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HOW IT FLIES

A Tundra 200 Flying Qualities Review

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Photos by Phil High

FLASH: Another mini-Beaver arrives in kit form from Canada. Dream Aircraft's Tundra 200 is a four-place, high-wing, taildragger/nosedragger/floatplane with a cockpit big enough to call a cabin and plenty of volume behind the rear seats for, well, all that stuff Beaver pilots put back there. Okay, it's not that big, but it's large enough for four people's stuff.

Pulling all that stuff is a Lycoming IO-360, 200-hp engine turning a Sensenich two-blade, fixed-pitch propeller. With a 60-inch advance, the prop is a compromise between cruise- and climb-optimized.

There's a fixed step for entry. With your outside foot on the step and either hand grasping the leading edge of the door frame, it's an easy hoist onto the seat. The wide doorway and generous fore/aft seat adjustment allow a variety of entries, and none require contorted joints or result in bruises. Seat back angle is fixed, and fortunately the angle is comfortable.

Once belted in, the cockpit is roomy. A normal sitting position has your outside arm in contact with the door, but when you're doing the driving, holding the stick pulls that arm just far enough to remove the contact.

There's a full set of controls for each pilot, and all panel controls can be easily reached by either pilot with the shoulder belt snug. The four-position flap lever lies between the seats. All the way down has the flaps reflexed 8 degrees, which netted at least 5 extra mph during this evaluation. You have to depress the button at the end of the lever to move the flaps from reflexed to zero. Increasing the deflection to 15 degrees, 25 degrees, and 40 degrees does not require the button to be pressed, but you will have to use the button to pass each detent when lowering the lever to raise the flaps. Dynamic pressure keeps the flaps from drooping past the selected deflection.

During the early part of the takeoff roll in the demonstrator, there wasn't enough air load on the flaps in their 15-degree setting, so the lever had to be held. This lasts only a few seconds, and the company has incorporated a stiffer spring in production kits to alleviate the problem.

Pitch trim is mechanical, set with a wheel protruding from

below the center of the instrument panel. Rotating the wheel repositions a tab on the right elevator. A mechanical trim indicator is adjacent to the trim wheel.

The control sticks are shaped to allow full lateral displacement (11-5/8 inches stop-to-stop) without leg interference, and the foam grip seems to be right where it ought to be. Longitudinal displacement is 12 inches. The torque tube connecting the sticks for pitch is exposed in the demonstrator, and its proximity to the rudder pedals makes for awkward foot placement for the nonflying pilot. [In the final kits, this tube is now located under the cockpit floor.] Full pedal displacement puts 3-½ inches between the pedals.

A nudge of throttle starts the plane taxiing on level pavement, and even with 900 rpm, you'll need occasional brake-taps to keep the airplane at a reasonable speed. A taildragger with a big engine generally means the forward field of view is obstructed, and that's the case here. A 10-degree heading change away from your side is enough to clear the taxiway ahead, but it'll take at least 30 degrees when S-turning toward your side.

Tailwheel steering feels solid and works just fine for following the yellow line. Pivot turns take an appropriate tap on the toe brake, and bringing the now-castering tailwheel back into steering range does not require a clumsy stomp or inconsiderate prop blast, making congested maneuvering easy and ramp-friendly.

Takeoff from a 1,100-foot density altitude, paved runway takes about 12 seconds in calm wind. Using 15 degrees of flaps and holding the stick about halfway between neutral and the forward stop, the tail rises predictably as the airspeed indicator passes about 40 mph. Not forcing the tail up allows early recognition of any directional control requirements, and a few small pedal inputs keep the runway centerline stripe under the fuselage. Control forces are light throughout the takeoff, with the largest stick force being about 7 pounds of push as you wait for the tail to come up.

It appears the airplane would be happy with a variety of two-point attitudes as it accelerates, and maintaining one of them is easy. The airplane flies off from a slightly tail-low two-point attitude without additional back-stick at about 60 mph. The same trim setting for takeoff gets the airplane reasonably close to its 80 mph best rate of climb speed (VY). The company had not completed its performance testing at the time of this flight, and 80 mph is a best guess. [Flight testing showed VY to be 90 mph.]

The pitch attitude during a no-flap climb is about 12 degrees nose-high, necessitating some weaving to clear the sky ahead. Timed climbs through an average 4,160 feet density altitude revealed 840 feet per minute loaded to 2,010 pounds or 540 pounds below its maximum. Center of gravity was 28 percent aft of the forward limit.

