CLT—Cessna Breakthrough

'Center-line thrust,' important new general aviation deveolpment, makes its debut in Cessna's radical new twin. Skymaster makes multi-engine flying easier and safer, even for inexperienced pilot

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There's a new term in general aviation: "center-line thrust." It's not just a technical term that should be relegated to the aeronautical dictionary and forgotten. Unless I have done an unusually bad job of guessing, and Cessna has done the same (in addition to losing a sizeable fortune in the process), CLT is going to open a whole new era in general aviation.

CLT is about to be introduced to pilots and owners in the form of the Cessna *Skymaster*. Around Wichita you hear pilots jokingly refer to it as the "Push-me-pull-you," or just plain "The Beast." Those who have flown it, however, don't use such language. They're nearly all Cessna personnel, at least up to now, and these pilots speak of the *Skymaster* with considerable enthusiasm, and even with a touch of awe. The company is checking out limited-experience single-engine pilots among its employes in the *Skymaster*. If these pilots have anything to say about it, CLT is here to stay.

I have just spent part of two days flying the third production airplane N1703Z. The first experimental prototype has 480 hours on it, the second has 175. The third is being used by Cessna's administrative flight department to check out and qualify a variety of company employes, the second for accelerated service tests. The third is 03Z, which will shortly be turned over to Del Roskam, Cessna senior vice president, who makes it a practice to take the third production plane of each new model, and shake it down himself. Roskam is about to get the first CLT rating too.

For a time, Cessna had hopes of getting FAA to permit single-engine pilots to fly the *Skymaster* without having to get a multi-engine rating. FAA finally decided to recognize the new concept by inventing a new class of multi-engine rating: the center-line thrust rating.

If the appearance of the *Skymaster*, and the preoccupation with the new term "center-line thrust", appear to be a gimmick from the fertile imaginations of sales and promotion specialists, forget it. Frankly, I had such vague thoughts myself, but didn't bother to think too hard about it because I knew I'd eventually find out just exactly what there is to this much-discussed, long-delayed *Skymaster*.

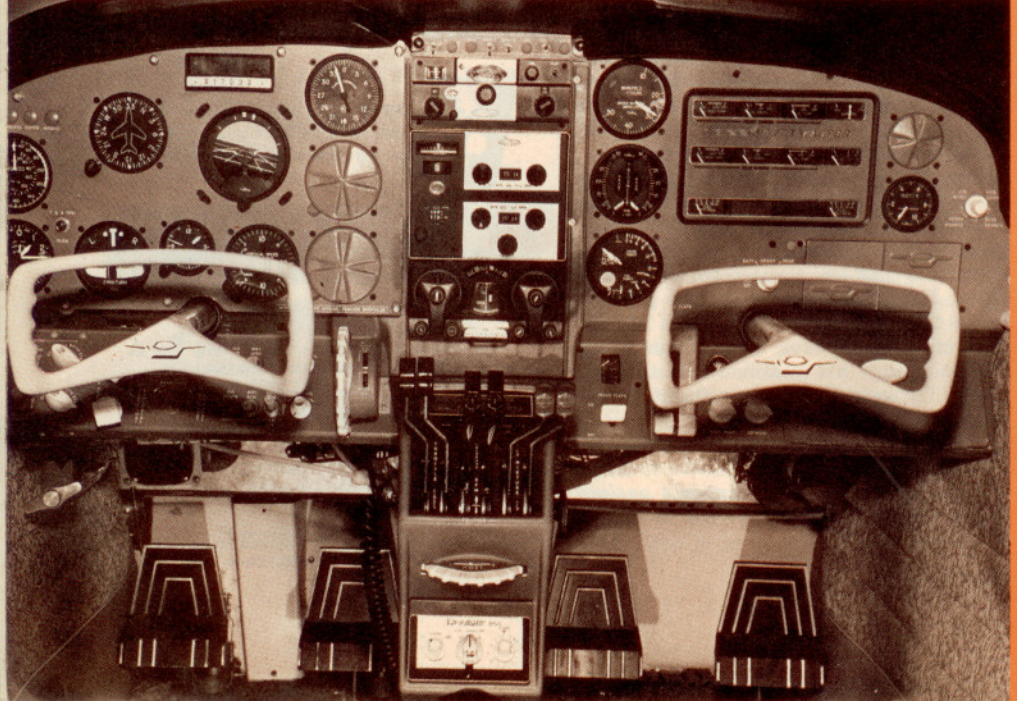
I now have found out. I'm not only impressed, I'm enthused—just as Cessna's blase, sophisticated test pilots told me I'd be. It's one thing to discuss a new model with salesmen, even the best-informed salesmen. But it's quite another to discuss it with pilots whose sole job is to prod and probe for the facts, the men who have spent long hours working in and around the new baby. It doesn't take much of a psychologist to get a quick insight into the thoughts of these men, even when they're hesitant.

