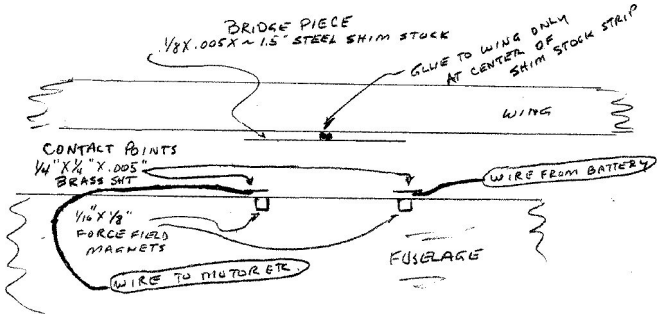
Preventing Stalled Motors in Electric Free Flight

by George White

I spent many weeks engineering my 20" Waterman Aerobile to fly on a couple of 145 Lipoly batteries and an N20 motor and a cut down 4.5" prop. Being — as my friends would say — "queer" for the use of magnets, I used 5 pairs of 1/16"X1/8" Forcefield magnets to hold the wing on, reasoning that such an arrangement would prevent the sort of wing breakage I've seen so often with scale models.

After working on the model for months, I waited more months to get the nerve to fly it. Having no tall grass available, I timidly glided it once at a Louisiana meet into a spot of high grass. With the elevons up about 30º, it seemed to glide OK. I took it to the 2004 FAC Nats, and decide it would be now or never. Much to my surprise (amazement would be more accurate), it flew quite nicely on a 50-second motor run. Having seen that it would fly, I set the timer for a 2-minute flight. I launched it, but failed to note that the elevons were not equally set at 30º, so it immediately spun in, knocking the wing aft and into a still-powered and spinning (pusher) prop. Before stalling the motor, the prop did a thorough job of chewing up the trailing edge. I became downright "cross" as my English friends would say, and vowed not to let that happen again.

The following schematic shows the basics of what I came up with.



On the Aerobile, as may be seen in Photo #1, I cut the positive wire lead from the battery and soldered it to a 1/4" square piece of brass sheet, and soldered the wire to the motor to another piece of the same size to form contact points. I then embedded 1/16"X1/8" Forcefield magnets into the wing support piece at the top of the fuselage, about an inch apart, and glued the brass sheet contact pieces on top of them. In Photo #1, the contact piece and wire to the motor is already glued over the magnet. The wire from the battery is seen ready to glue, with the magnet still showing. The other three magnets seen in a row are the wing front hold-down magnets and have nothing to do with the power cut-off scheme.

Photo #2 shows the complete installation —with the wing laying on the table in front of the fuselage. (The wing painting repair has not been completed.) The steel shim bridge piece is attached to the wing just ahead of the three wing-hold magnets.

Here are the key elements in making this scheme work:

1. If your wings are held on with magnets, the shim stock and brass contact points must not prevent complete contact between the wing hold-down magnets mounted in the wing and the fuselage. You must embed the magnets in the fuselage and carve out enough area under the brass contact pieces and their attached wires to keep them slightly below the level of the wing hold-down magnets.

2. The purpose of adding a magnet under each brass contact plate is to hold the ends of the steel bridge piece firmly against the brass. The magnet under the brass is sufficiently strong to act on the steel bridge piece through the brass.

3. To give the maximum flexibility to the steel bridge piece, adhere it only at its center, allowing the ends to flex under influence of the magnets under the brass contact pieces.

4. When the wing/fuselage hits the ground and becomes even slightly dislodged, the current to the motor is shut down immediately.

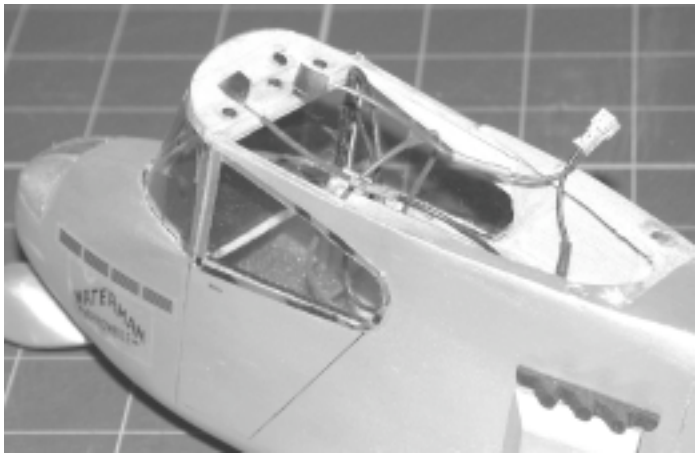


Photo #1

Photo #2

While this idea was installed on a very complex high wing pusher model, there is no reason it would not work equally well on either a low wing or high wing tractor model or even one with a wing held on with rubber bands. In the later case considerable care will have to be taken to maintain accurate alignment..