Accident

Aircraft Type and Registration:	Robinson R22 Beta, G-KKRN	
No & Type of Engines:	1 Lycoming O-320-B2C piston engine	
Year of Manufacture:	1989 (Serial no: 1201)	
Date & Time (UTC):	3 February 2025 at 1700 hrs	
Location:	Near Wokingham, Berkshire	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Empennage detached, significant damage to fuselage and rotors	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	1,580 hours Last 90 days - 97 hours Last 28 days - 27 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

At approximately 800 ft agl while approaching White Waltham, the trainee pilot inadvertently moved the fuel mixture control to the LEAN position instead of selecting the carburettor heating (carb heat) ON. The selection of LEAN caused the engine to stop. After immediately taking control, the instructor established the helicopter in autorotation but did not have sufficient time and height available to initiate an engine restart. While the helicopter experienced a partial rollover on landing, neither pilot was injured in the accident.

The risk of misidentification of the mixture control when selecting carburettor heating in the Robinson R22 Beta (R22) was first formally documented by the manufacturer in January 1981. The instructor was aware of the mis-selection risk and had briefed his student on the correct operation of the controls before the accident flight.

This accident is a reminder that, while risks can be identified and mitigated, the limitations of human performance mean lapses leading to risks maturing cannot be completely eradicated.

History of flight

The accident occurred on an R22 conversion course for a pilot who was already qualified on the Guimbal Cabri G2 (G2) helicopter type[1]. On the morning of 3 February the trainee satisfactorily completed a general handling/familiarisation flight in G-KKRN.

The syllabus for the second flight included simulated emergency handling, engine out training and practice autorotations. Before flight the instructor briefed the trainee on all aspects of the exercises to be undertaken, including the risk of carburettor icing and the appropriate use of carburettor heating. On both flights, the trainee occupied the right seat and carried out the full start sequence, including checking the correct operation of the carburettor heating system.

The flight progressed as planned until the aircraft was being positioned to rejoin the circuit at White Waltham. Shortly after passing visual reporting point Sierra (M4 Junction 10) the instructor asked the trainee to descend to circuit joining height. He initially began descending without selecting carburettor heating ON so the instructor asked him to level off and reminded him of the need to select carburettor heating before entering a descent. The trainee was then instructed to continue the approach and descend. At this point, the trainee reached down and pulled what he thought was the carb heat control but was actually the mixture control. Realising his mistake, he called that he had "pulled the fuel" at which point the engine rpm was dropping rapidly. The instructor immediately took control and entered autorotation from approximately 800 ft agl.

Once autorotation had been established the instructor asked the trainee to push the mixture control back down to the fully rich position, the intent being to try an engine restart if time allowed. Having established the autorotation as his immediate priority, the instructor then focused on field selection. With the M4 motorway to his right, and trees and powerlines to his left, the only viable option was the ploughed field ahead. At this stage there was not enough height left to consider a restart, therefore the instructor concentrated on executing an engine-off landing at the slowest possible forward airspeed. He assessed that the helicopter was travelling at less than 5 kt when he levelled the skids just prior to ground contact. As the skids touched down, they dug into the soil and the helicopter tipped forward onto its nose before "gently" rolling to the right. During the period immediately after ground contact the main rotors struck the rear empennage, which detached from the helicopter and was thrown forward of the wreckage.

Neither pilot was injured in the accident, and both were able to self-evacuate through the left door (Figure 1).

Footnote

[1] He held a PPL(H) and had completed approximately 106 hours flying on the G2.

Figure 1

G-KKRN after the accident (image courtesy Thames Valley Police)

Aircraft description

G-KKRN is an R22 Beta, powered by the Lycoming O-320, a normally aspirated engine with manually operated carburettor heating[2]. The carburettor heating control is located on the centre console aft and right of the cyclic stick boot (Figure 2).

The mixture control is positioned directly forward of the carb heat control, close to the bottom of the lower instrument panel and to the right of the PULL RT TRIM control (Figure 2). It is coloured red rather than black and has a different physical shape to the carburettor heating control. On top of the mixture control is a friction release button which, when pressed, allows the control to be moved. During the before start checks the mixture control is set to the FULL RICH position (fully down) and a plastic tubular guard is placed around the stem of the control. In normal operation, the mixture remains at FULL RICH until the after-landing shutdown checks when it is pulled upwards to the OFF position to stop the engine.

Footnote

[2] The R22 Beta II variant is powered by the Lycoming O-360 engine which has an automatically operated carb heat system. The G2 is also equipped with the O-360 engine featuring automatic carb heat operation.

