



Turning the conceptual corner
from Murphy's taildragger
Rebel to the trigear Elite

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Murphy Aircraft Elite

A REBEL REFORMED

Everything you need to know about Murphy Aircraft's design philosophy can be found in the shape of the instrument panel. As employed in the taildragger Rebel and the new trigear Elite, the panel comes from sheet aluminum stock, creased and folded in but a few places. The glareshield, such as it is, comes from an equally flat source and is cut to fit just behind the windshield. You won't find wood trim or faux carbon fiber gracing this panel, nor will you hear apologies from the factory for its unorganic shape. It is what it is: a place for instruments and switches, intended to be easy to build, fill with expensive bits, and maintain. Period. ■ Continue to look around the cockpit and you'll see other examples of utilitarian design. An outsized flap handle descends from the ceiling;

it's long and hefty, betraying the forces to overcome in deploying large flaps. The cabin doors are nearly square, and the latches release at the tug of a long nylon-covered stainless steel cable. Both cabin windows fold down, à la the Piper Cub, and can be left there in flight. Notice the details in an unfinished interior. Wing attach points are stout, and there are no compound curves in sight to befuddle the novice airplane builder. All the rivets that you see are of the blind variety, pulled from one side of the panel with a pneumatic gun. Let the sense of spaciousness sink in, too. Murphy claims that the Rebel and Elite have 44-inch-wide cabins and enough headroom to clamber aboard in full hockey regalia without dinging the headliner. (Just leave your skates at the door.) Peer over your shoulder and imagine the baggage bay brimming with spoils of the hunt or a family's camping gear.

Murphy's choice of simple construction techniques reflects the mindset of Darryl Murphy himself. From his company's base in Chilliwack, British Columbia, Murphy directs the design of the utility kit aircraft with a singular vision:

Make the airplanes simple, comfortable, reasonably light, and capable of true STOL performance. If sleek appearances—in the mold of the fiberglass-bodied Stoddard-Hamilton GlaStar, for example—and outright cruise alacrity come in second best, so be it. It's clear that, to Murphy, unabashed sex appeal should come well after usefulness, ruggedness, and short build times.

Design points such as these have long been a Murphy hallmark. Darryl Murphy got into the kit business with his first design, the biplane Renegade, in 1985. (It's still available with a choice of Rotax powerplants ranging from the 50-horsepower, two-stroke 503 to the 80-hp, four-cycle 912.) Five years later, the Rebel emerged. Sharing little more than company name with the biplane, the all-metal Rebel was an early success. With a slew of powerplant options—from the 66-hp Rotax 582 to the Lycoming O-235—the utilitarian Rebel could be configured for just about any mission or any budget. In addition, Murphy to this day sells a version of the

Rebel in Canada as an ultralight powered by the 912 Rotax. (As an ultralight, the airplane's maximum gross weight must be kept below the Canadian 1,058-pound limit to be licensed in this category.) Eventually, the 150-hp O-320 Lycoming found a home in front of the Rebel, as did straight and amphibious floats.

In the last few years, Murphy has worked relentlessly to improve and update the Rebel. The old shock-cord main gear was joined by an optional, single-leaf spring. Various fairings and aerodynamic tweaks were placed on the options list to bump performance in increments. Through it all, though, the Rebel remained true to the simpler-is-better doctrine, which is perhaps why it accounts for about 600 of the 1,000 or so kits Murphy has sold. Today, most of the line is still available new—the Renegade, the ultralight Maverick, and most versions of the Rebel.

Add another to the list, the Elite. This much-revised Rebel has been on the drawing boards since last summer and emerged in time for the Sun 'n Fun confab in April. Murphy's new airplane marks something of a departure from the bush-or-bust focus of the various

Overhead flap handle incorporates a hefty locking mechanism. Conventional flaps join with drooping ailerons for superb low-speed handling.



