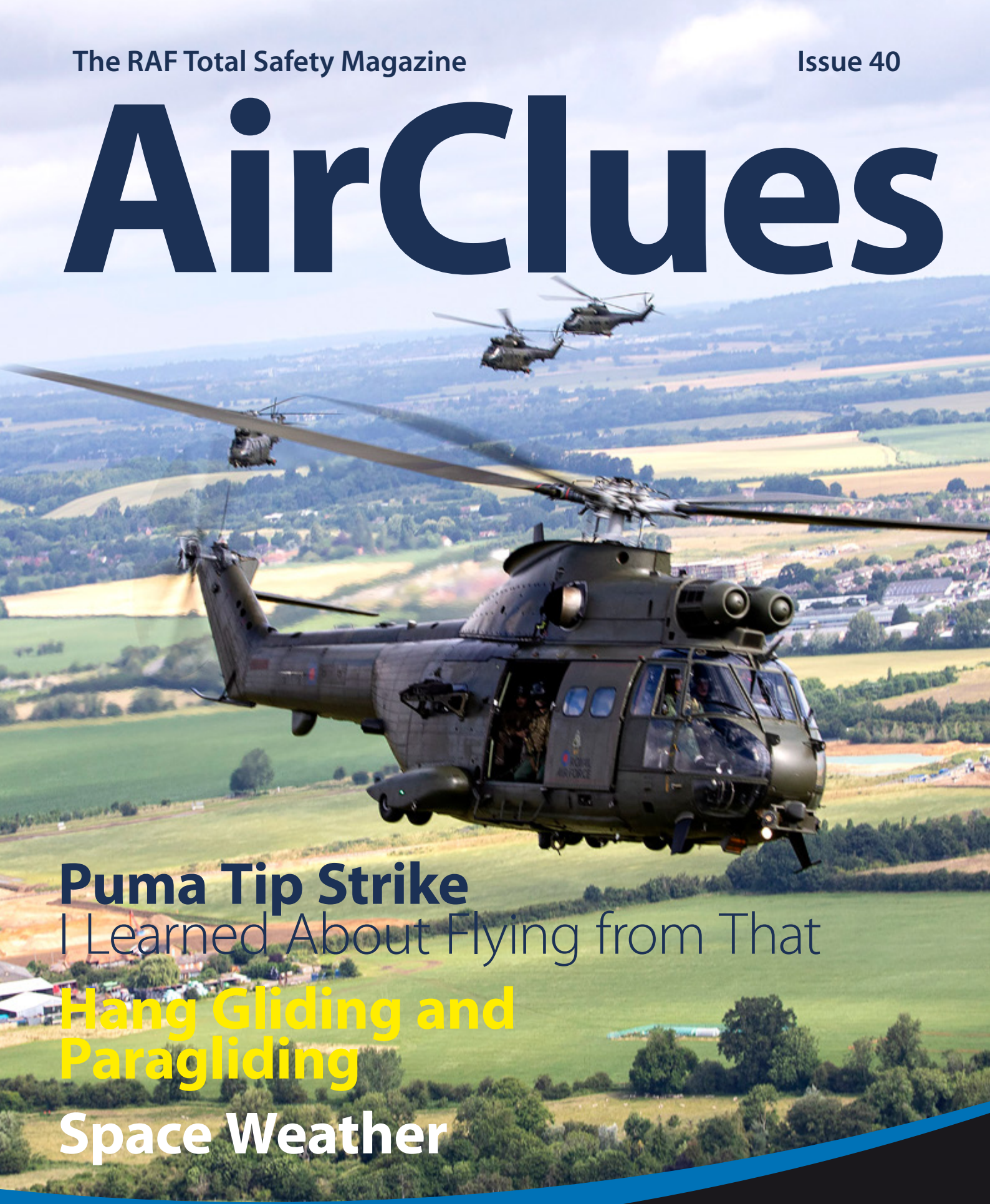
The RAF Total Safety Magazine

Issue 40

AirClues



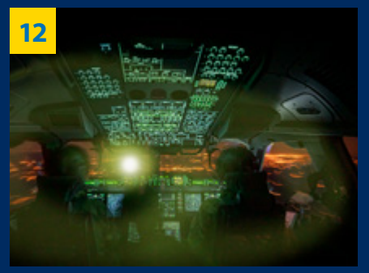
Puma Tip Strike

I Learned About Flying from That

Hang Gliding and Paragliding

Space Weather

ROYAL AIR FORCE Safety Centre



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Foreword

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

Air Commodore Sam Sansome

Welcome to this the 40th issue of Air Clues - the Ruby issue no less! Hopefully once again you'll appreciate the variety of articles and information that we've managed to conjure up - and thank you once again to all our contributors for their help. If you think you have an article in you - or even the idea for an article that we might be able to help you with then please contact the editor, Wg Cdr Jim Lawson, and speak to him about it at the Spry email address. Safety promotion is a vital part of any safety system and I'm very proud of the role that Air Clues plays in the RAF SEMS and the fact that it and the articles in it form an integral part of so many other organisations' Safety pictures. Its popularity in the 'safety world' is in many ways down to the contributions of you - its readers.

One of the other areas where 'promotions' can make a real difference to our safety behaviours is through the messaging on show in the workplace. In this issue of Air Clues we are announcing the publication of a new set of posters - the Life Saving Rules - that are available to display at or near the point of activity, as a final reminder of how to stay safe. The genesis of these 'Life Saving Rules' is once again from industry (e.g., oil and gas) where they realised that most of their accidents were caused by simple mistakes - forgetting to ensure something was earthed or forgetting to attach one's harness correctly - and if they could just remind people of a few simple rules then they could eradicate these accidents. As it says in our article - these are not meant as a replacement for process, policy or training - and they are not supposed cover all the different types of activity that we do. They are, however, chosen to address some of our most dangerous activities and the reminders in them would have prevented accidents and fatalities if they had been followed. Please, cut them out or order copies and display them where the activities are taking place - if we abide by them, we will save lives and avoid accidents. You will see similar 'Life Saving Rules' being issued and used across the whole of the MOD, so if you see a poster that looks like these, please take a moment, stop and read it, it could just save someone's life!

We need your 'I learned about flying/engineering/air traffic from that' articles. Please write to Wg Cdr Spry with your open and honest stories.

Safety Awards

Squadron Leader Ogston – RAFAT RAF Scampton Green Endorsement

Squadron Leader Ogston was the 2022 Season Red Arrows Synchro Pair lead, performing at the Rhyl Air Show. This was a highly dynamic, high-energy element of the flying display, featuring low-level aerobatics and high-speed synchronised crossing in front of the crowd.

The team had begun the second half of the display featuring the Synchro Pair. As Squadron Leader Ogston was approaching the second synchro pass, at a height of 120 feet above the ground and a speed of 330 knots flying 'head-to-head' with the other synchro aircraft, he saw a large bird directly in his flightpath. With no time to react the bird struck the right-hand side of his canopy. The canopy shattered immediately, sending shards and bird remains into the cockpit and into the airflow and striking Squadron Leader Ogston firmly on the head. This displaced a visor and severed the right-hand connector of his oxygen mask, which fell loose. At this stage the synchro pair were seconds from crossing; with incredible presence of mind, Squadron Leader Ogston calmly and assuredly maintained his heading and height. This ensured a safe cross at which point he eased away from the ground and kept the throttle in a fixed power position to protect the engine. His cockpit was littered with canopy and bird remains and the significant wind blast made external communication impossible.

With the added complication of operating away from the home base from a relatively short civilian runway, he expertly assessed his situation and planned his recovery. With normal engine indications, and concerned by the potential for airframe damage, he conducted a low-speed handling check once clear of built-up areas and people. Having confirmed that aircraft was handling correctly, he wisely elected to conduct a straight-in approach to reduce the need for external communication while expediting the landing, noting the potential for further deterioration of his canopy. He subsequently flew a flawless fixed power straight-in approach in highly stressful circumstances, avoiding overflight of built-up areas and achieving a safe and expeditious landing.

Mr Samuel Brimpong – RAF Northolt – Well Done

At RAF Northolt, Mr Samuel Brimpong was a leading hand Babcock aircraft handler and was tasked to see-in a VIP Cessna C560 XL aircraft. Whilst Mr Brimpong was placing the chocks around the nosewheel he noticed a loose cable hanging down from the upper nose wheel assembly above the torque links. He was curious as to the unusual length of this cable as this did not look correct. Mr Brimpong immediately informed the Captain of the aircraft, who in turn contacted his technical engineering support for advice. Technical support informed him that this was an earthing lead that had become detached from the bottom nose wheel assembly attachment point.

Lance Corporal Patrichot RAF Northolt – Well Done

During an RAF Northolt Air Safety Team monthly meeting LCpl Patrichot of the MPGS raised a concern that personnel were transiting the RAF Northolt North South Link Road on bicycles without sufficient hi-visibility clothing. Furthermore, LCpl Patrichot noted that, not only was this a road safety risk, but that neither the Air Traffic Control Tower nor a taxying aircraft would be able to identify a cyclist on the link road.
LCpl Patrichot suggested that high-visibility tabards could be made available for loan from the guard room.

Mr Noel Allsop – RAF Northolt – Well Done

At RAF Northolt, a small twin-engine Embraer E50P aircraft was parked on line 3. While waiting for passengers to arrive, a crew member approached Mr Allsopp, who was the Visiting Aircraft handler, and requested to start an engine prior to passenger arrival and boarding. Mr Allsopp was aware that the crew had not received permission from ATC to start an engine. Additionally, he knew that starting an engine prior to loading passengers is in contravention of RAF Northolt's Defence Aerodrome Manual. Subsequently, Mr Allsopp declined to facilitate an engine start until the passengers had boarded and aircraft doors were closed.

Flight Lieutenant Bell – 6 FTS – Good Show

At RAF Cosford, Flight Lieutenant Bell was a Grob Tutor T1 aircraft commander conducting Air Experience Flying with an Air Cadet as passenger. Soon after take-off, Flight Lieutenant Bell noticed the cadet starting to show significant signs of agitation and nervousness, which quickly escalated into the cadet becoming visibly distressed and unresponsive to simple questions. The situation then rapidly deteriorated further, with the cadet starting to panic and erratically grabbing at various parts of the cockpit, including the throttle and control column. At this point, faced with an extremely serious and unusual emergency situation, Flight Lieutenant Bell stayed calm and provided reassurance to the very distressed passenger, expertly de-escalating the situation by getting the cadet to sit on his hands. By doing so, he provided the cadet with a simple task to regain focus, whilst also ensuring the flying controls were no longer interfered with. Flight Lieutenant Bell then safely recovered the aircraft and passenger without further incident.

Sergeant Duke & Corporal Blakemore – 906 EAW – Well Done

Whilst deployed to 906 EAW, Sergeant Duke (pictured) and Corporal Blakemore of the Visiting Aircraft Handling Section conducted a 4-ship see-off of Typhoons from the dispersal. Following the Typhoons' taxy to the runway entry point, they observed a large item located on the centre line of the taxiway and immediately informed ATC and subsequently removed the item.

Chief Tech Whysall – 902 EAW – Commendation

Whilst on deployed operations, Chief Technician Whysall was deployed as the sole aircraft handler on a detachment that had no requirement or resource for ES. Chief Technician Whysall applied his previous experience and aptitude as an RAF Armourer to provide safety assurance to the CO of the Air Wing and the Host Nation (HN) Explosives Team and ensuring that a key delivery of ammunition to a visiting Exercise took place safely, effectively, and in line with regulations and procedures. On learning at short notice that the visiting Exercise planned to bring in Class 1.1 and 1.4 ammunition via the airbridge rather than by sea, Whysall took immediate charge of the situation. He coordinated between Royal Marine staffs and HN subject matter experts to facilitate the safe road move of Class 1 freight to another area in-country, ensuring that an initially unsafe plan to add the Class 1 to the transport before transiting to a hangar was halted immediately. Chief Technician Whysall's involvement in the Class 1 offload also saw him play a key safety role in facilitating the unfamiliar process of an Engine Running Offload.

Air Specialist Class 1 (Technician) Cuttle – RAF Benson – Well Done

Flight Servicing on a 28(AC) Squadron Chinook Mk6A helicopter. Air Specialist 1 (Technician) Cuttle identified that the Pilot's jettisonable door was wire locked using 0.5mm wire locking, rather than the tell-tale wire that should be used. As a result, the aircraft was taken off-line for further investigation into the issue. Following the investigation it was discovered that the use of the thicker gauge wire locking was not approved for use within the aircraft document set. The additional thickness of the wire used could have impeded the operating crew's escape in case of an emergency and as such it represented a significant airworthiness risk. A fleet-wide check was released in the form of a maintenance instruction to baseline the fleet. Additionally, Air Specialist 1 (Technician) Cuttle separately found that an engine exhaust cone had excessive lateral play. A visual assessment was carried out and it was found that the exhaust cone's vertical support strut had excessive wear at the upper and lower positions; the rod support was worn through approximately 50% of the original material at both locations.

Air Specialist Class 1 Howe – RAF Benson – Commendation

Royal Air Force Benson Fire Service was called out to attend a serious fire in an accommodation block on the base. Initial investigations concluded that the source of the fire was a tumble dryer located in one of the laundry rooms. Shortly after this event, Air Specialist 1 Howe took it upon himself to create two posters highlighting fire safety issues. One poster was designed to remind people of the importance of ensuring that tumble dryer lint filters are cleaned regularly, the other focussed on the importance of ensuring fire doors are closed. The issue with fire doors left propped open had previously been reported on a number of safety inspections – the poster produced by AS1 Howe is a clear reminder that fire doors are a vital safety measure which help stop fire spreading.

Left-Right: Flt Lt Ashton – AS1 Wintle – Sgt Richie

Crew of Ascot 2133 – RAF Brize Norton – Commendation

At RAF Brize Norton, during the taxy to the runway on a Voyager task, a passenger was experiencing breathing difficulties. The passenger had deteriorated rapidly, with an on-board doctor diagnosing a possible heart attack and the requirement for a defibrillator. The aircraft was returned promptly to the stand and the patient was offloaded into the care of the paramedics a short time later. Throughout the incident the cabin crew worked very well as a team, communicating effectively with each other and the aircraft Captain. They acted both calmly and professionally and utilised their immediate care skills and common sense in rapidly locating a Doctor. They then helped stabilise the patient, using the on-board first aid kit and emergency oxygen, thereby maximising his chances of survival. Flight Lieutenant Ashton, Air Specialist Class 1 Wintle and Sergeant Richie are pictured. Commendations were also awarded to: Corporal Reeves, Air Specialist Class 1 Glennard and Air Specialist Class 1 Worsley (not pictured).

Corporal Horsfall – RAF Odiham – Commendation

Corporal Horsfall was the senior mechanic on shift as part of a Chinook aircraft environmental training exercise. During the shift handover brief, as the maintenance tasks for the shift post routine flying were issued out, Corporal Horsfall raised the question of why aircraft engine air orifices were not being inspected for sand blockages as stated within a recently issued technical instruction. He further identified that the requirement for inspections following compressor washes had increased but that this had not been captured within maintenance capturing software.

Air Specialist Class 1 (Technician) White – RAF Odiham – Well Done

Air Specialist 1 (Technician) White was tasked with completing an After Flight Servicing on an aircraft which had undertaken a 30-minute air test, following replacement of its Aft Rotor Head. During the Servicing, AS1(T) White noticed a potential issue with components on the aft rotor head which were not seated correctly and applying his training and intuition, sought advice from his supervisor. Upon further inspection, it was found that elements of the component stack being inspected had not been fitted.

Air Specialist (Class 1) Jewitt & Air Specialist (Class 1) Leask – RAF Benson – Well Done

At RAF Benson, Air Specialist (Class 1) Jewitt and Air Specialist (Class 1) Leask acted swiftly to extinguish a fire which occurred within the kitchen area of the Section crew room. At the time the crew room was unoccupied, and flames could be seen inside the microwave – which was the source of the fire. On entering the room, AS1 Leask immediately located a fire extinguisher and attempted to fight the fire whilst AS1 Jewitt quickly raised the alarm ensuring other occupants of the building were made aware of the need to evacuate and then ensured access to the building was controlled until the Fire Service arrived.

Sergeant Saunby – RAF Coningsby – Well Done

At RAF Coningsby, and during a Canopy Earth bracket inspection on a 41 Squadron aircraft, it was noticed by Sergeant Saunby that elements of the aircraft data set for removal of an equipment cover referenced a task that should have been subject to independent inspections. This step was not hyperlinked within the data set as part of the pre-job requirements, and the chapter of the data module used to remove and refit the cover was also not in the table of chapters subject to mandated independent inspections.

Sergeant Saunby raised the issue to his management and submitted a Defence Air Safety Occurrence Report to immediately highlight the issue to other Typhoon users within the fleet, as well as a Technical Publication Request Form to highlight the anomaly to initiate formal change to the data module.

Other Awards

RAF Northolt Stn Flight Safety Award Mr Paul Brockton (Centreline)

RAF Northolt Stn Flight Safety Award Corporal Jones (RAFP MWD)

905 EAW Award – AS1(T) De Carvalho

Prior to a planned a 2-ship training sortie AS1(T) De Carvalho noticed a leak from the left hand hydraulic bay of a Typhoon aircraft. The source was identified between the pressure switch and the filter pack in the left hand hydraulic bay and was confirmed by the Supervisor.

2022 L G Groves Awards Ceremony

Left to Right - Dr Gerd Folberth – Meteorology Award; Dr Fiona O'Connor – Meteorology Award; Elizabeth Harris, Met Office Programmes Director; Air Cdre Sam Sansome, Inspector of Safety RAF; Anthony Groves, L G Groves Charity Trustee; FS Adam Syrett – Ground Safety Award; Flt Lt Jamie Jenkins – Ground Safety Award; Stephen Moseley – Met Observation Award; (Major Chris Pickett - Absent)

Presented annually since 1946, the L G Groves Awards Ceremony was established in memory of Sergeant Louis Grimble Groves, RAFVR, 517 Sqn Coastal Command, who lost his life while flying on a meteorological sortie on 10 Sep 45. Presented by Air Cdre Sam Sansome, the Inspector of Safety RAF, this year's event took place at the Fleet Air Arm Museum, RNAS Yeovilton on 09 Dec 22.

