Distracted Takeoffs With Disastrous Results

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Jonathan (Jon) spent his early years growing up on an island in Lake Victoria, Tanzania. Always interested in aviation (his first word was "airplane", according to his mother), he received his flight and maintenance training at Moody Aviation in Tennessee, graduating with a BS in Missionary Aviation Technology. He served as a pilot, mechanic, safety officer, chief pilot, and program manager in Kenya and Tanzania with AIM AIR, taught advanced aircraft maintenance at Moody Aviation, and has served as President/CEO of Mission Safety International for the last 19 years. He is a commercial pilot and CFII, and A&P with IA.

It was not a good weather day that morning, with low clouds and fog all around. The pilot had a full day of flying scheduled and was feeling pretty uncomfortable taking off into the marginal visibility with mountains all around. He approached the Chief Pilot (CP), who was also scheduled to fly that morning, and expressed his concerns. There were some tensions in the relationship, and this day, things boiled over into a full-blown heated argument. The CP insisted that the weather was "workable" and angrily got into his aircraft (a Cessna 206) and proceeded to take off, turning left shortly after liftoff to avoid some low clouds. The pilot was visibly upset by the whole exchange but got into his aircraft (also a Cessna 206), taxied to the end of the runway, and took off, lifting off quite abruptly into a nose-high attitude and banking hard left very soon after liftoff. The aircraft only climbed about 50 feet before it stalled while still in the left bank, crashing to the ground and seriously injuring the pilot and some of the passengers on board. The passengers had witnessed the exchange with the CP and reported that the pilot was visibly upset and did not follow his normal routine of "playing with the engine and controls" at the end of the runway before takeoff. The investigation determined that the elevator trim was in the nose up position rather than being set for takeoff. The pilot was very experienced, with several thousand hours in the C206 operating in this location.

The second accident we are looking at today had some similarities. It was also a very experienced pilot, with over 20,000 hours, more than 2000 of them in the accident aircraft, a Quest Kodiak 100. He was operating from his home airstrip, a short turf runway with a raised bridge and roadway crossing the far end. While loading passengers and baggage, a disagreement with one of the passengers arose over some baggage. The passenger was insisting that two large boxes accompany him, but the pilot was insisting that there was not enough weight allowance for them. Things grew heated during the discussion. The pilot finally got into the plane and prepared for takeoff. By this time, the schedule was delayed, and he was trying to keep things moving. On takeoff, the aircraft did not lift off at the normal location on the runway despite a normal rotation but continued down the runway and lifted off very late. The aircraft never cleared the raised roadway and bridge, but struck the embankment, killing the pilot, and destroying the aircraft. A

small fire broke out, and one of the passengers in the very back panicked and jumped out of the aircraft, falling down the embankment and breaking his neck. He later died at the hospital when he moved his head (against doctor's instructions) while the doctor was retrieving a neck brace to put on him. The investigation later found that the flaps had not been set to takeoff position before commencing the takeoff roll.

The third accident involved another Quest Kodiak, but a less experienced pilot. This pilot had been released for solo operational flying only recently, and this was one of their first flights. The aircraft was loaded at the hangar with supplies for a remote location, and when she called for start-up clearance at the normally busy towered home base airport, she was immediately given taxi clearance to the end of the runway. Shortly after beginning to taxi, she was given take-off clearance and another aircraft was given taxi clearance immediately behind her. There is evidence that she did not perform her normal run-up at the departure end of the runway, but proceeded directly onto the runway and took off. The aircraft climbed about 400 feet, then began a steep descent into a lake at the end of the runway. The pilot was killed, and the aircraft destroyed by the impact. It was later determined that the wing flaps were still in the full down position during the takeoff, and the elevator trim jammed during flap retraction, producing a strong nose down force.

All three of these accidents have a common thread—the pilots were distracted by something—either conflict or pressure, and their normal pre-takeoff routine was disturbed, and they forgot something while they were configuring the aircraft for takeoff. As someone who has flown thousands of hours in the same aircraft, at first glance it seems hardly possible that someone could forget to do something that is so routine and ingrained as setting trim or flaps for takeoff. However, we as humans are more susceptible to influence by what is going on around us than we realize sometimes, and we can all forget or fail to do things when distracted. That is why following (and actually thinking while doing) checklists is so important.

Switching gears a bit, I wanted to also talk about how these human factors can be discovered during an investigation. In most general aviation accidents, we don't have FDRs or CVRs to refer to, so sometimes determining what happened requires a bit more work. The two Kodiak accidents did have Garmin G1000s installed, which helped, but even then, some information was missing (like flap positions). But as we all know, determining what happened is only the beginning. As the seminar theme points out, we need to know the why. When it comes to finding the why, electronics don't always help much. We have to somehow figure out what the pilot was thinking or experiencing. This is the hard part. Experience helps, and that is why so many investigative agencies want investigators to have operational experience before becoming investigators.

