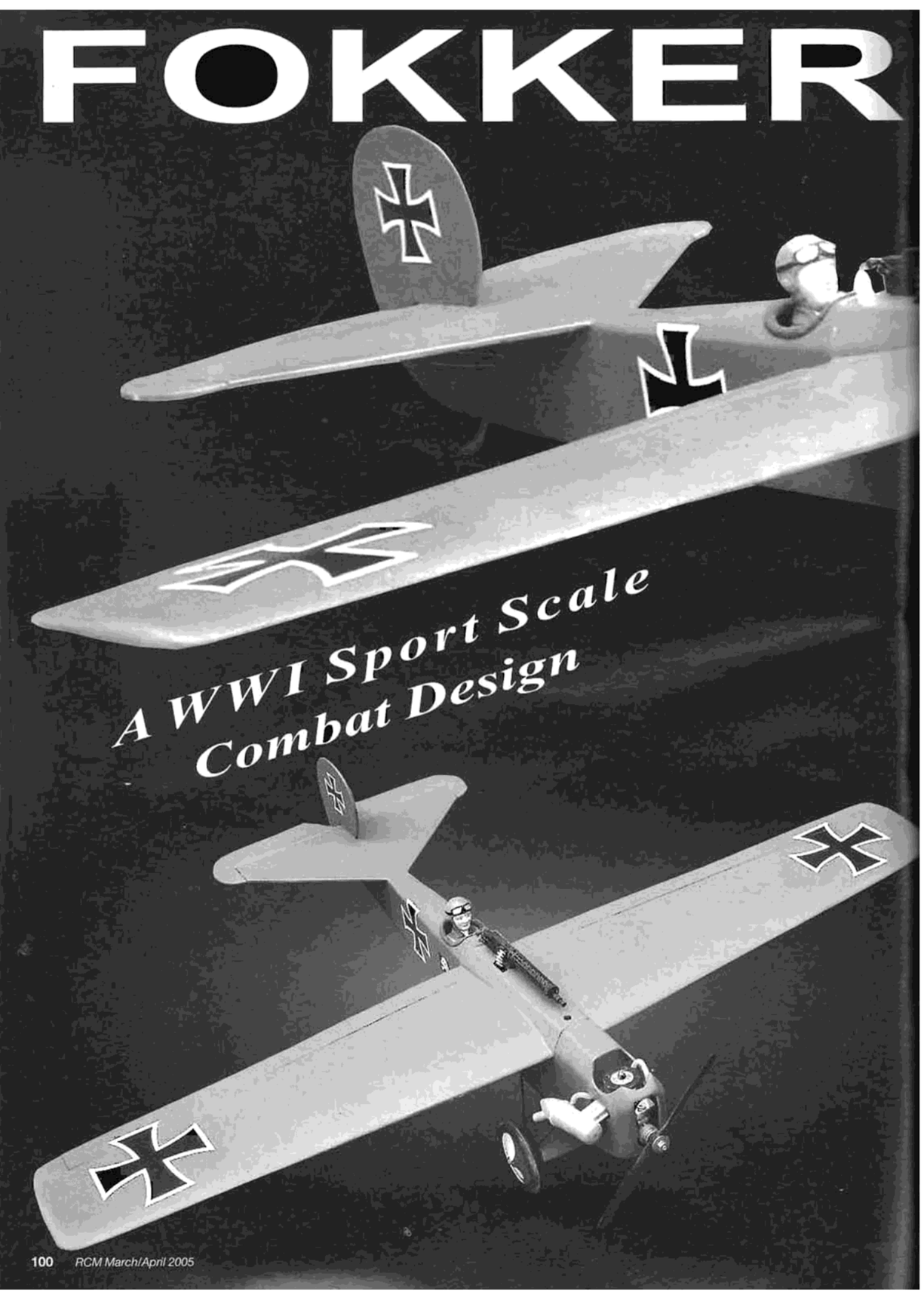
FOKKER V.23

A WWI Sport Scale Combat Design



By Bob Wallace

The author with his new WWI Combat model, ready for action!

