Thomas P. Turner's
# Mastery of Flight™

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# *FLYING LESSONS* for September 5, 2024

*FLYING LESSONS* uses recent mishap reports to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In most cases design characteristics of a specific airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference in your success as the scenario unfolds. So apply these *FLYING LESSONS* to the specific airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence. **You are pilot in command and are ultimately responsible for the decisions you make.**



## *This week's LESSONS:*

**The Flight Safety Foundation's** Aviation Safety Network reports this week, with my emphasis added in **bold font**:

> The [Cessna] 206 attempted a landing at Johnson Creek [Idaho's] RWY 17 with a **15-20 knot tailwind**. The **initial touchdown point was near midfield**; **three long bounces** ensued, at which point **the pilot attempted a go-around near the end of the runway**. The pilot **pitched up aggressively** which caused the **left wing to drop and the plane to bank left**, it disappeared into the trees and moments later crashed into the mountain killing both occupants.

See https://asn.flightsafety.org/wikibase/418988

**Johnson Creek Airport (3U2)** at Yellow Pine, Idaho, has a single grass Runway 17/35, 3400 feet (1036 meters) long, and a field elevation "estimated" to be 4960 feet above sea level. A 900-foot rise in elevation is about 4000 feet north and 400 feet right of Runway 17.

**Two notes appear** in the Chart Supplement (again, with my emphasis added):

- Recommend Land Rwy 17; Tkof Rwy 35 **When Wind Conditions Allow**.
- **Special Considerations Should be Given to Density Altitude**, Turbulence, and Mountain Flying Proficiency.

See https://www.aopa.org/destinations/airports/3U2/details

## Blue skies and tailwinds

***"May the wind be always at your back"*** is a nice thought…except during takeoff and landing. I covered this in detail, including examples from Pilot's Operating Handbooks for different airplane types, in the February 29, 2024 *FLYING LESSONS Weekly*. Read the full *LESSON* in that report, but what follows is a summary of the *LESSONS* learned.

See https://thomaspturner.com/flying-lessons-weekly/flying-lessons-for-february-29-2024/

**Most Pilot's Operating Handbooks (POHs)** carry at least some warning about tailwind takeoffs and landings. Combine the recommendations of a few and you can derive some good **rules of thumb about tailwind takeoffs and landings** to decide if it's worth the risk. **In summary:**

- Each knot of headwind component on takeoff improves takeoff performance by roughly one percent, while each knot of **tailwind component *degrades* performance** by three to five percent. **Tailwinds are three to five times as detrimental to takeoff as headwinds are an improvement.**
- While each one knot of headwind component improves landing performance by about one percent, each knot of tailwind component extends landing distance by about three to five percent. **Tailwinds are also roughly three to five times more detrimental to landing performance compared to headwinds.**
- In almost all cases, then, **there is very good reason for avoiding tailwind takeoffs and landings**, even if it makes more sense for the direction of flight on departure or arrival.

**If the airstrip** is truly one-way, and you must sometimes accept tailwinds for takeoff or landing, **add the substantial distance margins necessitated by tailwind performance degradation**. Taking winds into account you may have to delay, cancel or divert more frequently than when you are able to operate more conventionally into the wind.

## You're my Density

**The ASN report's** preliminary information does not include weather data. It does tell us the accident happened at 1535 local time, close to the hottest time of the day, on August 29th. If the surface temperature was 70° Fahrenheit (about 21° Celsius) the density altitude would have been about around 6900 feet. More likely the temperature at the airport was closer to 85°F/30°C the density altitude would be about 8000 feet.

**Final approach speed** at 50 feet above ground level (AGL), according to the T206H POH, is 70-80 knots indicated airspeed (KIAS)—a couple of hundred feet AGL on short final it's likely a proficient pilot will be at about 85 KIAS. Under the likely environmental conditions true airspeed in knots (KTAS) would be 94 knots at 70°F/21°C and 95 KTAS at 85°F/30°C—a significant increase in inertia over a standard day, resulting in substantially longer landing distances.

