

Ruffner 6120.1 Accident Report

Narrative History of Flight and Recommendations

Note that the section indicated by a border in the left margin was prepared at 7:40 PM on 8 /9/2018. It was prepared later in the same day as the accident while all the details were still fresh in my mind. The remainder of the report was prepared over the next several days after I had reviewed the video that was shot of the accident.

This was to be my first solo flight.

I arrived at the airport at about 10:50 AM for a scheduled flight at 11:00 AM. When I had arrived, I checked the wind conditions from AOPA Go, which was reporting wind at ~190 and 7 mph. The wind sock near the runway was consistent with this. The Tercel was not in the hangar and I assumed that Leo (my instructor, Leo Hollis) was not back yet from his prior lesson. I had a brief conversation with Josh in the Hangar when we heard the Tercel arriving. I opened the hangar door as they parked the Tercel. The earlier student moved the Tercel into the hangar.

I began my preflight inspection, examining the fuel level first. There was ~5 gallons on board. I asked Leo if I should go ahead and add the contents of one full 5 gallon container, which was the typical fueling that I had performed. Leo instructed me to add one and one half containers reasoning that additional fuel would help to compensate for the absence of a passenger. Additionally, Leo placed two large dumbbells in the right (passenger) seat and secured them using the harness. Again this was to compensate for the absence of a passenger. Leo briefed me on the fact that the Tercel would behave differently without a passenger, indicating that performance would be better. He indicated that with the lighter weight, the Tercel would want to take off quicker so watch my speed to be sure it was sufficient that it would fly when coming off the runway. Leo asked me to name the four steps for taking off once the rotor was up to speed. I told him release the prerotorator lever, release the brake, pull the stick back and apply full throttle.

I continued with my preflight and observed that the cap for the oil tank was missing. I told Leo and continued to check the oil. The oil level was fine. I looked thoroughly under both engine access panels and up under the rear to see if the oil tank cap was present in the engine compartment area. The cap was not seen. There is a central tunnel into the cabin under the engine. It was partially covered with a Velcro-attached fabric covering. I reached into the tunnel as far as I could and did not detect the oil cap. Leo went between the two tail booms and under the engine. From there, he also reached into the tunnel and reported that he didn't feel it either.

We located a cap on an oil tank that had been removed from another engine. I installed the cap. After completing my inspections of the engine hatches, I reinstalled both and finished my preflight. No other anomalies were observed.

After completing the preflight, Leo briefed me on the intended plan for my solo. I would perform one takeoff. Depart the airport to the west and spend about 30 minutes in the practice area getting comfortable with the performance and handling of the Tercel in the absence of a passenger. I would then return and perform a flyover at mid field to check current wind conditions, enter the pattern

for the appropriate runway and land to a full stop, and return to the hangar. Leo would monitor me using a handheld radio.

I asked which runway and indicated runway 12 was indicated by my observations when I arrived. Leo indicated that that was the active runway earlier when he was out with the earlier student. Leo had the handheld on and a radio call came in indicating someone was taking off or landing runway 30. At this point, a wind sock behind the hangar indicated a switch to winds from the north, although the wind sock was largely hanging limp indicating light or no wind. Based on the radio call and the wind sock, we decided that I would take off on runway 30.

I pushed the Tercel out of the hangar. I went through the startup checklist and started the Tercel. I saw that while the oil temperature was in the green, the pressure was in the red. I signaled for Leo to come over and I showed it to him. The idle rpm was also low. Leo had me shut the engine off. He suggested that I restart it and increase the throttle to clear it out and see if that brought the oil pressure up. The oil pressure was now fine.

I proceeded to taxi out to runway 30. I pulled just south of the taxiway entrance to perform my next check list including engine runup and mag checks.

I entered taxiway A1 and held short as two planes landed from a left downwind pattern. I believe the first came to a full stop and exited the runway and the second did a touch and go. After the second departed west, I waited briefly. After hearing no additional radio calls nor seeing any additional traffic, I made my radio call that I was taking runway 30 and would be there with a momentary delay while I spin up the rotor.

