

TOWARD THE FLIGHTLINE WITH THE

MURPHY REBEL

MURPHY AIRCRAFT MANUFACTURING LIMITED

The Rebel is an all-aluminum, side by side, high wing, taildragger with several engine options, long range cruising capability and more leg, head, and shoulder room than you'll find in any comparably priced aircraft kit. It is adaptable to oversize tires, straight and amphibious floats, as well as skis, making it the plane for all seasons, all reasons. Visibility from the Rebel is exceptional. The low profile cowling offers excellent forward visibility and the wide, outward folding door windows give a perspective of the countryside and cityscapes that turns every flight into an engaging adventure.

Combining the looks of popular classics from the 1940's with modern technology for performance, the Rebel offers pilots and passengers quick transport to the airways, river banks, lake shores, ski slopes, back country and islands in recreation country. What a great way to tour the Southwest or Northeast! What fun for exploring the Florida Keys, the San Juan Islands of Washington, or the vast expanses of Canada.

With minimal effort, you can install the standard floor in the aft fuselage and use the space for sleeping, turning your Rebel into a camper. If your family expands or you want to enlarge the circle of friends you take along, you can add a third seat and take a child along, or an adult weighing up to 175 lbs.

You can do it! Building a Rebel is probably a whole lot easier, quicker, and more economi-



cal than you think. You do not need any special skills, nor any materials beyond what you can order for a kit. We've even covered all the logical options so you can get it all at once... from one source. If you have access to the space of a one car garage, and some common hand tools, you can start building.

Once your Rebel is finished, you'll find a wonderful experience awaits you. Taking off in something you've built yourself is a

thrill. When that "something" happens to be a Rebel, the thrill becomes an absolute joy.

Ground handling of the Rebel is superb due to excellent forward visibility, differential hydraulic braking, a kick-out steerable tailwheel, and the wide-stance gear. On take off most people are surprised to see how quickly the tail comes up (about two plane lengths) and how soon the aircraft levitates off the runway. It takes all of 175' with two people on board. Rate of climb, starting at sea level is around 1,000 fpm with the O-235 engine. There are three powerplant options, ranging from 80 to 160 hp. That puts cruise, at 75 percent power, in the 90 to 120 mph spectrum. Full span flaperons are responsive in slow flight, right down to stall. With a couple of notches of flap, you can

cruise around for hours at 50 mph, taking in the sights below. Fly the final approach at 55 mph and expect to flare around 40. Flying a taildragger has *never* been easier. Most pilots can transition from tricycle to conventional gear with a few hours of dual... something you can do in your own Rebel... before the first 40 hours are flown off.

When you're done with the fun, two people can remove the wings in about 45 minutes to 1 hour. The stabilizer and elevator fold up to accommodate the wings for trailering. In that configuration, the Rebel can be towed on its own gear for home storage or maintenance, or it can be mounted on a simple trailer for longer hauls.

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BUILDING YOUR DREAM

Rebel Airframe

With the exception of the flaperon covering, which is fabric, the Rebel airframe is aluminum. We chose aluminum over composites, wood, as well as tube and fabric, because it has known measurable strength qualities, it stands up to ultraviolet light, is generally faster to build because it's easy to work with, and it gives a nice finish to any airplane. Aluminum aircraft also have better resale value, though we doubt that consideration will come up for quite some time once you discover the benefits of owning and flying a Rebel.

Any welding required for the Rebel is done at the factory. Steel parts are powder coated to assure longevity. Aluminum sheets are pre-punched to assure correct alignment and expedite riveting. No jigs are required, just a straight, level work table.

Fuselage

The Rebel fuselage uses semi-monocoque construction. Bulkheads are stamped aluminum. The skins are .020" 6061-T6 aluminum, giving the fuselage exceptional strength. An aluminum sub-floor installed over the lower bulkhead sections provides a good base for seat mounting and, perhaps more importantly, a crushable floor for energy absorption and crash protection. Pre-bent aluminum tubing is used to frame the doors, which are covered by aluminum skins on the lower half and large Lexan windows above. Hinges across the midsection of the doors allow the large side windows to fold outward and



down... even in flight. Great for summer sight seeing, or photography.

Where high strength is required, fittings are cut from 2024-T3 aluminum. For the engine mount, rudder pedals, and control column, 4130 chrome-moly steel is used. All hardware used in the fuselage and wings is AN spec aviation hardware.

