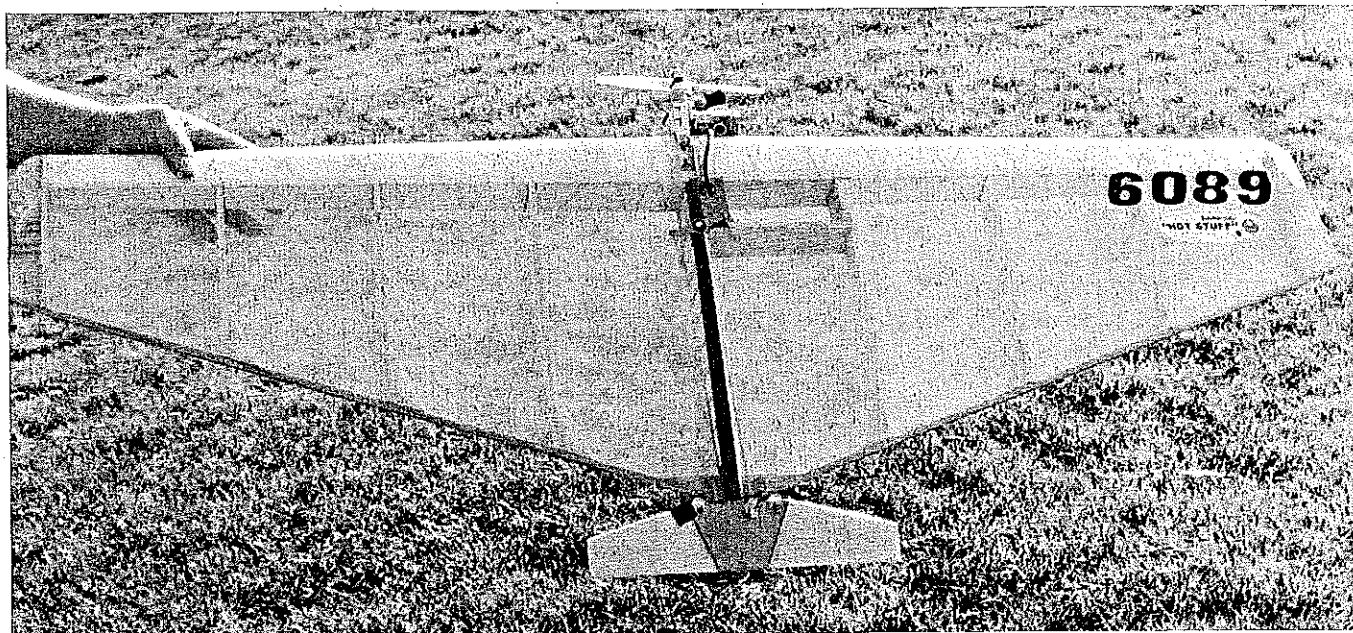


Beliaev's Winner

#680



Beliaev's F2D wonder ready to fly and nibble streamers. Center rib doublers are wrapped with Kevlar thread so as to completely cover them. Thread is then wrapped around the leading edge and spar in a spiral out to the tip rib; a couple of extra turns are taken and the spiral brought back to the center rib and terminated. A hefty coat of glue holds the Kevlar in place. That makes the wing just about impact-proof!

Soviet F2D models, Beliaev's in particular, are creating a sensation wherever they are flown to the point where even the British, long known for leading model development in F2D, have been reduced to sorting through post-contest rubbish bins in an effort to gain equipment parity with fliers such as Beliaev.

DURING AN EARLY 1990 trip to visit modeling friends in Leningrad I was pleased to meet Viacheslav (Slava) Beliaev, widely regarded as the best FAI CL Combat flier in the world. Knowing of American in-

terest in Soviet modelers and their equipment, we struck an agreement whereby Slava and his compatriot, CL Combat pilot Svetlana Filippova would begin work toward publication of Slava's F2D model—draw plans, take pictures, write a rough outline of the text and then somehow get all the stuff to Seattle.

Generation of the text was to be my task, made significantly more difficult when photos taken in Leningrad proved substandard. A request to borrow the only current Beliaev model in the Pacific Northwest was refused, forcing Svetlana and me to begin building the models pictured while she was here in Seattle following the 1990 AMA Nationals.

Meanwhile, Beliaev had gone on to live up to the claims made for him, winning the 1990-91 FAI CL Combat (F2D) World Championship in a completely dominant fashion: Nine match wins, no losses. In addition to being current World Champion with this design, Slava has won the European Championships three times, won the Championship of the U.S.S.R. and placed second at the 1984 World Championships.

While you can rest assured that the above competition record is based solidly on the flying skills and a lot of experience on the part of Beliaev, even his abilities cannot overcome equipment that is deficient. The model presented here is a highly developed piece, even if quite different from the usual American style of model in planform, construction techniques and aerodynamics.

When I first met Slava he had almost 90 complete and ready-to-fly models prepared for the upcoming season. Building (and con-

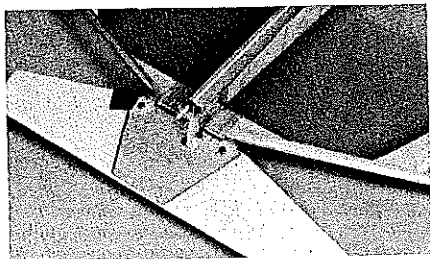
suming) models at that rate gives one quite a large database to use in eliminating structural weaknesses while also refining the flying qualities to a high level.