Aiming to encourage the study of Air Safety and to stimulate research in the science of aviation meteorology, whilst also recognizing the work of personnel engaged in meteorological observer duties; the awards are open to personnel from all 3 services, the Met Office and civilian support staff.

The prizes and awards offered are a £1000 Air Safety Prize, which this year went to the Major Chris Pickett from the 1st Aviation Brigade Combat Team for his outstanding commitment to the innovative transformation of the Air Safety culture across the British Army Apache Force.

Dr Fiona O'Connor and Dr Ged Folberth of the Met Office were awarded the £1000 Meteorology Prize. Recognised for their work to jointly develop the world's first climate model capable of representing, in unprecedented detail, changes in the world's methane budget. This new capability advances the international climate science community's ability to provide essential evidence to underpin climate mitigation policy.

The £500 Ground Safety Award was won collectively by RAF Leeming Air Traffic Control (ATC) Squadron and collected by Flt Lt Jamie Jenkins and FS Adam Syrett. An extraordinary sequence of events on 09 Dec 21 saw RAF Leeming ATC calmly deal with multiple emergency incidents. This award recognised their outstanding teamwork, exemplary management, and clear communication throughout an exceptional series of high-intensity incidents.

Mr Stephen Moseley was awarded the £500 Meteorological Observer Award. Mr Moseley is a Senior Post-Processing Scientist in Weather Science and a leading expert in nowcasting (a detailed analysis and description of the current weather and forecasting ahead for a short period) and post processing. His efforts have been instrumental in the development of the new, probabilistic post-processing system, IMPROVER, which has just become operational. His work has had a significant beneficial impact on Met Office services and enabled him to cultivate a strong international reputation.

Nominations for the 2023 awards are under way and Unit Flight Safety representatives are encouraged to identify suitable candidates as per the guidelines laid out in 2023DIN06-001.

New Inspector of Flight Safety (RAF) - **Gp Capt Andrew Keith MA RAF**

Following the departure of Gp Capt Mark Manwaring, Gp Capt Andrew 'Boomer' Keith joins the RAF Safety Centre as the new Inspector of Flight Safety (RAF). Formerly a Skyhawk pilot with the Royal New Zealand Air Force, Gp Capt Keith transferred to the RAF to join the Harrier Force in 2001. Since then he has completed a variety of tours which include: the Royal Air Force Aerobatic Team (The Red Arrows), 83 Expeditionary Air Group, UK JFACHQ, and ISTAR HQ at RAF Waddington.

His flying experience also reaches beyond the military arena. In his former years he helped his father build a Thorpe T-18 light aircraft in the garage of their family home. He flew regularly with his father from the local airfield in New Zealand which no doubt sparked his passion for aviation. He now joins us from a recent tour as the Battle Director working in the Combined Air Operations Centre in Al Udeid.

IFS' Message to You

"As we all know, Air Safety is something that should be engrained in all of us, not just aviators but the Whole Force. Safety, and of particular interest to this audience, Flight Safety, allows us to conduct our daily business in an effective manner and maximise our operational output whilst protecting our people. I look forward to working with you all to achieve this goal."

Photo owned by IFS

Photo credit: LA (Phot) Luis Holden

Photo credit: Cpl Phil Dye

Civil Insights From the UK Flight Safety Committee
Lasers and the Law

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

In his recent article on Laser Illumination Hazards and Protection (Air Clues Issue 38), Dr Eric Liggins gives an excellent overview of the threat posed by lasers. If you have not read it yet, I commend it to you. He also touched on UK law. Until May 2018, the perpetrator of a laser attack on an aircraft – let us call him Joe Public for the purposes of this discussion – was effectively only subject to the provisions of the Air Navigation Order (2016) and its earlier iterations, and could only be prosecuted under two Articles:

Art.225: A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft.

Art.240: A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft.

The problem was the extreme difficulty of proving the reckless endangerment element, which was the indictable offence that attracted a higher penalty. Most cases were therefore either rejected by the Crown Prosecution Service or were being heard summarily as Art.225 offences by magistrates who, unfortunately, did not always fully appreciate the significance of a laser attack. In turn, this meant Joe Public's reward for his idiocy could best be described as 'light and variable', depending on if and where he pitched up to a Court. The consequence of this approach was the absence of any real deterrent effect; attacks increased steadily from 2000 onwards.

The legal landscape changed with the entry into force of the Laser Misuse (Vehicles) Act 2018, which created a new offence of shining a laser at any form of transport, carrying a penalty of up to 5 years imprisonment and/or a significant fine. You no longer need to prove endangerment or distraction, simply pointing a laser at you is an offence. However, this does not absolve you of the requirement to report an attack – to the contrary, reporting is now more important because the offence is 'reportable'. That means police forces are obliged to treat reports seriously, the crime must be recorded, i.e. it will be given a crime number, and there is a requirement for offences to be notified to the Home Office. NB, white light attacks from high-power LED torches etc. can only be prosecuted under the Art 225 distract/dazzle provision and will therefore also need reporting.

So how did we get a new law on the statute books? It is not easy, and it takes time. The CAA had a Laser Working Group which had become moribund by late-2013 because of resources being diverted during a major transformation programme, so I approached the Department for Transport (DfT), explained the problem and offered to run a UK Laser WG on their behalf, on the understanding that success would be a DfT triumph and failure attributed to my own shortcomings! The offer was accepted and the UKLWG was rapidly established with me as Chair and a DfT official as the Vice-chair.

From the outset it was a multi-disciplinary team that included a CAA secretariat and representatives from the MAA, Met Police, the National Police Air Service, BALPA, Public Health England, QinetiQ, dstl, the Crown Prosecution Service, several UK-based airlines and of course the RAF. We also co-opted 2 consultant ophthalmologists, one with deep practical knowledge of laser eye surgery, the other having had his interest fired by treating several young patients with permanent damage from laser-induced retinal burns. These good people provided the three legs of the stool: aviation ops, regulation/enforcement and science. Unfortunately, the stool was a little wobbly to begin with.

One of our first tasks was to determine what we wanted to achieve and then what might be achievable. Not surprisingly, there were some very different views, with frequent collisions between intent and reality. For example, whilst "Ban all laser pointers" would address a large part of the problem, of more concern to the DfT policy staff was that this would criminalise a segment of the population overnight and therefore would not survive scrutiny, and it would be very hard to enforce.

There was also some pressure to get things done quickly, not least because some commercial pilots had started buying their own laser protection equipment (LPE) and airlines needed answers on whether they should allow their use or not. Clearly, LPE could not be introduced on an individual basis without a formal trial to ensure cockpit or flight-deck integration was safe, otherwise the formal airworthiness process would be compromised. We therefore needed to reassure crew members that the personal odds of an attack were slight and that unofficial LPE was not the way to go.

The biggest challenge we faced was to our own opinions when it came to the prospect of eye injuries from a (non-weapons grade) laser strike. It had been a long-held belief for many of us that injuries were a real possibility from the type of strikes being experienced at airports or by low-flying aircraft and that it was only a matter of time before someone was permanently damaged; this view under-pinned many of the assumptions that had been made about procedures and countermeasures. It took many hours of argument before the aircrew, who bear the personal risk, accepted the scientific advice that hand-held devices were unlikely to cause damage beyond temporary dazzling effects. This still holds true for the commonly available devices – the classroom-style pointers - because of aiming scatter, dispersion, attenuation from atmospheric conditions, cockpit transparencies, etc. and distance from the laser source.

That said, high power lasers still represent a threat. If you are so inclined, you can purchase an advertised 'burning' laser of up to 5W power output, which makes it a Class 4 device that should not be on sale to Joe Public under UK rules. That laser is distracting (FAA definition) at 50km, will cause temporary flash blindness at 1.2km, and will cause increasing levels of injury below 250m from source. If a laser is capable of bursting a balloon or setting fire to paper, what do you suppose that might do to your retina or, worse, the foveal area responsible for your central, accurate vision?

The UK power output limit is 1mW, though it is widely accepted that 5mW is eye-safe. One of our ophthalmologists cited a patient (age 10) with a self-inflicted disabling eye injury, the son of medical-

professional parents who had bought him 3 laser pointers from the largest online retailer as a Christmas gift. All were labelled as 1mW devices but, when tested, clocked in at 20mW, 30mW and 70mW respectively. Bottom line: they are not toys.

The next problem we had was in finding a suitable means of bringing legislation before Parliament, which included finding time in the business calendar. Many Bills fail simply because there is insufficient time to deal with them, and it was clear we were not going to be given a bespoke Bill at the time; the Private Member's Bill route was also rapidly closed off as the ballot-winning MP had other plans in mind. Instead, we managed to have the issue included in the Vehicle Technology and Aviation Bill (VTAB), a catch-all piece of legislation sponsored by DfT which covered inter alia regulations for electric vehicles and some additional powers for the CAA. This Bill created the new offence and had reached the Committee Stage when a general election was called in 2017. That was the end of the Bill, along with all the other draft laws still in progress, and we were back to square 1.

Crucially, the opportunity of a new Bill in the next Parliament, which became the Laser Misuse (Vehicles) Act of 2018, allowed us to expand the scope of the legislation drafted for the VTAB. We were able to convince the policy teams that ATC facilities should also be covered, and the 'aircraft on a journey' language in the VTAB was amended to aircraft that were moving or were ready to move, i.e. had engines running. A further improvement was the extension from 'person controlling' to '…controlling or monitoring the control of…', so the offence covered an attack that was only experienced by the pilot monitoring and not the pilot flying.

Further, we were able to show the problem of laser attacks was not confined to aviation, although we only had a few reports of attacks on train drivers from trackside and bridges, plus anecdotal evidence of attacks against cars and lorries; for the latter case, we had to explain that anecdotal evidence was all we had, because there was no reporting system in place, nor any encouragement for drivers to report, nor any real awareness of the risks (the closer proximity to a laser source raises the injury stakes when you consider that distances can be reduced to just a few metres from, say, a bridge.) There also were formal reports of attacks against maritime targets, such as against crews on the conning towers of submarines entering the Faslane facility, so the maritime world was added to the list, making the scope now all forms of transport.

The next stage was communication, an important part in the process of securing cross-party support. We provided briefing material ahead of the detailed Committee work and Parliamentary debates, which helped ensure that supporters were equipped with answers to likely questions, and there were some press releases and other articles to prepare the ground. In the event, there was little serious push-back against a new law that was seen by all as being straight common sense, and its passage through both Houses was very smooth. Royal Assent followed on 10 May 2018. We had changed the law of the land in just over 4 years, which I am told is very fast for a non-manifesto initiative.

There are some wider lessons that I drew from the process:

- You need to invest time in developing and maintaining working relationships if they are to be genuinely productive; it will not be wasted effort.
- In any complex scenario, collaboration is the key to success; as part of this, you need some diversity of thought and a willingness to accept other points of view.
- Challenging your own ideas is difficult, changing them is even harder.
- Communication matters: don't forget to talk to people and socialise new concepts.
- Compromise solutions are a political reality and are not always bad.
- Persistence pays off in the end…

Wg Cdr Spry Comment:

Air Clues is grateful for this clarification about the law on lasers. Not so long ago we had a flight safety poster that stated that intent needed to be proven, thereby encouraging you to report laser illumination. Air Cdre Whittingham has put that incorrect assumption to bed in this article, so we have updated the poster and it is included in this magazine. If you have any of the old posters, please replace them with this correct version. ■

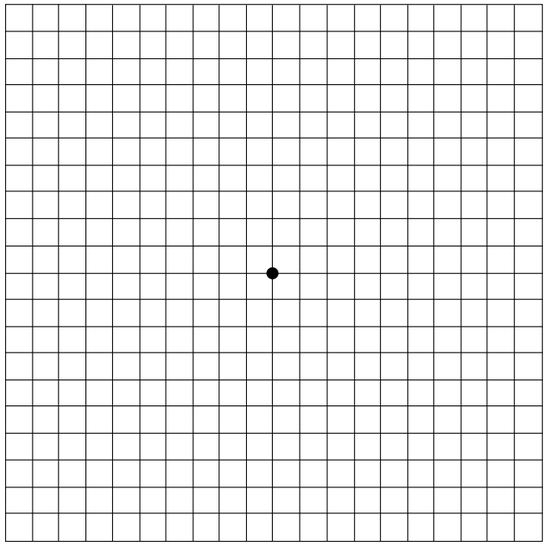
Doc's Corner:
Ol' Square Eyes –
The Amsler Grid in Laser Exposure Self-Assessment

By Dr Ollie Bird – Medical Officer Instructor – RAF Centre of Aviation Medicine

Photo credit: Cpl Lee 'Matty' Matthews © UK MOD Crown Copyright

An eruption of light on the windscreen and a twinkling disco-tinted firefly appears in the cabin, zigzagging across the ceiling and side panels in an erratic, drunkard's reel, reflecting off surfaces, so that the crew's attention is momentary broken, their concentration interrupted away from the pressing task at hand. Laser 'incursions', 'strikes' or 'attacks' are sudden and unexpected when they happen and may occur to any aircraft in any phase of flight. Most are carried out with hand-held, green lasers, typically over or near large population centres:

On approach for the ILS Rwy 15 at Rio de Janeiro airport at night, the crew of a Voyager KC3 experienced a consistent laser event from approximately 3000 feet to 500 feet above mean sea level, which shone on the aircraft throughout. The green laser was approximately 1nm south of the threshold and stopped only as line of sight was broken. The following night, on departure from Rwy 15, at approximately 1820 Local, another green laser event from the south was observed, this time from 500 feet to 3000 feet. On both occasions a member of the crew announced the attack before harm was done, with all crew averting their gaze. Fortunately, no injuries resulted, with ATC being informed on the approach.



https://www.macular.org/care-and-treatment/monitoring-your-macular-degeneration/amsler-chart

Startle, glare, flash-blindness, and after-image are well recognised effects of lasers on the eyes, all of which can have a detrimental outcome on flight safety. Review of data compiled by the CAA shows that in 2021 there were a total of 536 laser incidents in the UK and 44 involving UK operators overseas. Although these figures compare favourably with those from 2011 (1912 UK incidents and 366 overseas), the deliberate targeting of aircraft by hand-held lasers continues to represent a clear and present danger to aircrew, many of whom may not have easy access to early medical evaluation. Be this as it may, help is at hand in the form of the aviation laser exposure self-assessment policy (ALESA), more about which comes a little later in this article.

Due to the ubiquitous nature of the hazard both in the UK and overseas, it makes sense for all aircrew to manage their expectations about the possibility of a laser incursion on the aircraft they're flying in. Beyond the proportionate and sensible anticipation that an attack can occur at any time, simple measures in the aircraft can reduce its negative impact. Where appropriate to the aircraft type, crew composition and phase of flight, these will include the following:

- Looking away
- Turning away
- Shielding the eyes
- Turning up the cockpit lighting
- Avoiding rubbing the eyes
- Engaging the autopilot or transferring control
- Considering executing a missed approach
- Informing ATC

While windscreens and canopies will be partially protective and permanent eye damage is extremely unlikely, any concern amongst crew members following a laser incursion should be reported to, and discussed with, a medical officer. When operating at remote locations, however, early medical evaluation won't always be possible, and in these situations, aircrew can make use of the aviation laser exposure self-assessment guidance. This includes utilization of the Amsler grid. This 10 x 10cm square has horizontal and vertical lines printed on it, forming a grid pattern, with a dot at the centre. Downloadable grids are readily available online.

In the event of a laser event, the grid should be held at a normal reading distance (about 30cm in front of the eyes), under good lighting, wearing any spectacles normally used for reading. Covering one eye at a time with the palm of a hand, staring at the central dot at all times and not letting your eye drift from this, ask yourself the following questions:

- Can I see the dot in the centre of the grid?
- Can I see all four sides and corners of the grid while looking at the centre dot?
- Do all the of the lines appear straight with no distortions or blank or faded areas while I'm looking at the centre dot?

If you answer YES to all three questions, follow the flowchart in ALESA. If you answer NO to any of them then you might wish to remove yourself from flying or controlling duties as soon as it is safe to do so and consult your medical officer.

While the sudden, surprising appearance of light from a laser in the interior of an aircraft has the potential to be unsettling, it's important to remember that some effects are only temporary and non-injurious, and that acute visual loss can improve with time. Reassurance that permanent eye damage is extremely unlikely is important to alleviating concerns, and the Amsler grid should be used for self-assessment on those occasions when early medical evaluation is not possible following a laser attack.

References:

1. asor\Brize Norton - RAF\101 Sqn\Voyager\22\7922
2. https://www.caa.co.uk/data-and-analysis/safety-and-security/laser-incidents/
3. https://www.aao.org/eye-health/tips-prevention/facts-about-amsler-grid-daily-vision-test
4. http://www.eyecaretrust.org.uk/pdf/eyecare-trust-amsler-chart.pdf
5. https://www.macular.org/wp-content/uploads/2016/05/amslerchart.pdf
6. AP1269A Leaflet 5-14 Annex D: Medical Management of Combat Laser Eye Damage in Aircrew
7. AP1269A Leaflet 5-14 Annex D Appendix 2: Aviation Laser Exposure Self Assessment (ALESA)

Near Controlled Flight into Terrain (CFIT)

By Sqn Ldr Mike Kitching, RAF Safety Centre

Photo credit: Dejan Milinković GFDL 1.2 <http://www.gnu.org/licenses/old-licenses/fdl-1.2.html>), via Wikimedia Commons

On 23rd May 2022, an Airbus A320-200 with 172 passengers and 6 crew members on board narrowly avoided disaster after descending to a radar altitude (RA) of only 6ft above the ground approximately 0.8 nautical miles (nm) from the end of the runway. The pilots of Flight NSZ4311 from Stockholm to Paris CDG were operating in poor weather with low cloud, rain, and low visibility. The crew stated that they were in cloud for the entirety of their first approach and experienced moderate turbulence.

