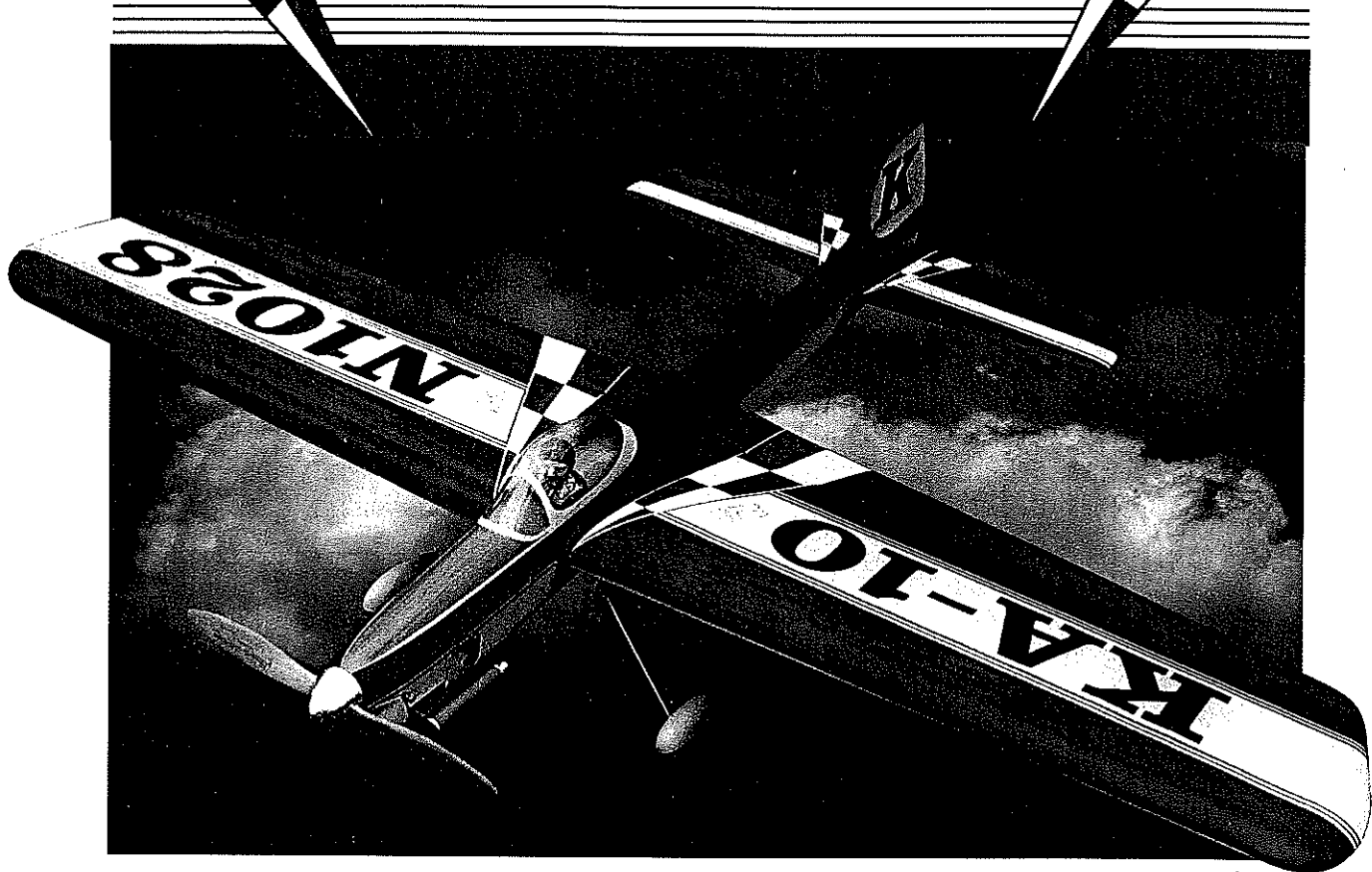


KA-10



■ Tom Dixon

For a number of years I have been drawn to developments in Control Line Precision Aerobatics outside the US. A model that caught my eye in the *Aeromodeller* coverage of the 1986 World Champs was the winning model of Anatoly Kolesnikov, flying for the Soviet Union. It is seen again, along with other finalists, in the videos of the 1988 World Champs in Kiev (still available from Windy Urtnowski).