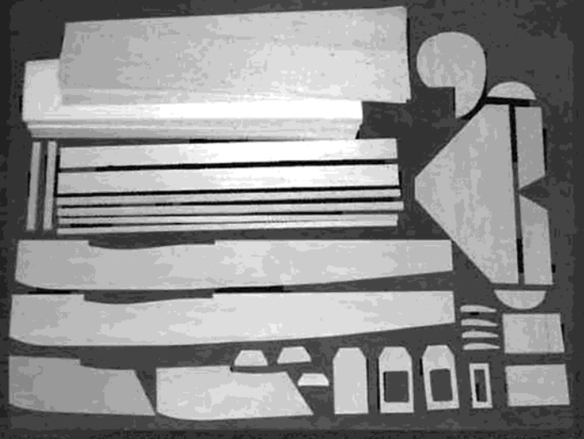
WWI R/C scale combat has become quite popular, and one of the strongest areas of interest is in New England. This event was originally conceived by noted WWI scale builder, Dave Johnson, who drafted a simple set of basic rules for this event that work very well; especially for club, local, and regional type competitions.

Dave, who is nationally known and respected for his finely crafted giant scale WWI designs, would on occasion engage in simulated air combat battles with other giant scale WWI enthusiasts.

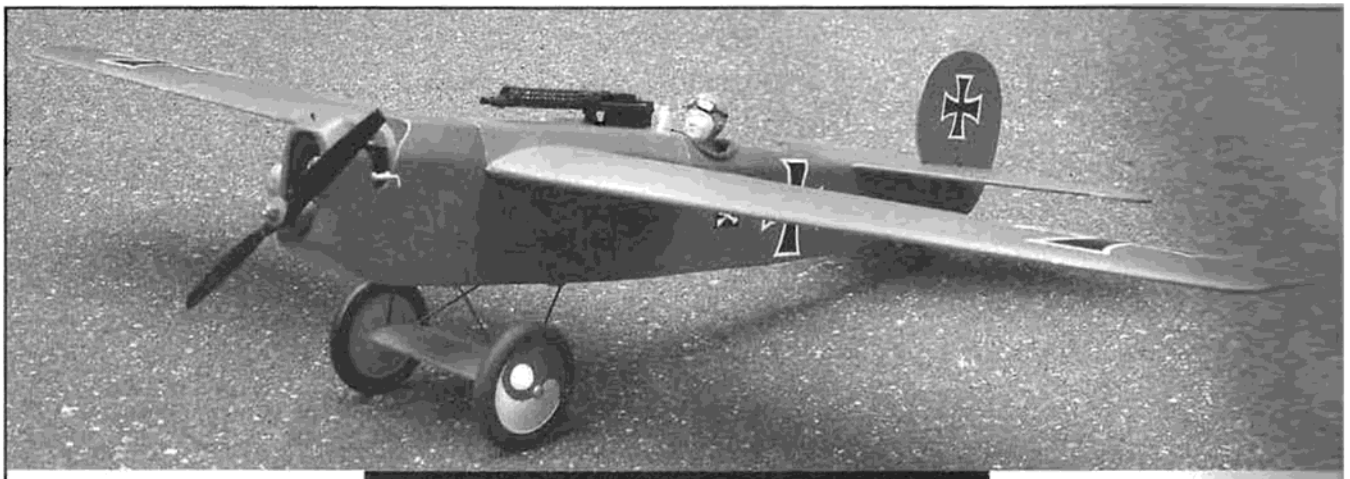
However, the time and expense involved in creating these beautifully crafted and detailed models, mandated that such activities be conducted in a rather mild, non- aggressive manner.

With 1/12 scale WWII R/C combat already a very popular event on a national level, Dave's idea was to draft a simple set of rules for use with WWI type aircraft of a similar size, that would be inexpensive, and easy to build and fly.

There is no fixed or specified aircraft scale reduction for this event. However, all aircraft must be easily recognizable replicas of the full scale original. Obviously, these rules are intended for use on a local



A basic parts "kit" is prepared prior to starting assembly. Note that foam wing cores are available from the author if you don't cut your own (address in article).



1/12 SCALE WWI R/C COMBAT RULES

AIRCRAFT SPECIFICATIONS

Minimum size wingspan

Monoplanes – 48 inches

Biplanes – 42 inches

Triplanes – 36 inches

Minimum Airfoil thickness

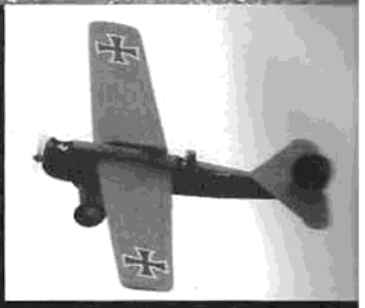
9/16 inches

Maximum weight (ready to fly, less fuel)

4 pounds

Allowable engines

Any (stock) plain bearing (2 stroke) .25 engine



RULES OF ENGAGEMENT

Scale 3 views to be provided to CD, if requested, for scale fidelity verification.

