a Rivet Joint aircraft. He was lubricating components in the aircraft's nose undercarriage bay when he noticed grease protruding from a crack in a bracket. The minimal light available together with the normal presence of dirt and grease in that area and the angle at which the crack was positioned was such that it would have been almost un-noticeable during the regular servicing and inspections of the aircraft in that area. Failure of this component in flight could have had potentially catastrophic results.

Flt Lt Scott Daniel – 14 Sqn - RAF Waddington - Commendation

Flight Lieutenant Daniel is the Flight Safety Officer for 14 Squadron at RAF Waddington. A key part of this duty is the investigation of Squadron Defence Air Safety Occurrence Reports in which he has excelled. Diligent, emotionally intelligent and with an impressive degree of maturity he has delivered thorough and insightful investigations. He has used his naturally unassuming and approachable character well to encourage a robust reporting culture amongst his peers and is highly regarded across 14 Squadron. He has also assisted the Station Flight Safety Team on many occasions where his advice has enabled the rapid resolution of issues ensued following an occurrence report submission.

One example of his contribution to air safety is: following an investigation into an airprox between a Shadow aircraft and a 41 Squadron Typhoon Flight Lieutenant Daniel quickly gathered all the evidence and statements from the involved parties, allowing the occurrence report to be closed only six weeks after the event. He reached out to other subject matter experts to ensure the accuracy of the statements and the investigations findings. This was not a simple cause to pin down, as the Typhoon pilot's statement was misleading, but Flight Lieutenant Daniel was confident in his understanding of the situation, demonstrating his strength of character to apportion the cause to a Human Factors error by the Typhoon pilot. The Traffic Collision Avoidance System brief he subsequently created for the Typhoon Force was excellent.

14 Sqn Flight Safety Team – RAF Waddington

Over the period June 2019 - December 2020, 14 Squadron assembled a squadron flight safety team comprising: Flight Lieutenant Daniel as the Flight Safety Officer, Warrant Officer Davies as the Defence Safety Occurrence Report Recommendations Manager, Flight Sergeant Bighi and Sgt Davies as deputy Flight Safety Officers and Chief Technicians Edwards and Greer who provided subject matter expertise and lead on investigating all engineering occurrence reports. Since their inauguration this team has dedicated itself to the support of all Squadron flight safety activity. Initially, this was not an enviable task: they inherited a safety system that was struggling under the burden of high operational tempo and constant deployment. There was a backlog of occurrence reports requiring investigation, numerous recommendations that were not being monitored regularly for progress and closure, and little by way of feedback on findings and outcomes to squadron personnel. However, with persistence, commitment and sheer hard work the safety team has delivered a remarkable turnaround and huge improvement in the Squadron's safety management system and the investigation of occurrence reports.

14 Squadron now enjoys a robust reporting culture with healthy levels of third age and hazard observation reporting. Management and investigation of occurrence reports is timely and of very high quality. Feedback to squadron personnel is conducted regularly with training and continuous improvement events linked to findings and outcomes. Recommendations are proactively handled and communications with appropriate external stakeholders established.

L Cpl Dylan Cope – 651 AMP (5 AAC) – RAF Waddington – Well Done

On 29 March 2021, while conducting maintenance on a Defender aircraft in support of UK Counter Terrorism operations in Northern Ireland, Lance Corporal Cope noticed a slight resistance in the left-hand Pilot's controls. Upon further investigation it was identified that a brake cable was chaffing on a component of the control system. The cable had moved over time and was close to causing a restriction to the aircraft's controls. The fault was difficult to observe and could have easily been missed and was all the more impressive given that Lance Corporal Cope had less than 6 months experience as a Technician.

Cpl Allan McClurg – 903 EAW – EAW Flight Safety Commendation

On 11 Sep 21, during the final shift before the penultimate week of 6 Sqn's Op SHADER detachment, 2 Typhoon aircraft returned in the early hours of the morning. Cpl McClurg was the supervisor of a team conducting the After-Flight Servicing of an aircraft which had no pilot reported faults. While carrying out the servicing, he discovered evidence of a bird strike inside the right-hand engine intake. Despite the reduced visibility and time of the activity, Cpl McClurg's diligence in carrying out the servicing ensured that the small impact was identified. Consequently, the recovery maintenance could be carried out before the next SHADER wave. Had the bird strike not been discovered during a thorough After Flight Servicing, the aircraft may have not been available for the next sortie. McClurg has not only had a direct impact on the availability of Op SHADER aircraft but also regularly sets the highest standard of engineering practices in all his work. He has also had a significant part to play in the recovery of some extensive avionics repairs and is highly respected by 6 Squadron Engineers and his chain of command.

Sqn Ldr Adrian Penwill – Air Command Air Cap - Commendation

Squadron Leader Penwill is a member of the Air Capability Centre of Excellence at Air Command. In this role, he has been pivotal in improving Air Safety awareness within the organisation and was instrumental in Air Capability achieving full assurance in a recent Air Safety Assurance Visit by the Safety Centre. His relentless work in the closure of 26 recommendations in the Air Safety Assurance Visit report of November 2019 has significantly improved the organisation. He has actively sought to raise awareness of Air Safety via a variety of work strands including the revision of the Air Safety Management Plan to make the document more applicable to a Duty Holder- Facing organisation as well as incorporate Military Aviation Authority Regulatory Article1205 guidance to Air Capability programmes.

Additionally, he developed the Air Cap, Air Safety SharePoint site to make it the one-stop location for all Air Safety matters. Squadron Leader Penwill has worked extensively with swim-lane Air Safety Managers to ensure they are aware of current safety reports and signposted them to key Air Safety documents. To raise awareness of the changes to Military Aviation Authority, Regulatory Article 1205, he presented at the ACOS Capability Strategy Townhall, highlighting the importance of including Air Safety at the conceptual phase and also drafting a report for ACOS Capability Strategy to identify which programmes were most effected by the Regulatory Article. He has also been key to the development of a First Party Audit for Air Safety in Air Capability in which he developed a format and ran a Proof of Concept with the Air Enablers swim-lane.

Cpl Dan Marshall – GEF - RAF Akrotiri – Commendation

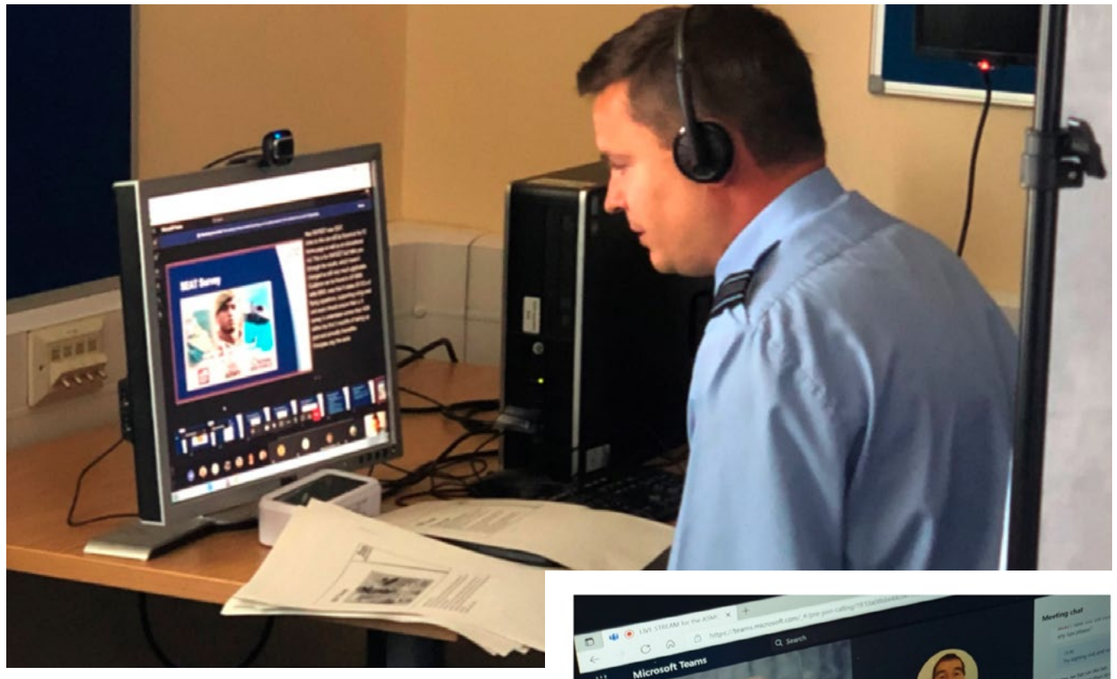
On 12 Jan 2021, at RAF Akrotiri, Corporal Marshall was tasked with "before use' inspections of the Station's Mk42 variable, dual setting Arrestor Barrier. In doing so, he observed that, after the barrier had been selected to the 'Heavy' setting and then back to the 'Light' setting, residual pressure remained in the system instead of dissipating as would be expected. Corporal Marshall investigated the issue further and identified that the additional pressure would mean that the force applied to arrest a light aircraft may be too great – potentially causing damage to aircraft should the barrier be engaged. Meanwhile, Air Traffic Control personnel would be unaware of the increased risk as controllers would assume that the barrier was in the 'light' setting and suitable for the aircraft type. Corporal Marshall immediately highlighted the issue to Air Traffic Control, explained the problem fully and raised a DASOR to alert other users of the same barrier system.

The subsequent and detailed research conducted by Corporal Marshall was presented to the Air Commodities team at DE&S, which was unaware of this attribute of a system that has been in service for some time. The Design Authority was also presented with the details and were able to determine that the additional pressure would be immediately dissipated in the event that the barrier was used. Therefore, the Design Authority concluded that any associated risk is acceptable and within the safety case. The Air Commodities team has accepted the task of updating all relevant publications to reflect this previously unidentified operating characteristic and reduce the potential for confusion.

Air Safety Management Conference – 2021

By Safety Centre

The Safety Centre hosted the Annual Air Safety Management Conference on 16 Sep 21 using Microsoft Teams as a virtual conference centre. This event was formerly known as the Station Flight Safety Officers' Symposium but, due to the ever-evolving shape of unit safety teams, it was decided to be more inclusive to personnel involved in Safety as opposed to being specifically unit FSOs.



The Conference lasted a day and culminated in the announcement of the Safety Centre Safety Trophy, which was awarded to RAF Valley Whole Force (see Awards in this Issue of Air Clues).

As well as presentations from Safety Centre Staff, the audience, which peaked at around 140 viewers, saw deliveries from: Sqn Ldr Gary James, RAF Shawbury, who discussed the life of a Stn FSO; Mr Jason Carnihan, MAA, who gave a useful update to ASIMs; and Miss Emma Smith, RAFCAM Psych, who gave a very informative presentation about the value of Operational Events Analysis.

AirClues

UKFSC

Civil Insights From the UK Flight Safety Committee

by Air Cdre (Retd) Dai Whittingham, Chief Executive, UK Flight Safety Committee

The post-pandemic recovery for commercial aviation is under way but very far from complete. During July/August, traffic levels across Europe have ranged from 30-50% of the activity that was the norm in 2019 and everyone is faced with trying to maintain high professional standards without the benefit of repetition and routine. Even the airports can be a different experience, the operational context having changed for many.

There is still plenty of pressure for On-Time Performance (OTP), which can ramp up the stress levels when you are faced with the additional Covid-19 protocols that are likely to improve your prospects of an unfortunate chat with management because of the need to pay delay compensation or foot the additional airport charges. Flight time limitations are set by regulation and you can't simply seek a waiver from the chain of command if the start of your overnight rest period has been delayed by a couple of hours in a queue at immigration.

Pilots and ATCOs are required to be fit and rested when they start a duty; if they operate when they are unwell or insufficiently rested, they do so outside the terms of their licences – in other words, the duty (and flight) becomes illegal. Whilst that observation might generate the odd crew-room groan, some pilots are only paid when they fly, so you might ask yourselves what your decision might be if you were (a) sick, and (b) trying to pay off the £120-150K loan you took out to pay for your professional training, especially if you were on a zero-hours contract, or where you know that there are plenty of people willing to bend the rules and take your place.

All of us who have flown on ops will have gone beyond 'peacetime' limits to get the job done. There is normally some form of alleviation because the safety risks are outweighed by the operational imperatives, but there is still an over-riding need to avoid doing the enemy's work by having accidents, which means continuing to manage the safety risks sensibly where you can. Sometimes that just means taking more time.

One of the issues that UK commercial aviation has been wrestling with recently involves wildlife. The CAA issued a formal Safety Notice after 3 unreliable airspeed events over the course of a few days at Heathrow, caused by pitot tubes being blocked by insects, specifically solitary bees. Whilst the initial assessment was that the events were Heathrow-related, it quickly turned out that this was not the case as the data quickly showed other occurrences which had also led to rejected take-off or air returns. Although main pitot-static blockages were affecting airspeed measurements, some Boeing types feature an elevator pitot that helps control the pitch feel system and there has been one recent UK occurrence, also believed to be attributable to solitary bees. Could these insects affect your aircraft? The answer is obviously 'yes'. You may be surprised to know there are over 250 species of solitary bees in the UK. They typically lay an egg and deposit food in a convenient tunnel in vegetation

or disturbed earth which is then sealed with a cap, but a nicely finished pitot tube clearly offers 5* luxury, at least until someone turns the heater on. What had not been well understood by operators was that the egg-laying process could occur in less than an hour. The biologists are working on the ecology to see why this problem has emerged at the scale experienced.

The question of wildlife ingress has been known about for many years, but most previous UK cases had involved aircraft that had been on the ground for an extended period, not with aircraft parked overnight. Most UK operators have reviewed their procedures, and several have now changed SOPs as a result. With larger aircraft, a normal crew or engineering walk-round inspection will not necessarily detect a blockage – you actually need to get quite close. That has meant a direct visual inspection using cherry-pickers or similar, which is being done by engineering staff.

SOPs have also had to be adapted for the increased use of pitot covers, which is not normal business for an aircraft that is on the line and being flown daily. Some operators are now fitting covers when an aircraft is expected to be on the ground for 48 hours or more, whereas others have opted for 24 hours. Other periods are also been used, but all will have been run through a risk assessment via the company SMS. As you all know well, as soon as you fit a lock, blank or cover to an aircraft, you open the possibility that someone will forget to remove it – especially if routines have changed. Sorting out a pitot head that has had a cover melted on to it is both time-consuming and expensive. Could it happen to you?

Lastly, the AAIB is investigating an accident at Heathrow involving a B787 that sustained serious damage when the nose landing gear retracted, the gear handle having been selected up as part of an engineering process to reset some software. Fortunately, nobody was injured, though it was a close call. The AAIB has already made public its finding that the NLG safety pin had been incorrectly inserted in the wrong hole within the NLG mechanism. Following a previous occurrence with a non-UK operator a fix had been identified and an FAA Airworthiness Directive (AD) issued. Unfortunately, the (still-current) AD allows a period of 36 months to introduce an engineered insert which would prevent the pin being incorrectly positioned.

The aircraft operator is conducting its own review but has chosen not to focus on the accident mechanism; instead, it is the organisational aspects that are being questioned. What should be the process at company level for assessing and prioritising ADs that have a long implementation period? Who decides? What risk assessment process is being used by the OEM and regulator? You might also wonder how such an obvious 'Murphy' came to be part of the design. The military airworthiness system has well-tested processes for issuing technical instructions and procuring modifications but, as the Heathrow event proved, nobody is perfect. A little thought, or at least a willingness to challenge accepted wisdom, might have generated additional temporary measures such as the use of paint markings or even a cork or other frangible plug of the right dimensions. That implies you should all be questioning the intent behind an engineering change – i.e. what it is meant to fix - and then what the failure mechanisms might be. If you think there may be a weakness, report it.

Unhealthy Office Habits

A Baker's Dozen For You to Consider

RAF Safety Centre

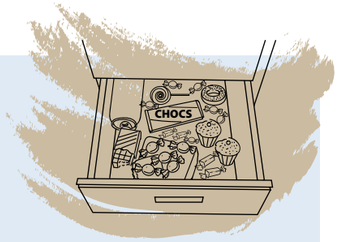
1

Sitting all day.
Standing up for just a few minutes every now and again, at least once an hour, is a great habit to get into for your overall well-being. Stand up, stretch, take a wander around the office. Even if you are a regular gym goer, don't be under the illusion that a gym session counters a sedentary rest-of-the-day sitting in front of the computer.

2

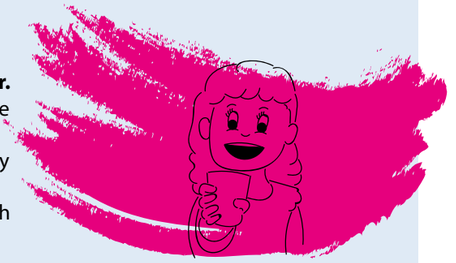
Eating lunch at your desk.
Worse still, eating lunch alone at your desk. If you do, you probably finish it inside 10 minutes and it is as if you never had a break. Apart from the fact that you are not taking a break, the lack of social interaction is unhealthy too. Good interpersonal connections are good for your mental health and morbidity. If you are a line manager, and your staff are consuming lunch whilst carrying on working, you need to ask yourself some questions. Are they overtasked? Is there a bit of social isolation going on? You can intervene. Also, consider this: have you noticed that your desk doesn't get cleaned by contractors anymore? The toilets are cleaned every day, so if you have food on your desk every day, the chances are your desk is dirtier than the toilets!

3



Drawers full of snacks. Take a look in your desk cabinet drawers. Does it look like a tuck shop? Crisps, biscuits, dehydrated snack pots? Do you really only dip in there occasionally for a treat, or are you giving yourself a sugar rush several times a day? Excessive sugar consumption, especially from sugar-sweetened beverages, has been strongly linked to the development of type 2 diabetes. This is likely due to sugar's direct effect on your liver, as well as its indirect effect of increasing body weight.

4



Not drinking enough water.
You might think that because you drink a lot of tea and coffee, you are getting plenty of fluids. The caffeine in tea and coffee is a diuretic, which means it will make you pee, and therefore you become dehydrated, and want to drink more tea and coffee. If you drink a lot of coffee because you 'need' it, that may be a sign of stress, and you should think about what is causing that stress, and maybe discuss it with someone who can help. You should also consider switching to Decaf. Drinking water is good for your skin and your mind. It will help to reduce headaches and boost your energy. Go to a water dispenser that is some way away from your work station and you will also stretch your legs, and get the opportunity to chat to others, boosting your social interaction.

5

Bad seat posture. Do you hunch over in your seat? This will sap your energy, weaken your core and maybe give you a bad back. Sit up straight and roll your shoulders back. Look up some seated-position exercises that you are comfortable doing in front of your colleagues.

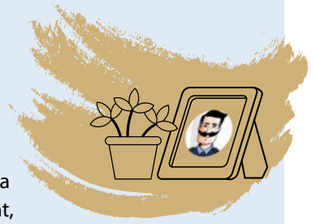
6

Staying late. A bit like working through lunch, everybody involved in causing this needs to ask why. Line managers especially should take it personally if staff need to routinely work late. Being in a 'high profile' job just doesn't cut the mustard anymore if someone's health and wellbeing is being seriously affected. If someone is signed off work for stress, please look to see if your area's work ethic is a contributory factor. If you yourself are routinely staying late, and you are doing so voluntarily, look out for symptoms of fatigue and stress and keep an eye on how it may be affecting things at home.