Cruising with 2450 rpm at 4,600 feet density altitude the airspeed indicator showed just over 130 mph indicated, or 140 mph true. The forward field of vision naturally improves here to 10 to 15 degrees downward over the nose. Laterally, you can see around to include about half the horizontal tail on your side and about 60 degrees behind the wing line looking cross-cockpit. The look-up through the windscreen is 30 to 40 degrees. Leaning forward to improve your look-up, which is particularly desirable when turning, doesn't offer much help if your shoulder strap is snug.

Looking out your side window, the view is almost straight down; it's about 30 degrees below horizontal looking cross-cockpit. The eyes of an average height pilot will be above the top of the side window, limiting the sideways view to approximately 5 degrees below level. Tuck your chin into your neck, and that view improves to about 5 degrees up under the wingtip.

Control Feel

The Tundra is a nice-flying airplane. Flight controls are smooth and harmonious, and have force gradients appropriate for this class of airplane. Pitch trim is, well, unusually nice. The large trim wheel allows both substantial trim changes and tiny adjustments, providing expeditious fine-tuning throughout the airspeed range without the sensitivity or insensitivity issues that sometimes accompany both electric systems and other mechanical implementations.

One to 2 pounds applied to the control stick in any direction is enough to start the plane pitching or rolling. This breakout force sounds a bit low, but no inadvertent stick inputs were noted in calm air. There's no slop in the longitudinal control system (zero free play), and the stick returns almost completely to its pre-displaced position upon release. This not-quite-there stick centering results in a residual hands-free pitch rate of approximately 1 degree per second. Laterally, there's also zero free play and a bit of friction that makes for a 3/8-inch stick centering band, resulting in a hands-free residual roll rate of no more than 1 degree per second. So you may have to bump the stick a time or two after maneuvering to get it exactly where you want it. Rudder breakout is a light 5 to 10 pounds, and this system feels as tight as the stick.

Static longitudinal stability is positive, meaning you'll have to hold the stick back to maintain an airspeed slower than the speed the plane is trimmed for and forward to increase speed. Count on 4 and 8 pounds of pull to fly 120 and 100 mph, respectively, and 3 and 6 pounds of push to fly 140 and 150 mph. These forces are low enough for temporary off-trim flying and high enough to nail the desired off-trim airspeed without chasing it. The trim speed band, or range of airspeeds the airplane will maintain hands-free without re-trimming, is 7 mph.

Maneuvering stability is also positive. As in the non-maneuvering case, stick force requirements increase predictably, and the airplane's response to longitudinal control inputs is probably better than you'd expect from this style of plane. A level 30-degree bank turn takes 5-6 pounds of stick pull. That increases to 8-10 pounds for 45 degrees of bank and 20 pounds for 60 degrees. These are low by general aviation standards but high enough to avoid over-controlling the airplane.

The Tundra's dynamic stability characteristics are similarly well behaved. An abrupt pull or push on the stick causes the expected pitching activity without any residual wiggles—a deadbeat short period. Its long period, or phugoid, is positively damped. Pull or push the airplane off its trim speed, release the stick, and it converges back toward its trim speed with several decreasing amplitude cycles, each taking 30 seconds.

Don't expect fighter-like roll performance. That big "Hershey bar" wing provides a lot of roll damping, which in this case is a good-news/okay-news story. The okay part is that the maximum average roll rates timed during full-stick coordinated rolls from 30 degrees of bank through 30 degrees of bank the other way are just under 60 degrees per second. The good news is the development and decay of the roll rate

is just about perfect—short but not abrupt, so quickly capturing the desired bank angle comes easily.

Dihedral effect is positive. Step on a pedal, and the plane yaws and rolls in the direction of the applied pedal. Spiral stability—the airplane's rolling tendency when established in a bank angle—is essentially neutral, meaning you don't have to apply any lateral stick for the airplane to maintain its bank angle.

For roll rates typical during cruise flight, expect to use 7 or 8 pounds of stick force. Yank and bank if you like, but the Tundra shines doing what it was designed to do. Pack the camping gear and the family and go someplace in a smooth, comfortable airplane.

Power effects on pitch control fall into that same predictable and benign category as the rest of the airplane's responses. Pull the throttle to idle from its cruise setting and the nose drops 10 degrees or so and the plane accelerates slightly. A light, 3-4 pound stick pull is necessary to maintain the 130 mph speed. If a level deceleration is the goal, ease in about 5 pounds of back-stick over the 5 seconds it takes to go from 130 mph to the 100 mph maximum speed for 15 degrees of flaps. A level acceleration requires an initial 4-5 pounds of stick push after applying full throttle. Hold that condition, and the airplane tops out at an indicated 148 mph. Never exceed speed (VNE) is 162 mph.

