

# Proposal of Purchasing, Assembly and Final Status of Murphy Rebel Experimental Aircraft Kit. Proposed by Mike Newman on 06/10/2020

Classics looks - with modern performance

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.

The kit has never been started, still in crate. Was purchase by a gentleman in early ,90's in Brandon , Florida. I can purchase the kit for \$ 10,000.00 from the gentlemen. There is no engine mount, cowling, engine or avionics . The aircraft can be certified as LSA-E by keeping gross weight down to LSA standards. Here are the specs with different type of engines.

|                                     | Homebuilt / Experimental |           |           |     | Canadian<br>Ultralight | U.S.<br>Sport Pilot |
|-------------------------------------|--------------------------|-----------|-----------|-----|------------------------|---------------------|
| Engine                              | Lyc O-320                | Lyc O-235 | Rotax     | 912 | Rotax 912              | Rotax 912           |
| Horsepower                          | 160                      | 116       | 80        |     | 80                     | 80                  |
| Power Loading (lb./hp)              | 10.3                     | 14.2      | 18.1      |     | 15.4                   | 16.88               |
| Gross Weight (lb.)                  | 1650                     | 1650      | 1450      |     | 1232                   | 1320                |
| Empty Weight (lb.)                  | 950                      | 900       | 700       |     | 625                    | 700                 |
| Useful Load (lb.)                   | 700                      | 750       | 750       |     | 607                    | 650                 |
| Wing Area (sq. ft)                  | 150                      | 150       | 150       |     | 150                    | 150                 |
| Wing Loading (lb./sq. ft)           | 11.0                     | 11.0      | 9.7       |     | 7.0                    | 9                   |
| Rate of Climb @ Gross (ft/min)      | 1200                     | 800       | 500       |     | 800                    | 550                 |
| Climb Speed (mph)                   | 65                       | 65        | 60        |     | 60                     | 60                  |
| Take Off Run (ft)                   | 300                      | 400       | 450       |     | 300                    | 450                 |
| Landing Roll (ft)                   | 400                      | 400       | 300       |     | 200                    | 300                 |
| 50' Obstacle Clearance (ft)         | 533                      | 754       | 976       |     | 626                    | 976                 |
| Stall (No Flap) Power Off (mph)     | 44                       | 44        | 40        |     | 38                     | 40                  |
| Stall (FULL FLAP) Power On<br>(mph) | 40                       | 40        | 36        |     | 35                     | 36                  |
| Cruise (65% POWER) (mph)            | 120                      | 105       | 100       |     | 85                     | 100                 |
| Vne (mph)                           | 151                      | 151       | 143       |     | 143                    | 143                 |
| Top Speed (mph)                     | 140                      | 125       | 100       |     | 105                    | 100                 |
| Fuel Burn (gal/hr)                  | 7                        | 6         | 4         |     | 4                      | 4                   |
| Fuel Capacity (US gal)              | 44                       | 44        | 44        |     | 22                     | 44                  |
| Range (hrs)                         | 6.1                      | 7.6       | 11.0      |     | 5.5                    | 11                  |
| Range (statute miles)               | 733                      | 797       | 880       |     | 468                    | 880                 |
| G Limit (Ultimate)                  | +5.7 -3.8                | +5.7 -3.8 | +5.7 -3.8 |     | +5.7 -3.8              | +5.7 -3.8           |



### **Proposal of Procedures on Assembling of Airframe.**

Proposal is to have three teams (Alpha, Bravo and Charlie Teams) to assemble the sub-assemblies. Each team will have 8 members with students and guests. Each Team will have Team Leader and Inspector. Each team will pick week on the month, except for 4<sup>th</sup> week of month on Saturday for Chapter monthly meeting. One team will work on wings, another team on fuselage, and last team on tail section and ailerons. Each team member will work 2 to 3 hours or even more only if crew decides to do more for that week. Each team should accumulate minimum of 10-15 hours for each session for total of 30-45 hours for each month for all three teams. 1000 hours work hours is estimated for completion of airframe with all wiring done for installed trim motors and lighting and not avionics, engine mount, cowling, upholstery and engine installations. Estimated time of completion would take 33-22 months for airframe. Each team project will have another inspector from another team to do double inspection on items and both inspectors and team leader will sign off on items.