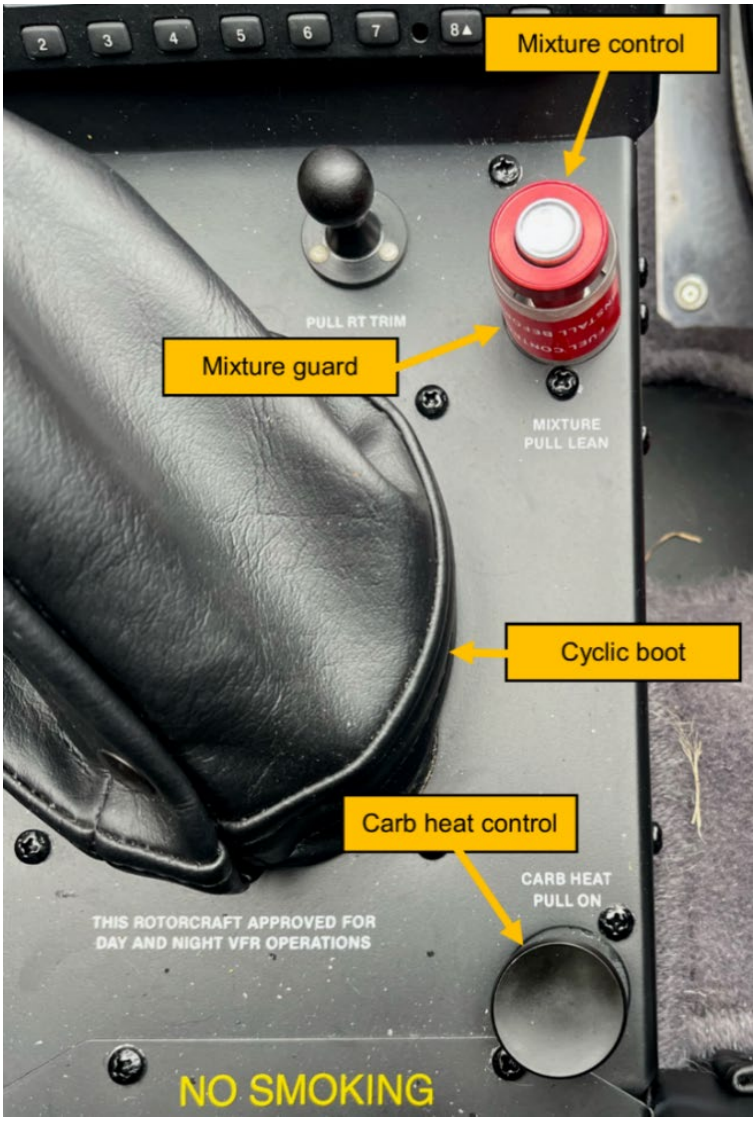


Figure 2

Centre console controls

The mixture guard is a tactile physical barrier intended to reduce the risk of inadvertent mixture operation during flight. It is common practice for pilots to remove the guard when intentionally operating the mixture control. Some pilots temporarily stow it over the adjacent trim selector (Figure 3 (left)) before returning it to the mixture control on completion of the selection. It is possible to dislodge the guard with the control in the FULL RICH position if a pilot slides their index and middle finger under the mixture control and applies upward pressure (Figure 3 (right)).

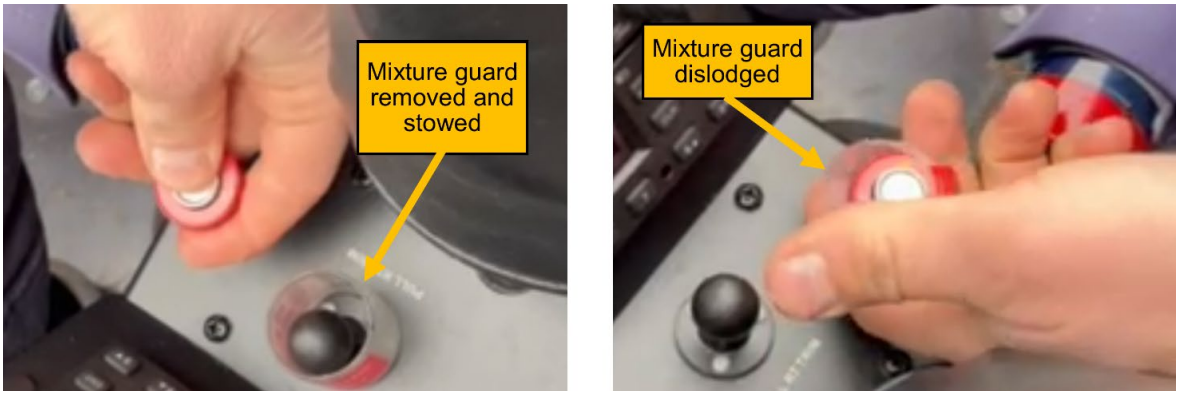


Figure 3

Mixture control guard removed and stowed (left) and dislodged (right)

