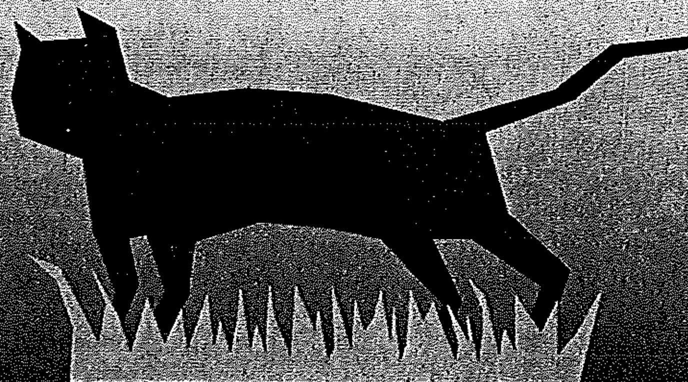
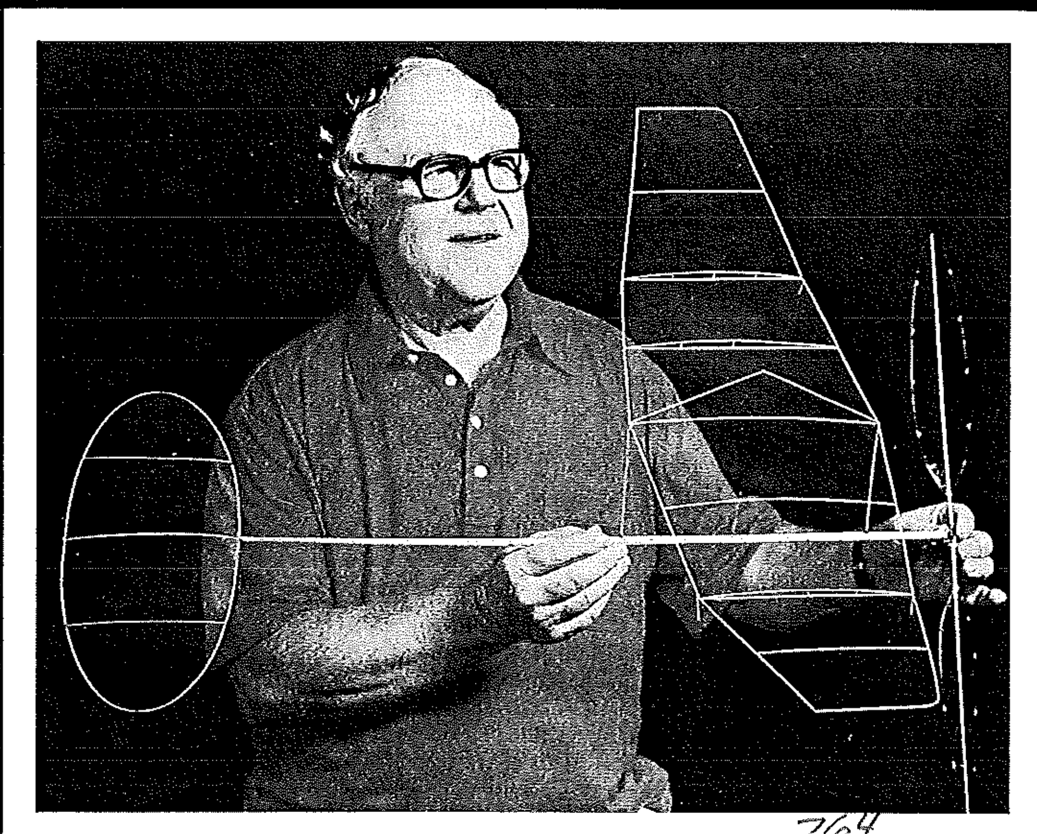
Super Cat II



■ Bob Randolph



This outstanding Indoor design just kept breaking world records until it had them all

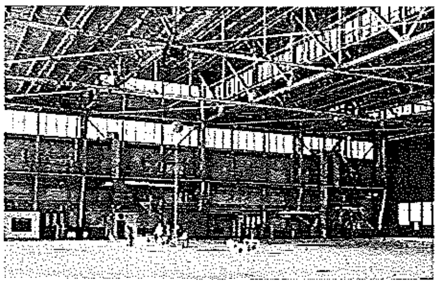
In a five-month span, Super Cat II captured all the Indoor model world records. Its 55:06 Cat. IV flight is the longest ever made by a rubber-powered Indoor model. It features a variable-pitch propeller that can be adjusted to work its magic in any size flying site.