## Proposal of Ownership or Pull the Plug Procedures.

EAA 175 Chapter will purchase kit from the gentleman at the cost of \$ 10,000.00 and will put annual 15% fee till airframe is sold to flying club, partnership or member. Also chapter members will decide on occurred expenses and purchases of project. On finish airframe will have trim motors and lighting installed with the wiring to panel not hook to switches. Will have no upholstery, engine mount, engine, avionics and cowling. Fuel tanks will be installed with fuel lines going to firewall. When final assembling occurs (assembling of sub-assemblies into the finish airframe), *involved chapter members* will decide on fate of airframe. They could decide on starting a flying club or if majority *involved chapter members* are not interested in flying club then it will be offered to any *involved chapter members* to be purchased. After decision of ownership then owners can decide to classify as LSA-E or not and can then decide on what type of engine and avionics to purchase. New ownership then needs to purchase engine, engine mount, cowling, upholstery and avionics and have items on hand and ready before airframe is finished.

If flying club is decided, then club needs to file with state and federal agencies and do all necessary requirements before airframe is finished. Once the airframe is finished by the *involved chapter members*, the new ownership will pay for airframe of \$10,000.00 and any other occur cost to complete airframe and the annual 15% fee when kit was purchased. EAA 175 *chapter members* and new owners will be involved in the final stages of installing engine, upholstery and avionics. Once the aircraft is finished and ready for airworthiness inspection and if chapter 175 has hangar space available by then, the chapter will allow new ownership to store aircraft till the 40hrs testing is done at no charge. Afterwards new ownership will be required to find new storage vicinity for aircraft at their expense. If chapter has no hangar space available, then new ownership will need to move aircraft to new location at their expense.

If airframe is not finished in a proper time period (time period will be decided before project starts) and involved members lost interest in project, then Chapter 175 EAA members will vote to end project (pull the plug) and find another EAA Chapter in the state of Florida to finish project. Cost of new ownership will be decided by both chapters.

If airframe is finished and no *involved members* have interest in purchasing airframe, then will sell to the public of price at \$10,000, plus 15% annual fee at purchase time of kit and any added occur expense items during construction. 175 Chapter members also could increase price if majority members agree. Also majority members could decide to use Chapter 175 funds to finish the airframe with engine, engine mount, cowling, upholstery and avionics and then sell to the public and the majority members will decide on price of finishing aircraft, but have the minimum sale cost of \$10,000, plus 15% annual fee at purchase time of kit and any added expense items during final construction of finished aircraft.

Here is link to Murphy Rebel website.

[www.murphyair.com/detail/rebel.html](http://www.murphyair.com/detail/rebel.html)

Here link to mykitlog website for Thomas Swartwood from Everson, WA.

Build time for completion was 1382 hours for getting airworthiness inspection.

[www.mykitlog.com/users/index.php?user=Swartwood&project=2275](http://www.mykitlog.com/users/index.php?user=Swartwood&project=2275)

*(Involved Chapter Members - 175 EAA members that work on the percentage of time on airframe. Percentage of time will be decide by majority of 175 EAA members before project starts.)*





Jim Koepnick

# REBEL . . .

## With A Perfectly Good Cause

By MARY JONES

Gather up 20,000 rivets, 400-500 clecos, a Murphy Rebel kit and what do you have? The fixings to build yourself a mighty practical airplane! And, one that could be a lot of fun, too! What's more, the folks at Murphy Aircraft Manufacturing say if you're an experienced builder, you can complete the airframe in about 400 hours.

Murphy Aircraft Manufacturing Ltd., Chilliwack, British Columbia, first introduced the Rebel at Sun 'n Fun '90. The roomy, side-by-side, all-metal taildragger drew onlookers like a magnet; before the week was over, in excess of 20 orders were placed - this despite the fact that the prototype hadn't even flown.

As a company, Murphy Aircraft Manufacturing entered the light plane marketplace in early 1986 with their

Renegade biplane. The aluminum tube fuselage, fabric-covered aircraft proved very popular, and Murphy Aircraft gained a reputation for producing a quality kit. To date, some 450 Renegade and Renegade Spirit kits have been sold.

While Darryl Murphy, president of Murphy Aircraft Manufacturing, was confident that sales of the Renegade biplane would support his company profitably for several years, he was also contemplating building a high wing monoplane as well. He held off developing the idea for some time, feeling the light plane market was already saturated with high wing aircraft, but when sales of the Renegade kit necessitated moving the Company into larger facilities and the opportunity to obtain large metal-working equipment arose, the stage was set to begin work on the high-wing design.