7

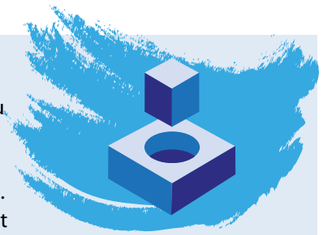
Coming into work when sick. If you get sick, do you feel you need to demonstrate your work ethic by coming in anyway? Do you feel your workload just can't afford a day or two off? Good line managers will recognise that (infectious) sicknesses, such as flu or colds will spread like wildfire, and will insist that you don't bring it to the office. If you need to rest, then rest. Discuss at a staff meeting the possibility of having a work-from-home contingency for people who are off sick but able to work anyway. It might be that you just can't travel. Maybe there is some online training that can be done.

9



Disliking your workspace. Show your desk a little love. A plant, a few favourite photos, some colour - all can make it a more welcoming space in the morning. Check out which offices make an effort at Christmas, and which don't. The smiles and joviality will be greater in one than the other.

8

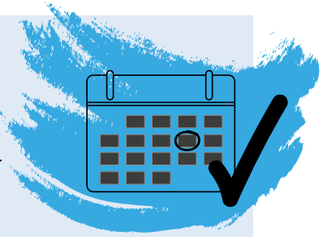


Persevering in the wrong job. Are you a square peg in a round hole? Are you sticking it out because of the money, or the convenience? Military personnel usually get around this because they are regularly rotated, around every 2-3 years, and often need to strongly negotiate being able to stay in the same job. Civil Servants can be in the same job for a lifetime. Have you noticed you don't get any feedback anymore? Have you stopped learning? Have you noticed that the people around you are not staying for very long? Does it just feel like time to go? Make a promise to yourself to at least look around for something that will stimulate you a bit more. You can go for interview without commitment. Just going through the application process might make you feel more enthused.

10

Avoiding work events. Do you always find a reason not to take part in a leaving social, or a Christmas party? Often, there will be a good reason for that. You might live a long way away and the event is even further away than work is. But, every single one? Promise yourself you will try to plan to make it to at least one or two in the year. It will boost your relationship with your colleagues, and you will probably have fun too.

11



Putting it off until tomorrow. If you can nail a task sooner rather than later, it will be a great boost to your morale. There is nothing worse than drifting towards a deadline with a bunch of time-consuming jobs still to do, that you really knew you could have done earlier, if you could just be bothered. Use your calendar to set specific tasks on specific days, or half days, and don't allow yourself to be distracted.

12

Dwelling over Monday morning on Sunday afternoon. If you come into work on Monday morning and think 'wow, it feels like I only left work on Friday five minutes ago' that's not necessarily a bad thing. It's likely a sign you are enjoying your weekends. However, if it gets to Sunday afternoon, and you are dreading Monday already, then you could be in a bit of a mind-twizzle. Instead of telling yourself that Monday is looming, change it up a bit. On Friday, make an (achievable) things-to-do list for the following week. This will make you feel that you are going to have a good productive week. Also, promise yourself a treat on Monday, such as a catch-up with a colleague you haven't chatted to for a while, or a mindfullness walk or run at lunchtime. Arrange it on the previous Friday.

13

Being Victor Meldrew. Ok Victor, it can be good to vent your spleen now and again, but doing it all the time can be hugely negative on your own psyche, and that of your colleagues. If you have become a bit of a grump, you are more likely to become stressed and annoyed by smaller and smaller issues. First, you will need to recognise this, so ask your mates if you come across as a moaning minnie. They won't miss this opportunity to tell you if you invite them. If you do recognise it, develop a strategy to deal with it. Promise yourself you won't react to something that annoys you for at least a few hours. You will probably work out by then that most of it is irrelevant and trivial. If you are still grumpy after a while of trying not to be, think about whether No 8 applies to you.

RAFSEET has had a purple makeover and is now... The SEAT Survey

By Sqn Ldr Ozzy Osborne, RAF Safety Centre

RAFSEET has undergone some changes and become the Safety Environment Assessment Tool (known as the SEAT Survey).

Why has it changed?

The Royal Navy and Army have seen the benefits of RAFSEET and wish for their personnel to get more involved with the tool; however, there has been limited uptake to complete safety surveys due to the RAF branding and the content being focussed on RAF ways of working and language. Building on the success of RAFSEET, with over 40,000 surveys completed and to enhance the project further, the RAF branding has been removed and the question set given a tri-service makeover. The hope is to make the survey mechanism easy to distribute across all 3 services and get wider 'buy in' from across the Services. Greater use of the tool can only be a positive step in developing the engaged safety culture across Defence.

What has changed?

- New web address; https://seatsurvey.co.uk
- Sole RAF branding has been removed from all the content and it has been given a new name: SEAT Survey.
- A new home page design to encompass the tri-Service ethos.
- The principles behind the questions remain the same, but some of the content has been changed to remove RAF ways of working and language.
- The survey administrator can now amend the number of surveys they have for their unit, where previously you had to request this from the RAF Safety Centre.
- The contacts page has been updated with SEAT Survey, JHC and Royal Navy representatives contact details.

The 5 fixed types of survey that can be requested are:

Aircrew	Aircrew Safety Survey	Surveys Aircrew regarding perceptions of safety culture in the operating environment.
Engineering	Engineering Safety Survey	Surveys engineering and technical personnel regarding perceptions of safety culture in their work environment.
Support Services	Support Services Personnel Safety Survey	Surveys personnel in the wider support roles regarding perceptions of safety culture in their work environment.
Air Operations Support	Air Operations Support Safety Survey	Surveys Space & BM Fce, ATC, Fighter Controller, Aircraft Controller, Air Ops and Int personnel regarding perceptions of safety culture in their work environment.
HQ	HQ Survey	Surveys Higher Headquarters personnel regarding perceptions of safety culture in the operating environment.

What is the SEAT Survey?

Many of you may have used RAFSEET, with some having already used the new SEAT Survey. The aim has been to make the SEAT Survey very similar to the previous product and hopefully, when you come to use it, you won't notice too many differences. This is by design, to make the transition easier and to ensure that all the comparison sets from RAFSEET are still relevant to the SEAT Survey.

For those that haven't used the tool before, the SEAT Survey is anonymous and provides unit commanders with a means to assess the safety culture within their unit and receive real-time data on the attitudes and perceptions of their personnel. Its goal is identification and correction of subtle organisational conditions that increase mishap potential. The SEAT Survey helps OCs/COs identify safety concerns and hazards while highlighting where to focus improvement activity. OCs/COs and their safety staff can use this information to develop strategies, perform risk management decisions and implement controls to better their organisation's performance.

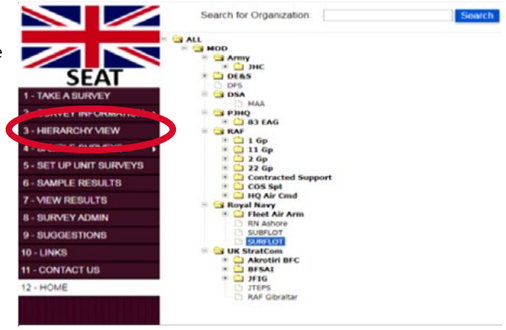
Over the last 5 years, the percentage of the 5 fixed survey types that make up the 40,000 surveys has been: Aircrew 17%, Engineering 37.5%, Support Services 28.5%, Air Operations Support 11% and HQ 6%. AP8000 leaflet 8005 states: 'All Commanders within AIR TLB shall conduct organisational attitude surveys as appropriate, in order to fully understand the safety environment within their AOR with a view to continuous improvement'. OCs/COs should employ the SEAT Survey, or similar organisational attitude survey systems to comply with this. It is recommended that 'A survey is undertaken across their AOR within the first 3 months of taking up post and annually thereafter'.

It is important to note; the design of the SEAT Survey ensures the individuals' anonymity, so they feel free to respond without fear of reprisal. This aim is to ensure the accuracy of the data and provide maximum benefit to commanders. Unit results are also kept confidential to avoid the SEAT Survey results being used as a unit safety report card. OCs/COs may share their results as they wish, but higher commands will only have access to aggregated trends across broad areas.

How to set up a SEAT Survey:

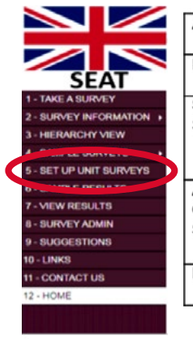
STEP 1

To initiate a survey for your unit, navigate to the SEAT page and look to the left hand side options.
If this is the first time you are setting up a survey, click on '**3 – Hierarchy View'** to locate your unit from our current hierarchy.
If you your unit is not represented in the hierarchy, then it requires amending; please could you provide us with the details by emailing Air-SafetyCtre-SEAT@mod.gov.uk and we'll make these changes.



STEP 2

Now click on '**5 – Set Up Unit Surveys**'.
In the guidance material you will see that there are 5 fixed types of survey to choose from (you can have more than one of these for your unit).
After reading the guidance material the request process begins at the bottom of the screen.



Aircrew	Aircrew Safety Survey
Engineering	Engineering Safety Survey
Support Services	Support Services Personnel Safety Survey
Air Operations Support	Air Operations Support Safety Survey
HQ	HQ Survey

STEP 3

On the second page, you will be asked to locate your unit from our current hierarchy (should be there if you requested it to be amended at the start).
On submitting your survey request/s, we then approve them, and both the POC and the OC/CO (survey owner) will receive an automated email detailing the next steps, i.e. survey links to promulgate to your personnel.
Note, if you require more or fewer surveys post set up, this can now be done by the survey administrator.

If you have any questions regarding a SEAT Survey or would like any help / advice, please contact the RAF Safety Centre Flight Safety Team at Air-SafetyCtre-SEAT@mod.gov.uk

Reducing the Mid-Air Collision Risk Through Engagement

By Gp Capt Mark Manwaring – The Inspector of Flight Safety (RAF)

Mid-Air Collision (MAC) is the highest aviation-related risk to life for the RAF. This risk is continually assessed and mitigated through a variety of measures which include Electronic Conspicuity (EC), planning tools, collision avoidance systems, radar service and, ultimately, 'see and avoid'. However, to complete the strategy of mitigation, we must not forget to continue to engage with other airspace users. This engagement and education process is a 2-way affair and, as Covid restrictions are gradually released, now is the time to consider resetting relationships with our civilian aviator counterparts.

Collision involving military and civil air systems is assessed as the highest likelihood of the MAC Risk. This is for many reasons; first and foremost, it is the sheer number of those that share our non-segregated airspace, namely the General Aviation (GA) community. It is estimated that there are 9000 fixed wing aircraft, 4100 microlights, 1300 helicopters and 2100 gliders registered in the UK! Clearly, not of all these air systems are serviceable and flying, but it does indicate the potential scale of non-commercial UK aviation.

The current Military and Civil mitigation strategies focus upon EC systems which build Situational Awareness of other Air Systems. However, EC is not a silver bullet and a large percentage of airspace users, particularly within the GA and gliding cadres, do not routinely carry compatible devices. This has been recognised by the Civil Aviation Authority (CAA) who has offered a financial rebate for private pilots who purchase one of the very capable EC systems currently on the market. Unfortunately, take-up has not met expectation, which has led to an extension of the scheme and slower than hoped utilisation of this technology.

Good relationships between those who share the airspace and an understanding of each-other's requirements is key to avoiding conflicting usage, and engagement with other airspace users has long been an additional Military mitigation to the MAC risk. Engagement can be achieved

in many ways – one such example is the excellent liaison between RAF Halton and the CAA 'Skywise' team which followed numerous infringements of the Halton Air Traffic Zone during the Summer of 2021. This resulted in a nationally broadcast 'Infringement Hot-Spot' alert which provided GA pilots the context to the issue and ways of avoiding further infringements. Early indications are that this has been a success, however, memories fade quickly, and strategies must be holistic and enduring.

In many locations, a permanent Regional Airspace Users' Working Group (RAUWG) is in place. The aim of each RAUWG is to reduce the risk of MAC between military and civilian airspace users within its region. The aim is achieved through suitable engagement, namely:

- Knowing and understanding the operations of other airspace users
- Building strong and sustainable relationships between airspace users
- Promoting an Engaged Safety Culture.

There are 8 RAUWGs set-up in the UK, with London Oxford, RAF Northolt, RAFC Cranwell, RAF Leeming, RAF Lossiemouth, RAF Marham, RAF Shawbury, RAF Valley and MOD Boscombe Down assigned lead roles. Are you at one of these Stations and not familiar with this responsibility or your role?

Are you at another Station that might benefit from forming a RAUWG? AP8000 (Leaflet 8201) states that 'Heads of Establishment establish a RAUWG in order to engage with other local military and civilian airspace users to resolve

airspace confliction issues.' In addition, Leaflet 8201 clearly sets-out the rationale and conduct of such Groups and has recently been updated by the RAF Safety Centre.

Whilst the 'leading-players' meet at the RAUWGs, arguably, not all of the goodness filters its way down to individuals at the grass-roots. This is possibly due to the disparate nature of private aviators who will often travel alone to their local airfield and then operate in isolation before travelling home. Until around a decade ago, Military Civil Air Safety Days (MCASD) were successfully run at numerous RAF Stations around the country. These events complement the RAUWGs by inviting GA pilots to fly (and drive) into a military airfield to attend a focussed safety event. For the private pilot, the prospect of getting a military airfield in their logbook is totally irresistible, and for the Station, the prospect of educating those that regularly fly near to their airfield or aircraft should illicit the same response!

Given that most of the attraction for attendees is already in place, organisers have the ability to tailor the content to meet their needs. Whilst every location and event will be different, it is worthwhile 'corralling' attendees into a hangar (or similar) for a captive audience series of presentations which should include the serious local message and some interest content. The serious local message could include:

- The Station Brief to include military output and national importance
- Station flying assets' role, outbound/inbound routing and training areas
- Station ATC (LARS and other services, instrument pattern, MATZ crossing, etc)
- Other non-military major regional organisations
- Organisers of regional events (gliding competitions, air shows, etc).

Whilst the interest message might include guest speakers from:

- General Aviation Safety Council (GASCo)
- UK Airprox Board (UKAB)
- UK Flight Safety Committee (UKFSC)
- RAF Safety Centre
- Stn Human Factors facilitators
- Display team members
- Relevant Industry.

The secret for success is to keep it short, relevant, full of eye-candy and leave them wanting more – a maximum of 2½ hours seated is advised.

Downstream success does not look like empty skies for a 20-mile radius around your airfield. Instead, your event will have generated more aware and considerate users of airspace who are now advocates of Mil/Civ Air Safety on behalf of you, their hosts.

For a keen MCASD Project Officer, a lot of preparation and liaison awaits. They must ensure that the entire process from advertising and bookings through to arrivals and parking goes smoothly, and above all is safe.

The Inspector of Flight Safety's staff represent the RAF at GASCo, UKAB and UKFSC, attend all RAUWGs, and are able to advise ProjOs. In early 2022, AP8000 will be updated to include guidance on organising and hosting a MCASD. In the meantime, now is the perfect opportunity to place a MCASD marker in your station Summer 2022 calendar.

GASCo
General Aviation Safety Council

MAC (Mid Air Collision)
It's The Wrong Kind of Sandwich

SC121
Produced by Air Media Centre, HQ Air Command.

ROYAL AIR FORCE Safety Centre

I Learnt About Flying From That Buccaneer Overstress

By Trevor Brown

Much of life in the late 1970's UK was very grey – high inflation, low pay, RAF Nuclear Bomber crews moonlighting on summer evenings by painting telephone boxes and their wives leaflet-dropping just for the basics. Meanwhile, the Buccaneer squadrons in Germany were always considered to be having much more fun (and money) than us in Suffolk. One of their jets had just completed its major servicing and was awaiting air test at St Athan. My navigator and I were suddenly offered the chance to complete that test on the Thursday afternoon then ferry the jet to them the next day. We were not booked to return to Suffolk until the Monday carrying our full duty free allowance after a weekend with mates. This looked like fun!

We'd already carried out a few full air tests at home base. On the document for their special engineering test schedule some test items were outlined in great detail and ran much like our own checklists whilst others were very broadly defined so, after we signed for the jet, we would sit down and go through the pages adding pencil notes so as not to lose track and not waste time and fuel.

We travelled by train dragging full flying kit through the London Underground and checked into the mess on arrival to be told of a delay. Previously, the major servicing had been completed by civilian contractors but this was the first one there done by an RAF engineering team and they were very keen to get everything exactly right. Apparently, there had been a couple of last-minute problems and we were invited to return the next day. In the morning we arrived ready to go but there were a few more problems, time dragged on but still enough to complete the tests and get to the RAF Germany base for the weekend. When all was ready, we crewed-up and started to complete the extra pre-start checks. With a few more snags we climbed out and returned after an hour and tried again. Things went swimmingly this time and we got up to 'canopy closed and locked' – but it wouldn't. Out we got again.

When we finally made it airborne, we could still just make it. Normal operations over there ceased about 19:00 on a Friday. Gradually ticking off the checks, we got to a very detailed part near the end concerned with configuration for landing. Now, the Buccaneer was optimised to fly as slowly as possible to land on the deck of a carrier. It had almost full span ailerons and tiny flaps all of which drooped down to provide extra lift for landing aided by bleed air for Boundary Layer Control (we called Blow) which started automatically with flap lever movement. A large trim change here was compensated for by a blown trailing edge flap on the elevator which lowered automatically with the flaps. The entire right hand side of the cockpit above and below the coaming was taken up with Blow Gauges to monitor the bleed pressure, indicators ('cheeses') to monitor surface angles and switches to adjust them in the event of failures. Our schedule for this bit went something like this:

'Flaps 15-10-10 – Check Angles of Flaps, Ailerons and Tailplane indicating correctly. Check those two important Blow gauges on the right hand coaming showing boundary layer control had begun over the wing and tailplane.'

The final section of the check took us to the bottom of that page. There were further checks on flaps lowering, gear lowering and then raising to check the warning horn by which time we were getting a bit too far from base so with that check complete, time for a fuel check, start the turn back, leave a bit of flap out to aid the turn, turn the page.

'What's next?' 'Oh, timed level acceleration from 250kt to 520'. 'Right'

'250kt, Start the clock. Hmmm, acceleration a bit slow, should have got there now but only 480kt, attitude a bit low, AND WHY IS THE BLOW STILL ON……?'

'Ah, that's because the flaps are still at 10deg. So let me see, Flap 10 limit speed 280kt and we've just exceeded that by 200KT!' So weekend off, 'Might need to land'.

There were then lots of decisions to make such as: divert to a longer runway; land as we were; land at St Athan and take the arrester wire at touchdown at the end or - because the ailerons must have already been used to high speed deflection, and the Buccaneer was renowned for its strength -configure and do a low speed handling check and not declare the problem. We configured and all went well. Smiling confidently to the awaiting ground crew, we drew the Squadron Commander aside and confessed. Unbelievably, he said 'no problems, we can hide our mistakes more easily than you so we'll do a check and let you know the damage'. By the time we had told Germany we weren't coming, the inspection had surprisingly revealed 'a flap bracket crack' and we started the long train journey home. On Monday morning we were ready to confess but of course the boss already knew. He was good about it saying it was unfortunate but that 12 other people had made the same mistake on air tests. We saved further embarrassment by not submitting an incident report and none was suggested.

Now you'd think the story would end there but here comes the interesting bit. Sometime later I was posted to RAF Handling Squadron where they wrote Pilots Notes and Checklists (no, not a punishment posting). Downstairs one day, I discovered by accident that the guy beavering away in the dark office below me wrote engineering air test documents. I told him my sad tale and suggested some slight re-wording of the schedule. After protesting that engineering worked in a very different way, the layout was set in stone and it was impossible to influence them, he finally agreed to add the additional steps suggested. So at least I'd redeemed myself in some small way!