In fact, having now built and flown several of these models, I have to wonder if the Soviets and the rest of the world—particularly we here in the U.S.—are even reading the same FAI rule book. True, FAI Combat is not the dominant CL Combat



The required man-with-toy-airplane picture. Our author, out for a long flying session with one of the several Beliaev models he's built.

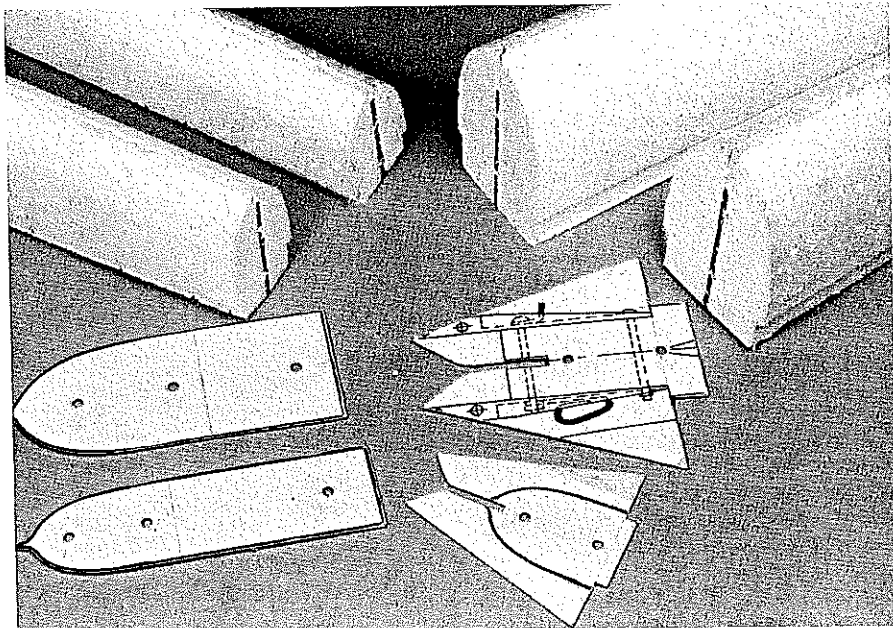
Model Design:
Viacheslav Beliaev
Plans: Viacheslav
Beliaev and Svetlana
Filippova ■ **Photos:**
Dan Rutherford and
Svetlana Filippova
Text: Dan Rutherford



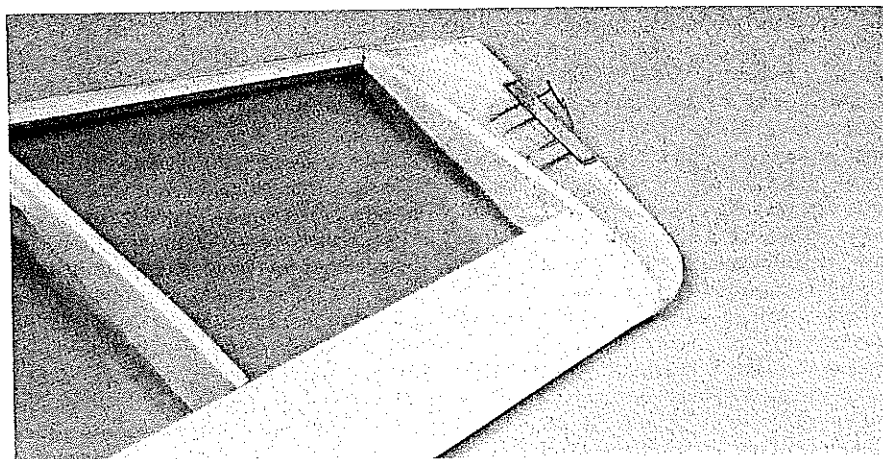
Tailplane is hinged directly to the trailing edge of the wing, a radical departure from U.S. designs. A #3 aluminum knitting needle serves as the pushrod, wheel collar and cap screw securely attach to the nylon control horn, allowing easy adjustment.



Nothing fancy with such disposable models: the tip weight is simply taped in place. This also allows for convenient experimentation with the tip weight for different conditions.



Foam-cutting templates used to cut leading pieces from one-pound-per-cubic-foot white foam. On the left are templates for cutting the airfoil; those on the right are used to cut all three spar notches. Templates are made from scrap Formica.



Wire leadout guide simply plugs into brass tubes embedded in wing tip. Multiple positions allow for trimming the model to suit conditions. Legs of leadout guide are kinked slightly to provide positive engagement of tube, yet allow removal when required.

event in the U.S., and no other country in the world stages the huge and frequent Combat contests seen in the Soviet Union. But it still is a shocker on one hand to be peripherally involved with U.S. development of the most radical and high-tech whiz-bang of all F2D models, and then be confronted with the seemingly simplistic (even the word "crude" has been uttered by local fliers seeing the models for the first time and from afar) design from Beliaev.

As it turns out, Beliaev's model is far from crude as a close examination of construction details will show. Weak points have been eliminated by what can only be called elegant design obviously accomplished with an extremely clear idea of what is required in competition. Only a nod is given to high-tech materials in use of Kevlar thread reinforcement even though Soviets have, for example, high quality carbon fiber which is readily available.

To put a finer point on it, those who fol-

low FAI FF and CL competition know full well that all skills and materials required for blow-your-mind construction techniques are quite easy to come by in the Soviet Union. And yet Soviet F2D models, Beliaev's in particular, are creating a sensation wherever they are flown. There is a huge clue in all of this, and if you have questions concerning U.S. lack of success in recent editions of the F2D event at the World Championship level, construction and operation of the model presented here may provide some answers for you.