The Rebel features an all-metal, semi-monocoque fuselage with metal wings. Side-by-side seating for two is comfortably afforded in the 44-inch wide cockpit. Room for a third seat, or beaucoup amounts of baggage, is available behind the seats. There's even room for two to sleep in the cavernous fuselage - making it the perfect Canadian northwoods aircraft, or an airplane that'll earn its keep if necessary.

Although the prototype aircraft which captivated folks at Sun 'n Fun '90 was outfitted with a Rotax 912 four cylinder, four cycle engine, the Rebel was originally designed with the Continental O-200 engine in mind. While the aircraft gained quick initial acceptance with Rotax power, a number of potential buyers asked for a more conventional powerplant. Listening to their constituency, the folks at Murphy Aircraft immediately began



working on modifying the design. The results of that work were embodied in the Lycoming O-235 powered, cream and blue Rebel on the flight line at Sun 'n Fun '92.

#### STOL Features

The wing-span of the Rebel is 30 feet, with an overall chord of five feet and a flaperon chord of 17 inches, giving the aircraft respectable STOL performance. It stalls at approximately 35 mph indicated with full flaps. Cruise with the O-235 engine is 105-110 mph with a top speed in the 125-130 range. Takeoff roll is 250 feet at the Rebel's gross weight of 1,450 lbs., with a climb rate of approximately 1,000-1,100 fpm with two people on board.

Powered by the Rotax 912, the Rebel cruises at 85-90 mph with a takeoff roll of 350 feet at gross weight and an 800 fpm climb with two on board. Engine options open to Rebel builders include the 65 hp Rotax 582, the 80 hp Rotax 912 or the 115 hp Lycoming O-235. Dave Walker, marketing manager for Murphy Aircraft, describes that as one of the pluses of the kit . . . "A customer can buy the Rebel kit without



Mike Steinhilber

Murphy Aircraft Manufacturing will offer conical and dynafocal mounts for the Lycoming engines as well as mounts for the Rotax 582 and 912 engines.

having to commit to an engine immediately. He or she can start building this airplane from the firewall back and go from a two-stroke engine to a more conventional aircraft engine up to 275 lbs. and not have to modify the airframe. We have a lot of customers who are building the airframe and waiting for just the right engine deal to come across."

Walker also reports that some builders are opting for auto engine conversions such as the Subaru engines or the new 100 hp Canadian Airmotive CAM 100 Honda conversion. The flexibility of engine choices has created a problem for the Murphy folks as far as engine mounts are concerned. Presently, they've decided they will limit the mounts to be provided to the standard Rotax and



Rick Davis/Murphy Aircraft

The prototype Rebel flies with new Murphy 1500 aluminum floats. Murphy Aircraft will offer the floats as a kit with preformed bulkheads and prepunched skins. Powered with the Rotax 912 engine, the factory is reporting takeoff times of six seconds solo and 15 seconds dual. To date, the prototype has logged over 700 hours total time.



Lycoming engines, including dynafocal and conical mounts for the Lycoming O-235-N2C.

The Rebel comes standard with 10 U. S. gallons of fuel housed in five gallon tanks which fit neatly between the wing rib bays. The tanks are rotationally molded, cross-linked polyethylene; if you desire more fuel capacity, additional tanks can easily be added for "just a few dollars more" (approximately \$115 per tank). Fuel burn with the Rotax 912 is 3-3.5 gph versus 5-5.5 gph with the Lycoming O-235 engine.

The wing of the Murphy Rebel is a modified 4415 airfoil with C-spars for the front and main spars and a Z-spar for the rear spar. Thirteen ribs along with 12 stringers which run the length of each wing combine to create a sturdy wing that's supported by a single strut located in front of the doors of the aircraft (a nice safety feature reducing the likelihood of folks walking into a spinning prop). Ribs are stamped aluminum.

The flaperons are the only fabric-covered surfaces on the aircraft, so covered to reduce the weight of the control surface and eliminate the need for mass balancing. The flaperons are split into two sections providing three hinge points and thus reducing torsional stress. They're operated as a single unit via a push/pull torque tube and a common bellcrank. The flaperons can be deflected 18 degrees and reflexed 5 degrees upward. This technique, borrowed from high performance aircraft designs, lifts the nose and increases cruise speed of the aircraft.

