

# Micro Scale Fokker D-VII

Ever since getting into micro RC I have wanted to do a WWI scale biplane. Inspired by Dave Robelen's Pixel (RC Microflight April 2002), and some correspondence and advice from Dave, I decided to give it a go. My choice of plane was an easy one. When I was five the first model plane I ever built was a Guillows rubber power Fokker D-VII I built with my dad. Well, let's just say he did most of the building. Since then it has remained one of my favorite planes.

I was looking for some way to make it look as scale as possible and keep the weight down. Then I remembered the fiddlersgreen.net web site with graphics files for printing out and making static display planes from card stock. This site is a treasure trove of downloadable planes. For \$2.95 I downloaded a file for the Fokker D-VII, complete with a set of three-views and the graphic shown below. I enlarged the three-views and graphics up to a 13-inch span plane using the standard paint program that comes with Microsoft Windows.

Taking some tips from articles I had read, I printed the graphics on tissue paper that I ran through my inkjet printer. This involved temporarily adhering the tissue to a sheet of printer paper with photo mount spray. I cut out and built a balsa wing. Then I dusted it lightly with 3M photo mount spray, lay the cut out printed tissue on it, and smoothed it out with my fingers. It worked well and looked great so I knew this would work and continued on to the other wing and the fuselage — covering them the same way.

My original plan was to use the RFFS-100 with actuators mounted in the rudder and elevator control surfaces. Propulsion was to be from a geared M20-LV motor and three-cell 120mAh NiMH battery pack. But, as I progressed it became apparent that the wing loading would be on the high side. So, the plane with its tissue covering sat on a shelf in my workshop awaiting lighter equipment.

First word started to circulate about small and powerful motors from some micro RC cars called BitChargers. I found a hobby shop in Hong Kong selling these motors separately and got a few for



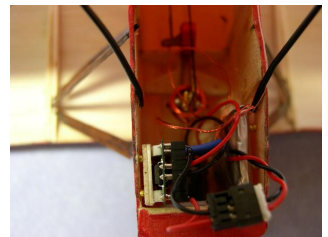
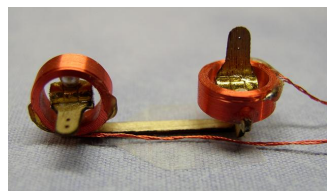
experimentation. Then, Lithium-polymer cells became available which weighed 1/3 the weight of the originally intended three-cell NiMH pack. So, I started work on the plane again.

I made struts from carbon fiber rod with paper colored with a brown marker glued to each side. I made the landing gear from piano wire with wire insulation pushed on over it to give it a more scale look. Finally I had the wings in place, landing gear on, and discovered that even with lighter the lithium-polymer battery and the RFFS-100 receiver mounted right behind the nose there was no way the plane would balance.

I calculated what would happen if I removed the actuators from the tail surfaces and moved them to the CG. It looked like that would solve the problem, so I removed them (the holes where they were are still in the rudder and elevator, waiting to be filled in). The next problem was coming up with actuators with control arms to work with push rods for remote actuators. My friend Carl Martin came to the plane's rescue and retrofitted two of my Dynamics Unlimited actuator coils to be remote actuators. I made a pair of CF push rods with very thin brass wire z-bends glued on the actuator ends so as to not

<b>SPECIFICATIONS</b>	<b>MODEL:</b> Fokker D-VII
	<b>DESIGNER:</b> Gordon Johnson
	<b>WINGSPAN:</b> 13.5 in.
	<b>WING AREA:</b> 46 sq. in
	<b>WEIGHT:</b> 22.4 grams
	<b>WINGLOADING:</b> 2.42 oz./sq. ft.
	<b>RADIO:</b> Dynamics Unlimited RFFS-100
	<b>POWER SYSTEM:</b> BitCharger 2.6 motor, Didel 5:1 gears, and Kokam 145mAh lithium polymer battery
<b>DURATION:</b> 10 to 12 minutes	

<b>WEIGHT BREAKDOWN</b>		Grams
	Airframe (uncovered)	8.70
	Printed tissue covering	1.34
	RFFS-100 w/magnet mounting	2.24
	Modified DU actuators & push rods	2.22
	BitCharger 2.6/gearbox/U80 Prop/Wires	2.50
	145mAh LiPoly/Wires/Plugs	4.34
	Glue/misc	1.06



interfere with the magnets. On the control surface ends I used fine steel piano wire z-bends and heat shrink to allow adjustments to be made.



Finally, I got one of my FFS-100's retrofitted with Matt Keennon's reprogrammed PIC chip. This modification (available from Dynamic Web Enterprises and from Bob Selman Enterprises) roughly doubles the output force of the actuators, which is important if control linkages are to be used. It also improves the throttle control at low throttle settings and has a safety feature to keep the motor from starting when the system is powered up.

Assembling all this inside the fuselage made me feel like a Swiss watch maker. I made a balsa sandwich in which I embedded four of the 1/32-inch diameter Forcefield neodym magnets and four corresponding magnets on the inside of the fuselage. I mounted the RFFS-100 to this piece of balsa with thin strips of 3M double-sided sticky tape. This



allowed plugging the actuator wire plugs into the RFFS-100 before inserting the RFFS-100 into the fuselage. Once the receiver was attached in the fuselage, the motor and battery wires were plugged in. This method allows the RFFS-100 to be swapped easily between models. The lithium-polymer battery was mounted on the other side of the fuselage right behind the nose with the same size magnets (see October 2002 RC Microflight). I determined the position near the CG for the pair of reworked actuators, with the push rods attached, that would allow the plane to balance, and glued them in place. Finally, I hooked up the tail surfaces to the control rods, adjusted them and the plane was done.

Amazingly, all the work paid off. On its first flight, it took off from the gym floor in a wide circle and gained a few inches of altitude. It was stable, so I gave it some more power and up elevator and it climbed smoothly. As I got more comfortable I did right and left hand circles and finally figure eights. All in all, it is a very smooth and predictable



flier and looks very good in the air. It flies very well in a single basketball court gym. There is nothing quite like seeing a very scale plane this small flying inside. I'll probably experiment with different motors, gearing, and props. But, whatever refinements I make, I finally realized my dream of flying a tiny scale Fokker D-VII indoors. Now, if my friends will build a couple of SE5a, Sopwith, or Nieuport planes I could realize my other dream — micro indoor dogfights!