CHIRP GENERAL AVIATION FEEDBACK
Confidential Human-Factors Incident Reporting Programme

Share and share alike

Everyone benefits from the experiences of others

CHIRP Drone/UAS Programme Manager: RUPERT DENT

Welcome to Edition 2 of Drone/UAS FEEDBACK. As many of you will know, CHIRP is developing a confidential reporting programme for Human Factors "HF" and Just Culture occurrences arising from the operation of Drones, UAS or Remotely Piloted Aircraft Systems (RPAS). The aim is for what are, in some cases, relatively new members to the world of aviation, drone pilots, to benefit from safety reporting practices developed within the other more traditional aviation sectors.

Many of the same issues and human performance factors apply as equally to drone/UAS pilots as to aircraft pilots and, where we can learn from something that has already happened to someone and been reported, it is to everyone's benefit.

Although those who are flying their drones/UAS commercially should in the first instance report any incidents through their company safety management system, CHIRP is a conduit for all drone/UAS pilots to confidentially share their HF experiences in a safe way that enables others to learn. CHIRP never passes on the details of reporters to third parties, and any contact we have with outside agencies is done in a manner such that reports are not only disidentified but circumstantial information that might identify someone is removed.
In the last nine months, CHIRP has developed its Drone/UAS activities

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on several different fronts. A Drone/UAS Programme Manager has been recruited to develop and then action a strategy for the programme, which was approved by the Director Aviation and the Trustees. An Advisory Board has been set up, and had its first meeting in January. The second meeting took place on 29th June with a third planned for the end of 2021.

An Advisory Board Chairman has also been appointed and we would like to welcome Rob Buckley who volunteered for this newly established role. Rob is a trained aeronautical engineer and a very experienced large model aircraft pilot who also has experience with large UAS. He will help guide the Drone/UAS Advisory Board in the coming months as we set up specific operating procedures and processes and transition to a fully functioning Board.

As part of an expanded section on Human Factors, the forthcoming 9th Edition of CAP 722 will include reference to CHIRP and will highlight our reporting processes. CAP 722 Ed 9 will be published later in 2021. In order to spread the word about the benefits of using the CHIRP reporting portal we have also emailed an explanation about CHIRP to all of the 6,700 old-style PfCO holders that were listed by the CAA in April of 2020. CHIRP's intention is to initially focus on the "professional Drone community" as we set up our processes, and then, in due course, widen our involvement to include the sport and leisure community as well.

Because we are still establishing our reporting processes and Advisory Board procedures, this second edition of Drone/UAS FEEDBACK will also focus on three incidents that have been reported through different channels but which serve as good examples of where HF played a role in an occurrence. Although you may be aware of these incidents, we felt that it was a good opportunity to reflect on the specific HF aspects for pilots flying drones/UAS. Overall, our intention is to provide a useful service to the drone/UAS community in the interests of improving safety for all so do let us know your thoughts. We don't claim to have all the good ideas by a long margin and so now is an opportunity to share your views or send us a report of your own if you have a good example of where others might learn from your experience.

Our reporting portal is at www.chirp.co.uk, where you will be guided through the drone/UAS reporting process when you select the 'Online' option within the 'Submit a report' section of the homepage. The last page of this edition of FEEDBACK shows a slide from a presentation that gives guidance on what and what not to report but, if in doubt, report!

I wish you all a happy summer's flying and look forward to more shared learning in the winter.

Rupert Dent
CHIRP Drone/UAS Programme Manager

Reports

Report No.1 – DJI Phantom 4 RTK looses its propeller

A very recent Air Accidents Investigation Branch (AAIB) report concerns an accident with a DJI Phantom 4 RTK (P4RTK). The report found that the aircraft lost a propeller and as a result fell to the ground, not far away from a member of the public walking along a nearby footpath.

Although it is unclear from the report what originally caused the P4RTK to lose its propeller, one hypotheses is that it was not fixed correctly in the first place. Drones built today have improved immeasurably in how they are designed and propellers are constructed in such a way that they click into place in a very definitive manner, leaving little doubt as to whether it is fixed on or not. However, it is easy to make mistakes of this nature when in a hurry and, if the aircraft is a quadcopter with no ballistic support, the chances of controlling its descent are very slim.

A practice we know some operators use is that once the propellers are fixed in place a second crew member checks them over before the first flight. CHIRP recommends this procedure whenever possible.

Another HF issue to consider is the replacement of such items with non-OEM equipment. Replacement propellers are widely available on the internet, but may not be manufactured to the same standards as the original. That is not to say that they will necessarily be a lower standard, but sometimes 'you pay for what you get' and so consider carefully what you are buying if you are replacing critical items like this. It's human nature to go for the cheapest, but it may not be cost-effective in the long run if they fail in flight.