Super Cat II on its way to the Cat. I record. It took almost 13½ minutes to reach the 23-foot Loma Linda ceiling.

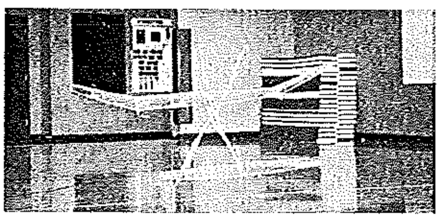
Super Cat II World Records

DATE	PLACE	CATEGORY	DURATION
September 26, 1993	Norton AFB	III	45:14
October 17, 1993	Norton AFB	II	45:32
November 28, 1993	Tustin MCAS	IV	53:48*
December 5, 1993	Tustin MCAS	IV	55:06
January 9, 1994	Loma Linda	I	36:40

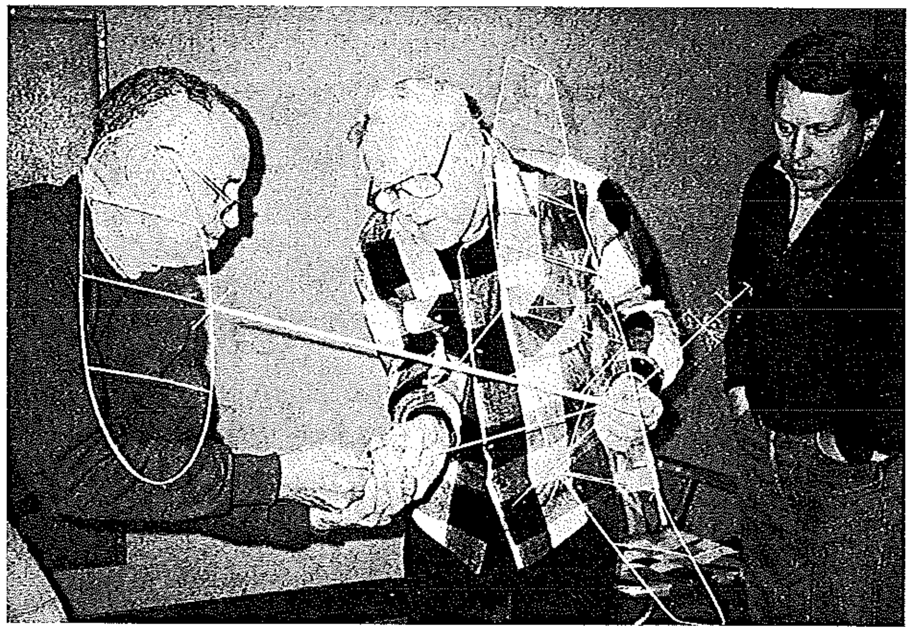
* not claimed



A great Cat. II flying site: Hangar 795 at Norton Air Force Base has a 47-foot ceiling and large floor area.



Prop pitch is very high at launch. There is very little forward thrust when fully wound, which holds down the climb.



After a record flight, Warren Williams counts unused turns while Bob holds the model and Steve Brown looks on. Boron rudder and prop outlines are almost invisible.

I've developed many winning and record-holding Indoor models during the last 32 years, but Super Cat II (a small D Indoor Stick design) is definitely in a class by itself. Its success exceeds my wildest dreams, and the ease with which Super Cat II knocked off new records is almost embarrassing.

At the time of this writing, all of the world records are pending, because it takes 8-10 months for the Federation Aeronautique Internationale to homologate and approve them.

Super Cat II is really a third-generation design. The objective was to design a new wing for my FAI models, keeping the same area but stretching the span to the maximum that would fit in my model box (35 inches). I wanted to still utilize my FAI motorsticks and props but gain the added performance of a high-aspect-ratio double-tapered wing.

The first version set a Cat II. world record with a flight of 37:12 in Seattle on July 20, 1992. Next came Super Cat I, which had a longer tailboom and a unique stab that was half wood and half boron. It was lighter but proved to be too weak and flexible; sometimes the stab film would get wrinkles and distort, causing it to flap like a manta ray with high drag. I did manage several good flights of more than 12 minutes on a ¼-length test motor in a Cat. I site before I moved on to Super Cat II.

Experiments with the new Tan II rubber in June 1993 proved to me that shorter and lighter motors were possible with this rubber's superior power, so I shortened my motorsticks to 14½ inches and lengthened the tail booms to 12 inches. I also increased the stab span to 18 inches and separated the boron rudder from the stab bracing post. Prop diameter was reduced to 22 inches and the low pitch to 34 and 35 inches to better utilize the last winds of a lighter motor.