The pilots were cleared for the Required Navigation Performance (RNP) approach to Runway 27R. They performed a RNP with LNAV/VNAV minima, which is a barometric approach. Unfortunately, the incorrect altimeter setting (i.e. the measure of altitude based on air pressure) was passed by Air Traffic Control. The difference equated to 10hPa and would mean that the approach was carried out some 280ft too low. The pilots were twice given this incorrect setting (1011 instead of 1001 local QNH); however, neither ATC or the pilots realised the error.

ATC extract below:
CCG International Controller: *"Red Nose 4311, descend … descend 6,000ft, 1011."*
Flight D84311: *"6,000ft, 1011 … 1 …011, Red Nose 4311."*
CDG International: *"Red Nose 4311, descend 5,000ft, 1011, cleared full RNP 27R."*
Flight D84311: *"Descend 5,000ft QNH 1011, cleared full RNP approach 27R, Red Nose 4311."*

During the final approach, the Minimum Safe Altitude Warning (MSAW) alarm triggered in ATC, and the controllers also received a ground proximity alert. Luckily, the crew aborted the approach before the crash, when they arrived at their minima (also incorrect due to the wrong QNH) and didn't acquire visual; however, during the go-around the aircraft descended to only 6ft above the ground some 0.8nm short of the landing runway.

After the go-around, the pilots flew a second approach to the same runway. Unfortunately, at no point was it identified that the incorrect altimeter setting was being used, although they were given the correct QNH during the go-around which was read back incorrectly. Therefore, the subsequent RNP approach to Runway 27R was also around 280ft low.
The controller asked the crew if they were ok following another MSAW warning in ATC. Fortunately, during the second approach, the pilots became visual with the runway, corrected the height error, and landed safely.

At no point during either approach was a Terrain Warning (TAWS) recorded by the aircraft. Although this serious incident is still under investigation, information was released via a preliminary report by BEA.

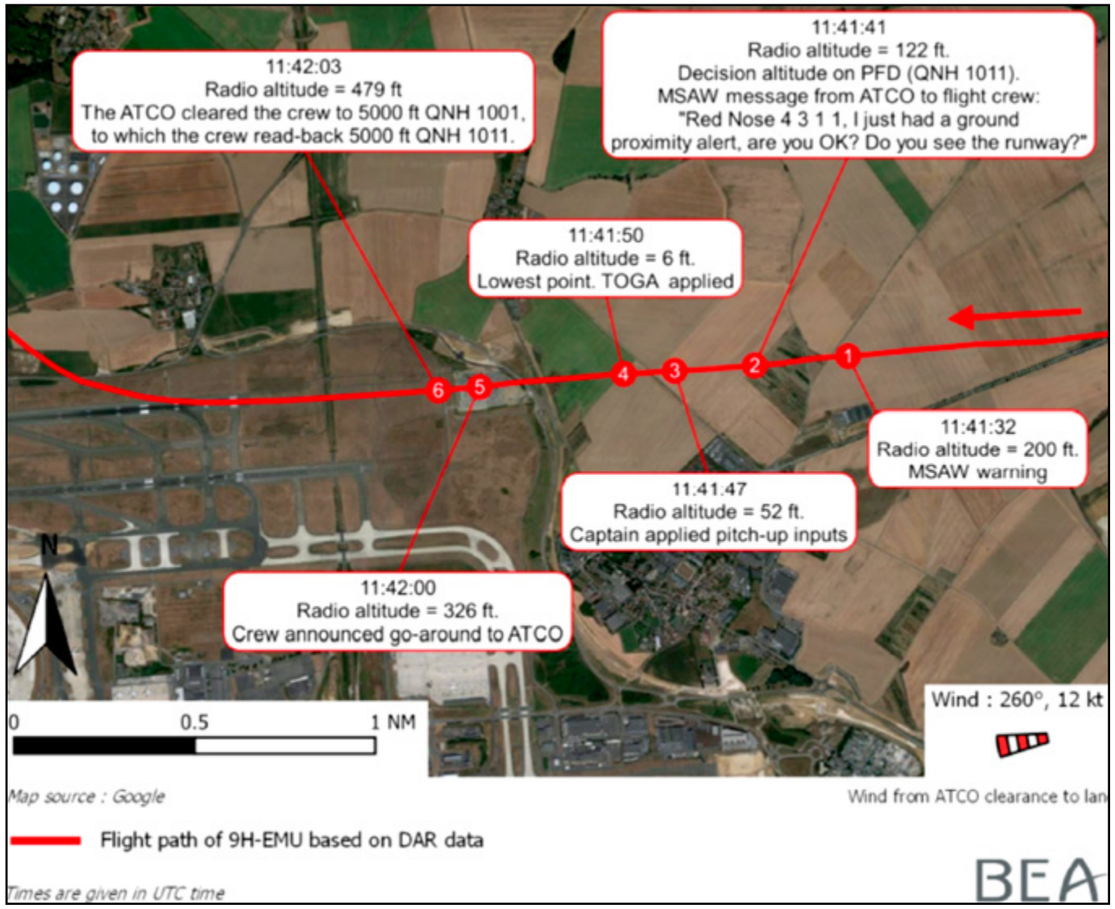


Image Source: Preliminary Report, bea.aero, BEA2022-0219.

More information can be found on the BEA Website:
https://bea.aero/fileadmin/user_upload/BEA2022-0219_9H-EMU_preliminary_report_for_publication_EN_finalise.pdf

With thanks to Thierry Rozec, BEA Lead investigator, for additional content.

Spry's Comments:

- If there is doubt, there should be no doubt. The safest option is to simply go-around. However, before committing to another approach it is important to try and understand what went wrong the first time. It is easy in hindsight to identify the errors made by both the pilots and the controller, but remember the operating conditions: moderate turbulence, rain, low cloud, and low visibility and a busy ATC environment.
- We are all human. Apply the substitution test. If another crew on another day, operating in similar conditions could do the same thing, then you need to ensure recommendations address the system not just the individual crew. We often see 'Rebrief and retrain' as a recommendation, but this will not be enough to truly mitigate any risks to life.
- The thing in this event is that when you fly a barometric approach in IMC with an incorrect QNH, you have almost nothing to save you from a CFIT …You do not have alarms, the procedures and checklist cannot save you, ATC doesn't know you are too low …So the key point is to fly baroVNAV approach with the correct QNH!
- This crew came within 0.5 secs of hitting the ground. With an RNP approach, the aircraft would have been showing 'on profile' but the only real clue for this one would have been the radalt – that of course requires you to have it in your scan. EASA has since issued an SIB: https://ad.easa.europa.eu/ad/2023-03. ■

I Learned About Flying from That - Puma Tip Strike

Submitted by JHC

Photo credit: Air Specialist (Class 1) Iain Curlett RAF © UK MOD Crown Copyright

Foreword by Gp Capt N J Paton, former Puma Force Commander and DDH

In May 2022, I got 'that call' that all Force Commanders and DDH are prepared for but hope never to receive: "Sir, there has been an incident…." It transpired that a French soldier we were exercising with had been struck by the main rotor blades of one of our Pumas. As you can well imagine, the first hour was somewhat uncomfortable as we gathered the relevant information from the detachment on exercise in Corsica. Thankfully, it soon became clear that no one was seriously hurt… I say that again, no one was seriously hurt. And yes, the French soldier really was struck by several main rotor blades traveling at c.260 RPM.

I won't steal anymore of the author's 'sandwiches' suffice to say that two things really struck home: First, the immediate response of the detachment to the incident was outstanding; ably supported by my Air Safety Team back in the UK, the 'Safety' machine smoothly rolled into action, everything from initiating a joint UK-French investigation to providing appropriate support (TRiM, etc) to those involved. Second, Support Helicopter activity is a risky business. Often there are no new lessons, but a re-learning of old ones, and arguably this particular incident is no different. I have had the pleasure of flying with the author on several occasions, he is an excellent officer, pilot and instructor. I was keen that he shared his experience 'warts and all' so others may learn or even re-learn a few valuable lessons.

In May this year I was the captain and handling pilot of a Puma Mk2 helicopter operating on the French Mission Commanders' course in Corsica, which resulted in a Main Rotor Blade tip strike with a French soldier; fortunately resulting in no injuries and only minor damage to the aircraft. This story is about how to identify lessons, get back on the horse and share the lessons with others.

As with many 'close calls' and Air Safety stories there are many contributing factors as to why an event happens. Operating helicopters is risky business at the best of times, particularly in an area with difficult terrain and a complex tactical scenario. I have been on the Puma Force for over 10 years, 4 of these as a QHI. When you fly long enough you eventually see incidents or are involved in them; this was a sobering reminder for me about the risks involved as an SH pilot.

The French Mission Commanders' Course will award French helicopter pilots who already hold combat ready status a Mission Lead qualification, the highest qualification they can obtain. The Exercise involves multiple helicopter types including French Caracals, Pumas and Fennec light attack aircraft. This means that the Exercise is high tempo with complex planning timelines, not to mention the difficulty in tackling the language barrier.

The UK Puma detachment itself had 3 crews and 3 aircraft of which I was the detachment commander. Two crews would be used each day for the 2-line flying programme and the other crew would be spare. The spare crew would include the Duty Authoriser. This resulted in a busy detachment, with little spare time. Ideally, I would have preferred another crew to allow more flexibility and the ability to separate the authoriser from the flying. However, due to other Puma Force commitments in the lead up to the exercise this resource was unavailable.

Each morning, one of the student Mission Commanders was allocated as the lead for that day. Missions increased in complexity as the exercise progressed, this mission was to capture a High Value Target in the mountains and was to involve French Special Forces and various helicopters. The mission involved 3 separate packages; two of the packages had a UK Puma, French Caracal, and Fennec light attack helicopter. The final package was the escort and C2 comprising of the Fennec.

The Terrain

Corsica is a mountainous island with the airbase on the coast at sea-level. The mountains extend above 8000ft AMSL and on this mission the objective area was around 5000ft AMSL. There was no doubting that we were operating in 'proper' mountains, which made our UK mountain ranges by comparison very small indeed. Before the deployment we had identified the risks of operating in the mountains both in the Dynamic Risk Review to the DDH and during the planning stages. I was conscious that operating in the mountains was not something the Puma Force had significant experience in. Of course, we were all mountain flying qualified but that is different to saying you are experienced. I had conducted a reasonable amount of mountain flying previously in Norway and the UK and identified that some of my detachment hadn't. It's also worth noting, at this stage, that most of that mountain flying the Puma Force did never really involved actual troops with real pickups and drop offs at difficult landing sites. Something that would catch me out shortly……

Planning

The planning cycle and environment in which the Exercise takes place will be familiar to most helicopter operators in JHC. To the untrained eye, it is a large hanger, lots of people and utter chaos. Of course, it is not quite like that; the planning involved various teams focusing on separate

elements of the mission. These 'boards' of teams would include the objective area, route, deconfliction, ground forces plan, timeline, and enemy locations.

To help spread knowledge, the 2 UK Puma crews would be split up across these various boards. As a result, you would not necessarily have a great deal of sight or input on the other boards apart from the occasional update briefs.

So how did this contribute to the events later?
Well, the first obvious challenge was the language barrier. Although the exercise was to take place entirely in English it was very easy for the French crews to slip back into speaking French and consequently this would create issues for us and meant we were sometimes left out of the conversation. This was not intentional, but the French were, naturally, used to working together and speaking with each other in French. The second issue was interoperability between planning systems. Quite simply, we conducted our planning with what we had on our system, and we were unable to exploit the better mapping the French units had. (Our mission planning system was not compatible, or able to attach itself to the French system.) We therefore struggled to obtain the right imagery and overlays. Looking back, this contributed to not really being able to understand the terrain we were going to be landing in despite the capabilities of our own Mission Support System. I wasn't truly able to appreciate the complexity of the terrain at the landing point.

Finally, the planning process, tactics employed and the way the French fly are different to how we operate. The way the mission was planned and conducted was largely driven by the French and, at this stage of the exercise, we had not really managed to put across our way of doing business. We were largely passive at this stage, and it is something I wished I had pushed a little earlier on. Incidentally, later in the exercise things did change and they moved towards following more of our practises. Had this been a UK exercise more focus would have been in other areas……such as the landing points and objective area.

Supervision
I can't just blame the planning cycle. Earlier that morning Exercise Control had requested that we fly the 'Red Force' out to the objective area. Wanting to be forward leaning I had agreed and sent my third crew. However, this meant the duty authoriser for our mission would not directly be able to watch the planning process and was effectively blind on the plan to a degree prior to authorising the mission. Whilst identified as a factor in the subsequent investigation I believe this would not have changed the outcome. In fact, the Authoriser later returned and briefed me on the difficulties he had landing at the objective area, albeit he landed at the target rather than our planned landing site. But what he did provide was a warning that it would be difficult. We identified areas that might be better, but the quality of our imagery prevented detailed analysis.

With hindsight I should never have agreed to that the 'Red Force' drop with the limited personnel I had. By doing so I eroded a layer of supervision.

The Incident
Now skipping forward to the incident. My crew consisted of a Combat Ready (CR) co-pilot and a Limited Combat Ready (LCR) crewman, both relatively junior. At the time I was content that this flight was within the crew's ability (with hindsight I probably underestimated the complexity of this mission, particularly the landing point). A CR crewman with greater experience may have been more appropriate.
The mission began with no issues and in fact all went exactly to plan until we crested the ridge a few miles short of our landing site. Due to the enemy locations and the need for the element of surprise the target run had been planned in a less than ideal direction putting our package high over the site and requiring a left descending turn to approach.

It was hard to conduct a 5'S recce (Size, Shape, Surrounds, Slope, Surface) and made even more so in the mountainous terrain; it would have been difficult to do a standard orbit with the rest of the formation. The landing site was effectively in a bowl and at 5000ft AMSL. The approach itself did not cause too much of a challenge and although we were heavy, we had more than enough performance to make this type of approach.

As the landing area came into view, I made a positive decision to land further down the slope closer towards the target. From my perspective I didn't assess the original landing site to be within sloping ground limits so elected to change.
As we arrived at the new landing location, we attempted the first landing. The area was very undulating, rocky and with steep slopes, this made for a tricky area to land. A tricycle undercarriage can be difficult to land especially with the very rocky surface of the mountain. I made my first attempt and managed to get the right and nose wheel on the ground. One soldier deplaned from the right door, but I had to stop the remainder as I didn't feel stable. We then lifted and re-positioned to land with a compound slope - with the mountain sloping up and away from me in the 2 o'clock position.

At this point I hadn't truly appreciated how steep the slope in that direction was nor how close the tip was to the ground. I was solely concentrating on the landing. All troops then exited the aircraft. As far as I was concerned that was it. What I hadn't seen was the second soldier run up towards the 2 o'clock and subsequently get struck by the blades. The other soldiers cleared to the 3-4 o'clock. We then lifted and departed to hold clear of the target.

Knock it off
Then came "knock it off, knock it off, knock it off" over the radio, an out-of-exercise radio call to stop any activity due

All photos supplied by the Detachment Authoriser; Reproduced by kind permission.

to something which prohibits the exercise, it's generally something to do with safety. This was followed closely by the other UK Puma asking me if I had a tip strike with a person. (They had a French Instructor with them who had been told to ask us). I immediately asked my crewman if he had seen anything. Had anyone gone near the tail? Had he seen anyone get hit? He said no. In my head all I could think about was surely if someone was hit by a blade we would know? My heart sank as I thought about the consequences.
We were directed to land on for CASEVAC. At this stage I was still in disbelief that it was even my aircraft involved. We made another approach to the area; this time landing at the target area on a flat section of land near the ruins of an old building. As I looked around the area everything was calm. I remember thinking well either it is calm because nothing has happened, or it was calm because it was too late. We loaded the soldiers on to the aircraft and started heading back to base. Enroute, I asked my crewman to find out what happened; the soldier in question took off his helmet to show us the damage. That was the moment I realised it was us. We then made a precautionary landing at a refuel site 2 minutes away.
When we shut down for inspection; we saw evidence of a tip strike on 2 rotor blades and the soldier showed us his helmet which had prevented any serious injury. I had never been so relieved to see him laughing and joking with me.

What I learnt
I won't regurgitate the OSI but here are the bits that count. As an experienced Puma pilot, captain and QHI I underestimated the complexity of the mission and the strain that it would place on me and my crew. Due to repositioning for the second landing, it resulted in the soldier running towards the high ground where the first soldier had gone - He was not aware of the blade tips.

The tip clearance due to the sloping ground was not adequate and was something I had not considered. Should I have landed there? With hindsight, no, definitely not. Our crewman tried to direct him in a safe direction but in this instance it did not work.

Looking back there are lots of things I would have changed. My crew was relatively junior and quickly reached the point where we were all working very hard. As I mentioned earlier, very few people have done live trooping in the mountains, or indeed any trooping at all, aside from on Operations which for the Puma Force has been assured HLSs, with a low threat. For example, 'arctic huddles' where troops exit the aircraft and remain close to the aircraft were previously common knowledge. I knew this and could have used this as an option and briefed the troops to do this before the sortie. I didn't. ***But ultimately, I was the Captain, and I made those choices.***

I end this story with the most important point I have learnt. Accidents and incidents happen. Hindsight is 20/20 and I sit here now thinking what I could have done differently. The problem is that it can impact the way you then perform moving forward. As a pilot, the incident knocked my confidence and got me questioning my own decision making - not ideal as a QHI and CR Captain. I know it also impacted the rest of the crew too.

As I write this article, I am in Brunei flying in some very challenging terrain with similar issues that I encountered on the exercise. Landing sites are very small, involve sloping ground and live troops. The incident in Corsica has allowed me to share lessons learnt to the crews in Brunei and hopefully refocus minds to the dangers when operating in difficult landing sites with troops.

