

SO YOU WANT TO BUY A PRE-OWNED COMPOSITE SAILPLANE?

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You may not find it hard to choose a pre-owned composite sailplane to buy based on your flying skill, pocketbook and advice from instructors and friends. However, evaluating and purchasing a used composite sailplane can be challenging. Since they differ significantly from just about any other used item you may have purchased, they can be difficult to evaluate and it can be hard to find knowledgeable help. To give you a start, following are some items I pay attention to when checking out a composite sailplane prior to purchase.

PREFLIGHT INSPECTION: Do a very careful preflight. This will give you a good overall view of the sailplane before you dive into the details.

Does the sailplane look like it has been well cared for? Does it look "square" and in order? I have seen a composite sailplane, which spent a lot of time flying in the wave, with about a 5 twist in the fuselage when looked at head on. When the controls are in a neutral position, do all the control surfaces look to be in their proper positions? Do all the controls operate freely and move symmetrically?

FINISH: Check the finish carefully for fine cracks. These should be most noticeable along the wing leading edge and the top and bottom of the fuselage. This is where the composite shells are joined together. Extra filler is used to maintain the contour in these areas which is more susceptible to cracking. Numerous fine cracks indicate a re-finish job is in the future. Larger, deeper, severe cracks can indicate something worse; especially if found in non-joint areas. These cracks that start in the finish may have propagated into the resin of the composite structure underneath the gel coat finish. Cracking in this resin negatively affects the ability of the composite cloth to carry flight loads. Cracks that propagate into the resin require repair to the composite skin, in addition to removing the gel coat. Severe cracks may also indicate de-lamination of the fiberglass skin. You can check for this by carefully pressing with a dime adjacent to the crack. If the dime side of the crack deflects more than the other, there may be a problem. Also, any cracks that form a regular pattern could indicate some kind of structural damage and should be checked out

by a professional.

In my experience, composite sailplanes built in the late 1970s and early 1980s have shown the most susceptibility to severe cracking. However, Grob's and DG's of this era appear to be less susceptible to cracking. Some sailplanes in the US have been refinished with Prestec, which stands up well. It is difficult and costly to import "factory" resins and gel coats since they are considered hazardous materials. PIK-20's are unusual as they do not have gel coat. They were built with high temperature curing resins. After the components were cured and profiled they were painted with some in interesting colors. Just for reference, a total re-finish for a composite sailplane can cost from \$15,000 to \$20,000 and so should be considered in any purchase decision.

Sometimes while examining the finish, you may notice broad lumps or bumps. You may see them, or they can be found by lightly rubbing your fingertips cordwise across the skin surface. These bumps may be most noticeable along the spars, especially on older sailplanes. They are usually a result of the sailplane manufacturer using room temperature curing epoxy resin systems. While manufacturers may speed up the cure process by elevating the temperature, these epoxies continue to cure with time and can, and typically do, change shape. The resulting deformations shouldn't pose a structural problem, but can degrade performance, especially if they are along the leading edges or spar. Performance can be improved with careful re-profiling, but again, this is a labor intensive process which needs to be done carefully to avoid damage to the composite structure. Better performance always seems to cost more, even in pre-owned sailplanes.

Try to determine how the finish has been cared for. For good longevity, fiberglass sailplanes should be waxed at least once a year. While there is a lot of controversy on the type of wax to use, it is probably best to use one without silicone. Several folks who repair and refinish composite sailplanes have lectured me quite passionately on the added difficulty and cost to deal with sailplanes treated with silicone based finishes. Finally, find out how the sailplane has been stored when not flown. Exposures to moisture/humidity, UV light, and extremely cold temperatures are the major contributors to the development of cracks in gel coat.

CANOPY: A canopy is expensive to replace (\$1,500 to \$3,000 for the blank and another \$1,500 to \$3,000

for installation) and will make you angry, surprised, and maybe even windblown if a crack propagates across it. Check carefully around the access window and all of the screw holes near it for small cracks, which do have a tendency to grow with stress and become big ones. Stop drilling the end of the crack and a bit of cyanoacrylate glue in it can stop its growth, but this does not always last. Make sure the canopy frame fits the fuselage well or you may find yourself with a cool draft or an annoying whistle. Finally, check that the hinges have not been bent and that there aren't any stress cracks in the finish around them. Sometimes a canopy will flip open in a gust damaging hinges and/or the composite structure in the area where the hinges attach to the fuselage.