Super Cat II features a variable-camber double-tapered wing, a 56-58% center of gravity (CG), and a variable-pitch (VP) prop with boron ribs and outline with separate nylon adjusting screws for maximum high pitch and pre-load tension.

The following are extracts from my record claim dossiers:

Cat III 45:14 September 26, 1993

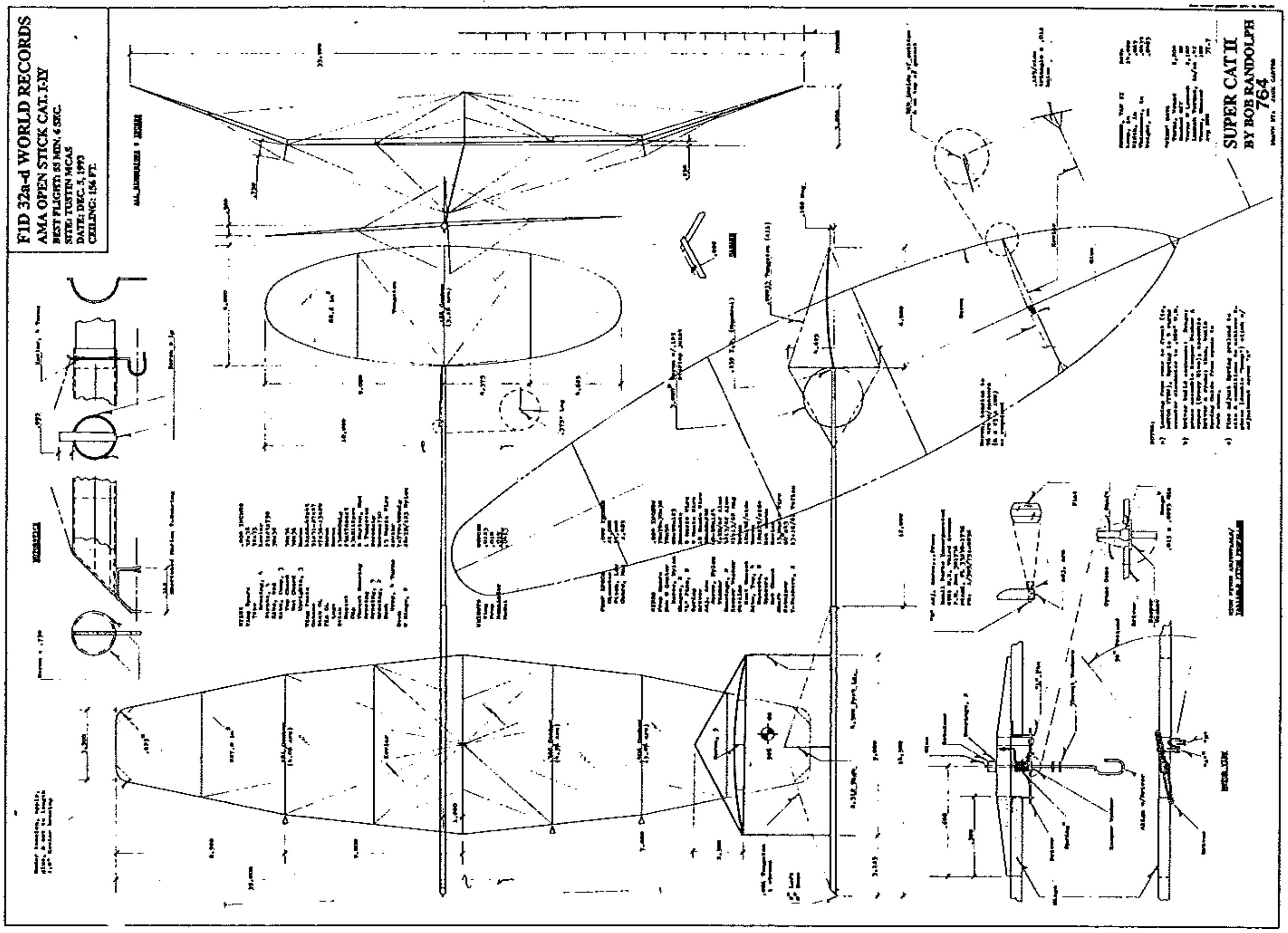
The weather was perfect for Indoor models with a high of 97°F, light winds, and low humidity. The flying site was Dock 1 at Norton AFB with an arched roof and 80-foot FAI ceiling.