Rebel models. Notably, the Elite's got a nosewheel, Murphy's first. And in the mold of the efforts from Cessna and Piper 40 years ago, this one appears capable of emerging from a head-on collision with a Zamboni not much worse for wear. (The Wichita and Lock Haven engineers believed back then that the nosewheel was an inherently weaker

design, and so they quite substantially overbuilt those first nosedragger models.) A thick milled-aluminum structure supports the main gear and connects to a revised fuselage. The new Elite soon will also be available with the third wheel aft, although expect to see the Rebel continue for a spell.

In the cabin, the Elite gains 4 inches in height behind the seats for more cargo room. Murphy advertises the Rebel and Elite as effectively three-person airplanes, and the boast sounds far from hollow. Though the backseater might have to face the tailcone for sufficient headroom, there's plenty of leg and shoulder space to make most adults



happy. With the Elite, you get larger doors for easier egress to that larger cargo hold. Murphy also touts the potential for installing a floor structure deep into the tailcone to make the airplane a winged Winnebago for the camp-under-the-stars set.

Major structural differences from the Rebel abound. The tail feathers, for instance, are larger, and the horizontal stabilizer is fully cantilevered. The control surfaces are mass- and aerodynamically balanced; as a result, the airplane's never-exceed speed has gone up slightly, from 131 knots indicated to 136 KIAS. On the wings, the flaperons formerly gracing the Rebel have been supplanted by conventional flaps and separate ailerons. A mixer assembly allows the ailerons to droop as much as 10 degrees with maximum flap deployment to improve low-speed lift. Spades protrude from the outboard sections of the ailerons to lighten stick forces. In a departure from the Rebel, all controls surfaces are metal, not fabric. Finally, the tail changes in concert with some thicker wing skins and slight revisions to the internals result in a higher maximum weight, to 1,800 pounds from the Rebel's 1,650.

Additional weight-carrying ability comes in handy to haul around the Elite's top powerplant choice, an O-360 Lycoming of 180 hp. Such a stout engine hung on a light, big-wing airframe speaks to the seaplane enthusiasts in the



crowd. Other engines will be available for the Elite, too, including the O-235 of 116 hp and the O-320 of 150 or 160 hp. Murphy recommends the O-320 for all but float-equipped airplanes, citing better fuel economy and lower overall cost for just a slight performance loss.

In the demonstrator aircraft, the O-360 comes mated to a climb-oriented fixed-pitch prop for excellent takeoff and climb performance. The factory estimates the takeoff roll as 470 feet; and based on our experience, this probably is close to reality. (Other models of the Elite

with the O-235 and O-320 are slated to have takeoff distances of 700 feet and 600 feet, respectively.) Once airborne, the Elite fairly levitates and it's all too easy to blast right through the recommended 50-knot climb speed. Though we didn't get a chance to do max-performance climb testing in the Elite, the factory's estimate of 1,500 fpm seems realistic.

In flight, the Elite offers few surprises. Control forces are moderate, with the pitch being slightly lighter than is considered the norm in Skyhawk-class airplanes. We noticed that a couple of low-

time Rebels we've flown had so much friction in the pitch system that the trim was rarely used. A higher-time example didn't exhibit this tendency, but it's worth bearing in mind as a builder. In any event, the conventional stick controls make for comfortable handling overall, and the pitch system has good feedback in the low-speed regime, even if it isn't terribly trim-tenacious.

Apologies in advance for fans of flaperons, but the Elite marks a significant improvement over the Rebel in roll feel. Because flaperons must deflect into the

Murphy goes for four

The enormous 2500 is coming soon

Murphy Aircraft will soon unleash upon the world a monster. OK, it's not a Stephen King concoction—or even something you'd see spoofed on *Mystery Science Theater 3000*. It's the Super Rebel, a four-place model that drinks sparingly from the Rebel/Elite gene pool but that nonetheless seems to have indulged in great quantities of protein powder.

