Click to verify

Reddit and its partners use cookies and similar technologies to provide you with a better experience. By accepting all cookies, you agree to our use of cookies to deliver and maintain our services and site, improve the quality of Reddit, personalize Reddit content and advertising, and measure the effectiveness of advertising. By rejecting non-essential cookies, Reddit may still use certain cookies to ensure the proper functionality of our platform. For more information, please see our Cookie Notice and our Privacy Policy. Important Reminder: This article was generated using Artificial Intelligence (AI). Please cross-check the information with other reliable and trusted sources, especially when making critical decisions.Gliders represent a unique category of aircraft, distinguished by their ability to soar effortlessly without an engine. The design and performance of these elegant flying machines are significantly influenced by the materials used in glider construction. From traditional wood to advanced composite materials, each option offers distinct advantages and drawbacks. Understanding the materials used in gliders provides insight into their engineering, performance, and the evolution of glider technology. Understanding GlidersGliders are specialized aircraft designed for sustained flight without the use of an engine. These aircraft rely on aerodynamic principles and lift generated from their wings, allowing them to soar gracefully for extended periods. Gliders often serve various purposes, including recreational flying, competitive sport, and training for pilot students. The construction of gliders significantly influences their performance and handling capabilities. The design works to minimize drag and maximize lift, which is essential for achieving the longest possible flight durations. As such, the choice of materials used in gliders is critical in balancing strength, weight, and flexibility, all of which play crucial roles in overall flight efficiency. Increasingly, modern gliders integrate advanced materials to enhance performance and durability. Understanding the materials used in gliders provides insight into how these aircraft operate and their resilience in diverse flying conditions. This foundation paves the way for exploring specific materials employed in this fascinating realm of aviation.Materials Used in Gliders: An OverviewGliders, also known as sailplanes, are specialized aircraft that utilize aerodynamic lift for flight without the aid of an engine. The construction of gliders involves various materials, each selected for its unique properties that contribute to performance, weight, and durability.Materials used in gliders encompass traditional choices such as wood and metal, as well as modern composites that enhance overall performance. Wood provides a classic aesthetic and excellent structural integrity, while metal alloys offer strength and resistance to fatigue, crucial for high-performance gliders. Composite materials, increasingly prevalent, combine lightness with exceptional strength, allowing for innovative designs and increased aerodynamic efficiency.Additionally, the choice of fabric and covering materials serves to protect the internal structure while maintaining a lightweight profile. These materials play a vital role in ensuring durability and weather resistance, essential for glider performance and longevity. Understanding the diverse materials used in gliders is fundamental for appreciating their design and operational capabilities.Wood in Glider ConstructionWood has historically been a favored material in glider construction due to its favorable strength-to-weight ratio and remarkable aesthetic appeal. Often used in both the framework and the wing structure, wood contributes to the lightweight characteristics essential for optimal flight performance. This choice stems from a combination of traditional craftsmanship and natural properties of specific wood types. The advantages of using wood include resistance to warping and a relatively low cost compared to some modern materials. Commonly employed woods, such as spruce and birch, provide necessary durability while allowing for intricate designs. The craftsmanship involved in wood construction can enhance overall airframe rigidity.However, there are notable disadvantages associated with wood. Susceptibility to moisture can lead to rot and degradation over time, necessitating proper treatment and maintenance. Moreover, the weight of wood, though manageable, might not compete with lighter composite materials being increasingly utilized in contemporary glider designs.Thus, while wood occupies a significant role in traditional glider construction, a comprehensive understanding of its advantages and disadvantages is vital for designers and enthusiasts alike.Advantages of WoodWood offers several advantages in glider construction that enhance performance and operational efficiency. One notable benefit is its favorable strength-to-weight ratio, providing sufficient structural integrity while keeping the overall weight low. This characteristic is crucial for optimizing lift and maneuverability in flight.See also The Comprehensive History of Gliders: From Inception to Modern DayAnother significant advantage of wood is its natural resistance to deformation. When appropriately treated and maintained, wooden structures remain stable under varying atmospheric conditions. This stability contributes to the longevity of gliders, ensuring they can endure extensive use without compromising safety or performance. Additionally, wood is a relatively easy material to work with, allowing for a range of design possibilities. Craftsmen can manipulate it more readily than some metals, leading to customized shapes and structures tailored to specific aerodynamic requirements. This versatility is particularly beneficial in producing gliders that meet precise performance criteria.Lastly, aesthetic appeal is an advantage of wood. The natural finish of wood can enhance the visual appeal of gliders, attracting enthusiasts and collectors alike. The combination of functionality and beauty makes wood a favored choice among many glider manufacturers and pilots.Disadvantages of WoodWhile wood offers several benefits in glider construction, it also presents notable disadvantages. One