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Category: Drone

Report TitleUSAF RQ-4B Accident Report - System awareness

Initial Report

UNITED STATES AIR FORCE AIRCRAFT ACCIDENT INVESTIGATION (Abridged)

On 6 August 2021, at 0727 local (L) time, an RQ-4B Global Hawk, tail number (T/N) 08-2035, impacted terrain 6.8 miles north of Grand Forks Air Force Base (GFAFB), North Dakota (ND), while conducting a local flying mission.

The mishap RPAS was flown by the 348th Reconnaissance Squadron (348 RS), a unit assigned to the 319th Operations Group, 319th Reconnaissance Wing, GFAFB, ND.

The mishap crew members were assigned to the 348 RS for flying and were all active duty United States Air Force members. The mishap did not result in any injuries. The mishap RPAS, valued at approximately $64 million, was destroyed.

On 6 August 2021, the mishap RPAS was flying a mission in a local military operating area (MOA) when the mishap mission control element (MMCE) experienced a workstation lockup, ultimately resulting in the mishap RPAS's return to base on an autonomous, pre-programmed route. The pre-programmed route returned the mishap RPAS from the MOA to GFAFB via a descent and approach, but the mishap RPAS did not initially descend as the pre-programmed route required since the mishap mission control element pilot (MMP) failed to sever the MMCE control link with the mishap RPAS. The mishap RPAS was too high at the final approach fix (FAF) and commenced a go-around/missed approach route. Once the MMP severed the MMCE control link, and while the mishap RPAS was on the go-around/missed approach route, the mishap pilot (MP) and mishap instructor pilot (MIP) gained control of the mishap RPAS with the mishap launch and recovery element (MLRE).

Instead of commanding a new flight route to the mishap RPAS, the MP commanded an altitude override command to the mishap RPAS, which resulted in the mishap RPAS being approximately 4,000 feet too high at the FAF. The MP and MIP were not aware of the altitude deviation. At that FAF, the mishap RPAS's go-around/missed approach route logic commenced an approach to land at GFAFB, but, because it was 4,000 feet too high, the mishap RPAS overshot and crashed into a farm field 6.8 miles north of the runway.

The Accident Investigation Board (AIB) president found, by a preponderance of the evidence, the cause of the mishap was the MP's incorrect selection of aircraft flight commands resulting in the mishap RPAS's controlled flight into terrain. Further, the AIB president found, by a preponderance of the evidence, the cause of the mishap was the MIP's failure to provide sufficient inputs to the MP to prevent the mishap RPAS's controlled flight into terrain. Additionally, the AIB president found, by a preponderance of the evidence, the MMP failed to follow established procedures, resulting in the mishap RPAS's delayed descent and pre-programmed selection of a go-around/missed approach route, significantly contributing to the mishap. Finally, by a preponderance of the evidence, the pilot workstation lockup, including the lack of documented procedures regarding requesting numerous detailed status requests within a short timeframe, resulted in the MMP's inability to positively control the aircraft resulting in the mishap RPAS's execution of pre-programmed logic and return to base, significantly contributing to the mishap."

In the published report on the accident the USAF includes a section on the Human Factor component as follows:

11. HUMAN FACTORS ANALYSIS

    The Department of Defence Human Factors Analysis and Classification System 7.0 lists potential human factors that can play a role in aircraft mishaps and identifies potential areas of assessment during an accident investigation. Four human factors were identified as relevant to the mishap:

    (1) procedure not followed correctly – a procedure not followed correctly is a factor when a procedure is performed incorrectly or accomplished in the wrong sequence

    (2) rushed or delayed a necessary action – this is a factor when an individual takes the necessary action as dictated by the situation, but performs these actions too quickly or too slow

    (3) wrong choice of action during an operation – a wrong choice of action during an operation is a factor when the individual, through faulty logic or erroneous expectations, selects the wrong course of action

    (4) pressing [on] – pressing is a factor when the individual knowingly commits to a course of action that excessively presses the individual and/or their equipment beyond reasonable limits (e.g., pushing self or equipment too hard)

Comment

There is a surprising sequence of errors that lead up to this accident. From our perspective one of the main points here though is that by not understanding the control logic, the pilots were very quickly behind the aircraft in its execution of its pre-programmed logic and became further and

further away from it as time progressed. The Human Factors element is well summarised by the US Accident Investigation Board, and it is clear it had a role to play. If the very high level of training undertaken by the US military still leads to humans making these sorts of errors, it sets the scene for how the logic execution sequence training objectives for the future civilian BVLOS operations world need to be at a very high level.

The other aspect that is worth noting is that situational awareness was lost early in the sequence and never really re-established. Once the aircraft was 4,000ft too high at the initial final approach fix, it remained too high. This would perhaps have been less likely to have happened if the pilot had been on board the aircraft.