

ACCIDENT

Aircraft Type and Registration:	Robinson R44 II Raven II, G-LLIZ	
No & Type of Engines:	1 Lycoming IO-540-AE1A5 piston engine	
Year of Manufacture:	2008 (Serial no: 12140)	
Date & Time (UTC):	2 October 2019 at 1058 hrs	
Location:	Sherburn-in-Elmet Airfield, Yorkshire	
Type of Flight:	Training	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1	Passengers - N/A
Nature of Damage:	Beyond economic repair	
Commander's Licence:	Student	
Commander's Age:	34 years	
Commander's Flying Experience:	47 hours (of which 2 were on type) Last 90 days - 8 hours Last 28 days - 5 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

A student pilot was on a solo circuit sortie as part of his PPL course. After landing from the third circuit, the pilot noticed that his jacket, which had been secured on the left seat, had moved. In attempting to retrieve the jacket, it is likely that the pilot inadvertently raised the left collective lever. The helicopter pitched up, yawed to the left and rolled onto its right side. The pilot was able to vacate the helicopter but suffered a head injury in the accident.

History of the flight

The pilot arrived at the airfield to complete a solo circuits flight as part of his PPL training. He was briefed by the supervising instructor and, having completed the external and internal checks on G-LLIZ, he proceeded to start the engine. Whilst the engine was warming up post-start up, the pilot removed his jacket and placed it onto the left seat of the helicopter, using the seat belt to secure it. He also decided to open both the side vents and the nose vent as the carbon monoxide light had illuminated. This is not unusual when the helicopter engine is running for a period whilst stationary. Opening the vents increased the air movement in the cockpit and the light extinguished. Having completed the pre-takeoff checks, the pilot lifted into the hover and proceeded to the centre of the airfield to depart for his first circuit.

After landing off the third circuit the pilot realised that his jacket had moved on the front left seat so that it was now resting next to the open vent in the front left door. The pilot

was aware of the risks of items striking the tail rotor when sucked out through the open vent in flight so before commencing his fourth circuit he reached out to retrieve the jacket¹. Although the pilot does not recall the exact sequence of events, it is likely that the jacket was caught around the left collective lever. As he pulled the jacket, it raised the lever which increased the pitch on the blades and caused the helicopter to pitch nose up. This increase in pitch caused the rear tail stinger to contact the ground. The helicopter then yawed to the left before rolling right, coming to rest on its right side. The sequence is illustrated using snapshots taken from the airfield CCTV shown in Figures 1 to 7.



Figure 1

G-LLIZ begins to pitch nose up



Figure 2

The tail stinger contacts the ground

Footnote

¹ Robinson Helicopters Safety Notice SN-30 warns about the risks associated with loose objects in the cabin. Available: https://robinsonheli.com/wp-content/uploads/2015/12/rhc_sn30.pdf [accessed March2020]



Figure 3
G-LLIZ begins to yaw to the left



Figure 4
G-LLIZ yaws to the left and begins to roll right



Figure 5
First blade impacts the ground



Figure 6
Second blade impact



Figure 7
G-LLIZ comes to rest on its right side

The pilot was able to vacate the helicopter via the left door although he had suffered a head injury. The helicopter was damaged beyond economic repair. Figure 8 shows G-LLIZ after the accident.



Figure 8
G-LLIZ after the accident

Aircraft details

The R44 is designed with a centre mounted cyclic control, a collective lever to the left of each front seat, and a set of tail rotor pedals for each front seat. The collective levers also have a twist-grip throttle fitted. The left seat controls may be removed. Although the pilot was flying the helicopter solo, dual controls remained fitted to G-LLIZ. The manufacturer's standard practice is for the controls to remain fitted unless there is to be a person occupying the left seat who is not a rated helicopter pilot. The manufacturer does not suggest removing the dual controls for student solo sorties. Cyclic and collective controls are fitted with adjustable friction devices. These devices allow the pilot to adjust the amount of force which is required to move the controls. There is no friction device fitted to the tail rotor pedals.

The main rotor is two-bladed with a teetering head. The manufacturer states in the pilots' operating handbook that pilots should not raise the collective to slow the rotor during shutdown as this might cause the blades to '*flap and strike the tailcone*'. If the throttle is at idle and the pilot raises the collective, the energy of the blades may not be sufficient to retain them in their normal range as their pitch increases and it is possible that they may flap beyond the limit, with the retreating blade striking the tailcone.

The aircraft checklist requires that all loose articles are removed and stowed as part of the pre-flight checks although the pilot of G-LLIZ removed his jacket after this checklist was complete.

Dynamic rollover

Dynamic rollover is caused when a landing gear wheel or skid is in contact with a fixed object or the surface which stops the wheel or skid moving sideways. The helicopter can then begin to rotate about the wheel or skid and eventually the helicopter's critical rollover angle is reached, which will be different for each helicopter type. Once this angle is reached the main rotor thrust will continue the roll and the situation is no longer recoverable. The application of opposite cyclic will not stop the roll and only rapidly lowering the collective as the helicopter begins to pivot may stop the roll before the critical angle is reached.

Analysis

In reaching to the left side of the cockpit to retrieve his jacket, the pilot did not realise that the jacket had become caught around the left collective lever. As he pulled the jacket, it raised the collective increasing the pitch on the rotor blades and causing the helicopter nose to pitch up. It is possible that his body position as he reached across the cockpit caused an inadvertent application of left pedal which also caused the helicopter to yaw. As the helicopter was in contact with the ground, this yaw caused the skids to catch on the surface, generating a right roll from which there was ground contact.

The pilot was looking inside the helicopter when the movement began, and he had little chance to notice and stop the movement before it went past a point where recovery was possible. Only lowering the collective rapidly could have prevented the roll once the

helicopter had begun to pivot about its skids. Although there are friction devices fitted to the cyclic and collective controls, the pilot did not apply them as he was in the middle of a flight and was planning to takeoff shortly after retrieving his jacket. It is possible that the application of the friction devices might have prevented the left collective being pulled up by the jacket. Pilots should always consider the use of the friction devices should they need to move around in the cockpit for any reason when on the ground.

Had the pilot used the twist-grip throttle on the collective lever to reduce the engine rpm and rotor rpm before moving around the cockpit, it is possible that when the collective was inadvertently raised the main rotor would have flapped, contacting the tailcone. This would likely have resulted in a very similar level of damage to the helicopter.

The helicopter manufacturer includes a check for loose items as part of the pre-flight checklist although the pilot removed his jacket after completing this part of the checklist. All loose articles can be a danger in a helicopter or aircraft at any stage of the flight, and pilots should stow belongings or equipment securely. It is best to ensure that the pilot and any passengers are comfortable with their clothing before the flight begins.

Conclusion

An innocuous reach to retrieve a jacket from where it had moved began a sequence of events that led to the helicopter coming to rest on its right side and being damaged beyond economic repair. Whenever a helicopter is stationary on the ground, with the pilot attending to items inside the cockpit, things can rapidly occur that lead to an incident or accident without the pilot being alerted because they may not be looking outside the cockpit. The whole accident sequence of G-LLIZ took just four seconds. Ensuring that all items inside the cockpit are secure and that the pilot and any passengers are comfortable for the flight are essential for minimising the risk of such an event occurring.