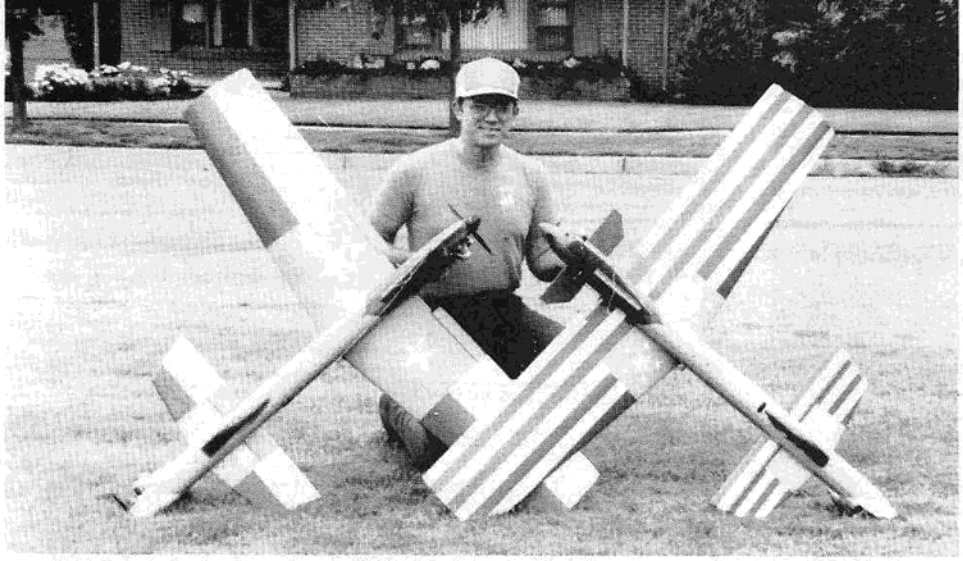
SCAT TWIN 40

If you want the awesome twin engine performance without the dead engine problems, this is the one for you!

By Steve Broome



Totally original color scheme. Whoever heard of an American and a Texas flag design on airplanes?

SCAT TWIN 40
Designed By:
Steve Broome
TYPE AIRCRAFT
Push/Pull Canard
WINGSPAN
65 Inches
WING CHORD
11 Inches (Avg.)
TOTAL WING AREA
704 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Tapered/Swept
DIHEDRAL EACH TIP
None
O.A. FUSELAGE LENGTH
50 Inches
RADIO COMPARTMENT SIZE
(L) 7⅝'' x (W) 2¾'' x (H) 2¾''
STABILIZER SPAN
24¼ Inches
STABILIZER CHORD (incl. elev.)
6¾ Inches (Avg.)
STABILIZER AREA
182 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Front/Mid Fuselage
VERTICAL FIN HEIGHT
8¼ Inches
VERTICAL FIN WIDTH (incl. rud.)
8 Inches (Avg.)
REC. ENGINE SIZE
(2) .40-.46 2-strokes
FUEL TANK SIZE
(2) 8 Oz. Flex Tanks
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam, Balsa & Ply
Empennage	Balsa & Spruce
Wt. Ready To Fly	**112 Oz. (7 Lbs.)**
Wing Loading	**16 Oz./Sq. Ft.**

ABOUT THE AUTHOR

Steve Broome is 36 years old and lives in Pampa, Texas. He is an accountant for Panhandle Industrial machine shop. He always loved airplanes but did not start flying R/C until about six years ago.

He flies .40-.60 size sport planes and participates in area fun-flys. He is also vice president of the local PROPS club in Pampa.

The Scat Twin evolved from the desire to fly twins without the bad spin tendencies when flying on one dead engine. After painstaking efforts, including a few mishaps, the Scat Twin took final form.

