

## Frequently Asked Questions

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(1) Question:

What type of testing has been done on the Butterfly Gyroplane?

Answer:

The Butterfly has been load tested as well as stability tested with very favorable results. It has also passed the “double hang test” to make sure the “Vertical Center Of Gravity” is ABOVE the Propeller Thrust Line. This eliminates the possibility of a power push over. Power pushovers are the cause of most gyroplane fatalities. The Butterfly will not power push over.

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(2) Question:

How was the load testing done and what were the results?

Answer:

\*Most airliners are good for about 2.5 g's.

\*\*The Butterfly frame was load tested to 3,966 lbs. without failure or distortion.

Method of testing: A pulley was anchored to the floor under the frame and a double cable was routed through the pulley and hooked to two straps on the frame then routed to the side where it was connected to a winch and a 2,000 lb scale. The two straps were positioned in two areas of the frame and the winch was used to pull the frame toward the floor. Because of the double cable the force was double to what the scale was reading. The only reason the test was stopped at 3,966 lbs was that we didn't want to break the scale. The frame was tested to over 7 g's without failure.

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(3) Question:

What type of stability testing has been done?

Answer:

The Butterfly has been tested for pitch and yaw stability just like Cessna and Piper test their aircraft with a very favorable finding.

Method of testing pitch:

Stability test #1:

The Butterfly was trimmed out for hands off level flight. The stick was then pulled back for two seconds until a 20 degree angle of climb was achieved and then the stick was released.

\*An aircraft is considered pitch stable if it doesn't take more than THREE oscillations to return to level flight.

\*\*The Butterfly just leveled out without any oscillations.

Stability test #2:

The Butterfly was trimmed out for hands off level flight. The stick was then pushed forward for two seconds until a 20 degree angle of dive was achieved and then the stick was released.

\*An aircraft is considered pitch stable if it doesn't take more than THREE oscillations to return to level flight.

\*\*The Butterfly just leveled out without any oscillations.

Stability test #3:

The Butterfly was trimmed out for level flight and the rudder was pushed to the left for two seconds until the aircraft yawed 20 degrees to the left and then the rudder pedals were returned to neutral.

\*An aircraft is considered stable if it doesn't take more than THREE oscillations to return to straight and level.

\*\*The Butterfly just centered back straight without any oscillations.

\*\*\*The same test was done to the right with the same results.

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(4) Question:

Does the nose pitch up or down if power is added or removed?

Answer:

\*An aircraft is considered stable if it doesn't change pitch when power is added or removed. The aircraft should simply climb when power is added and it should descend when power is removed without changing pitch. Most airplanes are "power" pitch stable but they do require a trim setting change with each power setting.

\*\*Because the Butterfly is a true Center Line Thrust gyroplane and has a "true airfoil" large Horizontal Stabilizer on a long moment arm, it doesn't change pitch when power is added or taken away.

It simply climbs or descends with power changes. Unlike the airplanes mentioned above the Butterfly doesn't require a trim setting change.

If the power is suddenly removed the Butterfly just slows up and goes into the best rate of glide for a normal approach.

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(5) Question:

We hear a lot of talk about "hands off" flying but see very few people actually able to do it for more than a few seconds at a time. How does the Butterfly handle "hands off" flight?

Answer:

I have driven some of my flying buddies' nuts when they look over and see me with my hands in my pockets as we are flying cross country. The Butterfly is so stable and docile that you "don't have to" hold the stick all the time to fly it. Most of our testing is done on thermally hot and windy (20-30 mph) Texas days. When a thermal hits the Butterfly it doesn't change pitch but simply rises or descends with the thermals.

We have even flown the Turbo Golden Butterfly (2 place trainer) hands off for up to 10 minutes at a time (with hands literally in the pockets) with only a 2 mph change two times during the test.

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(6) Question from: Howard.

A couple of questions about the Butterfly...

A long time ago (a very long time ago) I build and flew a Benson Gyrocopter.

How does yours compare?

This doesn't qualify as an ultralight - so what kind of training is available?

What are the cross country capabilities?