WING ROOT FITTINGS: Check for fore-and-aft motion of the wings when the sailplane is assembled. There should be NO noticeable play. To check this, have someone apply about 20 pounds of pressure, fore and aft, on the wing tip while you watch, and feel, for motion at the root. Or, if alone, find a thin, slightly tapered shim and wedge it into gap at root, from the bottom, at the trailing edge. Then, apply pressure at the wing tip and see if it falls out. Repeat at the leading edge and the other wing.

Looseness indicates that the wing root rib pins and sockets are not where they were when the sailplane was built. This can be caused by folks moving the sailplane by pulling on the wing tips (something you promise NEVER to do when you buy a composite bird). Sometimes shimming can cure this, but many times the wing pins and sockets must be removed, the glass around them rebuilt and the pins and sockets put back in; another expensive (\$3,000-\$7,000) operation.

MAIN FITTINGS: Check the main pin(s), their sockets and other wing fittings. The bearing surfaces are usually un-plated and need to be kept greased to keep them from rusting. Rust, or any kind of marring, is a problem. Sometimes, these problems can be carefully polished out with emery cloth. If it's deep rust or a deep scratch, the offending part may have to be replaced. Most inspectors check this very carefully. You may have difficulty getting an annual until problems in this area are resolved. If the main pin sockets in the spars are loose or damaged, repairing them will be expensive for the same reasons as noted above for root fittings.

Check the attachment fittings for the horizontal stabilizer. These are usually smaller versions of the pin and socket assemblies found on the wings, and should be examined in the same way. Make sure that, when assembled, there isn't any play when moderate fore-

and-aft or up-and-down pressure is applied at the tips of the stabilizer.

CONTROLS: Check all of the exposed control mechanisms and make sure they are not loose or corroded, are clean, in good repair, and that the connection points are not worn. Lubrication requirements of control rods, bearings, mechanisms and quick-connects varies among sailplane types. Sometimes lubrication is even prohibited (i.e. for longitudinal push rod bearings). It's best to look at the sailplane's manuals to verify that lubrication has been properly performed. Hopefully, where specified, they have been lightly lubed with some kind of greaseless product (I like LPS). This helps to keep them from attracting dust and dirt. Check for play in the control system by holding the control surfaces in their neutral position and gently moving the control stick. If the stick moves more than 1/16th of an inch, there could be problems (the manuals should have exact specifications). If these items are loose, I would wonder if someone has had flutter in the controls, and possibly elsewhere. Suspicious sloppiness in the controls may not be just due to worn control linkages. Mounting brackets may have come loose and/or control bearings may have worn. I have seen all of the problems noted here

Check all of the control surfaces carefully. Look for cracking around the hinges and at the actuation points. Gently tap the surface, especially along the trailing edge, and listen for buzzing sounds which would indicate de-lamination of the fiberglass. This can be another sign of flutter damage. On most composite sailplanes the weight and balance of these surfaces is controlled carefully to prevent flutter. If you see signs of repair, try to determine if these component are balanced and within the allowed weight. This should be noted in the logbooks with any repairs. Because of the criticality of control surface weight and balance, control surfaces often cannot be repaired when damaged.

Finally, check for cracks around the spoiler boxes. These are usually found emanating from the corners of the boxes. This is an area of unusual stress in the wing skins, so many sailplanes develop these cracks over time. Since they may be unavoidable, make sure they do not look severe as this indicates the structure under the gel coat may need to be repaired. This is usually a several hundred dollar repair.

LANDING GEAR: Off field landings can be hard on landing gears. Take a look inside the gear well at the gear mechanism. (Don't forget your flashlight!) Make sure that the tubes look "normal"- straight and not

dedent. Carefully check the paint for cracks, since this can indicate areas of over-stress or unusual bending. Ensure that the gear doors fit snugly when the gear is retracted. Ill-fitting doors, slightly open due to interference with the tire, usually indicate something isn't the same as when the sailplane was built.