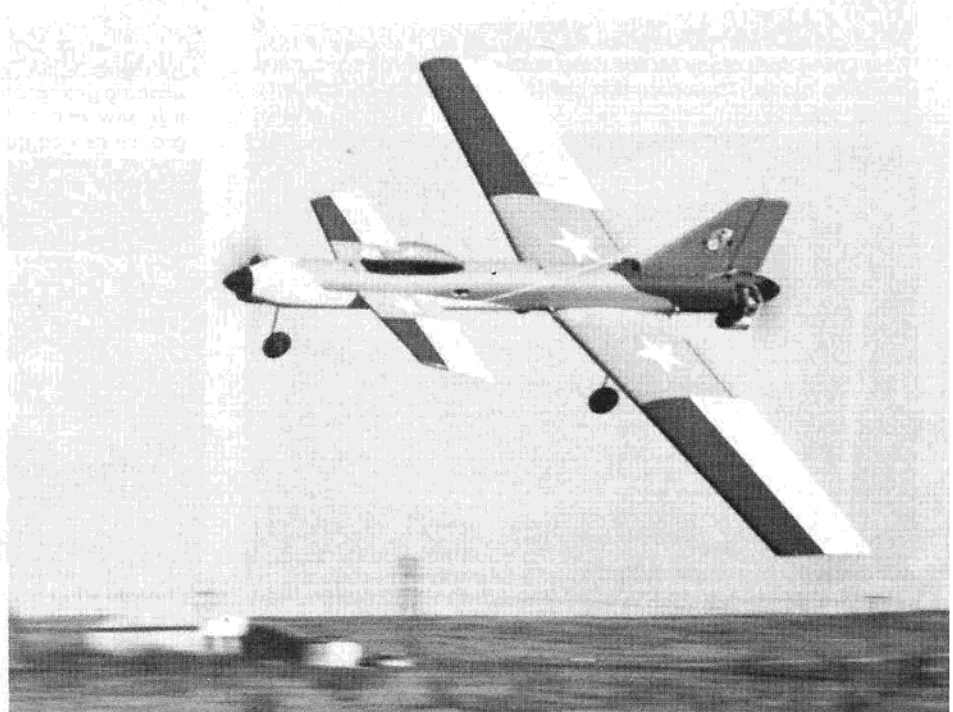
Much thanks goes to Joe Petz, Gary Wood, and Rodney Darling for helping to build these airplanes, and especially to Bob Finsterwald for test piloting some of the wild test flights.

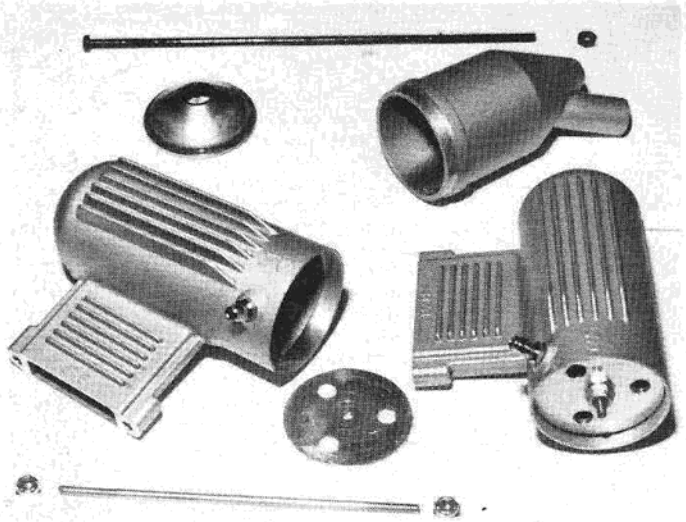
Have you ever wanted to fly a twin engine airplane, but just couldn't stand the thought of building a complicated twin nacelled airplane and then see it spin into the ground with one dead engine? Neither could I. That's why I designed a twin push/pull canard that I call Scat Twin 40. After some teething pains, there is finally an easy to build twin that will just slow down if you lose one engine. Scat Twin is also a joy to fly. After about ten seconds of flying, you won't think it is flying backwards either. I tell first time canard fliers to just think of it as a missile or a delta winged airplane.

Scat Twin was designed to be very simple to build, and yet sturdy enough to stay together with engines as powerful as O.S. .46 SF ABC's trying to twist each end off. With the exception of the wing saddle, every piece of wood will be cut in straight lines, too. All of the building materials and hardware, with the exception of engines and radio, came from Balsa USA. I have always used Balsa USA for my wood and supplies, and have always been pleased with the quality of wood, and their service has been excellent. If you can build any of the various stik models on the market today, you can easily build Scat Twin. The 3/4" triangle balsa in the fuselage allows for generous sanding, and along with the large canopy it doesn't look much like a stik. Even though wing bolts work fine and look good, for simplicity, this particular airplane uses rubber bands to hold the wing.

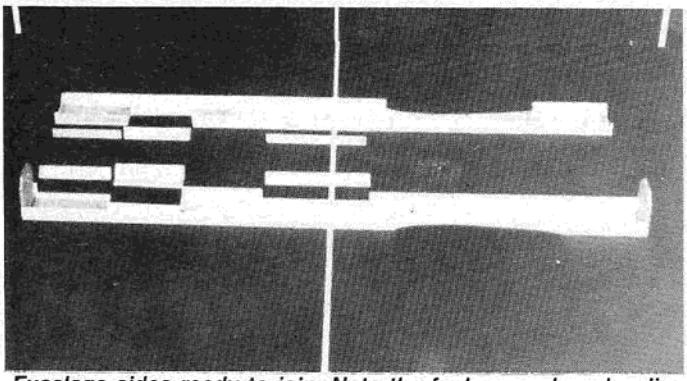
There are three things that you should never forget about the Scat Twin. (1) Never let your fingers touch the rear prop while running. Unlike the front propeller which will push your fingers back after a painful pop, the rear prop will pull your fingers through, causing serious cuts. I've seen it happen twice, but only to

Texas Scat Twin on a low fly-by. Yes, it's as low as it looks!

