Aviation Investigation Final Report

Location:	West Palm Beach, Florida	**Accident Number:**	ERA21LA011
Date & Time:	October 8, 2020, 11:15 Local	**Registration:**	N8132Q
Aircraft:	Cessna 414	**Aircraft Damage:**	Substantial
Defining Event:	Runway excursion	**Injuries:**	7 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The copilot, who was seated in the right seat, reported that after an uneventful run-up and taxi, the pilot, who was seated in the left seat, initiated the takeoff. The airplane remained on the runway past the point at which takeoff should have occurred and the copilot observed the pilot attempting to pull back on the control yoke but it would not move. The copilot then also attempted to pull back on the control yoke but was also unsuccessful. Observing that the end of the runway was nearing, the copilot aborted the takeoff by reducing the throttle to idle and applying maximum braking. The airplane overran the runway into rough and marshy terrain, where it came to rest partially submerged in water.

Postaccident examination of the airplane and flight controls found no evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation. Specifically, examination of the elevator flight control rigging, in addition to functional checks of the elevator, confirmed continuity and normal function. Additionally, the flight control lock was found on the floor near the rudder pedals on the left side of the cockpit. Due to a head injury sustained during the accident, the pilot was unable to recall most of the events that transpired during the accident. The pilot did state that he typically removed the control lock during the preflight inspection and that he would place it in his flight bag. He thought that a shoulder injury may have led to the control lock missing the flight bag, and why it was found behind the rudder pedals after the accident.

Review and analysis of a video that captured the airplane during its taxi to the runway showed that the elevator control position was similar to what it would be with the control lock installed. While the pilot and copilot reported that they did not observe the control lock installed during the takeoff, the position of the elevator observed on the video, the successful postaccident functional test of elevator, and the unsecured flight control lock being located behind the

pilot's rudder pedals after the accident suggest that the control anomaly experienced by the pilots may have been a result of the control lock remaining inadvertently installed and overlooked by both pilots prior to the takeoff.

According to the airframe manufacturer's preflight and before takeoff checklists, the flight control lock must be removed during preflight, prior to engine start and taxi, and the flight controls must be checked prior to takeoff. Regardless of why the elevator control would not move during the takeoff, a positive flight control check prior to the takeoff should have detected any such anomaly. It is likely that the pilot failed to conduct a flight control check prior to takeoff. Further, the pilot failed to abort the takeoff at the first indication that there was a problem. Although delayed, the copilot's decision to take control of the airplane and abort the takeoff likely mitigated the potential for more severe injury to the occupants and damage to the airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's inadequate preflight inspection during which he failed to detect a flight control abnormality, and his failure to expediently abort the takeoff, which resulted in the co-pilot performing a delayed aborted takeoff and the subsequent runway overrun.

Findings

Aircraft	Elevator control system - Inadequate inspection
Personnel issues	Preflight inspection - Pilot
Personnel issues	Lack of action - Pilot

Factual Information

History of Flight

Takeoff-rejected takeoff	Runway excursion (Defining event)
Takeoff-rejected takeoff	Collision with terr/obj (non-CFIT)

On October 8, 2020, about 1115 eastern daylight time, a Cessna 414, N8132Q, was substantially damaged when it was involved in an accident at North Palm Beach County General Aviation Airport, (F45) West Palm Beach, Florida. The two private pilots and five passengers sustained serious injuries. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

According to the multiengine-rated private pilot seated in the right front seat (copilot), after engine start and taxi, the pilot performed a runup and did not notice any irregularities. As the pilot taxied the airplane onto the runway for takeoff, the copilot checked the takeoff trim setting, which gave him a clear view of the pilot's control yoke and he did not notice the presence of the control lock. The pilot then applied the brakes and advanced the throttles to full power. Once at full RPM, the pilot released the brakes, and they began the takeoff roll. Shortly into the takeoff roll, the copilot felt a "slight shudder," which appeared to come from the controls, but it only lasted for a moment. As they continued down the runway, he realized they should have rotated for liftoff; he observed the airspeed indicator, and they were about 10 to 15 mph past "blueline" (119 mph), but the airplane remained on the runway and continued to accelerate. The copilot looked at the pilot, who was looking down at the controls and trying to determine why he was unable to move the control yoke. The copilot attempted to pull back on the control yoke as well, but the controls would not move. He aborted the takeoff by pulling the throttles to idle and applying maximum braking. He estimated they were doing between "120 and 130 knots" when the takeoff was aborted.

The airplane came to rest about 450 ft beyond the departure end of runway 14. Two distinct tire skid marks for the left and right main landing gear were visible departing the right side of the runway adjacent to the numbers of runway 32. The tire marks continued through the grass and mud for 575 ft before the airplane impacted the mound with the right wing. The airplane spun around and came to rest nose down in a marshy area and was partially submerged in about 5 ft of water. The fuselage, wings, and empennage sustained substantial damage.

The pilot reported he performed the preflight, taxi, and runup according to the checklist and there was nothing unusual. The pilot further stated that he always removes the control lock per the checklist and that, when the flight controls appeared jammed during the accident takeoff roll, he looked down and observed that there was no control lock in place. He also stated that when he removes the control lock, he puts it in his flight bag but that a shoulder injury may

have led to the control lock missing the flight bag and that's why the control lock was found behind the rudder pedals. Due to his head injury, he remembered no additional details about the accident.