Now surely the story ends there, but no! Sometime later the Buccaneer fleet was grounded for about two years whist wing attachment mods were made after a tragic failure. By chance I read an incident report from one of the first aircraft to return to service when a very experienced and respected crew carried out a full air test and accidentally overstressed the flaps at the same point in the schedule. So crew number 14 was the first to submit an incident report about this problem. How could this problem persist when the test schedule had been changed. The answer was, 'it takes time to amend the document…..'

I'll leave you to list the failure string but it's clear an incident report travels faster.

Spry's Comment:

"We saved further embarrassment by not submitting an incident report…."

There's no way that could happen today, is there? ☐

Climate Injury - COLD

By the RAF Safety Centre

It's not unusual for people to be badly affected by cold, even when the air temperature is above freezing. This is, of course, made much worse as wind speeds increase (including travelling in open vehicles) and when people become wet. People who study cold exposure in the workplace have noted 'slowing down of workplace efficiency', slowness of thinking, clumsiness (especially in performing fine tasks), and diminished concentration and attentiveness. It is known that people who are cold are more easily distracted and come to concentrate more on their cold rather than doing their jobs properly, to the point that it can adversely impact on safety. When working in any cold environment, be it out of doors, on a ship, or in a cold room indoors, there are several things to keep in mind:

Most cold (and heat) injuries occur in temperate climates during training. You do not need to be in Norway or the Sahara Desert. People working in cold environments, even well above freezing, need to be provided with: Proper clothing for climatic conditions. As anyone who has ever enjoyed the outdoors in winter knows, the key to cold protection is layering with a waterproof over garment. The layering provided pockets of air which provide highly effective insulation, as do the air spaces between the strands of fabric. If the fabric becomes wet, this insulation becomes ineffective, and heat can be conducted away from the body very quickly. Hence the importance of a waterproof overgarment. If people are exercising during their work, layers should be stripped away during exercise to prevent the material from becomes saturated with sweat, which destroys the insulating effect. The layers should be replaced gradually when exercise comes to a stop. On the other hand, if people must remain static during their work (such as guards or engine mechanics) they are more prone to cold injury and need to be provided with either a heated work environment or very effective protective clothing. Proper nutrition - the requirements for nourishment increase as workplace temperature decreases, be this in a ship, hanger, or in the field. For example, there is a need for twice as many calories when working at minus 20°C. Warmed break shelters of some kind for workers to warm themselves, as well as warm drinks if possible. The colder, windier, wetter the workplace, the more often and longer the warm-up breaks should be.

Wind and wetness certainly increase the chances that cold will impair work performance. 'The wind chill factor' refers to the fact that as wind speed increases, it 'blows heat away from the body' faster, which acts as if the temperature were colder in still air. Feet are especially sensitive to cold injury. If shoes/boots are laced too tight, this can reduce circulation which decreases the ability of the feet to keep themselves warm, and compresses insulation provided by socks, which reduces effectiveness. These effects are, of course, much worse if the feet are wet.

Hypothermia may be moderate or severe and can be caused by rapid exposure to extreme cold or prolonged exposure to wet and windy weather. Non-Freezing Cold Injury (NFCI) is the most common injury in land operations and exercises. The main cause is allowing feet or hands to remain wet and/or cold for long periods. Freezing Cold Injury (FCI) includes frost nip and frost bite (which causes lasting damage). Parts of the body most prone to freezing are the extremities and exposed areas - face, fingers, toes, heels and soles of the feet.

What can you do?

- Avoid alcohol for 48 hours before activity.
- Stay well fed, rested and drink plenty of fluids.
- Wear the right kit for the weather conditions: use layering.
- Keep feet and hands dry.
- Don't lace your shoes/boots too tight.
- Use gloves where possible.
- Add layers to keep warm.
- Change wet socks and gloves as soon as you can.
- Keep moving; wriggle toes and fingers or march on the spot to keep you warm.
- Be aware that if you are a smoker, or are unfit, you are at greater risk.

Talk to your chain of command or medical officer. Remember You can be at risk from both Heat Illness and Cold Injury during the same exercise or operation. Use the body heat equation to think about how to protect yourself:

Heat Storage = Heat Gained - Heat Lost
Cold Injury can be very serious - make sure you know the Immediate Actions.

Buddy Buddy
Look out for the risk factors in your colleagues. Keep an eye out for signs and symptoms in others and raise the alarm straight away. Always report any concerns you have as soon as possible - especially if you start to feel strange or unwell.

The Commander's Guide to Cold Injury – JSP 375 Chapter 42 Annex F
The Commander's guide to cold injury (Annex F to Chapter 42 of JSP 375) contains a host of information about cold weather risk factors, wind chill, recognition and response, hypothermia and a cold injury Risk Assessment Checklist. It's a must-read for any commanders detailing activities in cold conditions.

Extract: Commanders are responsible for the supervision of all personnel and control measures during the duration of the activity. They must ensure that an activity is covered by an appropriate degree of first aid/medical cover. Commanders should ensure that their medical staff are involved in medical planning at the earliest opportunity and are empowered to raise concerns about cold injury at any stage before and during an activity. They must review their risk assessment throughout an activity as circumstances change. All cases of cold injury must be reported by the Chain of Command. Commanders must ensure all personnel are made aware of cold injury including methods of prevention, identification and first-aid management. This must be covered as part of single Service periodic mandatory training.

Cold Weather Actions

Ministry of Defence

An Individual's Guide to **Cold Injury**

Based upon JSP 375 (Management of Health and Safety in Defence), Chapter 42, Cold Injury Prevention Ver 1.0

AC64680

Hypothermia

First Aid Treatment Guidelines

What to look out for:

Moderate Hypothermia

- The casualty may say they feel very cold
- Un-controlled shivering
- Feel cold to the touch
- Cold, pale hands and feet
- Loss of manual dexterity (clumsiness)
- Mild confusion, disorientation or irritability
- Loss of insight, denying having any problem
- May reject help, could be difficult to treat

Severe Hypothermia

- Slurred speech
- Apathetic, confused, irrational, and clumsy
- Lips may turn blue
- Consciousness may be reduced
- Slow and/or irregular pulse
- Shivering has stopped
- Casualty is unresponsive, breathing and pulse will be faint or even undetectable and they may look dead

PAUSE ACTIVITY

INDIVIDUAL

- Commence treatment
- Remove the individual from immediate danger and prevent any further casualties from occurring
- Initial assessment should always address airway, breathing and circulation problems first

GROUP

- Risk assess others, then recommence activity
- A single case is a warning that other personnel are at risk, the commander is to carry out a dynamic risk assessment of the activity, and is to consider other control measures including stopping the activity

Is the casualty conscious?

YES

- Gentle exercise, if able
- Give the casualty warm drinks (not alcohol) or high-energy foods, such as chocolate

NO

Place the casualty in the recovery position

- It is important to handle the casualty with hypothermia gently and carefully
- Move the casualty indoors or somewhere warm
- If you cannot move the casualty indoors find something for them to lie on to insulate them from the ground
- If casualty's clothes are wet, change them into dry clothes; make sure their head is covered
- Put the casualty in a sleeping bag and cover them with blankets
- Encourage the casualty to shiver if they're capable of doing so

Evacuate to medical care as quickly as possible

NOW REPORT IT

Freezing Cold Injury (FCI)

First Aid

What to look out for:

- Any part of the body can be affected However, the extremities, such as the hands, feet, ears, nose and lips are most likely to be affected.

Early signs (frost nip)

- The affected part feels cold and is painful to touch
- A tingling sensation followed by numbness
- No feeling when the affected part is moved
- Skin looks mottled - white and pink

Later signs (frost bite)

- No feeling in the affected part
- Skin white and waxy-looking
- A clear line between white and pink skin
- After re-warming, skin may appear bruised and blistered

A single case is a warning that other personnel are at risk, the commander is to carry out a dynamic risk assessment of the activity, and is to consider other control measures including stopping the activity

What to do:

- Remove the casualty from the risk environment
- Shelter the casualty or if available help move them indoors
- Provide supplementary whole-body insulation (eg Sleeping bag, extra clothing layers, hat etc)
- Once sheltered / inside, gently remove anything constricting like rings, gloves or boots
- Dry affected feet and/or hands

IF THERE IS A DANGER OF THE AFFECTED BODY PART BEING FURTHER EXPOSED TO FREEZING CONDITIONS (RE-FREEZING), THEN DO NOT WARM IT UP YET AS THIS CAN CAUSE MORE DAMAGE

- Next, warm the body part with your hands on your lap, or under their armpits
- **Do NOT** apply direct heat (heater)
- **Do NOT** rub the frozen part in an attempt to thaw because this could damage their skin tissue
- **Do NOT** allow the casualty to smoke or take alcohol
- **Do NOT** use skin ointments (eg Deep Heat)
- **Do NOT** allow the casualty to use the limb when re-warmed
- Replace wet socks or gloves as needed
- If blistered or discoloured put on a light dressing, ideally a gauze bandage from your first aid kit
- Give the casualty warm drinks (not alcohol) or high-energy foods, such as chocolate

EVACUATE THE CASUALTY TO SAFETY

- Remain sheltered until evacuation can be arranged
- Do not allow the casualty to return to the cold environment even if they appear to have recovered

NOW REPORT IT

Non-Freezing Cold Injury (NFCI)

First Aid

NFCI can occur in temperatures that are not particularly cold if there are other risk factors present, such as damp / wet conditions or immobility.

What to look for in hands or feet:

- Numbness
- Pain
- Pins and needles

A single case is a warning that other personnel are at risk, the commander is to carry out a dynamic risk assessment of the activity, and is to consider other control measures including stopping the activity

What to do:

- Remove the casualty from the risk environment
- Remove wet boots and socks and /or gloves
- Dry affected feet and/or hands
- Replace wet socks or gloves as needed
- Change into dry kit as soon as possible
- Encourage the individual to wriggle their toes and fingers to keep them warm

If they have to stand still for long periods:

- Order 10 mins of step ups or marching on the spot to keep the circulation going
- If exercise is not possible (with help if required):
- Gently re-warm their feet/hands
- Try to get their feet into a dry sleeping bag - they should then massage them gently

EVACUATE THE CASUALTY TO SAFETY

- Do not allow the casualty to return to the cold environment, even if they appear to have recovered

NOW REPORT IT

News

RAF Sets Strategic Objective to Operate Safely

RAF Safety Centre

In a published refresh of the RAF Strategy 2021, the Chief of the Air Staff has set 5 Strategic Objectives, one of which commits to 'operating safely; delivering output efficiently; and to act professionally'.

In doing so, the RAF will: *'ensure that risks to life are managed intelligently down to the level where they can be considered as low as reasonably practicable and tolerable; comply with appropriate standards of governance; meet our obligations to protect the environment; contribute to MOD's 2050 emissions targets; and continuously improve efficiency'.*

Specific detail on how these objectives will be managed and measured will be stated in the annual Command Plan.

ALARP & Tolerable

Managing Risk to Life appropriately is something the RAF has been a global leader on for some time now. The keen-eyed will have noticed though that we have switched from saying 'Tolerable & ALARP' to 'ALARP & Tolerable'. ALARP must be determined first - if you can't make it ALARP then you can't proceed to the tolerable judgement. You should only therefore progress to whether you think the remaining risk is tolerable once you have determined what the ALARP position is.

Whole Force

As you would expect, the Strategy focuses on people as one of its main vehicles to achieving these objectives. 'Whole Force' means the optimum blend of regulars, reservists, civil servants, contractors and industry partners, it is recognised that we have a highly-talented and motivated workforce of aviators which would be the envy of any organisation. Every single person in the RAF has a particular skill; nobody is recruited to be a 'number' which contributes to our claim to be an agile, adaptable and capable organisation.

'Aviators'

By the way, if that's the first time you've heard the term 'aviator' in that way, then get on board. No longer does it mean just aircrew, but the term 'aviator' has now replaced the generic term of 'airman' to bring right up to date the way we should describe all of our personnel in a modern and appropriate manner. So, it's no longer 'Soldiers, Sailor & Airmen' but 'Soldiers, Sailors & Aviators'. Watch out for TV commentators getting used to that.

Next Generation Air Force

As well as people, the Strategy discusses the need for a 'Next Generation Air Force' and it's no surprise that information and digital technology will be at the forefront of that 'next generation'. ASTRA will be the vehicle behind delivering the Next Generation Air Force and therefore all the objectives set out in the Strategy. With over 120 Astra 'Sprints' undertaken already, manged by 1300 ambassadors, change is accelerating again.

'Sprints'

The concept has introduced another modern term that needs explaining – 'Sprints'. Ever since we started adopting business speak with terms such as 'overarching this and underpinning that' we have developed a particular fondness for new terms. 'Sprint' is another business term that needs explaining. If you Google it, you will see that it means 'a short time-boxed period when a scrum team works to complete a set amount of work'. No doubt the word 'scrum' is on its way too.

Strategic Objectives

In order to achieve our ambitions, five top-level strategic objectives have been formulated:

1. **Meet our Operational Commitments**
   Generate and sustain delivery of battle-winning air and space power for United Kingdom and Coalition Commanders in line with the Defence Plan and Government Intent.
2. **Build a Workforce Fit for the Future**
   Get the foundations for tomorrow's workforce right today; understand the evolving requirement; recruit and retain the diverse people we need; transform our people structures and training system; reward, empower and motivate our people to unlock their full potential.
3. **Deliver the Next Generation Royal Air Force**
   Exploit innovation, science and technology; enable and exploit Multi-Domain Integration; embrace data and networks; mobilise space and cyber; modernise our 21st Century bases; transform our way in warfare, training and how we look after our people. We will also support the Government in meeting its objectives to address climate change.
4. **Support Global Britain**
   Ensure that we play a full part in projecting Global Britain on an international stage by building the capacity of partner nations and contributing to UK influence. Promote British industry to provide greater prosperity for all of the United Kingdom.
5. **Operate Safely. Deliver our Output Efficiently. Act Professionally.**
   Ensure that risks to life are managed intelligently down to the level where they can be considered as low as reasonably practicable and tolerable; comply with appropriate standards of governance; meet our obligations to protect the environment; contribute to MOD's 2050 emissions targets; and continuously improve efficiency.

2050 Emissions Target

The environmentally astute of you will have noticed the RAF commitment to 'contribute to the MOD's 2050 Emissions Target'. In fact, the RAF has gone one step further and has declared an ambition to have Net Zero emissions by 2040, and therefore be the first Net Zero Air Force in the World. This will encompass: a Net-Negative RAF estate that has increased energy and vehicle fuel resilience through over-generation of renewable energy and carbon offsetting, enabling an ability to operate off-grid at home and when deployed; Net Zero Aviation with enhanced operational capability and minimised air, aviation and space emissions through innovative, energy-informed solutions; and Net Zero as BAU (Business as Usual) - an RAF that is Net Zero connected across the whole force with technology, data and innovative thinking, has evolved its behaviours, culture, ethos, procedures, financing and commercial models, makes energy-informed decisions, and has fully transitioned Net Zero activity to Business as Usual. Exactly how this will be achieved is not clear to the author of this article but, at the time of writing, there was a plan for Lizzy Kijewski, the RAF Safety Centre's Environmental Champion to explain more in a future article. Look out for that.

Other News - New Version of JSP 907

The DIO has published a new version of JSP 907 which covers the management of the Defence Training and Evaluation Estate (DTEE). The policy covers all locations that Defence uses to train including TLB owned training areas. In the near future the Defence Ordnance, Munitions and Explosives Safety Regulator (DOSR) will be bringing in OME regulations that will mean that all RAF owner training areas including those where training is conducted on Stns will require formal licencing and 2PA.

For clarity the policy covers all training locations:

- Defence Infrastructure Organisation (DIO) provides the DTE. DIO is responsible for the management and stewardship of the majority of the Defence land-based training estate.
- The Reserve Forces and Cadet Associations (RFCA) Estate.
- Defence Science and Technology Laboratory (DSTL).
- QinetiQ, Provider of the T&E.
- Training Estate retained by Navy Command, Army, Air Command and JFC. These include:
  - Small back-door training areas and small arms (SA) ranges within Garrisons. These cannot be booked using the BAMS booking process but should be booked direct7 . A list of some of these sites available for booking is contained within the Catalogue at Chapter 8, Part 2 - Guidance.
- Leased or Licensed Land in the UK. Leased or licensed land in the UK that is available for military training is controlled and funded by DIO.
- Private Land in the UK. Private Land, which is land that is not owned, leased or licensed for use by the MOD may be booked using the Training on Private Land (TOPL) procedures specified in Chapter 4.
- Other Nations Training Areas (ONTA). ONTA is training areas that can be used by the MOD following negotiation with host countries.

Continuous Improvement

By Flt Lt Alexander Smales, RAF Safety Centre Assurance

"Practice the philosophy of Continuous Improvement. Get a little bit better every single day."

(Brian Tracy, author and motivational speaker)

As the Air Safety Assurance Team (ASAT), we are tasked by the RAF Safety Centre with providing Second Party Assurance (2PA) within the Flight Safety (FS) domain across the RAF at HQ level, as well as to many deployed locations. In doing this, we are able to observe and assess the performance of many Air Safety Management Systems, all with differing structures, roles and practices, from which we can establish trends, both good and bad, across RAF and Defence Aviation more widely.

One area in particular where we have observed both strong and weak performance in the assured organisations, is in the facet of Continuous Improvement (CI). When CI is mentioned, many immediately think of a large event with white boards, sticky notes and big bold ideas aimed at completely reinventing the way things are done. This can seem like a daunting, time-intensive task, haunted with the possibility that the resultant changes would cause significant disruption for what may only be minimal improvement in the long run. While these large-scale events do have their place, it is the experience of the ASAT that the much smaller acts of CI conducted more regularly lead to consistent long-term improvement

Acts of CI can be as basic as raising an issue to a friend, colleague or Line Manager, simply suggesting small improvements to the way things are done. Over time, the cumulative effect of these small acts of CI can bring significant improvement to output, processes or both.

Firstly, for long term and effective CI to occur, a good Air Safety (AS) culture needs to be in place. Individuals should feel able and empowered to raise CI suggestions that will be taken seriously and considered. A good way to demonstrate a serious approach to this is by providing feedback. Even if a CI suggestion is not implemented for whatever reason, feedback should still be provided to the person who raised it in the first place. This helps people to feel that their idea was valued and given due consideration, which in turn helps to keep them feeling valued and much more likely to engage with CI subsequently.

To support and encourage the raising of CI initiatives, a clear process needs be in place that should be accessible to the Whole Force of service personnel, civil servants and contractors. The use of In-Form, a locally produced CI form or an accessible online tracker are commonly observed, but no matter which, it is important the process is made clear and detailed as part of the Safety Management Plan or similar. It is also key to have an individual nominated as the focal point for CI within the organisation. This could be either the Quality System Coordinator (QSC) or the Flight Safety Officer (FSO), depending on the structure of your organisation, but anyone could be the CI focal point.

Formal CI rallies can be a really useful tool to stimulate thought, either as part of a regular programme of CI events, or to help deal with a particular challenge. These types of events work best when given a specific area of focus and are led by a suitable individual to coordinate activity and keep a record of discussions and decisions.

Having previously mentioned the importance of providing feedback, it is also useful to maintain a CI log to record all CI suggestions raised, including any outcomes, regardless of source implemented or not, along with the supporting reasons why. This helps to prevent duplication of effort if the same suggestion is made in the future, while allowing future incumbents to understand why changes were made.