The *Skymaster* was born as the result of four deceptively simple requirements listed in a memo from management several years ago:

1. They wanted what they called a "light-light" twin;
2. It must have flight characteristics comparable to any single-engine Cessna;
3. It must have performance comparable to any competitive twin;
4. It must have exceptional single-engine performance.

No. 2 was the toughest nut to crack, and when they began expanding on what they meant, they soon realized they had an almost revolutionary job on their hands. Because management insisted that they meant No. 2 in every sense: it must be as close as possible to the single-engined Cessnas in ease and simplicity of flight. That meant that the pilot with little experience, who didn't want to get a standard multi-engine rating because of the difficulties and complexities that exceeded his capabilities, could safely and easily fly this ship. It also meant he didn't have to hire a professional pilot to fly it for him, as is done with so many twins these days.

It was a whopping order, and it was



◀ Skymaster's instrument panel is much like those found in the more elaborate single-engine Cessnas, except for dual engine and prop controls. Six handles in center cluster control power; two on left are throttles; two in center are prop controls, and two on right are mixture controls. Each left handle in the pairs is for the front engine, those on the right are for the rear power plant. Note small lights on top of prop controls—they light whenever the engine to which they are attached loses thrust. Elevator trim control is wheel at bottom of instrument panel (left of power-control cluster). Flight instruments are on pilot's side of panel, radios in the center and engine instruments on right. Radios in photograph are (top to bottom) ARC ADF, ARC omni and VHF communications and King KX-150. ARC autopilot is mounted at bottom of power cluster

▶ Two production prototypes now undergoing service tests. Author Karant flew recently built N1703Z. It was the next model produced after N1702Z, shown in the foreground. Note the position of the pilot, who sits well in advance of the leading edge, and the rear-engine air intake on top of the fuselage

turned over to Don Ahrens, who spent years prior to that as project engineer on the 310. Ahrens and his crew drew dozens of sketches and kicked around hundreds of ideas. They considered conventional twins, high wings, low wings, pushers, tractors, and even bolting two engines together and gearing them to drive one prop (an idea that had been tried several times before and discarded). Finally, they ended up with eight serious designs. One by one, for various reasons, they eliminated all but one, which became the Model 336, or the *Skymaster*.

The airplane just now going into production should be one of the most significant new developments in recent general aviation history. It is literally true that single-engine pilots can fly the *Skymaster* with only a little checkout—safely. And the checkout is concerned largely with things like familiarization with the dual engine and prop controls, and with the plane's general flight characteristics. Despite its high wing loading (19.4 lbs. sq. ft.), the *Skymaster* "floats" on landing much like a 172.

But once the average pilot understands these differences, and does a little practicing, he's well on his way toward being a full-fledged multi-engined pilot—CLT, that is. On takeoff, for example, there's no torque. The props turn in opposite directions and cancel out the torque for each other. If one engine quits on takeoff (which I simulated a few times), there's no more torque than you're already accustomed to in single-engine aircraft, and you can take your own sweet time about doing something about the lost engine—the kind of mishap no pilot of a conventional twin could dare treat this way.

I flew 03Z much of the time at about maximum gross weight. Landings, takeoffs, stalls and single-engined flying was done at 3,848 pounds, just 52 pounds under maximum gross. I did touch-and-gos with one engine windmilling, and took off from a standing start with the front engine feathered, flew the traffic pattern and landed. It just took a little longer to get up to 80 m.p.h. for takeoff, but once we did we climbed right out on the one engine at 500 f.p.m. at 100 m.p.h.

Most significant feature of all, as I've indicated, is that "moment of truth" when the pilot faces the most dangerous situation usually associated with a twin—loss of one engine. In the *Skymaster*, the ship seems to keep right on as though nothing happened. The sound changes, but the most positive indication the pilot gets is the little red light built into the handle of each prop control. Invented by Cessna for the purpose, the light comes on for that engine that has lost its thrust. Because of the outstanding engine-out characteristics of the ship, the pilot can safely take his time, study the controls, determine which engine went out, then shut off the engine for which the light is on. They even have a placard on the panel: "When one engine is inoperative, please feather it." All this can be done on climbout, or elsewhere. No sudden wild grabbing of the controls, instantaneous reactions to the sudden yaw caused by the good engine, and the necessity for using muscle to cope with the emergency. The accident rate in some of these light twins soared, and Cessna had this record vividly in mind as they worked to devise a plane that avoided much of this.

