

CHIRP

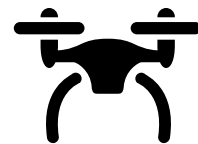
Confidential Human-Factors
Incident Reporting Programme

Aviation FEEDBACK



Edition 3 | January 2022

DRONES



When human factors come into play

What can happen to others can affect you too



CHIRP Drone/UAS Programme Manager: RUPERT DENT

Welcome to a New Year and Drone FEEDBACK Edition 3.

As many of you will know, CHIRP has developed and is promulgating the use of a confidential, incident reporting programme for Human Factors and Just Culture occurrences arising from the operation of Drones or Remotely Piloted Aircraft systems. The aim is that drone pilots, who are in many cases relatively new members to the world of aviation, will be able to benefit from lessons learnt and practices that have developed within the aviation sector over many years for crewed aircraft.

Many of the same theories that apply to crewed aircraft apply to aircraft with remote pilots. If all of us can learn from an event that happened to one individual and might happen to another, it is to everyone's advantage to be able to do so. CHIRP is the conduit for individuals to confidentially share their experience of HF occurrences in a safe way that enables many others to learn from them.

Since FEEDBACK Edition 2 was published in July 2021, efforts to continue to convey the benefits that the CHIRP drone programme will bring to the world of remotely piloted aircraft have continued and with some success. →

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For those with smaller devices, you can view this report in a single-column format. Open the newsletter in Adobe Acrobat Reader and select the 'Liquid Mode' icon in the toolbar.



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Whilst we have had reports from the sub-25kg Specific category we still need to be more effective in reaching our target audience and explaining how and when drone users should report occurrences, incidents and accidents. Whilst there have been some updates to drone regulations (most notably CAP 2038A00) we still await Edition 9 of CAP 722 which will contain much more information on Human Factors and will serve as an effective educational tool about the CHIRP drone programme.

Working with the CAA, we have done some fact finding. 16,746 individuals who have signed up to Skywise have indicated they are happy to receive information about drones. FEEDBACK Edition 2 was sent to all of these Skywise subscribers.

Since publishing Drone FEEDBACK Edition 2 in July 2021, we have had several reports that we think are worth commenting on in this issue. They all concern small drones being used for what would probably fall into the definition of professional work. We can learn something from each of them. What should you report to CHIRP? Any Human Factors or safety-related incidents or events involving yourself, other people, or your organisation/ organisations you deal with. See the infographic on the last page.

We wish you all a Happy New Year and safe flying in 2022!

Rupert Dent
Drone Programme Manager

‘Especially in winter when leaves are no longer on the trees, vision systems find it hard to provide protection against thin branches and twigs and contact can occur!’

Reports

Report No.1 – Inspire 2 collision with a tree

In Spring 2021, we received a report of an Inspire 2 colliding with a tree whilst filming for a television show. The report read as follows:

“DJI Inspire 2 collided with a tree during filming for television show. No injuries or personnel harmed. Drone and camera suffered damage but repairable.” The reporter then wrote that lessons learned were: “switch to Tripod mode when filming”.

“CHIRP Comment”

It seems from the report and subsequent correspondence that the pilot was happy to describe the incident as pilot error. The reporter’s suggestion of how to avoid this type of incident in future is based on the following: In Positioning or “P” mode the acceleration and deceleration

time of the Inspire 2 is relatively quick. It is obviously quicker still in Sport mode! In Tripod mode, however, it flies at a maximum speed of 1 m/s. This enables the pilot to concentrate on the imagery and maintain situational awareness with greater ease than if flying in “P” mode or indeed “S” mode.

However, it is worth noting that just because you are flying in Tripod mode it doesn’t mean you shouldn’t be looking at the aircraft when it is in flight. Yes, in Tripod mode it normally means that the aircraft has its vision systems switched on, as well as having its speed limited to 1 m/s and therefore should stop before coming into contact with something. But, especially in the winter when leaves are no longer on the trees, vision systems find it hard to provide protection against thin branches and twigs and contact can occur! Additionally, it becomes more difficult to judge perspective when manoeuvring a dark coloured unit in the air, against a dark coloured background.



The two photographs give a feel for how perspective can change depending on the background of the point of interest





Report No.2 – Low altitude immediate flyback and crash

We received another report in the Summer of 2021 about an incident where a drone had unexpectedly flown backwards just after take-off. The reporter sent us the following account of what had happened:

“On powering up the drone there was some sort of alarm coming from the radio control. I checked everything, and the alarm appeared to stop. I turned on the props and decided to take off. Immediately as soon as the drone lifted off, it took off backwards and rapidly fast at 30cm ALT. It clipped the edge of the wall nearby and flipped onto its back shattering all 4 propellers. The drone was not damaged any further and there were no other people in the immediate vicinity other than the pilot. The drone was immediately taken out of service and another drone was used to complete the job.”

“ CHIRP Comment ”

After the incident, the pilot examined the radio control unit and saw that the right-hand stick was stuck in the down position. Subsequent additional analysis showed that the stick would revert to centre once it had been worked a little. Perhaps grit or something similar had been the cause of it sticking.