As to the most salient of many apparently low-tech features in Beliaev's design, the external control system, you must understand that this model is normally fitted with receptacles for the wire leadout guide at both inboard and outboard tips. If the model suffers severe damage to the inboard panel, the Soviets simply remove the guide from the wreckage, insert it into outboard receptacles, flop the model over and relaunch it.

Sure, it doesn't fly real well in that condition, but when both contestants have damaged models just a little airtime may win out, and Beliaev has won many close matches with this feature. So while having the 'crank outdoors may stink aerodynamically, one cannot fault the functionality.

Speaking of aerodynamics and things that smell funny, the airfoil is bound to cause gales of laughter for many students of this complex subject. I offer no defense; I chuckle at the airfoil myself. However, I laugh not because it looks weird (and it does). I laugh because somehow—possibly even in spite of this funny-looking section—the model flies beautifully and there is (evidently) no readily-available explanation forthcoming from all the self-appointed aero whiz-kids peering around the corner while clutching well-worn books of Eppler sections.

A few other features deserve mention: The fixed fuel line clip allows the mechanic to start the motor on prime and then simply

to flick the fuel line out of the clip. The streamer clip is located on the underside of the model so that frantic pit work during a match tends to have the two mechanics working on one side of the model and so out of the way of the other. Any required tip weight is simply taped in place, as more or less may be required during a contest, depending upon wind conditions. Ditto with the tail weight; just tape it on. (Baliaev purposely builds his models just a little nose-heavy and then adds tail weight as required.)

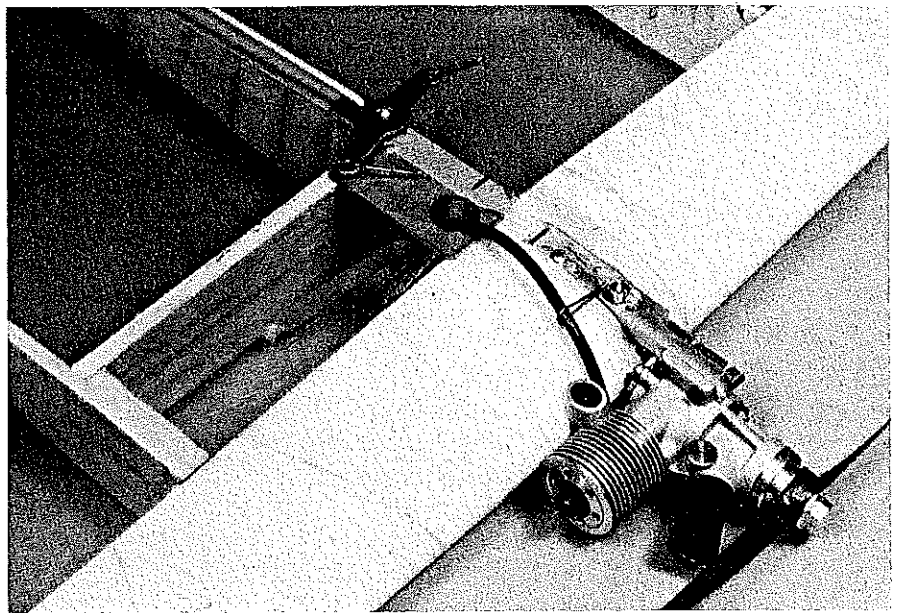
The aluminum motor mounts were pioneered years ago by the Soviets, and the resulting rigidity is a requirement for ultimate horsepower and super consistent engine runs at the typical 29,000 and up rpm seen in this event. Notice the vertical pieces of ply at the forward end of each balsa rib. In a crash that would normally result in these ribs splitting along their length, the ply prevents such damage.

The wrapping of the leading edge assembly in drafting paper and the strength afforded by such a simple technique must be experienced to be appreciated. Never have I seen such a rigid leading edge structure in a CL Combat model—in fact, this rigidity can be a problem if significant warps are built in, as the rigid structure effectively resists anything but minor tweaking.

The Kevlar thread reinforcement at the juncture of the two trailing edge pieces makes an otherwise simple and relatively weak glue joint nearly bullet-proof in addition to securely attaching the hinge-pin tube. This same Kevlar thread also adds to the structural integrity of the leading edge assembly tending to localize damage which would otherwise blow huge chunks out of this piece.

And all of this is nearly free; it takes only a few minutes to do the wrapping and, at two grams worth of Kevlar per model, the weight is nearly insignificant.

Finally, the immensely strong construction of this model comes in real handy when need arises to knock your opponent's model out of the sky. Like it or not as a tactic—and of course U.S. fliers don't like it both because we didn't think of it first and because our model types typically won't survive



Soviet-made Gievsky 2.5 cc engine mounted to a completed model. This engine is very light, extremely reliable, and likes to operate in the 29,000 rpm range. Metal mounts are required for maximum power. Note the .027 safety tether which attaches at the other end to a bolt retaining the Fox 2-in. bellcrank.