In each of these accidents, interviews with witnesses and surviving passengers were the key. In the first accident, the passengers observed the interchange with the CP, noticed that the pilot was visibly upset, and having flown with the pilot numerous times before, noticed that he did not follow his normal routine of running up the aircraft and performing his pre-takeoff checklist at the end of the runway prior to the takeoff roll. The CP also corroborated the gist of the conversation he had with the pilot. After gathering the information from the interviews, it was

not difficult to confirm the physical evidence that the elevator trim was not set to takeoff position, resulting in a premature liftoff (slow airspeed) which compounded with an abrupt left turn (pilot was still angry) resulted in an aerodynamic stall at low altitude.

In the second case, the pilot's mental state was noted by the passengers, who also had flown with him on other occasions. They reported that he appeared to be very upset and angry and did not follow his usual routine. In this particular case, the investigation was conducted partly by local investigators and supervised remotely by another. It was only later, when speaking to a family member who had spoken to the passengers, that some of the information was shared about the argument and mental state of the pilot. The physical evidence had determined that the flaps were not set for takeoff, and that the pilot had tried to deploy them midway through the takeoff roll when he realized they were still retracted (basically when the aircraft did not lift off at the normal rotation point), but due to the short duration of the takeoff roll they only deployed a few degrees before striking the abutment. The reasons as to why such an experienced pilot would forget to set flaps for takeoff were unclear until the reports of the passengers were passed on to investigators. It is also worth noting that there was cell phone video made available of previous takeoffs, which provided a comparison on where the normal liftoff point should be. With the proliferation of smart phones all over the world, quite often landings and takeoffs are being recorded, especially in remote areas, so this is a resource that should not be overlooked when investigating an event.

The third case presented quite a challenge to the investigators. The aircraft ended up in the water, but fortunately the data from the G1000 was able to be recovered. Again, eyewitnesses played a key role, as did airport surveillance video and ATC communication recordings. Once it was determined that there was not an uncommanded engine power loss, and that takeoff was commenced with full flaps deployed, the focus turned to why there was an apparent loss of pitch control. When the previously reported (but not resolved) problem of elevator trim jamming came to light, it became apparent that the elevator trim had been set to a very nose down setting to compensate for the inadvertent full flap takeoff, and when the flaps were retracted, testing showed that it required up to 80 pounds of pulling force on the yoke to maintain level flight. This exceeded the physical capabilities of the pilot, and the aircraft pitched down into a dive into the lake. The question as to why a full flap takeoff was done is difficult to determine with 100% certainty, but there were enough clues to help give a pretty good idea as to some of the reasons. This occurred at a normally very busy airport with a mix of small general aviation and large commercial jet traffic. The pilot, who had just recently undergone initial field check-out training, had been told several times to be aware of the need to not delay other aircraft, especially the jets—they burn a lot of fuel on the ground, and complain a lot if they are delayed by small GA planes. In addition, the operator of the Kodiak normally put the flaps full down for washing and the pilots liked to do their pre-flight inspections with the flaps down, so it was fairly normal to start the engine with the flaps full down on the first flight of the day. It doesn't take too much imagination to see how a pilot could become distracted into missing an item like flaps in the pre-start and pre-takeoff checklists when they feel the pressure of an impatient pilot behind them breathing down their neck!

Why are human factors like these distractions often missing from the official reports? For one, they are often hard to uncover. It takes a lot of extra work to find and interview witnesses, find surveillance or cell phone video, and even dig into the pilot's life and relationships. Investigators often are pressed for time and under pressure to come up with answers quickly. In addition, some of these factors can only be extrapolated, which feels a bit like speculation, and we all know how much speculation is discouraged in our investigations. But I would submit that unless we talk about some of these issues, true solutions cannot be found at the root cause level, so we need to be willing to take the risk of talking about probabilities and not just certainties in our investigations and reports. Take this last case as an example: yes, the elevator trim jamming was a huge contributing factor, but was it inevitable that the aircraft would crash at that point? Why did the pilot not revert to the last known configuration when they were faced with unexpected nose down force (re-deploy the flaps)? In fact, I have the same question regarding both 737 Max accidents—the MCAS only triggered when flaps and slats were retracted—why did the crews not re-deploy flaps and slats to regain control? Why is no one talking about this? In my informal questions at half a dozen flight schools, I have found that most current students are apparently not being taught the principle of reverting to last known good configuration when faced with control issues. This seems to be a pretty big oversight for our industry that does not bode well.

Let me conclude with some take-aways we can all benefit from:

1. Experience matters—if you as an investigator don't have operational experience in that aircraft or type of operation, find someone that does to help you understand what the pilot may have been thinking or facing.
2. Encourage operators to develop procedures to protect flight crew from distractions before takeoff as much as possible. Teach pilots to "take ten" seconds to calm themselves, relax, clear their minds, and focus on the tasks at hand.
3. Constantly emphasize the importance of using the checklist as a tool to help us remember things. This involves thinking about what we are doing, not just blindly punching buttons while we talk or think about other things…
4. Ensure we are teaching and practicing the principle of reverting to last known good configuration when faced with control issues or unexpected aircraft behavior (this works on our computers, too).
5. We need to be willing to dig deep to get to the why, and it is often uncomfortable and a bit "squishy", but that is where the really valuable takeaways and safety recommendations come from.