There are no "left" & "right" fuselage sides and no "top" & "bottom" either! All 4 panels are identical, eliminating any chance for confusion. Also, all of the corner-wrap sections have the same radius, and are interchangeable. This commonality of parts makes for much easier building.

Six inch wheels with high profile tires are standard for the Rebel, giving it rough field and river bed landing capability. The standard bungee suspension provides excellent shock absorption. An optional aluminum spring gear

is available, reducing drag and smoothing out off-airport landings. Murphy 1500 and 1800 Series straight floats, and amphibious floats are also available. The Rebel also flies and lands beautifully on skis.

The Cabin

Spacious is the word for it. The wide doors and track mounted seats were designed to allow big, tall people easy access to the cockpit. Unless you can make Michael Jordan look short, you'll be able to run the seats back to the point that your legs fall short of the rudder pedals. Same thing applies to headroom. The doors of the Rebel are four inches farther apart than a Cessna 172. So there's plenty of shoulder and hip room. The seats are designed for long cross country endurance and offer exceptional comfort as well as freedom of movement. A third "sideways" seat can be



LYCOMING O-235 POWERED REBEL.



RICK PORTEOUS AND HIS REBEL ON GREAT BEAR LAKE IN THE NORTH WEST.

added for positioning behind the two front seats. This optional seat can carry a child or an adult weighing up to 175 lbs. The seat can be removed to increase the capacity of the enormous cargo area.

The instrument panel is wide and has a wrap-around look that makes checking instruments very convenient. There's enough room to accommodate a full VFR panel or a basic IFR package.

Fuel read outs are accomplished by looking at clear sight tubes that are mounted in front of the root rib and give instant, accurate indications, at a glance, of fuel on board.

Visibility, as we've said, is extraordinary. In addition to the sights provided by the standard blown, one-piece windshield and the two fold-down windows mounted in the doors, it's possible to add up to six skylight ports in the ceiling. If that isn't enough, fly your Rebel without the doors... the aircraft doesn't seem to know the difference... but you sure will. Doorless visibility is fantastic!

Optional vacuum formed interior panels will add to the finished appearance and reduce noise levels in your Rebel.

Wings

There are three spars, 14 nose ribs and 13 main ribs in each wing, which are all covered with three sheets of pre-punched aluminum sheet. Pre-formed leading edge material covers the nose ribs creating a D-Cell, which ties into a box section that is formed by the main ribs and upper and lower skins. This results in exceptional strength. 12 full-length extruded

stringers help stiffen the skin against torsion and shear loads. The wing is joined to the fuselage by extra heavy fail-safe 2024-T3 aluminum fittings. A single streamlined, custom extruded strut is used for high strength and low drag. Wing tips are gelcoated fiberglass.

The Rebel features "wet" wings for fuel storage. Two 22 (US) gallon tanks are standard, giving the Rebel considerable range, even with the larger engines. If that is not enough, optional 58 (US) gallon tanks are available.

Controls

The control system on the Rebel uses push-pull tubes connected to a massive 2-inch torque tube which operates the full span flaperons. This results in swift and accurate response to control input. The flaperons are lowered with a mixer box controlled by a teleflex cable and flap lever which has been placed within easy reach of the pilot. Flaperons have the advantage of being lowered in 6 degree increments to a maximum of 18 degrees and can be put into a 5 degree reflex position to increase cruising speed and give a smoother ride, thus giving the Rebel a very large flight envelope.

Tail Group

A simple box design, utilizing pre-bent channels, covered with aluminum skins forms the vertical and horizontal surfaces of the tail. The horizontal members fold upward for storage or transport and are braced in flight position by small aluminum struts.

The elevator and rudder are controlled with

$\frac{1}{8}$ " stainless steel aircraft cable. For elevator control these cables are attached to dual push-pull tubes.

Ease of Assembly

The Rebel design uses pre-punched pilot holes to locate most parts, reducing and almost eliminating the need to make difficult measurements which can result in errors and, in some cases, ruined parts.

For example, the pre-punched wing skins are located and attached by clecos. The pilot holes are then drilled to size and deburred so the $\frac{1}{8}$ " AVEX rivets may be installed. Stringers attached to the wing skins can be located by clecoing the



THE REBEL'S STRESS TEST.



LARGE INSTRUMENT PANEL.



AT TERRITORIES.



WILLIAM YAWORSKI (REBEL BUILDER) WITH LES MCINNIS' AND JACK WIEBE'S REBELS.