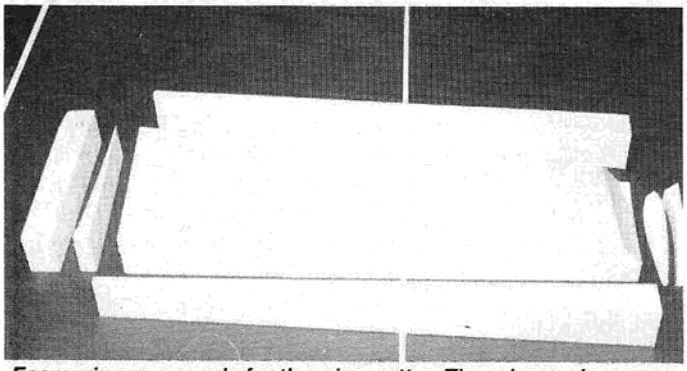




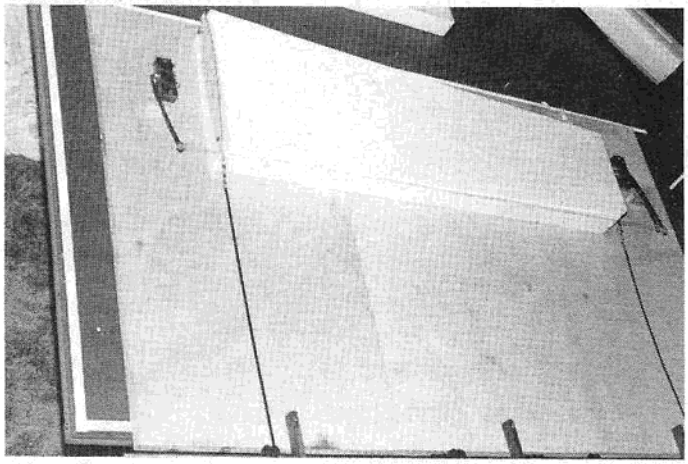
Top of photo is unused bolt, baffle, and rear muffler half. Bottom shows a disassembled and fully assembled rear muffler.



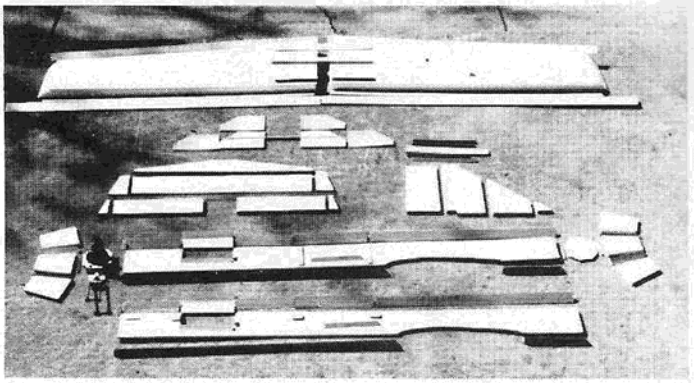
Fuselage sides ready to join. Note the fuel, canard, and radio hatch supports.



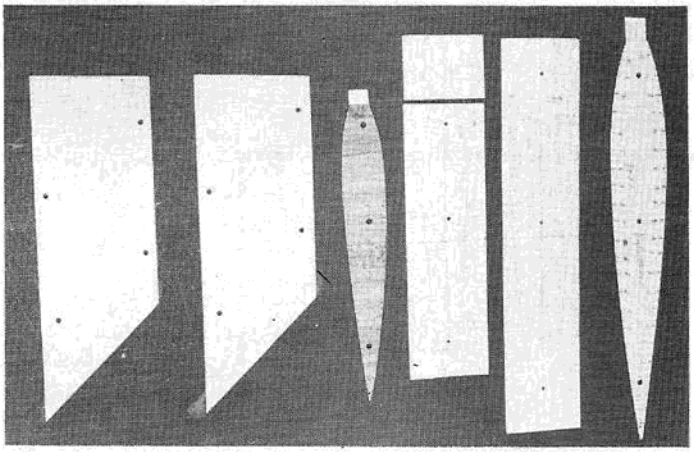
Foam wing core ready for the wing cutter. Three large pieces are blocking scrap. The other two are (1) wing sweep at root and, (2) 45° tip.



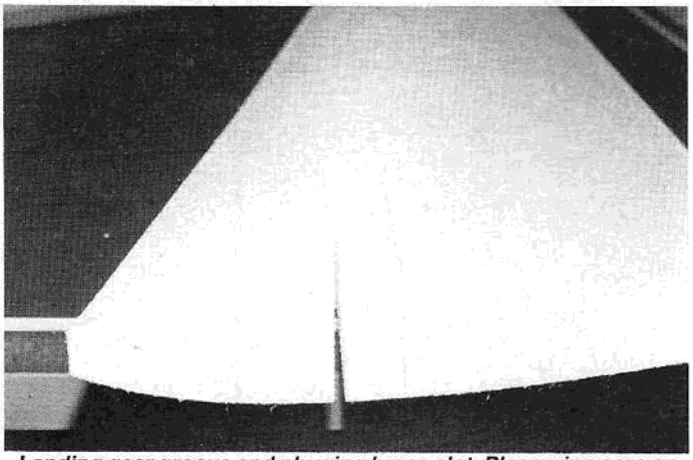
The wing core about to be pulled through the wing cutter. Note the two cutting wires and two belts that will pull the foam between them.



