SET ON JETS

WHAT'S IT LIKE TO FLY A JET

Flight Training
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You've been flying light piston singles ever since you began working on your private pilot certificate, and now let's say you've logged 150 hours. Frankly, you're tiring of what seem to be ever more lethargic groundspeeds and climb rates, small useful loads, and limited ranges—not to mention the squirrely behavior in turbulence. And light piston singles' engines can be so finicky to start, you think, as you recall the day your parents came out to see you fly—only to watch you fruitlessly crank the engine until the battery died. As you sit alone, pondering your fate while watching Top Gun for the forty-third time, you begin to wonder. What if you had a jet? Yes, that would give you the performance—and the status—you deserve!

Perhaps. But what would it be like to fly a jet? The differences between a piston single and a jet are vast. Let's take a look at some of them, Maverick.

First, the obvious. Jets have sleek lines and are slippery. They're designed to go fast, and they have powerful engines that help them achieve that goal. The engines in a 10,472-pound Phenom 100, for example, put out a total of 3,390 pounds of thrust. Compare that to the 160 horsepower for a Cessna Skyhawk at max gross weight. Moreover, most jets have two engines, so if you're unlucky enough to lose an engine on takeoff, it's no big deal if you're

proficient. A fully loaded Phenom 100 can climb at least 580 feet per minute on a single engine—and keep on climbing, all the way to 26,000 feet.

But you don't just line up, firewall the power levers, and blast off. Oh, no. First you have to calculate all your takeoff climb airspeeds, or you'll never realize your best climb rates. The speeds vary with weight, runway elevation, ambient temperature, and pressure. The first speed you need to know is V1 (takeoff decision speed); if an engine quits before reaching this speed, then stop on the remaining runway. If one quits after V1 you will climb away. VR (rotation) is the next speed; that's when you raise the nose.

Then comes V2 (takeoff safety speed), the airspeed that roughly equates to best single-engine rate of climb speed. It's a new chore for you, and these calculations have to be done before each takeoff or you won't realize book performance for either stopping on the remaining runway or obstacle clearance. Once you've determined the airspeeds and posted them in the cockpit, however, the fun can begin.

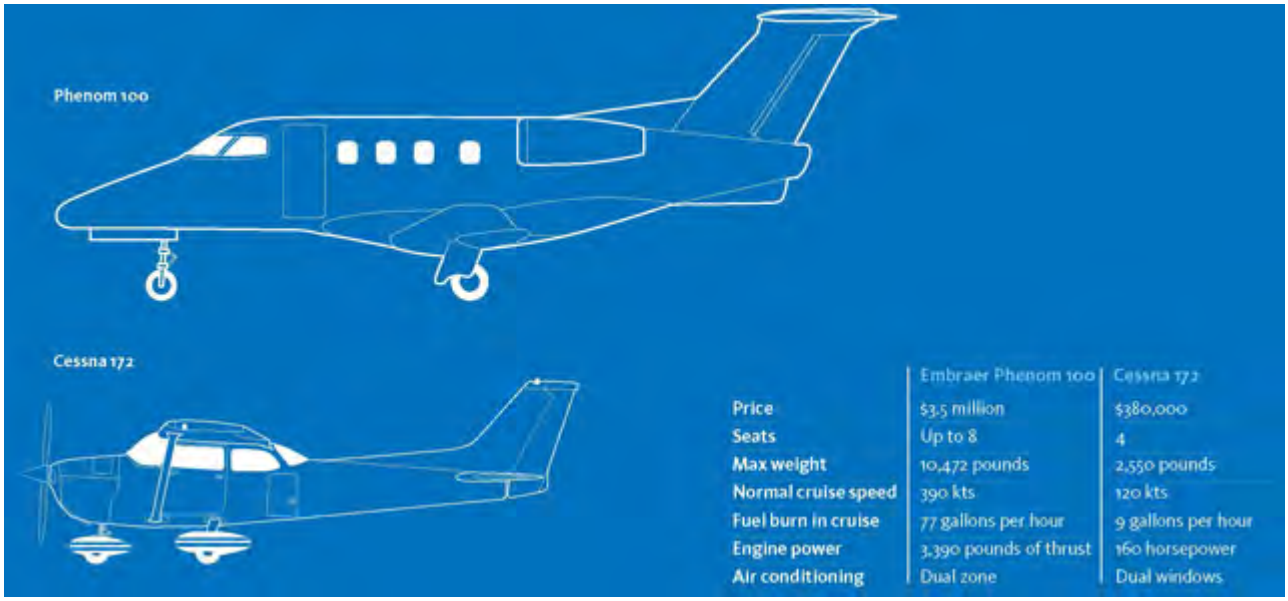
A jet takeoff is a rush of sensations. First, the anticipation as you line up the ship on the runway and hold the brakes. Then you advance the power levers to the takeoff position, and listen to the increasing engine whine. But you don't feel the thrust immediately. It takes a couple of seconds before full thrust kicks in and you have to push harder on the brakes to keep the jet from inching forward. But once you release the brakes, hang on. You'll definitely feel it as you're pushed back in your seat, and very quickly the runway rushes by in a blur. Steering can be sensitive, so you have to split your attention between tracking the runway centerline and eyeballing the airspeed indicator—all while building speed at what seems like an incredible rate. You'll be airborne in seconds. Are you ready?

Very quickly, V1 (this is usually around 95 knots in a loaded Phenom 100) comes and goes, followed immediately by VR (about 97 knots), and it's suddenly time to raise the nose and begin your climb. A couple more seconds and you're passing through pattern altitude, climbing at perhaps 2,500 fpm and heading for 200 knots. If you were in your Skyhawk, you'd still be back there checking your mags. Instead, you're passing through 5,000 feet agl, pulling back on the power levers so you don't bust the 250-knots-below-10,000-foot speed limitation, and talking to ATC about your next move—all at once. And you did program your flight control system—and couple your autopilot—with your first altitude clearance, yes?