The reporter’s own list of lessons learned included the following:

- A) I need to understand what the controller alarm bleeps mean.
- B) I need to check that the controller sticks are in the correct position before take-off and that they self-centre.
- C) Take-off in more open areas where possible, to allow time to correct for anomalies.

This incident is a classic Human Factors situation, perhaps with an element of misfortune. Out in the field doing several different tasks, a pilot’s

dirty or dusty hands have tremendous potential to drop material into vital parts of both the controller and the aircraft.

The controllers of small, typically Open category, drones are quite often designed so that they can work off Applications that are downloadable onto mobile phones. The actual hand controllers, which have two movable arms that grasp the mobile are small and typically use a ball joint with a transversal section where the stick is attached in the middle and moves from side to side. It is very easy to foul the moving parts with even a small amount of dust or dirt.

As for crewed aircraft, it is always worth a “full, free and clear” movement check of the control levers/sticks before start up and getting airborne



A typical controller, showing the right-hand control stick

Report No.3 – Flying within Special Use Airspace

This report concerned a drone flight that took place in Special Use Airspace. The location was near Coulport, and the text of the report was as follows:

“YouTube user [name] has posted a video showing them flying their drone

between Ardentinny and the Nuclear Storage Depot at RNAD Coulport. The Zone is Special Use Airspace P6121 (COULPORT / FASLANE)”

“ CHIRP Comment ”

The initial reaction to reading the report was to say that this one is for the CAA because it relates to air law more than anything else. However, on closer examination it does potentially raise a number of interesting Human Factors issues related to the mapping of Geofencing data and how this is input into drone controllers, rather than the pilot of a drone per se.

To be precise, the issue is this: on the Aeronautical chart ICAO 1:500,000 P611/2.2 (Coulport / Faslane) is shown by a red circle with hatching that appears to be centred on Coulport and includes Ardentinny (see first photograph). A crewed aircraft using the map would avoid entering the Prohibited area unless they had the necessary approval. However, using the Mavic Mini controller and checking on the Geozone map, the Coulport and Faslane areas are coloured blue and are categorised as Authorisation Zones.

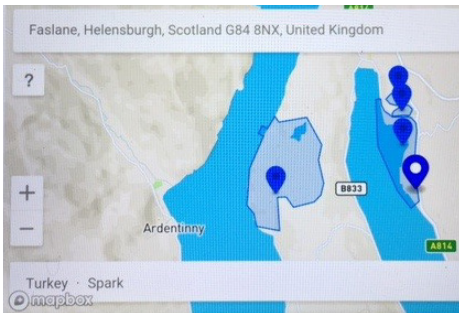
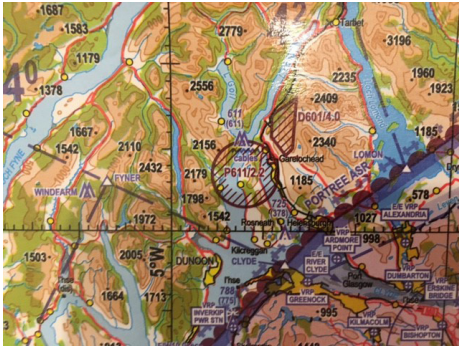
Importantly, the area designated is not a circle but is a very precise polygon that looks as if it has been designated by reference to the land ownership (see second photograph). The drone pilot in question was therefore able to fly around Ardentinny in P611/2.2 without any restriction from the Geofencing function. As a result, if the drone pilot didn’t know that P611 existed then they could inadvertently enter its protected zone.

Ultimately, the aeronautical data (i.e. P611) takes precedence in avoidance terms and so this incident highlights the need for drone pilots to make sure they are aware of local airspace restrictions irrespective of what Geofencing might be within their system’s controller. In that respect, the NATS Drone Assist App provides a very accessible and useful tool for checking local airspace and airfield proximity before getting airborne





We have requested clarification from the manufacturer regarding the correctness of their Geofencing data and whether it is geospatially accurate, or not and are awaiting a response.



The first photograph shows the aeronautical 1:500,000 chart around P611/2.2. The second photograph shows the same area as depicted by DJI's Geo Zone map, with the two light blue dotted areas indicating the Faslane and Coulpert sites

Report No.4 – Unexpected loss of battery power on a DJI Spark

We received a report of an unexpected loss of power during a flight by a DJI Spark as below:

“Normally there is an ‘endurance’ countdown on the telemetry screen, a warning that the battery is depleted to a (user set) level, and an auto ‘Return Home’ feature if the battery approaches a level determined by the software. None of these actuated. All other telemetry was working normally.

The endurance countdown apparently froze on 5 minutes (normal affective endurance around 10 minutes). As soon as I noticed that the endurance countdown had frozen I started to

fly the drone back, but less than a minute later I had the first warning message, that the battery was at a critical state and the drone was landing immediately. As I wasn't sure that it had cleared a tram track and main road at that time, I overrode the landing and managed around a further 30 seconds of flight before the battery failed and the drone fell from a recorded 80 feet height.