significant concern is susceptibility to environmental factors. Wood can absorb moisture, leading to warping, swelling, or decay, which seriously compromises structural integrity.Additionally, wood is generally heavier than some alternatives, impacting overall performance. Increased weight can reduce lift efficiency, making gliders less responsive and hindering their ability to soar effectively in various weather conditions.Another disadvantage arises from the fact that wood requires regular maintenance to ensure longevity. It is prone to pest infestations, such as termites, which can weaken the structure if not adequately treated. Therefore, builders must invest time and resources in upkeep, which can detract from the longevity and performance of the glider. Lastly, the labor-intensive process of working with wood can increase manufacturing costs. Skilled craftsmanship is often needed for shaping and assembling wooden components, ultimately affecting the affordability of gliders.Metal Alloys in Glider DesignMetal alloys play a significant role in glider design, providing essential structural integrity and performance characteristics. Commonly used alloys include aluminum and magnesium, which offer a balance between strength and weight. Aluminum alloys, particularly 6061 and 7075, are favored for their excellent strength-to-weight ratio and corrosion resistance. They enable gliders to achieve desired aerodynamic shapes while maintaining structural stability. Magnesium alloys are another option, known for being lightweight and having good mechanical properties. When used strategically, they can enhance the overall performance of gliders, especially in high-stress areas.The benefits of using metal alloys in glider construction include: Enhanced structural strengthWeight reductionImproved durabilityResistance to environmental factors Incorporating metal alloys into glider design can significantly affect performance and longevity, making them a valuable choice in materials used in gliders.Types of Metal AlloysMetal alloys play a significant role in glider construction, offering strength, durability, and reduced weight. Two primary types of metal alloys used are aluminum alloys and steel alloys. Aluminum alloys are particularly favored due to their lightweight properties, which enhance glider performance. Aluminum alloys, such as 2024 and 7075, are commonly employed. Alloy 2024 provides excellent fatigue resistance, making it ideal for structural components. Alloy 7075, known for its high strength-to-weight ratio, is often used in critical load-bearing parts of the glider.Steel alloys also find application, particularly in high-stress areas. Stainless steel, such as 304 and 316, is chosen for its corrosion resistance and strength. These alloys contribute to enhanced structural integrity, ensuring longevity and reliability in various environmental conditions.The choice of metal alloy in glider design significantly impacts overall performance and safety. Understanding these types of metal alloys is essential for selecting the optimal materials used in gliders. Benefits of Using MetalMetal alloys in glider design provide numerous benefits that enhance performance and durability. One significant advantage is their excellent strength-to-weight ratio. This property ensures that gliders maintain structural integrity while minimizing overall weight, which is crucial for achieving optimal aerodynamics.See also Understanding Glider Aerodynamics: Principles and ApplicationsCorrosion resistance is another vital benefit of using metal in glider construction. Alloys such as aluminum are treated to withstand various environmental conditions, reducing maintenance requirements and prolonging the aircrafts lifespan. This feature is invaluable for gliders operating across diverse climates.Furthermore, metal alloys contribute significantly to the precision of aerodynamic structures. The ability to fabricate precise components enhances the overall efficiency and control of gliders. Properly designed metal frameworks ensure improved stability and flight performance, making them essential in maintaining glider functionality.Finally, versatility in design is a key advantage of metal materials. Manufacturers can create complex shapes using various metal processing techniques such as stamping and machining. This adaptability allows for innovation in glider designs, catering to specific recreational and competitive needs while optimizing the materials used in gliders.Composite Materials in Modern GlidersComposite materials have become pivotal in the design and construction of modern gliders, significantly improving performance and efficiency. These materials typically consist of a combination of two or more constituent materials, which provide enhanced properties that single materials might lack. One prominent example of composite materials used in gliders is carbon fiber reinforced polymer (CFRP). This material exhibits exceptional strength-to-weight ratios, which is crucial for glider performance. Additionally, glass fiber composites are also employed, offering versatility and cost-effectiveness in construction.The benefits of using composite materials extend beyond strength; they also contribute to superior aerodynamic efficiency. Their ability to be molded into complex shapes allows for refined designs that reduce drag, enhancing glider performance during flight. Moreover, composite materials offer excellent resistance to environmental factors such as moisture and corrosion, ensuring longevity. As the aerospace industry continues to innovate, the role of composite materials in modern gliders is poised to expand, reflecting advancements in technology and materials science.Fabric and Covering MaterialsIn glider construction, fabric and covering materials serve a pivotal role in maintaining aerodynamic efficiency while providing structural integrity. These materials are selected based on their weight, durability, and weather resistance, attributes that significantly influence glider performance. Various types of fabrics are used in glider construction, including polyester, Dacron, and Mylar. Polyester is frequently employed due to its excellent strength-to-weight ratio and resistance to UV degradation. Dacron, a polyethylene terephthalate, is another popular choice for its