Non-Stalls

Idle stalls are ho-hum affairs with the test-day loading. With the trim set for the 130 mph cruise condition, the stick pull force reaches a hefty 25-30 pounds at the aft stop.

Performances	Wheels	Skis	Floats
Power	200 hp	200 hp	200 hp
Max. take off weight	2550 lbs	2550 lbs	2800 lbs
Design load factor normal @ 2550 lbs	+3.8 -1.7	+3.8 -1.7	+3.8 -1.7
Maximum wing loading @ 2550 lbs	14.2 psf	14.2 psf	15.25 psf
Maximum flap extended speed	90 mph	90 mph	90 mph
Maximum cruise speed - VC	140 mph	128 mph	125 mph
Never exceed speed (VNE)	160 mph	160 mph	140 mph
Takeoff roll	400'	650'	1300'
Cruise speed 75% power @ 1500'	132 mph	125 mph	118 mph
Stall speed (flaps down)	30 mph	40 mph	45 mph
Stall speed	42 mph	45 mph	52 mph
Rate of climb	1000 ppm	800 ppm	600 ppm
Service ceiling	14 000'	14 000'	14 000'
Endurance	5.1 hrs	5.2 hrs	5.2 hrs
Range	673 miles	660 miles	613 miles

Specifications	Wheels	Skis	Floats
Length	25.5'	25.5'	25.5'
Height	7'	7'	7'
Wing span	36'	36'	36'
Wing area	$183.6'^2$	$183.6'^2$	$183.6'^2$
Wing chord	5' 1"	5' 1"	5' 1"
Horizontal tail span	10' 7"	10' 7"	10' 7"
Horizontal tail area	$39'^2$	$39'^2$	$39'^2$
Empty weight	1450 lbs	1604 lbs	1692 lbs
Design gross weight	2550 lbs	2550 lbs	2800 lbs
Useful load	1100 lbs	946 lbs	1108 lbs
Fuel capacity	58 gal US	58 gal US	58 gal US
Fuel weight	348 lbs	348 lbs	348 lbs
Design payload	722 lbs	598 lbs	760 lbs
Wing loading	13.9 lbs/pt2	13.9 lbs/pt2	15.25 lbs/pt2
Power loading	13 lbs/bhp	12.78 lbs/bhp	14.2 lbs/bhp
Cabin width	44"	44"	44"
Cabin length	112"	112"	112"

That's about the one-hand limit most people find tolerable in a short duration. The airplane just nibbles at the stall with the stick in your lap. The airspeed needle points to 45 mph here, with the plane's nose a couple of degrees above the horizon. There's no pitch break, only a gentle wing-rock that rarely exceeds 10 degrees of bank in both directions. The vertical speed indicator displays a solid 800 fpm descent, and that's about it. Ailerons and rudder remain effective, although adverse yaw is pronounced. Relax the stick for the recovery. You can firewall the throttle and keep a light pull on the stick to minimize the altitude lost.

Having now painted a seemingly harmless stall character, let's keep a couple of mitigators in mind. First there is no natural stall warning. No airframe buffet, warning horn, propeller percussion, significant changes in pitch attitude or wind noise—not much to cue the pilot to an approaching stall. There is the ponderously high stick force when trimmed for cruise speed, but this won't be as significant for the pilot who trims for a slower speed. There's also the insidious nature of the gently falling leaf that invites inattention to altitude.

Finally, loading the airplane to a center of gravity further aft than it was for this test should increase the elevator's effectiveness, perhaps enough to truly stall the wing instead of merely getting close to its stall angle of attack. The company says stalls at the aft center of gravity limit produce the same gentle falling leaf character, but we were unable to test that.

The final take on stalls brings us back to the glass being half-full. Recovery using only elevator is simply a matter of relaxing the back-stick slightly. A normal recovery using full power turns the 800 fpm descent into a climb in less than 50 feet. Ideally, every airplane would exhibit clear stall warning and a well-defined but benign stall character. But if you could have only one, what would you rather have—no warning with a benign stall or plenty of warning with a real attention-getter?

Flap speeds used for this evaluation were 100 mph for 15 degrees and 80 mph for 25 and 40 degrees. From a level-flight trimmed condition at 100 mph, pulling the flap lever from its reflexed cruise position to its 15-degree position produces little pitch change. Going from 15 degrees to 25, and then 40 at 80 mph shows more pitching moment changes. Control stick force doesn't exceed 5 pounds while the airplane slows in level flight—that's easily managed with one hand while working the trim wheel with the other.