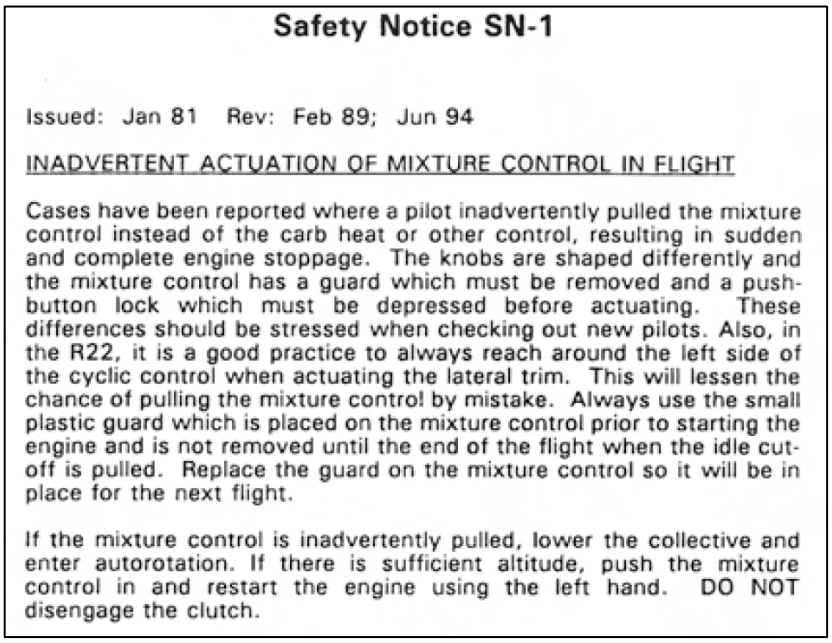
Inadvertent operation of the mixture control has been an identified risk for the R22 type for many years and was the subject of the manufacturer's Safety Notice SN-1, first published in January 1981 (Figure 4). This safety notice is further reproduced in Section 10 of the official R22 pilot's operating handbook published online[3]. The manufacturer's Operational Suitability Data document (OSD)[4] '*provides the requirements for pilot training, checking, and currency specific to the R22 type rating.*' Section 5.7 of the OSD lists '*Training Areas of special emphasis (TASE)*' which training providers are required to comply with. The manufacturer explained that including the inadvertent actuation of the mixture control in the TASE had previously been considered and rejected. After a further review following this accident, they explained that:

> *'From a review of accident reports, the frequency of occurrence of accidents caused by inadvertent actuation of the mixture control is still relatively low compared to other accident causes also addressed in the Robinson Safety Notices and not included in the TASE. Furthermore, each additional TASE item dilutes the level of emphasis for existing items. Consequently, a revision to the TASE to include inadvertent actuation of the mixture control does not appear to be justified at this time.'*

While not specifically referring to the potential for inadvertent mixture selection, the TASE states that it '*should be read in conjunction with the R22 POH, Robinson Safety Notices and the Robinson Maneuver* [sic] *Manual found with the R22/R44 Flight Training Guide.'*

Footnote

[3] Available at R22 Pilot's Operating Handbook [accessed 15 May 2025].
[4] Operational Suitability Data (OSD) Flight Crew R22 RTR 165 December 2024. Available at RTR 165 Operational Suitability Data - Flight Crew, Rev. 2 [accessed 15 May 2025].



Safety Notice SN-1

Issued: Jan 81 Rev: Feb 89; Jun 94

INADVERTENT ACTUATION OF MIXTURE CONTROL IN FLIGHT

Cases have been reported where a pilot inadvertently pulled the mixture control instead of the carb heat or other control, resulting in sudden and complete engine stoppage. The knobs are shaped differently and the mixture control has a guard which must be removed and a push-button lock which must be depressed before actuating. These differences should be stressed when checking out new pilots. Also, in the R22, it is a good practice to always reach around the left side of the cyclic control when actuating the lateral trim. This will lessen the chance of pulling the mixture control by mistake. Always use the small plastic guard which is placed on the mixture control prior to starting the engine and is not removed until the end of the flight when the idle cut-off is pulled. Replace the guard on the mixture control so it will be in place for the next flight.

If the mixture control is inadvertently pulled, lower the collective and enter autorotation. If there is sufficient altitude, push the mixture control in and restart the engine using the left hand. DO NOT disengage the clutch.

Figure 4

Manufacturer's Safety Notice SN-1

Analysis

This accident resulted from the misidentification of a critical control by a qualified pilot who was inexperienced on type. The risk of misidentification was first formally documented by the manufacturer in January 1981. The instructor was aware of the mis-selection risk and had briefed his student on the correct operation of the controls before the accident flight. Nonetheless, the student's instinctive action, to operate the carburettor heating without first visually identifying the control, managed to overcome the safety barrier of the mixture guard and resulted in an unintended engine shutdown. With little time and height available to restart the engine, the instructor focused on establishing safe autorotation parameters. The instructor considered that, had the available touchdown location been on firmer ground the landing would have been completed without damage.

AAIB observation

This accident is a reminder that, while risks can be identified and mitigated, the limitations of human performance mean lapses leading to risks maturing cannot be completely eradicated. Faced with a challenging, unexpected and time-critical situation, the instructor appropriately prioritised establishing and flying the helicopter in autorotation ahead of attempting a restart.