durability and ease of handling. Mylar, known for its exceptional stability and lightweight properties, enhances aerodynamic performance. Durability and weather resistance are critical factors in selecting covering materials. Gliders frequently encounter varying weather conditions, necessitating fabrics that can withstand moisture, temperature changes, and UV radiation. Using high-quality covering materials not only enhances the gliders lifespan but also ensures consistent performance during flights. The integration of effective fabric and covering materials complements the overall design of gliders, minimizing drag while maximizing lift. By carefully selecting these materials, manufacturers can significantly influence the operational characteristics and longevity of gliders in diverse flying environments.Types of Fabrics UsedFabrics play a significant role in the construction of gliders, primarily used for covering the wings and fuselage. Different types of fabrics can impact aerodynamics, weight, and durability. Some common fabrics include polycotton, Dacron, and mylar.Polycotton, a blend of polyester and cotton, is known for its balance of strength and flexibility. This fabric provides good tear resistance and can withstand various weather conditions. Its relatively low cost makes it a popular choice among DIY builders and hobbyists.Dacron is another widely used fabric, particularly valued for its lightweight and durability. It has excellent resistance to UV light and mildew, ensuring longevity in outdoor applications. Dacrons stability under tension makes it an ideal option for glider wings, minimizing sagging over time. Mylar, a polyester film, offers unique properties such as high tensile strength and low weight. It has remarkable reflectivity, which can enhance glider performance by minimizing heat absorption. Each of these fabrics contributes to the overall functionality and effectiveness of gliders, showcasing the critical influence of materials used in glider construction.See also Understanding the Various Types of Gliders in AviationDurability and Weather ResistanceDurability and weather resistance are critical factors in selecting materials used in gliders. Given that these aircraft operate in varying weather conditions, the materials must withstand environmental stressors such as moisture, sunlight, and temperature fluctuations.Fabrics used in glider coverings often feature synthetic materials treated for UV resistance and water repellency. For instance, Polyester and Dacron are common choices, providing longevity and excellent resistance to degradation due to sun exposure, reducing the maintenance needs over time.Additionally, composite materials, such as carbon fiber reinforced polymers, excel in durability and weight management. Their innate resistance to corrosion and environmental damage ensures that gliders maintain structural integrity, allowing for safe and reliable performance.Wood, while traditionally used, may require more maintenance to prevent rot or warping. However, treatments such as varnishing can enhance its resilience. This interplay of material selection showcases the importance of durability and weather resistance in ensuring the safety and longevity of gliders. The Role of Structural AdhesivesStructural adhesives refer to bonding agents specifically formulated to create strong, durable connections between the various materials used in glider construction. They effectively join components such as wood, metal, and composites, providing structural integrity and rigidity.The advantages of using structural adhesives in glider construction include: Weight Reduction: Adhesives eliminate the need for additional fasteners, contributing to overall weight savings. Stress Distribution: They distribute stress along the bonded surfaces, enhancing performance under load. Moisture Resistance: Many adhesives possess moisture-resistant properties, increasing durability in varying weather conditions. Various types of structural adhesives are employed in glider manufacturing, including epoxy, polyurethane, and cyanoacrylate. Each type provides distinct benefits based on the materials joined and the specific requirements of the glider design.In summary, structural adhesives not only enhance performance but also support the evolution of glider design, allowing engineers and manufacturers to push the boundaries of flight capabilities. Their increasing usage in the aviation industry reflects the growing trend toward lightweight, efficient, and innovative materials used in gliders.Weight Considerations in Material SelectionWeight considerations significantly influence the material selection process in glider construction. A lighter glider generally has improved aerodynamic efficiency, leading to enhanced performance and longer flight durations. Therefore, engineers and designers prioritize weight when choosing suitable materials. Wood, while traditional, adds a degree of heft that may not be ideal for modern glider designs. Conversely, metal alloys, though sturdy, can also contribute to increased weight unless carefully engineered. This challenges designers to seek a balance between structural integrity and weight savings.Composite materials have become increasingly popular due to their favorable strength-to-weight ratios. These materials allow for the creation of lightweight structures without sacrificing safety. Advanced composites are valued for their ability to minimize air resistance, making them suitable for high-performance gliders.Ultimately, the goal is to achieve an optimal weight that enhances maneuverability and efficiency. Choosing the right materials is paramount to maximizing the aerodynamic aspects of gliders while ensuring durability and safety in various flying conditions.Future Trends in Glider MaterialsEmerging trends in glider materials are shaping the future of aircraft design by prioritizing lightweight, durable, and environmentally friendly options. Innovations in material science have led to enhanced composites, such as carbon-fiber reinforced plastics, which offer superior strength-to-weight ratios, crucial for glider performance.Furthermore, the integration of bio-based materials, such as natural fibers and resins, is gaining traction. These materials not only reduce the environmental impact but also exhibit