RADIOS/INSTRUMENTS: Make sure the airspeed, altimeter and compass are in good condition. These three instruments are required by the FAR's. Many manufacturers specify markings for airspeeds which can be found in the owner's manual. These instruments need to be functioning properly, the airspeed marked as required and a compass deviation card in sight for the sailplane to be airworthy.

Unless the radio is a 720 channel model, you are probably facing replacing it. The FCC has basically regulated the older ones out of existence. If the sailplane has a transponder, ensure that it has been maintained and calibrated properly (again this should be noted in the logbooks). Determine the capabilities of the transponder and see if they meet existing and future regulatory requirements. The value of any installed variometers and flight computers is very dependent on personal preference. If you like what is installed, this can be an important value, since replacements can be a significant additional cost.

The needle on older mechanical variometers can "float" up. The aging of the paint on the needle makes it lighter. If it's a Winter, it can be sent back and overhauled. The needle of a Sage can be adjusted for minor errors. You may be out of luck with other variometers such as a PZL or LUN. I've had mechanical variometers cleaned and overhauled if they were 10+ years old or demonstrate sluggishness. This costs about half as much as a new one, and you'll be surprised how much better they work. Of course you may want to consider purchasing a new electronic variometer with an audio instead.

Whatever you purchase, plan to replace all of the instrument plumbing and electrical wiring. Most plastic instrument tubing takes a set and the connections loosen slightly with age. Plastic tubing connectors can be scratched or cracked. Some sailplanes have rubber tubing, which deteriorates rapidly. These problems cause leaking, and your instruments, especially variometers, can start telling you lies. I replace all tubing and connectors in my panel every few years. You'll find that in many cases older sailplane wiring has been hastily patched and repaired and generally has degenerated into a confusing rats nest, with exposed terminals and even abraded bare spots. Instead of being terminally

frustrated with electrical and plumbing problems (varios and radios failing halfway to nowhere), I tear it all out and start over. Something I always add is pneumatic and electrical connectors, which easily allow the instrument panel to be removed. This makes future maintenance of the panel and cockpit area much easier. My preference is to solder wiring connections and cover them with shrink tubing.

Finally, try to determine how the batteries have been cared for. This will help you decide how much life is left in them. Some folks don't properly care for their batteries. So, while they may reach full charge, they may die off fast. Batteries should be stored at room temperature and Gel type batteries should be charged regularly when stored. NiCads should be discharged to the point where the electronics won't work properly, then re-charged periodically. In any case, I usually replace the batteries so I am confident of their state and care.

TOW RELEASES: Almost all composite sailplanes have Tost tow releases. Tost releases have a specified service life, after which they can be overhauled and recertified. The critical part is the release spring. For many years, the service life of a Tost release was three years, then increased to four years. In 2001 this was changed by Tost TBO 1-2001 to:

"Maximum TBO between 2 general overhauls = 2000 launches (that means 10.000 releases/actuators). Should you have in pure training operation more actuators per launch, the TBO is reduced accordingly (with 8 actuators per launch to 1250 launches)."

This assumes that the release had been regularly serviced and properly upgraded as of 2001. If a sailplane you are considering does not have the Tost document with the date of its certification, dated within three years of April 2001, the release needs to be overhauled, since you can't tell if it is a three or four year release. After overhaul and recertification, the TBO will apply.

Be aware that if the sailplane has both a nose and a cg release, they both need to be overhauled and recertified. Generally, dual releases are tied together and actuated simultaneously. It doesn't matter whether or not a rope/cable and/or tow was involved or not in the actuation. Many of the sailplane parts and/or service folks in the US offer exchange programs, where you can send in your release and receive an overhauled and recertified one in exchange. Expect the exchange cost for a nose release to be \$200-\$350 and \$250-\$400 for a cg release. Some aircraft inspectors haven't been

known to check release service life. Most now know and should require compliance for the next inspection. Remember, out-of-service equipment in an aircraft makes the aircraft un-airworthy.

OXYGEN SYSTEMS: Watch for out-of-service systems. Cylinders have service dates stamped into them. Other components (even cylinders) have yellow tags, when purchased, indicating when the items must be serviced. Most owners keep these tags with their owner's manual. Again, installed, out-of-service equipment makes an aircraft un-airworthy. You shouldn't be able to get an annual unless they are current or removed. Following is a list of popular oxygen tank types, their re-test period, and service life. Note that tanks with a specific service life must be destroyed when it is reached.