During a follow-up interview, when asked the copilot stated he could not recall if the pilot left the control lock installed during preflight, or whether the pilot may have attempted to remove it during the takeoff roll.

During impact, the stabilizer/elevator assembly was torn from its attachments, but both sides (left and right) remained attached to their respective locations and the elevator control rigging was intact and operational. The control lock holes for both left and right sides yokes had no signs of elongation or damage. Examination of the elevator flight control rigging in addition to functional checks of the elevator confirmed continuity and functionality of the elevator. No pre-impact anomalies with the airframe or flight controls were noted during the examination.

The control lock was located on the left side of the cockpit under the far-left rudder/brake pedal and showed no signs of damage. The control lock was about 12 inches long and consisted of a metal rod in a "seven" shape that slid into the control yoke on one end and on the opposing end there was a red and yellow streamer attached.

Witness and airport surveillance videos were sent to the NTSB Vehicle Recorders division for a detailed video study. The witness video showed the airplane as it began to taxi on the ramp. Still images captured from the video show the elevator was in the trailing-edge-down position with the elevator horns above the horizontal stabilizer. An exemplar airplane with a control lock installed was used for reference and showed the elevator in a trailing-edge-down position with the elevator horns above the horizontal stabilizer surface. The accident airplane's exact elevator position, although similar to the exemplar airplane with a control lock installed, could not be calculated from the still images (see figure 1).

Figure 1 – Still frame from video footage of the accident airplane's elevator during taxi (left) compared to the elevator on an exemplar airplane with a control lock installed (right).

Footage from a third video showed the airplane as it accelerated down the runway. A review of all three videos determined that the airplane was accelerating through 100 knots with about 1,800 ft (of a total 4,300 ft) of runway remaining. Airport security camera footage showed the airplane proceeding down the last third of the runway as it departed the right side of the paved surface before colliding with a dirt mound and disappearing out of view

Airplane performance data indicated that the airplane should have taken off at 2,185 ft down the 4,300 ft long runway. The weight and balance of the airplane were within center of gravity and weight limitations.

According to the manufacturer's preflight checklist and before takeoff checklist, the flight control lock must be removed prior to engine start, and the flight controls must be checked prior to takeoff.

Pilot Information

Certificate:	Private	**Age:**	70,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	April 14, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	December 6, 2019
Flight Time:	1987 hours (Total, all aircraft), 897 hours (Total, this make and model), 1926.6 hours (Pilot In Command, all aircraft), 32.6 hours (Last 30 days, all aircraft)		

Co-pilot Information

Certificate:	Private	**Age:**	36,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 None	**Last FAA Medical Exam:**	November 13, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	149.3 hours (Total, all aircraft), 5.6 hours (Total, this make and model), 115.6 hours (Pilot In Command, all aircraft), 23 hours (Last 90 days, all aircraft), 10.7 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8132Q
Model/Series:	414	**Aircraft Category:**	Airplane
Year of Manufacture:	1997	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	414-0032
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	August 27, 2020 Annual	**Certified Max Gross Wt.:**	6550 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	6377 Hrs as of last inspection	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520
Registered Owner:		**Rated Power:**	310 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PBI,21 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	10:53 Local	**Direction from Accident Site:**	146°
Lowest Cloud Condition:	Scattered / 3100 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	29°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	West Palm Beach, FL	**Type of Flight Plan Filed:**	IFR
Destination:	Claxton, GA (CWV)	**Type of Clearance:**	Unknown
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	North Palm Beach County General Aviation Airport West Palm Beach, F45	**Runway Surface Type:**	Asphalt
Airport Elevation:	22 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	14	**IFR Approach:**	None
Runway Length/Width:	4300 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	5 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	7 Serious	**Latitude, Longitude:**	26.840489,-80.217183

Preventing Similar Accidents

Flight Control Locks

Accidents have occurred after pilots omitted seemingly obvious procedures, such as removing flight control locks and performing flight control checks before takeoff. Errors of omission are frequently associated with interruptions, distractions, time pressures, divided attention, and complacency about standard operating procedures (SOPs).

Pilots of all experience levels should follow SOPs and use checklists, which serve as a memory aid to help counteract human performance vulnerabilities. Do not rely on memory alone.

Procedural omissions are common in many types of accidents, including those involving gear-up landings, fuel starvation, incorrect fuel pump settings, and flap misconfigurations.

Pilots should be prepared to abort the takeoff if something does not seem right. When a pilot is confronted with a sudden, abnormal event, responses are more likely to be delayed or inappropriate. Having a plan will help reduce reaction time and can result in a safer response.

When flying alone, reading the checklist aloud and touching the applicable switch or control can ensure each checklist item is accomplished. Research has shown that touching an object while verbally communicating enhances the probability that an activity has been accomplished.

Avoid using improvised control lock devices that may be inconspicuous and easily overlooked during preflight checks.

See http://www.ntsb.gov/safety/safety-alerts/documents/SA_048.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Mccarter, Lawrence		
Additional Participating Persons:	Juan Garcia; FAA ; Orlando, FL Richardo Asenio; Textron; Wichita, KS		
Original Publish Date:	December 7, 2022	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=102116		