Fail safe fittings are used at the



With a 30-foot wingspan, the Rebel exhibits pleasant STOL flight characteristics, stalling at approximately 35 mph with full flaps.

wing attachment points, as on many certified aircraft. Walker explains, "We use two 3/16" fittings as opposed to a single 3/8" fitting on each attachment. Hopefully the pilot would notice a crack in a fitting during a pre-flight check, but if not, the second fitting will get you home. We've done this for redundancy throughout the airplane. It's something that's necessary to certify the airplane. Right now the cost of certification is prohibitive, but if that ever changes we want to be ready. In the meantime, our customers benefit from that safety factor whether the plane's certified or not."

Durability of the aircraft was a major concern of designer Darryl

Murphy. "With greater numbers of certified airplanes leaving the U. S. and Canada for England and other places, we North Americans may be looking at homebuilts as our basic means to fly. I don't have a problem with that, except that we're going to start expecting aircraft that previously have only been flown 250-300 hours to last 3,000 or 4,000 hours and 20 years. Are they built to do that? We don't know because we've never used them in this manner before. That's why I think we need to start building our aircraft to stricter standards, and that's why we're building our aircraft to be certifiable if that option becomes financially feasible. We want an aircraft that will last 20 or 30 years, something we can pass on to our grandchildren - an airplane that's durable, easily inspected and practical to use."

#### Original Design Modifications

Limited visibility over the nose of the aircraft was one drawback of the original Rebel design. In the process of modifying the aircraft to accept the O-235 engine, Murphy Aircraft took the opportunity to reduce that factor. By changing the angle of incidence of the wing by one degree they were able to gain 3-1/2 to 4 inches more visibility over the nose, thus reducing the need for S-turning while taxiing. Other modifications included enlarging the doors, cutting them lower on the sides to make it easier to get in and out of the back of the airplane, and enlarging the window area.

Oil canning of the fuselage sides was a small problem on the original design as well. To reduce that



Breaks in the fuselage sides reduce oil canning problems. Fuselage bulkheads are pre-drilled and formed. A false floor turns the plane into a "camper" as well.





Fabric-covered flaperons extend the full length of the wing. They deflect 18 degrees down and reflex 5 degrees up providing a broad range of flight control.

problem, Murphy added three "breaks" in the side fuselage skins a la Ford Tri-Motor style. The breaks cause the aluminum to "think" it's thicker than it is, thus making the fuselage sides stiffer.

#### A Basic Buildable Airplane

"The Rebel is just a basic airplane," says Walker. "There's nothing really unusual about it. We've

used an airfoil that's pretty well known. We've put the tail where the tail goes and the wing where the wing goes and designed a simple airplane, but we've taken advantage of today's technology, computers and new alloys and created an airplane you can build yourself."

That was another of Darryl Murphy's main goals in developing this design. "We wanted an airplane that wouldn't end up hanging on our cus-

tomers' garage walls for years, and we wanted to get rid of the onus that you have to be a professional metalworker to build a metal airplane," says Murphy. "We feel we've created a project that can be built by an average person in 500-600 hours. An experienced builder should be able to complete the airframe in 400 hours, less engine, instruments and upholstery."

At first glance, those build-time estimates may appear overly optimistic, but not so once you consider the amount of work already completed by the factory. Murphy Aircraft uses the matched hole tooling technique refined in Thorp T-18 construction to eliminate much of the builder's work. All parts are preformed and no jigs are required. ("The only jig you'll need," says Walker, "is a flat table, and we include a drawing showing how to build the ideal table for this project.")

Most holes (there are somewhere between 14,000-18,000 in the airframe) are prepunched, reducing time-intensive measuring. All the curves are preformed so no bending brakes are needed. In fact, Walker says you can build the Murphy Rebel with very little outlay of cash for tools other than those found in an average handyman's garage. "The only unique items you might need are a deburring tool, an air riveter, a good



With a 44-inch wide cockpit, the Rebel offers plenty of room for two, comfortably, side by side, with space for an optional third seat. Adjustable seats allow easy access to all controls for pilots of any length.





Rick Davis/Murphy Aircraft

Now, this is living - can you imagine life any better than this!

supply of No. 30 and No. 11 drill bits . . . and lots of clecos!"

While the Rebel kit is fairly detailed, there's still plenty of work left for the builder to complete to meet the 51% requirement, and the Rebel recently obtained 51% approval by Transport Canada. Under a reciprocal agreement between the U. S. and Canada, the Rebel now qualifies for 51% approval in the U. S. as well.