OUR FIRST RUSSIAN REBEL.

ends, and aligning with the row of pre-stamped holes in the skin. These holes are then drilled through the stringers so the rivets may be installed.

Similar methods are used when attaching the bulkhead quadrants to each other for the fuselage. Pre-punched guide holes allow the bulkhead quadrants to be aligned, drilled and riveted by the builder. This simple type of construction is backed up by superior-quality exploded assembly drawings and parts lists in the builder's manual. A tool list is included at the beginning of each sub-assembly and the instructions provide easy-to-follow step-by-step procedures.

Easy-to-follow instructions combined with the simple type of construction mean even a novice builder can build the kit with relative ease. Assembly times are significantly reduced in comparison to what might be expected for an all-metal aircraft of this type.

Indeed, we estimate the first-timer's assembly time of the kit at an average of 1000 hours, without instruments, interior, and paint.

Rebel Technical Specifications

The structure of the Murphy Rebel has been designed to meet the airworthiness standards of the U.S.A. FAR Part 23, Subpart C, the U.K. BCAR Section S. and the Canadian TP10141E. Depending on the gross weight and power selected, it will comply with the acceleration factors and airspeeds specified for the normal, utility or aerobatic categories of Part 23.

In general, the structure is conventional and compliance with these standards has been demonstrated by detailed analysis using well established methods. In many areas of the primary structure the strength is set by the minimum gauges of available material and

REBEL • DESIGN SPECIFICATIONS

Engine	Lycoming O-320	Lycoming O-235	Rotax 912	Rotax 912 UL
Horsepower	160	116	80	80
Power Loading	10.3 lb./hp	14.2 lb./hp	18.1 lb./hp	13.1 lb./hp
Gross Weight	1650 lb.	1650 lb.	1450 lb.	1057 lb.
Empty Weight	875-950	825-900	650-700	610-650
Useful Load	700-775	750-825	750-800	400-447
Wing Area	150 sq. ft.	150 sq. ft.	150 sq. ft.	150 sq. ft.
Wing Loading	11 lb./sq. ft.	11 lb./sq. ft.	9.6 lb./sq. ft.	7 lb./sq. ft.
Rate of Climb @ Gross	1200 fpm	800 fpm	500 fpm	800 fpm
Take Off Run	300 ft.	400 ft.	450 ft.	300 ft.
Landing Roll	400 ft.	400 ft.	300 ft.	200 ft.
50' Obstacle	500 ft.	800 ft.	800 ft.	500 ft.
Stall (No Flap) Power Off	44 mph	44 mph	40 mph	36 mph
Stall (Full Flap) Power Off	40 mph	40 mph	36 mph	34 mph
Cruise 75% Power	120 mph	115 mph	90 mph	85 mph
Never Exceed V _{ne}	151 mph	151 mph	143 mph	143 mph
Top Speed	140 mph	125 mph	100 mph	110 mph
Fuel Burn	7.2 gph	5.8 gph	4 gph	4 gph
Fuel Capacity	44 gal.	44 gal.	44 gal.	22 gal.
Range	733 st. miles	796 st. miles	880 st. miles	467 st. miles
G Limit Ultimate	+5.7 -3.8	+5.7 -3.8	+5.7 -3.8	+5.7 -3.8

Note: Rotax 912 with 1,058 lbs. gross weight to conform with Canadian Advanced Ultralight Regulation TP101.41. Empty weights may vary due to avionics, instruments, type and amount of paint and upholstery chosen by builder.

the margins of safety are very large. A major portion of the wing structure is redundant and a full scale component has been tested to support the analysis.

The maximum design loads on the horizontal tail result from a combination of Balancing and Gust loads at V (D) on the flight envelope. In addition to the analysis, this structure has been tested to ultimate loads.

The fuselage is a rugged metal box for "crash-worthiness", stiffened with a substantial main frame to support the undercarriage and provide a carry-through structure for the wing reactions. Engine mounting pick-up points have been designed for a range of engines up to 160 hp. Provision has been made for up to three seat and harness attachments that will accept load factors in excess of 9 G. The fuselage strength has been verified by static tests.

Since the structure is governed to a major extent by minimum gauges of stiffness (EI) considerations, high strength alloys with debatable characteristics from the standpoint of corrosion and fatigue are not required. Most of the preliminary structure is comprised of flat skins or formed parts using 6061-T6 alloy. Margins of safety on joints are large and "fail safe" provisions have been made in many instances.

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