Its big problem was many hang-down lights that extended to 53 feet in the center third of the hangar and even lower at both sides. Flight above 53 feet required precision steering and release to avoid the four irregularly spaced lights that surround a model and are never more than 15 feet away. At my age (70), the stress involved was close to my limit.

In addition, 8-10 pieces of a huge disassembled C-141 field maintenance stand were stored on the hangar floor. The largest piece was 20 x 8 and 8 ft. high. Also there were five or six hang-down ropes near the hangar sides.

Upon the completion of satisfactory half-

Full-Size Plans Available–See Page 168



motor test flights, three official attempts were made. The first attempt was terminated at 12 minutes when the motor suddenly broke and dropped off. Damage to this model was sufficient that I had to go to a backup model and more tests.

Half-motor flights of 24:24, 21:36, and 23:05 with heights of 50, 40, and 39 feet indicated this model was ready. The first attempt resulted in hitting a beam and an exciting 15-foot tail slide before recovering for a 41:19 flight. I made a different motor and a VP prop adjustment and was ready for the record flight.

I wound 2040 turns into a 13¼ x .0435 x .058 motor and backed off 120 turns for a launch torque of 27. At 5:50 p.m. and a floor reading of 92°F, the model was launched.

The climb was very slow, taking five minutes to reach five feet in altitude. Low-level drift moved it toward the corner of the hangar. At 12-13 minutes, the model reached 18 feet and increased its climb rate slightly. A steer was required to move away from the corner and lower lights.

The model certainly appeared to be underpowered; to our surprise, however, it continued its slow climb to 62 feet or about nine feet above the lights. I estimate that it peaked at 30 minutes. Drift was low at the higher levels, but two steers were made to avoid the hang-down light lines.

As it slowly descended, drift increased, and later two steers were needed to avoid the maintenance stand parts. Super Cat II was about 12 feet high when it passed the old (44:43) record, and a cheer went up from all present. The model settled in at 45:14, using all but 50 of its turns, yielding an average rpm of 41.3.

Super Cat II

Type: FF F1D Indoor

Wingspan: 35 inches

Rubber motor size: To suit site/ conditions

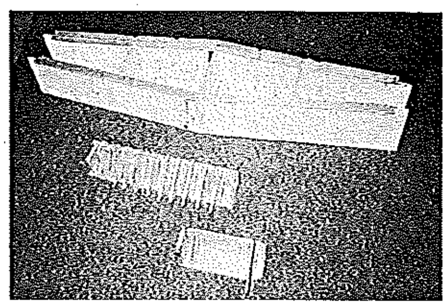
Flying weight: .0413 ounce (less rubber)

Construction: Built-up, balsa/ boron/Kevlar

Covering: Microfilm

Cat. II 45:32 October 17, 1993

The flying site was Hangar 795 at Norton AFB, San Bernardino, California, where I retired from the USAF twenty years ago. It has a level open-beamed ceiling 47 feet, 7 inches high with the lights above the beams. The only physical obstructions are three ropes hanging down near the eastern side.



Top: Super Cat II wing bracing jig. Center: A multipitch propeller jig. Bottom: A prop pitch checker for field use.

It had rained the day and night before, and a leaky roof allowed many water puddles to remain on the hangar floor. The weather outside was partly cloudy with 10 mph winds, and the temperature inside the hangar reached a high of 78°F.

My Super Cat II design was almost the same as I used for the Cat III record.

About 7% greater power was required than usual, because of the cooler temperature and higher humidity. I made a half-motor test flight of 20:30, and decided I was ready for an official attempt; however, the observers had not yet arrived. Instead, I made an unofficial full-motor test flight of 42:30, staying about eight feet below the beams.

The observers arrived at 3 p.m., and I was more than anxious to make an official attempt.

I carefully wound 1940 turns into a 13 x .0435 x .062 motor, and backed off 60 turns for a launch torque of 35. The model was released inches from the floor, and it climbed slowly but steadily to about 40 feet.

Eighteen minutes into the flight, it was down to 35 feet when the prop moved to a lower pitch and it started another slow climb, peaking at 43-44 feet.

While it drifted around somewhat, my main concern was that the 20 or so pigeons that were flying about might collide with my model and possibly spoil a great flight. Near the 40-minute mark, the ship drifted to within a foot of one of the hang-down ropes, but no steering was required. The model finally settled to the hangar floor at 45:32. The turns remaining were counted, and the average rpm was determined to be 35.7.