Aircraft must be able to rise off ground (ROG)

No profile models allowed.

String leader on streamer shall extend 10 feet behind aircraft.

Streamer shall be 25 feet long.

SCORING

ON TIME TAKEOFF – 10 Points (2 minute starting time)

FLYING FULL HEAT – 10 Points

(heat time is 5 minutes)

STREAMER CUT – 25 Points (each cut)

RETAINED STREAMER – 1 Point (per foot)

MIDAIR COLLISION – deduct 50 Points from each participant

or club level. Should this event grow in popularity, so that participation is on a national basis, a more definitive set of rules would have to be drafted. However, for club, local, or even regional use, Dave's set of rules work fine.

Those rules are as shown in the chart on page 102.

With such a wide variety of well known WWI fighter type aircraft to select from for use in this event, you might be wondering why my choice was the Fokker V.23.

It's an obscure design, of which only one prototype was ever built, and an aircraft that only serious or dedicated WWI aviation buffs would be aware of.

While I did, in fact, first consider the more famous WWI fighter types, I rapidly narrowed my aircraft type search to those aircraft that I thought would produce the best in flight performance for use in R/C combat.

Past experience in competitive WWII scale R/C combat had clearly shown that the type of full scale aircraft selected to be modeled was a very important consideration if one hoped to do well in that event. Most often, the use of one of the more popular or well-known WWII aircraft types, was not the best choice if maximum in-flight performance was the goal.

Why wouldn't the same hold true for WWI aircraft types? Any full scale fighter type, that permits the scaled down model to be constructed so that it maintains proportional scale fidelity, along with low wing loading and clean aerodynamics, will always offer a distinct in-flight performance advantage in competitive R/C combat activities!

With that thought in mind, my aircraft type search quickly focused on monoplanes, preferably those equipped with an inline engine, possessing clean aerodynamics, and with generous amounts of wing area.

Using that criteria, the Fokker V.23 appeared to have all of those qualities.

Another consideration that made the Fokker V.23 even more appealing for use in R/C combat, was the fact that being a monoplane, it would be simpler and quicker to build than any of the multi wing types.

Its fully sheeted cantilever wing was ideally suited to be modeled as a balsa sheeted foam core type wing rather than as a more labor intensive, rib and spar type. Another plus would be that the sheeted foam core type wing would be more rugged, and thereby better suited to withstand the rigors of R/C combat than a built-up type wing.

The Fokker V.23 was, in fact, not even a Fokker design! It was designed and built entirely by Pfalz, a more obscure producer of German fighter aircraft during WWI, who produced many aircraft under license, in addition to their own designs.

The Fokker designation, rather than Pfalz, was most likely due to the aircraft being designed and built as a part of the on-going effort to improve upon the famous Fokker D-VIII "Flying Razor" design.

Pfalz was a strong proponent of cantilever wing monoplane designs, that were unencumbered with struts or guy wires, and the V.23 reflected this advanced design concept.

While I did, in fact, first consider the more famous WWI fighter types, I rapidly narrowed my aircraft type search to those aircraft that I thought would produce the best in flight performance for use in R/C combat.

The V.23 was a mid-wing monoplane, that was powered with a 160 hp. Mercedes D.IIIa inline engine.

Its fuselage and tail surfaces were almost identical to those of the Fokker D-VIII, except that the fuselage nose mount was extended to accommodate the larger liquid cooled, six cylinder inline Mercedes engine.

The V.23 was entered into fighter trials at Adlershof, but was rejected, with the main criticism expressed, being that the pilot's downward vision was severely limited by the expanse of the wings.

The V.23 was, however, preserved by Fokker, and taken to Amsterdam.

It was eventually donated to the German Air Museum in Berlin, and was apparently destroyed during WWII allied bombing raids.

As might be expected, with the Fokker V.23 being an almost unknown prototype design, scale documentation is limited. Small three views and some photographs do exist in a few books pertaining to WWI aviation. The best Fokker V.23 line drawings that I was able to find are those available from: Martin Photos c/o M.P. Wilkinson, 10 Carlisle Close, Whitefield, Manchester, England, M45 6TH.

www.ivyandmartin.demon.co.uk/martinphotos/fok_v23_dwg.htm

CONSTRUCTION

As the Fokker V.23 is a fairly simple model to fabricate and assemble, these instructions will be basic, and not follow a regimented "tab A into slot B on part C" format.