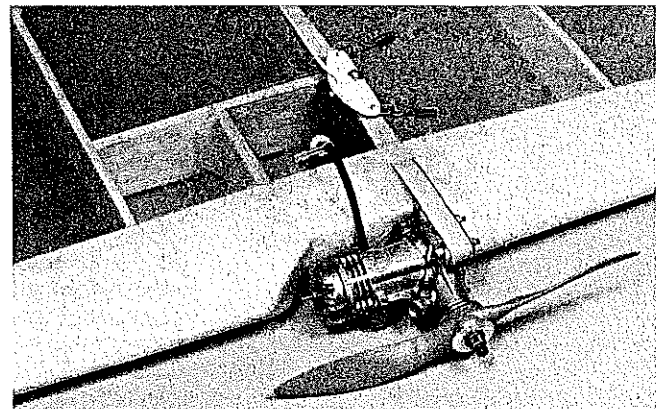
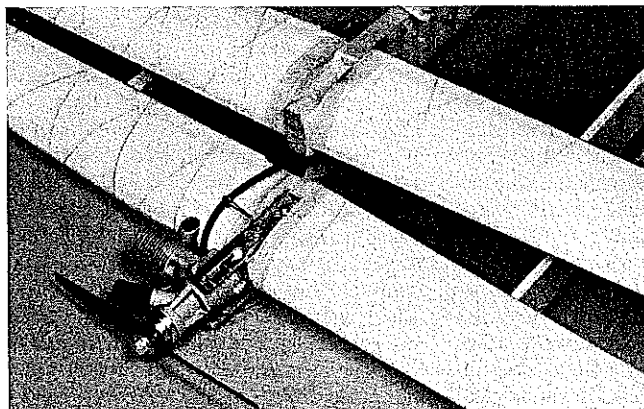
such treatment—the fact is that F2D rules are such that in certain situations one can either fly defensively, with almost no chance to win, or remain on offense and aim for the other guy's model.

In the resulting collision you don't want to be the guy with the fragile, super-tricky model unless, of course, you happen to enjoy clouds of toy airplane parts raining down. And after a model such as the one presented here grenades your first, tossing a second in the air will only provide you the opportunity to have a matched pair of junkers plus loss of the match. It might not be the most popular of tactics, especially here in the U.S. where modeling is simply a hobby, but in the Soviet Union, where modeling is a sport, whacking the opposition into dust is a fact of life, so you best be prepared.

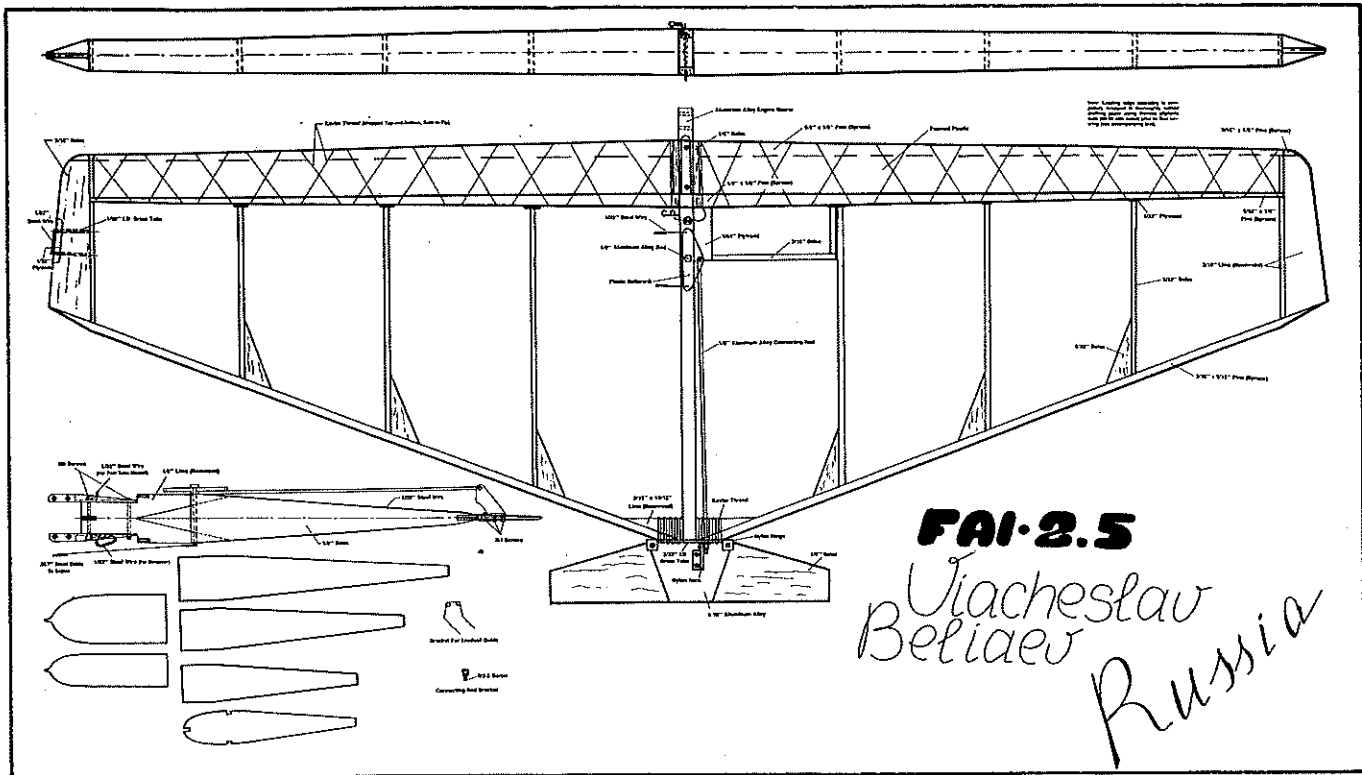
Yes, there are more subtle features in this design—features appreciated only after a thorough understanding of the F2D event, a careful examination of the plans, and the building and flying of one of these models.