Get back on the Horse
Finally. When you are involved in incidents don't bottle it up, speak to someone, share your experience. As aircrew we are bad at that. There are lots of options; whether that be mates, the padre, med centre or performance coaching which can help overcome some of this stigma and get you back in the cockpit.

(Submitted by the FR MCC Det Cdr at the time of the incident.)

Operational Pressure

From: Issue 1, 2022 of 'Flight Comment, Royal Canadian Air Force

Photo Credit: Cpl Marc-Andre Gaudreault RCAF – Reproduced by Kind Permission

Several years ago, I deployed with a Long-Range Patrol (LRP) crew for an International Operation. The 28-day Operation consisted of patrolling sectors of the Pacific for illegal fishing activity with a CP-140 Aurora, along with an on-board Department of Fisheries and Oceans officer. The US Coast Guard and participation of a C-177 Globemaster were also used. At the strategic level, the Operation was supposed to bolster diplomatic ties. This deployment was to be my check ride for the LRP Captain (LRPC) qualification, so I was prepared for the unexpected and confident in my decision-making skills. We were flying out of a civilian airport with limited and rigid hours. Unfortunately, things unravelled rather quickly, which led to a significant amount of stress and operational pressure.

On our first sortie, we experienced smoke in the cabin (which we found out later was from overcooked food in the galley) but led us to declare an emergency with ATC and end the sortie early. Little did we know, ATC at this airport take emergencies extremely seriously. Upon landing, we experienced another emergency—a propeller malfunction on one of the starboard engines, which resulted in a decision to "e-handle" the engine (essentially an emergency shutdown). After the propeller stopped, one of the AESOPs advised the front-end crew of smoke coming out of the engine. The "Engine Fire on the Ground" procedure was carried out as per SOP, which requires discharging one of the fire extinguisher bottles into the engine. After the first fire bottle was discharged, observers noted that smoke was still coming from the engine. This required discharging the alternate fire bottle, but it also didn't stop the smoke. At this point we had cleared the active runway and were discussing evacuating the aircraft on the taxiway. As previously mentioned, emergencies were taken very seriously, and we counted no fewer than 26 fire trucks at the small airport. Fortunately, the smoke ceased before we had to carry out an emergency evacuation.

It turns out that the two fire extinguisher bottles connect via a single fitting before heading into the engine compartment. In this instance, the fitting was cracked, presumably from over torquing, and failed when firing the first bottle, which dispersed the fire extinguishing material of both bottles into the atmosphere rather than into the engine compartment as intended. The aircraft required an engine change and two

Photo credit: Govt of Canada Crown Copyright © 2023, Reproduced from https://www.canada.ca/en/air-force/services/aircraft/cp-140.html.

new fire bottles. This proved difficult because we could not secure a clearance to fly new fire bottles into our location, as the squib that detonates them is "explosive," nor could we get the part from the Americans stationed there. Our aircraft technicians worked tirelessly every hour the airport was open. Although we actively pursued every available avenue, we were unable to complete a single other mission during the 28-day Operation.

During this time, the crew experienced operational pressure to get the Op back on track. I knew if we didn't get any missions in, I would be unable to complete my check ride, and it would require another trip to complete it. The Standards pilot carrying out the check ride was under pressure to get it completed because the unit was short-staffed. Luckily, the Standards pilot had thousands of hours of experience with both the RCAF and airlines and was the unit Flight Safety Officer. Knowing he would back the safe decisions over mission accomplishment took a lot of the pressure off and made it easy to make unpopular decisions.

Locally, the civilian airport director was furious that we dumped two fire bottles and quite a bit of oil on the taxiway. The Detachment Commander and I had a meeting with him, and our techs ended up having to scrub the taxiway daily to placate the airport director, who was threatening to kick us out of our location. Our Detachment Commander had to have regular briefings with the airport director, tasking authority and Embassy, constantly having to push back the expected date of serviceability and justifying our lack of progression. We attempted to alleviate the pressure on our technicians by letting them know we wanted the job done properly rather than done quickly.

The entire crew felt the disappointment of not being able to complete even one mission while tasked for the Operation. There were "suggestions" made by others that included trying to accumulate missions while on our trip home. As much as we did not want to return from a zero-mission trip, we also knew that it was not safely feasible, considering our current aircraft configuration, and as can happen with aging aircraft, we did not want to take the chance to land at a foreign base and again, get grounded for some sort of maintenance issue. For safety of flight, our crew decided it was best to swallow our pride and return home ASAP.

Almost everyone in the RCAF has been there: feeling the pressure, real or perceived, to get the job done with less and often in a time crunch. We've all been to the Flight Safety briefings, coffee in hand and feet on the ground, thinking we would have done it differently. As a personal observation, it's to the RCAF's great credit that Flight Safety culture is taught and encouraged. Through this culture, we can resist the urge to succumb to operational pressure and make sure we keep our heads on straight to sift through all the information and make safe decisions—even if sometimes, they are unpopular.

CESO
A Net Zero RAF by 2040

By RAF Safety Centre

The RAF is on a mission to reduce carbon emissions and achieve Net Zero by 2040

We all have a responsibility to reduce our environmental impact and prevent climate change. The RAF has a strategy of initiatives and projects to strive towards sustainability and lower its carbon footprint, while maintaining operational effectiveness - a few of which include:

- Using sustainable and synthetic fuels for aircraft
- Upgrading equipment with hydrogen and electric alternatives
- Developing electric aircraft
- Introducing environmental strategies
- Developing Station nature conservations
- Using alternative energy resources
- Ensuring infrastructure is modern, well insulated and maintained
- Spreading the 'reduce, reuse and recycle' message
- Minimising work travel
- Reducing single-use plastics

Why is it Important to go Green?

We are dependent on the ecosystem to succeed but the world is gradually becoming more damaged by human activity. We need to use our power to maintain the environment, improve its condition, and enhance the ecosystem before it is too late. The Net Zero strategy will ensure the Next Generation of RAF is prepared and can continue achieving its primary mission to deliver operations and protect our people. The RAF must see how climate change impacts our people and equipment; working to reduce its reliance on fossil fuels, as resources become scarcer and cause environmental damage. It is important for the air force to adapt to the changing climate in the future, because it will affect the way we deploy overseas with changing conditions etc. Such changes alter the geopolitical climate and global mega trends – which will affect the nature of how we defend the nation – particularly as nations increasingly compete for scarce resources.

"Climate change is a transnational challenge which threatens global resilience and our shared security and prosperity. I am determined to tackle this head on and have set the Royal Air Force the ambitious goal to be Net Zero by 2040. The way we power our aircraft will be a big part of achieving that goal, and this exciting project to make aviation fuel from air and water shows how it might be done."

(Air Chief Marshal Sir Mike Wigston, Chief of the Air Staff)

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Project Martin

The RAF, in collaboration with Zero Petroleum, has won a Guinness World Record for the world's first successful flight using only synthetic fuel. 'Project MARTIN' explores the use of Sustainable Aviation Fuels as a possible solution to the reducing fossil fuels. Group Captain Peter Hackett successfully flew the Ikarus C42 microlight aircraft, powered by synthetic UL91 gasoline at Cotswold Airport, to test the theory. This was the first successful flight with only synthetic fuel. The synthetic fuel is manufactured by extracting hydrogen from water and carbon from atmospheric carbon dioxide, which is then combined using energy generated from renewable sources. It has the potential to save between 80% to 90% of carbon per flight without compromising aircraft performance.

AirClues

Photo credit: © UK MOD Crown Copyright

Reporting Near-Misses

By the RAF Safety Centre

MOD definition of near miss: an event that had the potential to cause injury, ill health or death to a person(s) or damage to property plant or equipment, or harm to the environment, but no actual harm occurred.

We all know that reporting hazards or incidents in the workplace is an important aspect of maintaining a safe and healthy work environment. When employees report hazards or incidents, it allows the employer to identify and address potential issues before they can cause harm. This can help to prevent accidents and injuries, as well as protect the well-being of employees. For example, if a wet floor that could cause someone to slip and fall is reported, we can take steps to clean up the spill and put up warning signs to prevent accidents. Similarly, if a malfunctioning piece of equipment is reported, the employer can fix the problem or replace the equipment to prevent injuries.

However, have you ever considered reporting a near-miss?

2. Icy/muddy sports pitch?

1. Unintended Discharge?

3. Slipped Knife?

Photo credits 1. Karolina Grabowska, Pexels.com 2. Peter Muller, Envato Elements 3. Jonathan Borba, Pexels.com.

Report today for a **Safer Tomorrow**

Photo credit: Paul Roberts RAF Shawbury

What are we talking about when we say near miss? Is it the smoking microwave? Maybe it's the tool in the component bay you spotted when you made one final look. Perhaps it's the unintended discharge on the firing range that nobody else noticed? It could be the very muddy or icy sports pitch that should have resulted in the game being cancelled.

Near misses are less severe than accidents. However, they should not be ignored or treated lightly, as they can provide valuable insight into how well you are managing health and safety in the workplace. Near miss reporting will allow you to see if there are any patterns in when or how things go wrong. A pattern of near misses provides an early warning that something needs attention. It makes good business sense to be proactive and take action early when problems are likely to be less serious. Near misses may seem trivial but they are a valuable source of information. Taking time to review the underlying causes is likely to reduce risk, improve health and safety, and save you time and money.

Some of the dangers of not reporting near-misses include:

- **Lack of awareness:** If near-misses are not reported, it is difficult to identify patterns or common causes that may be contributing to the incidents. This can make it more difficult to identify and address potential hazards and increase the risk of future accidents.

- **Increased risk of accidents:** If the root cause of a near-miss is not identified and addressed, it is more likely that a similar incident will occur in the future. This can increase the risk of accidents and injuries. Inability to learn from mistakes:

- **Lost learning opportunities:** They can help to identify problems or weaknesses in processes or procedures to improve safety practices.

- **Decreased employee trust and engagement:** If employees don't feel that their concerns are being taken seriously or that their employer is not addressing potential hazards, they may lose trust in the organization and become disengaged. This can have negative impacts on productivity and overall morale.

- **Legal and regulatory consequences:** In some cases, employers may be required by law to report certain types of incidents, including near misses. Failing to report these incidents can result in fines or penalties.

Why do people tend not to report near-misses? There are several factors that can contribute to people not reporting near-misses, including fear of retribution, lack of awareness, embarrassment, and cultural factors. It is important for all organizations to create a culture in which people feel comfortable reporting near-misses and potential hazards, in order to improve safety and reduce the risk of accidents and injuries.

Report all near misses, whatever the occasion, where you think injury or worse could have occurred under different circumstances. USE FSIMS and FSORS.

Air Safety Hazard Observations

By Sqn Ldr Mike Kitching, RAF Safety Centre

It's important to first identify what we mean by hazard and hazard observation. The Military Aviation Authority Master Glossary (MAA02) provides some guidance:

Hazard – An intermediate state where a potential for harm exists.
Hazard Observation – A report used to provide information on a specific situation or set of circumstances which did not actually result in an Air Safety Incident but where the potential for an Air Safety Incident to occur in the future was identified.

So, what's the difference between this and an incident?
Incident – An Air Safety-related Occurrence which has not resulted in an Accident but has resulted in any or all the following conditions:

1. An assessment of Air System Repair Category 1, 2 or 3 damage.
2. A person receiving a specified Injury lasting less than seven days.
3. An event which compromises Air Safety.

Most of our incidents fit into the third category and further guidance about what is reportable can be found in Annex B Regulatory Article 1410 – Occurrence Reporting and Management.

Why is reporting hazards important?
The main reason is because it provides an intervention opportunity to reduce the likelihood of an incident or accident occurring in the future. I.e. a chance to implement a change to ensure that any potential for harm is not realised.

You may have seen documents or heard people referring to Hazard Observation to Incident Ratios. This is something which is used by air safety teams to measure how we are doing in terms of hazard observation reporting.

As you can see from the graph, the RAF has seen a gradual increase in the percentage of hazard observations (in green).

Although there is a concerted effort to increase this ratio further, we must ensure that reports are correctly identified in the first instance i.e. incidents aren't incorrectly inputted as hazard observations. The onus is on safety teams to promote and encourage overall air safety reporting, ensuring that people understand the difference between hazard observations and incidents.

A recent example of a hazard observation was deer reported by ATC in the undershoot of runway 07 at RAF Brize Norton. I.e. not an incident because air safety wasn't compromised. Whereas an actual runway incursion by deer should be classed as an incident.

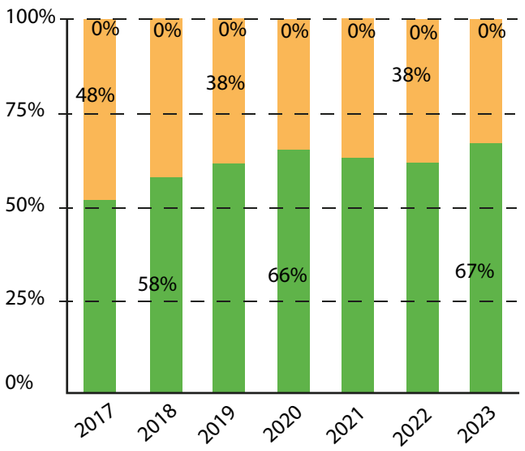
As a takeaway, have a think about the following reports and choose between hazard observation and incident:

1. Aircraft has a small overspeed event during descent into an airfield.
2. Engineer reports that airfield lighting is insufficient to safely conduct engineering work.
3. Aircraft cleared for take-off with vehicle on the runway.

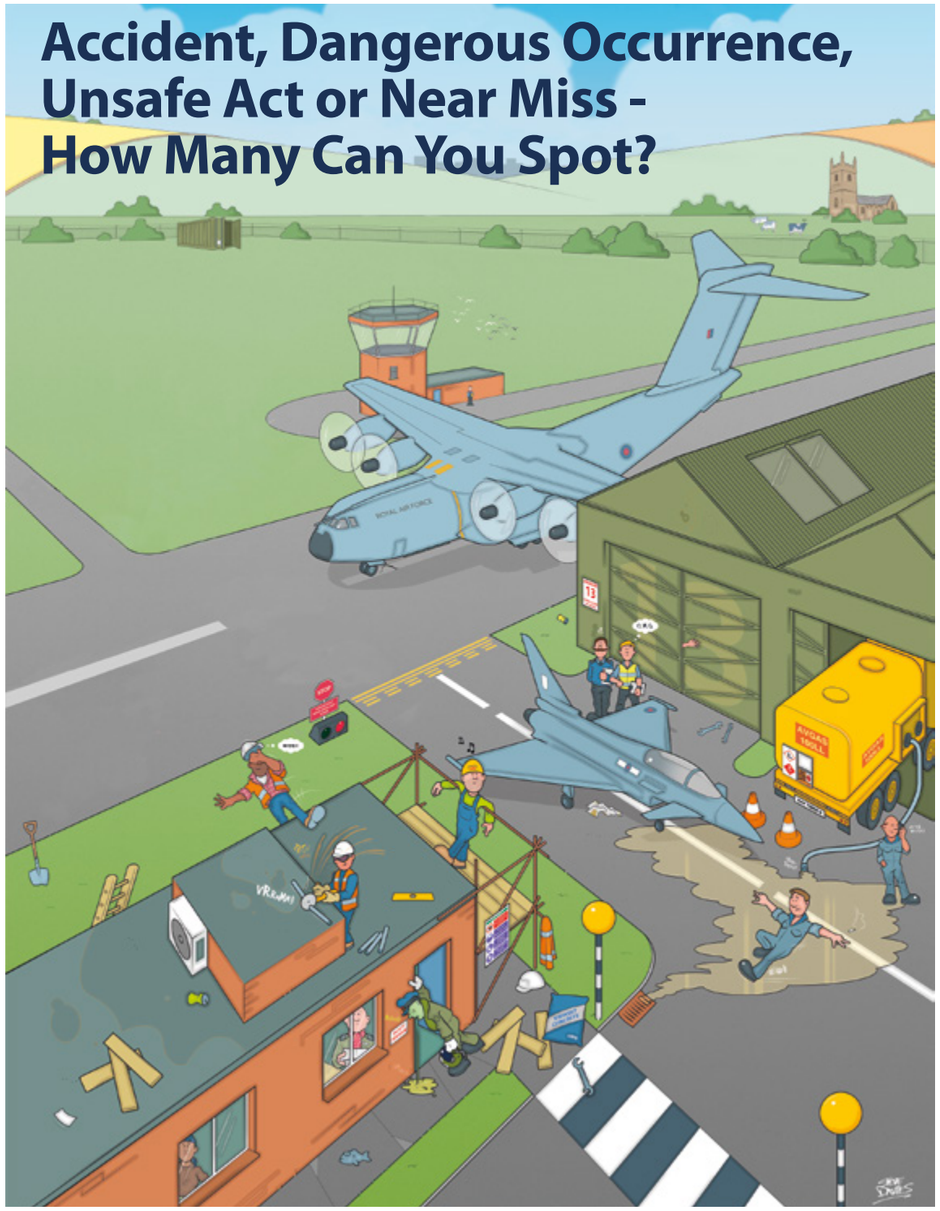
There will be differing views out there, but only the airfield issue should be classified as a hazard observation. This is because a potential for air safety incident was identified because nothing happened which compromised air safety.

Wg Cdr Spry Comment:

There's another article in this magazine which encourages readers to report near-misses in the functional safety world i.e. on FSIMS... ☐



Accident, Dangerous Occurrence, Unsafe Act or Near Miss - How Many Can You Spot?



Report all functional safety related incidents in your workplace on the new Air TLB

Functional Safety Information Management System (FSIMS)

For more information, contact your Station Health and Safety Advisor.

SC133
Produced by Air Media Centre, HQ Air Command.