Finally, promotion of CI can be really helpful in encouraging those with good ideas to come forward. This can be as simple as a poster, advocating the benefits of CI and explaining the local CI policy. CI updates could be promulgated in a local newsletter and the use of a local awards scheme can provide recognition to those who have raised good suggestions.

Within the RAF, we have organisations of many different shapes and sizes, all uniquely structured to fit their specific roles and responsibilities. The most consistent thing throughout is the quality of our people; you are the glue that binds everything together and are responsible for the amazing output we deliver. It is important that we exploit your knowledge and experience to help improve what we do as an organisation.

As part of our work, the ASAT maintains a Good Practice Portal which can be found in the Safety Centre Flight Safety Sharepoint Page. We record Good Practices observed during our regular assurance visits. Please feel free to both visit this site and contact one of the Team if, during your own CI activity, you think of something that could be worth sharing more widely.

AirClues


011
ZM145
DANGER FAN INTAKE DANGER
011
RESCUE
DANGER
INTAKE DANGER

RAF Centre of Aviation Medicine
Operational Events Analysis

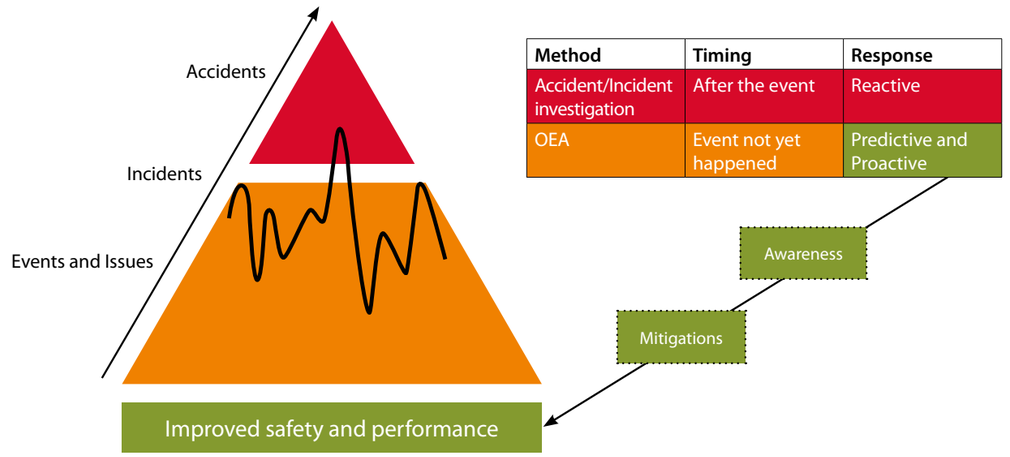
By RAF Centre of Aviation Medicine

The RAF Centre of Aviation Medicine (CAM) Operational Events Analysis (OEA) is a preventative Human Factors (HF) review that provides a high level version of the analysis performed during Defence Accident Investigation Branch (Defence AIB) Air HF investigations.

Experience from conducting HF accident investigations has demonstrated that many of the pre-conditions that increased the likelihood of the accident were present before the day of the incident. This is in line with Heinrich's pyramid, illustrated below, which highlights that for each accident, many lower level events and issues are present.

The OEA provides a structured and proactive method of reviewing the underlying HF issues, making it possible to identify human-related risks that are present in a unit that could:

- Increase the likelihood that personnel may enter a hazardous scenario;
- Reduce the likelihood that personnel may successfully recover from the scenario;
- Reduce the likelihood personnel may successfully escape following a hazardous scenario; and
- Reduce the likelihood that personnel would survive the hazardous scenario (including undertaking appropriate survival actions).



Method	Timing	Response
Accident/Incident investigation	After the event	Reactive
OEA	Event not yet happened	Predictive and Proactive

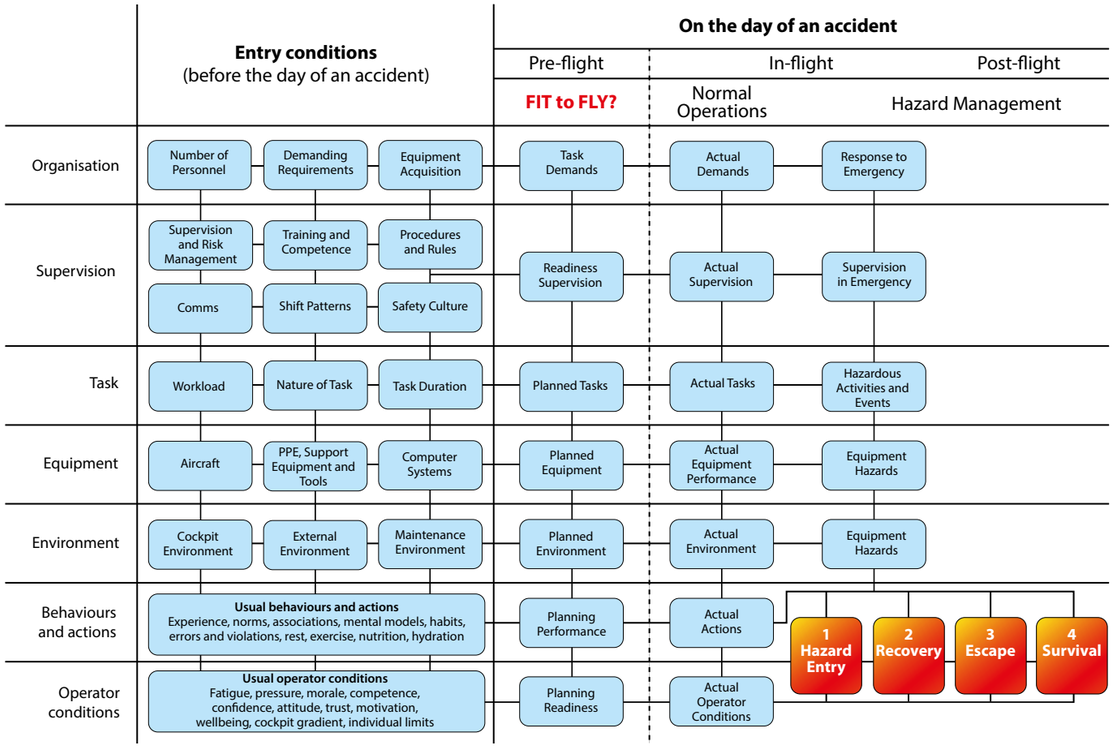
Once HF issues have been identified, it is possible to take action to address those issues. As part of the OEA, the CAM team will work with the unit to develop an action plan to address the issues identified. The team also remains available after the OEA to support implementation of actions based on the report.

The OEA is undertaken based on the Accident Route Matrix (ARM) which is the same approach used to guide Defence AIB HF investigations. The ARM is based on the systematic and validated framework of the Human Factors Analysis and Classification System (HFACS), which is grounded in Reason's Swiss Cheese Model. HFACS outlines a series of HF issues that have been identified across accident scenarios and classifies those factors into organisation influences, unsafe supervision, preconditions for unsafe acts, and unsafe acts. The ARM has developed HFACS to support the grouping of evidence by both type (organisation, supervision, equipment, environment, and operator) and by time of effect (factors that occurred prior to the day of the accident, on the day of the event, or during the sortie itself). A generic ARM outlining some of the factors that are explored during an OEA is presented below.

The OEA is usually undertaken over a ten day period by an on location HF specialist from RAF CAM. During the ten day period the following tasks are undertaken:

- One-to-one interviews with members of the organisation in which the OEA is taking place. It is not necessary to speak with everyone; however, it is important to speak with a range of personnel across levels and groups within the organisation. Each interview takes approximately one hour.
- Observations of tasks undertaken. For maintenance teams this will involve observation of a sample of engineering tasks including tool control and paper work. For flying personnel, this will involve observation of planning, briefing, and debriefing and (where possible) observation during the sortie. For ATC, this will involve sitting at the console with the controller.
- Observation of working environment. The HF specialist will spend time in the main working areas, and observe the organisational facilities including the cockpit workstation.
- Attendance at team briefings.
- Review of documentation relevant to issues identified.

The combination of these activities enables the HF specialist to build a picture of the HF issues associated with the operation of the organisation that is grounded in the ARM framework.



At the end of the ten day period, the HF specialist will provide an initial verbal debrief to the key stakeholder(s) at the organisation. Often this is to the Station Commander or Sqn OC (or nominated deputy). The initial debrief outlines the key HF issues that were identified during the OEA. The HF specialist will then undertake a detailed analysis of the observations and interviews, and this will lead to the production of an OEA report which includes the ARM, a description of each issue identified, and the impact of those issues for safety. Key stakeholder(s) will have an opportunity to comment on a draft version of the OEA report before a final version is issued.

The benefits of an OEA include:

- **Independence.** The OEA is an independent assessment by a HF specialist with prerequisite accident causation knowledge.
- **Anonymity.** The OEA includes one-to-one discussions where personnel are informed result would be anonymous, thus promoting honesty and disclosure.
- **Representativeness.** The OEA covers a variety of tasks and roles.
- **Prevention.** The OEA provides practical preventative recommendations.

Limitations of the OEA include:
The OEA is limited to the personnel interviewed during the investigation period. HF issues and recommendations, therefore, do not identify safety or welfare issues that were not detected during this time.

The issues identified primarily reflect the perception by those persons interviewed rather than a full assessment of the validity of that perception. This in itself provides a valuable insight into how issues are viewed, but is a limitation that should be taken into account when taking action based on the report.

The OEA focuses on HF issues only and so does not provide a full assessment of non-HF issues associated with Flight Safety. However, where non-HF Flight Safety issues are identified, these are included in the report.

To discuss whether an OEA wouldbe beneficial for your team please email: Air38Gp-CAM-AMW-AIHF-GpMbx@mod.gov.uk. An initial conversation about the value, scope and timescales for the OEA will determine the potential benefits. If appropriate, a formal OEA request can then be made by the unit.

All OEA requests are reviewed by the OEA Steering Group, chaired by the RAF Safety Centre, after which the OEA will be tasked.

Exploiting Technology Advances for Future Flying Training

The Live/Synthetic Balance (continued from Issue 32)

By Wg Cdr Simon Elsey, Smith Barry Academy, Central Flying School.

Photo by Wg Cdr Nic Green. Reproduced by kind permission of Thales (Issue 25).

Worldwide, many organisations are increasingly turning to technology to assist with their training. The i-Generation (colloquially known as 'digital natives') expect technology to be involved in most aspects of their training and work. Simulation has been used extensively for a long time in UK military flying but it was originally the preserve of infrequent emergency handling or initial conversion training. Leaps in technology have given us modelling and visual systems which have permitted the virtual world to close-up on the real world. This has allowed us to reconsider how we use the various types of devices. The RAF has ambitious plans for the future use of simulation with aspirations of 80 – 90 % of flying training being completed using simulators and related equipment. The ratio is often known as the 'LSB' – Live/Synthetic(or Simulator) Balance and it has attracted considerable attention in the last 10 years because, in general, simulator training is cheaper than the live equivalent, simulators are safer, and they are more reliable. However, there is a long-held belief that a lot of military flying training must be completed in the live environment because the simulations are not good enough. This is an over-simplification of a much more complex discussion but widespread advances in simulation technology have resulted in the belief being challenged.

The technology is not necessarily new, in many cases it is simply improved – for example Virtual Reality (VR) has been used for over 20 years in helicopter rearcrew training but improvements have propelled it into various other spheres including driver, crane operator and pilot training. Alternative projection techniques have reduced simulator complexity but increased visual fidelity. There are lists of advantages and disadvantages of increasing the use of simulation, clearly context is important, and everyone has an opinion!

The Smith Barry Academy (SBA) of the Central Flying School (CFS) has been considering some of the opportunities this move may present but also some of the consequences to avoid or mitigate. The issues are many and varied but we will focus on a few which have clear safety implications.

Mental model of risk. Discounting underlying health conditions, you cannot die from crashing a virtual aircraft. Aircrew know this and it is likely that their behaviour and decisions are affected by this knowledge. Practising catastrophic emergencies in a Full Flight Simulator (FFS) is done with the knowledge that if it goes wrong towards the end, you can have another go. Simulator training needs to be regarded appropriately – repeating below-standard attempts may be acceptable for consolidation but assessments must have pass/fail outcomes to influence behaviour. Failure is a blunt motivator, but it is easy to incorporate into a system.

However, to assist the trainees, it is essential that the devices become more immersive. To generate the desired behaviour, we need to convince the aircrew they are in the live system. This requires a temporary suspension in their belief of what is real. This is challenging to maintain over a period of time and requires careful management with no disturbances. Targeted distractions can assist with the theatrical aspects – this requires relevant tasks which can use up some cognitive capacity to prevent the subject from mentally leaving the scenario. If we sustain this environment, we stand a better chance of seeing mental processes and decision-making more aligned to live flying.

The latest VR equipment can provide astonishing quality graphics. This gives visual immersion by removing peripheral distractions (the simulator operator for example). By adding headphones, we can easily achieve aural immersion and therefore take two powerful senses out of the challenge. With force-feedback on representative flying controls and an approved flight model, it may be possible to attain periods of acceptable immersion.

However, we should remain aware of the unintended consequences. RA2309(14) highlights the potential hazards associated with muscle memory and emergency training when moving between simulated and live training. The desired transfer of training could result in the undesired movement of critical controls in the live environment leading to an unsafe situation. It is likely that Aviation Duty Holders will need to monitor their policy on live practice emergencies as we adopt a greater degree of simulator-based training.

Unintended changes to lookout and scan. Transfer of training is a relatively well-understood concept and one we rely on in flying training. If we teach a skill in a simulator and the trainee can reproduce the same skill to the desired standard in the live aircraft without further training, we are very happy. However, it is not just about the handling skill, the correct supporting behaviours (habits) must transfer too. From their first sorties, trainees are taught about the importance of one supporting behaviour – lookout. If we cannot replicate the cockpit view in a simulator there is a risk that we will not be able to achieve desirable transfer of training. The patterns may be practised but the actual lookout may be ineffective (we have all moved our heads while keeping our eyes on the instruments!). If our dominant training medium is a suite of simulation-based devices, we will need to ensure that they are capable of delivering appropriate training. A reduced Field of View (FOV) is thought to lead to greater head movement and lookout to build up the 'missing' picture, but trials have noted that intentionally narrow FOVs led to over concentration on flight instruments and therefore reduced lookout[1]. Therefore, there is a concern that head and eye movement patterns learned from hours of live flying may be harder to embed in the future due to the different media and visual representations. This is further compounded by the fact that current simulated airborne environments are often eerily sterile (further discussed later), with rarely anything to actually 'look out' for! At present, there could be a tendency for aircrew to go through the motions, moving their eyes quickly around the virtual environment, in a manner where they would not actually perceive another aircraft in the real-world.

A recent joint trial within 22 Gp involving VR training transfer generated data relating to head movement. The data is being analysed by academics at the University of Birmingham for the SBA and will hopefully provide a useful baseline as we see more VR use in UK military flying training. Due to the importance of lookout, it is likely that further research will be required using trials, data capture, analysis and monitoring over time.

Fig 1. Trial conducted at RAF Valley. Photograph by Smith Barry Academy. Reproduced by kind permission

[1] Field of View Effects on Pilot Performance in Flight, Covelli, J.M., Rolland, J.P., Proctor, M.D., Kincaid, J.P. & Hancock, P.A. (2010).

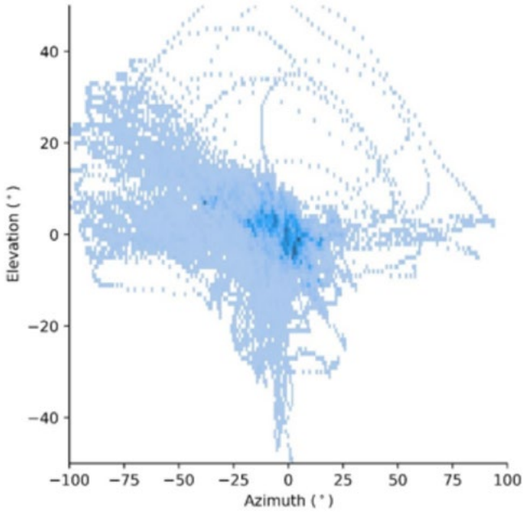


Figure 2. A summary histogram of head-movements for a group of participants who performed a left-handed circuit task in the dome simulator, having received training in a VR device. Various metrics will be derived from these data to allow their head-movements to be compared to a group of participants who received their training in the dome simulator.

As ever, one question leads to others - do head movements and lookout scans change between day and NVD flying? Is the training medium capable of addressing both environments to the required fidelity? If other areas of military training adopt similar training media, do new users of head mounted systems require conditioning programmes to avoid neck strain or related injuries?

Reduction in physiological stimulus. The intent to reduce live flying training in favour of increased use of simulation usually attracts negative comments regarding physiological stimulus – 'the seat of the pants feeling', particularly from FJ aircrew. It is very expensive to provide a simulator which has an effective g capability. The Thales Centrifuge at RAF Cranwell delivers an excellent capability, but it would not be feasible to provide relevant pilots with the regular experience. Research has shown that the time between g events can negatively impact g tolerance – 'g lay-off'[2]. The effects are seen in 2 – 4 weeks; further lay-off has little further impact but regular exposure tends to sustain g tolerance. Modern equipment and g-warming are methods of mitigating this, but in training, Aviation Duty Holders will be required to consider whether it is suitable to aim for 'just enough' exposure.

For ME and RW air systems, the motion vs non-motion debate continues to split opinions. The most important issue is the proposed activity. If you only want to fly circuits and instrument flying currency, then you are less likely to need physical cues to fly the profiles (assuming you are in balance…). However, if you want to fly manoeuvres which require repeated low-g physical cues (RW – sloping ground or a PFL) then motion can have perception-based benefits.

Trials have been conducted with motion systems turned on and off, but the results were rarely conclusive. One trial even randomly reversed the roll (a demanded left turn resulted in a motion cue to the right), but the trainees did not comment or note a difference in sensation[3]. With a greater focus on, and demand for, simulator training we may see efficiencies in motion systems – high-speed electric actuators are likely to replace hydraulic systems potentially reducing space, complexity, and costs. It is unlikely that there will ever be a simple, common answer to the motion vs non-motion debate.

Airmanship influence and impact. In addition to potential lookout impacts covered earlier, SBA staff have also considered the possible impacts to the other components of airmanship as defined in the AP3456 model of airmanship[4]. Few subjects generate intense discussion like airmanship, and we are not attempting to make any declarations here, just thoughts for consideration. A live training flight typically involves multiple inputs so maintaining SA can

The RAF Cranwell Centrifuge Gondola (See Issue 25). Photo by Wg Cdr Nic Green.

[2] Impact of the lay-off length on Gz tolerance, Polish Air Force Institute of Aviation Medicine trial study.
[3] The Effect of Simulator Platform Motion on Pilot Training Transfer: A Meta-Analysis Transfer, E Vaden.
[4] Situational awareness (SA), decisiveness, communication, resource management, mental performance and spare mental capacity.

be complex with an extensive picture being generated through knowledge, visual cues, technical systems and r/t transmissions. The general lack of realistic ATC and r/t transmissions in aircraft simulators contributes the previously mentioned sterile environment. We train aircrew to listen effectively, decide if it is relevant and then use it to build their mental picture of what is happening around them. If we do not (or cannot) provide a similar range of inputs during simulator training sessions, then we must expect a lack of progress and development in those areas. This has obvious Air Safety implications for when the aircrew conduct the same activities in the live environment but with comparatively more complex and cognitively demanding inputs. This suggests that future simulation must address not only the air system modelling but also the supporting environment otherwise we risk under-preparing our future aircrew for the rigours of live flight.