Answer:

I also flew a Bensen for several years back in the 70's. Because the thrust line of the propeller was about 3" ABOVE the Vertical Center Of Gravity the ship was naturally unstable as it produced a torquing moment nose down which caused a lot of accidents in what is called a Power Push Over. The gyro would tumble forward out of the sky as the thrust of the engine pin wheeled the craft out of control usually after a pilot induced oscillation. The Bensen had a rock guard under the propeller but it was just a flat plate and was very close to the gyro's center of pressure so it was useless as a horizontal

stabilizer. A horizontal stabilizer could prevent the craft from tumbling and just put it in a dive if it was large enough and the moment arm was long enough.

The Butterfly has a thrust line that is about 2 inches BELOW the Vertical Center Of Gravity. This would make the nose want to torque upward mildly and reload the rotor automatically in a zero G situation. This eliminates the Power Push Over. The large horizontal (true airfoil) stabilizer is also in the prop blast and on a long moment arm. This dampens out any sudden pitching moments up or down. It becomes a very docile, stable, and fun ship to fly.

There are several CFI's around the United States that give training in two place Gyroplanes. A list of these instructors can be found on the PRA website at:

[www.pra.org](http://www.pra.org)

The Butterfly comes with a 7.4 gallon seat tank and an optional 6 gallon reserve fuel tank giving you 13.4 gallons of fuel. That makes the Butterfly a pretty serious cross country machine.

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(7) Question from: Billybob:

Can the Sky Cycle be licensed to drive on the road in Florida. What kind of licensing do you need to operate this? What are the landing and takeoff distances? How wide are the rotors when extended out? and..... do I have a list of other questions! This is just way too cool and for someone that has a hour drive to work and only live 15 miles from the office what an answer this could be. Get back to me when you get a chance, I might just need to make a road trip to come see you!

Answer:

Yes, the Super Sky Cycle can be licensed in Florida.

You will need a motorcycle license and a Pilots license. You can legally fly it single place with an aircraft medical that has been signed by a Gyroplane CFI allowing you to solo your craft after an average of 6 to 10 hours of dual instruction.

The Super Sky Cycle will take off and land easily in less than 300 ft.

The rotors are 27" extended and 14' 2" when folded.

We are designing it to be a Commuter for people to go to work in.

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(8) Question from Harold:

Currently hold my private SEL and looking into taking gyro training. In that process I have looked at a number of rotorcraft. In the single place market two have my attention the Butterfly Monarch and the Dominator Single.

My understanding is the Butterfly products come with specific engine combinations mostly Rotax with upgrade on the Golden to the Subaru. There are no options of using the Jabiru or other converted auto engines such as the AeroVee. Please correct me if that is an incorrect understanding.

Other than those differences can you tell me the primary design differences between the two products? Both seem to strive for a centerline thrust design and the extra landing capability is clearly defined on the Butterfly video's.

My preferences is 4 stroke, GA pilot of course, so would look into that direction. Appreciate any information you can provide to aid my search. Things I could not find on the site relate to fuel quantity with extended tanks, range with 4 strokes, gross weight and such. Note the weight of the Monarch is 350 pounds not sure if empty or with fuel, pilot up to 250 pounds. Leads me to believe gross weight might be 600-700 pounds with smaller engine.

The video page is top notch and probably the best I have seen on any aircraft, fixed or rotor.

Answer:

We do offer the Rotax 912 and 914 Turbo four stroke engine on the Monarch. We stay away from the heavier Subaru engines on the single place.

We are prototyping a Jabiru engine on a Monarch at this time.

The Metro Launch System now allows us to bring the rotors to full flight speed before releasing the brakes and we are leaving the ground in 3 to 5 seconds.

The gross weight is listed on the Price List Page for each model.

The new reserve fuel tank gives the Monarch 13.4 gallons of fuel.

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(9) Question from Alex:

What is usually necessary to legally fly these vehicles? Is it necessary for one to acquire a pilot license? I live in Houston, Texas and there is plenty of traffic here and would consider purchasing one of your vehicles.

Answer:

You will need a motorcycle license and at least a student pilots license to operate the Super Sky Cycle. A student pilots license is at least a 3<sup>rd</sup> class aircraft medical with a gyroplane CFI signoff for solo. The signoff is good for 90 days at a time as you build solo time in your aircraft toward getting your Rotorcraft/Gyroplane rating. You will need 20 hours of dual and 20 hours of solo time to get your regular pilots license.