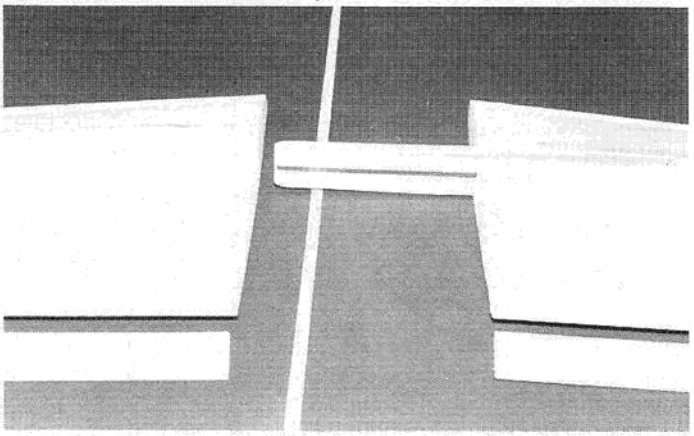
A complete Scat Twin kit. It even looks simple!



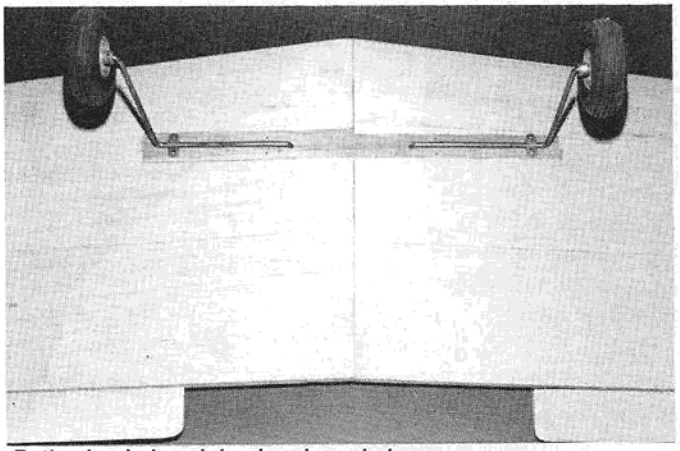
Formica wing templates. Also, two alignment templates, and 45° tip templates. Formica scraps are cheap or free at your local decorating store.



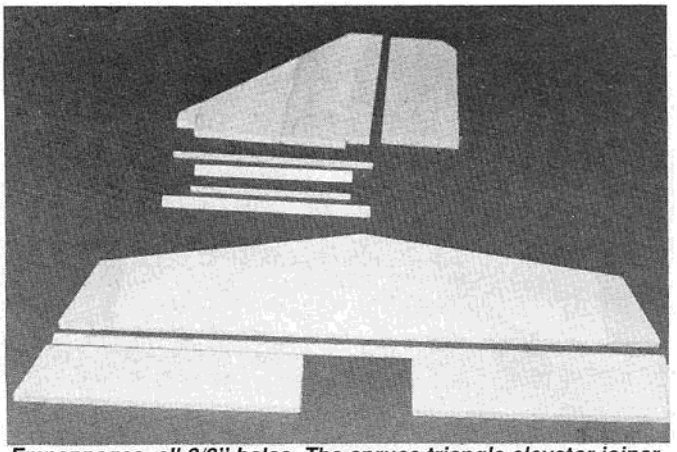
Landing gear groove and ply wing brace slot. Place wing core on a jigsaw and cut the slot through entire wing. Landing gear groove can be cut on a drill press.



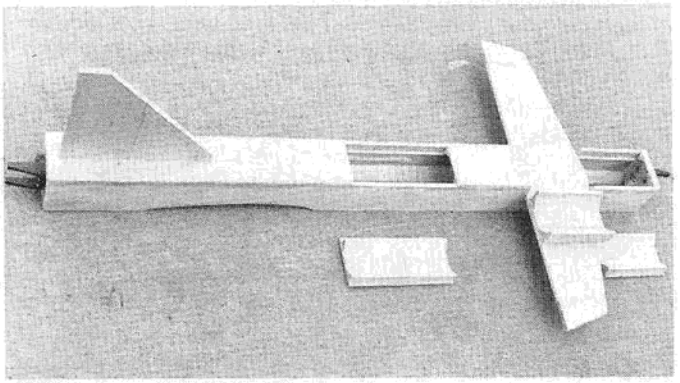
Sheeted wing halves about to be joined. The landing gear block and ply brace have already been epoxied into one wing half.