Weighing a maximum of 2,500 pounds and powered by a Lycoming O-540 swinging an 84-inch constant-speed prop, this airplane will be Murphy's biggest venture yet. Sized and shaped like a slightly blocky Cessna Skylane, the Super Rebel will have more wing area than a Bonanza and a stall speed of 39 knots. Expected cruise performance is in the 120-knot range.

Murphy displayed the fuselage and cabin of the as-yet-uncompleted Super Rebel to amazed crowds at Sun 'n Fun.

Usually, the first comment from spectators was "Geez, that thing's big"—followed quickly by "When will it be ready to fly?" Murphy expects the airplane to leave the ground well before Oshkosh so that initial testing can be completed in time to fly the airplane to Wisconsin. Many of the new features found on the Elite—separate flaps and ailerons, cantilever tail, for example—came from the development work of the Super Rebel. In that sense, you might just as well call the 2500 a Super Elite.

Prices at press time start at just more than \$17,000 for the basic airframe kit. Better plan on spending at least \$40,000 for the project, because Lycoming O-540s and constant-speed props do not come cheap, even used.

Nonetheless, when Murphy turns loose the Super Rebel, it will be alone in the class of four-place, all-metal kit-planes large enough to scare small children. —MEC

airstream as the flap portion is used, roll forces tend to rise quite sharply; overall roll authority can also suffer at the extremes of airspeed and flap displacement. Not so in the Elite. With separate ailerons and flaps, roll control is robust and communicative from cruise down to the landing flare. By increasing the maximum deflection from 18 degrees in the Rebel to 30 degrees and by drooping the ailerons as much as 10 degrees with flap deflection, Murphy recovered much of the lost low-speed lift. Separate control surfaces also improve the stall characteristics and allow for smaller and lighter mass balances. (Part of the reason the Rebel's flaperons are fabric-covered is to reduce weight and the heft of the necessary counterbalance.) Stalls themselves are fairly ho-hum, with a straight-ahead break (assuming you've got the ball in the center) and plenty of aerodynamic warning. One obvious clue to an imminent loss of lift is the large pitch input necessary to hold a desired attitude.

As you might expect, a thick wing (and lots of it) combined with a luxury-width cabin and a prop whose pitch is finer than baby's hair gets you modest cruise performance. Murphy says that the 180-hp airplane will do 114 knots true at optimum cruise; we came close to that num-



ber at an admittedly suboptimal 2,500 feet msl. Other engine options give the following speeds—the O-235, 102 knots; the O-320, 110 knots. In all, these claimed speeds seem completely reasonable and represent a refreshing change from the oft-inflated kitmakers' numbers.

In flight, the Elite's large cabin and expansive windows do much to alleviate boredom and discomfort. With the cowling quite low on the horizon and the optional eyebrow panes in place

(not, obviously, fitted to the Elite we photographed), the view out is about as good as it gets in a high-wing airplane. (Cardinal and Skymaster owners, save your stamps; we know you've got it better.)

As you build the Elite, you have the choice of installing the normal 44-gallon fuel system or closing out more bays of the wing for additional fuel in seven-gallon increments. Murphy uses a system similar to Mooney's, in that the seams in the interior of

Simple Rebel instrument panel represents Murphy's utility-think; new Elite comes with a curved-top panel that looks a bit more modern.

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the wing are coated with a tar-like sealant; there are no secondary tanks or bladders. Both wing tanks feed through simple on/off valves to the engine.

Systems-wise, the Elite and Rebel are as straightforward as they come. Access to the under-panel space and beneath the floor is excellent, with no need of employing a dimensionally challenged individual to string wire or secure secluded hydraulic lines. Moreover, the quality of the raw materials appears excellent; so, if properly built, the airplane should be durable.

