

Incident Report

Tod Schultz

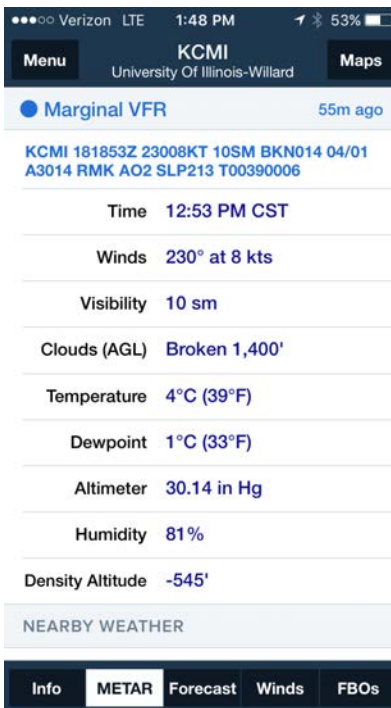
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The incident involving N8042B took place at KCMJ on runway 32L between taxiway bravo and runway 22/4 around 1:35pm local time the 18th of January 2017. If I heard the tower correctly, just shortly before the incident occurred, the winds were 240° @ 9. Below is a screenshot of the METAR taken shortly after impact.



This took place while the student and I had been performing 180° autorotations. We had already been doing these maneuvers for about an hour prior and had done multiple 180° autorotations to the same runway using the same steps. Not even five minutes earlier we had done a 180° autorotation where the student responded with the same inputs as he did when the incident occurred with no trouble at all, other than me having to correct him on the improper input. We were flying left traffic on runway 32L at an indicated airspeed of 70 knots and an altitude of 1250 feet MSL which is roughly 496

feet AGL. Shortly after being cleared for the option 32L I partly, but quickly, rolled the throttle down to about 85% to split the needles. The student quickly responded by lowering the collective, moving the cyclic aft to arrest the decreasing RPM, (which had decreased to about 95%) and putting in right pedal, at which time I then rolled the throttle to between 70-78% so that the student would not have to work against the governor. Roughly one to two seconds later the student initiated a left cyclic turn; however, it was mainly just left lateral cyclic which made our airspeed decrease as we turned. At around the 90° point of the turn the student seemed to realize that the airspeed was decreasing. At the slowest point of the turn the ASI indicated around 60 knots at which point the student initiated forward cyclic as well as maintaining left lateral cyclic. The airspeed stabilized then started to rise. Everything felt good and normal for a couple of seconds then the student added a little more forward cyclic. This forward cyclic movement was not large, abrupt, or too rapid, and has happened to me many times before with students, and it had been done the same way earlier that same flight on the same runway, but this time the result was completely different. Just before the student added the additional forward cyclic the ASI indicated we were nearing 70 knots. As the student added the forward cyclic (we were roughly at 100° at this point) the helicopter started a rapid descent that was much faster than it should have been for the pitch attitude and airspeed so I immediately took over all the controls. As I took over the controls, I immediately initiated a go-around per section 4 in the Robinson POH (Takeoff & Climb) & (Practice Autorotation - Power Recovery), and FAA-H-8083-21 section 9-20. I simultaneously went aft on the cyclic while raising the collective to lower the rotor RPM from being just in the upper yellow arc to being in the green, so I could bring in the engine to marry the needles and arrest the high descent rate while preventing an engine over-speed. With the needles now married, and in the green, I continued to raise the collective, aft cyclic, finish the turn, and slow down for the recommended 60 knot climb speed in an attempt to climb out and go around but we continued a rapid descent. We were now lined up with the runway just to the right of center; however it felt as if we were still being pulled or pushed to the ground. As we descended to roughly fifty feet I flared harder to attempt a next-to-final arrest, but quickly realized that none of the inputs that I was making seemed to have any effect on our descent. At that point I leveled the aircraft and at 20-30 feet I raised the collective the rest of the way to the stop. Since a Robinson R22 has little rotor inertia I would normally wait until being much closer to the surface before raising the collective to the stop as I did, but because of the high descent rate, it was required. Just before impact, the tachometer showed in the green and the ASI indicated roughly 50 knots. I was very careful about checking the RPM both visually and audibly (visually by looking at the tach and audibly by listening to the rotors and gearbox whine). I was also checking the airspeed by looking at the ASI and looking outside, because I was trying to troubleshoot why I had such a high rate of descent while maintaining a speed well above ETL and having RPM in the green while on a takeoff profile. This indicated RPM matched audibly. In other words, the RPM was good no matter if the gauge was incorrect or not. We impacted the runway in a level attitude with the collective all the way to the top with the engine running and rotor RPM still in the green. We did not hit the tail on the runway. Instead, the impact caused the skids to collapse, as they were designed to do in this type of situation, and the main rotor blades to strike the tail without completely severing it from the tail cone. The tail broke just

forward of the visual warning bar (candy cane) and twisted to the side. Later we saw and documented that the tail rotor blades were located near the impact zone but that the stinger was not impacted on the bottom as one would see if we had still been in a flare and had a tail strike. The stinger showed signs of grinding on the side which would be consistent to what I felt. Immediately after impact I applied pedal to keep us straight and it initially responded according to my input, but a short time later I had a total loss of heading control. As we slid down the runway the engine was still running and the RPM was above 97%, as proven by the tachometer display, the sounds of the engine and blades, and the fact that no RPM horn or light came on. I still had the collective up all the way to the stop and was applying left lateral and slightly aft cyclic to slow down in an attempt to not vacate the runway. I had only applied a moderate amount of aft cyclic because at this time I thought the tail was still intact and I didn't want to risk striking it. After what seemed like approximately 300 feet we slid to the right. At this time it felt as if the right skid stuck in the ground. This then turned us to the right and perpendicular to the runway while also tipping us forward onto the nose. We balanced there for just a short time then the main rotor blades struck the ground and we rapidly spun and tipped to the left side. During or immediately after the tip-over the engine quit. As soon as the movement stopped there was no engine noise. I simultaneously checked on my student while shutting off the master switch, main fuel valve, carb mixture, and key, in that order. The tail was now severed but laying near the tail cone, as seen in the photos below. After seeing the impact area, I discovered the likely reason why I only had the ability to have pedal control for just a moment after impact. It appeared that the impact caused the main rotors to droop and strike the tail. Since I had the collective pulled up to the stop, and still had proper RPM, it was only a partial cut. This is also proven by the fact that the tail rotor drive shaft was never severed at the point of main rotor blade contact, and also by looking at how far aft the cut took place. As a reminder, the lower the rotor RPM is, the further forward to the main part of the fuselage the final strike of the rotor will be because of the lack of centrifugal force. In this case, it appears that the main rotor hit nearly as far aft as is physically possible. Having only a partial cut allowed for tail rotor control until the damage caused the aft portion to fail and drop down and to the side.

I have successfully performed thousands of autorotations, but this is the first time I have ever felt that I was being sucked, pushed or pulled to the ground and that every input I made did nothing to arrest the descent. I followed the guidelines set forth in the Robinson POH and FAA-H-8083-21 for recovery. There were no malfunctioning controls of which I am aware and any larger aircraft had been on the ground for some time prior to this incident. I can only come to the conclusion that a weather phenomena was the cause.

Note the stinger's significant wear on the side without being bent and the lateral cut on the right side of both tail cone pieces. The axial bends in the main rotor show that there was still significant RPM at the point of the rollover when the blades contacted the ground. One belt coming off the sheave while the other one is still tight indicates that the engine was still running at the point of main rotor blade contact, leading to sudden stoppage.