I entered the runway and lined up on the center line. With the brake on, I throttled up to 2,000 rpm and started engaging the prerotator. As it engaged, I added throttle to keep it around 2,000 rpm while watching the rotor rpm. As the rotor rpm approached 100, I fully engaged the prerotator and held it until the rotor rpm reached 209. At this point, I released the prerotator lever, disengaged the brake, pulled the stick back and advanced the throttle to full. I accelerated down the center line while checking my speed. I noticed that I was past 45 mph and had not noticed a need for much right rudder pedal to stay centered on the runway. Additionally, there was no tendency for the nose to rise. The engine sounded fine but the lack of a need for right rudder and no tendency for the nose to rise seemed amiss. I had a brief thought that either I abort or try to raise the nose with some back pressure on the stick. My speed had quickly shot to 61 mph and I applied slight back pressure. As soon as I did, it seemed that the Tercel immediately turned left, rolled on its side and skidded off the runway to the left where it skidded to a stop. I reached for the stick for the radio button and the buttons and wires were sticking out. I pressed the button and made a call that I was down. I was stunned and sat there on my side for a minute and someone showed up and offered his hand to help me climb out. I climbed out. Paramedics were there quickly and had me enter their vehicle where for 15-20 minutes they checked my vitals.

When I got out of the ambulance, I walked around with others surveying what had happened. I noticed a cap on the ground near the wreckage that resembled the oil cap on the oil tank. I assumed that it was the cap that I had installed and didn't think much more about it. When we left the area, I rode in Leo's truck in the front seat. I looked down at the center console and saw the cap sitting there. I asked Leo about it and he said that it was the lost cap. I asked if he was sure and he said yes, that the Tercel still had the cap on the oil tank that I had installed.

I don't know what to make of the missing cap. It may have fallen off earlier when Leo was with his other student. It seems like quite a coincidence that it would end up right near the wreckage. I don't know how close it was or its exact location relative to the wreckage since I didn't think much of it when I initially saw it since I just assumed it was the new one. The fact that my thought was that it had just come off the Tercel seemed to me like it was very close to the wreckage.

While I was at the scene of the accident, right after it had occurred, my instructor Leo Hollis showed me the video of the accident that he had shot on his cell phone. He suggested that the stick might not have been all the way back when I started my takeoff roll. I have reviewed it several times since then. I feel certain that I pulled the stick back during the takeoff roll, and I think that it is apparent in the video that the rotor is pitched back. However, I think that it is probably not all the way back. I need to see a video of a gyro takeoff with the rotor known to be full back to compare.

Never-the-less, based on how the gyro was performing while going down the runway, and how it pitched up and swerved left causing the accident, I would say that the rotor was not all the way back. This is based on the fact that throughout my takeoff roll, the nose wheel did not come off the runway until I pulled back harder on the stick and then simultaneously, it pitched up and swerved left. Also, I was aware that as I hit about 35 knots and above, that I was not having to apply as much right rudder input, as I typically did. I knew that the gyro was going to handle differently without the added weight of my instructor. However, in the seconds that passed in going from about 35 knots when the nose should have been lifting and right rudder would need to be applied, and 55 knots airspeed when the gyro would lift off, I was not able to realize that, if anything, what was happening would have been opposite of what should have happened with less weight.

So, from the video and from the way the gyro was handling, I think that it is clear that the stick (and consequently the rotor) was not full back. It seems from the video that the rotor may have been in a neutral to a slightly back position. As a consequence, when I pulled back on the stick, I was at or above lift off speed. I instantly went from a neutral rotor to a lifting rotor which pitched the gyro up drastically. With the nose wheel off the ground, there was nothing to counteract the left turning tendency resulting from the rotation of the propeller. Additionally, going from a neutral to a lifting rotor would instantly bank the gyro to the left since the advancing rotor would have higher lift than the retreating rotor. Had the rotor been full back from the beginning, I would have been adding increasing amounts of right rudder and right stick to counter the forces as they increased with increasing speed. As it was, I went from little left turning tendency and no left banking tendency, to the full effect, in an instant. The correct action would have been to pull the power and push the stick forward, rather than rearward.

