

Airplane Design & Construction

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What is the best airplane design?

- If you are new to the event or have a limited amount of time, build a proven good performing design.
- If you have an experienced coach and have a significant amount of time for flying practice a custom design can be considered.
- Success in the flight events is 20% design and 80% flying practice and motor winding.
- At the very start of the school year, arrange to get gym time for flying practice. Meet with your school principal or board to get this done, if necessary. Two or three 3-hour practices each month is recommended. Ask to have the gym blowers off, or at least turned to their very lowest setting.
- You can be very successful flying a proven design without customizing.

Should I build a kit or from scratch?

- If you are new to the event and/or have limited time, build one of the excellent kits on the market.
- A “best kit” depends upon the time you have to commit and your objectives. A top-level kit can take 8-12 hours to build and will get flights of 2:00-3:00. A mid-level kit will take 2-6 hours to build and 1:30 flights, or a little better, should still be possible.
- If time is limited, less time building and more time practicing is recommended.

Kit Manufacturers

- Lasercutplanes – Good simple to construct medium-level kits; less expensive
<https://www.lasercutplanes.com/product-category/indoor-kits/>
- Freedom Flight Models – Top level kit with excellent written and pictorial instructions; a little more expensive and more challenging to build - <https://www.freedomflightmodels.com/>
- J&H Aerospace - Top level kits with excellent video instructions; both mid-price and a little more expensive designs available <https://jhaerospace.com/product-category/indoor-rubber-power/page/2/>
- Retro RC Kits – Good medium-level kits; a little less expensive
<http://retrorc.us.com/FFRubberPowerKits.aspx>
- Guru Engineering – Good medium-performance kits; less expensive
<https://www.guruengineeringtech.com/>
- Wards Scientific – Build materials; official kit supplier of Science Olympiad

Very Simple Scratch Build

- Here is a simple mid-level Division B airplane build and flight video; takes 30 minutes from craft store balsa, costs \$12-15 and can fly over two minutes in a typical school gym.
https://www.youtube.com/watch?v=Mbxba3g1hMU&list=PLe1IYdMr0FSw2kL0_WXi1b6Z3nQ_GCoQZ&index=23&t=129s

Complex Scratch Build

- More complex, higher performing design “Finny 09” by Bill Gowen (will require modifications to meet and take advantage of “fit in the box” rules):
https://www.hippocketaeronautics.com/hpa_plans/categories.php?cat_id=5&page=3

What else do I need to start? What glue should I use? Tips, etc.

- Read the kit instructions twice before starting. Ask questions in the Scioly forum (Navigate to Build Events/Flight) for quick help from experts.
- Build with accurate alignment and with “gap free” joints. If you misalign a part, cut or crack the joint and do it over again.
- Good quality fresh cyanoacrylate (CA or “super glue”) for almost all joints. Fresh glue will bond in seconds. Glue that has been sitting on a store shelf for a year will not work. “Thin” CA if carefully applied to accurate joints can be a little lighter. “Medium” CA is also fine; you can buy at most hardware and craft stores. Favorite brands include, Zap a Gap, Bob Smith, Instacure, Gorilla Glue and Loctite (the “gel” viscosity is not necessary).

- Make a simple CA glue tool as pictured below to apply the correct small drop of THIN CA to each joint. Applying glue directly from the bottle adds 5% or more to the airplane weight. Put a medium sized blob of glue on a small square of wax paper and pick up a tiny drop with the tool for each joint.
- If using Medium CA, it can be applied with a larger capillary tool or the tip of a toothpick
- Duco Cement is also handy for joints that you need a little time to position (like winglets attached to a wing). This is a strong light glue that dries and cures slower than CA. This you can buy at most hardware stores.
- 3M77 spray glue for attaching ultrafilm flying surface covering, or Elmers or UHU “blue” glue stick to attach tissue to flying surfaces. This you can buy at most hardware stores. Do not use CA to attach the covering.
- You can build on any flat surface, but a foam project panel is handy and available from the most hardware stores like this <https://www.homedepot.com/p/Project-Panels-Formular-1-in-x-2-ft-x-2-ft-Rigid-Foam-Board-Insulation-Sheathing-PP1/203553730>



*Figures 1-2: Simple glue tool; 1/4" sq x 4.5" balsa with pins.
Correct size glue drop picked up by capillary action.*