ROYAL AIR FORCE Safety Centre

Hang Gliding and Paragliding

By Martin Baxter, Chairman of the Yorkshire Dales Hang Gliding and Paragliding Club

Photo credit: Bekir Umut Veral, pexels.com

Hang gliders consist of rigid airframes covered in high performance Dacron. They were first flown in the UK in the early 1970s. Paragliders, which are essentially high-performance parachutes, lacking a rigid airframe, first started to appear in the UK in the mid-1980s and soon overtook hang gliders in popularity because they are lighter, pack into much smaller packs and have simpler controls. A typical paraglider (including harness, reserve and instrumentation) weights between 10 – 20kg and fits into a large rucksack, making it the most portable of flying machines. Conversely, hang gliders pack into a long thin bag weighing around 36kg and some 17 feet in length.

Whilst all pilots must comply with air law, the Air Navigation Order 2016 provides that foot launched aircraft (and those with wheels, weighing less than 70kg) are not required to undergo a formal course of instruction and do not need a Pilot's Licence to fly. Although there is no legal requirement to join the British Hang gliding and Paragliding Association (BHPA), it has been estimated that 90% of paraglider and hang glider pilots are members of the BHPA. However, only about half of powered paraglider pilots (paramotors) are thought to have joined the Association. BHPA members benefit from a formal course of instruction at a recognised school and £5M third-party liability insurance. The BHPA currently has about 7000 members of which 5000 are paraglider pilots, 1000 are hang glider pilots and 1000 use power.

The BHPA's Pilot Rating System consists of Elementary Pilots who can only fly under the supervision of a BHPA instructor; Club Pilots who can only fly within the vicinity of launch; and Pilots (and Advanced Pilots) who are equipped and trained to fly cross-country. Licences are awarded to instructors, tandem pilots and coaches who attend the appropriate course and meet the required standards. Novice pilots will tend to stay on the ridge near to the launch point. This can make the area around take-off very busy.

Photo credit: Brendon Becker, pexels.com

More experienced pilots will use thermals to climb towards cloud base before they depart on a cross country route trying to fly as far as possible – normally in a downwind direction. To maximise their chances of searching out the next thermal, they will often fly in 'gaggles'; if you do see one paraglider there are likely to be more nearby. Lightweight ADS-B devices are now available but have thus far, not proved to be very effective. Pilots do not normally carry Airband radios or transponders and avoid controlled airspace. A number of pilots have taken advantage of the CAA rebate scheme and now have a FLARM device (combined with a GPS, variometer and moving map display).

Launch is normally from a hill facing into wind. Pilots can also be towed into the air, and both types can be fitted with a power unit making it possible to take off from flat ground. All aircraft operate under VFR anywhere between the ground and cloud base. Modest forward speeds mean that they are limited to relatively light winds, about 20kts for hang gliders and 15kts for paragliders. Precipitation is generally avoided although they can tolerate a light shower. Unpowered aircraft utilise rising air, either in the form of ridge lift or thermals. On a good thermic day pilots stay airborne for many hours and it is now common for pilots to fly 100km or more. The current UK record stands at just over 300km.

Thermals tend to form in unstable air when the ground is relatively cold, and the sun is strong: spring can be ideal. The top of each thermal is usually marked by a cumulus cloud, but it's a fine balance – too unstable and conditions will overdevelop with showers (towering cumulus) or dangerous cumulonimbus. A high cloud base is generally preferred if flying cross country. You can get a good idea of when and where you might encounter soaring aircraft by looking at the Regional Atmospheric Soaring Predictor (RASP). Check out the star rating for foot launched aircraft. A low rating (blue/green) means activity will be limited to ridge soaring. A high rating (amber/red) indicates that it is likely to be a good cross-country day: you should expect soaring aircraft anywhere in Class G airspace (The other star rating will give you a good indication of gliding (sailplane) activity).

UK winter weather makes for more limited flying opportunities, almost exclusively ridge soaring between Oct – Feb. The cross-country season kicks off in late March when a significant proportion of pilots will be 'rusty' after a winter lay off. There are no currency requirements for solo pilots. It used to be the case that weekends were much more popular for recreational flying, but with remote access and flexible working regimes many pilots now organise their work around a good forecast during the 'working' week.

Hills suitable for hang gliding and paragliding tend to be in the same areas that the military uses for low flying training. Both types often fly below 2000ft AGL, increasing the risk of a mid-air collision; however, the principle of 'see and avoid' is of limited value. A paraglider who sees you has a low forward speed so there is very little that we can to do get out of the way. Pilots of fast jets have very little time to acquire something that appears to be stationary and then react; accordingly, and an instinctive avoiding manoeuvre may take them into the path of other unseen gliders or generate additional wake turbulence. The recommended action for glider pilots who see (or more likely hear) an approaching jet is to perform a steep turn. This makes them more visible and pressurises their canopy making it less likely to collapse under the influence of wake turbulence. Hang and paraglider pilots are also warned to avoid flying down the middle of valleys below hill top height, except when landing.

Historically, the risk of conflict was countered by marking some hang gliding and paragliding hill sites on military charts, but this information is now largely out of date. The BHPA has recommended that they be removed from charts (and the Low Flying Handbook) altogether because the weather dictates that they are inactive most of the time, and just add 'clutter'. Instead, we rely on NOTAMs (The Civil Aircraft Notification Procedure (CANP) gives us short notice access

Photo credit: Joint Services Championships 2016. Credit: Martin Baxter; Reproduced by kind permission.

"On a good thermic day pilots stay airborne for many hours and it is now common for pilots to fly 100km or more. the current UK record stands at just over 300km."

to the NOTAM system). If you see a hang gliding or paragliding NOTAM, it means that the previous evening at least 5 pilots were planning to fly at that site today. Although these NOTAMs are warnings, rather than avoids, ignoring them not only puts lives at risk but also discredits the system. The procedure isn't mandatory and every incursion makes it harder to encourage members to use it to enhance your situational awareness.

Case study: (AIRPROX report 2022049). "Although they had checked NOTAMs a formation of 4 x F-35 still flew through an active paragliding NOTAM. They spotted the paragliders on the ridge but it seems likely that they didn't see the one on final approach to land. He reported that the formation flew right underneath him with a vertical separation of about 200ft. The centre of any NOTAM is likely to be the take-off/ ridge soaring area, not necessarily the bottom landing area which may be out in the valley."

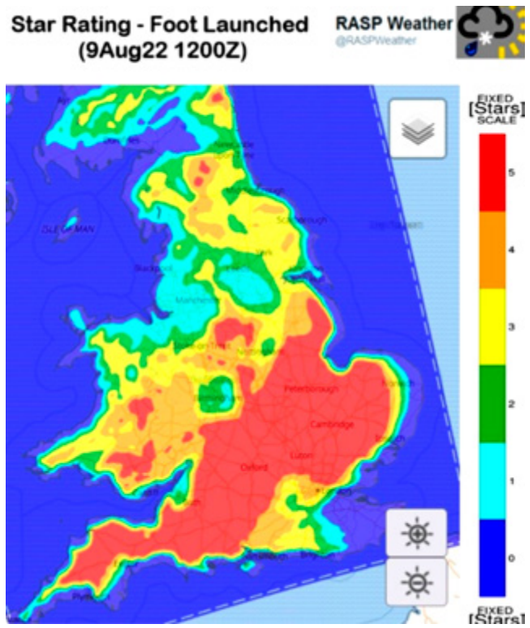


Image Credit: RASP UK: https://rasp.stratus.org.uk

Wake turbulence can last for several minutes after an aircraft has passed and can extend for hundreds of metres. If can cause a paraglider to collapse and, if the pilot can't deploy his reserve parachute in time, is likely to result in a fatality. Pilots who haven't already seen it should look at a YouTube video produced by the French company BEA (Google 'BEA wake turbulence'). They investigated the death of a paraglider pilot due to wake turbulence from a helicopter. The video is less than 7 minutes long and includes a clip of a similar incident from a paraglider pilot's perspective. The distance between the helicopter and the paraglider at the time of the accident is surprisingly large, and it's worth noting that the wake turbulence is influenced by the prevailing wind and local airflow.

Fixed wing aircraft produce wake turbulence similar to that of a helicopter in forward flight. Clearly, the heavier the aircraft the greater the wake turbulence but, perhaps it is not

Photo credit: diegograndi envato elements. Panoramic View at Ninho das Aguias (Eagle's Nest) - Nova Petropolis, Rio Grande do Sul, Brazil.

so obvious how much the turbulence is increased by low airspeeds and tight turns – the more lift being demanded of a wing, the more turbulence it creates. Hang gliders and paragliders will try to soar the hills on the downwind side of a valley and are therefore vulnerable to aircraft tracking the valley bottom.

Case study: "A hang glider was soaring a 100ft coastal ridge (in Canada), in 25 mph winds when a C-130 appeared. The hang glider dived down to about 200ft over the ridge; the C-130 saw the hang glider and turned to pass 200ft higher, parallel to the ridge about half a mile offshore. After approximately 1 to 2 minutes the hang glider pilot thought nothing was going to happen when he was suddenly hit with violent turbulence." Examination. The average sink rate of vortices in still air over a few minutes is approximately 300ft/min. However, in air with orographic lifting the sink rate will be less, more like 150ft/min. The aircraft was 200ft higher; thus, at a sink rate of 150ft/min the vortices would have taken around 1 minute 20 seconds to sink to the hang glider's level. The wind was 25 mph (approximately 2,000 ft/min). The time the vortices would have taken to drift the half mile (2,600ft) to the hang glider coincides with the time that the vortices took to sink 200ft (1min 20 seconds). The vortices stayed intact and travelled over half a mile in stable air due to the uniform coastal wind. They caused the hang glider pilot to experience violent turbulence as they drifted over the ridge. A paraglider would have suffered a serious collapse.

The BHPA supports a country wide network of clubs and schools. Most clubs participate in 6-monthly Regional Airspace User Working Groups held at RAF Stations, and have a good working relationship with ASMTs and SFSOs. If you don't know your opposite number then the BHPA (www.bhpa.co.uk) will be able to put you in touch.

(Martin Baxter is an ex-Army helicopter pilot and Squadron Commander with a background in Flight Safety. He is now a paraglider pilot, Chairman of the Yorkshire Dales Hang gliding and Paragliding Club, and Sites Officer for the BHPA. martin-baxter@BHPA.co.uk)

Wg Cdr Spry Comment:

Unfortunately, there have been several recent incidents of aircraft (both military and civilian) flying through paragliding activity, many of which had been NOTAM'd. This article is very informative and serves to highlight the risk of vortices from both fixed wing and rotor downwash. I highly recommend that you watch the YouTube video (BEA Wake Turbulence), that was mentioned within the article, as it demonstrates the risks to paragliders in the most excellent way. The BHPA is to be commended for its efforts to try and promote the use of NOTAMs and CANPs to raise awareness of paragliding activity for other air users. Every NOTAM that is flown through during paragliding operations only undermines the system and puts operators off using them. Often, there is a telephone number for the launch site attached to the NOTAM. This should be used to come up with a deconfliction plan if you are flying through that area. Remember, a paragliding NOTAM means there are 5 or more operators launching in that area and you have seen how busy some sites become. If you see one paraglider, there is a good chance that you may not have seen others that could be closer and therefore, at a greater risk from your wake turbulence. ☐

The OSI Process

By RAF Odiham AST; originally produced in HeliNet (edited for Air Clues)

Pexels.com: Credit Andrea Piacquadio

The Occurrence Safety Investigation (OSI) is not always something that is well understood and can be an emotive subject. If you find that an incident you have been involved in is being investigated in the OSI format, it is not a reason to worry – the primary reason for an OSI being conducted is to learn from the occurrence and put barriers in place to ensure it doesn't happen again. Human nature means we are likely to worry if we think people are taking an in-depth look at a negative event we were involved in, so this article aims to set out the OSI process in a bit more detail. Hopefully this extra knowledge can put your mind at rest if you are involved.

What is an OSI?

RA 1410 defines an OSI in the following way: 'A non-statutory and flexible investigation that provides a standard Defence investigation format within ASIMS that can be used to record an investigation into any Air Safety Occurrence. An OSI also provides additional levels of scrutiny through the Occurrence Review Group (ORG).' Essentially, it's an investigation method for events which don't meet the threshold for a Service Inquiry yet need to be looked at in more depth than a standard local investigation.

What happens before the investigation starts?

The decision on whether or not an OSI is conducted into an event can be made for various reasons, it could be a serious incident/accident such as a wire strike, it could be that the event is the latest in a growing trend of similar occurrences, or often its judged that there are human factor influences which could be avoided in the future. The decision will often be made by one of the risk holders in the duty holder chain, but anyone from the supervisory chain can request an OSI. Once the decision has been made to carry out the OSI, AST will look for suitably qualified personnel to carry out the investigation. This will normally be a team of two people, and they will have to be Occurrence Investigator (OI) qualified.

The OI Course is 4 days, focussing heavily on how to discover the underlying system weaknesses that made it more likely for an error, mistake or violation to lead to an incident. If you want to help improve your workplace by ensuring people have the chance to share their experiences, and ensure fair treatment of those, people, then get in touch with your safety team to find out more about the role. The nominated investigators will get some Terms of Reference to bound their work and they will begin.

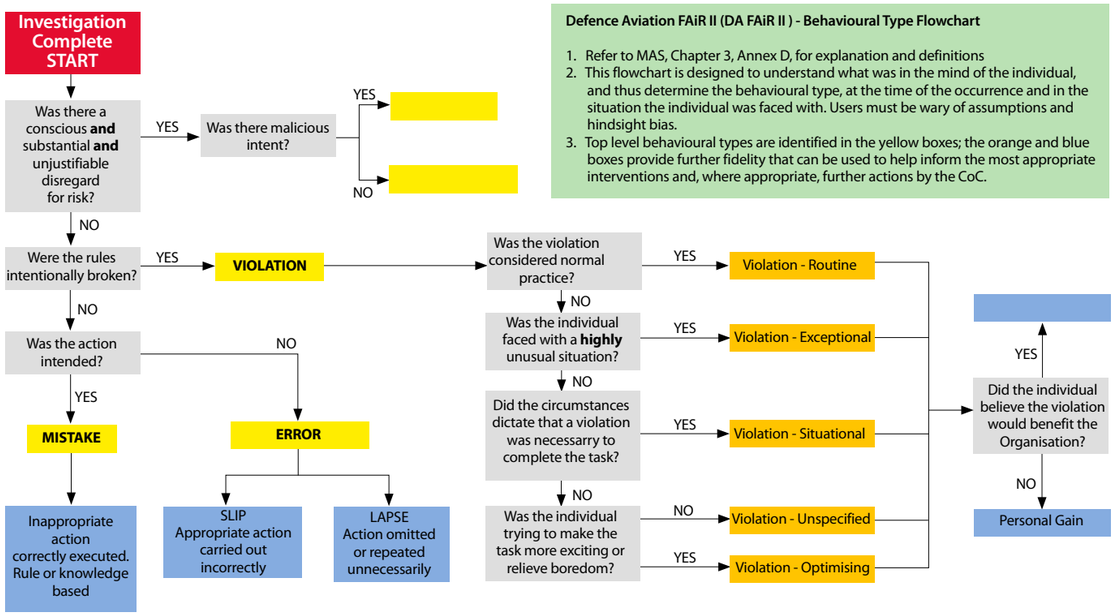


Fig.1. DA FAiR II Model. Source MAA.

The Investigation.

The OIs may not be experts in the field they are investigating, so one of their first tasks will be to collect any documents, orders, SOPs or other relevant information that they think they'll require. A plan will then be put together on how to conduct the investigation. This will invariably involve:

• **Collect data;** staff debriefs, documents, photos and any other data required e.g radar traces.

• **Analyse data;** timelines, review of data and any further analysis required • Identify HF Issues using FAiR2 model.

• **Develop recommendations;** these should be effective, sufficient and sustainable.

• **Record;** enter the report, findings and recommendations into ASIMS in anticipation of the ORG.

There are a few key points to make about this process. The first is that the debrief is purely an information gathering exercise, it is not there to catch individuals out. Those same individuals are the experts who best understand the job, have the knowledge of where the organisation needs to improve and often are best placed to make effective recommendations. The investigator's role is to help people share their stories and to understand what can be learnt by the organisation. It is understandable that anyone who is asked to come in for a chat with investigators will feel a bit apprehensive, but it should be made clear at the outset of the meeting, and throughout that this is a chance to make sure all the relevant data is collected, and it is not a police interview where the questioners are trying to apportion blame! The second, and probably most important point, is that identifying the behaviours that have been demonstrated is key to getting useful recommendations. The DA FAiR 2 model, as shown at Fig. 1, is how we decide which behaviour has caused the incident, and more often than not it comes down to an error, mistake or violation.

A brief look at these terms will show us why the behaviour type dictates the type of action required:

- **An error** is an unintentional action, for example selecting the wrong button in the cockpit, and is not something we can eradicate – human nature means that we all commit errors. We cannot change the human condition, but we can change the conditions humans work in. In the example of a wrong button being used, maybe we could recommend moving the button away from similar ones or changing how it feels.

- **Mistakes** are intentional actions, but that the action or plan does not achieve the required goal. An example would be mis-identifying the emergency that is presented, the crew then carry out the correct actions for the emergency they have mis-identified, but it does not achieve a safer outcome. The obvious recommendations to mitigate mistakes is extra training, however this is normally looked at from an organisational perspective,

Pexels.com: Credit Brett Jordan

Pexels.com: Credit Ekaterina Bolovtsova

are we as the Chinook Force training people correctly for this given situation and could we do it better?

- **Violations** are the areas where we can often gain the best insight into an organisation and its cultures. A violation is an intentional deviation from the rules, procedures, instructions or regulations, and is split into different types as seen on the FAiR model. The key question an OI should ask themselves, is what bigger issue has caused the individual to feel the need to violate. It may be time or people pressures, lack of supervisors or normalisation of deviation to name a few. It could even be a more effective or safer way of getting the job done that needs approval for others to copy. It follows that although a violation sounds like it should fall on the individual, most often the OI will come up with recommendations that are aimed at solving the organisational issues that led to the incident, so that out systems perform better in the future. Violations are often where we find 'practical drift', this is the difference between how a system is designed to work (baseline performance) and how it is actually working in the real world (operational performance).