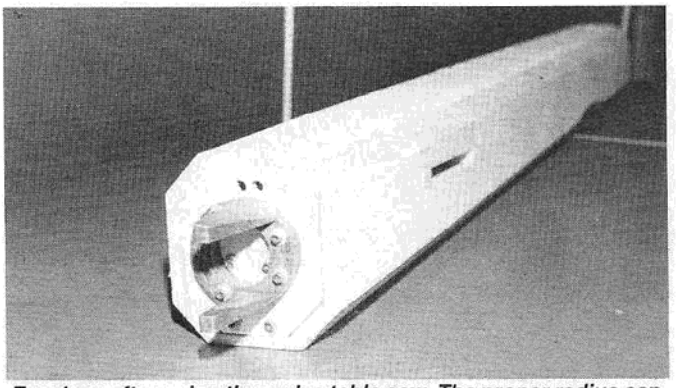
Both wing halves joined and sanded.



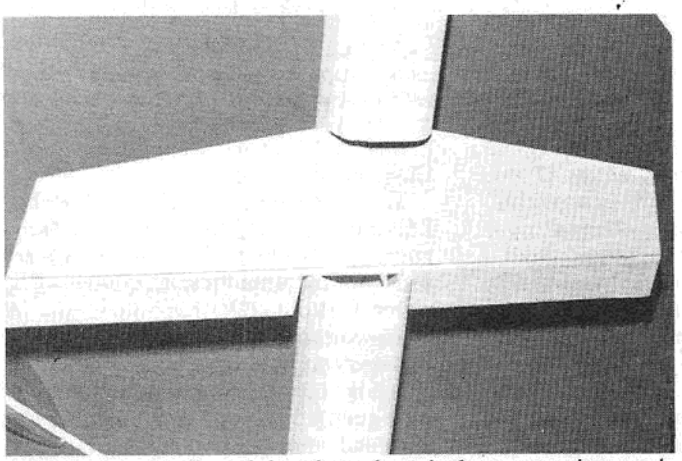
Empennages, all 3/8" balsa. The spruce triangle elevator joiner has hinge slots cut through it.



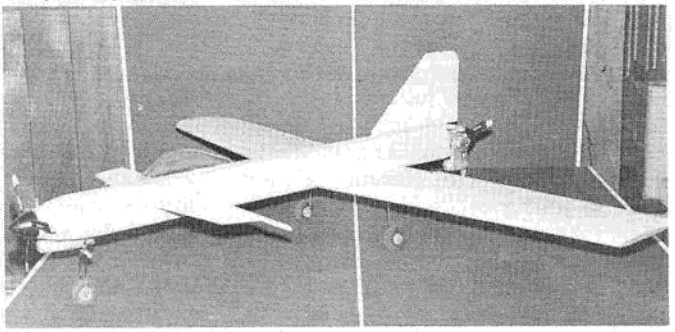
Partially completed fuselage.



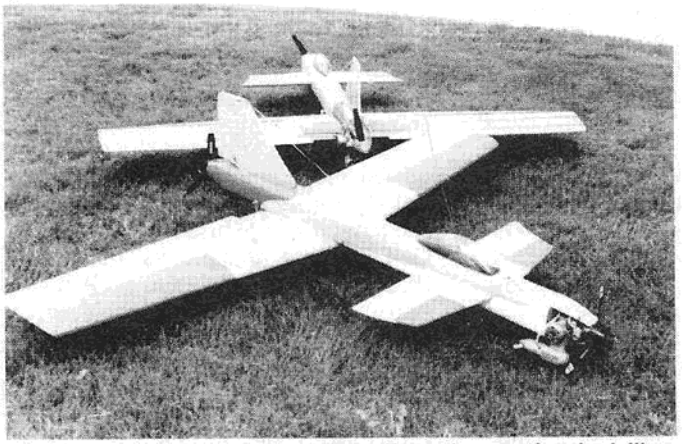
Fuselage after going through a table saw. The proper radius can be sanded easily by hand now. Note the 3/8" balsa scrap temporarily glided, supporting the canard hatch for sanding.



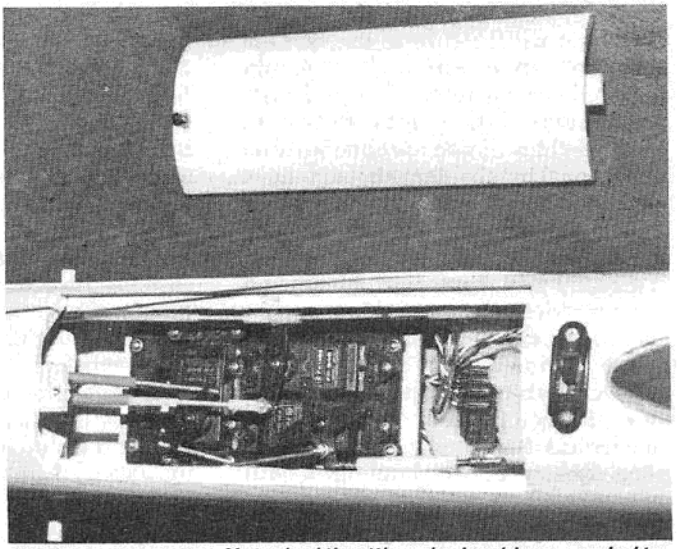
Finished canard and fuselage just before covering and permanent hatch installation.



