

Flying an aircraft, the actual driving-it-through-the-sky part, is a tactile experience. For aircraft without autopilots, there are hands on stick/yolk and throttle almost 100% of the time. The hands are the man/machine interface. They manipulate the controls, roll the trim wheels, flip the switches, touch the toggles.

Eyes gather data about the condition of switches in the cockpit, such as whether something is "On" or "Off." The brain processes the difference between what is seen and what is desired, and then commands the hand to reach out and provide the corrective action; flip a switch "On," roll the wings to a level position, etc.

Our T-28's were built by the North American Company and bought by the U.S. government as trainer aircraft. They have been in training squadron paint schemes a number of times in their earlier lives. A government contract for trainer aircraft these days would include a complement of full motion simulators and Cockpit Procedures Trainers (CPT). What is a CPT, and why is it useful device?

A Cockpit Procedures Trainer is a less sophisticated version of a simulator. It does not move. It normally has all the actual toggle switches the real plane has, but might have a paper picture of a gauge pasted to the instrument panel. All switch locations are identical to those found in the actual aircraft but it isn't used to practice flight techniques, it is back at "Square One;" used to familiarize the student with various checklists, especially start-up and shut-down.

A typical student's first interaction with a flight training device occurs after he or she has been given a checklist of normal and emergency

procedures. Setting up the cockpit for a flight and starting the engine are the first two things addressed in the checklist, so the student climbs in the device, looks at the checklist, tries to find a switch being referred to, verifies a switch position is correct or manipulates the switch to place it in the desired position. The "flow" of a checklist usually either pans across the cockpit from extreme left to right, or from extreme right to left. With a good design, the switches to touch will be in sequential order next to each other, or clustered close together for ease of manipulation. The eyes verify that a desired switch is the one being touched and then the fingers typically move it.



Student in a current T-6 CPT

Mass production of identical components lowers the unit cost of each component and lowers construction time, but years and years of erroneous switch movements by pilots finally convinced engineers and manufacturers to start purposely designing switches that are physically different from each other. Some are large round switches, some are thin, some have triangular heads, others are square. The thinking is that distinctly different shapes will draw the eyes to the right switch and will also train the fingers to anticipate the shape of a switch; possibly helping to break an error chain of events if the wrong switch is grabbed.

For example, if a fuel boost pump is supposed to be turned off at a certain point in the checklist (usually after takeoff), and it has a round switch, that was hoped to prevent inadvertently turning off the electrical system (never a good thing at night), which might have a triangular switch nearby.

The experience of sitting in the Cockpit Procedures Trainer while trying to find the right toggles and switches called for by the checklist is, at first, an exercise in lengthy frustration. Literally hours can be spent trying to find a small piece of metal to manipulate. Once found, the position of it has to be verified or corrected. Muscle memory for where the switches are located has to be built up for a variety of reasons.

First, flight instruction is all about learning how to fly. The less time it takes to start and taxi the aircraft to the runway, the more time is left to actually drive the plane in the sky.

Second, there is a military rite of passage that is usually a graded event (Pass/Fail), known as the "Blindfold Cockpit Check." Whether the student is literally blindfolded, or the check is done with eyes closed, the instructor calls out a switch or toggle and the student is supposed to identify it by feel and place his/her index finger on it. One explanation for the utility of this drill is that the student would be able to accomplish the correct switch manipulation in an emergency situation even if the cockpit were filled with smoke. I have a philosophical problem with the Blindfold Cockpit Check, in that I think it teaches, early on, that the goal of familiarity with the cockpit is to be able to find switches without looking at them. Very dangerous path to go down, in my book. The number of military cockpits filled with smoke is

minuscule in proportion to the number of burned up engines and fuel-out conditions caused by pilots flipping an incorrectly identified switch. I'm in the minority, disliking Blindfold Cockpit Checks; but there's no denying mishap cause factor statistics.

Third, and the REAL reason the student should aspire to finding start sequence switches and toggles quickly, is because military flight school locations where primary trainers are found include Florida and Texas. Those flight lines are blazing hot in the summer and until the prop starts driving a breeze over one's sweating brow, the instructor is getting hotter by the minute. Got to keep the instructor happy!

Slow recognition or manipulation of the switches either runs down the aircraft's battery or burns too much fuel on the ground; either condition is undesirable.

Thus Cockpit Procedures Trainers serve a useful purpose in saving fuel and saving sweat. At their best though, they teach good habit patterns that stand one in good stead no matter what machine one moves on to.



Student in a current T-6 CPT

My first encounter with a Cockpit Procedures Trainer was at Whiting Field, near Pensacola, Florida, when in a training squadron that

included T-28's and T-34's on the flight line. Before my first instructional event, I had climbed in the device a few times and had gone through the checklist by myself. I hadn't flown an aircraft before, but I found all the items mentioned in the checklist and felt fairly satisfied that I had the situation well in hand. Then the instructor showed up. He sat in a chair outside and above the mock-up cockpit and had me run through the Preflight, Start, Taxi, Takeoff and Cruise checklists. Given my lack of experience, my hesitations and searches for switches were probably average to below average, but I was pleased that everything had been flipped, pushed or toggled to the correct position. I then set up for landing by reading the checklist aloud, doing some manipulations and verifying conditions by looking at the appropriate things.

The instructor said, "OK, let's say we are on the ground now. Is it going to take more than the usual amount of power to taxi this plane back to the line?"

Rats. Normal taxi power setting was not a number I had memorized. "Uh, I'm not sure, but I don't see why it would," I replied.

"Look again at your gear handle."

I looked. There it was, in the "Up" position, with a red light (the better to attract attention) in the gear handle. I was stunned; not only because I had "landed" gear up, but because I had read the checklist aloud, looked at the tire-shaped gear handle and had SEEN IT in the desired position (the "Down and Locked" position). That was my first encounter with the "you see what you want to see" perception error. I had read the word "Down," looked in the general direction of the gear handle and

perceived that the handle was down. That brief perception was incorrect.

At that point, I figured the aviation career was over before it had begun; but the instructor, without mentioning psychological error mechanisms, must have seen it before because he calmly said, "if you touch something you're supposed to look at, it will focus your attention on that one object better."

And to this day, some thirty years later, whether in piston prop or thirsty turbine planes, every dial, every number, every switch, gets my fingerprint on it before I move to the next item on the printed page of the checklist. Haven't landed a real plane unintentionally gear up... yet.

-Peyton Dehart