Cylinder Type	Re-Test	Life
AA-Standard Steel	5 years	Indefinite
HT-High Tensile Steel	3 years	24 years
AL-Aluminum	5 years	Indefinite
CO-Composite (Aluminum lined Kevlar)	3 years	15 years

Most sailplane owners now use constant flow regulators with an in-line flow meter to the mask or cannula. There are different cannulas, of which some can help conserve oxygen. I consider masks and cannulas "personal" accessories, and usually dispose of existing ones and buy what I like. If the sailplane has a small oxygen cylinder, consider a pulse demand (EDS) oxygen flow meter, which is very efficient.

I would like to make a special note: If the sailplane has an A8A regulator, which was very popular in older gliders, it is probably many years out of certification, as key overhaul components have not been available for about 20 years. If you end up with one, plan to replace it as soon as possible.

BELTS AND HARNESES: Another sailplane component which is usually life limited are the belts and harnesses. This lifetime limit should be found in the sailplane manuals which may also reference the manufacturer's manuals for the belts and harnesses. I have seen web life limits of 10-12 years. These can be overhauled and the webbing replaced, however an inspection may reveal the buckle and other components too corroded to re-certify. Expect a new set of belts and harnesses to cost \$600 - \$800 and an overhaul about half that amount. There should be separate certification paperwork for the belts and harnesses and notes in the logbook if they have been overhauled or replaced. Be suspicious if the belts are stiff and/or the

buckles have significant corrosion.

TRAILERS: This is usually one of the most neglected glider accessories. In addition to checking the overall state of the trailer, take a look at the tires. Usually tires exceed their design life or rot from the sun before they wear out. I've had tires with real good tread disintegrate on the road. For this reason, I replace them based on age and I make sure I have a spare. Another good reason to have a spare is that correct size rims can be hard to find, especially in the nether reaches where the soaring is best.

Find out how the running gear has been cared for. I have the bearings greased and the tires balanced yearly. Out of balance tires can be very hard on your instruments. If you buy a sailplane, I would make sure the tires are checked and balanced and the wheel bearings greased before you drive it home. If the trailer has a surge brake system, be sure to have the brakes checked and the trailer tongue lubed using the provided grease fittings. This is good to do when the bearings are greased.

For the best UV protection of your sailplane, the trailer should have a metal top or have a metalized coating added during construction. In humid climates, fiberglass tops are popular since they do not "sweat" internally like a metal top might (and then drip on the sailplane). If there is a chance of significant humidity, there should be good vents and a solar powered fan. This helps keep moisture from condensing on the sailplane while it is in the trailer. Many of us in dry and/or high altitude climates enjoy the durability of metal topped trailers.

When you pick up the ship, be prepared to troubleshoot and repair electrical lighting problems on the trailer. I have rarely seen a used glider trailer that had a working light system and plug that matches one on my vehicle.

HANDLING GEAR: Well-designed trailer fittings and sailplane assembly gear make a big difference in the enjoyment of your sailplane. Good, well maintained systems keep trailer rash to a minimum and will keep crew happy. Make sure to ask the current owner if there are any special tricks to assembling the sailplane. I have found that finding the right position for the fuselage and the first assembled wing can make a big difference when it comes to inserting the second wing and putting in the main pin(s).

Tow out gear and one-man rigging systems have become popular to further ease the assembly and

handling of sailplanes. While these can be very useful, they can cause significant damage to the sailplane if used improperly or in windy conditions. Note that any tow system which lifts the tail off the ground puts high loads on the fuselage, so ensure that all cuffs and other attach points fit snugly and are secure. And most of all drive slowly - walking speed.

PARTS: One important factor to consider is the availability of parts. Some manufacturers are no longer in business. This can make getting parts very difficult if you damage the sailplane. Landing gears, gear doors, tail skids/wheels, wing tips, etc. can be damaged easily on an off-field landing. So if you are planning to fly cross-country you, might want to choose a sailplane whose manufacturer, or someone who picked up the business, is still supplying parts.