All materials and hardware necessary to produce the Fokker V.23 are commonly available items that can be found at any well-supplied hobby shop.

As with any scratch-building project, I find it best to cut out all of the basic parts prior to starting the assembly process. These parts include the fuselage sides and doublers, bulkheads, and formers, sheet tail surfaces, wing leading edges and sub trailing edges, ailerons, and wingtip pieces.

While fabricating all of the shaped parts first may not actually speed the assembly process, it does create a "kit" effect whereby the construction phases progress in a less interrupted fashion.

Selecting your balsa wood stock carefully, and using only the medium/soft grades (4 to 6 lb. cu/ft. density), can save several ounces of unnecessary aircraft weight. The only exception being the wing leading edge pieces, where fairly hard balsa stock should be used for durability.

Wing:

Start by first cutting out the necessary foam cutting templates. These templates can be made from 3/32" plastic laminate such as scrap Formica type countertop material, plywood, or aluminum.

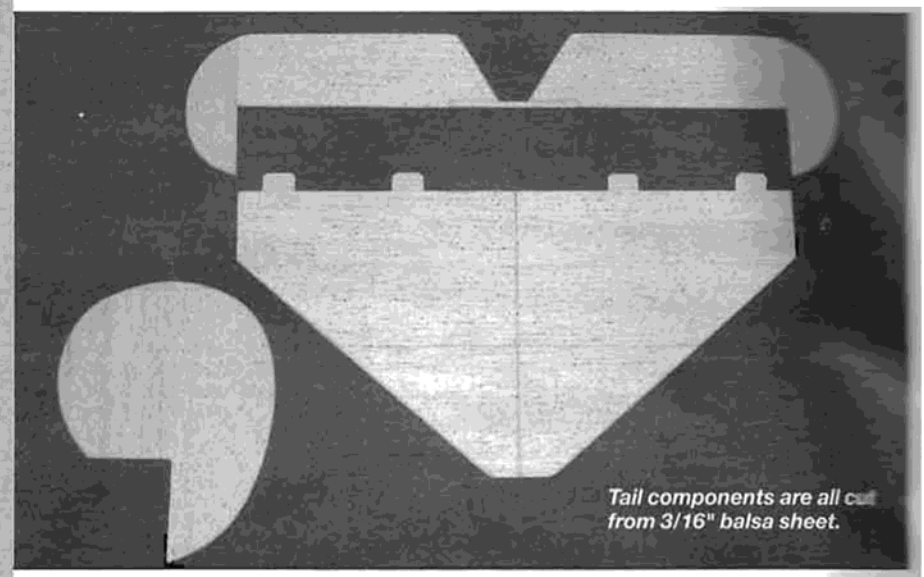
My templates were made from plastic laminate. Cut the foam core blanks out of 1 lb. density expanded polystyrene (EPS) foamboard, that is readily available at most building and roofing supply outlets. If you do not have a foam cutter or an aeromodeling friend who does, a set of Fokker V.23 wing foam cores are available from:

Wallace RC, 91 Sylvan Street, Avon, CT 06001.

The cost is $22, including shipping, within the U.S. and Canada.

After the wing cores have been cut, carefully block sand and vacuum them clean and set them aside. Prepare the 1/16" balsa sheet wing skins and also block sand and vacuum them. When

FOKKER V.23
Designed by:
Bob Wallace
TYPE AIRCRAFT
WWI Combat/Sport Scale
WINGSPAN
48 Inches
WING CHORD
7-1/2 Inches (Avg.)
TOTAL WING AREA
360 Sq. In.
WING LOCATION
Upper Fuselage (Shoulder Wing)
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
33-3/16 Inches
RADIO COMPARTMENT SIZE
6-5/8" (L) x 2-1/8" (W) x 2-3/4" min. (H)
STABILIZER SPAN
16 Inches
STABILIZER CHORD (inc. elev.)
5-13/16 Inches (Avg.)
STABILIZER AREA
90 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
4-1/4 Inches
VERTICAL FIN WIDTH (inc. rud.)
5-1/8 Inches (Max.)
REC. ENGINE SIZE
.20-.25 2-Stroke
FUEL TANK SIZE
4-6 Oz.
LANDING GEAR
Conventional Taildragger (Fixed)
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
C.G. (from L.E.)
3 Inches
ELEVATOR TRAVEL
5/16" Up — 5/16" Down
AILERON TRAVEL
3/16" Up — 3/16" Down
RUDDER TRAVEL
7/8" Left — 7/8" Right
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply, Lite Ply, Hardwood
Wing ..... Foam, Balsa, Hardwood
Empennage ..... Balsa, Hardwood
Wt. Ready To Fly ..... 46.6 Oz. (2 Lbs. 14.6 Oz.)
Wing Loading ..... 18.7 Oz./Sq. Ft.