The drone was subsequently recovered from the edge of the field I was flying from. It had landed in long grass and appeared undamaged. Following a battery change, a careful test flight confirmed that it was in full working order. Total flying hours on the Spark at that time was 60:45; subsequently, hours logged went up to 70:55 with no further occurrence of this type noted. The Spark was eventually replaced with a DJI Mini 2, although is kept in reserve. There was a mobile phone/TETRA

communications mast in the area but I thought that I had been keeping a good distance from it.”

Lessons learned were offered by the pilot as being:

“The need to keep a very good watch on all telemetry aspects shown and also have an idea as to how long you have been airborne and not rely on the endurance countdown.

In the past I had lost telemetry from this particular drone but it was immediately obvious as the video downlink first started to ‘break up’ allowing the drone to be flown back visually (the control link wasn't affected). This was a very insidious telemetry failure as the endurance countdown is just a tiny area at the top of the screen, but was being checked regularly. All the normal ‘failsafes’ (battery level warning, auto RTH) failed to activate before the ‘Emergency Landing’ activated.”





“CHIRP Comment”

In the top right hand corner of both the “Smart” controller and the mobile phone version of the DJI Pilot App there are three dots visible on the opening screen immediately after power is turned on and the pilot has entered the “Manual Flight” section. When the pilot clicks on the dots it leads to a sub menu which includes the choice “HD” on the left hand side. If the pilot clicks on HD it will display a continuously updating

chart of the controller to aircraft downlink interference levels.

Whilst it is not clear if the Tetra mast was the cause of the power level indicator freezing, or whether the pilot in question did indeed check by looking at the HD drop down, we find it is always worth looking at the HD display to verify the level of interference in the surrounding area as one of the pre-takeoff checks.

CHIRP commends the reporter for their quick-thinking efforts to prevent the drone from landing on the road or tramline, and this raises another important issue about always being aware of the immediate area that the drone is flying towards or above, and having a contingencies plan in mind to avoid any associated danger zones should a failure occur which retains some element of reversionary or temporary control.

CHIRP’s Mandate & Role Guidance to Reporters

WHAT DO I REPORT?

- Safety-related incidents or events involving:
 - Yourself
 - Other people
 - Your organisation or organisations you deal with

WHEN DO I REPORT?

- When other reporting procedures are not appropriate or are not available
- When you wish others to benefit from an important "Lesson Learned"
- When you are concerned to protect your identity (but note that anonymous reports are **not** accepted)
- When you have exhausted company/regulatory reporting procedures without the issue having been addressed

WHAT DO I NOT REPORT?

- Incidents or events with no safety content
- Issues involving personality clashes
- Industrial relations and/or terms and conditions of employment problems

Incidents/events can include:

- Errors/mistakes
- Individual performance affecting safety
- Health & Safety matters affecting operating procedures
- Regulatory or Company policy/procedures aspects
- Unsafe practices

CHIRP

Aviation and Maritime Confidential Incident Reporting

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SAFE DRONE FLYING



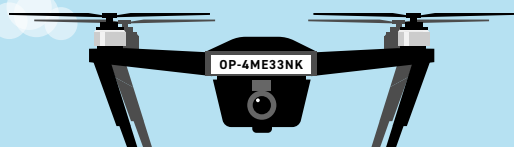
The UK has a set of drone rules to keep everyone safe.

To legally fly most drones, other than toys, you will need to have a Flyer ID and be a registered operator with the CAA.

The rules include how high you can fly and how far away you need to keep from airfields, people and property.

You can check the rules, register as an operator and get a Flyer ID at register-drones.caa.co.uk.

You need to renew your operator registration every year and your Flyer ID every five years.



For more safety information, visit caa.co.uk/drones

AIRSPACE SAFETY

When you fly a drone you are sharing the airspace with thousands of others from private pilots to medical emergency helicopters to the military. Some of these may be flying below the maximum height for a drone so please stay alert when flying. Mobile apps and websites are available that show the airspace where you are flying and alert you to the rules for where you are.

STAY UP TO DATE

Once you're flying it's important to stay up to date. Rules do change and short-term airspace restrictions are frequently put in place.

You can get updates by subscribing to the drone and airspace alerts categories in our Skywise system at skywise.caa.co.uk.

INCIDENTS

If you lose your drone, or find a lost drone, then you can report it at dronesreunited.uk.

If you have a serious safety incident with your drone then you should report it to the UK Air Accidents Investigation Branch at aib.gov.uk.

If you are concerned about a drone being used from either a safety or privacy perspective, then contact your local police on **101**.

THE SKYWAY CODE

“As an aerobatic display pilot I really value the accessibility and helpful reminders of the SkyWay Code; it is a one-stop shop for everything you need to consider before you brief and head out to your aircraft to go flying. I encourage all pilots to take the time to read through this free online document.”

Kirsty Murphy

Blades Aerobatic Display Pilot and former Red Arrow pilot

The SkyWay Code provides practical guidance for GA pilots, students and flight instructors on operational, safety and regulatory issues relevant to their flying.

Download your copy at: www.caa.co.uk/skywaycode