Completed Scat Twin before covering.

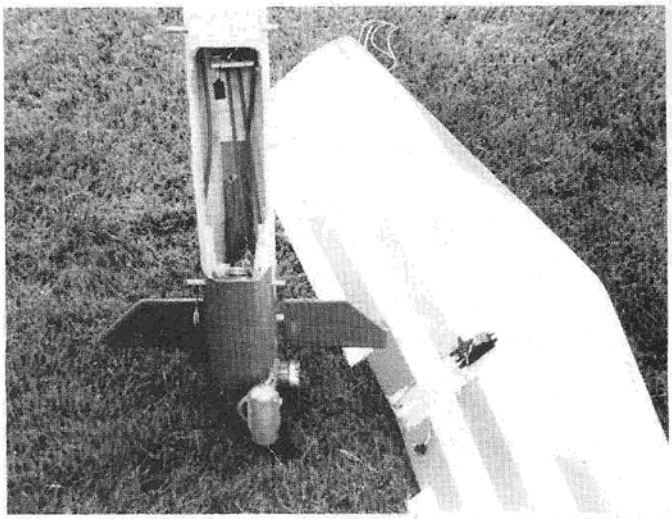


Both canards have very clean lines. From the rear they look like guided missiles.

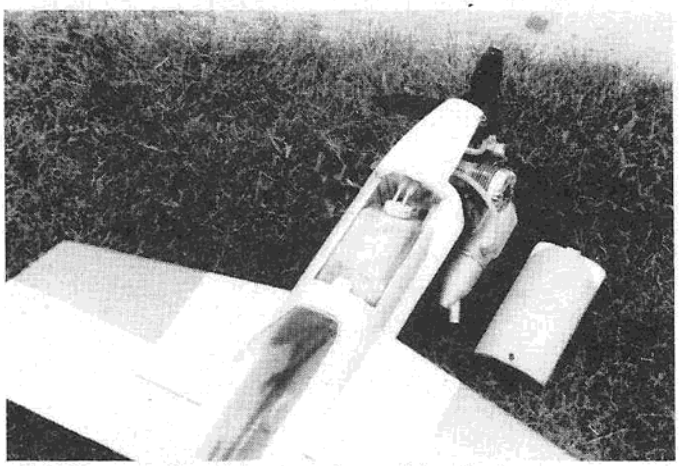


Radio compartment. Note dual throttles, dual rudders coupled to nose wheel, and elevator coupled to stabilator. It's not as complicated as it looks. Also, note the 1" piece of 4-40 NyRod allowing adjustments for the elevator. A nylon clevis might not withstand the strain.

Easy to make rear wheels for transport. Even though the author has never broken the rear stabilator, it is fairly delicate.



Wing saddle and aileron servo set-up. Even though the receiver is far forward of the wing, you can see that the aileron extension will reach.



Totally conventional front engine and fuel tank.

The rear engine with pusher prop. Note that the prop is facing forward which is backward in relation to the backward engine. Understand? Sure!

people who tried to tune it while running full throttle. Not me! I either tune it idling or dead. (2) Canards exert extra stress on vertical stabs. A canard, less its vertical stab, will flutter earthward like a falling maple leaf and, unfortunately, they always seem to get torn up! I have seen that happen three times! So, have a vertical stabilizer gluing party like I do so you will be sure to use enough epoxy to keep the stab in. (3) Securely attach the radio antenna to either the vertical stab or the wingtip. If it comes loose in flight, your antenna will be shortened by the length that goes through the rear prop. Abide by these three rules and you will really enjoy Scat Twin.

Scat Twin has absolutely no asymmetrical thrust problems when one engine dies. I honestly cannot tell which engine is dead until it comes close enough to see the propellers. It has plenty of power to execute a downwind turn on one engine and then make a perfect landing. It will also take off on one engine easily.

If this airplane didn't fly and look so good, I would have become too discouraged to perfect it after all the bad luck with the early prototypes (maybe you can avoid some of my mistakes). Before I describe the initial failures, remember that they all flew well. I also had never seen a canard fly before (still haven't except for mine), and I had to experiment on the C.G. position until I acquired a computer program to do that.

#1 was a .40 sized twin pusher canard. (It was a stand way-off scale Beechcraft Starship.) The radio failed after about five minutes of the first flight. Destroyed!

#2 was a .20 sized push/pull canard. It lasted longer than most of the early ones. The vertical stab came off during a dogfight with a Midwest Twin Stik. We lost!