Tail components are all cut from 3/16" balsa sheet.

preparing the wing skins, make sure that they are slightly oversize to allow for the airfoil curvature and trimming.

Applying the wing skins to the foam cores can be accomplished via several methods. Epoxy, contact adhesive, and aliphatic resin type glue, all produce good results.

Most modelers seem to have their own preferred method of sheeting foam wing panels and my preference is to use slow cure epoxy, thinned with isopropyl alcohol. I believe that this method produces the strongest, stiffest wing with minimal weight gain if done properly. I will outline the necessary steps for this process, using the simple "weighting of the sheeted cores" method while the epoxy cures. Experienced modelers may prefer to use a press or vacuum bagging for this phase of construction.

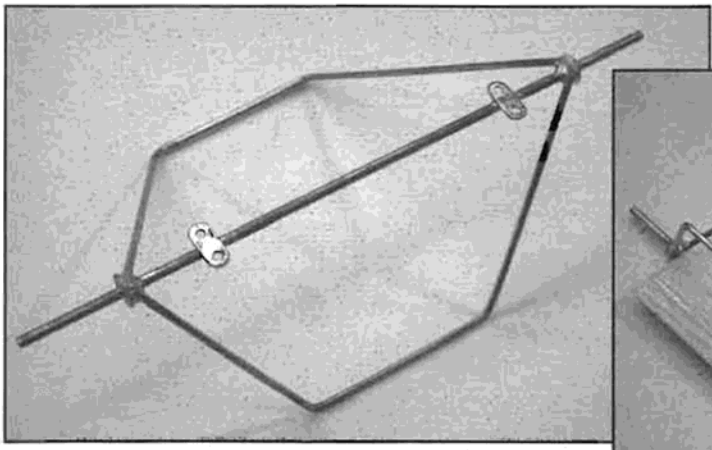
Mix about 1-1/4 oz. of slow cure epoxy such as Hobby Poxy's Formula 2 or Great Planes 45-minute cure epoxy and thin it slightly with 90% isopropyl alcohol to permit easier spreading. Apply the thinned epoxy to the balsa wing skins and squeegee off all of the excess epoxy. If you don't have a plastic squeegee, an old plastic playing or credit card works equally well for this step of construction.

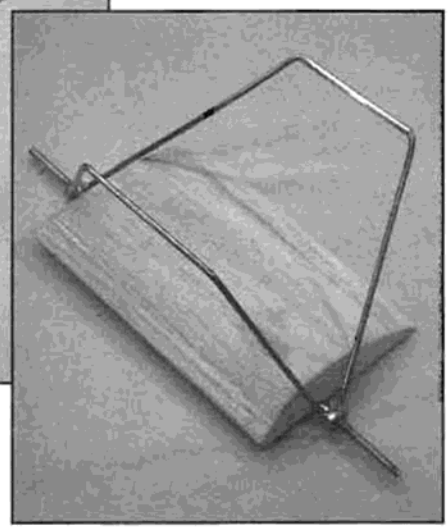
The epoxy coated wing skins should appear to be dull and not have a "wet" glossy appearance as this indicates that too much epoxy has been applied. Squeegee, or brush, a small amount of epoxy along the leading and trailing edges of the foam cores. Apply the epoxy-coated wing skins to the foam cores and place them back into the excess foam cradle scrap pieces. Carefully align both sheeted wing cores and the foam cradle pieces on a flat building surface, stacked one on top of the other, and place a flat piece of plywood, plate glass, etc., on top, and then place heavy weights on the entire stacked assembly.

