MEDIOCRE FRED

A COMPETITION ROCKET GLIDER

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The exceptional Kevin Wickart holds the Mediocre Fred.
Photo by Chris Taylor

Deep Background

During NARAM 42 I was indulging in the time-honored NAR ritual known as Building Everything At The Last Damn Minute, and found myself in a bind regarding the D Rocket Glide Duration event. I had no slide-wing models built; I had no kit to build; I had no time to engineer something else. My only recourse was to develop something simple.

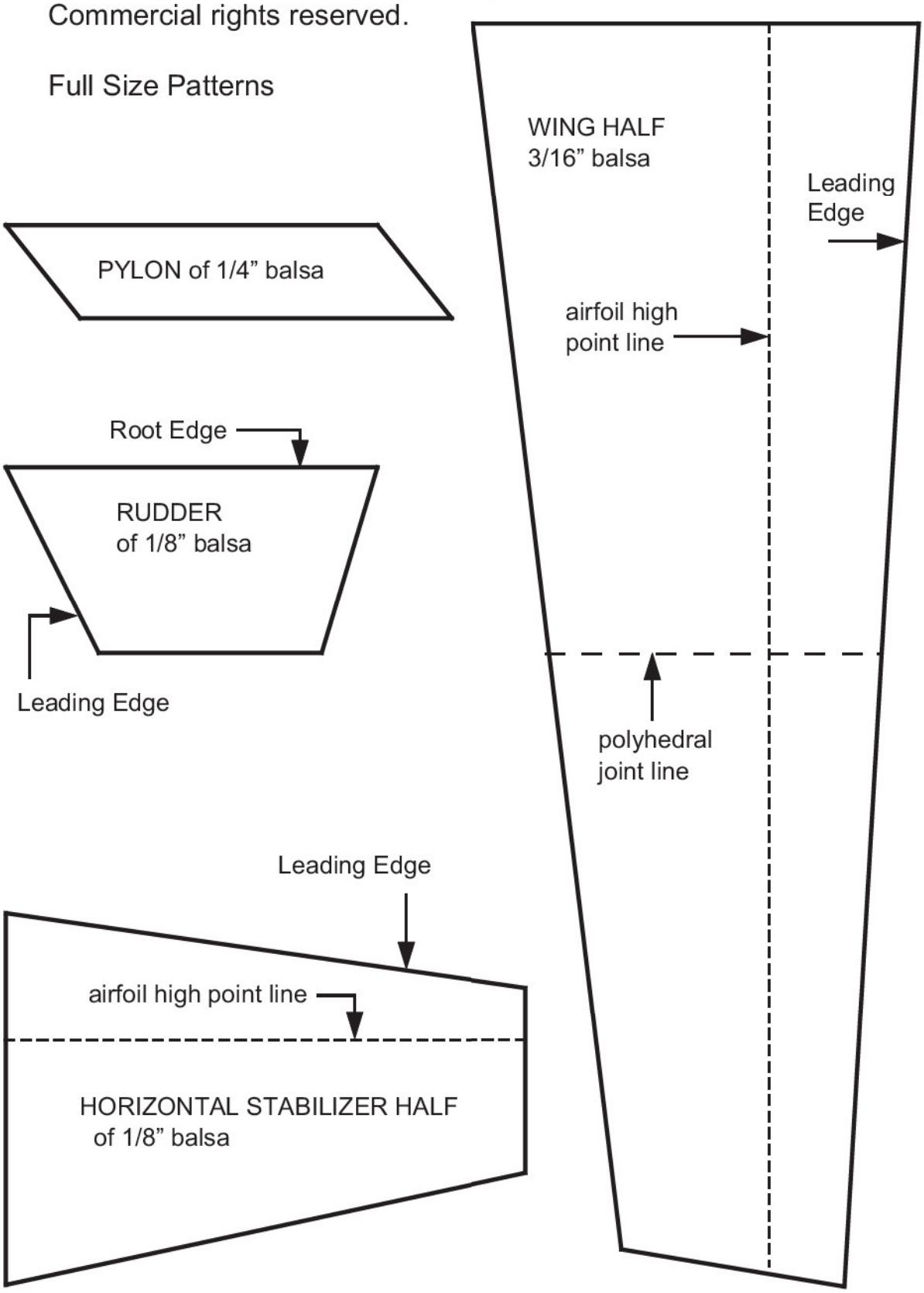
As a starting point I chose the old Juliee-Bird VI glider, found in the *MIT Competition Plans* book (available from NARTS). It was a static (i.e., no moving parts) design that relied on the loss of propellant to shift the model's CG to proper glide position. It looked very straightforward and quick to build, which was just what I was looking for. I traded the elliptical wing/stab planform for trapezoidal, and scaled the dimensions up for D-motor power.

