

ACCIDENT

Aircraft Type and Registration:	Believer (UAS, registration n/a)	
No & Type of Engines:	2 electric motors	
Year of Manufacture:	2020 (Serial no: 3)	
Date & Time (UTC):	2 May 2020 at 1430 hrs	
Location:	Solent Airport, Hampshire	
Type of Flight:	Commercial Ops (UAS)	
Persons on Board:	Crew - N/A	Passengers - N/A
Injuries:	Crew - N/A	Passengers - N/A
Nature of Damage:	Destroyed	
Commander's Licence:	Not applicable	
Information Source:	Aircraft Accident Report Form submitted by the operator and additional enquiries made by the AAIB	

Synopsis

The flight was part of a test programme prior to the start of commercial operations to the Isle of Wight.

The accident UAS was considerably smaller than the production aircraft but it was representative in terms of the avionics and communications. It crashed shortly after taking off because the safety pilot switched the radio control transmitter off before the automatic flight control system was engaged. Several safety actions have been undertaken by the operator because of this accident.

History of the flight

The UAS had already completed two successful flights on the day of the accident. A pre-flight check was carried out, and a mission profile was loaded into the automatic control system.

A pre-flight briefing outlined the normal plan. The UAS would be hand-launched with a safety pilot manually controlling the initial phase of the flight. When the UAS was airborne and stable, the automatic flight control system would be activated and the ground control system (GCS) operator would authorise the shutdown of the radio control transmitter.

The UAS was launched successfully but the safety pilot turned the radio control transmitter off before receiving the verbal command to do so, and before the automatic flight control system was activated. The pilot reported that he incorrectly believed that this instruction had been issued. It is possible that fatigue could have contributed to the error because the operator stated that the "*crew had been working long hours for [the] last few days*".

The onboard fail-safe logic¹ detected the loss of signal and reduced the throttle to idle and applied an aileron input. With the aircraft at an altitude of approximately 235 m the safety pilot was unable to switch the controller on again and regain control before the aircraft crashed in an open area of the airfield at a speed exceeding 40 m/s. There were no injuries but damage to the aircraft was extensive.

UAS information

The Believer UAS is predominantly constructed from foam and has a maximum takeoff weight of 6.5 kg². It has a V-tail, two wing-mounted electrically driven propellers and a wingspan of approximately 2 m (Figure 1). Information online indicates that the UAS is typically used for aerial survey operations.



Figure 1

General view of the Believer UAS

Analysis

The launch was conducted with the UAS in manual mode, which meant that the safety pilot had full control of the aircraft. The safety pilot believed that the instruction to turn the transmitter off had been issued, but this was incorrect. When the transmitter was turned off, the fail-safe logic operated as designed, and there was insufficient time to regain control before the aircraft crashed.

The operator reviewed their operating philosophy and modified the control system so that takeoffs are performed with the aircraft in automatic mode with the safety pilot correcting the flightpath as necessary. Whilst not a direct cause of this accident, they also reviewed the fail-safe logic to ensure that the settings are automatically configured by the mode the aircraft is in eg if the aircraft is in automatic mode the transmitter failsafe is disabled. Prior to this improvement, the transmitter fail-safe had to be manually turned off, which required human intervention and was open to error.

Footnote

- ¹ The onboard monitoring system detected the loss of the transmitter signal and, because the UAS was in manual mode, it induced a descending turn (fail-safe) to curtail the flight.
- ² Maximum takeoff weight quoted in the Operator's operations manual.

Conclusion

The safety pilot erroneously turned the transmitter off before the automatic control system was activated and before the instruction to turn the transmitter off had been issued.

The operator believed that the accident was unavoidable after the radio control transmitter was turned off because there was insufficient time to switch it back on and regain control of the UAS.

Safety actions

The following safety actions were introduced:

- 1) Operations were reviewed to minimise the period where a UAS is under manual control. The UAS is now launched in a revised automatic mode where the safety pilot can apply control inputs to correct the flight path if appropriate. The safety pilot can also disable the automatic flight control system and take full control of the UAS in the event of an emergency.
- 2) The fail-safe logic has been reviewed and modified so that settings are automatically configured depending on the status of the UAS.
- 3) The operator has reviewed their fatigue risk management strategy and is introducing limitations with respect to permissible crew working times and a requirement for crew members to consider their well-being and declare themselves fit for operation during every flight briefing. The operator is updating their operations manual accordingly.