Prior to presenting the construction details, it is important to note two special considerations. First, we here in the U.S. continue to be largely ignorant of the metric system of measurements, and modeling materials used in the Soviet Union differ from those easily available in the U.S. The former problem has been dealt with by Svetlana in making conversions to suit and as shown on the plans; in the case of the latter problem, basswood may be substituted for limewood and spruce for pine, although pine is of course readily available, even if not at Local Hobby.

On the other hand, opportunity exists for Americans to not only build and fly the baddest of the bad FAI Combat designs currently available, but to build models lighter and stronger than Baliaev's best. We have ready access to balsa and foam that is lighter than that seen in the Soviet Union, and our glues are much better with even the lowly aliphatic resin (yellow wood glue) being of poorer quality over there.



Two completed Bellaev F2D models. (Left) Note drafting paper wrapping of the leading edge assembly, a feature which provides a very rigid structure. Kevlar thread is spiral wrapped over the entire leading edge and is applied over foam. (Right) Oh no! Mutant versions of this design have already begun to appear. This one's a standard version of Baliaev's design modified to accept a Fox .35 Stunt for a local AMA Combat event where the primary rule limits fliers to use of stock Fox .35s.



FAI-2.5

*Viacheslav
Beliaev
Russia*

Cyano glues are nearly unobtainable for the Soviets as I discovered when delivering to Leningrad an immense bag of "UFO" and Hot Shot donated by the Hunters at Sattellite City.

Construction. Begin construction by first making positive-image templates from your favorite material; cheap scraps of Formica are my choice. Yes, I know the templates look a bit odd, but they work well. Simply make two passes, each beginning at the leading edge of the template. A properly sized blank results in a nearly finished part after two passes with the hot wire.

The slot in the leading edge for the spruce spar can be cut either with a table saw or a hot wire, as can upper and lower spar slots. A bit of fiddling with templates and cutting technique results in precise parts with little mess, so it is the method we used.

All wood parts should be cut from appropriately sized stock. Please note that the outboard tip rib and wing tip are cut from basswood while inboard parts are balsa. Ribs are purposely drawn oversize toward the trailing edge to allow for minor misalign-



Final preparations being made prior to another series of enjoyable flights.

ment during assembly, the excess being sanded away after installation.

Pay particular attention to obtaining a very good fit between bass and balsa parts of the center rib. And while you will no doubt obtain a little more horsepower if you utilize the suggested aluminum motor mounts, I am of the opinion that standard maple mounts—fabricated with all the best methods, of course—will suffice for a Sport model.

Glue the center rib complete, being certain to obtain a very good epoxy glue joint between the bass front end and the balsa piece. The center rib should be drilled for aluminum motor mounts and bellcrank bolt. Notch the rear of the center rib for the trailing edge piece.

Assembly. Serious assembly begins now, and use of a jig is strongly suggested. While the set-up can be elaborate, I have had success by simply blocking the excess and overhanging the leading edge spar material with identically-sized wood blocks, then shim-ming both tip ribs and center rib to identical heights.

The usual flat building board is assumed. Have you checked yours lately? This might be a good time to do so; as mentioned earlier, this structure does not respond well to removal of warps.

In relatively quick succession, install the center rib doublers, and epoxy the leading edge spar to the center rib. Install foam leading edges, upper and lower spars and both tip ribs. You will have your hands full for a few minutes getting all this stuff aligned but it comes out fine, especially if you use aliphatic resin at spar-to-foam locations. Note that the foam leading edges themselves tend to be self-aligning to a certain extent. Place this assembly on the jig, weighting where required. Upper and lower spar to center rib

joints are important. Clamp in place. Simple strips of masking tape serve to hold spars to foam. After both tip ribs are installed, spend some time to ensure that the centerlines on the tip ribs and center rib are precisely aligned equidistant from the building board.

Double-check all measurements. You really want this model to be straight.

Once this assembly is complete, sand the leading edge spar to blend into the foam leading edge, and sand the foam at the back edge of the spars (or cut it with your hot wire setup) flush with the rear edges of both upper and lower spars. Wrap Kevlar thread around the leading edge and spar assembly. Extra wraps around the center rib doublers, covering them completely, are suggested. More extra wraps at the tips completely tie the spar/leading edge/tip rib structure together. Can you say, "impact resistant"?

Apply thinned aliphatic resin (50/50 with water is fine) to the leading edge assembly, then wrap it completely in thoroughly wetted drafting paper. The process is similar to covering a structure with Japanese tissue,

Continued on page 160



Filling the bag with fuel. Note the use of disposable two-oz. syringe for filling high-pressure bladder tank.

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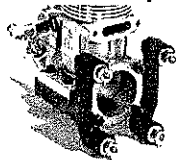
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"Sunday—Standard: 1) Craig Korsen, 1:44.9; 2) Mark Seiler, 1:48.2; 3) Tony Giovanetti, 1:48.3; 4) Mike Bumbaca, 1:48.7; 5) Andy Finley, 1:48.8. Expert: 1) David Doyle, 1:37.8; 2) Dave Chapdelane, 1:40.9; 3) Mike Mungavin, 1:37.9; 4) Pete Reed, 1:39.0; 5) Steve Pastula, 1:35.5."

A side note from Irv: It's important that contest reports highlight any differences from the AMA national rules in order for reported times to be meaningful.

Well put, Irv. Thanks.

See you next month.

Beliaev's Winner/Rutherford

Continued from page 51

but you may want to practice and/or experi-

ment on those first foam leading edges that were unusable. Actually, most any type of light paper would probably be okay, but drafting paper is available in large sheets and is pretty tough stuff. Gift wrapping paper might even work acceptably well and add some show-biz to the model.