Cat. IV 55:06 December 5, 1993

It was another beautiful California day with sunny clear skies and light calm winds. The flying site was Hangar 1 of the Marine Air Station, Tustin, California (formerly called Santa Ana). It is probably the best Cat. IV site in the world, due to its size and good weather.

The dirigible hangar has an open-beamed arched ceiling that is 156 feet high at the center. The only obstructions were rows of helicopters parked on each side of the hangar. This was no real problem, but required some steering.

While the huge main hangar doors were closed, three large entrances approximately 10 x 10 feet had no doors. It had been almost seven years since we last flew here.

My Super Cat II design is the same as I used for the Cat. II and Cat III records.

The VP prop was adjusted for a lower high pitch, to climb properly without using heavier rubber. A half-motor test flight of 26:28 indicated that the prop/power setup was about right.

I carefully wound 2200 turns into a 14 x .0435 x .063 motor, and backed off 20 turns for a launch torque of 42. At 3:50 p.m. the model was launched about three feet from the floor. It climbed steadily and was just below catwalk height at 14 minutes.

I was quite concerned that it might outclimb the site and hang up, since it usually starts a second climb at about 18 minutes. My first steer was made at 19 minutes to avoid the catwalk. The model peaked out at around 32 minutes at 136 ft. and centered perfectly. When the torque finally decreased and the VP prop reached its fixed low-pitch position, the model started its slow descent. Another steer was made at about 48 minutes to keep it from landing atop the helicopters.

Part of the model's circle was now over our model boxes and tables, so these were quickly moved back. My model finally settled to the hangar floor at 55:06 with 100 turns remaining. The average rpm was calculated to be 37.7.

After the flight was completed, my good friend and former F1D world champion Erv Rodemsky commented that I make it look too easy.

Cat. I 36:40 January 9, 1994

January 9, 1994 was a partly cloudy day with a high temperature of only 66°F with low humidity and light winds. The flying site was the Academy Elementary School Gym in my hometown of Loma Linda, California.

It used to be one of the best Cat. I sites in the world, due its 25-foot one-inch ceiling, good air, recessed lights, and solid wooden beams that made hangups almost impossible. Its 85 x 105-foot floor area is surrounded by six basketball backboards.

Two years ago, the school installed rows of 2 x 6-foot soundproof hang-down panels which lowered the effective ceiling to 23 feet. Worst of all, the panel bottoms can easily catch the wing's upper bracing wires.

For the first three hours of the trials, the site had cold air turbulence that made flight adjustment difficult. I finally made several reasonably good half-motor test flights of 20:32 and 20:29. I decided to attempt a full-motor official flight at about 2:30 p.m. with a gym temperature of 66°F.

I carefully wound 1740 turns into a 11.5 x .061 x .0435 Tan II motor and backed off 60 turns for a launch torque of 34. Super Cat II was released about three feet from the floor, and it started a slow, steady climb. It reached the bottom of the hang-down panels at 13:27.

The nine-inch wing post extension kept the model below the panels and reasonably centered. However, many steers were still required because of 50-75 contacts with the panels. The last touch was at 29:12, and Super Cat II settled to the gym floor at 36:40. There were 320 turns remaining, so the average rpm was 37.1.

CONSTRUCTION

The wood sizes that I use are listed on the drawings, but they are for experienced Indoor modelers only. Others should increase the sizes by 20 to 30% to avoid ending up with a model that is too weak to survive the first flight session. Wood selection expertise is very important for light-yet-strong models, but it only comes from experience.

Since the VP props, with their boron ribs and outlines, are the most difficult to make and cover (and describe), let's start with them.

Propellers: A VP prop provides additional flying time by utilizing turns that would have been backed off when using fixed-pitch props to avoid going through the site ceiling and hanging up. Additional time is gained because the super-high pitch at the start is a lower rpm than fixed pitch. Last but not least, VP props provide excellent altitude control. In my book, these advantages far outweigh the .003-ounce weight penalty.

Cut two 1/16 O.D. bearing washers from the side of a beer or soda can. You need to make a hole less than .013 and ream it to exactly .013 in. I must admit that I break so many small drills that I usually end up piercing a small hole using one of Bud Romak's extra sharp pins. The tiny reamers can be obtained from a jeweler (I get mine from Andy Faykun).

Make the keeper washer in a similar manner from .020 magnesium. Keep the hole size under .013 so as to have a force fit on the .013 prop shaft.

Don't forget to deburr the ends of the prop shaft. I find it easier to deform the prop shaft before the hook is formed. I grasp the .013 wire near the end of a miniature round needle-nose pliers, then place on an anvil and strike the upper plier jaw gently with a hammer.