Fokker V.23 Bill Of Materials

5 – 1/16" x 4" x 48" Balsa Sheet
1 – 3/8" Sq. x 48" Balsa
1 — 1/4" Sq. x 48" Balsa
1 – 3/16" x 4" x 48" Balsa Sheet
2 – 1/8" x 4" x 36" Balsa Sheet
2 – 5/16" x 1-1/4" x 36" Balsa Trailing Edge Stock
1 – 1/4" Δ Stock x 36" Balsa
1 – 3/32" x 3" x 36" Balsa Sheet
1 – 1/32" Plywood (8" x 12")
1 – 2" thick (16" x 24") EPS Foamboard (2 lb./cu.ft. density)
*1 – 1/2" Sq. x 12" Balsa
*1 – 3/16" Plywood (3" x 4-1/2")
*1 – 1/8" Plywood (4" x 8")
*1 – 1/8" Lite Ply (3" x 6")
*1 – 3/8" Balsa Sheet (4" x 6")
*1 – 3/4" Sq. x 2-1/2" Balsa Block
*1 – 1/4" x 3/8" x 6" Balsa
*1 – 1/4" x 1/2" x 6" Balsa
*1 – 1/4" Plywood (12" x 6")
*1 – 1/4" x 3/4" x 8" Hardwood
*1 – 1/4" Sq. x 10" Hardwood
*1 – 3/16" Sq. x 2" Hardwood
*1 – 3/32" O.D. x 4" Aluminum Tubing
*1 – 3/32" I.D. x 2" Brass Tubing
*1 – 3/32" x 20" Music Wire
*1 – 1/8" x 8" Music Wire
*1 - .040 Clear Butyrate Plastic Sheet (2" x 1")
*1 – 3/32" Plastic Laminate Board (8" x 10") (for foam wing core cutting templates)
1 - 3-3/4" Williams Brothers (#13100) Vintage Wheels
2 – Du-Bro (#158) Steel Retainer Straps Sets w/Screws
1 – Goldberg (#402) Strip Aileron Horn Set
1 – Goldberg (#441) Nylon Control Horns
2 – 10-24 Nylon Socket Head Cap Screws
13 – CA type Hinges
1 – Engine Mount
1 – 4 to 6 oz. Fuel Tank
1 – Williams Brothers (#16200) Spandau Machine Gun kit (optional)
1 – 1/12 scale Pilot Bust (optional)

** Denotes small amount materials; many modelers may already have in their "scrap boxes.*





ABOVE: The landing gear is made from 3/32" music wire and silver soldered together. See plans for details.

RIGHT: Landing gear assembly complete with the sub-wing mounted in place.

Allow the epoxied wing panels to fully cure overnight.

Remove the sheeted wing cores from the cradle pieces and trim and block sand off the excess balsa sheeting, flush with the foam core edges. Glue the balsa leading and sub trailing edge pieces in place.

(While not structurally necessary, a strip of carbon fiber laminate or rod may be glued in place between the leading edge and the sheeted wing, as an additional impact strengthening measure.)

Block sand these edges flush with the wing sheeting and trim the ends; glue the balsa wingtips in place. Mark and trial-fit the aileron/trailing edge pieces to indicate the portions that will be ailerons and fixed trailing edge pieces. Install the hinges into the aileron portions and channel the sub trailing edge and inner trailing edge portions to accept the aileron torque rod assemblies. Glue the trailing edge/hinged aileron strips in place, with only the fixed trailing edge portions (inner and outer) being glued. (The hinged ailerons, although still a part of the trailing edge, should be glue free so as to allow for their removal after sanding.) Block sand both wing panels, and radius the leading edge and wingtips to the indicated contour. Block sand the root ends of both wing panels to produce the proper dihedral angle, and epoxy them together, making sure that the dihedral angle is correct and that there is no built-in twist in the joined-together wing. Cut the ailerons loose from the trailing edge pieces and fine-sand the ends to fit them to their respective openings to produce a smooth, non binding operation.

Apply a 4" wide strip of 4 oz. fiberglass cloth over the wing center section joint with slow cure epoxy. Carefully blot off all excess epoxy from the glass-reinforced center section joint. When the epoxy has fully cured, lightly sand the center section glass cloth and feather-in the edges to the balsa wing skins with lightweight spackling. Cut the aileron servo well and install the hardwood servo mounting blocks, according to the servo that is to be used. Finish-sand the entire wing assembly and set it aside.

Tail Surfaces:

All of the tail surfaces are cut from 3/16" sheet balsa. The elevators are coupled with a short piece of 3/16" hardwood dowel. Radius all the perimeter edges on each surface and cut and fit the hinges. Finish sand the tail surfaces. Do not glue the hinges in place at this time, as it is easier to do this later, during the finishing process.