**At the lowest** density altitude estimate the POH tells us the ground roll distance would be 940 feet (287 meters) ground roll distance (assuming a **full-stall touchdown at idle power and maximum braking)** and 1690 feet (516 meters) from 50 feet AGL to a stop using the same landing technique. Any speed above the "book" final approach speed and/or any change in the landing technique adds to these distances by an unknown amount.

See http://www.aeroelectric.com/Reference_Docs/Cessna/cessna-poh/Cessna_206-T206H%20Conventional%20POH%20Section%201-5&7.pdf

## Landing in translation

**All of this** is academic if the pilot doesn't use the available runway. The reported touchdown "near midfield" and the "three long bounces" are each indicative of extra speed on final approach that not only caused the pilot to miss his target but also would add even more to the distances need to stop on the runway.

**"About midfield"** on 3400 foot/1036 meter runway leaves about 1700-2000 feet (roughly 520-600 meters) of runway remaining at touchdown. This permits a stop with a small reserve remaining ***if*** the pilot uses a full stall/maximum-braking technique. Anything else and the margin is erased. **But the reported 15 to 20 knots tailwind would increase landing distance by 45% to 100% more** depending on the wind speed and the rule-of-thumb percentage increases.

**The pilot should have known** under existing conditions that there was no chance of stopping on the runway unless touchdown occurred at the very beginning of the runway, and even then he'd need to precisely use the right speeds and apply aggressive braking.

**What appears to have** happened here: The pilot, deciding he could not stop, attempted a go-around…too late. From there the flight path correlates with the **go-around or "trimmed" stall**

profile that results when a nose-heavy airplane, trimmed for landing, ends up in a very high nose-up trim condition and power is quickly applied, resulting in a sharp nose-up pitch that increases angle of attack. Turbocharged piston airplanes like the T206H are especially susceptible to this hazard. Read about trimmed stalls and other facets of going around in my 2016 "Commanding the Go-Around" in *Flight Safety Australia.*

See https://www.flightsafetyaustralia.com/2016/12/commanding-the-go-around/

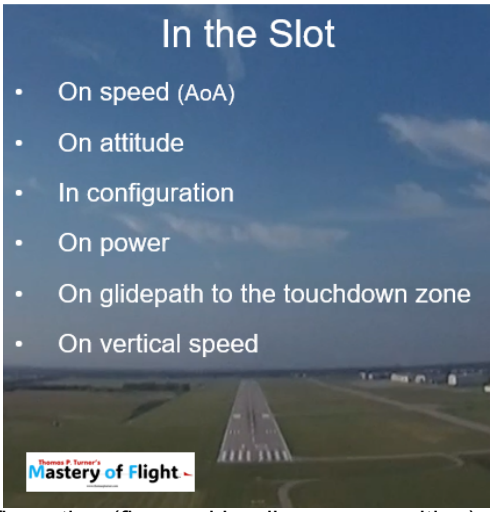
**How can we translate** this into a technique that works regardless of airplane weight or density altitude?

# In the slot

**The one critical factor** in almost all runway overruns and delayed go-arounds is **the aircraft was not *in the slot*** in the seconds before touchdown. By "the slot" I mean a position on short final where all the conditions are set for arrival. Although the precise altitude may vary, let's use 500 feet Above Field Elevation (AFE) for visual landings.

**As your airplane passes through** 500 AFE it should satisfy ***all*** of these conditions to safely continue to landing—conditions when collectively met I call being **in the slot**:

- **Airspeed** is on target for touchdown. Generally this will be 1.3 times the stalling speed in the airplane's current configuration at its current weight as you pass 50 feet AGL. This may be a computed or tabulated indicated airspeed from the Airplane Flight Manual (AFM) or Pilot's Operating Handbook (POH). **Establish an airspeed *trend*** at 500 AGL such that at 50 AGL you are at the target speed as you cross the runway threshold.
- The indicated **angle of attack**, if an AoA sensor is installed, is on target. If the AFM or POH calls for flying a specific AoA on short final, or an approved aftermarket AoA device contains specific indications to attain on short final, then this becomes a condition for being **in the slot**. If you have an AoA indicator that is supplemental, i.e., it is not approved by a Type Certificate or STC, you may from experience determine **an approximate AoA *trend*** that correlates to being on the proper airspeed in 1G flight when passing through the 500 AFE point.




