

## Defensive Posturing By Kent Lewis

Recent reports point to the high number of mishaps that occur during takeoff and landing evolutions. Most interesting is the number of these mishaps that occur during flight instruction. In 2005, there were 132 takeoff and landing accidents during instructional flights, resulting in 4 fatalities ( 2006 Nall Report). Landing accidents ranked higher than the overall GA average, while takeoff accidents were lower. The FAA Safety Team (FAASTeam) has designated takeoff and landing accident reduction as a special emphasis area. Additionally, the Commercial Air Safety Team, of which the FAA is a member, has also analyzed approach and landing accidents and found high potential for safety gains through effective hazard awareness education and preventive training.

Now some may believe that accidents happen during flight instruction because of the higher threat and error exposure, because new pilots are developing skills necessary to safely negotiate these environments. or skilled pilots are practicing advanced maneuvers in a low altitude regime. One constant in these scenarios though, is the presence of a Certified Flight Instructor (CFI) or Airline Transport Pilot (ATP), one who is responsible for the safe outcome of the flight. What happened to this safeguard? Are we effectively identifying and managing the additional hazards associated with flight instruction? And what desired knowledge, skills, tactics and experience can help us safely manage these hazards?

Let's start by saying that I hope this article will generate discussion amongst students and CFIs. The main hazard during flight training is letting the aircraft get to an unrecoverable state, and way to prevent that is defensive posturing. Defensive posturing is the mental attitude and associated physical actions that ensure that an aircraft never reaches an undesired state in flight training. Maintaining a defensive posture to manage threat and error during flight instruction is the responsibility of both parties. Good defensive posturing begins in the brief, by establishing who the Pilot In Command (PIC) is, who will be the Pilot Flying (PF) and who will be the Pilot Monitoring (PM). The student has unspoken expectations, at a minimum, that the instructor will be responsible for the safe conduct of the flight. The student is exposed to the threat of not knowing how far the instructor wants a maneuver to develop and at what point he will appear to correct an undesired aircraft state. A good CFI will ensure that these states do not develop by maintaining a defensive posture, mentally and physically, throughout the flight and keeping the student in the loop. The student should be briefed on speaking up if their comfort level is being challenged and to call for a "Training Time Out". This will signal the instructor that the student has serious reservations about the maneuver in progress, and immediate action is required to ensure flight safety is maintained. Both parties must ensure steps are taken to maintain desired aircraft path and communicate. Questions are free, hospitals are not.

Lets consider a training flight with the "Practical" Test "Standards" in mind. Just as with any practical test, the oral portion shall be completed prior to the flight portion. It is

important for both agents in this transaction to establish common ground on what is “practical” to complete during the flight, and what “standards” both people expect. The people with the 500 pound heads call this a “shared mental model.” In other words, everyone in the cockpit, cabin, hangar, control tower, etc...needs to be on the same flight plan. While it is practical to practice simulated emergencies and aircraft handling at various speeds and altitude, the standard is that no one shall simulate any condition that may jeopardize safe flight or result in possible injury or aircraft damage.

Here’s where the discussion begins, with an example. When I instructed in the UH-1N (Bell 212), we did not practice full autorotations, but rather power recovery autos that ended in a 5 foot hover. Other schools took the maneuver all the way to the deck, increasing training and at the same time assuming increased risk. Many flight schools teach full autos in smaller helicopters. What’s the right method? Well, the standard applied here is that “the instructor is expected to use good judgment in the performance of simulated emergency procedures. The use of the safest means for simulation is expected. Consideration must be given to local conditions, both meteorological and topographical, at the time of the test, as well as the applicant’s workload, and the condition of the aircraft used. If the procedure being evaluated would jeopardize safety, it is expected that the applicant will simulate that portion of the maneuver.” (Flight Instructor Practical Test Standards for Airplane, August 2002, p. 6). Now I just noticed this irony, the fact that any term associated with weather contains the word logical. But I digress. In the example above, you would want to be sure of the practice area you are using. Is the terrain flat? Is the aircraft in good condition and certified for the intended operation? How are the winds? And is the student prepared and the instructor qualified? Be sure that when introducing simulated emergencies, they are briefed before the flight and preceded by an announcement, such as “you have a simulated engine fire”. If you want to play “gotcha!” and just blurt out “engine fire”, your student might just beat you to the throttle, fire handle, mixture, etc...unless you are defensively postured. Be positioned to guard and maintain proper power, flight path and configuration. Don’t let a simulated emergency become a real emergency.

Evaluating your resources and the student’s capabilities, this is where the mental part of defensive posturing comes into play. Do you shut down an engine during training, or simulate failure? Do you fly the single engine pattern in your Huey with one throttle at idle, or have the instructor defensively guard the collective and simulate max torque at the single engine value? How about the Power-Off 180, how far do let the maneuver go before someone calls to “knock it off”? Do you let stalls become fully developed? And where’s the line drawn on crosswind takeoffs and landings? Hopefully, not in the grass beside the runway. Most mental models are strongly influenced by goal completion, let’s make sure the primary goal of the evolution is to safely maneuver the aircraft.

Another standard is that there needs to be someone actually flying the aircraft at all times. Be sure to brief Positive Change of Controls. “During flight training, there must always be a clear understanding between student and flight instructors of who has control of the aircraft. Prior to a flight, a briefing shall be conducted that include the procedure for the exchange of flight controls. A positive three-step process in the exchange of flight

controls between pilots is a proven procedure and one that is strongly recommended” (PTS) Be sure to use the word controls during the exchange, not salty slang like “I got it”. You got what, another aircraft in sight, the FBO, or the controls? If instructing in tandem seat aircraft, brief a lost intercom procedure to exchange controls such as shaking the stick fore/aft and left/right and /or hand signals. That is the preferred method, vs whacking someone on the head with a kneeboard.

