

# WHAT IT TAKES TO TYPE

*Ever wonder if you have what it takes to earn a type rating for a small jet? Success comes from preparation—something that helps with learning any new aircraft.*

**M**ake no mistake about it: Going through a two- to three-week type-rating course is grueling. Many pilots have a strong preference for turboprop aircraft for the explicit reason that no type rating is required. But like the process of flying jets itself, the type course is structured; a specific set of steps impart a specific knowledge to the pilot. The information that must be learned is clear and finite for a type rating. Unfortunately, finite doesn't mean small.

While it's possible to show up for a two-week type course with no prior preparation and breeze through, it's also possible to win the lottery twice in a week. For 99 percent of pilots, a healthy dose of study and preparation prior to Day One of the type course is essential.

## Proficiency and Profiles

First off, don't even consider starting a type course unless you're confident you could blaze through an IFR checkride with a smile. Your first day in the sim you will be flying approaches to minimums, and there is zero time allotted for teaching pilots to fly instruments. If you can't handfly both an ILS and a non-precision approach to minimums, followed by a handflown missed to a non-published hold, get training.

No matter how good an IFR pilot you think you are, you will be overloaded with learning your

new airplane. The single most important thing you can do to ensure success during the sim check is to master the aircraft's profiles. A transitioning jet pilot new to profiles may underestimate their importance—often to his later dismay. Simply put, a profile is a recipe for conducting a given operation or maneuver in the plane. Jets are not seat-of-the-pants aircraft; they demand a specific, precise approach to every phase of flight.

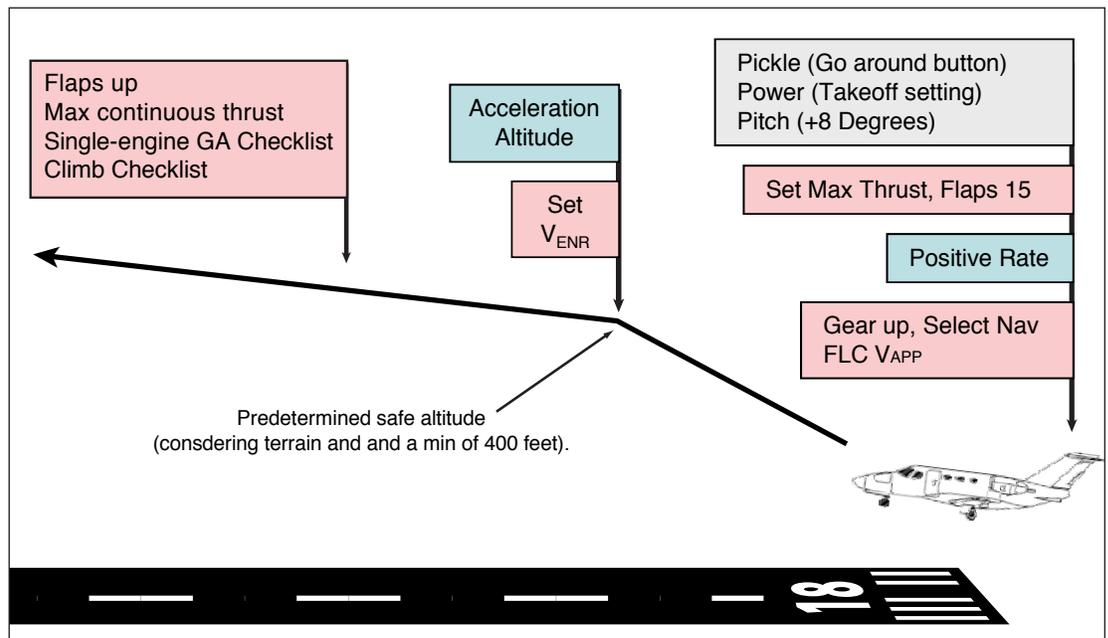
For example, on a single-engine missed approach, a pilot must begin flap retraction, raise the gear, set the flight director/autopilot to climb at the single-engine best-angle speed ( $V_{xse}$ ), set the FD/AP to navigate along the missed-approach procedure, accelerate to single-engine best rate ( $V_{yse}$ ) when clear of obstacles and then clean up final flaps when fast enough. These events must be conducted in the proper order, and at specific cuing events. The profile is the way to execute all steps properly.