Anecdotally from discussions, increases in simulator use resulted in more frequent errors from walk arounds. This should perhaps not be a surprise given that simulators rarely require an external walk around. For the aircrew reading this, if you only completed a pre-flight walk around every few weeks (because of greater use of simulation) what would you expect to be the effects? Would you be more likely to miss a subtle problem due to lack of recent practice? Would you take more time to complete it due to reduced familiarity? It is likely to be different between fleets, but we could mitigate negative effects by mandating checklists for example. Technology could also help; high definition video of a walk around would be easy to capture and make accessible for some types.

While it should be our aim to identify and remedy every hazard presented by increasing the use of simulation, it is unlikely. We have worked hard over the last decade to mature our Air Safety culture and our reporting is generally regarded as being good. In the future, we should continue to encourage reporting relevant events in both the live and simulated environments and hopefully our reporting culture will reveal tendencies before they become impacts.

We have only covered a few of the areas that have been identified in previous studies into LSB assessments and the increased use of simulation for aircrew training. One of the most important aspects is an awareness of the potential for 2nd and 3rd order consequences to emerge from an ever-increasing reliance on simulation. Done correctly, we have opportunities to train and prepare aircrew better than previously as we can create scenarios that were not feasible or technically possible, at a time of our choosing, and with increased confidence of successfully achieving the training. However, we must be mindful of the complexity behind the decisions when selecting which media to use in training.

Inside the RAF Cranwell Centrifuge Gondola. Crown Copyright.

Specialist Training School
Joins the RAF Safety Centre

By Howie Wadsworth, Head of STS

HEAD OF STS TRG - Howie Wadsworth

A/TM QM - Belinda Smith

TRAINING MANAGER H&S & EP – John Tredgett

Did you know that the RAF CESO AOR has a new training arm to the RAF Safety Centre? Quality Management, Health and Safety & Environmental Protection Training is now under the command and control to the RAF Safety Centre as an integral arm within CESO RAF area. This change has occurred as part of the changes Programme PORTAL presented and the subsequent closure of RAF Halton scheduled for 2025.

Specialist Training School (STS) is exclusively staffed with a small team of Civil Servants who specialise in assurance training. The training team is unique to the RAF and its dictated requirement is to underpin the RAF Safety Centre and wider defence customer training requirements. STS must meet the high standards of excellence required of a modern and accountable fighting force.

The training provided in Quality Management has ensured the RAF engineering and logistic branches are sufficiently organised in meeting the legislative and regulatory standards contained within AP 100c-10. STS also has the privilege of being the only face-to-face facilitator in Environmental Protection training to Defence. STS is also responsible for training RAF personnel in the management and applications expected by Law and higher command in Health and Safety. The 3 STS departments routine output is 2300 individually trained personnel, this however, has been dramatically impacted by COVID 19 but, against many challenges STS has still delivered a steady state of 1052 qualified personnel to frontline and further afield operations including marine spill response training to British Forces Cyprus and Gibraltar.

Recent developments in improving the STS online DLE training has seen QM providing 3 quality awareness training courses which during COVID has seen a further 4602 Defence personnel enrolling and successfully using this style of learning.

Over the past 18 months, STS has used the lockdown periods in reviewing, overhauling and transforming its training packages, not only ensuring this training and content is fit for purpose to stay abreast of the times, but also with the re-group and selection in new eclectic trainers to provide the training excellence the RAF demands.

This new STS compliment of specialists have come in to support the RAF from a plethora of industry backgrounds, who have heightened the school to new levels, with new ideas and knowledge to enhance our specialist areas from offshore oil, canals and river trust, private sector health and safety to other government organisations of the prison and metropolitan police services and ex RAF Officers and SNCO's. This new well rounded, well bonded dynamic team enhances the training experience of those in attendance to ensure embedded learning in a fun, friendly and pragmatic environment. STS trainers travel the length and breadth of the country and overseas to provide value for money and peace of mind in the reduction of time away from their frontline duties in skills training that online fails to give.

Environmental Protection (EP)

In the ever-changing field of Environmental Management, it is often easy to get behind with the constant changes in Government legislation and policy.

STS offers several courses aimed at individuals requiring both general and specialist training in environmental issues. Whilst the complete set of courses provides the candidate with a comprehensive understanding of environmental topics, the modular approach offered enables personnel to tailor training to meet requirements. Training is available to all Defence personnel from Service and CS positions. Contractors, please apply via International Defence Training RAF (IDT) This is the case for selling STS training to MoD partners and international students.

STS EP Training Courses – Part 1

Course: INTRODUCTION TO EP.
The Intro to EP course is held over 3 ½ days and provides entry level pre-employment training in environmental issues and concerns and demonstrate how environmental legislation affects Ministry of Defence (MOD) activities.
This course is a pre-requestee to attending EP Law and Policy, EMS and Auditing. Environmental issues and concerns are affecting all aspects of everyday life. Ministry of Defence (MOD) activities have an impact on the environment, and changes in environmental law and public expectations are altering the way the Armed Forces can and should operate. This course covers the main environmental subjects and how they relate to military matters. The aim of this course is to provide managers, supervisors and operators policy, so that the impact of military activities on the environment can be properly understood, addressed if necessary and remedied.

Eligibility. The course is open to all personnel of all branches and trade groups who have a designated responsibility for environmental protection matters on their unit.

Course: EP – LAW & POLICY. The EP Law & Policy is held over 2 ½ days and provides managers, supervisors and operators with an understanding of the concepts, objectives and implications of environmental legislation and policy in MOD activities.

Course: FOUNDATION IN ENVIRONMENTAL AUDITING. The Foundation in Env Audit course is held over 4 ½ days and provides delegates with the skills and knowledge to design and implement the auditing and monitoring systems required by their organisation's existing environmental management structure to reduce environmental risks. The course will primarily train to MOD policy auditing requirements, though other environmental management standards will be referred to. The course provides delegates with the skills and knowledge to design and implement the auditing and monitoring systems required by their organisation's existing environmental management structure to reduce environmental risks. The course will primarily train to MOD policy auditing requirements, though other environmental management standards (such as the equivalent ISO Standards) will be referred to.

Eligibility: The course is open to all MOD personnel of all branches and trade groups who have been identified by unit commanders as having responsibility or involvement in the auditing or monitoring of environmental management systems.

Course: WASTE MANAGEMENT. The Waste Management course is held over 3 days and provides managers, supervisors and operators with enough knowledge and understanding to carry out their duties in circumstances where waste legislation is a consideration. The course will also provide knowledge of the complexities of waste legislation, safe

waste disposal and waste management in terms of the legal implications and cost reduction in the MOD. Some Ministry of Defence (MOD) activities generate waste that is difficult to get rid of both in terms of cost and strict legal requirements. This course provides the core skills and knowledge for proper waste management to be achieved in terms of legality and cost reduction. The aim of this course is to provide managers, supervisors and operators with enough knowledge and understanding to carry out their duties in circumstances where waste legislation is a consideration.
Eligibility. The course is open to all personnel of all branches and trade groups who have a designated responsibility for storage.

Course: INTRODUCTION TO ENERGY MANAGEMENT. The Intro to Energy Man is held over 2 days and provides understanding of energy management within the MOD and highlights areas where opportunities for making savings of energy bills can be achieved.

Eligibility. The course is open to all personnel of all branches and trade groups who have duties concerned with managing energy within the MOD, such as Energy Unit Focal points.

Course: PRACTICAL POLLUTION PREVENTION TECHNIQUES. The PPPT course is held over 2 days and provides the necessary knowledge so that first response and subsequent actions minimise the adverse effects of pollution and how to comply with the obligatory reporting procedures. This course has a practical element to practice the skills taught.
The MOD has many activities that have the potential for causing water pollution and other environmental problems. The consequences are often expensive to remedy and can result in prosecution. The course introduces methods of prevention using the equipment available and immediate actions when spillages and losses have occurred and to provide the necessary knowledge so that first aid and subsequent actions minimise the adverse effects of chemical and fuel spillage's and how to comply with the obligatory reporting procedures.

The aim of the course is to provide the necessary knowledge so that first response and subsequent actions minimise the adverse effects of pollution and how to comply with the obligatory reporting procedures. The course will also provide knowledge of methods of prevention using the equipment available, and of what action is required when spillage and losses have occurred.

Eligibility. The course is open to all personnel of all branches and trade groups who are working in areas and carrying out tasks where the risk of water pollution/land contamination is most likely. For example: Bulk Fuel Installations (BFI's) and Fuels and Lubricants (F&L) activities, bulk chemical storage and use.
Course: ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS) IMPLEMENTATION, The EMS Implementation course is held over 4 days and provides delegates with the skills and knowledge to design and implement an Environmental Management System (EMS) within their own organisation's existing management structure.

Eligibility: The course is open to all MOD personnel of all branches and trade groups who have been identified by unit commanders as having responsibility for the implementation of an EMS.

Course: ENVIRONMENTAL MANAGEMENT SYSTEMS FOR ARMY SITES (EMSAS). The EMSAS course is a half day course that will allow the candidate to contribute to effective implementation and maintenance of Environmental Management Systems on Army Sites, or where Army sites are joint with RAF sites, by providing focused pre-employment training for those implementing EMSAS.

Eligibility: The course is open to all MOD personnel on Army sites who have been identified by unit Commanders as having responsibility for the implementation of or working with an EMSAS.

Course: MARINE OIL SPILL FIRST RESPONDER. The Marine Oil Spillage Response (for MCA 1P First Responder) is a 1-day course which normally runs after a PPPT course. To be legally compliant many units based in a marine environment require staff to be trained to a competent level.

Eligibility: The course is open to personnel working with fuels and lubricants in a marine environment (units based on the coast) that have an MCA legally required training need established by their TLB.

Part 2 of STS Training Courses (CESO Training) coming in issue 37

ROYAL AIR FORCE Safety Centre

RAF High Wycombe
Station Safety Day-23 Sep 21

By Safety Centre

Performance Based Navigation – Accuracy Means Access

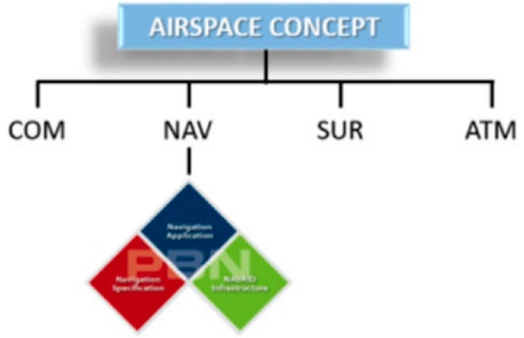
By Alan Lindsell, SO2 ATMCNS, DAATM

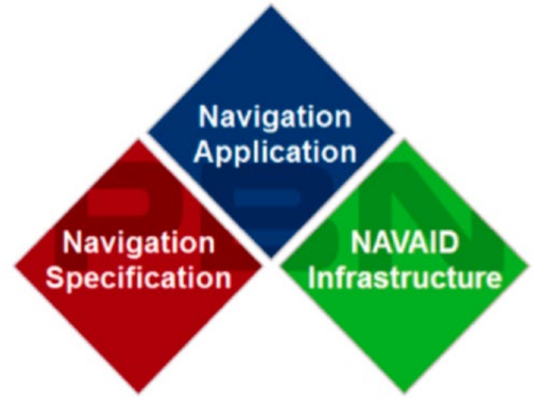
Two years ago, I could barely spell 'PBN' let alone tell you what 'Performance Based Navigation' meant or why the MOD should do anything about it. Now, it's clear that PBN is already here and we risk our freedom of manoeuvre if don't consider it in our procurement programmes, procedures, and training. It is everywhere (Eurocontrol reports that 50% of all instrument runway ends in Europe are enabled for 3D PBN approaches (using LNAV/VNAV or LPV procedure minima) - this is expected to increase to 75% by Q4 2023).

There is no mandate that requires MOD platforms or crews to operate using PBN. Some RAF aircraft are fitted and some are not. Our own regulatory Article 1380(1) states that: "UK military registered Air Systems that regularly use the civil Air Traffic Service (ATS) structure as General Air Traffic should comply with or demonstrate equivalence to civil PBN regulatory requirements….." Issues such as impending out-of-service dates complicate our approach to the requirement. But, we can ignore it and not be in trouble from Eurocontrol for doing so. Except, the world around us is changing and civil aviation is rapidly shifting towards the use of PBN and we could be left flying around using out-of-date procedures that cause delays or inefficient routing/altitude, limit diversion options and ultimately result in greater CO2 emissions. That's not very 'Astra', so perhaps we should take note.

The goal of PBN is to create a safer flying environment whilst accommodating the expected increase in airspace users (including commercial RPAS operators and space flight). More efficient routing should result in shorter flights – even if only marginal, they add up – and reduce environmental concerns over noise pollution and fuel burn. It also supports the 'rationalisation' of costly ground infrastructure further reducing emissions – radio spectrum as well as CO2.

The existing navigation environment has developed over seventy years and is reliant on a network of ground-based beacons: Non-Directional Beacons (NDB); VHF Omnidirectional Radio Range (VOR); and Distance Measuring Equipment (DME). As technology evolved, it was no longer necessary to fly via a series of waypoints as on-board computers could calculate turns between beacons making the 'old' route structure highly inefficient. Global Navigation Satellite Systems (GNSS) further reduced the reliance on conventional navigation aids ('navaids'





for short) and can help enable a totally 'free-route' airspace environment.

But we are not there yet. Undoing 70 years of airspace route construction takes time and reducing separation between aircraft for efficiency requires a lot of safety work. Not to mention a justifiable nervousness at relying heavily on vulnerable GNSS signals. The International Civil Aviation Organisation (ICAO) recently recognised commercial pilots' reporting of GNSS outages in the Eastern Mediterranean and now emphasise the need for resilience and the maintenance of a minimum operational network of conventional navaids. PBN makes use of a blend of sensors including GNSS, ground-based navaids and Inertial Navigation Systems (INS) on board aircraft. There are strict rules on what can be used where and when and these are what constitute Navigation Applications. They apply Navigation Specifications based on the Navigation Infrastructure in an area/at an airfield and these three elements make up the PBN concept.

Navigation Specifications (Nav Specs)

There are 11 Navigation Specifications. These are broken down in to two main areas – Area Navigation (RNAV) and Required Navigation Performance (RNP) and many are followed by a number which indicates the accuracy of the specification in nautical miles e.g. RNAV 5 requires a flight to be within 5nms of the route for 95% of the total flight time.

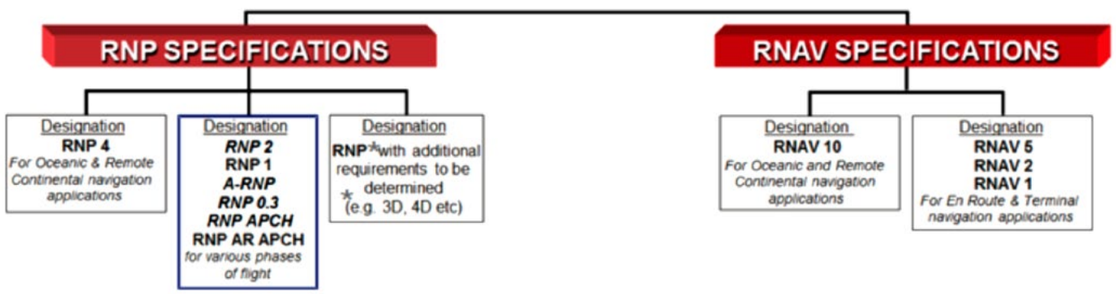
Nav Specs also define the type of approach. At geographically challenged airfields, such as those in mountainous terrain where conventional navaids are less effective, GNSS solutions can provide 3D approaches that wrap around the contours of the terrain. Such complex approaches require specific training and are designated 'RNP AR APCH' where 'AR' means 'Authorisation Required'. More routine approaches that do not require specific training or authorisation are designated RNP APCH and are far more common.

RNP is essentially a more reliable version of RNAV. It requires On-board Performance Monitoring and Alerting (OPMA), so that deviation from the route is automatically brought to the attention of the pilot. RNP therefore permits much more accurate routing and enables final, missed approach and departure procedures based on PBN. This more accurate routing makes it particularly useful to the rotary wing community should they wish to fly within 0.3nm (or even 0.1nm) of a particular path.

Navigation Infrastructure

Conventional navaids include VOR, DME and, where approved, the DME portion of military Tactical Air Navigation (TACAN). NDBs are not used in PBN and across Europe over 90% of NDBs are being decommissioned in the coming years . Inertial Navigation Systems (INS) may be used for certain Nav Specs providing they are accurately and routinely calibrated.

GNSS is, of course, the main piece in the infrastructure jigsaw that opens up a whole host of Navigation Applications due to it being available (almost) everywhere. The most widely known – and commonly used - is the US Navstar Global Position Satellite (GPS). Europe has Gallileo, China BeiDou and Russia GLONASS. The UK Space Agency is developing its own constellation however it will be some years before this is certified for use in the same way as GPS.



	Permitted Sensors				
	GNSS	INS	DME/DME	DME/DME /INS	DME/VOR
RNAV 10					
RNAV 5					
RNAV 2/1					
RNP 4					
RNP 2					
RNP 1					
A-RNP					
RNP 0.3					
RNP APCH					
RNP AR APCH					

There are two GPS codes in use for the purpose of air navigation: The Standard Position Service (SPS) and the Precise Position Service (PPS). The first is the one in your phone, tablet and just about every navigation system on Earth uses and the second is a secure, more accurate version, reserved for specific users i.e. military. Whilst it is widely accepted that Mil GPS (PPS) is more accurate, it is less obvious that the design satisfies civilian certification standards for reliability and integrity and is extremely unlikely to given the classification of the design and codes in use.

NATO and Eurocontrol are currently investigating whether an alternative certification standard may be met through Performance Equivalence and the MOD is contributing to this important work. Until dual-use of Mil GPS is approved however, military aircraft need to use civilian certified GPS to make full use of PBN.

Navigation Applications

Navigation applications apply Nav Specs to the infrastructure available and define the routes, departure and arrival procedures (e.g. SIDs and STARs). It could be an airway which requires RNAV 5 using a mix of VOR and DME or an RNP APCH to an airfield using GPS with a procedure minima of 400ft agl. Lower procedure minima may be available using Space-, Ground- or Aircraft-Based Augmentation Systems (SBAS, GBAS or ABAS) but these are still in development (SBAS was available in the UK but, since 25 Jun 21, is no longer assured for use [2]).

Current Military situation

En-route Air Traffic Services (ATS) routes in the UK have been designated RNAV 5 since 2011 and many civilian airports have RNP APCH procedures in place. Several MOD airfields also make use of PBN procedures and they can be used as an excellent alternative to PAR and ILS. Compared to PBN, both ground-based navaids are expensive to install, operate and maintain and not all runways can use them. PBN procedures could be used where ILS is not equipped or as a resilient alternative to PAR. Once augmentation technologies are approved for use, PBN could represent a step change in recovering safely to airfields in poor weather, even those that were previously only VFR capable. Most modern aircraft in use by the MOD are, or will be in the coming years, PBN compliant and it is up to us to ensure we train our crews and our controllers to make the best use of PBN.

Summary

PBN represents a revolution in navigation enabled through advances in GNSS and aircraft navigation systems. The benefits to its use are enormous and include safe, cost-effective and reliable alternative approaches to airfields – particularly where ILS and/or PAR cannot be used. More efficient routing can result in significant environmental benefits including less noise pollution, reduced fuel burn and lower CO2 emissions.