I was particularly interested in Kolesnikov's method of shutting down the engine exactly two laps after the last maneuver, with a quick pull on the lines. This mechanism was so effective that it was outlawed by FAI (Federation Aeronautique Internationale) in 1990! Over the years I

have been trying to get data on the model and shutoff.

In 1991 I was able to get some beautiful drawings of the shutoff mechanism from Svetlana Filippova (now Miles) through Dan Rutherford. I was totally intimidated by the intricacy of the spring-loaded bellcrank and need for very exact adjustment of spring tension. I decided to "pass" on that feature!

Data on the design remained elusive. In late 1993 I met Roland Surugue, a world-class Team Racer from France. Roland had an ongoing relationship with the Soviet Team Racers and engine builders, and he offered to try to track down data on the model. By mid-1994 Roland had dimensions of the Kolesnikov model and a full-size drawing of the airfoils at root and

tip. No construction data was available.

Several versions of the airplane were built by Kolesnikov and others. The 1986 model, used until 1990, was red-and-white and had a rounded rudder shape, as on my model. The later versions had swept rudders with vertical trailing edge lines. Canopies have shifted fore and aft slightly, and dorsal fins made shorter or longer; these cosmetic differences are of no consequence in performance. All of the models featured the typical Russian swept-forward landing gear, inline thrust/wing/stab setup, and 10cc custom-built rear-exhaust engines.

A 10cc/.60 cubic inch engine seems a lot for a model this size, but in most cases these engines are run on no-nitro fuel, compared with usual 5-10% nitro in the US. The

specifications called for a 340mm diameter x 4mm pitch prop. That's 13 $\frac{3}{8}$ x 5 $\frac{1}{2}$ inches. Such a large prop would tend to limit engine output somewhat and ensure constant maneuvering speed. The large engine was being used for power and brake.

Kolesnikov's model was not especially light—1,700 grams or 59 $\frac{1}{2}$ ounces. That's a fairly high loading on the 640-square-inch wing. With a smaller engine, performance at that weight would be average, but with the 10cc engine and large prop, there was plenty of power to keep the wing working.

I was astonished to find that the airplane had differential flaps (the inboard flap moves slightly more, to create a rolling force to aid in tension). Most people gave up on differential flaps about 1961. It has been felt that the outward roll this setup creates is more than offset by the consequent inward roll, and also by the difficulties in getting tip deflection correct to get clean square maneuvers. My airplane is built with the customary single flap horn.

The nose moment is fairly long by US standards, because the hand-built engine weighs only about 12 ounces complete with silencer. The silencer weight is distributed somewhat rearward. A shorter nose would require excess ballast; a heavier engine can result in a shorter nose. My airplane uses a Kolesnikov .60 or an ST .50 and has the nose 1 inch shorter.

The KA-10 design is presented here as a tribute to a World Champion. Kolesnikov was also European Champion on several occasions. (I don't know for sure that KA-10 is the accurate name of the model. Kolesnikov's airplanes had KA-10 in large letters on the bottom of the wing. I presume this stands for "Kolesnikov Aerobat 10cc.")

CONSTRUCTION

The construction engineering you see is typical US style, provided by me. Whether it is all similar to the originals is not

known. It is known the wings were built-up and paper-covered, however. I used solid $\frac{3}{8}$ inch spar and elevator on my model for simplicity.

Wing: Begin by making root and tip rib templates of plywood or aluminum. Twelve blanks of $\frac{1}{16}$ balsa are stacked between the templates and are carved and sanded to shape. Repeat for the opposite wing. The spar is $\frac{1}{8}$ medium balsa. Try to make the rib slots and spars slots a snug-but-not-forced fit with one another.