Keep checking the deformity with a micrometer until you have a full .015. You will find that if you use too hard a blow, the wire will be severed.

Now force the magnesium washer on the shaft until it touches the deformity. Place the shaft loosely in a vise with the washer end up. Raise the shaft so that the washer is about 1/64 above the vise and tighten it. Drive the washer down so that it is forced into the deformed spot of the shaft and straight. Now you can bend the hook on the washer side of the shaft. Leave the other end of the prop shaft long but deburred.

Slide the .012 driver arm on the front of the shaft and align it next to the washer and lightly glue it with cyanoacrylate (CyA) glue. Build up a CyA cone over the driver arm and washer on the front side of the shaft by placing the shaft vertically in a vise, hook end up. Place a drop of CyA on waxed paper, and dab small amounts with a pin; it takes about four applications (always wait for the CyA to cure between applications).

The drive pins and spring are made from .009 wire. The spring can be bent around an .032 drill rod to form the nine coils. Glue the two aluminum bearing washers to the hub.

I usually cut a dozen prop spars from tapered stock, then measure, weigh, and sort them into matching pairs. I don't sand prop spars very much, to keep them square and stronger. The spars must mate perfectly with the wood hub at the hinge overlap. I align the hub and spar on a flat surface and tack-glue them with Ambroid thinned with acetone.

For ease of handling, cut the MonoKote into two strips ½ x 2 inches. Place the MonoKote on the correct side of the hub and across the hinge line and iron it on, taking care not to crush the wood. Repeat for the other spar, and trim the Monokote with a sharp razor.

Brush the hinge overlap area with acetone to dissolve the glue, and use your fingers to make the hinges open. The acetone will not effect the Monokote bond.

I suggest that you make the L-pins with

⅛ inch extra length, and glue them to the spars. Slip the spring on the shaft, then slide the hub onto the front of the shaft. If the end of the spring is in the driver arm, you must exert pre-load tension torque so the driver arms will fit on the L-pins.

The adjust screw assembly must be glued to the hub so the screw end is aligned with the driver arm, and has clearance from the spring end and the prop spar. With the screw at max-pitch position, you must be able to get 75 inches of pitch, measured at the six-inch station.

Mark the position of the spring end of the spar and disassemble the hub so you can drill a hole (#61 drill) in the hub, and tap it for the 00-90 pre-load screw. Both nylon screws must be filed flat on the ends to prevent slipping off at high torque.

If you fly just for fun, I would suggest that you make the ribs and outline from balsa. But if you want the lightest and strongest prop, this is how I do it:

Bend the outline tip shape by holding it over alcohol flame. The boron will turn white hot and can be formed. Try to get the tip shapes to match. Boron becomes more brittle from this treatment, so you must baby it or the tip will break.

I make a cardboard template of the blade and lightly glue on the wood triangles that are to be on the ends of the ribs. Next, the ribs are broken off by using a thumbnail so that they are all a little short of the outline.

Glue the ribs on top of the triangles. Now the wooden spacers are glued on the underside of the ribs at the spar centerline. The boron outline must be centered on the prop spar tip and glued.

Bend the boron so it is square with the end of the first rib triangle, and glue. Repeat until you have glued all but the hub end. Break the boron to the correct length for the hub end, and make a balsa piece to glue to the spar. Mark the spar centerline position on the rib spacers with a felt-tip pen. Remove the blade from the template by carefully cutting the triangles and spacers loose.

Make a second blade in the same manner.

To attach the blades to the spar, we need a 34- or 35-inch prop form; I have one that has balsa protractors every inch that can be set for any pitch.

Tack-glue the prop spar on the prop form, align the blade tip in position, and glue. Line up several ribs near the tip so that the spacer marks are on the spar, and pin the outline one station at a time. When the blade is pinned down and centered, glue the spacers to the spar.

The second blade is made in this same manner.

You will note that when removed from the form, all ribs are straight, so we must give them camber.

Place the prop on your building board, with the rear of one of the blades facing upward and its tip end closest to you. Starting at the tip, glue a length of Kevlar to the leading edge, directly over the first rib. Working over the rib, tension the Kevlar to obtain the correct camber by squeezing it just past the trailing edge, then glue it to the trailing edge.

If the camber is right and the Kevlar touches the spar, glue this point also. Trim the excess Kevlar when the glue is dry. With a little practice, the procedure becomes quite easy.