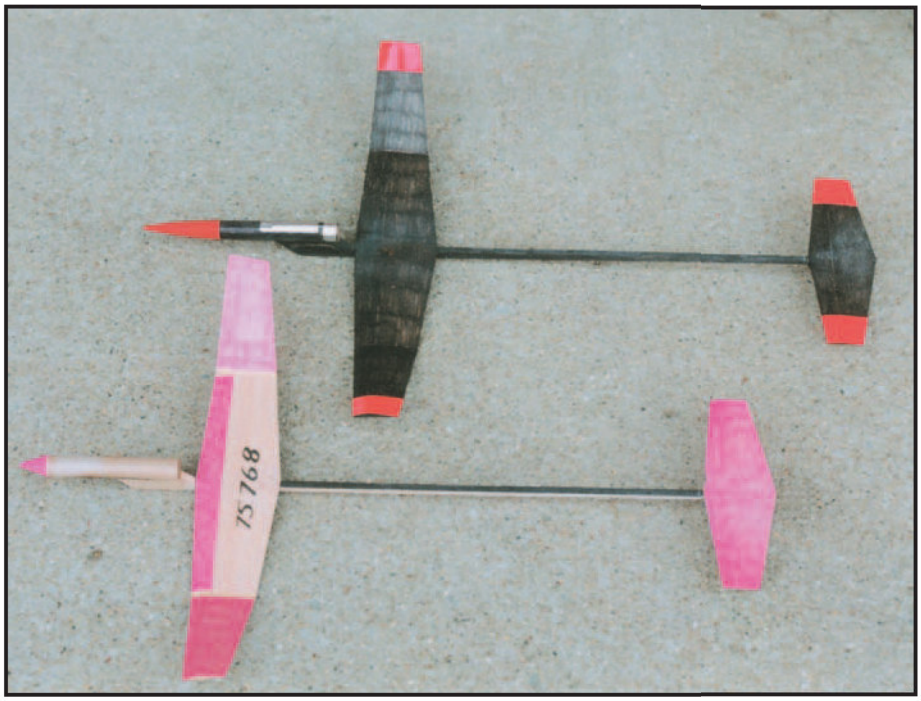
The resulting model was big, sturdy, and had an unsettling tendency to glide upside-down when I tried to trim it. Many helpful veteran competitors pointed out that the reason nobody was flying Juliee-Birds any more was because they were squirrelly in the air. My confidence was not improving. I inadvertently solved the inverted flight problem when I chose to add decalage to the stabilizer in an attempt to counter its prominent nose-down glide, killing (if you will forgive me) two Juliee-Birds with one stone.

Mediocre Fred

D-Class Rocket Glider, designed by Kevin Wickart NAR 33110

Full Size Patterns





But the proof of any design is in the flying, and there was much skepticism on the field as I prepared to launch the Mediocre Fred on a D3-3 motor. The boost was straight and so high that the model was all but out of sight. The timers were able to see it for over three and a half minutes, but it was in the air for at least five—and two miles downrange. That single flight earned a fourth-place trophy.

Since then I've determined that the Mediocre Fred can be flown, unmodified, on Estes C6 motors. My fear that the design was very touchy was banished when my wife Rachel built her own MedFred—with smaller wings—and flew it to the C Division first place in C Rocket Glide at NARAM 44. I flew my own MedFred to another fourth-place finish, this time as part of the CHEDAR_1++ team.

So...What's with the name? When Rachel began her competitive career at NARAM 41, she named her B Rocket Glider "Fred." Her own static RG for NARAM 42 was named "Fred Jr." In keeping with the family tradition, I named mine "Mediocre Fred" after a song written by comedian Pat Paulsen and recorded by the Smothers Brothers.

Parts

Boom: 1/4" balsa; 22 1/2" long; 1/2" high, tapered to 3/16" at the tail. The flat, untapered edge of the boom is the top; the wing and stab will be glued on this side. Make sure the boom is absolutely straight and unwarped.

Pod: 4 1/2" length of 18mm body tube; balsa nose of your choice, but do not glue it in until the glider is balanced; 1/4" by 1" exhaust port cut in the bottom of the pod, just behind the nose shoulder. Coat the entire interior of the pod—forward of the motor—with epoxy, or glue in a section of 18mm tube coupler before cutting the exhaust port, to protect the pod tube from ejection charge burn damage. I also add a motor hook to prevent motor ejection, but you can leave it off if you like to friction fit your motors.

Pylon: 1/4" balsa.
See plan page for pattern.

Wing: 3/16" hard balsa.
See plan page for pattern.

Stab and Rudder: 1/8" balsa.
See plan page for patterns.