Profiles often involve an oral call-out, which can be a command when flying in a two-pilot crew, or an oral checklist when flying single pilot. So the above procedure might have the PIC saying out loud, "Missed approach. Set max thrust. Flaps 15. Positive rate. Gear up. Select NAV. FLC  $V_{app}$ . Acceleration altitude. FLC  $V_{en}$  route. Flaps up." Any oral portion of the profile must be committed to memory. By that, I mean that if you hear "Set Max Thrust" in your sleep, you should mumble "Flaps 15."

Without exception, most trouble I see from transitioning pilots in the sim is caused by inadequate memorization of profiles. When everything is done promptly and in order, flying jets is not hard. When pilots start forgetting profiles and getting out of order, things go downhill fast. Also remember that reciting any profile isn't that hard after an hour of study. It's an entirely different beast after two hours in the sim with the left engine on fire.

Every major training provider will give pilots a detailed cockpit poster on

*BELOW: Here's the profile for a single-engine go-around in the Cessna Mustang. In a high-workload situation like this, these steps must be automatic.*



## THE EXTRA KNOWLEDGE TEST: RUNNING THE AVIONICS

It's a pretty new idea to prep for the avionics of an aircraft before beginning training. However, the advent of the G1000 has made it near insanity for a pilot to begin a type course in a Garmin-equipped plane without a good knowledge of G1000 operations. Most of the initial failures in the Mustang course were not for inability to fly a jet, but rather for inability to master the G1000.

Thankfully, there's no excuse to show up unprepared. Garmin sells an inexpensive PC simulator of the G1000, selectable by aircraft type, which is a fantastic training tool. Paired with a G1000-experienced CFI, a pilot can master all the functions of the Garmin before ever stepping into a

simulator or airplane. There are also several online or DVD-based G1000 training options. The advantage of training with a CFI is that it's far easier for an instructor to probe weaknesses and test how much has truly sunk in. It's all too easy to deceive yourself into thinking you have the Garmin down, only to be flummoxed in the sim.

If you haven't been flying an airplane with a sophisticated autopilot, using the AP of your new plane could trip you up more than you might think. While hand-flying skill is critical, the majority of the flying conducted in the sim will be on the AP. "Great, what could be easier?" you may be thinking. Not so fast, partner.

Not being able to properly use an AP will cause things to fall apart quicker than you can imagine. Turning the wrong way on an approach, flying the plane into a stall, descending through MDA—these are all things I have seen the AP do in the sim as a frantic pilot attempts to remedy the situation.

Most APs have more in common than not, so getting some training time in a modern GA simulator or flight training device on AP operations will be priceless if coming out of an airplane with only a basic AP. Understand the basics of NAV versus APR mode, NAV intercepts, ALT capture events, and the tricks of glideslope capture. If you are to be flying a G1000-equipped plane, get some time with the Garmin GFC 700 autopilot. They all work the same.

—N.S.



the first day of training. That's way too late. Call the training organization, airframe manufacture, your congressman, whomever. Whine and beg until they send you the poster well before your training starts. Sit in front of the poster. When you say, "Gear up," touch the gear handle. You're training muscle memory so that your hand will be moving in the appropriate direction for each step.

### Killer Memory Items

Certain emergency and abnormal events require immediate and specific pilot actions for successful conclusion. For these there are specific memory items, steps which should be performed immediately and without reference to a checklist. Once these steps are complete, the pilot references the checklist to ensure compliance with the memory items and perform additional, lower-priority steps.

An emergency engine restart in a Cessna Mustang starts with:

1. BATT Switch ... BATT
2. Throttles ... CUTOFF
3. Either Engine START button ... PRESS momentarily

4. Throttle (selected engine) ... IDLE  
These steps must be performed in the order given and none may be skipped.

Different aircraft have vastly different numbers of memory items. The Cessna Mustang has 21 procedures with memory items of one to eight steps. The Phenom 100 has only nine.

The FAA and training organizations expect perfect recall of memory items. It doesn't take a lot of thought to realize that anything that can cause a checkride failure due to one mistake should be studied early and often. Memory items are the only items with the potential of blowing either an oral or a sim check.

