AR19-338

Accident Investigation Report

N83AU

Experimental Unmanned Aircraft

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1. Accident Summary Analysis

On June 4, 2019, at 0709 eastern daylight time, the Aurora Proof of Concept vehicle, N83AU, an experimental unmanned aircraft, experienced an unpowered descent from stable hover at approximately 32 feet above ground level at the Manassas Regional Airport/Harry P. Davis Field, Manassas, Virginia. The aircraft was substantially damaged. There were no injuries and no ground damage. The test flight was conducted under 14 Code of Federal Regulations Part 91. The aircraft held an FAA Experimental certificate of airworthiness.

This was the fifth flight of N83AU. The flight was conducted on/over KHEF Runway 34L with the aircraft take-off, forward translation, and landing all occurring directly over the runway. According to the operator, all required parameters were within the prescribed nominal ranges, and after final checks and clearances, the aircraft was commanded to LAUNCH. After proceeding through a portion of the planned flight test maneuvers and while the aircraft was in a stable hover, the decision to land was made, and AUTOLAND was commanded. Approximately two seconds into the AUTOLAND process, all eight lift motors ceased to operate; resulting in the complete loss of lift and the aircraft impacting the runway.

2. Probable Cause and Findings

The operator determined the probable cause of the accident to be a loss of hover lift thrust provided by the eight lift motors due to a commanded rotor speed reduction from an implemented autopilot logic. Contributing to the accident was a vibrational excitation environment which exceeded the previously measured accelerations used to establish an autopilot ground-sensing threshold. The excessive oscillations activated the ground-sensing system, which transitioned the autopilot from Autoland into "ground" mode and commanded a reduction in rotor speed.

2.1. Findings

Aircraft	Autoland Logic (cause)
	Vibration Excitation (factor)

3. Factual Information

3.1. History of Flight

Autoland	Lift motor speed reduction and loss of lift (defining event)

3.2. Pilot Information

Certificate:	Commercial	Age:	46
Airplane Rating(s):	Airplane Single Engine Land;		

Remote Pilot (Part 107) Seat Occupied: Remote

Other Aircraft Rating(s): Rotorcraft-Helicopter; Airplane Multiengine Land Restraint Used: N/A

Instrument Rating(s): Instrument, Airplane and Helicopter Second Pilot Present: N/A

Instructor Rating(s): Certified Flight Instructor, Rotorcraft-Helicopter, Single and Multiengine; Certified Flight Instructor, Instrument, Airplane and Helicopter Toxicology Performed: N/A

Medical Certification: Class II, no limitations Last FAA Medical Exam: 3/11/19

Occupational Pilot: Yes Last Flight Review or Eqv: 9/27/18

Flight Time:

Flight Time *(Enter appropriate number of hours in each box)*	All Aircraft	This Make & Model	Airplane Single Engine	Airplane Multiengine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	3,500	1	120	50	1,200	292	412	3,300	1	
Pilot in Command (PIC)	1,700	1								
Time as Instructor	500									
This Make/Model										
Last 90 Days	2									
Last 30 Days	1	1								
Last 24 Hours	1	1								

3.3. Aircraft and Owner/Operator Information

Aurora Flight Sciences Corporation
9950 Wakeman Drive
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3.4. Meteorological Information and Flight Plan

Summary: At 1024Z ASOS Report – Winds calm (Aircraft initial heading was 329, aligned with Runway 34L), Vis 10 sm, Clear, Temperature 8 deg C, Dew Point 7 deg C (96%), Altimeter setting 30.19 inHg, calculated DA was -796 ft (Aircraft altitude was 182ft at takeoff point). The onsite anemometer reported winds calm. Calculated DA from the 1056Z Metar is -676 ft.

Departure Point:	KHEF	Type of Flight Plan Filed:	None
Destination:	KHEF	Type of Clearance:	VFR
Departure Time:	0708 EDT	Type of Airspace:	Class D

3.5. Airport Information

Manassas Regional Airport/Harry P. Davis Field, Manassas, Virginia. (KHEF)

Lat/Long: 38-43-15.6831N / 077-30-54.3643W
38-43.261385N / 077-30.906072W
38.7210231 / -77.5151012
(estimated)
Elevation: 192.3 ft. / 58.6 m (surveyed)
Variation: 10W (2000)
From city: 28 miles WSW of WASHINGTON, DC
Time zone: UTC -4 (UTC -5 during Standard Time)
Zip code: 20110

3.6. Wreckage and Impact Information

Crew Injuries:	N/A	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	N/A
Ground Injuries:	N/A	Aircraft Explosion:	N/A
Total Injuries:	N/A	Latitude, Longitude:	See 3.5 above

N83AU exhibits significant damage from the hard landing. Structural damage evident on the booms, horizontal tail, vertical tails, and warping of the main aircraft structure. The two aft-most lift motors and the associated aft section of booms were separated from the main booms (a) as well as the (4) landing gear noted as (b). It is improbable to cost effectively restore N83AU to flight test status. (Simplified illustration for clarity):