#3 was a .40 sized push/pull canard. (I have since settled on this size and design.) The vertical stab came off on its second flight. Destroyed! This one crashed before #2 so I marked it up to bad luck on the stab. But, when #2 lost its stab, I redesigned it with ply and triangular balsa braces inside the fuselage. This has solved the vertical stab problem.

#4 had all the bugs worked out so I really made it look pretty. Sorry! The radio failed on the second flight and it met the same fate as did #1. Destroyed!

This was when I switched to Futaba FG radios. There have been no further radio problems. Even after some pretty hard smashes, they are still glitch free.

#5 was built for my test pilot, Bobby Finsterwald. He actually took his plane home a few times until fate reminded him that E-Z connectors are not good on elevator controls. It came loose on the downside of a loop. The two engines almost touched each other. Destroyed!

After that disaster, I redesigned the elevator pushrod so it would be strong and adjustable. That problem was solved.

#6 was the only one that I really goofed on. I was too impatient and failed to glue the triangle braces on the outside of the fuselage. I reasoned that it would hold for the test flight that I was already late for. Well, if you dare fate to slap you in the face, it probably will! Off came the vertical stab and down came the plane. Slap! We picked up the pieces and actually put this one back together. When the vertical stab was glued back on, there was no joking around. It was glued on correctly and never came off again.

BILL OF MATERIALS

Wood: as ordered from Balsa USA

Wing:
2 — 3" x 11" x 9" White styrofoam wing cores
1 — 1/8" x 12" x 4" Plywood wing brace
1 — 12" x 1/2" x 3/8" Hardwood landing gear block
12 — 1/16" x 4" x 36" Balsa wing sheeting
2 — 3/4" x 3/4" x 36" Balsa triangular leading edge
2 — 1/4" x 3/4" x 36" Balsa trailing edge (from fuse scrap)
2 — 3/8" x 1½" x 36" Balsa ailerons

Fuselage:
2 — 1/4" x 4" x 42" Balsa sheet fuse sides
2 — 1/32" x 4" x 42" Plywood fuse doublers
2 — 3/16" x 4" x 42" Balsa sheet top/bottom deck
2 — 3/4" x 3/4" x 36" Balsa triangular fuse formers
1 — 1/4" x 1/4" x 36" Balsa hatch platforms
1 — 1/2" x 1/2" x 12" Balsa triangular servo platforms
2 — 1/4" x 2-13/16" x 3¼" Plywood firewalls
6 — 3/8" x 3½" x 3¾" Balsa cowlings
4 — 1/2" x 1/2" x 3⅝" Balsa triangular cowling formers
2 — 1/8" x 1/2" x 2-13/16" Plywood servo rails

Vertical Stabilizer & Rudder:
1 — 3/8" x 4" x 36" Balsa sheet
1 — 1/2" x 1/2" x 36" Balsa triangular vertical stab
1 — 1/64" x 9" x 1¼" Plywood decking brace

Horizontal Stabilizer & Elevator:
1 — 3/8" x 4" x 48" Balsa sheet
1 — 3/8" x 3/8" x 25" Spruce triangular elevator joiner

Optional Stabilator:
2 — 1/8" x 2¾" x 5" Balsa sheet
4 — 1/64" x 5" x 3⅛" Plywood sheeting
1 — 5/16" x 12½" Hardwood Dowel

Hardware:
1 — Nor-Ray "Hands Off Cut II" foam wing cutter
2 — Dave Brown #4045 motor mounts
1½ Sq. ft. Formica
7 — Nylon Clevises
2 — Sullivan Gold-N-Rods
2 — 1/8" Goldberg torque rods
2 — Sullivan 8 oz. flex fuel tanks
1 — Fult's 4" double strut nose gear
2 — Aerospan or Super MonoKote covering
12 — 4-40 socket head bolts, lock nuts, washers
2 — Packages Du-Bro #117 large hinges
3 — 2½" wheels
1 — 14" x 3" streamlined canopy
1 — 5/32" x 36" music wire
3 — Du-Bro #105 control horns
1 — Du-Bro #183 aileron dual ball link
2 — Du-Bro #181 ball links
1 — Du-Bro #239 landing gear straps

Three subsequent planes have been built and they will not lose their stabs either. #6 turned out to be the most successful canard of the lot. It flew for a long time at many fun-flys. I learned how to perform canard aerobatics and actually got a chance to enjoy one of my canards. #6 also showed how tough this plane can be. It crashed five times, still through no fault of its own, and could have been rebuilt again when I decided to retire it.

The first crash was when the vertical stab came off. Two and three were dead stick landings into the fence at our flying field. (Why me!) Four was a low altitude stall from a knife edge. (Should have been a little higher.) Five was a fantastic flat spin with the optional stabilator and I just stood there with my mouth open watching. (It would have recovered easily if I hadn't started my recovery 50 feet high.)