I built my wing "in hand," more or less. To do this, accurately join the spar halves so there is no droop or dihedral. Then join the two halves of the $\frac{3}{8}$ TE cap. I made the TE cap two inches high to match the spar depth, giving an "automatic jig." Draw a centerline full span of the TE cap.

Insert the ribs into the spar, but do not glue. Pin each rib TE to the TE cap, keeping the ribs perpendicular to the TE. When satisfied, glue with cyanoacrylate (CyA). Add the LE strip and hold with tape or pins. Double-check the center of all ribs on the spar, then glue the ribs to the spar and LE strip. Add TE sheeting and webbing.

The ribs in the four center bays are undercut $\frac{1}{16}$ forward of the spar and are planked with $\frac{1}{16}$ balsa prior to addition of LE sheeting. This "double covering" acts as a joiner for the sheeting and as extra insurance for safe handling (most of us pick up models at the wing root). A single layer of $\frac{1}{16}$ at this point is a bit fragile; I add one-inch-wide wide fiberglass tape to the LE sheeting joint.

Add the capstrips and shape the tip blocks, then cut the inboard ribs for leadout passage and bellcrank movement. The bellcrank is a three-inch nylon Top Flite, which is an approximation of the 80mm bellcrank of the originals. A four-inch bellcrank could have been used, but I prefer to mount the bellcrank entirely behind the spar; a four-inch crank would place the pivot farther aft than I wanted. The bellcrank is

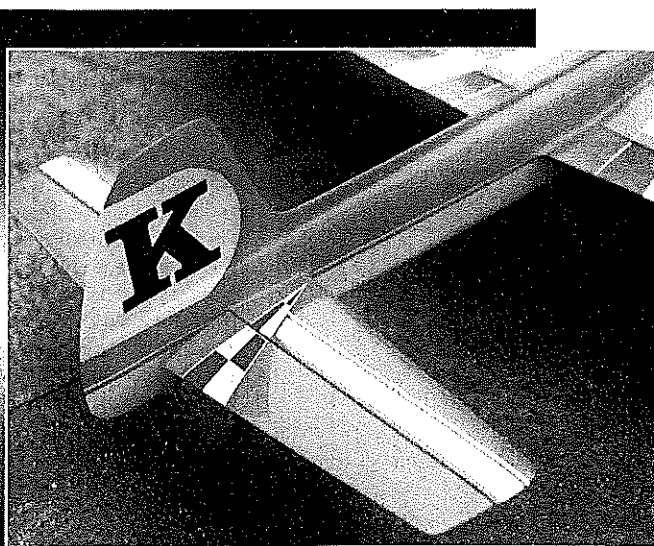
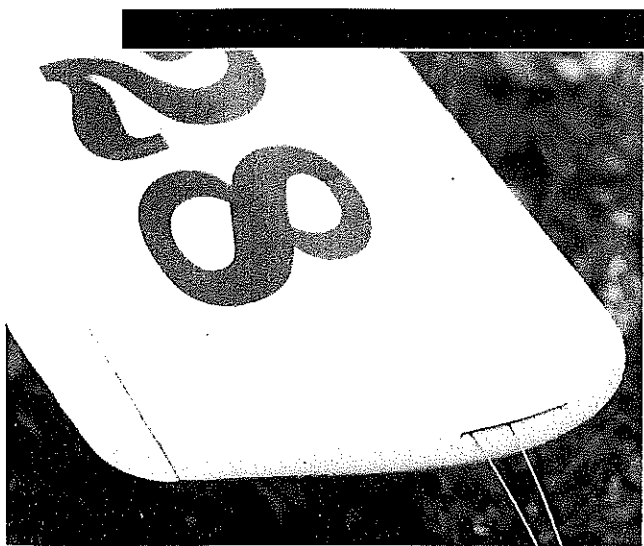
mounted on a piece of 8-32 threaded rod and epoxied to the center ribs. After the center section sheeting is added, "external" $\frac{1}{8}$ plywood mounts are added.