Slow-Speed Flying

Level flight at a final approach speed

of 65 mph and 4,200 feet density altitude takes 1950 rpm. Control forces are lighter all around, but most noticeably in roll. Airplane responses are more sluggish at this slower airspeed, so larger displacements are required.

The airplane can still be trimmed expeditiously, but there was a peculiarity with the trim system under these conditions. When we trimmed for 65 mph in level flight, then performed a couple of climbing/descending turns, and returned to straight and level flight at 65 mph, we found the airplane was no longer in trim. It took a couple of pounds of stick force, either fore or aft, to hold 65 mph. Despite the trim migration, the airplane remained easy to fly under landing pattern conditions. The company has since discovered an off-center bell crank in the trim system and reports that an adjustment solved the problem.

Rudder coordination is necessary to prevent substantial adverse yaw, but pedal forces are low, and accurate heading captures require no special skill. Roll rate is noticeably slower. Using full lateral stick and full rudder, timed average roll rates during 30-degree to 300-degree bank reversals were 25 degrees per second. Once established in a bank angle, the airplane maintains that angle, just as it does under cruise conditions, indicating neutral spiral stability. The pull force needed for a level, 30-degree bank turn is 3-4 pounds.

Although control breakout forces aren't much different from the cruise case, the lateral control stick centering band is larger. The stick returns only to within 1-1/2 inches of its pre-displaced position, leaving the airplane with a hands-free roll rate up to 5 degrees per second. The centering band and residual pitch rate in the pitch axis are about the same as the cruise situation. Neither of these imperfections consciously affects the way you fly the plane or the precision you can achieve.

Large power changes produce expected results. Chop the throttle to idle, and the draggy nature of this configuration bleeds the speed below 50 mph in 5 seconds or so, requiring a stick pull in the 12-15 pound range to hold altitude. Selecting maximum power from a level, 65 mph condition causes the nose to rise. It'll take 8-10 pounds of push to maintain the 65 mph during the resulting climb.

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Dutch roll, that yaw/roll oscillation that occurs when a sideslip is introduced, is slightly more yaw than roll. Alternately depressing and releasing the pedals gets one or two swings of the plane's nose. P-factor is obvious during this exercise, with the airplane pitching slightly nose-up when a left sideslip is introduced. A large, uncoordinated aileron deflection will also initiate the Dutch roll response of a couple of mostly yaw oscillations sufficient to foil a precise heading capture. Normal rudder coordination restores roll-out accuracy.

The Tundra looks like an airplane you'd see in a hard slip during an over-the-trees approach in one of those brochure-inspiring landing sites. Although fun to perform, a full-pedal slip only increases the descent rate by about 300 fpm. Full-pedal slips generate no more than 10-12 degrees of sideslip with the airplane 8-10 degrees wing-down in the sideslip direction. Control forces are low: 25-35 pounds on the pedal, 3-4 pounds of lateral stick, and about 5 pounds of stick pull for right sideslips and the same in the push direction for left sideslips.

Idle stalls with full flaps and the airplane trimmed for 65 mph in level flight are pretty much a duplicate of the clean stalls. Stick force with the stick all the way back is an estimated 30 pounds, and the stabilized rate of descent is 750 fpm with the airspeed needle between 40 and 45 mph. Alternating wing-drops of 10 degrees or less occur 1-2 seconds apart, and the plane's nose is near the horizon. Recovering with full power turns the plane around in less than 50 feet even without retracting the flaps. It'll take 8-10 pounds of stick push to hold 65 mph for the initial full-power climb-out. Turning stalls are virtually the same.

You'll have to keep the airspeed indicator in your scan all the way around the landing pattern, because stick force cues due to a change in airspeed are minimal. The view over the nose is good until halfway through the round-out for a three-point landing, when the nose slides up to erase the runway. Even with that broad cowl, maintaining runway centerline takes only normal tailwheel landing visual technique.

Manage your power all the way through the flare, or start with some extra airspeed, because once you pull the throttle to idle it doesn't take long for the energy to bleed off, even with only 25 degrees of flaps. Despite the elevator-limited stall situation, there's plenty of elevator authority to establish a three-point landing attitude. Control forces are low throughout the landing, and directional control on the runway is what you'd expect from an airplane of this design. You'll need to use your feet, but you won't have to stop chewing your gum. Tailwheel steering picks up when rudder effectiveness fades.

The Tundra probably looks more like a tool than a toy to some, but that characterization would deprive those "some" of the airplane's recreational potential. Whether it's working for a living, flying for flying's sake, or transporting you on an odyssey to find that brochure locale, Dream Aircraft's Tundra has a lot to offer. EAA