

SCALE SCENE

How-To: Build With Magnets

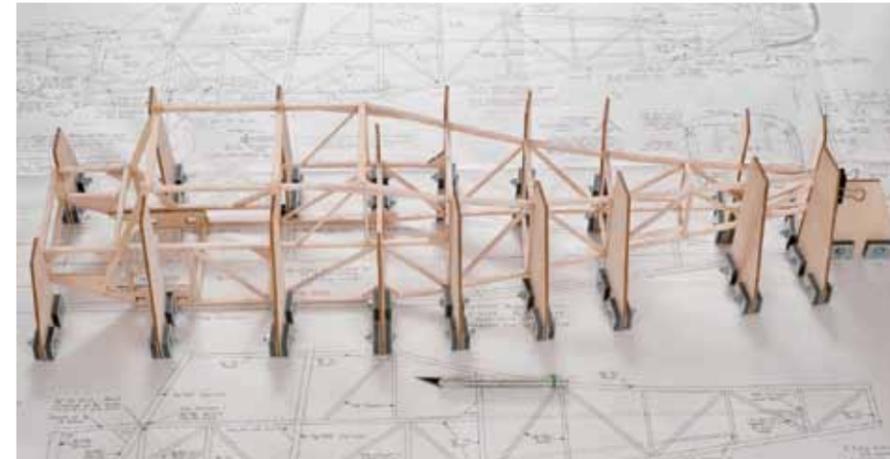
BY: **Mike MacFarland**

Like many model builders, I've always built my airplanes over a plan, sticking T-pins into a wooden board, simply because that was the way everyone else did it. A few years ago, I came across some guys online who were using a building method that was different than mine. They called it building with magnets, or a magnetic building board system. The technique involved using a large, flat sheet of magnet-attractive surface, in place of a wooden building board. Magnets were permanently attached to specially made wooden jigs to hold larger pieces, and smaller parts and sticks were held in

place with many small magnets. Watching the progress that some of these builders quickly made on their projects, I reasoned that this method must be easier and faster to build with than mine. Their comments about having happily switched from pins and wood also supported that conclusion. It was due to the stick-built construction of my latest project that I decided now was time to try this magnetic thing for myself.

After consulting with a friend and seeing his system, and reading information available online, I began the search for the materials I needed. Using the phone book, I talked with a few metal suppliers in my area and chose to visit

one where I knew they would have what I was looking for. At a company called American Metals, I explained to the worker my intentions and how I needed his help and experience to find a very flat, non-damaged piece of sheet steel. He seemed interested in model airplane building, and he took the time to show me their area where the most affordable pieces are found: the scrap bins next to the sheet cutting machine. In no time we located and cut-to-size a sheet of 14 gauge mild steel and loaded it into my vehicle. He also threw in another, smaller scrap of material that I told him I could use as a storage piece for surplus jigs. Upon settling up with the cashier, I



As the cross members are added, two opposing jigs are clicked into place on the metal table top, ensuring straight lines and plumb sides.

Sighting from the rear, you can see the tail has been brought together and locked in place with two jigs and a binder clip.



had purchased a 35 by 83 piece of mild steel sheet for \$46.00.

The other part of creating an accurate work surface is finding a strong base for the steel sheet. Although my steel sheet was free from waves and creases, it would only lay flat when it was on a perfectly flat surface. I assumed that my local door shop would have a solid-core door that would work nicely for this. As it turned out, they have a "bone yard" area where mis-bored and cancelled-order doors are stored rather than trashing them. They pulled out a commercial, three foot by seven foot, berry-colored, laminate-coated door that they said was mine for the taking if I'd simply haul it away. That was certainly within my budget, so my building table base was now a reality.