As you can guess from crash number five, the stabilator really increases the performance of Scat Twin. Turns and loops become tighter and spins become an adventure! If the C.G. and control throws are correct, it really will spin like a frisbee. After applying opposite aileron and rudder, it dives out of the spin easily. I decided that this was for me. Like any spin, though, you should keep an extra safety margin for recovery.

I now have two Scat Twins. One has a stabilator and the other doesn't. The plain one is what I call my "canard trainer." They look and sound awesome when flown at the same time. Add Bobby's twin and the sky is full of Scat Twins. It's even more awesome.

During all these early failures, Bobby Finsterwald flew the test flights. His nerves are steel and his reflexes are cat-like. My reflexes are okay, but when a new plane is on the line, my nerves go on vacation. Besides, whenever Bobby feels like it's about time for him to crash (we all do eventually you know), he crashes one of mine and that way he doesn't have to go home and rebuild! Seriously, I owe Bobby much thanks for keeping some "out of balance" and "out of trim" airplanes alive to fly another day. (#5 was so tail heavy that it did a back flip in the air and Bobby saved it!)

I haven't tried to hide any of the problems in developing this airplane. The main thing to remember, though, is that a Scat Twin has never crashed because it wouldn't fly the way it should (ex. snap on take-off, or not recover from a spin). Except for some radio and vertical stab failures, which have been corrected, these airplanes have performed flawlessly. They now perform the function for which they were intended: providing twin engined sound and performance without the asymmetrical thrust difficulties associated with conventional twins. Now that I don't worry about unexpected problems like radios quitting and vertical stabs falling off, it is really a fun airplane to fly.

Sometimes I even fly it until one engine runs dry, then I land with the other engine. It's a piece of cake! I have even had one engine die during a low inverted downwind pass. I just made a quick aileron roll and then a normal, if somewhat slower, turnaround and landed. I wonder what would have happened to a Duelist. (My next favorite twin.)

Now that I have had plenty of enjoyment, someone else can enjoy this airplane, too. Well, if you like that awesome sound of twins, but want to avoid some of the hassles, then order the plans and find how easy Scat Twin is to build.

CONSTRUCTION

The complete building instructions are included with the plans.

Flying:

This plane is very easy to fly if you are past the beginner stage. Take-offs are not sudden and climb out can be steep if you like. Scat Twin sacrifices a little aerobatics because canards are just more stable than conventional airplanes. It will perform all the usual stunts including loops, rolls, Split S's, hammerheads, rolling circles, and climbing knife edges.

For even quicker pitch response, you can add the optional stabilator. It will really tighten any maneuver that you attempt. Plus, this plane really looks mean with the extra control surface. With the stabilator, Scat Twin will do some stunts that are not even in the book. Fly in a steep climb, bleed off airspeed, pull full up elevator, and watch out! It will hang on the props and fall backwards until you cut the throttles. Then, just like magic, the nose drops, and it will dive

out quickly. At first, I thought this was a defect and then I realized that it was pretty neat if you knew what was happening.

Spins are different too. To make a spin, input up elevator, and opposite ailerons and rudder. Be prepared for a wild stunt. After the initial craziness, it will go into a flat spin. To recover, reverse the rudder and elevator. After one or two spins, it will easily recover. Be sure to keep both engines running full throttle. If they are running poorly, one or both might die and then you might not have enough prop blast against the control surfaces to recover. Don't do the spin on the deck, although, you can do the initial craziness pretty low. This is a real crowd pleaser! People keep telling me that a canard will not recover from a flat spin, but they haven't seen mine yet! Snap rolls are also different than with a conventional plane. It's hard to describe what it actually will do. Hold your controls for a snap roll and as best as I can describe it, it will do one spin, then a quick snap, a nose up stall, and repeat the sequence. But, just like the deep stall and flap spin described above, it will pull out very quickly. My heart still pounds when I do this!

There are two things to consider when flying. (1) If it stalls during a maneuver, it might not recover until the throttles are cut. But then the nose will drop quickly and it will dive out. When I get into trouble, I always cut the throttles anyway. (2) Landings are a bit different too. It should descend with the nose high until touchdown. If you descend level and flare like you would normally, it will climb and you will overshoot your landing. With a little practice, you can really grease it onto the ground. Single engine landings are easy with either engine, although, when the front engine is running, you can land with a steeper angle of attack and it looks neat.

One of the many favorable comments that I get regularly from other fliers who try it for the first time is, "It is very responsive." Or, "If you bank it, it stays banked. If you fly level, it stays level." I guess that's the way you want them to fly isn't it? I just love a smooth flying airplane.

Well, I haven't tried to make it sound like I haven't had any troubles with this plane, and I don't want to scare anyone away since it is really easy to fly. This is a fantastic airplane if built properly, and the great thing is that it's easy to build properly. So, if you want a real eye catcher at the flying field and have always wanted a twin engined airplane, Scat Twin is for you.

□