Now on to tales of daring and almost do...During the takeoff roll in a T-44 (King Air 90), the Instructor Pilot (PM) became distracted and did not make the required V1 call. The student (PF) reacted by initiating a high-speed abort several knots beyond V1 and selected reverse thrust. The instructor, seeing the end of the runway fast approaching, took control of the aircraft, rotated and attempted to push the throttles full forward. In this lickety-split series of unfortunate events the throttles mechanically stopped on the reverse side of idle, not at the desired max power setting. The airplane struggled airborne for a few feet, then crashed beyond the departure end of the runway. Both pilots survived, but the airplane was destroyed. During the takeoff roll, it is important for the instructor to guard power and flight controls to ensure safe manipulation. Strange things happen, like seats sliding aft and over-rotation, that require immediate correction. Have your hands and feet ready to take control. Guard the power, yoke/stick/cyclic, fuel, gear and flaps. You’ll need hands, feet, knees and maybe an elbow or two. The art here is to be ready to assume control of path and configuration, but avoid riding the controls, which can result in some instructor-induced oscillations and undermine student confidence. Discussing beforehand when and how much your student can expect to see or feel you near the controls will pay dividends here. Don’t even get me started here on mental defensive posturing, monitoring and automation mode awareness.

Not-so-good things happen outside the pattern, too. I learned a lesson early in my instructor days, fortunately up at 8500 feet. We were flying the mighty Turbo Mentor (T-34C), practicing recoveries from Power-Off Stalls. The aircraft was in the landing configuration, and the student initiated the maneuver. Maneuver entry was slow, and progressed too deep into the stall. The aircraft departed control flight. The student did not reduce angle of attack and level the wings, so I took control of the aircraft. At this point (almost inverted), I determined our best course of action was to “lower” the nose and regain airspeed. We completed the roll, returned to controlled flight and dusted everything off. My first and last “dirty” roll. The student was confused, appreciably so, because he wasn’t expecting Power-Off Aerobatics. I explained that it was my fault for not making sure we set up for the maneuver properly, and allowing it to continue beyond the initial departure. He was game for another try, so I demonstrated the maneuver again, and he went on to do several very nice stall recoveries. While I was ready for an upset recovery, the lesson learned here was to do a better job making sure the maneuver is set up properly. A poor set up usually equals an undesirable outcome, especially in the pattern. And it is always better to use superior judgment so you don’t have to use superior skills.

Now to the pattern. “A student pilot practicing takeoffs and landings in a Cessna 172, with an instructor on board, flared the aircraft too high, and held the flare. The flight

instructor told the student to go around, but the student hesitated prior to adding full power. The aircraft yawed 90 degrees to the left and struck a windsock before the flight instructor gained control of the aircraft. Both occupants were uninjured. The student failed to correct for left turning tendency and the CFI failed to properly supervise the flight.” (AOPA Safety Advisor, Ups and Down of Takeoffs and Landings, 2006)

Instructors must be alert to guard rudders in the pattern, especially against skidded turn stalls, and call the waveoff versus letting a maneuver degrade to a dangerous state. As an instructor, you’ll be guarding the yoke/stick/cyclic with one hand, power gear and flaps with the other, pedals with your feet, listening/talking on the radio and watching for traffic. Animal crackers and juice boxes are going to have to wait. Positive learning needs to be encouraged here, emphasizing the importance of textbook patterns, the use of checklists, stabilized control in the approach, flare and landing. Proper checklist usage ensures that the aircraft is configured properly. Flying a stabilized approach means you are hitting all of your airspeed, altitude, and heading/lineup waypoints. You need to be lined up, on speed, on altitude to make a good flare and landing. One mantra to remember is that you fly the aircraft all the way to the tiedowns. Once you have it strapped back down to Mother Earth, your flight is finished. Until then all aircraft, especially helicopters, are trying to return themselves to their natural animal, mineral or plant state. Another threat to manage here is configuration of the aircraft. There have been numerous accidents when aircraft land gear up during “simulated” gear emergencies, or stall because of improper flap settings during takeoff and touch and go maneuvers. Checklists, anyone? Workload is high here for everyone, but the instructor must be on the mental defensive to ensure the aircraft is configured and flown properly. If the evolution starts to unravel, disengage, select zone five afterburner and return to fight another day. Or just go around. The go around/rejected landing/missed approach is probably one of the least taught but most important maneuvers a student can learn. Think about and teach the go-around as a proactive maneuver, an accident prevention strategy.

Don’t forget the debrief, this is the best time to see if your perceptions of the flight match up with those of your fellow pilot. Open communication will result in an effective review of the flight. Avoid criticism and practice professional critique. Look for lessons learned and discuss how they will be applied to the next series of flights. Sometimes we learn best from our mistakes, but we like to keep those kinds of debrief items small and insignificant. It is very important to have the student communicate their perceptions of training, so the instructor can ensure decision-making skills are appropriate for the level of training. There are great gains to be made here by discussing the knowledge and skill based behaviors that lead to increased situational awareness, improved aircraft handling and efficient team resource management.

Fly smart and use your resources. The most important piece of equipment in the aircraft is the “computer” between your ears, the second most important is the BIG glass display, you know, that thing in front of your noggin that’s keeping the bugs out of your teeth? Use them and have a great flight!

Fly Smart

Kent has been a student and instructor in both airplanes and helicopters. He currently volunteers as a FAAS Team Lead Representative and is developing the safety website [www.signalcharlie.net](http://www.signalcharlie.net)