As you may have guessed, covering also requires extra work. Using strong blue microfilm, tape off about a four-inch section of a frame. Using a soft wet brush, place the prop carefully on the film so the tip is flat. Gently brush water on the tip station and on the part of the next station that is touching the film. Allow to dry for about 20 minutes, and cut the first station free with a hot wire.

Wet down another station and a half, wait until dry and cut loose. Sometimes the prop will lay on the film better if shims are used under the hub. Don't try to rush the process, or you will have troubles.

Check the prop low pitch at the six-inch station, and you will find that its pitch is higher than desired. This is because we could not cover the prop while it was on the prop form, and the boron outline tries to straighten itself.

I remedy this by brushing water all around the spar between the hub and blade. Hold the hub and tweak the spar for a lower pitch. Let it dry for 20 minutes in a pitch gauge. Check again and if not correct, repeat the treatment, then check the other blade.

It is very important that the prop tracks perfectly. If it doesn't, use acetone to reposition the bearing washers.

Motorstick and tailboom: These are formed following the standard soaking, rolling, and baking procedures. I use a metal form for the stick and a fiberglass boom form I made from an old fishing pole to get less taper and a stiffer boom.

I use a hypodermic needle to glue the seams. To avoid curved tailbooms from glue shrinkage, I use a special procedure:

Mount the large end of the boom form horizontally on a vise. Slip the baked boom onto the form and clamp down the form end 3/16 inch to bow the form. Glue the seam, keeping it on the top side of the form. The glue shrinkage will straighten the boom once it has dried.

Rudder: Round boron rudders are easily made with this procedure:

Break off a length of boron 1/8 inch longer than the rudder's circumference. Cut a 1/2 x 1 piece of waxed paper and place on your building board. Hold the boron ends atop the paper with 1/8 inch overlap and next to each other. Glue and slide the waxed paper back and forth until the glue dries. The boron will spring back to a perfect circle.

The two mounting boron pieces are best glued hanging straight down. As the glue dries, keep tweaking until they are perpendicular to the rudder. Cover by placing on a frame of microfilm with the mounts up. Wet the entire rudder outline using a soft brush. When completely dry, trim by using a hot wire. *Do not try to use acetone for trimming.*

Wing: Construction is conventional, except that the rib camber tapers. The "fat" end is the inboard wing to generate more lift at its slower speed.

The three built-up ribs have boron uprights and require precision sizing. I get about a 75% yield. Lengths that are too short are discarded. If too long, I place in a diagonal pliers' cutter jaw and break off the oversize with my thumbnail. This will work about half the time. Don't try to cut boron with tools—it will ruin them.

Wing ribs are merely cut off and lightly sanded. I don't use tapered or banana-type ribs.

The rounded wingtips are made by using a heated one-inch curling iron. Mark the tip spar 3 1/8 inches apart and moisten the wood in your lips before bending. They tend to spring back some, but keep rebending until the desired shape is achieved. The tips are strengthened with one-inch lengths of tensioned Kevlar.

When you lay out the wing frame, remember to just tack-glue the dihedral joints, to simplify bending the tips up after the wing is covered.

There are many ways to cover, but I prefer to shim up the wing ribs on a flat board, wet a one-inch-wide ring around the frame, wet the top surfaces, then lower a slack frame of microfilm over the works.

You will need to build a wing bracing jig that provides 1/4 inch of washin between the dihedral stations. The wing posts must be fairly stiff, and may require boron reinforcement. My first eleven Super Cat wings had reinforced posts, but the Cat. I and Cat. IV models did not.

The wing post sockets are round, but the post ends are square. All wing bracing is single strands of monofilament Kevlar. When bracing the wingtips, raise them three inches, but *keep them flat.*

Stabilizer: The stab spars are cut from tapered wood; the tips are tapered by sanding. I still use a scrap splice to join the two halves with CyA. The outboard ribs have 1/16 camber, while the center rib has 3/16. Cover on a flat board and shim under the ribs to retain the correct camber. After covering, trim the film with a hot wire.

Tail assembly: The leading edge of the stab should be shimmed up so it can be glued to the center of the tailboom end. After this is dry, glue the four-inch bracing post to the left side of the boom, perpendicular to the stab.

Install the tungsten wire (also on the left side) starting from the boom and ending at the boom. Be careful—too much tension will increase the stab camber. Keep the stab in line with the boom, and obtain the 3/16 negative incidence when the boom is glued to the stick.

The rudder goes on the right side of the boom. The rear mount is inserted through the boom wall. Before piercing the other wall, be sure the rudder lines up with the stab bracing post.