- The airplane's **attitude** is correct for the type of landing being performed (normal, short field). Pitch attitude, whether visually out the windows or as depicted on an attitude indicator or Attitude/Heading Reference System (AHRS) display, will be consistent for a given indicated airspeed and/or AoA at a given center of gravity location and airplane configuration (flap and landing gear position).
- Airplane **configuration** is correct for landing: gear down, flaps set as applicable to the aircraft type.
- Engine **power** is as expected for the landing. Attitude + Power + Configuration = Performance. In this case performance results in the proper combination of indicated airspeed and vertical speed at the correct power or thrust setting and in the landing configuration.
- The airplane is **on glidepath** and **aimed to a landing in the runway's touchdown zone**. This is usually 1000 feet from the runway threshold or one-third of the total usable runway length, whichever is shorter. In the case of a short-field landing, the pilot may

have to use a touchdown zone closer to the arrival end or the runway, using great care to avoid coming in short or too low over obstacles in the final approach path.

- The airplane's **vertical speed** is on target to carry the airplane on glide path from 500 AFE to the touchdown zone.

**If *any* of those conditions is not met** on short final, you are not **in the slot** and there is increased risk of a runway overrun. Don't wait to go around; don't try to salvage the approach. Power up and go around immediately, then re-enter the pattern and try for greater precision in another attempt. Or divert to another runway or airport if conditions are such you cannot get **in the slot** next time around.

**Checking that you're in the slot** also helps you detect if you've forgotten to extend retractable landing gear or if retractable gear is only partway down in airplanes so equipped, because the normal power, pitch, attitude and vertical speed will not result—you'll be on power and pitch but fast or at the wrong vertical speed, or require idle power to meet speed, attitude or vertical speed targets, etc., or in some other way **the variables do not *all* agree**. If you're not **in the slot** on short final go around and figure out what's wrong, then correct it, before landing.

Questions? Comments? Supportable opinions? Let us know at mastery.flight.training@cox.net.



# Debrief

Reader Jim Piper writes about last week's question, "What's the riskiest thing you do in an airplane?"

> Great thoughts, I couldn't agree with you more! I'm a CFII [instrument instructor] but do not actively instruct. At 85 years of age with over 25,000 hours in my log book over 65 years I've dodged a lot of bullets!
>
> **Things I stopped doing** years ago are:
>
> 1. ***Flying at night***. It simply **adds too much risk** to an engine failure and I believe in most cases **significantly reduces the chance of a favorable outcome** from such an event.
> 2. ***Night IMC in a GA [general aviation] aircraft*** under any circumstances, absolutely no way!
> 3. I feel that ***climbing into an aircraft that I don't specifically know the history of, even with a familiar pilot*** is too risky!
> 4. I've turned down requests to do flight reviews in **airplanes that lack upper body restraint** [i.e., shoulder harnesses]. Yes, there are still some out there!
> 5. The other "turn down" is **an owner with an aircraft type I've never flown**. How can you give a meaningful flight review in an airplane in which you are unfamiliar with the type's idiosyncrasies?
> 6. **The same is true for me of today's nav systems and glass cockpits**.
>
> Call me old fashioned, call me a senile old man, call me a woose, but I'm still here and still flying! Never had an accident in 65 years of flying which I realistically attribute to a thimble full of skill and a bucket full of luck!

I agree with you on all your “instructional limitations” except numbers 3 and 6. I’ll accept the risk of each if the instructional flight will be conducted entirely under visual flight rules in good Visual Meteorological Conditions (VMC). I don’t criticize your inclusion of these two items but I feel under controlled circumstances sometimes these are acceptable to me. Maybe some time within a couple more decades if I’m still flying I’ll allow myself the luxury of following your lead on those items as well. Thank you, Jim.

See https://thomaspturner.com/flying-lessons-weekly/flying-lessons-for-august-29-2024/

More to say? Let us learn from you, at **mastery.flight.training@cox.net**


See https://nafisummit.org

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**NEW THIS WEEK: Ross Ditlove**

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2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year