As you can see, takeoff and climb is a busy, busy time. It takes training, practice, and acclimatization to get used to the feel of a jet—and stay ahead of it mentally.

After about 35 minutes climbing at, say, 170 knots, you arrive at Flight Level 370. All the rush and adrenaline of the takeoff phase is behind you, and it's time to savor your 390-knot true airspeed—and if you're lucky, maybe even a 70-plus-knot boost from a nice jet stream that will put your Phenom 100's groundspeed above the 450-knot mark. In just a tad more than two hours, you'll have travelled almost 1,000 nautical miles. You're above all but the tallest cloud buildups, the air is smooth, and the noise level is way below that of a piston single. For the time being, all you need do is comply with your ATC clearance (for flights above 18,000 feet it's a mandatory IFR world), talk to controllers, and monitor your systems.

Eventually, it will be time to come down from your perch and get ready to land. As a piston pilot you didn't have to worry too much about targeting a descent rate so that you arrive at a fix at an ATC-mandated altitude, but the jet world gives heavy emphasis to vertical profiles. "Cross JOCKY [airway intersection] at 10,000 feet," comes the clearance. But you're up there at FL370. You have to lose 27,000 feet in—wait a minute, how far away is JOCKY? The answer determines your ideal descent rate, and thanks to your integrated flight control system—found aboard virtually all modern jets—the answer pops up on your multifunction display. Now call up a vertical navigation (VNAV) function and your autopilot will get you to JOCKY at the moment you arrive at 10,000 feet. Because you've put 10,000 feet in your glareshield-mounted altitude selector, your Phenom automatically levels off.



	Embraer Phenom 100	Cessna 172
Price	$3.5 million	$380,000
Seats	Up to 8	4
Max weight	10,472 pounds	2,550 pounds
Normal cruise speed	390 kts	120 kts
Fuel burn in cruise	77 gallons per hour	9 gallons per hour
Engine power	3,390 pounds of thrust	160 horsepower
Air conditioning	Dual zone	Dual windows

Does this sound like a lot of automation? You bet, but you don't do much hand-flying in jets. That's because, generally speaking, autopilots fly jets better than humans—especially in the thin air high in the flight levels. So jet flying means knowing your integrated flight control system inside out. You'd better, because standard procedure is to engage the autopilot after takeoff, when reaching 600 feet agl, and to disengage it on the final approach to land.

Tasks like losing 27,000 feet to hit a fix 80 miles away at 10,000 feet, then holding at that fix, then flying a curved-path entry to an RNAV GPS instrument approach into an airport experiencing 200-foot ceilings and half-mile visibilities is something you just don't do in piston singles.

Descents pose other challenges for jet pilots. Because they're slippery and have plenty of power, jets can build a lot of airspeed in descents. Here's another area where you must stay ahead of the airplane. A 3,000-foot descent in a piston single isn't a big deal, but unless you come back on a jet's power in a timely fashion, even a short descent in a jet can put your airspeed into barber-pole (the jet equivalent of redline) territory.

Down low and preparing for a landing is another busy time. Fortunately, because of their high wing loadings, jets ride turbulence much better than piston singles, so there are fewer bumps to bother you. What might register as a few light jolts in a jet would translate into head-banging chaos in a small single-engine airplane.

Because jets are so aerodynamically efficient, slowing for an approach and landing takes one more big dose of advance planning. Sure, you can reduce power to slow a jet, but using spoilers causes faster speed reductions, as does extending the landing gear and flaps. Typically, a light jet approach and landing is a very structured, sequential affair, with an initial power reduction about 10 nm from the final approach fix or the traffic pattern, followed by extending the first notch of flaps two to three miles away, then reducing power enough to slow to 150 knots. At the final approach fix, lower the landing gear, go to full flaps, and then reduce power to maintain a safe glide path—using vertical guidance if at all available—at a final

approach VREF (reference speed) of approximately 100 knots. (Again, these are ballpark speeds for a Phenom 100.)

Once established in this configuration, it's steady as she goes. The pressure's on now, especially if you have any passengers. No sudden power increases or decreases unless absolutely necessary, and an even, constant airspeed and constant descent rate to short final. That's the goal, always: a stabilized approach. Make your last power reduction to idle just before arriving over the numbers, and hold a slight nose-up attitude all the way to touchdown. None of your piston-single full-stall landings, please! In landing configuration at idle thrust, jets lose lift rapidly, and an aggressive flare will cause you to drop to the runway in short order.

Let the nosewheel fall to the runway, then apply brakes and slow to taxi speed. The Phenom 100 doesn't have reverse thrust—one big, big reason why a stabilized approach at VREF is a must—but if it did you might pull back on the power levers to help you slow and maybe save your brakes. Newer Phenom 100s have ground spoilers that shorten landing distances, and which deploy the moment the airplane senses that there's weight on the wheels.

But the big takeaway here is that if you fly the approach even a little too fast, you risk floating far down the runway. If you're unlucky you might go off the end. It has happened.

That's it in a nutshell. So how'd you like your first jet flight? Sensory overload? You bet. Of course, you'll have to attend formal, simulator-based training to understand the technique of jet flying. And as a first-time jet pilot, you'll be required to have a mentor ride shotgun with you for a while. That makes a lot of sense. Soon enough, you'll get the hang of it. Just remember, gradual adjustments to power and configurations, and think ahead—way ahead. In a piston single you're accustomed to thinking maybe 10 miles ahead of the airplane. In a jet, it should be more like 100 miles. Still want to fly one, Mav? Thought so.