Fuselage:

Assuming that you have already cut out the various component pieces, the first step is to glue the 1/32" plywood doublers to the 1/8" balsa sheet fuselage sides. Be certain that you are making a "left" and "right" fuselage side!

Using the plan sheet as a guide, mark the positions of the various fuselage bulkheads and formers on each fuselage side. Note: the position of the firewall bulkhead (F1) should be determined by first mounting the engine to be used, and engine mount, to the firewall bulkhead (F1). Position the firewall bulkhead with the engine and mount attached, on one fuselage side and determine the correct spacing to allow for the proper propeller clearance (about 1/4"). Be sure to allow space for the balsa nose block. Mark both fuselage sides relative to the correct position for the firewall bulkhead (F1). Remove the engine from the engine mount and using a square, glue the firewall bulkhead (F1), and bulkheads F2 and F3 in place on one fuselage side. Glue the opposite fuselage side in place, making sure that it is also square and in alignment with the opposite fuselage side. Glue the remaining fuselage bulkheads and formers, nose block, hardwood landing gear blocks, and various reinforcement pieces of balsa triangle stock, in place.

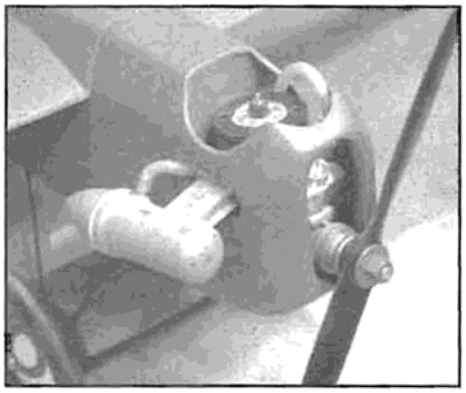
After slightly beveling the inner surface of the fuselage sides at the rear, draw them together and glue with CA adhesive.

The plans show the wing being mounted to the fuselage with two 1/4-20 nylon bolts; however, the wing can also be mounted via the rubber bands and dowels if that is your preferred method.

I prefer the wing bolt method as it results in a much neater looking finished appearance.

If wing bolts are to be used, the plywood wing bolt blocks should be glued in place at this time.

Position the wing in place, and when properly aligned, drill the wing bolt holes through the wing and mounting blocks using a No. 8 drill. Tap the holes in the plywood mounting blocks with a 1/4-20 tap and apply thin CA adhesive to the threaded holes to reinforce the threads. Run the tap through the holes once again to clean up the treads. Enlarge the holes in the wing, using a 1/4"' drill bit or rat-tail file, to accept the nylon wing bolts. Bolt the wing in place, and glue the stabilizer and vertical fin in place, after making sure they are properly aligned with the wing. The formers and fuselage



The author chose a Norvel .25 to power his model. The simple cowl allows easy access, but still hides the engine.

side pieces that blend the fuselage above the wing into the main fuselage portion should now be glued in place.

Now is also a good time to install the elevator, rudder, and throttle servos, along with their respective control rods, and the fuel tank.

Install the hardwood tailskid, along with the balsa bottom sheeting.

Glue the balsa fuselage top sheeting in place, and trim and sand the fuselage to the indicated contour.

Cut out the cockpit opening, and install whatever cockpit detailing is desired.

Cut the engine access opening, as required, to accommodate whatever engine is to be installed.

At this point the 3/32" music wire landing gear assembly should be fabricated. Bend the front and rear struts and trial-fit them in the channeled grooves in the hardwood landing gear blocks. Wrap and silver solder the wheel axle in place, after being certain that the landing gear assembly is aligned properly.

Silver solder the brackets to the axle that will hold the small airfoiled landing gear wing in place.

Assemble the landing gear wing, and cut and fit it to the finished landing gear.

The wheels used on my Fokker were Williams Brothers, Inc. (#13100) 3-3/4" Vintage type.

Engine and Fuel Tank:

Any .20-.25 2-stroke engine can be used in the Fokker V.23. I elected to use a Norvel .25 engine in my Fokker V.23, along with a 4 oz. (low pressure bladder type) fuel tank. The size of the fuel tank will be determined by the engine to be used, as some engines are "thirstier" than others. In most cases, however, a 4 oz. fuel tank should be adequate to provide the necessary flight time for a combat heat. However, there is sufficient space within the fuselage to accommodate a larger capacity fuel tank if desired.