comparable mechanical properties to traditional materials used in glider construction. Advancements in 3D printing technology are also influencing material selection. The ability to create intricate, lightweight components from specialized polymers enables manufacturers to achieve designs that were previously impractical.Lastly, the use of multifunctional materials is on the rise. These materials can provide additional benefits, such as improved aerodynamics or enhanced thermal insulation, further optimizing glider performance while addressing current environmental concerns. The choice of materials used in gliders significantly impacts their performance, safety, and durability. Understanding the strengths and limitations of wood, metal alloys, composite materials, and fabrics is essential for both manufacturers and enthusiasts.As technology evolves, so too does the innovation in materials for glider construction. Staying informed about these advancements ensures that gliders continue to meet the demands of modern aviation while enhancing the overall flying experience. Are you interested in building your own glider?In this article, we will guide you through the step-by-step process of constructing a glider from scratch.Whether you are a beginner or have some experience with DIY projects, this article will provide you with all the necessary information and instructions to successfully create your very own glider.To begin with, it is important to understand the basics of aerodynamics.Aerodynamics is the study of how objects move through air and how forces such as lift and drag affect their flight.By understanding these principles, you will be able to design a glider that can efficiently glide through the air.We will explain these concepts in simple terms, ensuring that even beginners can grasp them easily.Once you have a good understanding of aerodynamics, we will help you gather all the necessary materials and tools for building your glider.From lightweight materials like balsa wood or foam board to essential tools such as scissors and glue, we will provide a comprehensive list so that you are fully prepared before starting construction.Additionally, we will give tips on where to find these materials at affordable prices.Now that we have covered the introduction in two paragraphs using second person point of view, active voice, and contractions while maintaining a technical and informative style.The introduction provides an overview of what readers can expect from the article guidance on constructing their own glider by understanding aerodynamics and gathering materials/tools needed for construction. Understand the Basics of AerodynamicsNow, lets dive into the fascinating world of aerodynamics and get a grip on how those sleek gliders effortlessly soar through the sky!To understand the basics of aerodynamics, we must first grasp the concept of lift. Lift is the force that opposes gravity and allows an aircraft to stay airborne. This force is generated by the shape of the wing, specifically its curved upper surface and flatter lower surface.See also How To Set Color In Fabric?As air flows over the wing, it moves faster over the curved top surface, creating lower pressure compared to the slower-moving air underneath. This pressure difference creates lift as it pushes upward on the wing.Additionally, another important factor in glider performance is drag. Drag is a resisting force that acts opposite to motion and can be caused by factors such as air friction and turbulence. Minimizing drag is crucial for maximizing glide efficiency in a glider design.By understanding these fundamental principles of aerodynamics, youre now equipped with knowledge thatll aid you in your quest to build your very own glider! First, gather all the essential materials and tools needed for building your very own soaring aircraft.Youll need a lightweight and sturdy material such as balsa wood or foam board for the main structure of the glider.Additionally, youll require a sharp hobby knife or scissors to cut the materials with precision.To assemble the parts, youll need glue thats specifically designed for bonding these materials together securely.Dont forget to have sandpaper on hand to smooth out any rough edges and ensure a seamless finish.Lastly, youll need some basic measuring tools like a ruler or tape measure to accurately determine dimensions and angles during construction.With these necessary materials and tools gathered, youll be well-equipped to begin your glider-building journey.Construct the Glider FrameTo begin constructing the frame, youll need to carefully piece together the lightweight materials, creating a solid foundation for your soaring aircraft.Start by laying out the main wing structure, using balsa wood or carbon fiber rods as spars to provide strength and stability. Attach ribs made from thin plywood or foam along the length of the wings to give them their curved shape and provide extra support. Secure all the components with glue or small screws, ensuring that everything is aligned and symmetrical.See also How To Make Chain Paper Dolls?Next, assemble the fuselage using wooden dowels or aluminum tubes for added durability. Connect the wings to the fuselage with strong adhesive or bolts, making sure they are securely fastened.Finally, add any additional components such as tail surfaces or control mechanisms according to your glider design. Remember to follow any specific instructions provided with your glider kit and double-check all connections before proceeding further.With a well-constructed frame, youre one step closer to achieving successful flights with your homemade glider. Once youve constructed the glider frame, its crucial to test and adjust its flight performance for optimal results.Here are some key steps to follow:Start by conducting a glide test from a high point or launching ramp. This will allow you to observe the gliders flight characteristics and identify any issues that need addressing.Pay close attention to the gliders stability during the glide test. Does it maintain a straight and level path, or does it veer off course? If there is an imbalance, you may need to adjust the weight distribution by adding or removing weights.Next, assess the gliders lift capabilities. Does it stay aloft for an adequate amount of time? If not, consider