Once the investigation is complete the OIs will input their report and findings onto ASIMS, and AST will then organise an Occurrence Review Group (ORG).

The Occurrence Review Group.

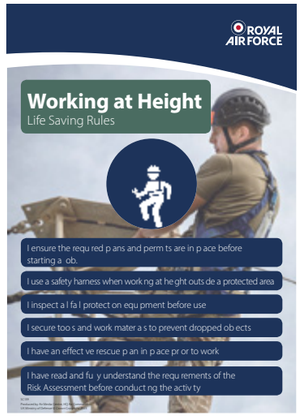
Normally an ORG is made up of 3 members (who have completed an ORG course) and the OIs. The ORG discusses the investigation, checks the recommendations are appropriate and confirms any behaviour types as required. The ORG members have a very important role to both understand the experiences of those who did the job for real, while focusing on how the organisation should change to improve performance; that also includes identifying where good practice identified by the investigators should be considered for wider use. The ORG members help give confidence that people are treated fairly by the organisation, and it's for this reason that we look for people ranked Sgt - Sqn Ldr to sit on most panels. From there the recommendations are assigned to implementors and should be completed within 30 days. The ORG outcome then gets recorded on ASIMS meaning that the whole process is transparent, and everyone can learn from the incident.

Wg Cdr Spry Comment:

While the term OSI is applied to just aviation safety investigations, the RAF wants the same principles and values to apply to other investigations. Treating people fairly (Just Culture) and understanding the organisational influences that led to undesirable events is just as important a principle for investigations into Health & Safety events as it is to aviation. Taking that even further, Policy Sponsor of Unit Inquiries (typically used when an operational capability loss needs investigating) has been passed from the Service Discipline Team to the RAF Safety Centre in order that good practice seen in OSIs can be applied to the widest range of investigation types. The RAF Safety Centre have a team of full-time safety investigators who can support units conducting these formal safety investigations, and mentor those conducting Unit Inquiries.

New Life Saving Rules for the RAF

By the RAF Safety Centre



The Health Safety & Environmental Protection Director has agreed to implement a set of Life Saving Rules that are applicable across Defence in accordance with the new Health Safety & Environmental Protection Functional Strategy. These Life Saving Rules are not new policies, but simply reinforcements of key existing rules in Joint Service Publications and other MOD publications. They do not aim to replace existing management systems, basic competence or site rules and procedures – but when these system barriers fail, by following the Live Saving Rules, an individual can save their life and potentially that of others. Quite simply, they are a final barrier to prevent a fatality.

The Life Saving Rules do not aim to cover all health and safety related risks within Defence. They are aimed to draw attention to a set of activities that are linked to our greatest risks and the most likely to lead to a fatality.

Each Single Service is developing its own Life Saving Rules. Above is a set of 6 Life Saving Rules that have been developed for the RAF. You can get a hold of these posters by applying to the Air Media Centre at Air Command. Simply visit the Air Media Centre SharePoint page at https://modgovuk.sharepoint.com/teams/24518 and select the 'Safety Centre Poster Order Form' in the Ordering section; the new Life Saving Rules Posters can be found from page 36 onwards. We will feature them as cut-outs in this and future Issues of Air Clues magazine.

A Planning Day with the BBMF

By Dave Unwin, GASCo

This is a slightly modified article by Dave Unwin of GASCo which first appeared in the GASCO Flight Safety Magazine. Reproduced by kind permission.

Dave Unwin – Photo Credit: Jim Lawrence

Photo credit: Allan House

I am standing on the runway at the former RAF Saltby, now home to the Buckminster Gliding Club.
It's the club's 50th anniversary, and as part of the celebrations the Battle of Britain Memorial Flight's Lancaster is scheduled to make three passes. As per the brief, all the club's aircraft are on the ground thirty minutes before the Lancaster's ETA and the airspace is 'sanitised' – a BBMF prerequisite. Hundreds of eyes scan the western horizon, searching for the iconic aircraft. "There she is!" shouts someone and the Lancaster's unmistakable silhouette comes into view. In a scene that will be replicated all over the country this summer it trails its thunderous wake across the airfield before banking gracefully around into another pass. It looks magnificent, and I'm already eagerly looking forward to my meeting with Flight Lieutenant Neil Whitehead the following week. Neil has been the BBMF's navigator leader since 2019, and he has generously agreed to host me at the Flight's base at RAF Coningsby so I can learn exactly how BBMF plan. As if to add emphasis to the amount of detailed planning that goes into a flypast, a few days later as I'm nearing RAF Coningsby I spot three C-130s tucked into a neat 'vic' formation, followed by a C-17 and an A400. It's the rehearsal for the Queen's Platinum Jubilee flypast, and as I was soon to learn that the amount of planning that goes into even the smallest event is considerable, you may imagine just how much thought has gone into this particular fly past!

Neil meets me at the guardroom and we're soon ensconced in the BBMF's suite of offices. Neil started his air force career as a Tornado F3 navigator with 43(F) Squadron in 2002 and flew operationally over Iraq enforcing the 'No-Fly' zone prior to Operation Telic. Having completed a tour as a navigator instructor on the F3 with 56(R) Squadron, the F3 was starting to go out of service and he transferred to the E3D Sentry fleet in 2009. He is also an active GA Pilot and owns a share in a Varga Kachina, but as he joined the BBMF in 2017, and became the navigator leader in 2019, on most summer weekends he can be found at the navigator's station on either the Flight's Avro Lancaster (PA474) or Douglas Dakota ZA947.

So, how does the BBMF plan? As you may readily imagine, carefully and thoroughly. In fact as on some weekends she may be scheduled to appear at over a dozen venues during a single sortie, the planning starts more than a week before. A little-known fact is that – if you're planning a village fete, street party, children's football tournament or indeed any community event, you can apply to the MoD for a fly-past, and if the MOD can accommodate the request, it will try. Perhaps unsurprisingly, as BBMF are out and about the most they get the most requests. (The Red Arrows mostly transit and appear as a single formation, whereas the Flight's Spitfires and Hurricanes (the fighters) and Lancaster and Dakota, (colloquially referred to as 'the bombers') will often fly singly, or in small formations. Indeed, it is unusual to see all the Flight together. Once the Ops Officer has collated the myriad requests (and there's always a lot) Neil starts to create a skeleton plan, although with a grin he acknowledged that at this stage it is "very much 'chicken and egg". As the plan (and remember, by now we were only discussing a single sortie) starts to come together, Neil relies heavily on three pieces of software ACANS (Aviation Command and Navigation System), AMPA (Advanced Mission Planning Aid) and CADS (Centralised Aviation Data System). Of the three, I found ACANS the most interesting. Created by Airbox, ACANS is described as 'a powerful cross platform Navigation and Situational Awareness tool in a single operationally proven EFB application'. Used by professional crews across the Emergency Services, Military, and specialist commercial operators, it is an extraordinarily useful tool, as it can display military and civil charts (1:250,000 and 1:500,000) Ordnance Survey maps (1:50,000) and 'Google Earth' type satellite imagery. I was hugely impressed! Neil showed me part of the route he had planned for a sortie over the Platinum Jubilee weekend and, despite the fact that wherever possible he tries to plan in straight lines, there were an awful lot of course changes, as the sortie contained 11 singleton flypasts, 2 formation flypasts and one formation display. He explained that each square along the planned track was an IP (initial point, chosen by him and typically a distinctive feature, such as a lake or unusually shaped wood) while the triangles were the actual events (targets). The Lancaster typically cruises at 500ft and an IAS of 150kt, with each IP normally between one-to-two minutes from the event, although for a flypast the organisers are told that

Flt Lt Neil Whitehead (Image Owner)

the Lancaster will arrive within plus or minus five minutes of the specified time. Incidentally, although NOTAMs are promulgated in UTC, the flight works in 'local' as that tends to prevent the village fete committee getting things an hour out!

The actual flypast is conducted at a height of 250ft AGL. Wherever possible, Neil will plan to avoid controlled airspace, but admitted with a grin that should a clearance be required if the event is inside a TMA, the Lancaster's callsign ensures one is always forthcoming! Similarly, GA airfields are equally accommodating, but for the Lancaster to pass through the overhead all local aircraft must be on the ground thirty minutes before the Lancaster's arrival, so that the airspace is 'sanitised'. An additional consideration is that, because the Flight's aircraft are still on the RAF's strength, they are military aircraft and, as such, must conform to the Military Low Flying Regulations, including abiding by the 'Flow Arrows' shown on military charts. However, as there is no military low flying on the weekend or Public Holidays, in reality this constraint isn't too onerous.

At this point we heard the sound of a big round engine grumbling into life, so went outside and watched the Flight's Dakota 'Kwicherbichen' having its Pratt & Whitney R-1830 engines ground-run, while a stream of BAE Typhoons roared around the circuit. Before going back to the planning room we moved into the Flight's hangar, which Neil described as "the best hangar in the Royal Air Force" – and as there's several Spitfires and Hurricanes in it, as well as a Chipmunk and of course the Lancaster I for one wouldn't disagree! Standing next to the Lancaster reminded me to ask Neil a few more operational questions, and I was intrigued when he revealed that he stands for most of each flight. The typical crew consists of the navigator, flight engineer and two pilots and,

Photo credit: Heidi Cox

because the navigator obviously spends most of his time looking out, but must also refer to his iPad, update the back-up paper chart and manage most of the comms (although the pilots handle the R/T for formation actions, the bulk of the enroute R/T is dealt with by the navigator) it's simply more efficient to stand.

A typical fuel load is between 3,600 and 4,100 litres of AvGas (the six tanks can hold a maximum of 9,792 litres but loads are kept light to manage the fatigue index) and when cruising at 500ft and 150kt a typical power setting is 1,900rpm and 'zero' boost. This means each Merlin is guzzling about 200l/hr in the cruise, but at maximum takeoff (3,000rpm/+9" boost) power the total fuel flow can peak at over 1,900l/hr! Anyway, each sortie is planned to have a very comfortable fuel reserve because, although all RAF stations will have some AvGas, it may be owned by the station's flying club, and uplifting say 1,000 litres may be problematic – or at least unwelcome.

Another concern with unplanned diversions (whether caused by weather or mechanical issues) is the perennial problem for all tailwheel pilots, the crosswind. This varies between 10-15kt (it depends on the captain's experience) and is another reason for the large fuel reserve (a ten-knot crosswind isn't that rare). Although we'd been mostly talking about the Lancaster, I also asked Neil about how the Flight's other aircraft transit between events. The fighters cruise at 180kt and tend to fly much higher (in case of an engine problem, although they can obviously climb and descend at exponentially greater rates than the Lancaster) while the Dakota cruises at 500ft and 130kt. More perceptive readers will already be thinking "130? Is that a typo? 150 and 180 I get as they're 2.5 and 3 nautical miles a minute, by why 130?" Well, most piston-engines have their 'sweet spots', and big radials more than most. It transpires that the Dakota's two 'Twin Wasps' really like to run at 2050 rpm and 29" MAP on a lean mixture, and this translates to 130kt IAS! I also asked Neil just how good his job was, and he

Photo credit: SAC Pippa Fowles

replied with a smile, "it is absolutely outstanding! The navigator is fortunate enough to fly on both the Lancaster and the Dakota from the get-go, so I was part of the Dakota's crew for the D-Day 75th anniversary celebrations where we dropped paratroopers, I've taken the Dakota all the way out to Ostrava in the Czech Republic and I've flown the Lancaster over London as part of the Queen's birthday celebrations. Every trip in either aircraft is unique and very special".

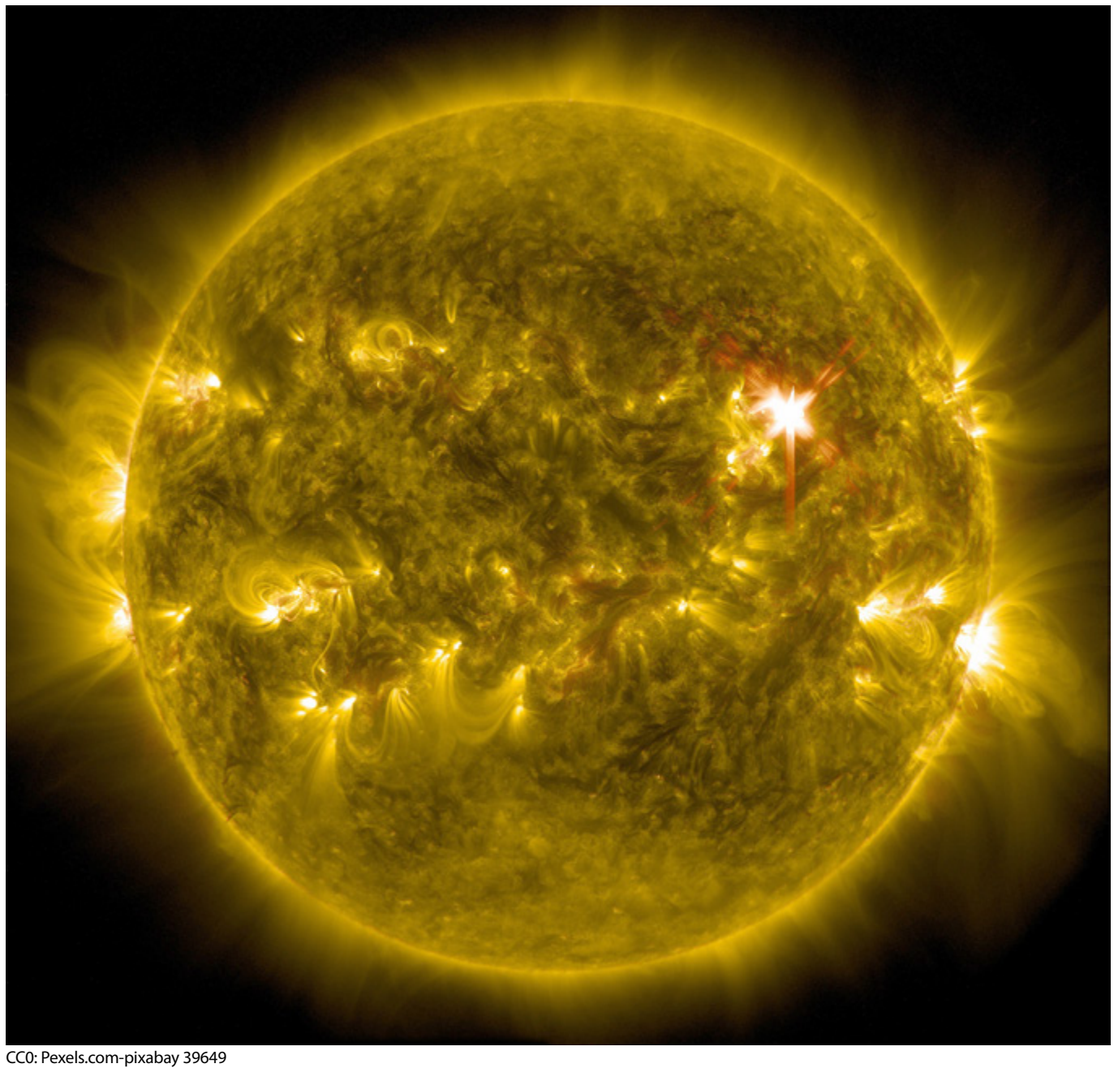
We also discussed the powerful emotions evoked when veterans see the aircraft and having watched the reactions of USAAF veterans from the cockpits of the Collings Foundation's B-17, B-24 and P-51 I knew exactly what he meant. In closing, I asked Neil what his biggest tip was for General Aviation Pilots and he replied that we should all check and respect NOTAMs – and not use them as a tool to seek out the Flight when they're transiting between events. All the aircraft have some form of Electronic Conspicuity such as P-Flarm, but of course not every GA aircraft does. Similarly, although Neil will also ask the local LARS unit for a Traffic Service if he can get one, the facts of the matter are that over the weekend (when BBMF is busiest) most military fields are closed, and at 500ft the SSR coverage is pretty spotty anyway. The Flight would much prefer it if pilots didn't go out of the way to cross their track at a specific time just so they can see these magnificent machines from above. Similarly, simply remaining well above 500ft will greatly reduce the chances of an inadvertent encounter with the Dakota or Lancaster.

On the way home I decided to pop into the nearby Petwood Hotel at Woodhall Spa to have a drink and write up my notes while they were still fresh in my mind. Famous for being used by 617 Squadron during World War Two it contains plenty of 'Dambusters' and BBMF memorabilia, and as I'd just stood next to a Lancaster and it was literally 79 years and one week since 'Operation Chastise' I thought it appropriate to raise a toast to the 53 brave men who died that night, and the 57,808 Others of Bomber Command who gave everything between 1939 and 1945.

As I drove out of Woodhall Spa a single Typhoon arced across the sky and it suddenly occurred to me that although the RAF's aircraft have changed out of all recognition over the last 80 years, its people are still the same. BBMF (motto 'Lest We Forget') does a wonderful job of remembering and commemorating the service and sacrifice of the RAF during the second world war.

Space Weather

By Sqn Ldr Mark Wareing, SO2 Safety, UK Space Command (with thanks to Dr Gemma Attrill, Dstl Space Systems Programme)



CC0: Pexels.com-pixabay 39649

Space Weather is a generic term most often used to describe phenomena which primarily emanates from our sun, most visibly encountered through the beautiful auroras at higher latitudes as charged particles from the sun interact with the earth's atmosphere. The effects which space weather can produce though have a more troubling side, affecting radio communication, power distribution, GPS accessibility and directly affecting avionics systems. Our general reliance on space technology for everyday apps from google maps to tinder, emergency service provision, position, navigation and notably timing of financial transactions, all exhibit vulnerabilities in the face of space weather. As such, in Oct 2020 the CAA released version 2 of CAP 1428, Impacts of Space Weather on Aviation. Developing an increased understanding of the effects and mitigations to space weather events will become a notable advantage as we head towards solar maximum in the coming years.