How to study? Let me count the ways. Flashcards, paper or electronic, are a must. You can start with all the memory items in the deck, then gradually weed out the easy ones, so you're hitting the difficult ones more frequently. Every smartphone has some free or low-cost flashcard program. I love this approach, as most of us always have our phones. In the doctor's office? Plenty of time to review a few memory items. Long line at the supermarket? You get the idea.

Next up is audio files. Audacity is a free program that allows for recording from a cheap USB mic to an mp3 file, which can be burned to CD or loaded onto an iPod. Read the memory items, pausing long enough between the title of the procedure (e.g., "Emergency Descent") and the list of steps so that you have enough time to recite during the pause and then hear if you got it right.

Now driving time and gym time can be turned into study time. I have free downloads for the Cessna Mustang (510) and CitationJet (525) on my website ([www.njsflight.com](http://www.njsflight.com)).

Finally, sit in front of the poster and review the memory items the same way you did profiles, touching each item as you recite it out loud. You'll be amazed at how when you're blanking at the fifth step of a complicated procedure, you find your hand going to the correct switch before you realize it.

If you have begged sufficiently, you got a handout before training containing every limitation you are expected to memorize. Limitations can be as simple as numbers (max landing weight is 8000 pounds or V<sub>le</sub> is 250 KIAS) or more complex lists (when the battery is on emergency power, what 15 items are powered?). Use flashcards and audio files, and start early. On a bright note, failure to recall a limitation on a sim ride is much less likely to cause a bust.

The final set of items to memorize are Crew Alerting System (CAS) messages (or, in older airplanes, caution and warning annunciators). These alert the pilot that something is amiss. CAS messages are displayed as text on a PFD or MFD, while annunciators are physical lights grouped together.

You must be able to explain exactly what the message means. Some are pretty darn simple. The "CABIN DOOR" CAS in the 510 indicates—get this—that the cabin door is not shut and latched. Others require more detailed knowledge. A "CABIN ALT" CAS indicates very different things depending on if it's displayed in amber or red, and in what mode the system is operating at the time. Some CAS messages have associated numbers that must be memorized. A 510 pilot must know that "FUEL LVL LOW" activates at 170 pounds of fuel. For other messages, a vague answer may be acceptable. Every 510 examiner I've asked would accept "Fuel pressure is too low" for an explanation of the "FUEL PRESS LO" CAS.

Why the difference? A pilot has a readout of fuel quantity, but not a readout of fuel pressure. So knowing what

PSI triggers the "FUEL PRESS LO" is really nothing but trivia. If your plane has a hydraulic pressure readout, be prepared to say what PSI triggers a low hydraulic pressure caution. If it doesn't have a pressure readout, memorizing the triggering PSI is almost universally considered unnecessary.

That leads us into all the assorted and detailed systems knowledge. For your oral exam, you will be expected to be able to explain, in detail, the normal and abnormal operation of every system in the plane. Two pieces of good news here. First, a few slip-ups are allowed, as long as it's apparent the pilot has generally good knowledge of the systems. Second, if you've done all your other preparation, there will be more than enough time during the training to learn this. In fact, I recommend only a cursory review of specific aircraft systems prior to the training course.

You should have a thorough foundation in the theory of turbine engines and jet-level systems. Training focuses on how *this* electrical system works, not how electrical systems in general work. There are several excellent textbooks, as well as online "jet pilot prep" programs that will give a good grounding in system fundamentals.

### Worry Now, Pass Later

If I haven't scared you a little, I didn't do my job. The three VLJs currently flying (Mustang, Phenom 100 and Eclipse) all initially had between 30-percent and 50-percent failure rates on type rides, largely because of non-existent or inadequate pilot preparation for the type course. As I tell my clients, the training isn't to turn pilots into jet pilots, it's to turn jet pilots into typed pilots.

But that's really true of any transition to a new aircraft. Arrive proficient and prepared and you'll be most likely to ace the course. Wait until you show up to start your serious effort and you may never catch up.

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*Neil Singer is a mentor pilot in the Mustang and CJ-series Cessnas, and a contributing editor.*



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