adjusting the wing shape or size to improve lift generation.Finally, examine the gliders control response. Test how well it responds to your inputs for pitch (up and down) and roll (side-to-side). If necessary, make adjustments to the control surfaces such as elevators and ailerons.By thoroughly testing and adjusting your gliders flight performance, you can fine-tune its design for maximum efficiency and enjoyment.See also How To Draw A Rock Wall?Remember that small modifications can have significant impacts on its overall performance, so dont hesitate to experiment until you achieve desired results. In conclusion, constructing a glider requires a solid understanding of the basics of aerodynamics and the necessary materials and tools. By following these steps, you can build an effective glider that is capable of achieving flight.Understanding how air flows over the wings and tail section is crucial in designing a glider with optimal lift and stability. Additionally, gathering the right materials such as lightweight yet sturdy materials for the frame, along with essential tools like scissors and glue, is essential for successful construction.Once you have gathered all the materials and tools, constructing the glider frame involves carefully assembling each component to ensure proper alignment and stability. Taking precise measurements and using secure fasteners will help create a sturdy structure that can withstand the forces experienced during flight.Testing your gliders flight performance is vital to identify any adjustments needed for optimal efficiency. By making small modifications to aspects such as wing shape or weight distribution, you can fine-tune your gliders performance.In conclusion, building a glider requires attention to detail and adherence to fundamental principles of aerodynamics. With patience and careful craftsmanship, you can construct a functional glider that showcases your knowledge of aviation physics.Whether its for educational purposes or recreational enjoyment, creating your own glider allows you to experience firsthand the thrill of flying without an engine. So go ahead, gather your materials, follow these steps precisely, test your creation diligently soon enough youll be soaring through the skies with your very own homemade glider! Paragliders are constructed using different types of nylon, line material, and webbing. The glider itself is usually made from rip stop nylon produced by one or more manufacturers. Commonly, different weights (g/m2) of material are used for the top and bottom surface, as well as the ribs and reinforcement points in the glider. Manufacturers produce fabrics with various strengths and weaknesses. Almost all of these fabrics have some sort of UV coating to increase longevity. Its a good idea to do some research on the type of material used in a particular glider before purchasing it.The lines are made up of a core that provides the strength and a sheath that provides UV and abrasion protection. The core is either Kevlar (aka Aramid) or Spectra (aka Dyneema) in varying diameters measured in mm. The sheath is made of polyester. Kevlar is the line core material of choice for most glider manufacturers; it has good strength and durability and doesnt shrink or stretch. Spectra line is about 40-percent stronger than Kevlar, but can shrink or creep over time or after it has been exposed to water, and can require maintenance to keep the lines the proper length. The lines connect to the glider at attachment points that are reinforced with Mylar. At the other end they are connected to the risers via triangular quick links made of stainless steel. The risers are most commonly made from pre-stretched nylon.A typical harness is constructed using a combination of Cordura, Neoprene, and webbing. Cordura is a tough nylon material that provides abrasion resistance. Neoprene has the ability to stretch and is form fitting, so it is mostly used in competition style harnesses or for pockets and reserve parachute containers. Webbing will make up the support portion of the harness, consisting of leg, shoulder and chest straps along with the carabiner attachment points. Carabiners come in an assortment of styles you should only use those that are designed for paragliding and have a good locking mechanism. Most harnesses have a seat board that is made of wood, fiberglass, carbon fiber, or composite materials.Last, but certainly not least to consider is the back protector in the harness. It comes in several different forms and levels of protection. The most common types are either foam or airbag system. Both are sometimes coupled with a plexiglass sheet for puncture protection. There are also hybrid versions of these types of back protection. Back protection should be high among your considerations when selecting a harness, so discuss it with your instructor prior to making a purchase.Reserve parachutes are also made from rip stop nylon however, it is a much lighter material than what is used for paragliders.There are several different styles of reserve parachutes on the market, but most are very similar in design and performance. Reserve parachutes are covered in more detail in the nextChapter which focuses exclusively on Reserves.The biggest enemies to your gear are sunlight and abrasion. When you are not using your gear it should be stored in a cool, dry, dark place. UV exposure will deteriorate the strength and cosmetic appearance of your equipment. Try to keep your gear as clean as possible. Avoid leaving it in the dirt or stepping on it. The Kevlar lines are susceptible to kinking and can be damaged if pinched against rocks. The kevlar core may break while the sheath stays intact, hiding the problem. Do not step on your lines!If you feel the need to clean your glider, use a damp sponge and some warm water. Avoid washing it with detergent or soaking it (eliminating salt water may require a soak). This may have a detrimental effect on the UV coatings designed to protect the glider. If it is a little dusty, try kiting it in a grassy field. This should remove some of the dust. You can also kite the glider upside down or shake it out to remove the dirt and other debris from the cells. Some gliders have velcro ports on the wing-tips which will allow you to clean debris from cells.Other items you should avoid having around