It is at this point that the leading edge assembly gains its maximum rigidity, so devise some effective way of holding it in alignment until dry. I have been locating the wing tips with wood blocks and weights and shimming the center and tip ribs until perfectly aligned. Allow to dry completely.

With the paper wrap drying, assemble the trailing edge pieces to the center joiner and hinge pin tubing. Sand trailing edges to a slight taper, but don't try for a sharp trailing edge.

With the basic framework back in the jig, position the trailing edge assembly in place and glue to tip ribs and center rib. Install the three remaining ribs in each wing panel. Take note of the 1/32-in. ply vertical pieces installed between the nose of each rib and the leading edge assembly. Fit and securely

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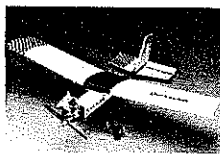
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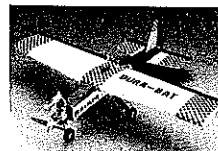
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glue all gussets between the trailing edge and ribs. Make sure joints are accurate; I suggest use of thin Hot Stuff for these preceding steps.

A piece of 1/32 diameter wire should be installed common to the center rib upper and lower surfaces and extending from the bell-crank mounting area to the trailing edge. Spiral wrap Kevlar thread around the center rib assembly with plenty of wraps (10-12) directly behind the spars and immediately in front of the trailing edge joiner. All this wrapping can be tack-glued in place with thin Hot Stuff.

The bladder compartment can now be installed; it is simply two pieces of balsa. Fuel-proof this box completely with epoxy.

Carving the stab to proper shape means rounding the edges a little; no airfoiling is required. To be strictly faithful to Beliaev's design requires reinforcement of the elevator with .010 aluminum sheet attached with contact cement. Use of 1/4-in. ply is an alternative, even though not bullet-proof. Most any plastic film may be used to cover the elevator, but prior to covering you may wish to substitute your favorite version of a hinge pin arrangement, as we have been unable to find any nylon fittings similar to those used by Beliaev. DuBro 1/32 aileron wire bearings are suggested and have proven reliable on many AMA (Fast) Combat models.

Covering. The model is now ready to be covered, and the choices are many since paper-covered foam is not overly sensitive

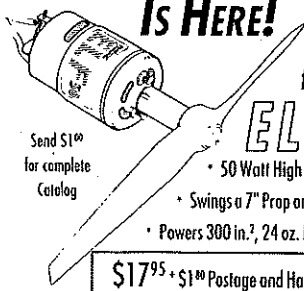
to heat. FasCal is fine, though a bit heavy. The Soviets use a one-mil Mylar material that is light, tough, and most important does not have gobs of adhesive that would only add extra weight to open structure. They attach the covering with a thinned mixture of some seriously gloppy stuff which closely resembles 3M Weather Stripping Adhesive and is used to attach weather stripping around automobile door frames.

We can get the same results with a light coating of 3M 77 Spray Adhesive, after which any heat-shrinkable film may be attached and shrunk tight with heat. I returned from Leningrad with a huge roll of the Soviet's covering material which I used on the FAI models, although other versions of the same design have been covered in Clearplane, available very cheaply from floral and crafts supply houses.

In a fit of misapplication of available resources and no matter which of the two coverings were used, I sprayed 3M 77 into a small container and then brushed the stuff onto the structure. This is not as bad a deal as it sounds as Beliaev only attaches the covering to each rib, the center rib, trailing edges, all around the tip ribs, the center rib doublers and a real good coat of glue to the bladder box. No glue is applied to the leading edge itself, and each panel is covered with one piece of film.

Total weight of covering adhesive when used as described is one gram. Total weight of Soviet-supplied film was 23 grams and

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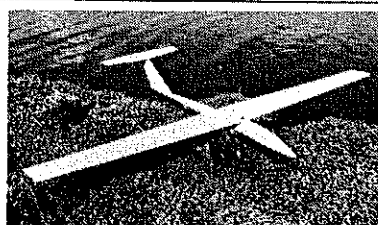
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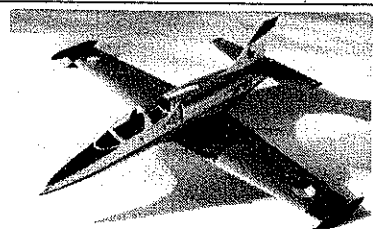
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the Clearplane added 22 grams. Suit yourself, there are many acceptable ways to cover this model. (If I ever get time to build one of these models as a super-light, Saturday afternoon hot rod destined for no more than freakin' the folks, I will certainly try Micafilm adhered with 3M 77, as this is real serious covering material.)

With the model covered, glue a piece of 1/64-in. ply to the covering over the bladder box as shown on the plans. Fuel proof where required, with special attention paid to the motor mount area. Install the elevator, complete with control horn, retaining the hinge pin with a piece of tape. The bellcrank is now installed and you will find a 2-in. Fox or a Sig 'crank cut to 2-in. spacing works. Beliaev uses a machined aluminum pin to retain the 'crank; 6-32 all-thread rod may also be used.

The pushrod must be relatively stiff, and a visit to a local fabric store will net you a #3 aluminum knitting needle which will work well. As shown in the pictures, a DuBro 1/2-in. wheel collar accepts the pushrod, and a 4-40 capscrew secures the collar to the control horn while also positively retaining the pushrod. Adjustments are relatively easy and wear appears to be minimal. Total elevator movement should be no more than 1 1/4 in. for first flights, and less is a good idea.