As discussed above, the cap on the oil tank was found to be missing during the preflight. The missing cap was found at the wreckage site. It either ended up there coincidentally, after falling off the gyro when it was flown earlier. Alternatively, it was at the accident site because it was still on the gyro when I had my accident. If it was there because it was on the gyro when I had my accident, it seems possible that it hindered the movement of the stick so that when I pulled back on the stick when I initiated my takeoff roll, that it was as far back as I could get it, and therefore thought that it was full back. An understanding of how the stick connects to the control mechanisms might shed light on whether this is possible or not.

It is possible that I simply did not pull the stick all the way back. During my various training flights, with Leo as well as other instructors, including Michael Burton, I was told to pull the stick all the way back. At different times. It seems like not pulling the stick all the way back on takeoff, might be a common mistake. I hadn't thought much about why one might not pull the stick all the way back, until after the accident. It seems that there might be an explanation for this. The rotor on gyroplanes is attached with a teetering mechanism. When the rotor is full forward for prerotation, the rotor is pushed forward by the back stop of the teeter mechanism. When one pulls the stick back for the takeoff roll, the teeter mechanism moves initially until it hits the forward stop, but the rotor would not necessarily shift back until you pull harder and the forward stop begins to lift the forward rotor blade. The force required for this is significantly greater as you have to counteract the spinning mass of the rotor to get it to pitch back. Consequently, in going from full forward to full back, there is an easy initial motion back followed by a substantially harder motion to go full back. This increased force that is needed can possibly be perceived as hitting the most rearward position. None of my instructors had discussed this phenomenon. They have all just corrected me by telling me to pull the stick fully back. Maybe this is a missed learning opportunity that might be addressed in the manner in which gyro CFI's are instructed to teach. If any of my instructors had emphasized that there is a biphasic amount of force required, I might have been more conscious of when or if I had the stick full back.

Perhaps another missed teaching opportunity is in preparing me and potentially other students to recognize when the stick is not fully back, what the correct course of action is, and what the consequences will be for the incorrect action. None of my instructors had discussed this directly. All of my instructors had simply told me that the stick was not fully back and to pull it back. So, I had never experienced how the gyro would handle if the stick were not full back during the takeoff roll, nor was I told how to recognize it. Consequently, the first time that I experienced how an accelerating gyro feels with an approximately neutral rotor position, I had a split second to figure out what was going on and what to do. I did think that something was amiss and I could either abort or try to lift the nose. In the brief instant that I thought this, I guessed that I could try the first and then abort if that didn't work. Unfortunately, as I found out, the option to abort is not possible if you try lifting the nose first.

In conclusion, I have had training in fixed wing aircraft and gyroplanes. It has been several years since my last fixed wing lesson. Nevertheless, the way that I reacted when things were amiss, was to do what you would do in a fixed wing aircraft and lift the nose. I don't know if subconsciously this is why I chose that action to try before aborting? The fixed wing experience may have made it instinctual that I first try lifting the nose. Maybe other students that had never had fixed wing experience would instinctually choose to abort instead. I was aware from my ground school of the left turning tendency and asymmetrical lift effects and was correcting for these during my takeoffs, many with prompting from my various instructors. However, none of the three flight instructors that I have trained with have really discussed this in the context of taking off, and what it would feel like to not have the rotor full back, and the consequences of pulling it back once approaching or in excess of lift off speed. I think that this points to a need for a change in how CFI's are taught to instruct. I don't know how common my type of accident occurs. I do know that there are much fewer gyro pilots, and probably most of them have not had any fixed wing experience. They learn to takeoff without the consequences of my experience and maybe as they increase their flight time the correct procedure is so ingrained that that would never have my experience. But if their training was similar to mine, they don't appreciate the consequences of a neutral rotor on takeoff, they are largely protected by muscle memory.

While thinking through this accident has been a real learning experience, I think that there is room to change the training so that one can appreciate the consequences without having to experience them first hand. Maybe this is also good place for using a simulator to drive home this lesson, or at least incorporating the video into the flight training experience.