"I don't want to oversimplify the amount of work needed to complete this airplane," says Walker. "Though most holes are pre-drilled, they're only location holes; each hole needs to be finish drilled and deburred. There's still a lot of work involved, but we've eliminated the difficult, time-consuming tasks, and we've simplified the tasks that are critical to the airplane's performance." For example, one area of concern for prospective builders was knowing where to position the strut attachment on the wing. Murphy Aircraft eliminated that problem by punching the center hole at the strut attachment point on the main spar. Using a paper template supplied with the

kit, the builder then aligns the remaining strut attachment holes with the prepunched hole. "That sets the dihedral exactly where it should be," says Walker.

Likewise, rivet holes are punched in the main spar and wing surface skins to mark placement of the aluminum ribs, and the ribs themselves are prepunched for riveting. Using a computer-controlled punch press, Murphy Aircraft is able to drill the holes to within .0001 tolerance over the 12-foot area. "Using this equipment was what really enhanced our ability to produce a comprehensive kit that's easy to complete. When we found out how accurate this equipment is, we nearly got carried away punching holes," laughs Walker.

"Sometimes I've wondered if we've gone a little too far - for example, we tumble most parts to deburr them, but at the same time that's what gives me the confidence to say the airframe could be built in 400 hours."

Seeing the parts for a Rebel kit come together while touring Murphy's production facilities last fall

convinced me that their build-time estimates are reasonably accurate.

Having purchased a second 7,000 square-foot building to complete their existing 14,000 facility, Murphy Aircraft is geared for mass production of this aircraft. Present capacity is one airplane kit a day based on single-shift production line.

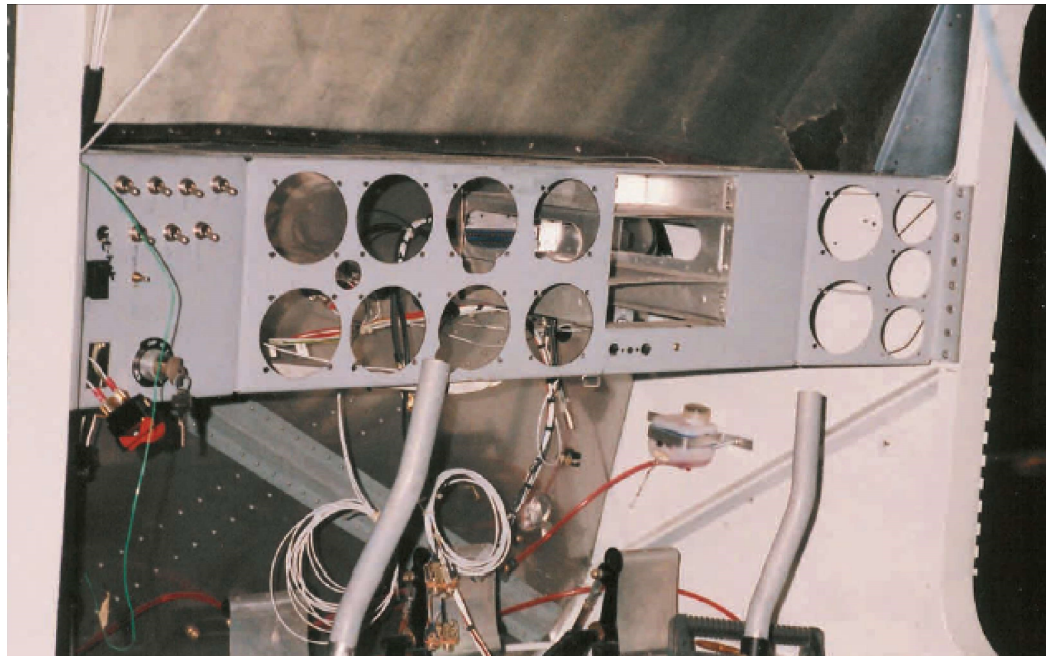
So what's it going to cost to get this kit in your garage? Firework back - i.e., less engine, cowling and instruments - the kit sells for \$11,950, U. S. funds. Current Murphy Aircraft is quoting delivery dates of 8-12 weeks following order placement.

Now, if I could just convince them to deliver one to my garage, dreams of a flying/fishing/camping trip to a remote lake in Canada could one day come true!

*If you'd like more information on the Murphy Rebel, contact Dick Walker at Murphy Aircraft Manufacturing, Ltd., 8880-C Young Road South, Chilliwack, British Columbia Canada V2P 4P6, phone 604/5855.*







## MURPHY REBEL Control Column