Attach your favorite high-perf 2.5 cc engine, and be aware that this model is designed to use one to three degrees of thrust offset to the outside of the circle. Don't for-

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get the engine retaining wire attached to whatever bellcrank anchor is used. Yes, it would be nice to be bolting on one of the STELS-produced Gievsky 2.5 cc pieces, as this model was designed with that motor in mind. However, these are still relatively difficult to come by in North America. Even if the model is nose-heavy—and it no doubt will be, as all neat 2.5 cc engines I know of are heavier than the Gievsky number—fear not. You really don't want to attempt the first flight with the suggested balance point anyway. A first-flight balance point 1/8 in. further forward is fine, another 1/6 in. if you haven't flown for a while, a little more if you haven't flown much lately and are prone to brain-fade in the first place. This is not your father's Ringmaster; this is a com-

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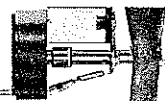
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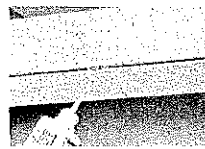
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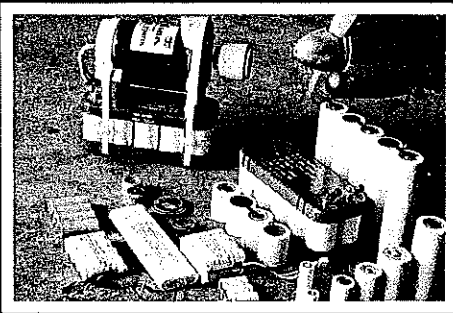
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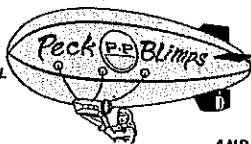
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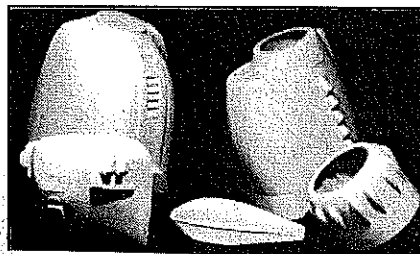


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loops can be easily opened up, and one can exit loops with precision.

One of the favored show-off tricks is to begin a large inside or outside loop, progressively cutting it a little tighter each time around. By the time you have max elevator cranked in, the model appears to be pivoting more than turning as the loops are not much more than 3½ to 4 ft. in diameter. Those outside the circle can easily look down on the tops of loops performed at very low altitude. (Okay, don't believe it. I know I didn't prior to actually flying one of these models.) While the model does slow down some when cranked to full control, you will be amazed at how little speed is lost. And—at least with a Gievsky 2.5 cc motor installed and singing its song—acceleration upon exiting this maneuver is immediate.

By the time you work yourself into a full frenzy, fiddling with tip weight, elevator throw, engine offset and moving the balance point into "we're-serious-now" range, you are in for a special treat as all manner of wiggles, squiggles, stair steps, hookers, squares, come-backs, diggers, "S" turns with a huge half loop leading into an itsy bitsy half loop the other direction and other outrageous maneuvers are just a flick of the handle away. And when you get totally confused low to the ground and plug it in, you'll get your chance to see just how rugged this design really is.

As Beliaev, himself, says of his design, "The construction of this model is simple enough to allow for easy building while also being extremely reliable in competition. I feel construction of the model as presented in this article is the best I have ever used. Happy flights to you."

I would like to thank Viacheslav Beliaev for freely and openly supplying plans and information about his design in a move I have found to be typical of Soviet modelers in that they are most willing to share designs, systems, props and engines which have been years in development and are extremely competitive at the highest levels of competition. And of course publication of this design would not have been possible without a lot of effort—both in Leningrad and here in Seattle—on the part of Svetlana Filippova.

Continued on page 168

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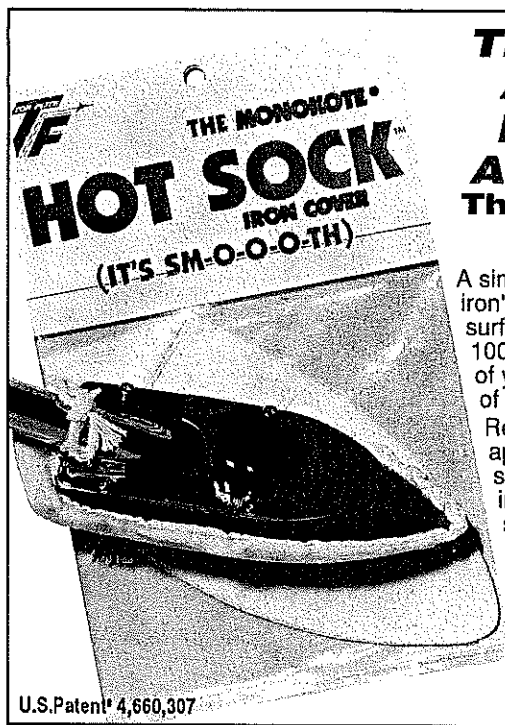
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Continued from page 164

Technical Data:

Wingspan: 47 in. Total area, including tailplane: 532 sq. in. Model Weight, less fuel: 16.8 oz. Wing loading: 4.55 oz. per sq. ft.

Note: While 16.8 oz. is a good weight and typical of Beliaev's models, 15.5 oz. is better and can be achieved with U.S.-produced

foam, good wood and Hot Stuff glues. One 14.2-oz. model has been built, but the structural integrity was compromised rendering it unsuitable for FAI competition. Still, it's a real killer in the air . . .

SAFE FLYING IS NO ACCIDENT

CL Combat/Johnson

Continued from page 53

lightest (and trickiest) parts possible.