As a pilot familiar with most of the conventional twins, I was impressed by what may seem to be little things. The procedure is to start the rear engine first. I did, only to react with a start at the noise in the rear while looking at a still prop in front of the windshield. The *Skymaster* even looks like a single-engine plane from inside. Then you have to learn that the engine and prop controls are in the usual place, but that they now stand for the front (left handles) and rear (right handles).

It's an odd feeling for a multi-engine pilot to taxi the *Skymaster* at first. Taxiing conventional twins requires jockeying the throttles for the left and right engines, a technique that takes practices and saves the brakes. Throttle-jockeying the *Skymaster* is a waste of time; both engines are going the same way. Matter of fact, to save brakes you learn to leave the rear engine at idle and taxi only with the front engine.

Takeoff is as simple as with a single-engine airplane—simpler, actually, because there's no torque, and you can keep your feet flat on the floor. You ease the nose up at any point after 70 m.p.h.; I used 80 most of the time. I tried 70 once, taking off from the Beech airport, where I'd stopped to get my camera bag out of my own plane. Quite a few Beech people came out for a look, and I couldn't resist the urge to get maximum takeoff performance just for them to see. That was about 30° of flap, and nose wheel up at 70 m.p.h. Under those conditions, the angle of climb is so steep the nose obliterates everything in front of you but the sky.

In level flight, visibility is quite good, despite the long nose sticking out in front of the windshield. The front seats, in addition to being unusually comfortable, are adjustable over a wide range, including a crank to move them straight up and down. So the pilot can adjust his seat to suit his eye level.

The *Skymaster* is listed as four-place, with optional seating available up to six. It started as a straight four-placer. Then, about three-quarters of the way toward completion, the marketing people decided it had better be six to compete in the market. That change, a problem with rear-engine cooling, plus Roskam's insistence that the noise level of the experimental version be improved, delayed the *Skymaster's* original schedule eight months. Cessna discussed this in some detail with its distributor organization and got unanimous agreement that, because of the ship's radical design, and the fact that everyone in aviation would "look for trouble" as soon as deliveries started, the delay was well justified. That's why there's been so much talk about the *Skymaster* during the past couple of years, but no airplanes.

Noise level in level flight now is excellent. It's almost exactly the same as that of the 310G, which Cessna engineers used for their sound-measuring comparisons. They also ran tests aimed at a question that came up early in the design, and which I asked: does that rear engine come tearing through the cabin in case of an accident? They rigged a test unit, hung a *Skymaster* on it, then dropped it in a curving arc so that the strongest point on the plane —the main spring steel gear legs—hit the equivalent of a brick wall and came to a sudden stop. The measured force was over 12 G's. The cabin seats tore loose, and all sorts of other things broke up, as they would with anything at such force. But the engineers had designed a special mount for the rear engine, with "weakened" lower components on the mount for just such an accident.

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The rear engine did what they'd planned: the mount broke off in a downward arc and went under the cabin.

Stalls are at 60 m.p.h. with full flap (30°) power off. With power, it's lower than that. In the stall it mushes forward, settling at a fairly fast clip. 03Z had a slightly rough left wing leading edge (later fixed) which caused it once to stall ahead of the right wing and do a sharp diving left turn. That even startled Bill Thompson (AOPA 113467), Cessna chief test pilot, and he immediately tracked down the cause and had it fixed.

We flew 03Z over a measured two-mile course four times at treetop level to get an accurate reading on top speed and cruising speed. Actual altitude was 1,040 ft. above sea level. The high speed runs were made at 27-inches manifold pressure and 2,800 r.p.m. and averaged 185.7 m.p.h. ground speed; indicated airspeed was 188. The cruising check over the same course averaged 161.5 at 23 inches and 2,500 r.p.m.; indicated airspeed was 162. Retracting the gear would add about 20 m.p.h.

