

## Robinson R22 Beta, G-WRLY

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| <b>AAIB Bulletin No: 10/2003</b>       | <b>Ref: EW/G2003/05/02</b>   | <b>Category: 2.3</b> |
| <b>Aircraft Type and Registration:</b> | Robinson R22 Beta, G-WRLY  |                      |
| <b>No &amp; Type of Engines:</b>       | 1 Lycoming O-320-B2C piston engine   |                      |
| <b>Year of Manufacture:</b>            | 1987   |                      |
| <b>Date &amp; Time (UTC):</b>          | 4 May 2003 at 1209 hrs   |                      |
| <b>Location:</b>                       | Cranfield Airport, Bedfordshire  |                      |
| <b>Type of Flight:</b>                 | Training   |                      |
| <b>Persons on Board:</b>               | Crew - 1   | Passengers - None    |
| <b>Injuries:</b>                       | Crew - 1 (Minor)   | Passengers - N/A     |
| <b>Nature of Damage:</b>               | Substantial damage to the main rotor system, transmission, fuselage and engine |                      |
| <b>Commander's Licence:</b>            | Student Pilot  |                      |
| <b>Commander's Age:</b>                | 33 years   |                      |
| <b>Commander's Flying Experience:</b>  | 53 hours (all on type)   |                      |
|  | Last 90 days - 8 hours   |                      |
|  | Last 28 days - 1 hour  |                      |
| <b>Information Source:</b>             | Aircraft Accident Report Form submitted by the pilot                           |                      |

### History of Flight

The student pilot had been authorised to carry out the pre-flight checks, start the aircraft, as he had done on over 30 previous occasions, and wait for his instructor to join him. Having engaged the rotors and accelerated them to 100% RPM, he was checking that the low RPM horn and caution light came on as the RPM decreased through 97%. To achieve this the pilot had to raise the collective lever slightly before reducing the amount of throttle because the horn and caution light are disabled with the collective lever in the fully down position. The pilot stated that he followed this procedure with the cyclic and collective frictions 'ON' and the governor 'OFF'.

Having decreased the RPM to 90% the horn and caution light had still not activated. The pilot lowered the collective and opened the throttle to regain 100% RPM. Suspecting that he may not have raised the collective sufficiently, the pilot decided to repeat the procedure. He again raised the collective and started to reduce the amount of throttle. As the RPM was approaching 97% the pilot noticed that the aircraft had begun to rotate, as he recalls, in an anticlockwise direction and he visually checked the position of the yaw pedals to ensure that the rotation was not the result of an input by him. He observed that the yaw pedals were centralised. By this stage the rate of rotation had increased and the pilot became aware that the aircraft was lifting off the ground. In what he described as a rapid sequence of events, the aircraft span round three or four times, lifted into a two foot hover

and, as he attempted to lower the collective, rolled right and descended on to the ground coming to rest on its right side. The pilot heard the low RPM horn sounding and noticed fuel spilling on to the apron from behind his right shoulder. He switched off the fuel shut off valve and the master switch and exited the aircraft through the left door. He had suffered minor injuries but there was no fire.

ATC became aware of the accident when they were advised by the pilot of a single engine light aircraft which was carrying out engine checks prior to takeoff. This pilot did not see the accident occurring, only the aftermath.

The accident was witnessed by a passenger in a helicopter which was hover taxiing towards the apron where the R22 was starting up. She recalled seeing the R22 on the ground facing the hangar building. With its skids still on the ground, the R22 started to rotate in a clockwise direction at an increasing rate. It span round two and a half times and then lifted into an estimated 10-foot hover. It was then seen to rotate while haphazardly pitching forwards and backwards and rolling left and right in a 'shaking and snaking' fashion. It then lifted a bit further before appearing to lose energy and, simultaneously, fall and roll onto the ground on its right side. The pilot of the witness's helicopter did not have a clear recollection of the accident because his concentration was devoted to manoeuvring his aircraft away from the vicinity of the R22.

The weather was warm and dry with the surface wind from 160° at 13 kt. The aircraft was on a heading of approximately 240° when it was starting up on the apron.

### **Procedures**

The last three items in the '*STARTING ENGINE AND RUN UP*' checklist in the Manufacturer's Pilot's Operating Handbook (POH) are:

*Cyclic/Collective friction Off*  
*Governor On RPM 102-104%*

*Lift collective slightly, reduce RPM Horn/Light at 97%*The POH also contains a CAUTION, reproduced below, to the '*STARTING ENGINE AND RUN UP*' checklist. It states:

*On slippery surfaces, be prepared to counter nose right rotation with left pedal as governor increases RPM*

The Operator's procedure for the low RPM check stipulated that the cyclic and collective frictions were to be ON and the governor OFF.

### **Analysis**

With sufficient torque being generated to enable the aircraft to lift off the ground, the aircraft would have tended to yaw to the right (clockwise), unless an input was made on the left yaw pedal. No such control input was reported. The surface wind was from the left and that would have helped to counter, but not overcome, this tendency, by virtue of the weather-cocking effect. Therefore, it is likely that, with the yaw pedals in the central position, the aircraft rotated to the right, as witnessed by the external observer in the R44 helicopter.

With the collective lever friction applied, the pilot's ability to make fine inputs and lift the lever slightly during the low RPM procedure would have been degraded. Once the aircraft had become light on its skids and started to rotate, the fact that both frictions were applied would have severely restricted his ability to control the aircraft. Allied to this, with the governor 'OFF', the rotor RPM would have been under the direct control of the pilot through the twist grip throttle, again increasing his workload once the aircraft had started to lift off the ground.

The pilot concluded that, because the collective lever friction was applied tightly, he may not have lowered the lever fully after the first attempt to check the low RPM horn and caution light. When he repeated the procedure he thought it possible that he could have raised the collective a sufficient amount to make the aircraft light on its skids, enabling it to rotate. The pilot also remarked that

having the collective and cyclic control frictions applied tightly made control of the aircraft very difficult when it started to rotate and lift off the ground.

Since the reasons why the pilot had difficulty in maintaining and regaining control of the helicopter stemmed from the friction applied to the collective and cyclic controls, it is recommended that the Operator amends his procedures for the Low RPM check, after engaging the rotors, to reflect the manufacturer's procedure.

The Operator has since amended his STARTING ENGINE procedures to include a radio call from the pilot to ATC to request clearance to start, so that ATC are more aware of the activities on the apron.

**Safety Recommendation 2003-74**

It is recommended that Patriot Aviation amend their procedure for checking the Low RPM Horn and Caution Light during the STARTING ENGINE checks to reflect Robinson Helicopter Company's procedure, for the same check, in the R22 Pilot's Operating Handbook.