DOCUMENTATION: Make sure there is a Registration and Airworthiness Certificate, and note the registered owner. You can easily check the registration online at:

<http://registry.faa.gov/aircraftinquiry/>

If the sailplane is certified Experimental rather than Standard on the Airworthiness Certificate, there should be accompanying Operating Limitations which are required to be with the Airworthiness Certificate. If you have any questions about the sailplane's documentation, you can request copies online at:

http://www.faa.gov/licenses_certificates/aircraft_certification/aircraft_registry/copies_aircraft_records/

For aircraft licensed 1984, the FAA has to search out the paper records and copy them for you. They will do this for a modest cost. For newer aircraft, you can request a CD for \$10. I have received CDs in less than a week. These had copies of original registration, change of ownership, airworthiness certificate, operating limitations, liens, and other documents the FAA received for the aircraft.

Review the logs and documentation to make sure Airworthiness Directives have been properly complied with. Some only need to be complied with and logged once. Others require periodic compliance and logging (usually yearly). You can find ADs online at:

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/

It is also a good idea to obtain copies of the Technical Bulletins for the sailplane. These are usually the source for ADs and also specify other important

maintenance procedures and/or approved methods for modifications such as adding water ballast, nose tow hooks, ELTs, transponders and such. Modifications to your sailplane are easily documented and approved if they can be done according to a technical bulletin. It can be extremely difficult to get a FAA field approval for a non approved modification. The following table lists some online sites I have found for technical bulletins.

Manufacturer	URL
Alexander Schleicher	http://www.alexander-schleicher.de/index_e.htm (TN/AD)
DG	http://www.dg-flugzeugbau.de/index-e.html
Blanik	http://www.nwi.net/~blanikam/ba/serv01.htm
Glasflugel	http://www.streifly.de/home-eng.html (Technical Info)
Grob	http://www.grob-aerospace.net/service-and-support/g-103.html
PIK-20	http://pik20.streckenflug.at/index.php?inc=tm
Schempp-Hirth	http://www.schempp-hirth.com/ (Technical Notes)

With some perseverance, you might be able to find others with an internet search engine. If you purchase a sailplane which is actively supported by a manufacturer, notify them that you own the sailplane. This allows them to send you new service bulletins as needed.

Review the log book, looking for any repairs that may have been done. Check for reports of major repair or alteration (FAA form 337). When I find these, I usually check up on them by calling the noted repair person, and/or others, to learn about the extent and impact of the work. Finally, check the log book to see if the sailplane has had a current annual (Standard) or condition (Experimental) inspection. If the sailplane is out of "annual," or if you are uncomfortable about some aspect of its condition, include getting a new inspection as a condition of sale. Make sure it is done by someone you have confidence in and who understands composite sailplanes.

Check the weight and balance. See how recent it is and if the equipment list really matches what is in the sailplane. In any case, you should plan to weigh and create a new weight and balance before you fly the sailplane. Do you really know if someone didn't put lots of lead in the tail and not properly document it? I have found 11 pounds of lead loosely secured in the tail

of a sailplane without any documentation of its existence.

The sailplane should have one or more manuals which cover at least flight limitations, flying characteristics, assembly, regular maintenance, and inspection requirements. Original copies of the manual will have the sailplane's serial number written on or near the front cover. Some ADs and tech bulletins will include updates to the manual pages. These changes should be included and are usually logged in the manuals. If you suspect the manuals have not been maintained, or are missing, they should be available from the manufacturer if they still exist. If not, try searching on the internet, as many clubs around the world have posted copies on their web sites for their members. You just might get lucky and find them there.

It is fairly common for sailplane manufacturers to specify a service life for sailplanes in one of the manuals (most I have seen are 3000 hrs). The service life can usually be extended according to procedures specified in the manual or a Technical Bulletin. The cost and risk in extending the sailplane's service life should be considered in its value if it is nearing a service life boundary.

Another thing you should do is double-check the sailplane's ownership so that you can get a good bill of sale. The FAA only has records of liens and other security instruments if the parties to these documents file them with the FAA Aircraft Registration Branch. There is no federal requirement for folks to do this and State law actually determines lien and security interests. These security instruments should be included if you obtain the aircraft documents as described earlier. The FAA's Clear Title online site:

http://www.faa.gov/licenses_certificates/aircraft_certification/aircraft_registry/clear_titles/

describes their process and also references companies which will do aircraft title searches and records reviews.