Finishing:

While any heat shrinkable type film covering material may be used to cover the Fokker V.23, I preferred to finish mine with a painted finish. Prior to painting, each component part was closely inspected and any noticeable surface imperfections were filled with lightweight spackling compound, and fine-sanded.

After vacuuming each part that was to be painted, one thinned-out coat of ZAP epoxy finishing resin was brushed on, and when fully cured, all surfaces were again fine-sanded. A coat of lightweight automotive primer was then sprayed on. This coat of primer, most of which was sanded off, filled almost all

of the wood grain imperfections and surface flaws. Remaining indentions and surface flaws were then filled with automotive putty and, when dry, sanded smooth. A thinned-out coat of light-weight automotive primer was then lightly sprayed on, but only heavy enough to produce a uniform base coat.

The final color coat was then sprayed on using High Tech brand Perfect Paints, with the top and side surfaces finished with #CHE 39 green, and the under surfaces with #CHE 36 gray.

The German Maltese cross insignias applied were water transfer decals (sheet No. 7004) from Major Decals, who also produce these decals in pressure sensitive form, for those who prefer to use a film type covering. A very light coat of satin finish clear epoxy was then sprayed over the decals to fuelproof them.

A Williams Brothers (No. 16200) Spandau machine gun and a pilot bust were also installed.

Radio:

I used an Airtronics RD 8000 radio system in my Fokker V.23, with the airborne components consisting of #94141Z mini servos for aileron and elevator control. And #94501Z micro servos for rudder and throttle control. A #92777 FM receiver was installed, along with a Batteries USA 350 mAh NiMH battery pack.

My Fokker V.23 ready to fly, less fuel, weighed 46.6 oz. (2 lbs.-14.6 oz.), with the resultant wing loading being a modest 18.7 oz./sq.ft.

Flying:

After the usual radio range checking test, a few minutes were spent setting the Norvel engine's needle valve and achieving a good idle adjustment, and checking to be sure there was no engine vibration-induced radio interference. A Master AirScrew 9 x 4 propeller was used for these tests and was to be used for my initial test flights. Almost perfect weather conditions prevailed, with sunny skies, temperatures in the 70s, and only a slight breeze.

The flying site, which is a very large, well manicured turf farm, was in the process of being partially harvested so a portion of it was smooth compacted soil, that was moist enough so that dust wasn't a problem, and this offered the opportunity to take off and land from a surface similar to a paved runway.

After topping off the fuel tank and restarting the engine, a minute or two were spent taxiing the Fokker to assess its ground handling capabilities. In spite of being equipped with a fixed tail skid, ground handling was found to be surprisingly good. The Fokker was then headed into the gentle breeze and full throttle was gradually fed in while holding just a bit of right rudder. The take-off run was smooth, and with slight input of up elevator, the Fokker was climbing out at a nice conservative angle. After gaining a few hundred feet of altitude, all that was needed to achieve straight and level, thumbs off, flight were several clicks of up elevator and right aileron. However, a few gentle maneuvers quickly revealed that elevator control was excessive and overly responsive. Aileron control appeared to be just about right. After a few minutes of mild maneuvering and just getting a feel for how the Fokker flew, a few slow flybys were made in preparation for the maiden landing. As it turned out, the first landing, a full flare three point type, was trainer-like, in spite of the sensitive elevator control.

The elevator travel was reduced, and after refueling, a second flight was made that proved to be a good deal more to my liking.

The Fokker V.23 is capable of performing all of the basic aerobatic maneuvers, and while almost a non-factor for R/C combat models, slow flight was surprisingly good. Stalls were clean, with no tendency to fall off into a spin, although the Fokker could be made to spin or snap with deliberate control inputs. Recovery from these maneuvers was rapid and positive, simply by releasing control input.

Overall, I am delighted with the Fokker V.23's in-flight performance.

Hopefully, those interested in trying their hand at WWI R/C Combat will find the Fokker V.23 to be a unique aircraft choice.

Being a monoplane, it can be built faster than the multi wing types, and, in my opinion, it will possess superior in-flight combat performance when compared to the multi winged types.

How well it will measure up against the other WWI R/C Combat type models in competition is yet to be determined, but after watching other WWI R/C Combat type aircraft in flight, and flying the Fokker V.23, it's difficult to not begin thinking like a wolf viewing a flock of sheep!

Even those modelers, with no interest in R/C Combat, may find the Fokker V.23 to be a distinctly different, fully aerobatic, small sport scale type aircraft that is worthy of building and flying ✈