Tony Drago sent a catalog listing a variety of Consolidated kits sold by Control Line Classics. Remember the Wow and the Wowie, the Manx Cat V and the Twin Terror? Here's your chance to enter Nostalgia Combat with a 520-in. twin-engine model. A K&B .15 and .19 Greenhead would be just the ticket. The Control Line Classics catalog lists a whole bunch of other interesting models. You can contact Tony at 24981 Nogal St., Moreno Valley, CA 92388. (Telephone: 1-714/242-5077.

The mystery 1/2A model that appeared in the January 1990 column belonged to Ken Powell. His newer SN003 replaces the SN002 pictured (I figured that out on my own). Ken's airplane features .010 unidirectional graphite (you know where you can buy it, right?) bonded directly to the foam with epoxy resin. He uses a balsa body with .020 Kevlar-49 doublers. Ken also included a lot of information about the airfoil, but I know you're still thinking about the graphite and Kevlar.

Ken had an ulterior motive, too. It seems that he sells two different styles of T-shirts. I've seen a number of the local hotshots wearing his Combat tees, and they look really sharp. You can reach Ken at 8439-F Sunset Trail Place, Rancho Cucamonga, CA 91730.

How about doing some public relations work for Combat? Chip Giordano sent me a packet of items the Pinelands Combat Team uses in the quest to be known as nice guys. Chip sent a nice article from the local newspaper featuring a picture of guess who, along with a well thought out explanation of what Combat is all about. The

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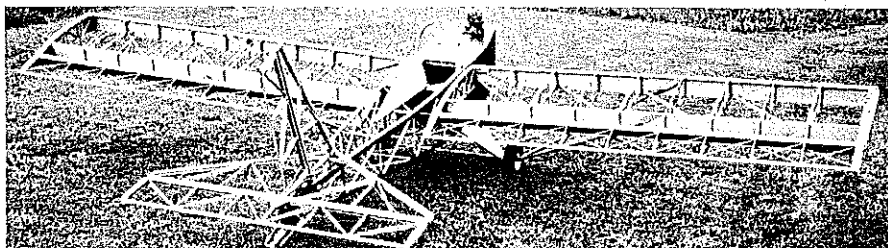
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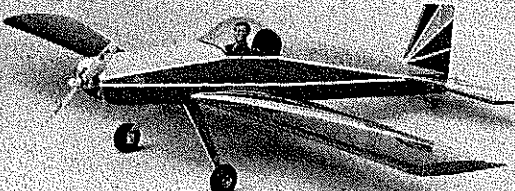

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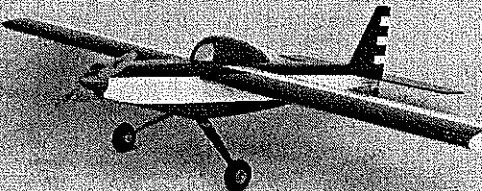

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The elevator and rudder servos were installed with servo-mounting tape directly to the 1/8-in. sheeting inside the cabin area. My pushrods were the old-fashioned kind made from 1/4-in. balsa sticks with wire ends attached with thread and glue. It will take a bit of juggling to get them in, so do it before you install the windshield! If you put slots in the sheet balsa pushrod exit plates before you glued them in place, you will find that fishing the pushrods through will be much easier. (Why did I do all this stuff wrong the first time?)

Anyhow, hook up all the servos, pushrods and control horns. Set the control throws at about 1/4 in. for the rudder and elevator. I rigged the ailerons to ride 1/8 in. high with the servo at neutral. This fools the model into thinking it has lots of wash-in in the wings.

The final trim items can be added now. I used black trim sheet for the lightning stripes, door outlines, and wing walks. Cut a light sheet of clear plastic for the windshield and fit it in place. Access holes for the fuel filler and needle valve will have to be cut, as will an exit for the antenna and the radio's On/Off switch. (Details! Details!)

Install the rest of the radio equipment. Move it around so that your Staggerwing balances as shown on the plans.

Mount the engine and check for the correct amount of down thrust.

Before you set out for the flying field, check the model over for warps and correct

any you find.

For the first few test flights I suggest that you use the old Free Flight formula: Long, tall grass; calm weather; no observers; put the prop on backwards. The absence of observers will help with your confidence, and the backwards prop will allow the engine to wind up to its full power without overpowering your Staggerwing on its first few flights.

If you've managed to keep the model's weight down, the Staggerwing is a snappy flier. Mine used micro-sized radio and servos and a 250-mAh battery pack to weigh in at 10 oz. ready to fly. The Staggerwing is a fast-flying model, so don't expect a floating glide. You can stretch the glide, though, because it is so slick and clean.

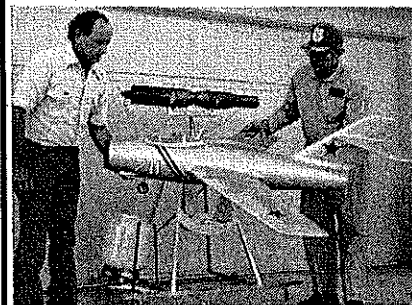
I hope that you have as much fun with your Staggerwing as I have with mine (more fun, if you remembered to put the aileron control horns on the top of the ailerons). Tell your envious friends to order their own set of plans and get started!

Electrics/Kopski

Continued from page 45

tor base. The remaining terminals are wired with the polarities shown in the illustration. I like to use two-conductor, 20- or 22-gauge, flexible, stranded speaker cord (so-called zip cord) for this. This wire is adequate for carrying the charge

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