Whilst there is no mandate or requirement for military air systems to comply with PBN regulations, we risk being given sub-optimal routing/level allocation, delays and may even be denied access to certain airspace or airfields unless we equip and train to the standards applicable to civil aviation. They will likely incur costs to implement and maintain, but these must surely be a fraction compared with costly diversions, inefficient routing and the continued upkeep of older navigation and approach technologies [3].

For more information please see the Defence Airspace and Air Traffic Management (DAATM) CNS Sharepoint site at https://modgovuk.sharepoint.com/teams/12826/SiteAssets/CNS.aspx or the Eurocontrol PBN portal at https://pbnportal.eu/epbn/home/home.html for some excellent training material.

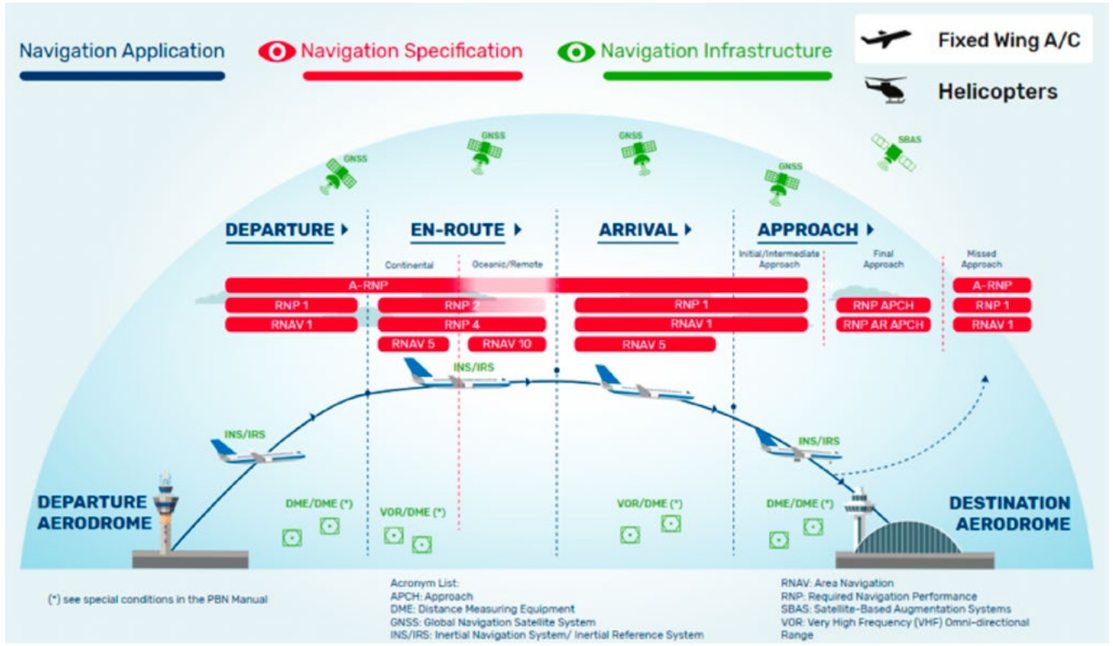
(Imagery reproduced by kind permission of Eurocontrol.)

[1] Eurocontrol CNS Advisory Group report published Apr 21 available at https://www.eurocontrol.int/publication/cns-infrastructure-evolution-opportunities

[2] The European Geostationary Navigation Overlay Satellite (EGNOS) Working Agreement was terminated on 25 Jun 21 resulting in UK airfields no longer having approaches reliant on EGNOS SBAS assured for use.

[3] For the purposes of resilience and as part of our commitment to NATO, existing TACAN, PAR and ILS are expected to be in service for years to come.

AirClues



5G and the Risks to Aviation

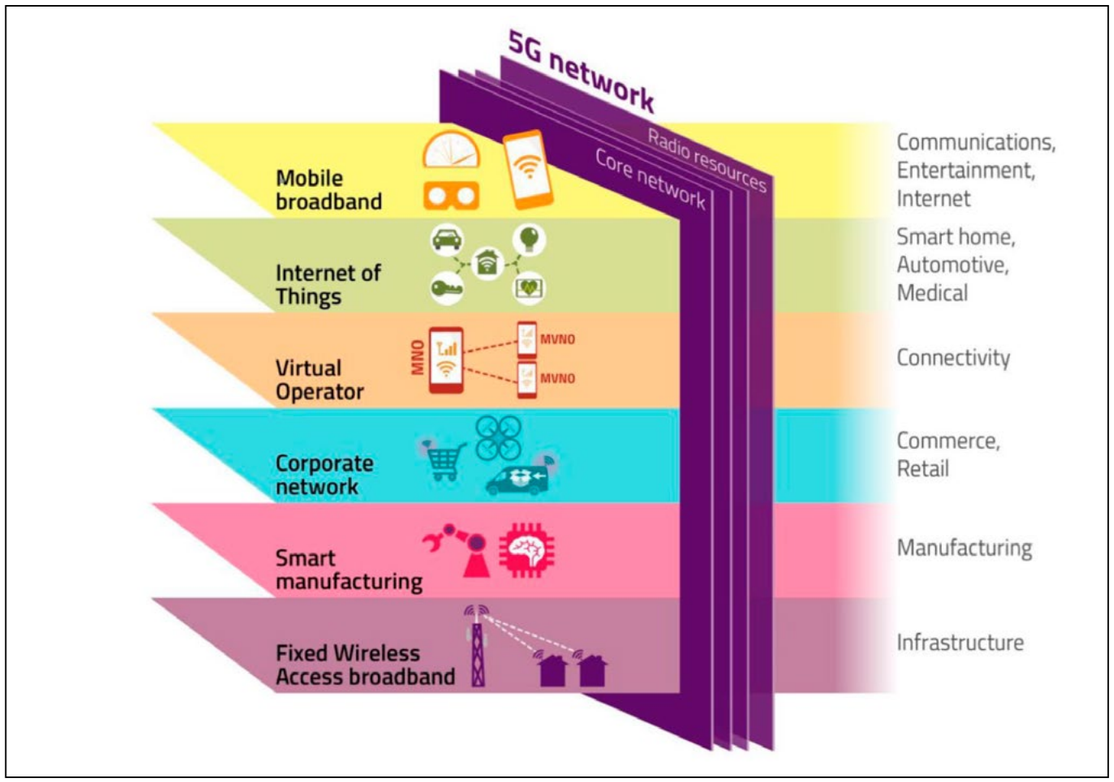
By Sqn Ldr Torsten Hossle, DSA, MAA, OpAssure FE Test

Picture the scene…as you leave the house on one of those rare days when you have chosen to go to the office in person, your driverless car (already warmed up and with your favourite 'radio' station already streaming) is waiting outside. Your Artificial Intelligence (AI) has already programmed the route and, joy of joys, has cleared out the junk emails and notifications from your diary.

You settle back as the car negotiates junctions and the traffic management network to bring you safely to the office. During the journey you ponder what delights you will enjoy for supper, confident that your fridge has already ordered the ingredients (delivered by drone, of course) and that the oven will be already warmed by the time you come home.

You wonder at the miracles of free-flowing traffic, of having goods and services delivered to you seemingly before you need them, of surgeons operating on patients remotely from across the globe, of perfect matching between demand and supply…this is the connected world, the fabled 'internet of things' – all built on the foundation of 5G.

Now for the tech bit.... what makes 5G so special?
It is a mobile data network characterised by fast data transfer speeds (up to 70 Gbps) combined with ultra-low latency of 1ms (latency is that frustrating gap between command and action, such as the lip-synch delay when watching a film on a large TV). To deliver this capacity the 5G spectrum is spread over three frequency bands:



Network slicing examples: Source: www.ofcom.org.uk (https://www.ofcom.org.uk/__data/assets/pdf_file/0020/135362/supporting-role-wireless-innovation-uk-industry.pdf)

Low @ 600-850 MHz = Same coverage area as 4G; 30-250 Mbs data speed (few takers so far)

Mid @ 2.3-4.2 GHz = Range measured in miles; 100-900 Mbs data speed (rural installations)

High @ 25-39+ GHz = Short range 500m; 70 Gbps data speed (high density, urban installations)

The capacity to handle large volumes of data is further augmented by 'network stacking', whereby multiple user-generated networks can overlay each other. This would mean that in your home you would have an entertainment network, a home-device network and a productivity network, each operating at maximum speed & capacity with minimal latency – no more dropped Skype when the kids start streaming a movie! More importantly, it enables vehicles to communicate at low latency with each other and the traffic management network – no more traffic jams or traffic lights!

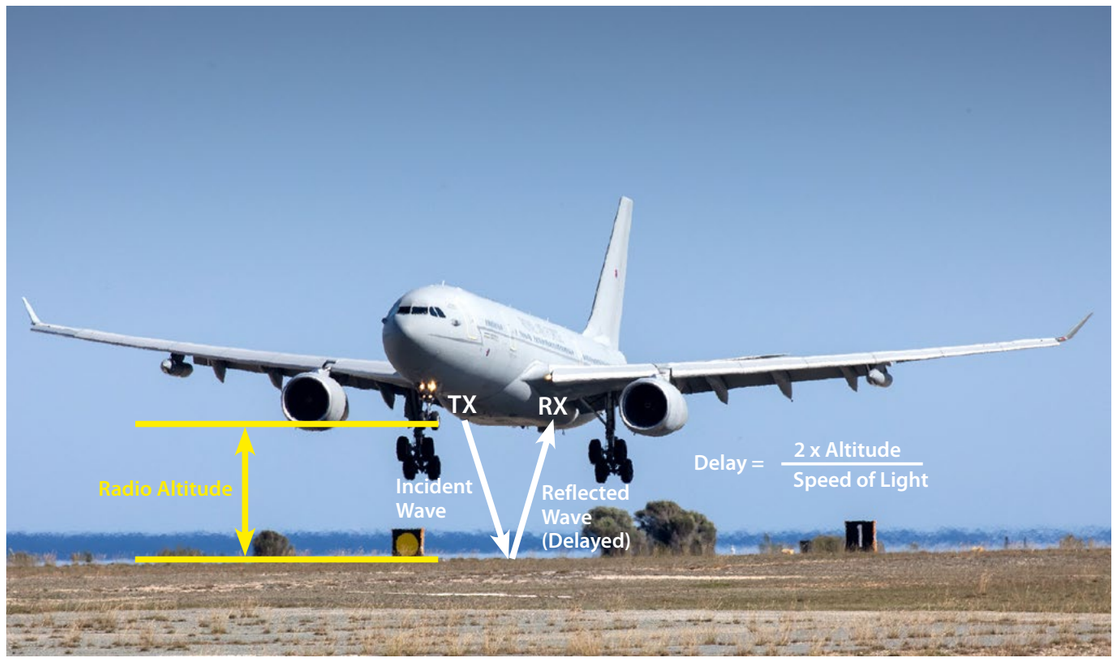
All science fiction?
No, it's here already, both in the UK and across the globe. In the UK, Ofcom has already approved licences for installations (to operate at restricted power levels) in the 3.8-4.2 GHz range and unrestricted in the 3.4-3.6 GHz band. Further auctions are ongoing for the 2.3 GHz and 3.6-3.8 GHz bands. Furthermore, the High band is now being offered for innovative applications, with Amazon pressing hard to begin drone delivery services in that range. Also in the pipeline are 5G services to be delivered by high-endurance, high altitude platforms using yet another characteristic (beam forming) to target vehicle data networks along transport corridors.

After what seems a slow gestation, the pace of installation is ramping up!

So, what's the problem?
This is going to be awesome, right? Well, yes…and no. If we discount the conspiracy theories linking 5G with COVID and if we also leave aside the ethical quandary over data sharing and privacy, there is an immediate concern within the aviation world concerning the close proximity of the 5G Mid band frequencies (2.3-4.2 GHz) to the Radio Altimeter (radalt) operating frequency band of 4.2-4.4 GHz. The concern is prompted by the potential for signals on adjacent frequencies to 'bleed through' to the next and for harmonics of separated frequencies to interfere with the radalt frequencies. It is further exacerbated by a seeming lack of out-of-band signal rejection within radalt installations. Hence, the two million-dollar questions are "what is the likelihood of such interference?" and "does it even matter?"

To answer them we must first understand what a radalt is and does. At its simplest, a radalt transmits a radio signal directly beneath an aircraft (or drone) to measure the distance between the aircraft and the surface directly below it.

This height information is displayed to the operator and is critical for certain phases of flight. For military applications, we think of ensuring terrain clearance during low-level operations or helicopter landing zone approaches. However, it is also of critical importance when aircraft – both civilian and military - land in poor, if not zero, visibility (so called Low Visibility Procedures Category II/III Ops).



Radalt information is also exploited by other aircraft systems, such as Ground Proximity Warning Systems (GPWS) where the height information predicts closure with terrain, and Traffic Collision Avoidance Systems (TCAS) which warn of mid-air collisions with other aircraft. But it goes deeper than that… Airbus aircraft incorporate radalt information into their Flight Control Laws, such that a failure of both radalts reverts the aircraft to Direct Law, thereby removing flight envelope protection from the pilots. Other manufacturers incorporate radalt information to provide additional control augmentation and situational awareness. These are operational conditions under which no reputable airline could routinely fly passengers, nor one where an aircraft's Air System Safety Case (ASSC) would still be valid. In sum, any interference to the signal derived by the radalt may have significant deleterious effects on the safe operation of the aircraft, so yes, it definitely matters!

However, how likely is it that radalts are indeed vulnerable to the threat of 5G signal interference? To date, theoretical modelling, conducted principally in the USA, but also arising from our own Defence, Science & Technology Laboratory (Dstl) in the UK, indicates a credible potential for such signal interference to exceed the signal rejection threshold which radalts are assumed to incorporate. Unfortunately, this theoretical vulnerability needs to be validated in practice to answer whether all radalts in all installations are equally vulnerable. If not, how do they differ and why? Moreover, what operational or technical mitigations can be applied to reduce both the threat and the vulnerability?

Fortunately, work is now underway to quantify this vulnerability. In cooperation with the CAA, Defence Digital, Dstl and the MAA (acting as both regulator and facilitator), a trial is being conducted by Frequencia (a UK-based avionics test company) to pit real radalt hardware against the 5G signal across all the frequency bands. This will identify the core vulnerability of a variety of radalt systems from which their operational vulnerability may be assessed under differing scenarios, such as landing at an airport in an urban environment or flying at low level. The trial should be complete late summer, the results of which will drive the next step of evaluating any potential technical solutions identified during those trials. This won't be a quick fix (assuming the fix is demonstrably required), but exposing the potential detrimental impact to aviation will more than justify the effort.

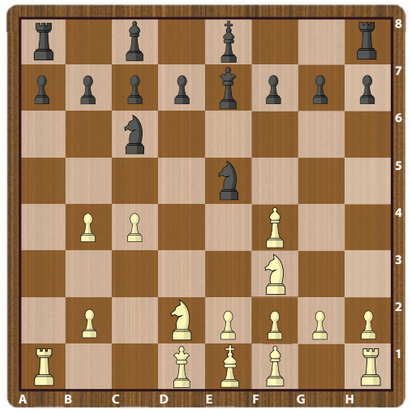
…and what of the rest of the world?

There is international recognition of the potential for radalt signal interference, but action is slow off the mark. The European Union Aviation Safety Agency (EASA) is engaged with civilian avionics manufacturers to develop a new technical specification for future radalt equipment – the results should be published in 2022! In the meantime, 5G rollout – without restriction – is continuing apace with, unsurprisingly, South Korea, China and Japan in the vanguard. As always, it seems the drive to deliver commercially profitable capability is unstoppable (let's face it, who doesn't want a self-driving car?) but it comes with a price to be paid in managing risk. For the time being this requires awareness of the potential for a radalt to suffer interference during a critical stage of flight, but hopefully there will soon be a technical mitigation either on-board the air system or at the transmitter. Watch this space for further news!

The Waiting Room - Puzzles

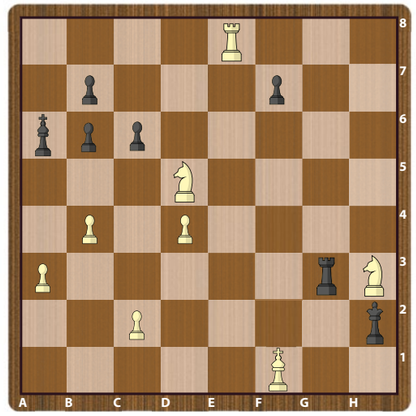
Chess

Position 1 from Rubinstein - Vidmar, Berlin, 1918, black to play and win. (Easy)



Solution 1: Nd3 ++

Position 2 from Mustonen - Sorakunas, Finland, 1968, white to play and win. (Medium)



Solution 2: 1, Nc7 + ka7 2, Ra8 ++

Sudoku

		7	8		1	4	6	9
				7		3		
6	1						8	
			4	1		6		
5		1		2	8		3	
4	2	9	7	6		8		5
7			3			1		
		6	2		4	5	7	
	3	2				9	4	

Easy

6		9		2	8			
	8	2				4		9
			9		5			8
				3				
7	5	3	2	8	4			
				5		3	7	
		6						3
4		8			3	5		
3	1		8	9				7

Medium

9		5	4			6		7
			9		7			
4	2					9	1	
5		8						
				6	5			
			1		9			
		6			3	8		
				8			2	6
8			2		6	3	4	

Hard

Doc's Corner: Dispelling Covid Myths

By Dr Vanessa Garnelo-Rey, RAF CAM

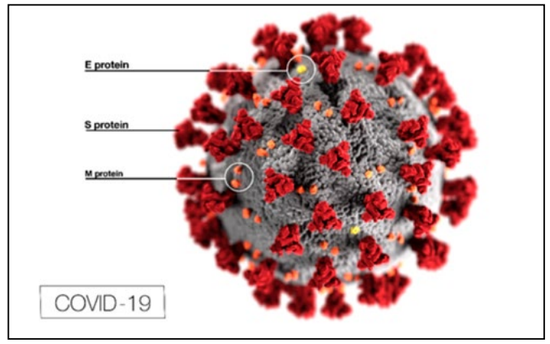
Human coronaviruses were discovered in the 1960s; however, their common ancestor can be traced back nearly 55 million years ago. They have been living with us for centuries and not all are capable of infecting humans.

The vast majority lived in animals (bats, camels, poultry) acting as carriers or reservoirs with minor mutations that rendered them non-transmissible to humans. However, rare mutations can unexpectedly occur giving birth to new strains that undergo animal-to-human transition which then cause epidemic outbreaks such as SARS (severe acute respiratory syndrome) in 2002-2003 and MERS (Middle East respiratory syndrome) for which our immune systems are not well equipped to handle given the lack of previous exposure. This is the case for the novel SARS-CoV-2 virus responsible for the COVID-19 disease first reported in Wuhan, China December 2019.

Both SARS and MERS have a higher mortality rate than COVID-19 but are less transmissible; therefore, the chain of transmission fades more rapidly. This is not the case for COVID-19, which is a highly transmissible virus leading to much greater case numbers. The more a virus spreads across a population, the higher the risk for further life-threatening mutations posing a challenge to any public health measure or vaccination programme. To date, COVID-19 has been responsible for 4.3 million deaths worldwide (WHO data, Aug 21), far more than SARS and MERS combined.