Unlike builders of many other metal airplanes, the Elite builder won't have to sweat intricate jigs or tons of drilling. Murphy manufactures the aluminum bits and pieces with pilot holes prepunched in a computer numerically controlled (CNC) machine; this makes the major components largely self-aligning. The builder assembles the pieces with clecos, drills the holes to final size, deburrs the holes, applies a zinc-chromate paste, reinstalls the locating clecos, and begins inserting and pulling the Avex blind rivets. Don't call them "pop" rivets, either, because these aluminum-body, steel-mandrel fasteners are more sophisticated than the hardware-store variety. Stainless-body rivets are used in some high-stress areas. You'll probably also notice that there are more rivets crawling the body of an Elite than is normal for metal airframes, and you'd be given a gold star for attention span. The basic rule is to use between double and triple the number of blind fasteners compared to solid driven rivets.

That makes for quite a bit of riveting, it's true, but the simplistic nature of the Elite helps keep build times down to between 1,000 and 1,200 hours. You could probably complete a minimally equipped airplane at the lower number,

but the truly fussy will probably see many more calendar pages flip by. As always, time to build is highly variable.

So is the finished cost of the project. With the Elite, you start with a firewall-back airframe that includes the basic airframe components for \$15,750. (Murphy is running a special through August 7; after that the trike will cost \$16,495.) A taildragger version of the Elite will cost \$500 less. Then you add \$3,430 for an engine-mount kit, about \$1,000 for a propeller, and a much larger chunk of change for an engine. Murphy is a Lycoming reseller, so it can sell you a new engine if that's in your budget. Figure on \$14,700 for the O-235 up to \$20,375 for the O-360. In all, you can figure that \$30,000 will get you a

Factory prototype Elite flies without wheelpants and eyebrow windows. The new trigeared model marks a significant shift for the company.

VFR-only Elite with minimal equipment and a used engine. You could spend double that for an Elite with a new engine, a set of Murphy's 1800

amphibious floats (\$6,120 in kit form), and a panel full of radios.

Talk to the factory's marketing types and they'll try to downplay gadget expenditures as not being in the true spirit of the Elite. Keep it simple and light, they say, and you'll really appreciate the backwoods capabilities of the Elite, as well as the look-outside-dummy recreational aspects of the airplane. While the Elite might not be the fastest or prettiest of the class, it may well be the purest of heart. But then, if you've peeked inside and seen the panel, you already knew that. □

Murphy Aircraft Elite		Rate of climb, sea level	1,500 fpm
Base price: \$15,750, airframe kit only.		Maximum level speed	126 kt
		Cruise speed/fuel consumption	
		@ 75 percent power, optimum altitude	
		Service ceiling	115 kt/9 gph
		Landing distance, ground roll	15,000 ft
			400 ft
Specifications		Limiting and Recommended Airspeeds	
Powerplant	Lycoming O-360, 180 hp	V _X (best angle of climb)	55 KIAS
Recommended TBO	2,000 hr	V _Y (best rate of climb)	70 KIAS
Propeller	Sensenich 76-in diameter	V _A (design maneuvering)	92 KIAS
Length	22 ft 3 in	V _{FE} (max flap extended)	70 KIAS
Height	7 ft 10 in	V _{NO} (max structural cruising)	126 KIAS
Wingspan	30 ft 4 in	V _{NE} (never exceed)	136 KIAS
Wing area	152 sq ft	V _{S1} (stall, clean)	39 KIAS
Wing loading	11.8 lb/sq ft	V _{SO} (stall, in landing configuration)	36 KIAS
Power loading	10 lb/hp		
Seats	2 or 3		
Cabin width	44 in		
Empty weight, estimated	980 lb		
Maximum gross weight	1,800 lb		
Useful load	820 lb		
Payload w/full fuel	556 lb		
Fuel capacity, std	44 gal (44 gal usable)		
	264 lb (264 lb usable)		
Oil capacity	8 qt		
Baggage capacity	201 lb		
Performance			
Takeoff distance, ground roll	470 ft		
Max demonstrated crosswind component	15 kt		

For more information, contact Murphy Aircraft Mfg. Ltd., Unit 1, 8155 Aitken Road, Chilliwack, British Columbia, Canada V2R 4H5; telephone 604/792-5855, facsimile 604/792-7006.

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.