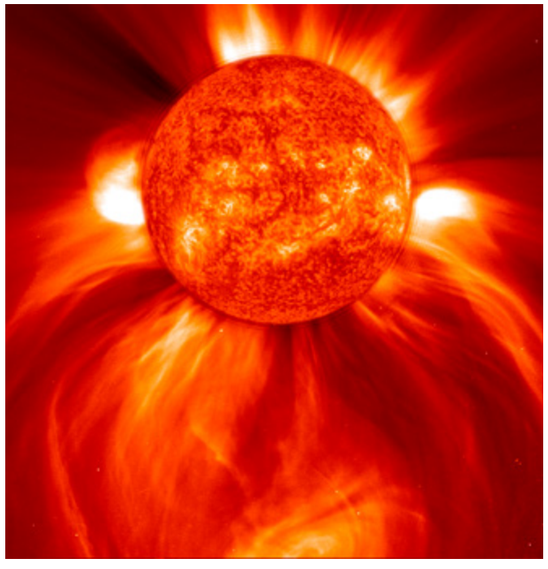
The Science Part

Gravity compressing the core of the sun creates helium (named after the sun god Helios) from hydrogen through fusion, resulting in extreme temperatures creating plasma, the fourth state of matter. As a ball of plasma, the sun has a differential rotation, that is at polar regions one complete rotation takes approximately 34 days, however at the equator this accelerates to one rotation around every 25 days. This differential rotation significantly affects the sun's magnetic field, tangling the field lines which would ordinarily run North South through the core, much like the earth.

Magnetic field lines can sometimes be seen as they break through the sun's solar atmosphere or corona, in the form of arcing prominences, loop like structures from the main disc of the sun's surface, forming cooler patches at their bases visible as sunspots. Although the sun's radiation is a persistent phenomenon, pushing solar wind across the solar system at differing speeds and densities, it's the arcing prominences in sunspot regions which have the potential for most damage. Magnetic pressure, buoyancy & twisting of magnetic fields contribute to creating the conditions for magnetic reconnection, where the magnetic field line shorts itself and the top of the loop is ejected into interplanetary space, creating a coronal mass ejection (CME), and the lower part of the loops produce a solar flare." These flares and CMEs have extremely serious consequences both on earth and in space. The sun's processes, although not yet fully understood, have a cycle of about 11 years during which the number of visible sun-spots on the surface increases to a point known as solar maximum with high levels of activity, eventually subsiding with fewer towards solar minimum. The next solar maximum is due around 2026, however activity is ramping up with a number of solar flares getting space weather watchers excited.

Carrington-Size CME

On 13 Mar 2023 a Coronal Mass Ejection was seen on the far side of the sun, estimated to be travelling at around 3000 km/second. Had this occurred perhaps 10 days later it would likely have caused significant surface charging damage to satellites, caused atmospheric drag in Low Earth Orbit and serious communications and power outages on Earth. It is estimated this was a Carrington-Event sized eruption, a near miss begging the question, are we prepared?



Coronal Mass Ejection. Image source © ESA/NASA Soho

Impacts

In 1859 when solar events were first linked to impacts on earth, the general dependence on technology as we know it was low. Geomagnetically induced currents in ground-based systems caused fires in telegraph booths and auroras bright enough read a newspaper at night, but a similar sized event now would bring very different outcomes. It is estimated by insurer Lloyds of London that an 1859 event, named the Carrington Event, will happen with a probability of one occurrence every 150 years.

In early February 2022, soon after the launch of 49 of Elon Musk's Starlink satellites, a CME wreaked havoc during the deployment phase, destroying over 80% of the satellites. Although there is relatively little in space to cause friction on vehicles, the radiation from a solar flare heats the atmosphere which causes it to expand, increasing the density at a given altitude. So, in the lower reaches of Low Earth Orbit (LEO), at around 200 km in altitude, there developed sufficient density to rapidly cause significant atmospheric drag, which slowed the space vehicles down with disastrous consequences. They dropped in altitude and 38 of Musk's satellites were destroyed as they re-entered the atmosphere. The importance of recognising the effects of space weather cannot be understated, being able to differentiate between damage caused through environmental factors or nefarious activity is fundamental to attribution of action in space.

The dangers through the increased depth and density of the ionosphere caused by space weather isn't just a challenge in LEO, it is a problem radio operators have been encountering for decades. The lower, D Band of the ionosphere fluctuates significantly, not just through day and night changes but also in response to space weather events. Bouncing radio signals off the underside of the ionosphere becomes ever more challenging as its altitude lowers, equally, trying to pass radio signals through the ionosphere becomes difficult due to increases in density, causing radio frequency blackouts. For a 15-hour period on the 29 October 2003 and an 11-hour period on the 30 October 2003, the ionosphere was so disturbed that the vertical error limit was exceeded and the US Wide Area Augmentation System (WAAS), which supplements GPS for increased accuracy, and was unusable for precision approaches.

Charged particles caused by the sun's activity can pass though the atmosphere by traveling down the earth's own magnetic field lines. The angles at which the field lines depart from the surface of the earth facilitate this form of interaction in the

Altitude (m)	Altitude (Ft)	Sv/day Equatorial	mSv/day 55 Deg Lat
5000	16404	0.5	0.8
10000	32808	2	4
15000	49212	4	12

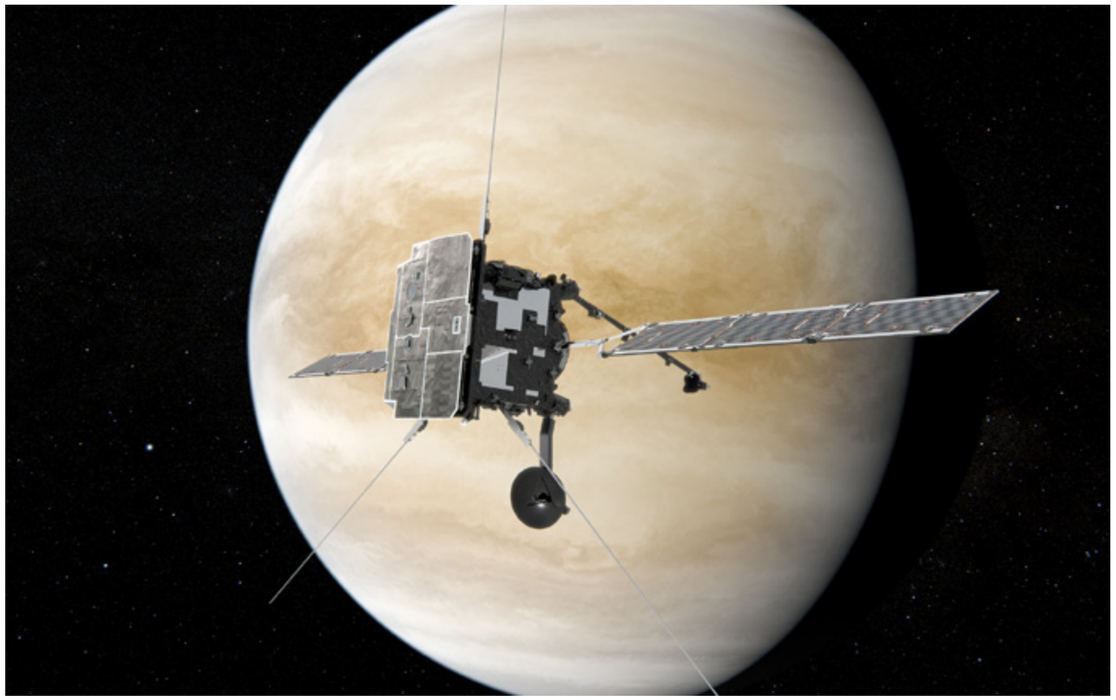
The table above shows the exposure levels to ionising radiation based on altitude and latitude. Source: thespacereview.com

higher latitudes, therefore there is an increased likelihood of encountering dangerous levels of ionising radiation from around 60 degrees latitude north or south, hence auroras predominantly in polar regions. Higher doses are also prevalent at increased altitude and with exposure time. Therefore, many very high altitude, lengthy, polar flights may significantly increase an aircraft or a person's susceptibility to the damaging effects of ionising radiation.

Understood for many years in human space flight, and more recently accepted for air travel, ionising radiation has the potential to cause cell abnormalities and mutations in humans. Dosage rates are generally low, however over the period of a career the cumulative effects have the potential to be significant. Research is ongoing in various areas to understand the risks in their entirety and cannot be studied in isolation from other potential sources of ionising radiation for example chest x-rays or even living in Cornwall. The Royal Academy of Engineering Extreme Space Weather Report 2013 states "Passengers and crew airborne at the time of an extreme event would be exposed to an additional dose of radiation estimated to be up to 20 mSv, which is significantly in excess of the 1 mSv annual limit for members of the public from a planned exposure and about three times as high as the dose received from a CT scan of the chest. Such levels imply an increased cancer risk of 1 in 1,000 for each person exposed, although this must be considered in the context of the lifetime risk of cancer, which is about 30%.

Avionics, electronics and software are also susceptible to risk of damage through space weather where the sub-atomic particles cause electrostatic charging, with the associated discharge impacting electronics or even causing physical damage through displacement damage, or affecting memory, turning ones to zeros in a process known as bit flipping."
In 2008, a Qantas Airbus A330-303 pitched downward twice in rapid succession, diving first 650 feet and then 400 feet, seriously injuring a flight attendant and 11 passengers.
The cause has been traced to errors in an on-board computer suspected to have been induced by cosmic rays. As with cell abnormalities, the incidences of these type of errors appear to increase with altitude.

'Aurora over Greenland' Photo Credit: 99 Sqn Pilot 'Dan'. Reproduced by kind permission.



Solar Orbiter Venus flyby. Image source © ESA/ATG Medialab

When the earth's magnetic field is disturbed by space weather, surface electric fields are induced, that can generate geomagnetically induced electric currents which seek the easiest means of conduction. Iron rich rock is a good conductor for these induced currents but better yet are the electric cables of our national grid network. Geomagnetically induced currents travel through the power grid placing significant extra load on substations causing either an automated safety shutdown or burning out the transformers. In Quebec in 1989 the loss of electric power to more than six million people for nine hours was calculated at an economic cost estimated to be around C$13.2Bn. Oil pipelines and railway lines can also be affected, weakening them and reducing their operational lifespan. There has even been evidence of counter-ship mines spontaneously detonating as the magnetic current near them changes.

Solutions

The study of space weather and its effects are in their comparative infancy, estimated to be about 50 years behind research in terrestrial weather. Studying the sun is made considerably more difficult for the obvious reasons of its environment and distance from us (150 million km). This said, missions to learn more are in progress and new discoveries are being made, in addition to throwing out more questions. NASA's Parker Solar Probe and the joint NASA/ ESA mission Solar Orbiter (SolO) are both currently in orbit around the sun collecting data to help scientists better understand solar processes in a bid to increase warning time of predicted events.

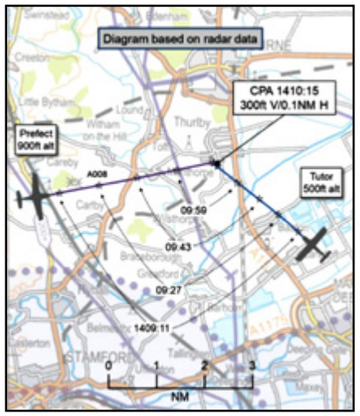
In the UK, the Met Office's Space Weather Operations Centre (MOSWOC) provides warnings to the UK Space Operations Centre (UK SpOC) which are accessible for all Defence users. Understanding the content of space weather forecasts is fundamental to decision making around responses. Without further testing it is difficult to understand precisely which parts of Defence equipment and infrastructure are most vulnerable, but a working knowledge of the effects of space weather can begin to help produce a clearer picture of where and how we could better protect our materiel.

Ensuring resilience, redundancy and recovery through tried and tested methods remains an effective current option to survive a severe space weather event. Space weather planning is slowly becoming part of the major exercise cycle, cascading this down to smaller level exercises, including at station level would increase its exposure.

The National Space Weather Preparedness Strategy (published same day as the National Space Strategy in Sept 2021) runs for 5 years, and along with other government departments, MOD will need to demonstrate progress in mitigating the impacts of space weather, being held to account by the Severe Space Weather Steering Group (SSWSG) which reports directly to the National Space Council and National Security Council. Fundamental to achieving success will be normalising the language associated with Space Weather from a niche activity only recognised by space nerds to a serious consideration in Air Safety and resilience planning.

Airprox Highlights

With Comments from Wg Cdr Spry



09 Nov 2021
Tutor v Prefect
Airprox No 2021227

The Tutor Pilot reported that, during a low-level navigation exercise, they had an Airprox with a Prefect approximately 1NM to the SW of Bourne. They were tracking NW towards their initial point for their grid run and, although Traffic Information was passed to them by ATC and the aircraft showed on their TAS at 600-700ft above and descending, they were not visual with the aircraft. They continued with the leg whilst looking for the traffic but were still not visual, and the TAS showed the Prefect to still be descending. After receiving a Traffic Advisory on their TAS along with increased volume and flashing lights on [other compatible EC equipment], they spotted the aircraft in their 11 o'clock moving left-to-right and they took avoiding action to move behind the aircraft. They didn't feel it was close enough to declare an Airprox at the time, however on reflection, they realised that if they hadn't spotted it there would have been a risk of collision due to converging headings and decreasing height deconfliction. Their route was submitted on the CADS,1 flown on an accurate timeline and showed no confliction in that area prior to take-off.

The Prefect Pilot reported that the sortie was a proficiency sortie for a trainee instructor. The sortie profile was introduction to low-level operations. A simple route was planned that included two medium level legs [prior to arrival at the] the low-level entry point. The sortie route was entered into CADS in the usual manner and the conflictions checked, which included two Prefects and one other aircraft, but no Tutors. Prior to walking to the aircraft, the CADS entry was checked again and no new conflicts were noted. Having entered low-level at [low-level entry point] on an eastbound heading, and in receipt of a Traffic Service from Cranwell, the [compatible EC equipment] triggered an alert for traffic below them and to the right. The traffic was sighted at around 200-300m and approximately 100ft below, no avoiding action was required or taken. They have no recollection of any TAS warnings during the incident.

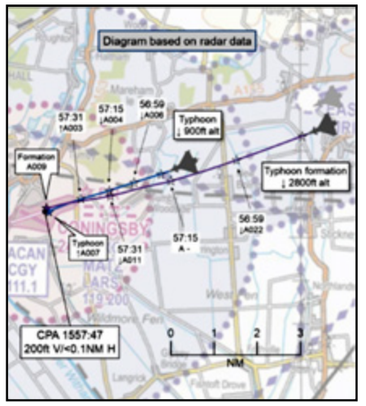
The Wittering Controller reported that they had taken over the control position at 1400Z. [The Tutor pilot] was received on frequency and identified by the outgoing controller, and it was logged that the pilot was reminded of their own terrain clearance given they were operating low level. The intentions of [the Tutor pilot] were ascertained as conducting a low-level navigation exercise in the local area north of the Wittering MATZ before returning to base. SSR was intermittent on the aircraft given its altitude, but a solid primary contact was continuously present, and track ident was maintained, thus the service was not downgraded. [The Tutor pilot] looped [sic] anticlockwise through sectors 3 and 4 passing the town of Bourne before calling for recovery. Their recollection of the air picture outside this profile is unclear given the time that has passed since its occurrence. They do believe that there were multiple general handing aircraft within the vicinity of Bourne comprising of both station-based and non-stationbased aircraft and they believe that all relevant traffic was called. No Airprox or concerns were raised on frequency.

The Cranwell Controller reported that they were the Departures controller working multiple aircraft on frequency. On departure, they planned on transferring control of [the Prefect pilot] to Waddington however this did not happen as they had taken up a southerly track, so they kept control of the [Prefect pilot] for the duration of their sortie. The pilot was on a low-level introductory sortie, thus operated at and near the base of radar cover throughout. On two occasions they reduced the service provided to [the Prefect pilot] from a Traffic Service to a Basic Service due to the return disappearing from radar cover. When the return was intermittent, they kept [the Prefect pilot] on a Basic Service but provided as accurate Traffic Information as possible when it was relevant. They recall seeing a Wittering squawk displaying on secondary radar and manoeuvring, indicating low level and without a primary return. They cannot recall whether at any point they were required to call this specific track to [the Prefect pilot], but it is possible that at some point during their respective sorties that the two aircraft may have been operating in the same vicinity, with one or potentially both aircraft not displaying on radar at the time. Due to not having clarity surrounding the time of the Airprox, they are unable to recall or listen to the correct time on the tapes.

For the full report, see AIRPROX REPORT No 2021227 on the Airprox Board Website.

Spry's Comment:

A worse incident was ultimately mitigated by See and Avoid; the sighting of the Prefect allowed the Tutor pilot to take avoiding action. ATC and Traffic Alert System (TAS) allowed the Tutor to get eyes out for the Prefect. However, the Tutor continued in a straight line with a constant sight line bearing towards the conflict. This makes it incredibly difficult to spot anything until the late 'ballooning' effect in the canopy, where late avoiding action has to be taken to avoid collision, as seen in this incident. It can be advantageous to manoeuvre or weave on receipt of an alert from electronic conspicuity equipment, as this enables the pilot to lookout in previously obscured areas, changes the profile of their own aircraft making it more visible to others and may even "break" the constant relative bearing reducing the risk of collision.