Carve and sand the flaps and hinge as you desire. I used five large Goldberg Klett hinges on each flap and three on each elevator. The flap horn I used is manufactured to my specifications by Karl Siefert. It has "offset" holes to compensate for pushrod angularity inherent in an all-inline setup. Standard control horns will give differential flap and elevator rates when used on an inline model.

I also offset the leadouts $\frac{3}{8}$ below the centerline of the wing at the tip, to partly compensate for the landing gear and cylinder weight, which move the vertical center of gravity (CG) below the wing centerline. I believe Kolesnikov's leadouts were centered at the tip.

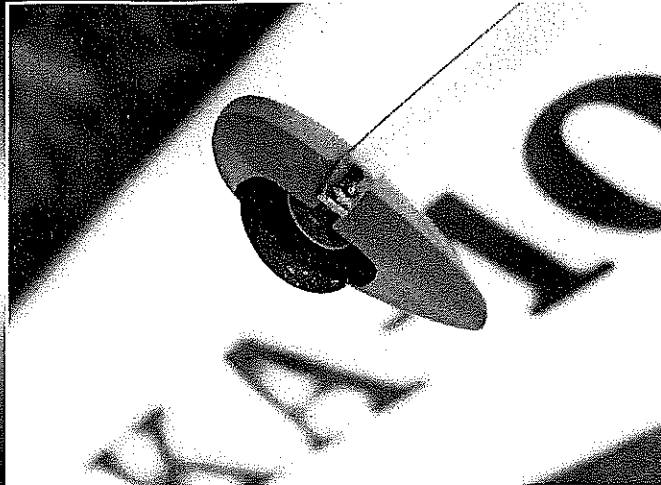
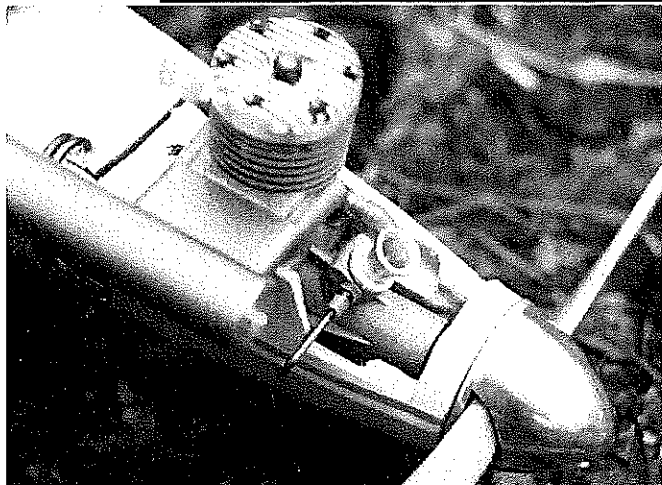
I double-covered the wing with silkspan, using a technique from Walt Pyron: The wing structure is finish-sanded, dust removed, then a coat of Hobby Pox Smooth'N' Easy is brushed on. This is heated with a heat gun and immediately wiped off with paper towels, leaving only the thinnest possible "seal" of epoxy on the wood. Work only on one panel of the wing at a time, or the epoxy will set too much before you can wipe it off. This epoxy strengthens, seals, and fuelproofs the wood, with almost no weight gain. Subsequent dope coats sit "on top" of the epoxy rather than soaking into the wood.

Apply two coats of nitrate dope after sanding the epoxy with 320 paper. Then apply medium silkspan. Fill with about three coats of nitrate and sand as usual. Re-cover with 00 silkspan and fill and sand. The second layer of paper weighs less, fills better, and contributes far more strength than the usual amount of filler coat. I prefinish the wing and tail up to the point of the silver base coat before installing in the fuselage.



about outlet is $\frac{3}{8}$ inch off center to properly align with the vertical Center of Gravity (CG) location.