Report No.2 – Alauda Airspeeder Mark II

The second example is the now well publicised Alauda Airspeeder MK II accident at Goodwood. The AAIB report stretches to 65 pages and a total of 15 Safety Recommendations that mostly refer to the airworthiness of the UAS. They summarised the accident as follows:

"Whilst performing a demonstration flight, the remote pilot lost control of the 95 kg Alauda Airspeeder Mk II scale demonstrator. After the loss of control had been confirmed by the remote pilot, the safety 'kill switch' was operated but had no effect. The Unmanned Aircraft then climbed to approximately 8,000 ft, entering controlled airspace at a holding point for flights arriving at Gatwick Airport, before its battery depleted and it fell to

the ground. It crashed in a field of crops approximately 40 m from occupied houses and 700 m outside of its designated operating area. There were no injuries".

The AAIB found that the Alauda Airspeeder Mk II was not designed, built or tested to any recognisable standards and that its design and build quality were of a poor standard. The operator's Operating Safety Case also contained several statements that were shown to be untrue. The CAA's UAS Unit had assessed the operator's application and, after clarification and amendment of some aspects, issued an exemption to the Air Navigation Order to allow flights in accordance with this Operating Safety Case. Unfortunately, the CAA did not meet the operator or inspect the Alauda Airspeeder Mk II before the accident flight.

There have been many other similar events where control of an unmanned aircraft has been lost, resulting in either it falling to the ground or flying away. Even a small, unmanned aircraft falling from a few metres could cause a fatal injury if it struck a person. The CAA and the organisation which designed and operated the Airspeeder Mk II have introduced measures to address a number of issues identified during the course of the investigation but, of the 15 recommendations made, Number 20211 caught our attention at CHIRP. It says:

Safety Recommendation 2021-011 It is recommended that the Civil Aviation Authority ensure that operators of Unmanned Aircraft Systems have an effective Safety Management System in place prior to issuing an Operational Authorisation.

CAP 722 8th Edition, section 5, covers Human Factors and Safety Management Systems. Whilst this will be expanded in Edition 9 when it appears, we feel that there is a clear case for all drone/UAS operators to record their HF occurrences in their SMS and then encourage all pilots to review the company SMS on a regular basis. All humans make errors, but we should not let a good error go to waste! Avoid making the same one twice, and make sure all the Team learn from each one of them.

Report No.3 –Gone In 65 Seconds: Pilot Error Led to $6 Million Loss in Military MQ-9A Reaper Drone Crash

An MQ-9A Reaper drone crashed at the end of a New York runway last year because the operators mixed up the levers on the control panel according to a US Air Force investigation report.

The Reaper crew launched the drone with plans to swap control to another crew once it reached military airspace at over 18,000 feet but it quickly lost power and hit the ground about a minute after takeoff - the Reaper lost all engine power after 44 seconds, at about 150 feet, and was "significantly damaged" when it struck the end of the runway 21 seconds later, crashing into runway lights and spinning 180 degrees before stopping.

Loss of engine power was found to be due to the pilot misidentifying the Flap Lever. Instead of pushing the Flap Lever forward to reduce the flaps, the pilot pulled the Condition Lever backwards which resulted in the fuel supply to the engine being cut off, stopping the engine.

The two levers are an inch apart but have "very different functions," the report said. The flap lever controls the orientation of the wing flaps, which are usually set at 15 degrees for takeoff, then retracted to 0 degrees by moving the lever to the middle or neutral position. The condition lever controls the fuel

shutoff valve, engine and the pitch of the propeller blades. When it is fully forward, the engine operates normally, but at the midpoint, the fuel valve and engine shut off, and at fully back it stops the propeller blades.

The pilot continued to misidentify the levers after the engine lost power, mistakenly pulling the wing flaps all the way back, which pushed the aircraft down instead of letting it glide. The pilot and the sensor operator were qualified, had logged hundreds of hours of flight time, including several recent sorties, and had the required amount of rest. But the board found that the pilot became fixated on the heads-up display during takeoff, which led to the lever mix-up.

The design of the ground control station console contributed to the crash, including the lack of a safety guard on the condition lever, the report said. Despite being right next to each other, both have black handles and are unmarked or differentiated by colour; *"These levers could easily be mistaken by an inexperienced, fatigued, or confused crewmember".*

The analysis above suggests that the accident was caused by the pilot confusing two levers, each with completely different functions but situated very close to each other. Some of the current sub-25kg Drones used today have controllers that are remarkably small for the sake of convenience. However, the small size does mean that the design often results in a tight cluster of important buttons and sliding switches, many of which could be pressed inadvertently by the pilot during the operation of a flight.

Progress does need to be made on the ergonomics of controller design in the future, in order to avoid a Human Factor error being incurred during an

operation. We hope that manufacturers of the more professional Drones will increasingly take this into consideration for equipment that is designed for use in the Specific category.

Nevertheless, make sure that you are absolutely clear on which button/switch/lever you are about to operate before you do so, and if everything goes wrong after making a selection, positively check which selector you moved; although not always a cure for things that go wrong, "undo the last thing you did" can often be a quick way of regaining control of the situation if something unexpected happens.

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