25 Nov 21
Typhoon v Typhoon Formation
Airprox No 2021237

The Typhoon Pilot reported that they were flying a post-maintenance air test which includes an auto-ILS approach. This was combined with a gear-up approach to test the undercarriage warning system and was flown to DH. After this approach they climbed out on runway track to join the empty visual circuit and land. Just before changing to Tower frequency they were informed of traffic joining through initials 2 . On reaching approximately 750ft [the Typhoon formation] flight flew just over their right wing with an estimated separation distance of 50ft and proceeded to break into the circuit just in front of them. They joined the circuit once satisfied that there were just 2 aircraft in that formation then completed their circuit to land.

The Typhoon Formation Lead Pilot reported that they were conducting a visual recovery from [the east]. A traffic call was passed from Approach frequency at 1455:13 with an aircraft 8.3NM away, same direction. The [other] aircraft was in the radar pattern cleared not above 2000ft and [they] were cleared not below 3000ft. A "traffic not sighted" call was made and both formation members [identified the track on their internal radar systems] on receipt of this call. [The other pilot in the formation] was the first to call visual with the aircraft 5NM in front of [the lead Typhoon]. They were at 3200ft and 350kts with auto throttle engaged. They called traffic in sight with the aircraft 4NM ahead and with 9NM to run to the RW threshold, [The formation] was at their 3000ft cleared height and they switched to Tower frequency at 1456:25 and requested join at 1456:44. They were 6NM from RW25 threshold and 3.5NM from the Typhoon with 225kts overtake. The response from Tower was cleared to join with one approaching 2NM gear up approach. After receiving this call from ATC, they passed that on chat frequency to [the other formation pilot] checking that they were still visual and expect to break early for deconfliction. Initial was called at 1457:10 at 3NM, having 210kts overtake and the Typhoon at a range of 10000ft. They were still visual, and the Typhoon was in the HUD FOV until 1457:40. They made a correction to ensure deadside in-between 1457:37 and 1457:45, this was requested from the ATC supervisor. The time at which the Typhoon stated in the debrief that they were closest to their jet was at time 1457:45. At this time stamp, [the formation] was at 800ft QFE, 810ft rad-alt, auto-throttle engaged at 350kts and at [coordinates supplied], this measures approximately 100m/330ft north of the runway centre line. At the same time stamp, the singleton Typhoon had switched to Tower from Radar and requested a join, the response from ATC was "2 joining behind currently at

initial", the response from the singleton Typhoon over the radio on stud 2 was "that was close" as they [the formation] passed over their right-hand side. They were content that they had maintained visual deconfliction.

The Coningsby Tower Controller reported that they were prenoted 2 air systems to join the visual circuit, The [singleton] Typhoon was on radar at 8NM, and the Formation (2 in formation) to join visually. At 4NM they gave a clearance for Typhoon to fly through gear up circuit clear. Formation were approximately 6.5NM away. They relayed this clearance information to the caravan controller over MRE3 , due to the standby caravan not having the appropriate and usual comms. The caravan controller acknowledged the clearance over MRE. With radar traffic (singleton Typhoon) approaching 2NM and a positive clearance, the visual traffic (Formation) requested join. They gave Formation their joining instructions and called out the radar traffic that would be flying through gear up to join. Formation proceeded to continue and called initials, they were south of the centre line at this point and following the radar traffic. They [again gave Traffic Information on] the radar traffic (Typhoon) at 1NM and repeated their intentions. Formation called visual with Typhoon. A couple of seconds later the ATC Supervisor called them via landline and requested that they relay to the pair joining visually that they must remain deadside (they were live side). They repeated the message and it was acknowledged by Formation with the response of "affirm". Typhoon then transferred over to Tower and requested to join the visual circuit. They gave them joining instructions and called out the 2 air systems that had already reported visual with them. Typhoon responded with "that was close". Formation broke overhead the tower and because of this they lost visual sight of the formation. Due to the close proximity of all air systems they couldn't tell which air system was which. They then requested the position of Typhoon. While this was happening a returning priority air system requested to join the visual circuit. Typhoon confirmed that they were breaking late due to the pair on top of them. Formation lead reported visual and going around circuit height. They acknowledged that Formation lead had reported visual and requested the intentions of the other pilot in the formation. With no reply to this question, they were both sent around circuit height. The returning priority air system elected to hold outside of the circuit and orbit 10NM on the centre line. Typhoon then called downwind to land.

For the full report, see AIRPROX REPORT No 2021237 on the Airprox Board Website.

Spry's Comments:

The DDH summed up the incident post the investigation nicely; "Although there were errors in both Typhoon and Formation, and a number of aggravating and contributory factors identified, the root cause of this appears to be a breakdown in basic airmanship and procedural following by Formation." This incident demonstrates how a simple procedure of joining the visual circuit can break down very quickly if the correct procedures aren't followed as well as highlighting the importance of accurate communication by both aircraft and ATC alike. Another lesson is to think from the perspective of the aircraft that may not be visual. Even though you are visual – as the Typhoon formation was in this incident - allow adequate separation to ensure that it is not only comfortable for you but also for the aircraft who may not be visual. ■

20 Jan 22
Juno v WT9 Dynamic
Airprox No 2022004

The Juno Pilot reported that during a formation departure from RW36 at RAF Shawbury and exiting the ATZ to the west, a civilian single-engine light fixed-wing aircraft was seen to pass underneath the lead aircraft by less than 50ft as the formation exited Harmer Hill gate. The pilot of the No2 formation aircraft reported that the civilian aircraft entered a steep dive to pass underneath the lead aircraft prior to resuming a northerly routing towards Sleap airfield. The civilian aircraft was unsighted by the lead aircraft's pilot and no associated ACAS alerts were received with no traffic reported from ATC. An Airprox was reported to RAF Shawbury on the Low Level frequency at 0952 and the sortie continued without further incident.

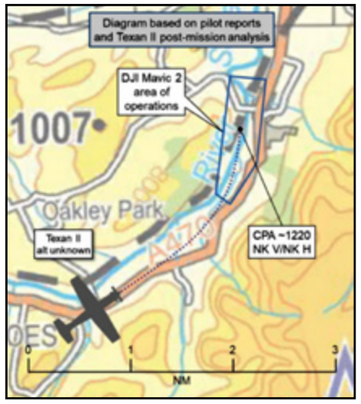
The WT9 Dynamic Pilot reported that Shawbury called them to advise of 2 helicopter contacts. They scanned left-to-right and saw them approaching from the right. They instinctively pushed the stick forward and the helicopters passed above and behind them. The Shawbury Tower Controller reported that a call on the land-line was received from the Shawbury Supervisor with Traffic Information on a civil aircraft south of the airfield by approximately 6 miles transiting to Sleap, not below 1400ft QFE. [The Juno formation] was transiting, in formation, to exit the airfield to the west via Harmer Hill at 1000ft QFE. Just prior to [the Juno pilot] calling Harmer Hill, Stud 4, the pilot of an aircraft called to cross RW36 to operate area right. After this call, [the Juno pilot] proceeded to call 'Harmer Hill, Stud 4'. The controller had a quick check of the ATM to check on the potentially conflicting civil traffic; at this point they did not believe there was a risk of collision and didn't notice that the civil aircraft had begun to descend. They replied to [the Juno pilot], 'Roger, Stud 4' sending them to their next frequency.

The Shawbury Low Level Controller reported that they were carrying out the Approach and Low Level task. Traffic levels were low. Filming was taking place in the Approach Control Room. The Zone controller called them with Traffic Information on an aircraft that was approximately 7NM eastsoutheast of Shawbury routing to Sleap via Shrewsbury at 1700ft QNH, routing through the MATZ. The controller had no traffic conducting radar approaches and the altitude was approximately 400ft above the height of RW VFR departures and arrivals, so they approved the MATZ transit. When the transit was 3NM south of Shawbury, they passed Traffic Information to the Tower controller, stating that it was not below 1400ft QFE for now. The Tower controller stated that a formation was departing to the west and that that was the only traffic to affect. As the film crew was packing away, the controller saw the formation approach the western gate. The formation was indicating 300ft below the Sleap inbound. The pilots checked-in on stud 4 "callsign 1, callsign 2" but did not speak to the controller (Shawbury Low Level) directly. They could see the conflicting traffic was very close to the formation now and made the decision not to call the traffic as they believed the reason the pilot had not spoken to them was that they had seen the conflicting traffic and the controller did not want to cause a distraction. The squawks of the 3 aircraft all merged and it was not possible to see exactly where they were or who was at what height/altitude.
As the tracks separated, the Sleap inbound was indicating 200ft below the formation. A second later, the formation leader declared an Airprox. The controller called Tower to ask if Traffic Information had been passed to the formation – the controller stated that they had not. They then spoke with the Zone controller who said that they had called the formation to the Sleap inbound but that the pilot had not acknowledged. The Supervisor was not in the room at the time and the Low Level controller informed them of the Airprox on their return.
The Shawbury Zone Controller reported that it was a busy period in Zone; [the WT9] was one of their circa 10 VFR tracks on frequency. [The WT9] was flying at 1700ft QNH recovering to Sleap from the south-east on a Basic Service. It is commonplace to put these tracks at 2400ft QNH to overfly the Shawbury Aerodrome Traffic Zone (ATZ), however, [the WT9 pilot] could not make higher so the controller instructed them to avoid the Shawbury ATZ. [The WT9] routed south of the Shawbury ATZ and the controller passed Traffic Information on [the WT9] to their Radar Approach controller (who was band-boxed with Shawbury Low Level). The Air Traffic Control Supervisor overheard the discussion and briefed the Shawbury Aerodrome Controller on the Zone controller's behalf. When [the WT9 pilot] called visual with Sleap Aerodrome, the controller warned them of a formation of helicopters departing Shawbury westbound through Harmer Hill Visual Reporting Point; the helicopters at the time were indicating 300ft below and 3NM away but converging laterally. They then asked [the WT9 pilot] to squawk 7000 and free-call Sleap. [The WT9 pilot] did not acknowledge their Traffic Information or the instruction to squawk 7000. The controller noticed the aircraft squawk 7000 so believed that their message had been received and they moved on to other tasks – it is not uncommon for [a pilot] not to acknowledge, especially when they are close to making an approach and when they know that the controller is busy on the radio. When the departing helicopters called their colleague on Shawbury Low Level, the Zone controller heard them acknowledge an Airprox – they looked and saw that [the WT9] had descended through the helicopter's level.

For the full report, see AIRPROX REPORT No 2022004 on the Airprox Board Website.

Spry's Comments:

This was a very close call but thankfully, with luck and last minute see and avoid from the WT9 pilot, a very serious incident was averted. The Junos were just checking in on Low Level when the Airprox occurred, leaving little opportunity to be given TI at that point. The gate departure system funnels traffic towards the approach lane of Sleap Airfield and the WT9 was descending in this area to join the airfield. This is a period of high workload and the WT9 pilot did well to spot the Junos and take avoiding action. Both formation ac were operating with transponders switched on leading to the Airborne Collision Alert System to sound regularly and therefore it was ignored. There have been several incidents of crews on many different platforms ignoring in-cockpit warnings, leading to catastrophic outcomes. Crews should be extremely wary of this. This is not normal 1 FTS procedure, and it is important to be cognisant of SOPs and to follow them. Overall, many lessons have been learnt from this and it is a timely reminder that although approach and departure procedures may have been in place for many years without incident, there is always scope for review and improvement. ■



7 Mar 22
Airprox No 2022024
DJI Mavic 2 v Texan II

The DJI MAVIC 2 Operator reported that, early on the morning of the intended flight, they uploaded their flight plan to Drone Assist UK. They arrived on the site at around 1200 and noted the weather – sunny with some cloud, moderate ~16mph wind with occasional gusts. Excellent visibility. Low risk of rain. Nobody else was present on site and the nearby fields were clear of livestock. At around 1215 their 'spotter' arrived and they set up the drone, undertook calibration, checked the battery and wifi levels etc. The drone operator briefed their 'spotter' on the procedure should anyone approach and the return to home function should they become incapacitated. At around 1218 they took-off and commenced their flight. At 1220 their drone was at approximately 100m elevation and 160m to their east when they heard a distant buzzing, which they knew from their ATC days was a turboprop – commonly used for RAF training (they suspected a Tucano, but later ascertained that these were replaced by the Texan recently). They immediately started scanning for a distant plane and told their 'spotter' to watch for any aircraft. As they finished their sentence, the RAF Texan appeared from a bend in the valley, over the trees. They immediately considered reducing the height of the UAV but realised that if the pilot had spotted it, they would stand a better chance of avoiding a static object than a moving object. Additionally, the UAV can only descend at ~2m/s. Within the split-second it took to appear, the Texan banked onto its port side and appeared to pass between their location and the drone at the same elevation. It appeared that the pilot may have attempted to fly directly over their heads, so was closer to them than the drone. They cannot emphasise enough that this was all within a split-second. The opportunity to react was solely instinct. They then considered what to do with the UAV. Their 'spotter' reminded them that training aircraft often travel in pairs or threes, so they descended the UAV. They then flew the UAV back to the landing point. At 1225 they called Welshpool ATC – they were unaware of any such aircraft in the area and suggested that they call RAF Valley, which they did. After 20+ min trying to get a response, they were finally put through to ATC, then Ops. RAF Valley could neither confirm nor deny whether they had aircraft in the area. RAF Valley Ops took their location, height of the incident, rough distance (at that point they estimated it was 200-300m away, but later confirmed it was only 160m away) and phone number. They asked if the flight was recorded on NOTAMs – the drone operator explained that this was done via Drone Assist and asked if they needed to report this anywhere else and were told no – Valley would deal with it all from there. RAF Valley Ops called back to ascertain if they would be flying just that day or tomorrow too. The drone operator confirmed that it was just on that day. They asked whether RAF Valley knew that they were in the area (so they can continue) and, whilst they cannot confirm or deny what they can or can't see, or whether any of their aircraft will be in the area, they do at least now know the location of their drone operations for the afternoon. They later called [their operating organisation's] drone experts. Contrary to the advice from RAF Valley, they confirmed that an Airprox needed to be reported.

The Texan II Pilot reported that, several days after completing their flight, they were made aware via email that a recreational [they believed] drone operator had filed an Airprox report, stating that they had come close to their drone at approximately 1220 in the vicinity of Llandinam, Powys, Wales. A NOTAMed route was loaded into the aircraft, and multiple hard copies of up to date, NOTAMed maps were carried by both aircrew. Nothing resembling a drone was seen at the time by either aircrew. Upon being informed of the Airprox report, the student pilot replayed the sortie recordings, which included a GPS ground trace, HUD tape and aircraft performance data. Nothing resembling a drone was seen on the HUD tape.

For the full report, see AIRPROX REPORT No 2022004 on the Airprox Board Website.

Spry's Comments:

It is heartening to see an Airprox report submitted by a drone operator. In many crewed vs uncrewed aviation 'close encounters', the crewed platform does not see the drone. In fact, in 2021, in all drone operator-reported Airproxes, the crewed aircraft was not aware of the drone at all. Capturing incidents like this can help understand the scale of the issue in the 0-400ft AGL band where military low level flying training and drone operators legitimately share the airspace. It allows both parties to consider measures to increase safety, although mitigations, such as mandated electronic conspicuity for all drones, are a still a way off. There are recreational and commercial drone flight planner apps where drone pilots can publish their flight details; for this particular incident, the drone operator had done just this. There is no mandate for drone operators to publish their flight in the Visual Line of Sight (0-400ft AGL band) and such, apps will not display a complete picture of all drone flights. However, it may be worth considering incorporating such programmes into the plan for SA building or something for Authorisers to check pre-flight.

Safety Contacts:

Group / Station / Unit	Flight Safety Officers	Health, Safety & Environmental Protection Advisors
1Gp	01494 495454	-
2Gp	01494 495049	-
11 Gp	0300 165 7695	-
22 Gp	030 6798 0101	-
Air Support	01494 497923	-
BM	95760 3230	
JHC	01264 381526	-
Test & Evaluation (ASWC)	01522 727743	-
1ACC	01522 603359	-
2FTS	01400 264522	01400 264551
3FTS	01400 267536	-
4 FTS	01407 762241 6666	-
6FTS	01400 266944	-
Air Cadets (RAFAC)	-	01400 0267817
Boulmer	01665 607325	01665 607282 / 7289
Benson	01491 837766 6666 / 7525	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 8182816	94641 4816
Fylingdales	-	01751 467216
Halton	01296 656666	01296 656640
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	-
Lossiemouth	01343 816666 / 7714	01343 817796 / 7697
Lynham	-	01189 763532
Marham	01760 337261 6666	01760 337595 / 7199
No1 AIDU	02082 105344	-
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 857380/95423 7380	01637 857162
Syerston	01400 264522	01400 264551
Tactical Supply Wing	95461 7177	-
Valley	01407 762241 6666	01407 767800 / 7685
Waddington	01522 726666	03001684954
Wittering	01780 416377	01780 417611
Wyton	01480 52451 7554 / 7146	-
Overseas Flight Safety Contacts	**Telephone**	**Email**
Al Udeid	9250 060 451 3043	83EAG-DepFSO@mod.gov.uk
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Akrotiri	94120 6666	BFC-Aki-Safety-AssuranceSFSO@mod.gov.uk
83 EAG	9250 060 451 3050	83EAG-AIROPSFSO@mod.gov.uk
Gibraltar	9231 98531 3365	GIB-RAF-ASM@mod.gov.uk
MPA	00500 75490 or 94130 5490	BFSAI-AirOpsWg-ASM@mod.gov.uk
Tactical Leadership Programme	0034 967 598527	aa3@tlp-info.org
Naval Air Station Jacksonville	001 904 542 4738	-

ROYAL AIR FORCE

Small Arms Safety

Life Saving Rules

I always treat my weapon as loaded and never leave small arms unattended.

I always wear 'prescribed medical aids', e.g. corrective lenses (glasses/contact lenses).

I always apply the safety catch unless I intend to fire the weapon.

I never point a weapon in jest.

I always follow the safe handling rules for the weapon.

I only handle weapons that I am trained on and have completed weapon handling tests for.

SC137
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