Also make sure you can get a bill of sale, title or other proof of ownership for the trailer. Most states require you to prove ownership before you can register a trailer and get a license plate. Check what your state requires before you close your deal.

Again, in the end, an aircraft is not considered airworthy unless both the aircraft itself and all the associated documentation is complete, current, and in the proper location.

EXPERIMENTAL SAILPLANES: The great

majority of these sailplanes were produced by foreign manufacturers and imported into the US before, or without, a US Type Certificate being issued. To allow these sailplanes to fly in the US, the FAA issued several Advisory Circulars over the years which define the procedures to issue these sailplanes Experimental "Racing" or "Racing and Exhibition" Airworthiness Certificates. Some of these procedures specify how to create the Operating Limitations for each sailplane. Think of the Operating Limitations as the "type certificate" allowing the sailplane to operate in the country.

The operating limitations include things like initial test flight requirements, where and when the sailplane can be flown and how it must be maintained, repaired and inspected. Some folks think that if a sailplane is certified Experimental, they can do whatever they want with it. All Operating Limitations I have read include phrases such as "the aircraft will be maintained and operated in accordance with the *manufacturer's name* maintenance and/or owners manual and technical bulletins." Also that the aircraft "must have a condition inspection in the previous 12 months in accordance with Appendix D of FAR Part 43." This is very near what a Type Certificate would say for a sailplane with a Standard Airworthiness Certificate. One sometimes handy difference is that condition inspections can be done by A&P mechanics and/or repair stations.

Generally for older sailplanes, their Operating Limitations allow the sailplane to be operated anywhere in the contiguous 48 states. However, procedures in more recent Advisory Circulars have required Operating Limitations to restrict flight operations to certain areas, like within 300 miles of a designated airport, with a Program Letter needing to be sent yearly to the local FAA FSDO specifying any operations that are planned to be conducted outside of that area.

It is very important that you read and understand the Operating Limitations for any sailplane you are considering which has an Experimental Airworthiness Certificate. Do not believe folks that claim the sailplane doesn't have Operating Limitations (it's probably just lost long ago) or that you can modify it any way you please. I have seen gliders where modifications have been done outside the bounds of their operating limitations, sometimes not even logged.

These sailplanes required costly work to put them back into conformance with their Operating Limitations.

INSURANCE: If you elect to insure the sailplane, you should have your policy set up and in force when the

purchase transaction occurs. Sailplane insurance is different from car insurance in that you declare the value of the sailplane. The premium is usually proportional to this value. Under-insuring is common but can be risky. If the cost to repair a damaged sailplane exceeds the insured value minus the salvage value, the sailplane will be totaled. In this case you get the insured value of the sailplane less your deductible. It is important to know that insurance companies expect you to include all instruments, radios, oxygen systems, etc., in your declared value. In case of a total loss, these items will be included in the salvage and retained by the insurance company.

If you want to insure the trailer, it is most common, and usually the most economical, to do this with the sailplane policy. But note, these endorsements do not usually cover liability (e.g. protect you if the trailer comes loose during travel and hits something or someone). Check your auto insurance as they usually provide liability coverage for towed vehicles.

OTHER THOUGHTS: Here are some more things to consider before you take possession of a sailplane. Think about how you are going to transact the payment. One idea is to take a cashier's check made out to the seller when you go get the sailplane, then give the owner the check once you have inspected the sailplane, trailer and ensured the paperwork is OK. If a bank is involved, they will probably have their own ideas on how to do this.

When sailplanes are transported at purchase, it is customary for the buyer and seller to drive halfway. Other arrangements are usually included in the negotiation of the selling price. If you are driving to get a sailplane, find out the size of the ball used with its trailer. Generally a 2" hitch ball will work, but some older trailers have 50 mm couplers. If it is a 50 mm coupler, you can usually use a 1 7/8" ball successfully. Also try to find out how the trailer lights are wired, then try to set up similar wiring for your car. But don't count on this working. I always take tools to rewire things since this always seems to be a problem.

Good luck!