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The average student is signed off or solo in 6 to 10 hours of instruction in a two place gyroplane trainer with a Certificated Flight Instructor.

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(11) Question from Doug:

Why did you choose the fully flying "T" tail for the Butterfly single place ships instead of the tall tail?

Answer:

We chose the fully flying "T" tail over the tall tail on the single place ships for several reasons.

First, let's talk about the tall tail. It is a good design and we use it on the Golden Butterfly two place trainer. By putting the rotor up at 11' tall we can also put the tall tail on a very long moment arm which makes it very powerful. Our Butterfly tails are of a true airfoil design which makes them twice as effective as a flat plate design. If the front edge of a tail has a sharp point it kills the airfoil effect and acts like a flat plate. The swirl of air coming off of the propeller is equalized on the top and bottom halves of the tail (if the tail is equally centered in the prop blast but in most designs it isn't) and the result is a little efficiency gained by not having to offset the tail to one side to adjust for the swirl just hitting the bottom half.

The down side of the tall tail is that you have to have the complexity of a second upper support bar to hold the top of the tail. That bar has to clear the top of the propeller and also the rotor blades. This means that the mast has to be raised up several more inches and the tail is also limited on the distance it can be placed behind the Rotor Lift Vector (kind of like the pivot on a weather vane). The center of pressure (the area vertically where the side surface area of the vehicle in flight is equal fore and aft) can be moved a lot farther behind the Rotor Lift Vector with the shorter T Tail. This is like putting a larger fin on a weather vane and keeps the aircraft from wanting to swap ends in flight and be more stable in yaw at all airspeeds. The tall tail is usually placed right behind the propeller which limits its moment arm from the rotor lift vector. Most tall tails have the horizontal stabilizer attached to the rudder so this also limits the possible moment arm of the horizontal stabilizer. This is not good.

We chose the fully flying "T" tail (a one piece tail that pivots as one unit with the horizontal stabilizer centered in the prop blast) because we can place it farther away from the aircraft Rotor Lift Vector and can also keep the mast shorter. The shorter the mast on a gyroplane the more maneuverable it is. The taller the mast the more sluggish it is. This means we can move the tail a few feet farther behind the Rotor Lift Vector and have the desired shorter mast at the same time. This also means the horizontal stabilizer can also be moved back a few feet farther which makes an unbelievable stable flying machine.

On the Monarch we simply offset the tail 1" to the right with different cable lengths and the pedals are centered in normal flight. In testing I have flown the Monarch all over the airport without my feet on the pedals using only the throttle and control stick.

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Remember, the test of a tail is measured on how much of a direct crosswind that you can take off and land in. Every Butterfly model will takeoff and land in a 30 mph direct crosswind. It has been noticed at major gyro gatherings that when all the other brands are parked because of a large crosswind component, the Butterfly's are the only ones still flying.

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(12) Question from D. B.

Why did you use the aluminum tubing type of construction instead of welded steel?

Answer:

There are three reasons we use 6061-T6 aluminum bolted together instead of the 4130 steel welded construction.

The welded 4130 steel construction has been around for decades and has proven to be a viable type of construction for airplanes. If the steel is properly welded and heat treated it is a very strong and light weight type of construction. The down side is that each weld is a possible area that can crack, hydrogen embrittlement can be at work undetected, and the steel can be rusting away inside.

The first reason we use the aluminum bolt together construction is that it is a SIMPLE and EASY TYPE OF CONSTRUCTION that the average Experimental kit builder can build without having to weld the structure.

The second reason is that ALUMINUM IS LIGHTER THAN STEEL and we can use a larger diameter of material than is normally used in steel construction. The 6061 T6 aluminum is tremendously strong for its weight and has proven itself as a viable type of construction in the Ultralight aircraft community for decades. We also use AN Hardware (aircraft bolts and nuts) that can be counted on for calculated strength and corrosion resistance.

The third reason is for EASE OF REPAIR if the aircraft is damaged. You can easily change out the damaged parts as needed. If the steel structure is damaged you have to replace a much larger part of the airframe.

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