How is the virus transmitted?
About one in five patients currently being admitted to hospital are young adults between 18 and 35 years old. This is four times higher than the last peak in winter. The UK Armed Forces have recently recorded their largest increase in coronavirus cases this year.

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, sing, speak or breathe, as part of larger respiratory droplets or smaller aerosols. The following situations are known to provide a higher probability of transmission:



Source: www.cdc.gov/media/subtopic/images.htm

1. People in close contact within 1 metre (short-range). In this example, aerosols or droplets are inhaled or come into contact with another person's eyes, nose or mouth.

2. Crowded or poorly ventilated spaces where people stay together for longer periods of time. Here, aerosols remain suspended in the air or travel further than 1m.

3. Touching contaminated surfaces and then touching eyes, nose or mouth without washing our hands, and so directly transmitting the virus into our bodies.

When do we transmit the virus?
People are most contagious in the 48 hours preceding any symptoms and also early in the course of the disease when fully symptomatic. In severe cases, this period is much longer with persistent positive PCR tests occurring even weeks or months later.

What are the symptoms?
It can take up to 5-6 days from being infected to displaying symptoms, sometimes even longer. For the vast majority of individuals, these will be mild or moderate, but it is important to highlight that the risk of becoming severely unwell even when fit and healthy is very real and the risk of long COVID exists even without hospitalisation.
Most common symptoms are:
1. Fever/chills
2. New and continuous cough
3. Loss or change of sense of smell and taste
4. Fatigue
5. Muscle or body aches
6. Headache
7. Shortness of breath or difficulty breathing
8. Sore throat
9. Congestion or runny nose
10. Nausea and vomiting
11. Diarrhoea

In more severe cases, the virus can cause serious lung inflammation that requires oxygen therapy and ventilatory support in hospital with a small proportion of individuals requiring intensive care. COVID-19 has been found to cause clotting events such as pulmonary embolism (clots in pulmonary circulation) or deep vein thrombosis, strokes, heart attacks, pericarditis and myocarditis (inflammation of different layers of the heart), cardiovascular collapse, liver and renal failure.

Indeed, the risk of serious illness or death increases with age, presence of other medical conditions and immunocompromised individuals (of any age). Pregnant women are at higher risk and they comprise many of the cases we are currently seeing in hospitals.

Myth-Busters

> To fight the virus, it is important to be well informed. Not only does that protect your health and that of others, but also the operational output of your unit. Let's look at some in turn….

I am asymptomatic. I don't pose any risk to others…
Initially controversial, but several studies have demonstrated that around 1 in 3 infectious individuals are asymptomatic. The rate of transmission is lower than for symptomatic individuals, but is not negligible and predominantly occurs in the early stages of the disease. Tackling asymptomatic transmission is of utmost importance to stop the spread. People who don't know they are contagious are unlikely to take precautions or isolate, and therefore mix 'normally' with others.

Avoiding the three C's helps mitigate transmission:
1. Crowded places
2. Close-contact settings
3. Confined and enclosed spaces with poor ventilation

I don't believe in COVID. The virus has never been isolated. It's just another flu…
This is an ill-informed statement. While coronaviruses have been known for decades, SARS-CoV-2 causing COVID-19 is a new strain. Flu is caused mainly by Influenza viruses but COVID-19 is caused by a beta-coronavirus whose genetic material (RNA) has been identified and isolated in the lab. This is precisely what a PCR test does, amplifying viral genetic material collected from a nose and throat swab sample.

Rapid diagnostic tests such as lateral flow tests detect viral proteins known as antigens from nose and throat samples. Results are much quicker but are generally less accurate. However, these tests perform better in the presence of high levels of circulating virus in the community and particularly when individuals are highly infectious.

If you suspect you have COVID-19 or in the presence of suggestive symptoms, get a PCR test done as soon as possible.

Why do we bother with face masks? They don't prevent transmission…
They do. They significantly reduce aerosol and droplet transmission by about 80% and stop it fully when a 6ft distance is maintained.

It would be incredibly difficult to run a randomised control trial assessing the efficacy of face masks against COVID-19 transmission in the general population as this would imply deliberately exposing individuals to the virus without any protection when it is certainly known from other respiratory viral epidemics such as SARS, MERS and flu that they do work. Surgical masks have been used in hospitals for decades as part of our standard transmission precautions.

I don't trust the vaccines. They're experimental. They alter your DNA…
The SARS and MERS outbreaks laid the groundwork for the development of coronavirus vaccines as scientists studied their signature spike protein. In fact, over 30 years of research on messenger RNA and its applications have made these new vaccines possible. So no, they are not experimental. When a cell wants to produce a protein, it uses the DNA to produce a copy of 'messenger RNA' (mRNA). This messenger RNA then serves as a blueprint for the protein that is built by the ribosomes in your cells. Your DNA is in the nucleus of the cell. The ribosomes, which the mRNA acts on, are not. Thus, the messenger RNA (mRNA) from a COVID-19 vaccine will not go into the nucleus but instead will simply go to the

ribosomes, which in turn will manufacture the spike protein generating the immune response without having to acquire the disease. So no, it is scientifically impossible for these vaccines to alter your DNA and no gene alteration occurs.

Natural immunity is much better. I have a strong immune system, so I don't need the vaccine….
When we are exposed to a virus our immune system has never encountered before, it takes weeks to build immunity capable of fighting the infection. Generating an effective immune response without having to endure the disease is precisely what vaccines are designed for.

It is unpredictable how a person's immune system will respond to the actual disease and COVID-19 can elicit a very aggressive immune response that leads to severe whole-body inflammation also known as "cytokine storm" which can produce lung damage, other organ dysfunction and increased risk of death. Some of the current treatments used in hospital and particularly intensive care target this life-threatening response.

The more severe the disease, the higher the risk for death, disability and long COVID sequelae. It is worth remembering that when considering life-changing long-term effects of COVID, reported death rates form only a small part of the overall picture of the long-term harm COVID is responsible for.

What is long COVID?
The chances of having long COVID do not seem to be linked to how ill you are when you first get COVID-19. People who have mild or no symptoms can still have long-term problems. This is a key factor to take into account when daily cases are reported and not only deaths or hospitalisations. The National Institute for Health and Care Excellence (NICE) defines long COVID as symptoms lasting for more than 12 weeks. These are:

- Difficulty breathing or shortness of breath
- Tiredness or fatigue
- Symptoms that get worse after physical or mental activities
- Difficulty thinking or concentrating (sometimes referred to as "brain fog")
- Cough
- Chest or stomach pain
- Headache
- Fast-beating or pounding heart (also known as heart palpitations)
- Joint or muscle pain
- Pins-and-needles feeling
- Diarrhoea
- Sleep problems
- Fever
- Dizziness on standing (light headedness)
- Rash
- Mood changes
- Change in smell or taste
- Changes in period cycles
- PTSD

A study led by the University of Leicester of just over 1,000 people who needed treatment in hospital for COVID, found that the majority (70%) had not fully recovered five months after they were discharged. The report's authors said that one in five of those in the study could be considered to have a new disability.

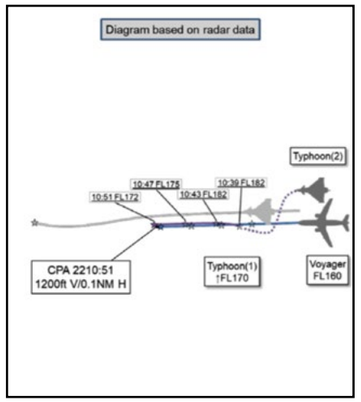
Long COVID is not contagious and it will not make you test positive, but it is not possible to say how long it will take to resolve.

The best way to prevent long COVID is by getting vaccinated. It is important to highlight that children also suffer from long COVID and a relatively rare condition called multisystem inflammatory syndrome that has led to children becoming critically unwell.

In summary, COVID-19 is not a disease anyone would want to gamble with. The last 18 months have seen an unprecedented worldwide collaborative approach in research, vaccine development and public health measures. The best and safest approach is always prevention, and this involves protecting ourselves and protecting others. Factual and scientific evidence is widely available from reputable sources. Social media can be dangerously misleading and I strongly encourage you to take testimonials from unverified sources, YouTube videos, Twitter, Instagram and Facebook posts with the very little credit they deserve. We see many critically ill patients in ICU who chose not to get vaccinated owing to various 'social' influences, and who desperately regret that decision.

Airprox Highlights

With Comments from Wg Cdr Spry



12 Nov 2020
Voyager vs Typhoon Pair (Departing the Tanker)
Airprox No 2020162

The Voyager Pilot reported that a flight of two Typhoons were conducting night air-to-air refuelling (AAR) training. The weather was clear below with excellent all-round visibility and broken cloud cover above with occasional light turbulence associated with forecast mountain wave. The Typhoons departed the tanker, climbing to FL170, and departed straight ahead, westwards. The Voyager maintained the same westerly track to complete after-refuelling checks prior to recovering to home base. As the tanker crew was watching the Typhoons depart ahead, one was seen to turn sharply left across the tanker's nose, well above. Shortly afterwards, TCAS gave a TA as this aircraft descended to an indicated 600ft above the Voyager. The aircraft was then seen to climb up and right before its aspect was lost. It appeared to recross the tanker's nose well above before descending directly head of the tanker. TCAS subsequently gave a descending RA with the Typhoon displaying about 1600ft above, descending rapidly. The TCAS manoeuvre was carried out iaw SOPs, passing FL155 before the warning ceased. CPA was not observed once the RA had sounded due to internal switching and monitoring workload. From the Voyager crew perspective, whilst they did not initially feel threatened, when the Typhoon aspect was lost and its manoeuvring became impossible to discern, the crew became increasingly concerned with its possible trajectory. Given that the Voyager had just completed air-to-air refuelling (AAR), it was fortunate that the after-refuelling checklist had been run as soon as the Typhoons had reached their departing altitude, which resulted in TCAS being reselected from TA only to TA/RA. It would have been reasonable for the Voyager to have TA only set immediately post AAR and to have been rewinding hoses and therefore for a short period, less able to provide self-separation by manoeuvring. For the Voyager crew it reinforced the need to continue to monitor departing receivers, despite them being cleared to leave and no longer working the boom frequency. This was even more important during night conditions when perceptions of attitude and aspect could easily be lost or misinterpreted.

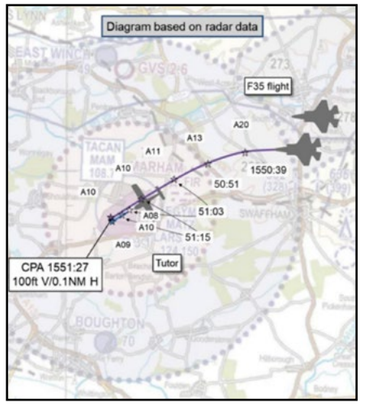
The Typhoon Formation Leader Pilot reported leading a formation pair of Typhoons, tasked to conduct a night AAR training sortie. This was the student's first sortie to the tanker at night. After successful completion of AAR at FL160, the pair departed the tanker at 300kt and climbed to FL170 on the tanker track. The formation leader directed the number 2 to take up radar trail and subsequently set 350kt to build separation between the 2 aircraft. Whilst attempting to gain a radar lock, the number 2 pilot inadvertently accelerated to 393kt, whilst keeping the lead aircraft in the head-up display (HUD) field of view. Separation between the 2 aircraft reduced to 192ft with 40kt of closing velocity. Having identified the potential confliction, the number 2 pilot initiated an overshoot to the left whilst also commencing a descent. The formation leader was not aware of the rate of closure or [separation] prior to the overshoot. On actioning the overshoot, the number 2 pilot called "2 breaking left" which the leader asked him to repeat. Aware of the proximity of the tanker, the lead pilot called "Do not descend" to the number 2 pilot, shortly followed by a call to climb immediately back to FL170. The number 2 pilot descended to 300ft above the tanker altitude before initiating a climb to FL185 and gaining radar contact on the lead aircraft. On review, task saturation was a factor in this incident and highlighted the requirement to ensure safe deconfliction is prioritised over sensor management.

The Swanwick Mil Controller reported having the Voyager on frequency, operating in AARA 8 in the Block from FL140 to FL170 with the Typhoon pair conducting AAR. The Typhoon pair were prenoted for general handling in East Anglia following AAR and had been instructed to climb to 1000ft above the Voyager on completion. The Typhoon pair checked in on the frequency at about 2208Z, climbing to FL170. A squawk was allocated, the formation identified and placed under a Traffic Service, with a clearance for 'own navigation' for the East Anglia MTA. The Typhoon lead ran ahead of the Voyager on a similar heading, with a second squawk appearing slightly behind the leader, believed to be the number 2. At about 2210Z, the Voyager pilot stated that they were responding to a TCAS RA, which was acknowledged, and the controller awaited a call that the situation was resolved. Shortly after this, the number 2 Typhoon pilot came on frequency to say that he had 'become slightly disorientated, overshot, did not descend below 163, now climbing back to 170'. The Voyager pilot then requested a climb back to FL160, which was approved as soon as it became apparent that both Typhoon squawks indicated FL170.

For full details of this Report see AIRPROX REPORT No 2020162 on the Airprox Board Website.

Spry's Comment:

Although this Airprox was specifically between the Typhoon #2 and the Voyager, it was the chain of events that transpired that are just as important. Air to Air Refuelling is a challenging discipline. Coupled with the added complexities of night flying, it is understandable that events transpired so quickly, given the pilot's limited experience and reduced capacity. In this situation, the Typhoon number 2 pilot went 'heads in' and became fixated on the radar screen, denying the ability to correctly assimilate all the threats that were in the peripheral. The unnoticed overtake resulted in a Loss of Safe Separation (LoSS) with the lead Typhoon, forcing a breakout situation and a descent towards the Voyager. Due to the careful monitoring and situational awareness of the lead Typhoon (the instructor), the student was able to arrest their rate of descent towards the Voyager. Both the crew of the Voyager and the lead Typhoon are to be commended for their careful monitoring and highlights the importance of always expecting the unexpected. Recognising when one is fixated can be a challenge; however, being disciplined in maintaining a robust scan can help prevent a situation like this from occurring. ■



Tutor vs F-35 Pair (Tutor on PD to Marham)
26 Oct 2020
Airprox No 2020154

The Tutor Instructor reported that the student pilot had just completed an ILS and was executing the go-around. The forward visibility while flying along the Final Approach Track was very poor due to it being directly into a low sun, however, visibility in all other directions was excellent. Once the student had completed the after take-off checks the Instructor took control, at approximately 500ft, and called Marham Approach iaw the briefed departure instructions. A Traffic Service was requested and then the TAS give a Traffic warning. The Instructor looked down to see a TAS contact at about 1 mile to the rear, indicating 300ft above then 200ft above as they were in the climb at about 1000ft/min. The instructor looked over their shoulder and saw 2 F-35s joining the circuit, slightly above and closing very rapidly. The instructor bunted the aircraft to try and increase vertical separation and the F35s passed directly overhead, breaking onto the downwind leg as they did so with the TAS now showing a separation of 300ft. The instructor was not sure of the maximum height reached in the circuit prior to bunting. The Approach Controller was informed that the Tutor Instructor wished to file an Airprox. The Tutor Instructor noted that the F-35 pilots would have had little chance of seeing the Tutor because from their perspective it would have been almost directly into the low sun.

The F-35 Pilot reports that both formation members were aware of and visual with the Tutor in the circuit. The F-35s were given Traffic Information by Marham approach, then switched to Marham Tower. Marham Tower also passed Traffic Information. The Tutor was visually acquired and on radar at 300ft agl. In order to keep separation from the Tutor, the F-35 flight broke into the RAF Marham landing circuit above and then behind the Tutor. The F-35s were offset just north of the runway to laterally deconflict and at the circuit altitude of 1000ft agl. The F-35 pilot noted that they were unsure why the Tutor would climb into an occupied military traffic pattern or unsure why Approach climb-out instructions would climb the Tutor through the occupied military circuit.

The Marham Approach/Director Controller reported that the Approach/Director positions were bandboxed. When they took over the position the Tutor was established on Talkdown, a pair of F-35s In the TACAN hold, a pair recovering for an ILS from the northwest and the Airprox F-35s requesting a visual recovery from the east. Reports of storms in the area were causing all aircraft to request alternative vectors to those given, increasing the workload. The Airprox F35 flight called visual with the aerodrome at about 10 miles. Traffic Information was passed on the traffic recovering from the northwest before sending the Airprox F-35 flight to the Tower frequency at about 7-8 miles. The Marham controller then turned their attention to other aircraft under their control. The Tutor had carried out its approach and the pilot re-contacted approach for the departure. After identification, the Tutor pilot said there were 2 fast jets behind and asked what they were doing. They were informed that the F-35 flight were joining the visual circuit and the Tutor pilot replied that they were close enough to file an Airprox.

The Marham Supervisor reported that the controller had just taken a handover in the position during a busy period. The controller workload was high and the situation made even more difficult with thunderstorms and lightning causing aircraft to be unable to take the instructed vectors. The Airprox F-35 flight were instructed to contact Marham Tower at about 7 miles to the east to join for initials. The Supervisor then switched their attention to the rest of the radar traffic. Tower then called via landline to say that two F-35s were joining via initials and that they had not made radio contact. The Supervisor informed the controller that it was [the Airprox F-35 flight] and to make a blind call on the Tower frequency. The Airprox was then called by the Tutor pilot. The Supervisor noted that the F-35 flight did not contact Tower until they had broken into the circuit and were downwind. The Supervisor noted that there were several contributing factors to the Airprox; the warning inbound call had been missed in the handover and due to the high workload had not been picked up by the new controller or the Supervisor; there was pressure in the radar room for a trainee controller to carry out an SRA for endorsement (which was why a change of controller took place); the original controller was a multi-tourist in their first live session when it became busy; Marham has had very little mixed type traffic in the visual circuit.

For full details of this Report see AIRPROX REPORT No 2020154 on the Airprox Board Website.