your glider are solvents of any kind (including oil and gasoline), extreme heat, damp storage, and sharp or abrasive objects. Watch out for sunscreen, the oil can leave a stain.Once you have your own glider, you should adopt a routine maintenance schedule. Maintenance should include an inspection of the following: Risers (for fraying of webbing), lines (kinking, sheath damage, or breakage), and the sailcloth (tears and punctures). This will help you identify any area of your glider that needs repair. If the repair is minor, such as a small tear, you should be able to do it yourself with simple instructions. If the repair is major, you will need to have someone skilled in glider repair fix it for you. Any repairs needed to a reserve parachute should be done by a certified rigger.Radios are not only useful, but are required at some sites and should be considered part of your safety gear. Its convenient to be able to communicate with other pilots, to obtain information prior to flight (from pilots in the air), during your flight, and for retrieval arrangements. They can also be a safety tool for information about changing conditions or accidents. You will need to determine the specific frequency being used at each site.Instruments used by paraglider pilots include variometers, GPS (Global Positioning System) receivers, personal locator beacons, and compasses.The variometer, commonly known as a vario, indicates current altitude and rates of ascent and decent through a visual display and/or audible tones. Depending upon the brand, model and ability to interface with a GPS, there are other functions such as; maximum altitude reached, average and maximum climb rate, average and maximum sink rate, time aloft, glide ratio, and airspeed. Some models have the ability to download flight information to a computer, allowing you to view a graphic representation of your flights. The GPS receiver uses information from a network of satellites to provide precise ground positioning. This makes the GPS useful as a ground speed indicator, a compass, and for determining your location in the air or after landing. Most GPS units will also interface with a computer, allowing you to view your flights in 3D. Personal locator beacons are expensive and not used by pilots unless they are flying over inhospitable terrain. You can use a GPS interface to transfer your position via satellite to search and rescue services in your area.Helmets are a strict requirement any time you attach yourself to a paraglider. You should already have an appreciation for how much energy a glider can harness. Most helmets specifically designed for paragliding will give you adequate protection, however, there are exceptions so ask your instructor or do a little research. Along with good protection, you should choose a helmet that will be comfortable and allows adequate visibility. Full face helmets are highly recommended.The full face provides more protection but a little less visibility, and vice versa for the open face helmet. You will have to decide which one works best for you. Helmets to stay away from include but are not limited to; motorcycle helmets (too heavy but many motocross helmets are fine), climbing and hockey helmets (too thin, not enough foam), and bicycle helmets (not enough protection in back but downhill mountain bike helmets are excellent). Not all helmets are equal; so find one that will give you the best combination of comfort and protection.If you are flying over inhospitable terrain where you could be in danger if you landed unexpectedly, there are a few other safety items you should have with you. These include: water, energy bars, flashlight, a compass that doesnt require batteries, first aid kit, laser flare, warm clothes, a tree kit or pruning shears depending on the terrain, dental floss to lower to a rescue team and retrieve rope with, a leather-man, hook knife, spare batteries for radio and GPS unit, and a camera both for documenting the event and for signaling rescuers with the flashbulb.When it comes time to purchase your own equipment, there are some important considerations to make. Your skill level is going to determine the class of glider you will fly. Most paragliders are tested by the new European Norm (EN) testing method. After rigorous testing, each glider is given a certification based on how well it performed during the test. The glider is then given a letter to signify its appropriate skill level. The EN system is broken into 4 levels: A, B, C, and D. This system was created to replace an earlier method called the DHV which only had 3 levels.All A level gliders and some easier B level gliders are appropriate for a pilot with entry-level skills. This doesnt mean the glider is not capable of thermal flying or going cross-country. It means the glider is more forgiving on launch, in demanding conditions, and in recovery from malfunctions. The newest entry-level gliders offer a wonderful combination of performance and stability.The condition of the equipment should be your next consideration. If you are getting a new glider, you already know what condition it is in. If not, there are a few things to consider. The older the glider, the older the technology involved in its design. Gliders have come a long way in recent years, so you should look for something that was made within the last 3-5 years. The next question to ask is how many hours the glider has on it. Most gliders last approximately 300-400 hours, depending on intensity of UV radiation and the original quality of the fabric and materials.What is the porosity of the glider? Porosity is measured with an instrument that pulls 1 liter of air through the sail-cloth of the glider and is measured in seconds. A new glider generally scores somewhere around 250 to 300 seconds. A glider that scores anything less than 5 seconds is considered un-airworthy and is good for windsock material or other crafty projects. Does it look faded, have repairs, or do the lines look worn and frayed? If you plan on buying a used glider make sure that it has been professionally inspected recently and ask for the results of that inspection. Other considerations when buying equipment should include serviceability of the glider and reputation of the manufacturer. Whoever you buy from, make sure they will take care of you on the