What constitutes a good flying powered parachute?

Every manufacturer likes to lay claim to having "the best" powered parachute on the market. And, for the most part, given the overall simplicity of what actually makes a powered parachute fly, there is little noticeable difference from one model to another for the novice. However, once you understand the actual characteristics of a powered parachute, you might find it easier to distinguish what is important to you and thus find it less complicated to make a decision about what is best or only appears that way.

The Airframe

First there is the basic cart, usually a three-wheel airframe with various forms of suspension. The cart itself is sometimes difficult to distinguish as to differences from one manufacturer to another, but just the same very important when considering that this is the one item that separates you from thin air and Mother Earth. So what makes a good airframe?

First it needs to be structurally sound. This means not only the best materials used in all the right places, but also designed and manufactured in such a way as to not compromise the original strength of the material any more than necessary once integrated into the final form of the airframe. This would include a minimal number of holes in any given tube for attachment points and *as few holes as possible at alternative angles* to each other to minimize the loss of structural integrity of the individual tube(s). In other words every time a hole is drilled in a tube, it weakens the tube at that point; and the more holes and particularly the closer together they are and at different angles to each other the progressively weaker the tube becomes.

Next would be the application of design manufacturing to assembly. One of the keys of powered parachute airframe design is using aluminum and steel materials to form a strong base without limiting performance with un-necessary weight. A proven method of this over aviation history is to use triangulation in the design assembly of the airframe. As most powered parachutes are made from a mix of aluminum and steel (usually stainless steel), it would be a difficult proposition to weld and trust the finished product, therefore most manufacturers use a mix of tubes, brackets and bolts to form a finished airframe.

It makes sense then, that the best connection joint is one that is part of a preconceived triangulation in those areas that are most subject to "load" requirements. Those areas would include but not necessarily be limited to: suspension, engine torque, and vertical and horizontal load torque transformation.

Once completely assembled, the overall weight of the airframe, including engine, prop, fuel, water cooling liquids, etc., now becomes fixed and part of an important equation called "wing loading", a subject that will be discussed later. But first lets discuss "center of gravity."

Center of gravity

What is center of gravity? One of the easiest ways to think of center of gravity is to visualize a teeter totter. If two people of equal weight sit on the teeter totter and the center of the board is equal distance from either end, the two people will be in perfect balance and each would have the same leverage or an equal center of gravity. However if one person outweighed the other by 20 pounds he would have an unfair advantage over the lighter person unless the center of gravity were changed by moving the center towards the heavier person to give the lighter person more leverage to offset the difference in weight.

In a powered parachute it acts somewhat the same way, keeping in mind that the passenger in a two seat model pretty much sits in the very middle of the center of gravity and therefore has little effect on the balance of the craft. It then becomes more of a balance between the pilot and everything that is located in proximity of the rear of the craft. That is why the center of gravity is always adjusted for the pilot weight to get the craft in perfect flying balance.

So, what does center of gravity have to do with proper flying performance? A lot! If you look at the design of a Six Chuter unit from the side you will see that the engine does not sit level. In fact the entire unit has a forward tilt to it sitting on the ground. However, when the correct center of gravity is in place, based on the weight of the pilot and the unit is in the air, the nose of the craft is slightly up from level; and in turn the engine itself is now level or close to horizontal while in flight. This accomplishes a few things.

First with the engine level it provides the absolute correct thrust line and when you apply more power it immediately pushes the craft ahead of the canopy changing the angle of attack and allows the craft to immediately climb.

If the craft were level during flight this would put the engine in a slight forward or downward tilt changing the thrust line in the same manner. When power is applied it actually pushes the craft down before it can get ahead of the canopy and creates a very slow sluggish climb in the process requiring more power and time to change the angle of attack.

So you can see that having the correct center of gravity is important for optimum flying performance, but it also will have a bearing on fuel consumption and overall life of the engine as well.

Second, with correct center of gravity and the engine level with the nose of craft slightly up, the aircraft is already in the perfect landing position. This means that the pilot only has to operate the throttle during landings to adjust for correct approach angle. This is one of the reasons powered parachutes are as simple to learn to fly as they are when set up properly.

Third, center of gravity exists on any powered parachute. But if you have looked around at the different models from different manufacturers you will see a variety of designs with some being quite longer, or, bigger if you will, than Six Chuter models. Why? Over the years we have discovered that there is a fine line between what is good and bad in overall length of our airframe. Of course like everyone we want to be able to offer as much comfort and style to as many people as possible. But, in getting longer and heavier as many competitors have done, the overall performance and safety has been compromised to some extent.

Again think of the teeter totter. If two people are sitting on a board with a single center point (narrow center of gravity), the board works smoothly and without effort. However, if you widen the center point (wide center of gravity) it now takes more effort to move the board and the wider the center of gravity becomes the worse the performance. That is why we made the determination to keep our center of gravity as narrow as possible. In doing so the aircraft is stable and responsive in climbs, turns and descents.

What is proper wing loading?

Wing loading is a figure derived by dividing the gross weight of the craft (including pilot and passenger) by the square footage of the wing that lifts the aircraft. In "all" cases, canopy manufacturers supply airframe manufacturers with their suggested wing loading capabilities of any canopy. In most cases this is approximately 1.2 to 1.5 pounds per square foot and should not exceed 1.7 pounds per square foot. This means that an aircraft full of fluids (water, coolant, fuel, etc.) that weighs 400 pounds; and, a pilot and passenger that weigh a combined 300 pounds for a total of 700 pounds gross, flying under a 500 square foot canopy, would have a wing loading of 700 lbs. divided by 500 or, a wing loading of 1.4 pounds per square foot.

So what happens if you exceed the proper wing loading? First of all you probably won't notice it for the short term as long as it is not a dramatic increase. But, it does figure into overall safety and performance; and, eventually into the life of both the engine and canopy. In simple terms a "lighter unit is going to perform better and therefore is safer" in that it climbs faster and turns easier.

As for life expectancy, it's rather easy to understand that less weight relates to working the engine less and better fuel consumption; but it also means that you are putting less strain on the canopy fabric and support lines each and every time you fly. Over the course of time that you own a powered parachute this could relate to not having to overhaul an engine or replace your wing.

Conclusion

As you can ascertain from above there is not a lot of rocket science to the marriage of airframe and canopy. But, an important marriage just the same. The overall weight and length of the aircraft is important both in safety and performance. But, what is done within the concept of the design is also important. Being lightweight is necessary, but remaining structurally sound is also important. When you can do both, then you have a product that is worthy of continued excellence both in safety and performance.

For sure you will find products on the market that are less money and some for more. But it should never be price alone that makes your final determination. Six Chuter, Inc. has been consistent in our product design for well over a decade and has been manufacturing powered parachutes longer than any other current manufacturer. So when you decide it's your turn in the sky, remember these few key issues and don't buy on price alone….buy as though your life depended on it.

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