Tail surfaces are solid sheet balsa. The K on the vertical stabilizer replicates Kolesnikov's own markings.



Engine is Vorobiev plain-bushing .60 from Moscow, Russia. SuperTigre .51 with Stunt rework also works well.

Wheel pants are balsa, covered with fibreglass, retained by single 4-40 bolt. Wheels are Dave Brown Lectra-Lites.

Fuselage: Cut the formers to match the width of the engine you will use. The formers, maple mounts, and cross-grained 1/2 balsa are epoxied together to form an accurate crutch. Drill engine mounting holes and install blind nuts. The 1/2 plywood fuselage doublers are laminated to the sides with slow-cure epoxy. Once cured, epoxy the engine crutch—first to one side, then the other—being very careful to keep everything “square.”

The cutouts for the wing and stab are not made until the fuselage is roughed out. Make a template of the root rib and trace the shape on the fuselage sides with a ball-point pen. Tack-glue the top and bottom blocks and cowl in place and carve and sand to shape. Remove and hollow as shown to 1/8

thickness.

The wing and stab are installed by cutting the fuselage sides at the top, then replacing the cutouts (with doublers behind the cuts) after installation. The landing gear platform and tail wheel mount go in just prior to final installation of bottom block.

My model’s fuselage is covered with .56-ounce glass cloth, applied with Hobby Pox Smooth-N-Easy.

Landing Gear: The plan shows a 1/2 wire landing gear; a custom 1/8 aluminum version is available from BJ’s Mfg.; or a carbon-fiber version is available from the author.

The wheel pants are held in place on the aluminum LG with a 4-40 screw into a blind nut installed in a 1/8 plywood insert into the pant. On wire landing gear, the pants should be permanently installed by soldering a wire brace to the main LG wire, then epoxying this brace into the balsa pant. I feel that wheel pants are mandatory on this airplane; it wouldn’t look right without them.

I used a Sig Super Chipmunk canopy; it is approximately same shape as the custom-molded canopies on the originals.

Flying: My model was built to use a reworked Supertigre .51. While the model was being constructed, I received a lightweight Vorobiev .60 from Russian Team Race engine builder Oleg Vorobiev. This engine fits perfectly in the mounts made for the ST .51. It seemed a natural match for a Russian-designed model. It is unfortunate that this engine is not readily available in the West; it performs in a world-class manner. The plain-bearing Vorobiev has the power and run quality of the SuperTigre .60, but weighs only 11 ounces.

On this engine I use a 13 x 5 B-Y&O prop and a Sig RC plug, Tom Muggleton lightweight muffler and Taffinder “P.A.” fuel, either 5 or 10% nitro, depending on temperature. Line length is 68 feet centerline to centerline. Lap speed is 5.2 seconds, with

the Vorobiev in almost constant four-stroke.

Thanks to Roland Surugue for his help in gathering data on this design, and to Mike Garmon for the inked plans. Special thanks to Anatoly Kolesnikov for his design, skill, and for providing an interesting, inspirational experience. ➔

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Control Horns:
Karl Siefert
2804 Gilham St.
Philadelphia PA 19149

Canopy, Balsa, Paint:
Sig Mfg.
401-7 South Front St.
Montezuma IA 50171

Aluminum Landing Gear:
BJ Mfg.
5630 S.W. 176th St.
Dunnellon FL 32630

Propellers:
Clarence Bull
B-Y&O Props
Box 492
Harrisburg OR 97446

Muffler:
Tom Muggleton
13045 Tom White Way, Unit F
Norwalk CA 90650

Fuel:
Doug Taffinder
8345 Delhi Rd
N. Charleston SC 29406

KA-10

Type: CL Precision Aerobatics

Wingspan: 60 inches

Engine: Vorobiev .60 or ST .51

Flying Weight: 59½ ounces (original)

Construction: Built-up

Covering/finish: Silkspan and dope