Back in the garage with my treasures, I laid out the steel sheet on some sawhorses and put on some work gloves. Using a metal file, safety goggles and an orbital sander armed with 80-grit sandpaper, I worked around the four sides and corners of the sheet, softening the sharp edges and removing the metal burrs. A full wipe down with lacquer thinner cleaned the dirt, markings and oily

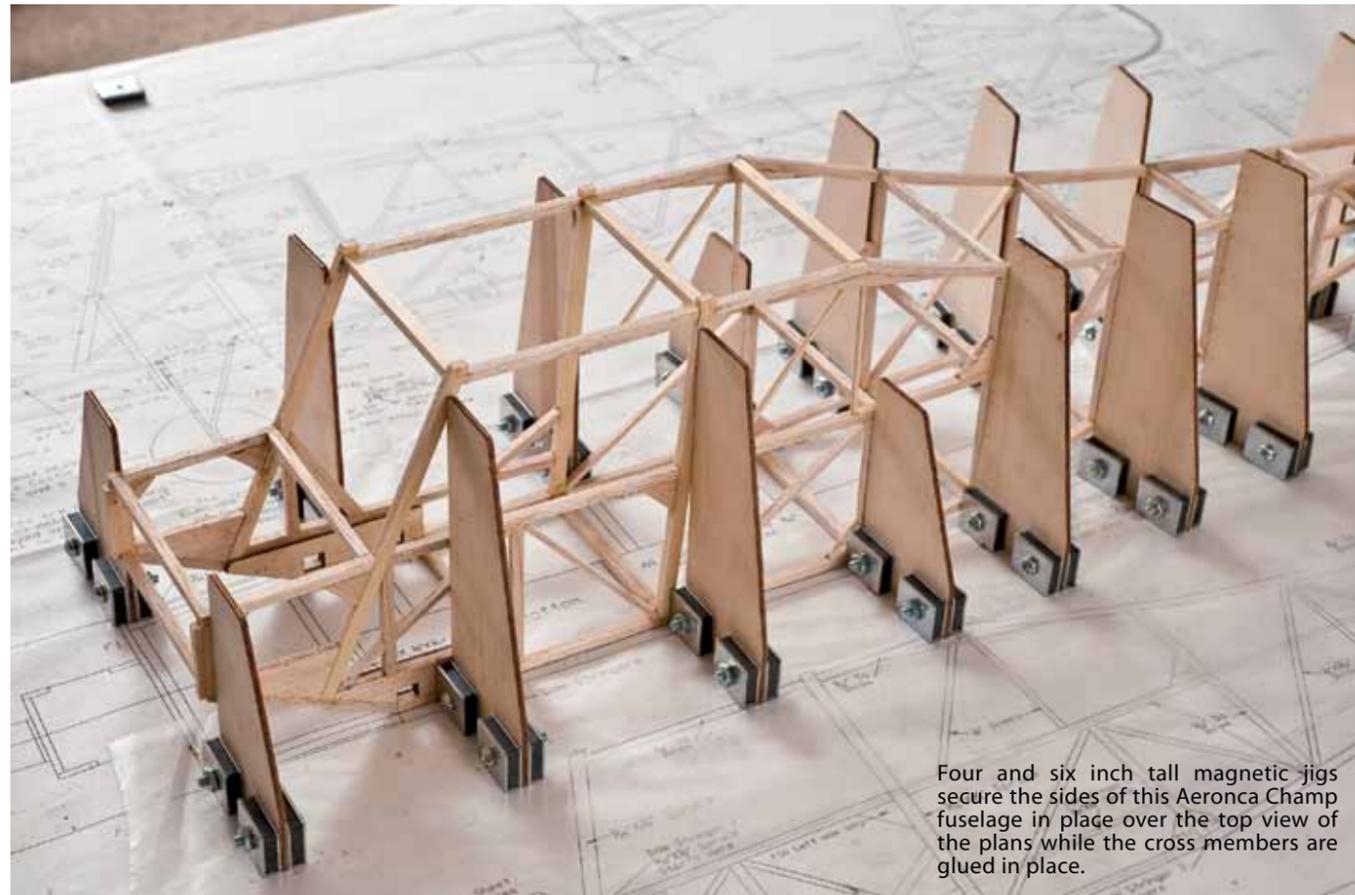
residue from it, making it ready for the clean airplane plans that would soon grace its surface.