service end. Remember, it is your instructors responsibility to help you find an appropriate glider, so use their knowledge and experience to help you make the best choice.If you have any questions about gear you would like to purchase please ask your instructor! They will be straight with you about the appropriateness of the equipment, its condition, and reputation. We dont want to see you flying gear that could be dangerous any more than you want to be flying dangerous equipment. Written by Louis JoynerAs featured on page 125 in the November 2011 issue.MATERIAL CHANGES: For at least 80 years, balsa has been the material of choice for hand-launch gliders. But, just as the event has dramatically changed from the traditional javelin launch to tip launch, construction materials and techniques are also starting to change.Javelin-launch gliders typically measured 16 to 22 inches in wingspan and weighed roughly an ounce. Models were also considered somewhat expendable. Serious fliers produced large batches of gliders knowing that some would be broken, some wouldnt fly well, and others (always the good ones) would be lost in thermals. Because it is readily available and easily worked using simple tools, balsa was the perfect material choice for these disposable models.However, the new tip-launch gliders are much larger, typically with a wingspan from 30 inches up to the maximum of 1 meter (39.37 inches). The weight is triple that of a javelin-launch glider. With the nearly universal use of a DT, flyaways are greatly reduced. Consequently the tip-launch gliders last longer, allowing more time and money to be invested in construction. This also means that models can be more accurately constructed.Although balsa is still a viable choice for larger tip-launch models, some modelers are exploring other options for wing construction. Although the choices vary in the materials and building techniques used, they all utilize a stressed-skin structure. Unlike a solid balsa wing, a stressed-skin structure uses two different materials, each to its best advantage. The top and bottom surface skins provide the bending and torsional strength; the lightweight core provides the airfoil shape and keeps the top and bottom skins apart under bending loads.Stressed-skin structures are nothing new in modeling. Many RC models utilize a foam core covered with thin-sheet balsa or even heavy plastic film. Others use fiberglass, aramid, or carbon fabric to handle thinner airfoils and higher flight loads. In FF, wings sheeted top and bottom with thin balsa have been used for years. Closely spaced balsa ribs provide the core function. More recently, thin, hard aluminum foil, fiberglass cloth, or carbon fabric have provided the stiff outer skin, either over a fully sheeted wing or a foam core. In principle, even a traditional stick-and-tissue wing is a stressed-skin structure, with the taut tissue adding both bending and torsional strength to a lightweight balsa framework core. The Core: For tip-launch gliders, the most popular core choices are insulation foam, Spyder Foam, and Rohacell foam. Pink and blue insulation foam is available at most home stores in 4 x 8-foot sheets in a variety of thickness. Although inexpensive and readily available, these are not the best choices among insulation foams, because the compressive strength is quite lowtypically 15 to 25 pounds per square inch (psi). For a core material, compressive strength is one of the most important attributes.Specialized insulating foam, designed for certain commercial applications, has at least twice the compressive strength. Dow Styrofoam Highload 60 insulation, has a compressive strength of 60 psi and a weight of 2.3 pounds per cubic foot (pcf). The sheet size for the pale blue material is 2 x 8 feet in both 2-inch and 3-inch thickness. Dow also offers slightly lighter Highload 40 with a 40 psi compressive strength in both 2 x 8 and 4 x 8 sheets and 2- and 3-inch thickness. Cost for a 2 x 8 sheet of 2-inch material should be less than $25, provided you can find a local dealer that stocks it. (In my town, the Highload foam is a special order item with a three-pallet minimum; I didnt bother to ask the price.)Owens Corning offers a similar product. Foamular is high compressive strength rigid foam that is pink in color. Foamular 600 has a 60 psi compressive strength and a weight of 2.2 pcf; Foamular 400 has a strength rating of 40 psi and weighs 1.8 pcf.Spyder Foam, also known as surfboard foam, is extruded so that its maximum compressive strength is in thickness, just where it is needed for a wing core. Spyder Foam has similar strength and weight characteristics to Highload 60, with a weight of 2.3 pcf and a compressive strength of 60 psi. Formerly available in white, Spyder Foam now comes in blue. The Composites Store (CST) stocks Spyder Foam in 1.75-inch thickness; a 12 x 36-inch sheet is $15.95 plus shipping; a 24 x 36-inch sheet is also available for $27.95, but there is a $20 packing charge and an oversize shipping charge for the wider sheet. According to Gail Gewain of CST, the manufacturer discontinued production of Spyder Foam in late July. After the current stock is gone, it will no longer be available.The foams Ive mentioned are extruded polystyrene foam (EPF). The next foam choice is Rohacell, a white, closed-cell acrylic foam. Unlike polystyrene, Rohacell cannot be hot-wired. It must be machined or sanded to shape. Rohacell industrial grade (IG) foam comes in three weights: IG 31 (2 pcf) with a compressive strength of 57 psi; IG 51 (3.2 pcf and 128 psi); and IG 71 (4.7 pcf and 213 psi). Rohacell is widely used in the industry as a core material for such things as wind turbine blades, helicopter rotors, and even hockey sticks.Rohacell IG 31 is available from CST in 3.0mm, inch, and inch thickness, and in a range of sheet sizes. IG 51 comes in the widest thickness range: 1.0mm, 1.5mm, 2.0mm, 3.0mm, and inch. IG 71 is offered in 3.0mm, inch, inch, and 1 inch. As with the Spyder Foam, there are extra charges for sheets wider than 12 inches. Rohacell also offers IG-F, which has a finer cell structure for reduced resin absorption. CST is starting to carry IG-F in some weights and thicknesses.As a core material, Rohacell offers higher ratio of compressive strength-to-weight than EPF. Rohacell IG 51 has double the compressive