Spry's Comments:

Several barriers were degraded in this occurrence; poor into-sun visibility, high controller workload and the USMC F-35 flight not following standard joining procedures, particularly missing the "joining" call. With a warning from the Tutor's Traffic Alert System (TAS), the pilot was able to acquire the F-35s visually and manoeuvre their aircraft to prevent the situation from worsening. When joining a visual circuit, it is imperative that crews have full situational awareness on all aircraft before going through initials. Good airmanship would also dictate giving aircraft a wider berth when breaking into the circuit. This is particularly important when considering the effect of wake turbulence or jet efflux on a light trainer. Consideration should also be given to the workload of ATC with several aircraft recovering at the same time and accepting a practice diversion. This can unnecessarily add complexities and increase the risks, as was demonstrated in this Airprox. ■

Tutor vs Tutor (Instrument Pattern at Wittering) 13 Jan 2021 Airprox No 2021003

The Tutor(A) Pilot reported that they had just aborted a PFL 1 instructional sortie due to weather (insufficient cloud base) and commenced a VFR recovery to Wittering from the NE where the cloud base was ~2000ft, descending to the west with an approaching warm front. The student was flying the aircraft, completed the checks, called for a visual recovery and began a descent heading towards Market Deeping and initials, at which point ATC informed them that the circuit was full and that they should hold off. The instructor told the student to hold to the NE of Stamford, and the student subsequently relayed these intentions to air traffic. As they approached Stamford at ~1300ft QFE, heading 255°, the controller asked them to climb to 2000ft QFE for deconfliction. The instructor informed air traffic that this would put them IMC but the instruction was re-iterated, the student instigated a climb straight ahead and once established the instructor took control (given that the student was unrated and they would shortly enter cloud) and requested a Deconfliction Service. This request was accepted by the controller and then acknowledged by the instructor; so they believed a Deconfliction Service contract existed between them and the controller. The aircraft went into the base of the cloud layer at ~1900ft, although vertically downwards they were still in sight of the surface. As they levelled off the aircraft at 2000ft QFE and accelerated to 100kts the student called TAS and concurrently they received an audio Traffic Advisory. On scanning cross cockpit to the EHSI/TAS they saw a solid yellow circle (TA) contact in the 12 o'clock well inside the 2NM range ring with a 03 underneath the circle indicating 300ft separation (noting the TAS fitted to the Tutor has a published +/- 200ft error). This TA was followed immediately by a collision tone from the FLARM (19-25 secs to collision), rapidly increasing in frequency (14-19 secs and then 6-8 secs to collision) and they therefore commenced immediate avoiding action believing there to be a very high risk of collision with an unknown aircraft inside the Deconfliction Service separation bubble. They rolled right to ~45° AOB while lowering the nose (knowing that they were in the base of the cloud, in sight of surface and would gain full visual refs almost immediately), they transmitted something along the lines of "traffic alert, descending" while increasing to 60° AOB as they gained sufficient visual references and increased the G to turn towards the north and increase separation. They were immediately visual with another Tutor in the 10 o'clock, range 3-400m and 100- 150ft above. They were now on a divergent track so rolled wings level and then turned on to a parallel track, content that they now had separation and the other aircraft waggled its wings in acknowledgment while the instructor declared an Airprox to air traffic. There was no call from the other aircraft on frequency (the other pilot was operating on WIT App #4 whilst they were on WIT Zone #3). They assessed the risk of collision at the time as very high. Air Traffic then cleared them for a visual recovery which they conducted through initials as the cloud base remained marginal for an 1800ft overhead join. The aircraft recovered without further issue.

The Tutor(B) Pilot reported that they were flying a Flying Training Refresher Sortie (IF1) for a prePhase 4 student. They had just completed a touch-and-go from a radar PAR and were being vectored downwind in the RTC for a further PAR. Having levelled at 1500ft (IMC) and heading 030° they observed a TAS contact in approximately the right 2 o'clock position indicating 300ft above at around 1.5-2NM. Approximately 5sec later ATC (WITT APP #4) instructed them to turn right heading 070°. This took them almost directly towards the TAS contact. At the same time they were slowly exiting solid IMC and were intermittently visual with the ground with light rain and mixed stratus layers in a constantly improving weather picture. The instructor voiced to the student that the TAS contact was becoming an issue and that they may have to descend. They had been given no Traffic Information from ATC and the instructor instinctively took control and began to initiate a descent against the contact indicating 300ft above. The TAS and FLARM audio were both transmitting. At the same time, they transmitted that they were descending and became visual with the TAS contact [Tutor(A)] who was clearly also attempting to take avoiding action. Given the visibility in rain it was difficult to assess the range between the two aircraft. They estimated that they passed through the same level within 0.3NM. They then told ATC that they had taken avoiding action on a TAS contact. The remainder of the sortie was continued as normal. On return to the Sqn, it was very difficult to get hold of anybody in the tower to discuss the issue, due to the lack of telephones and COVID restrictions. The DSS volunteered to walk to the building on their behalf and try and track down the controller. It subsequently transpired that 1 controller was working #3, #4 and VHF Zone with numerous (around 5) contacts IMC. The only SA the pilot had on the contact came from TAS.

The Wittering Approach Controller reported that they had just taken over the approach position with 4-5 aircraft on 2 different frequencies. Around 3-4 of those were under a Deconfliction Service due to poor weather conditions and the RTC was active with aircraft

requiring a radar recovery due to the weather. Upon taking over, they had 2 Tutors north of WIT under vectors under a Deconfliction Service for navigation flying and 1 aircraft turning north in the RTC at 1500ft QFE also under a Deconfliction Service. Shortly after taking over the control position Tutor(A) called for visual recovery approximately 4-5NM south of Bourne. The visual circuit was full at the time and the pilot was informed of this and instructed to hold off the approach. The pilot transmitted that they would like to hold north of Stamford. The aircraft was indicating 017 on Mode C which was the same height as Tutor(B). This would then put it in direct confliction with Tutor(B), who was under a Deconfliction Service. The controller quickly instructed Tutor(A) to climb to 2000ft QFE 1007, which was read back. In addition, the pilot stated that this would put them into IMC and would need an upgrade to Deconfliction Service. With Tutor(B) quickly approaching and a further 2 aircraft north of WIT also under a Deconfliction Service the controller informed Tutor(A) that they had another aircraft in the RTC under a Deconfliction Service that they would be coordinated against. To their best knowledge the pilot started to climb and acknowledged to hold at 2000ft. The controller then subconsciously did not call Tutor(B) to Tutor(A) as they decided they were safely vertically separated, and another aircraft to the north was coming into potential confliction with a Cranwell aircraft.

They then called this traffic to the aircraft north of the airfield and gave deconfliction advice to turn onto 180°. Following this, the controller heard transmissions being made by Tutor(A) and the term Airprox being used. They observed Tutor(A)'s Mode C which now indicated 017-016, which was not the 2000ft holding height that was instructed. They did not recall if Tutor(A) pilot had requested or informed them that they were descending or vacating 2000ft. The descent put both Tutor(A) and Tutor(B) in direct confliction with each other. The controller quickly acknowledged the Airprox and carried out the appropriate action. Tutor(B) continued the radar recovery without further occurrence and Tutor(A) was shortly allowed into the visual circuit without further occurrence. This was a busy period on console with the majority of pilots requiring a radar recovery or Deconfliction Service during the sortie, at the same time there were aircraft also conducting multiple approaches in the RTC. In hindsight, the controller noted they would have called Tutor(B) to Tutor(A) and vice versa, however at the time they felt that they were safe with vertical separation and that their attention was better suited elsewhere with the 2 aircraft north under a Deconfliction Service and multiple Cranwell aircraft coming into potential confliction.

The Wittering ATCO I/C reported that this was a particularly busy and complex period of controlling in IMC, although not outwith normal capacity for the Unit. Of note, the ATC support to flying comprised only of 3 controllers in the Radar Approach Room (no establishment for Supervisor), where 4 would be the normal number rostered. As the ATCO I/C, they handed over the Witt TC(RA) task 5-10mins before this incident. They maintained a listening watch for a short period following handover to ensure that all pertinent points had been understood and to lend support if required. Another controller was conducting the PAR task, who they relieved in order to allow that controller to cover the Witt TC(Zone) task and offer support to TC(RA). The ATCO I/C then engaged with the next PAR, following which they were advised of the Airprox. They instructed the TC(Zone) controller to take over the PAR task and then relieved TC(RA) controller, taking over the task. Although their intent was for this controller to commence the administrative work for the Airprox, due to the Unit work loading, they were subsequently required to offer further support and to eventually take up the PAR2 position. The Unit DSS was advised of all details and, once the controller was away from the console, both pilots were contacted. Engineers were contacted to impound all relevant tapes and a tape transcript was requested and a DASOR instigated. The ATCO I/C concurred with the details of the controller's narrative, though added that both aircraft were on separate frequencies, thus impacting their level of SA.

For full details of this Report see AIRPROX REPORT No 2021003 on the Airprox Board Website.

Spry's Comments:

Using the 'Swiss Cheese' model can help picture how this Airprox happened; on this day, the holes aligned leading to a very near miss. The preconditions: the weather was poor, manning levels had been reduced last minute without any effect on the flying programme for that day. Person: the workload experienced by the controller was extremely high with 4 aircraft on different frequencies requiring a Deconfliction Service. The pilots hadn't received Traffic Information to the expected level afforded under a Deconfliction Service. Organisation: COVID restrictions had led to controllers being routinely bandboxed (controller working more than one frequency at a time), thus increasing their workload exponentially during busy periods. Hardware: the education to crews on the functionality of TAS/Flight Alarm (FLARM) when IMC was not as well understood and as a result had the pilots, understandably, react to the uncertainty of the indications and warnings; however, this meant into further conflict. If there is any doubt with a conflict, then ask ATC early; this may help clear up any uncertainty. ☐

Instant Eye RPAS vs Chinook (Departing the Range)
24 Mar 2021
Airprox No 2021015

The RPAS Remote Pilot reported that during an Instant Eye Remote Pilot Course live flying activity, they were conducting a basic sortie with a trainee pilot at the northern edge of Horton's Folly, in Area 13, Salisbury Plain Training Area (SPTA). Another RSA instructor was operating under the same flying practice with another trainee on the middle eastern edge of Horton's Folly. They had been allocated Area 13 'Hot' from surface to 400ft agl by SPTA Air Operations at approximately 1315hrs. They were operating under Visual Line Of Sight (VLOS) flight rules and conducting flights at VLOS limits. At approximately 1445hrs they both heard a Chinook leaving Rollestone Camp approximately 1500m west of their position, where they knew training sorties were being conducted. At the time, they had two Instant Eye 2 RPAS in the air. Upon the Chinook's departure from Rollestone Camp it was noted that its flight path was leading directly into their allocated airspace at a height well below their 400ft ceiling. At this point they saw the other instructor's RPAS land and they had to immediately instruct the trainee to reduce height from around 100ft agl. Within a short time, whilst their RPAS was still in flight at around 30ft agl the Chinook passed directly over the top of Horton's Folly from West to East, no higher than 150ft agl. This flight path was directly over the other instructor's position. They immediately reported the incident to SPTA Air Operations. It was stated, by Ops, that the Chinook pilot had been made aware that they were operating in the area. They were not informed prior to the Chinook entering their allocated airspace that it was about to do so. Following the incident, they conducted a ten-minute grounding period to ensure all other air users were clear of their allocated airspace as they could see the Chinook handrailing the eastern edge of SPTA Centre (D125), heading North.

The Chinook Pilot reported that they were the No 2 Chinook in a formation tasked with moving passengers from Poole HLS to Rollestone Camp (SPTA). The task was originally to be completed as a pair, however due to an unserviceability on start, the task was completed as a singleton. Bookings for the formation were administered by 27 Sqn Ops. At the point of booking the use of SPTA, no information regarding UAS activity ivo Rollestone Camp was passed to 27 Sqn Ops. The pilot checked the SPTA Range Allocation sheet in the 18 Sqn Ops room, which also had no UAS activity briefed to be operating ivo Rollestone Camp. The Air Liaison Officer for the exercising troops had briefed 27 Sqn to utilise a clockwise flow around Rollestone Camp to deconflict air movements and a frequency on which to deconflict from any other traffic operating in the area (in addition to the SPTA Ops frequency). They made use of this frequency and were informed that there was no other known traffic in the area to affect. Following a period of transiting through poor weather and showers immediately south of SPTA, they made comms with SPTA Ops and called for entry to the Plain. They were informed by SPTA Ops that there was UAS activity in D123/D125 and that they should have been pre-briefed of the UAS activity prior to lift. Rollestone Camp is located within D125; as such they assumed that the surrounding area must be clear as they were cleared to the landing site. They were unaware of the proximity of the UAS activity in Area 13, immediately NE of Rollestone Camp. For an expeditious exit of the operating area; the pilot intended to route briefly to the NE of the camp until clear then directly east (through Area 13) on to the standard transit routes at Crossing C for a departure to the north at Rushal, instead of routing south about Durrington. They requested this routing via SPTA Ops in the north-easterly bound transition from the landing site which was denied. They had asked for this clearance after lift as they did not think they would reach SPTA Ops on the ground. The transmission asking them to route south also contained a warning that "We will probably be DASOR'd against", which was their first indication that this potential near miss had occurred. They immediately turned south upon hearing of the exact location of the UAS activity in Area 13. From reading the Airprox report, this south-bound turn appears to have taken them within close proximity of the UAS operator. They discussed as a crew immediately following departure from SPTA, during the crew debrief and subsequently since the event and none of the crew can remember being passed any specifics about the UAS activity. However, if this information was passed during a 'high workload' period of flight following poor weather and whilst configuring the aircraft for approach to the landing site whilst working and switching between Middle Wallop Approach, Low Level Common, SPTA Ops and Rollestone Safety frequencies, it is possible that it was missed. Had they known in advance of the activity in Area 13 they would not have considered this course of action for departure and would have headed south to exit the area. None of the crew saw UAS or operators at any point.

The SPTA OPS Officer reported that at approximately 1430(Local) the Chinook, (who was participating in priority 1 exercise on SPTA) lifted from Rollestone Camp initially in a northerly direction before turning right to take up a southerly heading to

pick up the helicopter low level route from Airman's Cross to route to Keevil. The aircraft took off from Rollestone Camp and at approximately 200ft agl and halfway through the turn on to a southerly heading, routed over into Area 13 which was active with MUAS activity. When RSA, or any MUAS unit, checks in to start or confirm activity, they get adjacent activity information brief and any restriction which may apply for that day. Hence, they were informed that Rollestone camp was being used as a forward operating base for a priority 1 exercise and so may encounter aircraft departing or arriving throughout. When rotary aircraft book in to operate on SPTA the pre-requisite for acquiring a booking number is that they are briefed on adjacent activities and any restrictions which may apply for the period. The Chinook pilot called to lift from Rollestone Camp to route as indicated above, and on lifting was reminded of the MUAS activity in Area 13 and told to next call clearing going on route to the north. Shortly after the Chinook got airborne, RSA called on airwave radio quite infuriated that a Chinook had just flown over two of their flying positions. On confirmation that they were still operating VLOS rules it appeared to be a very late acquisition of the MUAS observer, if at all, that may be the issue. Both operating units were aware of adjacent activities and should have been flying accordingly.

For full details of this Report see AIRPROX REPORT No 2021015 on the Airprox Board Website.

Spry's Comments:

This Airprox is a timely reminder to all operators of both manned and unmanned platforms of robust communication and airmanship within congested training areas. However, in this instance, the communication broke down due to the training area ops having an incorrect email address. This led to confirmation bias from the ops staff, thinking the Chinook were aware of the Instant Eye. It also meant the crews of the Chinook didn't have the up to date information detailing that an Instant Eye would be operating in the adjacent airspace and thus, thinking they had freedom to manoeuvre. The crews of the Instant Eye are to be commended for their swift avoiding action upon hearing the Chinook, preventing an uncomfortable situation. ☐

Safety Contacts:

Group / Station / Unit	Flight Safety Officers	Health, Safety & Environmental Protection Advisors
1Gp	01494 495454	-
2Gp	01494 495049	-
11Gp	TBC	-
11Gp Space and BM	03067707165	-
22Gp	030 6798 0101	-
38Gp	01494 497923	-
BM	03067707165	
JHC	01264 381526	-
Test & Evaluation (ASWC)	01522 727743	
1ACC	01522 603359	-
2FTS	01400 264522	-
3FTS	01400 267707	-
4FTS	01407 762241 6666	
6FTS	01400 266944	-
Air Cadets (RAFAC)	-	01400 0267817
Boulmer	01665 607325	01665 607282 / 7289
Benson	01491 837766 6666	01491 827109 / 7254
MOD Boscombe Down	01980 662087	01980 662312
Brize Norton	01993 895764 / 6666	01993 895525 / 7062
Coningsby	01526 346575	01526 347256 / 7196
Cosford	01902 704037	01903 37472 / 237
Cranwell	01400 266666	01400 267469 / 7498
Defence Geographic Centre	0208 818 2816	-
Fylingdales	-	01751 467216
Halton	01296 656666	01296 657640
Henlow	01462 851515 6150	01462 857604
High Wycombe	01494 494454	01494 496489 / 5094
Honington	01359 236069	01359 237782 / 7516
Swanwick	01489 612082	-
Leeming	01677 456666	01677 457637 / 7231
Leuchars	01334 856666	-
Linton-on-Ouse	01347 848261 6666	01347 847422 / 7617
Lossiemouth	01343 816666 / 7714	01343 817796 / 7697
Lyneham	-	01189 763532
Marham	01760 337261 6666	01760 337595 / 7199
No1 AIDU	020 8210 5344	-
Northolt	020 8833 8571	02088 338319 / 38521
Odiham	01256 702134 6666 / 6724	01256 702134 7650 / 7733
Scampton	01522 733053	01522 733325 / 3137
Shawbury	01939 250351 6666	01939 250351 7529 / 7559
Spadeadam	-	01697 749204
St Athan	01446 798394	01446 797426 / 8250
St Mawgan		01637 857264 / 7858
Syerston	01400 264522	-
Tactical Supply Wing	95521 7232	-
Valley	01407 762241 6666	01407 767800 / 7685
Waddington	01522 726666	01522 727652 / 7783
Wittering	01780 416377	01780 417611
Woodvale	01704 872287 Ext 7301	-
Wyton	01480 52451 7146	-
Overseas Flight Safety Contacts	**Telephone**	**Email**
Al Udeid	9250 060 451 3043	83EAG-DepFSO@mod.gov.uk
Ascension	00247 63307	BFSAI-ASCOpsOC@mod.uk
Akrotiri	94120 6666	Leigh.Robertson677@mod.gov.uk
83 EAG	9250 060 451 3050	83EAG-AIROPSFSO@mod.gov.uk
Gibraltar	9231 98531 3365	GIB-RAF-ASM@mod.uk
MPA	0050 073620 (94130 3620)	BFSAI-FLK-905EAW-ASM@mod.uk
Tactical Leadership Programme	0034 967 598527	aa3@tlp-info.org
Naval Air Station Jacksonville	001 904 542 4738	-

The Defence Accident Investigation Branch (DAIB)

What to Report :

All potentially safety-related accidents and serious incidents which result in the death or serious injury of a Service person, or a civilian where it is related to MOD employment, activity or estate.

All potentially safety-related accidents and serious incidents which result in significant loss of operational capability

Located
MOD Boscombe Down – Amesbury

Email:
DSA-DAIB-Land-Mailbox@mod.gov.uk

DSA-DAIB-Air-Mailbox@mod.gov.uk

DSA-DAIB-Maritime-Mailbox@mod.gov.uk

Website
Defence Accident Investigation Branch (DAIB)

Phone
Land:
9679 86587

Air: / Maritime:
9679 88276

For civil contact numbers, see the DAIB DIN or DAIB website

Specific categories of accident to be reported:

Aviation Accidents. Any accident resulting in an aircraft sustaining category 4 or 5 damage. Any accident where an aviation system has failed and has compromised safety.
Maritime Accidents. Any accident that causes entire or partial disablement of a ship or submarine for service. Any accident where a maritime system has failed and has compromised safety.
Land Accidents. Any accident where a land system has failed and has compromised safety.
Ordnance, Munitions and Explosives. Any unintended initiation of ordnance, munitions or explosives resulting in damage to MOD or public property or has compromised safety.
Fire. Any serious fire resulting in significant damage to MOD or public property.
Nuclear. Any nuclear accident rated 3 or above on the International Nuclear and Radiological Event Scale.
Environmental Incidents. Any environmental incident rated 1 or 2 on the Environmental Agency's scale or local equivalent level.
Heat Illness and Cold Injury. DAIB **must** be notified of all suspected or confirmed instances of heat illness and cold injury.
Near Misses. Any incident during which death or serious injury has been narrowly avoided.

Recommendations

The DAIB also provide unified tracking of all DSA safety investigation recommendations through to closure.

Total deployments since 1 Oct 2015

186

As of 14 June 2021

What we do

The DAIB provides Defence with an independent, multi-modal accident investigation capability. The DAIB conducts impartial and expert no-blame safety investigations across all domains.

Safety Recommendations closed since 1 Oct 2015

1357

As of 14 June 2021

Worldwide cover 24hrs a day 7 days a week