Assembly

Glue the pylon to the top of the boom flush with the front edge, *making sure it is perpendicular to the horizontal stabilizer!* Cut two rectangular 3/4" by 1 1/4" plates from 1/64" plywood and glue one to each side of the pylon/boom joint to reinforce it (just in case).

Construction of the wing and stab are the same: draw the pattern onto the balsa, flip the pattern over on the centerline, and draw the other half. Cut the piece out as a single unit, draw the centerline (and polyhedral cut lines), flip the piece over and draw the airfoil high point line. Airfoil the wing as a single unit before cutting the polyhedral joints.

Once the wing is airfoiled, flip it over and carefully cut apart at the polyhedral lines. Bevel the joints and re-glue the wingtip panels with 2" dihedral under each wingtip.

Glue the horizontal stab flush with the rear of the boom, *with the flat side down!* This glider uses a lifting airfoil on the stab. When gluing it, do not glue the last inch of the stab down. When the glue is dry, slip a 1/4" wide by 3/32" high wedge of balsa between the rear of the stab and the boom to give it some decalage, and glue the wedge in place. Yes, I know it seems dumb to put decalage into a lifting airfoil, but for some reason it works!

Glue the rudder to the bottom of the boom, flush with the rear. *Make sure the horizontal stab and rudder are exactly perpendicular while they dry.* Fillet all joints.

Mediocre Fred boosts off a rod for its winning flight at NARAM 44.
Photo by Chris Taylor

Glue the wing to the boom with the leading edge butted right up to the pylon. *Make certain the wing is level with the stab and straight on its centerline on the boom.* When dry, fillet all joints (including the polyhedral joints).

Glue the pod tube to the pylon with its rear flush with the rear of the pylon root (in other words, the tube should not hang out over the angled rear of the pylon. If you do this before gluing the nose in, you can sight down the inside of the tube to assure perfect pod/boom alignment. *This alignment is of supreme*

importance! If you're going to screw up a step, don't make it this one!

Glue the pod nose on, glue a launch lug to one side of the pod/pylon joint, and fillet all joints that haven't already been filleted.

Note: The Mediocre Fred design is pretty beefy, so you shouldn't need to tissue the wing. If you are planning on using a higher-thrust motor than a C6, or if you are uncertain of the hardness of the balsa, I'd suggest tissuing the wing. There are a number of ways to reduce drag and/or mass on this model: rounding the front of the pylon/body pieces, hollowing the nose, using tissued light balsa for the wing, etc. I've not tried most of them and so can't say if they would compromise the structural integrity of the glider.

Put some color on this glider! Make the lower surfaces black and the upper surfaces a nice bright color that you won't find on the flying field. Put a band of the opposing color on each surface (i.e. a black band on the upper surface of the wing and a bright band on the underside of the wing). If you're flying competition, don't forget your NAR number.

Trimming and Flying

To trim the glider, friction fit a spent motor casing in the pod, exactly as you would when prepping it for flight. Add clay to the tail (in the stab/rudder joint) of the glider until it the CG is roughly 1/2" forward of the wing trailing edge. Take the model outside to a nice, soft landing field to glide test it. *Until you are familiar with the flight profile I suggest trimming it to a slight stall.*

Prepping the model for flight is easy! Friction fit a motor (unless you're using a motor hook), pop in an igniter, and launch. Make sure, of course, that your launch rig has a way of keeping the clips from grabbing the tail.

What to expect: I wish I'd gotten an altitude track on this thing at NARAM 42, because it gets waaaay the heck up there! On its maiden flight the prototype Mediocre Fred boosted very straight, making a few vertical barrel rolls during ascent (probably due to a slight rudder or wing misalignment). Since the model transitions from boost to glide during motor burn there will be virtually nothing to signal motor ejection. You really have to have good eyes to follow this thing. A properly trimmed MedFred will turn in an impressive duration and loves thermals, so take that into account regarding how far downwind it will drift. It won't weathercock at all during boost.

Why does this design work? I have no idea. Call it magic.

The competitive advantages of a no-moving-parts Rocket Glider are pretty clear: it's easier to build, easier to trim, and a *lot* easier to prep. It's also significantly more reliable, since the only failure modes are motor ejection (and a motor hook can eliminate this) and the motor shutting down in mid-burn. With no extraneous hooks, hinges, elastics, or strings, it's a much cleaner aerodynamic design. Drag is minimized, translating into higher altitude and longer glide duration. And—here's the best part—if you're flying in relatively troublesome breezes, you can angle the launcher upwind so Mediocre Fred drifts back over the field. Try that with a slide-, flop-, or swing-wing glider and you'll have a transition failure due to high airspeed.