A round trip cross-country flight at 7,500 ft. at 72% power (Cessna's figures are based on 75%) averaged 176.5, or 3.5 m.p.h. faster than Cessna claims. With normal tanks (92 gals. usable) this represents a maximum range at 75% power of 4.3 hours; 03Z had auxiliary tanks too, which gave it a maximum range at 75% power of six hours. 03Z also was completely equipped with ARC and King KX-150 radio, and a "Nav-O-Matic 300" (also ARC) autopilot. All this, plus other extras, brought the price of 03Z to $48,291.50. The plane's basic list price is $39,950.

The elevator trim tab control wheel is located up in the instrument panel, just to the left of the throttle quadrant —and it's a good thing, because you use it frequently when flying the *Skymaster*. The flaps are linked to the elevator trim in such a way that, when they are retracted, they automatically roll forward on the trim control. In a balked takeoff this helps, but it's not enough. It is here that I ran into the hardest physical work in flying the *Skymaster:* holding the nose wheel down in a simulated go-around after applying full throttle, while trying to trim the nose down as quickly as possible. The engineers tell me it takes 35 lbs. of forward pressure on the wheel. They found later that this flap elevator trim linkage was improperly rigged, resulting in excessive forward pressure on the wheel.

Rate of climb on both engines is just over 1,300 f.p.m. It's officially listed as 355 f.p.m. on the front engine only, and 420 f.p.m. on the rear. This is interesting particularly because, in a single-engine condition, it's the rear engine that's the most efficient on the *Skymaster*. I asked about this and the engineers came up with some interesting points. The rear engine installation is about 10% more efficient than the front, under the same flight conditions. This is largely due to the slower air flow over the rear; if the flow over the front engine is, say, 150 m.p.h., it's about 140 over the rear. So the rear engine is more efficient because (1) it has lower inflow velocity, (2) a thinner boundary layer of air on the fuselage at the rear engine, and hence (3) less slipstream drag. So if you're going to go on one engine, and have a choice, always choose the rear one.

The *Skymaster* uses a new engine. It's the six-cylinder Continental IO-360-A, uses fuel injection and delivers 210 h.p. for takeoff and 195 h.p. for maximum continuous cruise. The rear engine is cooled by a large fixed fan bolted to the rear prop shaft; it looks like the turbine wheel off a jet engine. The *Skymaster* also has two 30-amp. alternators instead of generators, and the electrical system is 28-volt.

If Cessna has anything to say about it, center-line thrust is soon to become a widely-used term in general aviation. My guess is that it won't be a passing fad, but a permanent and valuable contribution toward making multi-engine flying simpler and safer. END

PERFORMANCE AND SPECIFICATIONS
Model 336

Gross weight (lbs.)	3,900
Empty weight (approx.) (lbs.)	2,320
Speed (best power mixture)	
Top speed	183 m.p.h. (2,000 ft.)
Cruise, 75% power	173 m.p.h. (7,000 ft.)
Range: (normal lean mixture)	
Cruise, 75% power	745 mi. at 7,000 ft.
92 gals. no reserve	4.3 hrs.
	172 m.p.h.
Cruise, 75% power	1,040 mi. at 7,000 ft.
128 gals. no reserve	6.0 hrs.
	172 m.p.h.
Optimum range	890 mi. at 10,000 ft.
92 gals. no reserve	6.4 hrs.
	139 m.p.h.
Optimum range	1,240 mi. at 10,000 ft.
128 gals. no reserve	8.9 hrs.
	139 m.p.h.
Rate of climb at sea level	
Twin engine	1,340 f.p.m.
Front engine only	355 f.p.m.
Rear engine only	420 f.p.m.
Service ceiling	
Twin engine	19,000 ft.
Front engine only	8,200 ft.
Rear engine only	9,500 ft.
Absolute ceiling	
Twin engine	20,400 ft.
Front engine only	9,500 ft.
Rear engine only	10,800 ft.
Takeoff	
Ground run	625 ft.
Total distance over 50 ft. obstacle	1,145 ft.
Landing	
Landing roll	655 ft.
Total distance over 50 ft. obstacle	1,395 ft.
Stall Speed:	
Flaps down, power off	60 m.p.h.
Wing loading: (lbs. per sq. ft.)	19.4
Power loading: (lbs./h.p.)	9.3
Oil capacity: total gallons	5
Power:	
Two Continental 6-cylinder, fuel injection engines, 210 rated h.p. at 2,800 r.p.m.	10-360-A
Wing span	38 ft.
Wing area	201 sq. ft.
Length	29 ft. 7 in.
Height (with depressed nose strut)	9 ft. 7 in.