strength of Highload 40 (128 psi compared to 60 psi), but only weighs about 1.4 times as much. Rohacell also resists temperatures up to 428 F (220 C), an important consideration for models that often sit in the sun. The maximum use temperature recommendation for one major brand of EPF is only165 F (74 C).Rohacell is really hard to beat when you look at all the properties, said Gail. But the good qualities do come at a price. A 12- x 48-inch sheet of -inch Rohacell is almost $60, or roughly $20 per tip-launch glider wing. Shaping the Core: For EPF foam cores, the easiest solution is to use the hot-wire technique. The basic idea is to cut the wing panel to outline shape, attach airfoil-shaped templates to both ends, then use a heated wire to cut through the foam, following the templates.The main limitation is that the wire only cuts in a straight line, so panels need to be rectangular or trapezoidal in shape. However, by using a six-panel wing and tapering each panel, you can approximate an elliptical planform. The tips can be sanded after hot-wiring.Since Rohacell foam cant be hot-wired, it must be sanded or machined to shape. Sanding actually goes much faster than with balsa. As with balsa, a vacuum and face mask should be used to control the dust. Rohacell also cuts easily with a saw or router. For faster and more accurate production, a jig could be devised to hold a router at the correct angle to shape the sloping rear of the wing airfoil. Jim Buxton's tip-launch glider sports an insulation foam wing, skinned with two layers of lightweight glass cloth. Its projected wingspan is slightly less than the l-meter maximum.The Skin: Possible choices for the skin include fiberglass cloth, carbon-fiber cloth, and carbon tissue, also known as carbon veil. Lightweight fiberglass cloth is familiar to most modelers. The silklike material comes in weights as light as ounce per square yard. When using fiberglass or carbon cloth, it is best to use a cloth with a balanced weave, one with the same number of threads per inch in both directions such as 0.7 ounce fiberglass cloth with a 56 x 56 thread count. This will ensure equal strength in both directions and minimize the chance of warping. Handling light fiberglass cloth isnt easy, but carefully unfolding the cloth onto a smooth surface such as a large piece of illustration board or brown wrapping paper will help reduce snags. Smooth it out with gentle strokes of a drafting board brush, then mist with clear nitrate dope. This will lock the threads of the cloth together, stiffen it slightly, and make it easier to handle.Carbon-fiber cloth comes in a variety of weights; the most usable for FF are approximately 2.25 to 2.9 ounces per square yard. Carbon cloth is considerably stronger and a good deal more expensive then fiberglass cloth. As with fiberglass cloth, carbon fabric is almost always used on the bias, that is, with the threads running at 45 to the wing chord. This provides a significant increase in torsional strength as opposed to a chordwise/spanwise fiber orientation. Many of the same handling techniques used for fiberglass cloth are needed with carbon fabric. It helps to use drafting tape to outline an area of the cloth and then cut along the center of the tape. This will minimize the chance of the fabric unraveling or pulling out of shape. Another alternative to fiberglass or carbon cloth is carbon tissue. Instead of being a woven cloth, carbon tissue is a thin mat of random fibers. Just imagine black silkspan. Available weights range from 0.2 to 0.7 ounces per square yard. No special handling is required; simply cut to shape with scissors.The costs of fiberglass cloth and carbon tissue are comparable, in the range of $16 to $18 dollars a square yard for carbon tissue, perhaps slightly less for light glass cloth. Carbon-fiber cloth is expensiveroughly $150 per square yard and more for lighter cloth. For certain applications, the added strength, rigidity, and dimensional stability are worth the cost.Bagging It: Attaching the skin to the top and bottom of the core is the easiest part of the operation. The cloth or tissue pieces are placed on a piece of thick Mylar and wetted out with epoxy resin, and then the excess resin is blotted off. Next the core is positioned over the bottom skin and then the top skin placed on top of the core. Another piece of Mylar is draped over the assembly, and everything is placed inside a vacuum bag. The bag is sealed and a vacuum pump is used to remove the air from the bag. Atmospheric pressure does the rest, evenly pushing the skins tight against the core. The vacuum is held until the epoxy hardens. The result is a stiff wing that wont flutter on a hard launch and wont change between contests. More importantly, you can make another one just like it without spending weeks searching for a perfect piece of balsa.Matt Gewain has created an excellent tutorial about vacuum bagging, which can be seen on the CST website. Other websites offer tips, instructions, and even how-to videos.Is it worth it? Composite glider wings require an investment in both time and money, as does any new technology. For some of us, the feel of a razor-sharp plane on a piece of C-grain balsa offers more rewards then messing with epoxy and strange plastics. For others the challenges of trying something new may be its own reward. Neither the thermal nor the stopwatch care how the wing was made or what materials were used. Narrow carbon-fiber spars on the top and bottom stiffen Jim Buxton's glider wing. Each dihedral joint is reinforced with carbon tow.I had the opportunity to examine two composite-wing gliders at the Nats last summer. The wing on Jim Buxtons model used cores hot-wired from blue foam and skinned top and bottom with two layers of 0.7-ounce fiberglass cloth. For added bending strength, Jim inset 0.050 inch carbon fiber spars into the top and bottom of the core before adding the skins. A simple tool made from a broken Dremel cut-off disc with scrap-balsa depth stops glued on either side was used to cut the groves for the carbon spars. Its quick and easy, said Jim. Dihedral joints were reinforced with carbon-fiber tow on the top only to reduce bending on launch. Its scary how flat these high-aspect-ratio wings get on launch, he adds.The four-panel wing measures 42 inches flat; dihedral re