

To: Zoe Keliher, NTSB

Subject: Throttle/collective correlator and RPM governor testing – R44 SN 11294, 10 November 2022.

RHC has done some recent testing to better understand the throttle/collective correlator and RPM governor system's behavior. The tests were flown at approximately 1000 feet, and were recorded by the RHC cockpit camera. While the view is broad, it is easy to see the engine/rotor tachometer, the manifold pressure gauge, and the collective throttle twist grip, particularly if the video is zoomed in. (We put a strip of white tape on the twist grip, to act as an indicator of the collective twist grip position). The idle RPM and throttle correlator rigging were checked and found to be correct just prior to the flight.

On a production Raven II, with a gross weight of approximately 2200 pounds, flying at 100 knots, RHC performed the following: the pilot rapidly lowered collective, while holding his hand off of the throttle twist grip on the collective, to allow the governor to make corrections to the system. (The pilot's hand was not touching the twist grip at all, he was only holding the collective stick). The engine and rotor RPM did not drop any noticeable amount, the engine and rotor RPM climbed a little bit since the rotor was unloaded during autorotation. The video shows the governor system making small corrections to the throttle as the collective was being raised back up, to prevent the engine RPM from going too high. We then had the pilot rapidly lower the collective while gripping the collective twist grip to prevent the governor from making any corrections to the system, so that the throttle arm movement at the fuel control servo was controlled only by the action of the collective/throttle correlator. The engine RPM dropped down to approximately 96 or 97%, the needles split a little bit – the rotor RPM was just under 100%. The governor was trying to make corrections to the throttle to keep the RPM at 102%, but the pilot over-rode it.

Next, we had the pilot perform the type of autorotation that is done during training – the throttle is rolled off as the collective is lowered, to make sure the needles split/the sprag clutch disengages so the rotor is truly in autorotation. The pilot continues to grip the throttle tightly after rolling the throttle off, over-riding the governor. In this test the engine RPM went down to about 85% and remained stable, the rotor RPM went down to about 90% and was stable. The engine RPM remained high enough that the governor did not shut off (the governor stays active as long as the RPM is above 80%).

Finally, we repeated the test in which the twist grip was gripped tightly to prevent the governor from making any corrections to the system, but the rotor tachometer breaker was pulled to show what a single tachometer needle would look like during the test, for reference.

RHC will provide the video recordings of these tests to the NTSB via Dropbox, but we can send them to you via the NTSB file share system if you prefer. Please let us know if you have any questions regarding what was done, or would like to see a variation of the testing. You are also welcome to come to RHC and witness these tests, or have someone else from the NTSB or FAA come by – the test is easy to set up and perform.