I wasn't sure at this point if it would need to be permanently secured to the door to stay put, so I decided to wait and see on that. As it turns out in use, the sheet seems to be the perfect compromise between not being so thick that it's expensive and heavy, but not so thin that it flexes or moves. In metal terms, my sheet is called 14 gauge, which means it is .074 inches, or slightly thicker than 1/16-in. I would also assume that 16 gauge would perform nearly equally well, as would anything thicker than 14 gauge. And although there still isn't any adhesive between it and the laminate surface beneath, they seem to stay put as if they are bonded together.

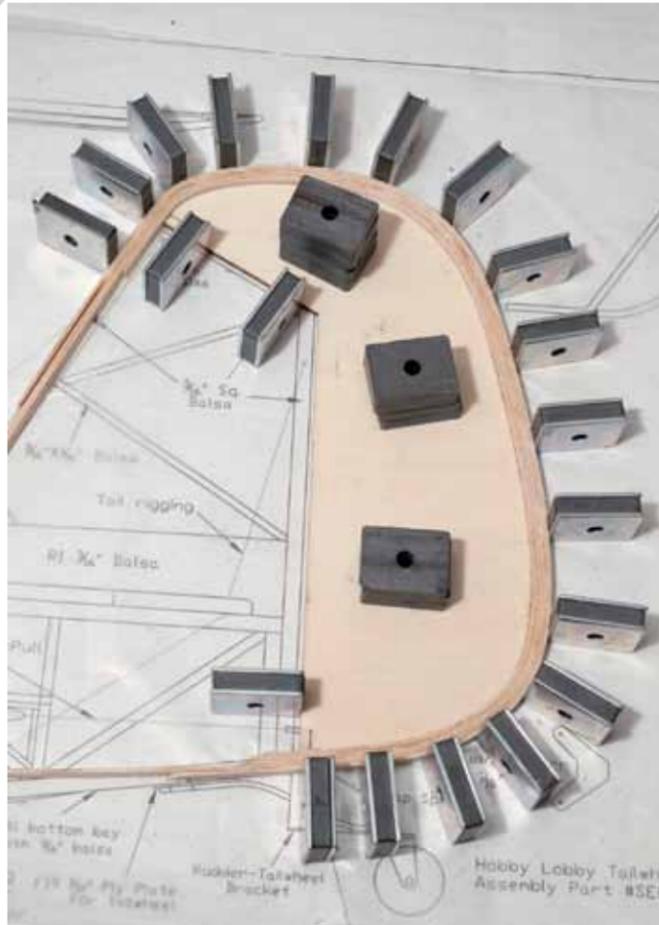
With an Aeronca Champ kit anxiously waiting in my building queue, it was definitely time to "get jiggy with it." My friend, Sky Greenawalt, shared with me a design for a six inch tall jig to be cut from 1/8-in. lite plywood. I used his design to make another design for a 4" tall jig, and then laser cut twenty of each size from the plywood. Using four ceramic "latch magnets", two 10-24 by

one-inch long machine screws and nuts, each jig was assembled and verified true. Thanks to online info from Airfield Models, I bought several hundred magnets for making these from an online business called "The Magnet Source". The magnets are the more expensive part of this system, costing about fifty-five cents each, and it takes four to make each jig. But once you have yourself a good assortment of jigs, you'll be set for many, many builds.

I'm including for you a free, full size plan for the jigs in PDF format on my website at Fly2Build.com. Simply download the file, print it out, and use a light mist of spray glue to stick it to your 1/8" scrap plywood. You can stack up eight blanks of wood with a light mist of glue between each, and then buzz the one-inch-thick



Four and six inch tall magnetic jigs secure the sides of this Aeronca Champ fuselage in place over the top view of the plans while the cross members are glued in place.



▲ The latch magnets can be used with or without the metal latch plates. The holding power is increased when the plates are used.

▲ Five strips of wood are held in place, after steaming and coating with wood glue, with magnets to the temporary plywood piece which form the rudder outline.

group using a band saw. Be sure to drill the holes accurately, using a drill press, as both the hole size and location are important to ensure they will perfectly locate the magnets for plumb results. To finish, just buy and bolt the magnets on each side. Also available on the website are laser cut and fully assembled jig options to help get you started.

The ceramic magnets have steel latch plates that can either be glued to the magnets or removed when using the magnets by themselves. I've found that having one hundred loose magnets is useful for holding the sticks, ribs, and other smaller pieces in place over the plans and when building sub-assemblies. When laminating curved wing tips and

bow pieces, loose magnets do an excellent job of holding the pieces firmly and square. As each piece of glue soaked wood is added, the outside magnets are easily repositioned until all strips are in place. When building wings, each rib can be pinched between opposing ceramic magnets and perpendicular to the board quite easily and securely.

Whether you prefer to build with the "wicking" method of thin cyanoacrylate (CA) glue (where all parts are assembled before hitting all joints with glue), or pre-gluing parts with aliphatic resin (AR), the magnet method shines. Since they are available in bulk, enough magnets can easily be on hand for holding an entire panel of wing ribs and spars in place for

the gluing. I've found that doing an assembly "mock up" like this will help ensure that you get things together in the proper sequence, and spot potential errors before they are permanent. When I used push pins and handmade pieces of aluminum angle for part holding, I was always coming up short in having enough. I'm also very glad to be done with having to pound the aluminum push pins, with a tack hammer, to secure them in place. With this method, the opposing magnets have attraction for each other, besides the table, so they do double-duty and hold the parts securely in a pinching fashion. And if you're a fraction of an inch off, you simply slide it to where it needs to be.

As far as negatives go, I now



▲ A solid-core, 1-3/4-in. thick, Wineberry-colored laminate door was my freebie from a local door shop (can't imagine why they couldn't sell it). The edges of the 14 gauge mild steel top were softened and de-burred prior to use.



▲ The table top is a generous, 3 by 7 foot flat surface, shown here with the Aeronca Champ fuselage and cowl. The trusty 10" disk sander and table saw stand ready in the background, while spare jigs await use in the foreground on a scrap piece of steel beneath the table.

have to use a cutting board on the table to protect the knife and razor blade edges since I no longer have a wood top to cut on. And, because the metal is untreated, it will rust if exposed to moisture. Mine is inside, so I haven't had nor do I expect any problems, other than keeping my drinks from sweating on it. I believe that automotive wax, applied regularly, will prevent this, but if your shop is outside, you might want to look for something galvanized or coated. Be sure to take a magnet with you, when buying your surface, for obvious reasons. And finally, the cost of upgrading to this setup is probably the biggest hurdle for most, but

one I think is worth saving for.

Without a doubt I've found the magnetic system more accurate, faster, and a more enjoyable building method than my old wooden "pin cushion". Since I've only been using it a short time, I know there will be future discoveries of ways and tricks for getting the most out of it. If you're just getting started in building, go this route and you'll never have to switch down the line. If you want to read more about this and many other bits of useful information, be sure to visit the Airfield Models website listed in the Source Guide. If you've been magnetic for quite some time, and have a tip to share,

be sure to drop me a line through the editor, Wil Byers, and tell me about it. I'll see you next month on the Scale Scene. 

Scale Scene Sources

Magnetic Jigs & Information
Airfield Models
by Paul K. Johnson
Website: airfieldmodels.com

Free plan download for jigs & Aeronca 7AC Champ Kit by Acme Aircraft
TFC Aeroplanes
9461 Deschutes Rd Ste 10
Palo Cedro, CA 96073
(530) 547-1703
Website: Fly2build.com



▲ The Aeronca Champ has a door on the right side of the cabin, and mine is shown hung and hinged with micro dollhouse hinges.



▲ Latch magnets can be used to keep things from sliding on the worktop. Here they are placed at each corner of the Micro-Mark table saw to secure it in place.