The front mount is installed in the same way, except care must be taken to avoid causing any rudder camber. The front mount is glued only to the far boom wall, so it can be easily changed to adjust circle size. Brace the leading and trailing edge of the stab with Kevlar, keeping the stab flat.

Insert the boom 1/8 inch into the stick, so the stick and boom bracing posts are aligned, and with 3/8 negative incidence for the stab.

Locating the wing position: The wing should be positioned for a 56% center of gravity (CG) location. While this can be done with a little algebra, I find it easier to use dummy loads for the wing and motor to physically balance the model.

One problem is that we can only approximate the rubber weight. I would suggest using a .050 ounce rubber weight.

Once the fore and aft positions of the wing posts are determined, remember to obtain 1/2 inch left bank in the wing. Drill the wing post holes completely through the stick. Insert, glue, and trim the one 1/16 I.D. paper sockets and we are finished.

O-rings: It is impossible to get the torque you want without using o-rings. Partial test motors require one o-ring; full motors need two.

Partial test motors: I feel very strongly that unless you understand and use correct partial-motor test procedures, you are wasting time and also taking unnecessary risks with your model.

You have spent many hours constructing your model; to just hook up a full motor without partial testing first is in the same class as Russian roulette.

A 1/4-size test motor requires a test stick that is exactly 3/4 of the distance between the prop shaft and rear hook in length, and weighs exactly three times the lubed weight of the 1/4-motor to be tried.

Since only 1/4 of the full motor turns can be put in, the model should be launched at 1/4 normal launch height and climb to one-fourth of the full motor altitude and do one-fourth the flying time. While four times the number of test flights can be made, any error induced by inaccurate procedure or poor height estimates will be compounded.

Different flying sites and weather conditions will change the optimum power. Partial test motors help you find the new optimum motor length and size faster and more safely. After I think I've found the optimum 1/4-motor, I like to verify with a half-motor flight. When there is a lot of ground turbulence in larger sites, I sometimes go directly to half-motor testing.

This procedure will also allow you to use a small site to adjust for a higher site.

Most of my test flights are in a 23-foot site. Last year I made 1177 flights; only 18 were full-motor flights, but six were record flights. Almost all of my test sticks are made from .025 wire. I also have wire balances so I can quickly find the right amount of clay to add to the center of the test sticks as motor sizes vary.

Keep in mind that a 1/4-motor test stick balance needs moment arms that are a 3:1 ratio. The clay to be added must be in the center of the test stick and molded evenly around the stick (wire). Failure to do this will affect the model's balance or crush its motorstick.

VP propeller adjustment: The Super Cat II propeller is versatile—it can be adjusted for all ceiling heights.

For a starting point, I make up a motor about 13 x .065 and put 120 turns in it. This should keep the prop in full low pitch. Launch about waist high, and keep catching the model until it is in level cruise flight.

Remove the motor and measure the cruise torque. We want the blades to just start opening when this torque is applied. This is done with the pre-load tension screw flush with the hub. If it is either too high or too low, disassemble the prop, take the spring off, and bend the spring so that it just opens at cruise torque. The high-pitch screw should be at about the midpoint of its range.

Start again with a 1/4 test motor 3 1/4 x .065, and put in 100 turns to get level cruise and adjust wing incidence and turn size. Try to keep the model from climbing more than 1/4 to 1/2 altitude by backing off from a fully wound 1/4 motor.

Once the model is in this range, you can start opening the high-pitch screw and backing off less. The goal is to back off very little, and to be able to launch with high torque with so much high pitch that the model barely climbs until the torque starts to drop off.

When the model reaches the altitude you have chosen, you can decide if the power was right from the turns remaining when it lands. If it deadsticks, the motor is too strong, and if it has many turns left, the power is too weak. The right motor with a good VP adjustment should use almost all the turns; the old rule of 1/3 row of knots is too much.

The more pre-load tension, the sooner the prop will start going to low pitch. Usually, 1/4 turn with the adjustment screw will advance the start almost one minute.

It is possible to vary the flight pattern by changing the pre-load tension. You can get a second climb when it goes towards low pitch if the motor still has enough power to do it. In a large site this second climb is hard to see, because the model is at a fair distance and the climb is very slow. It is easy to see in a Cat. I or II site.

Anytime you have the high-pitch screw all the way out and the model is still climbing too fast at launch, you must rework the screw amount to provide more travel. Since the prop driver is only glued on, I sort of baby them when I hook up. Until I am ready to launch, I take all of the motor's high torque by holding the hook end of the prop shaft.

It takes some time before you learn what to change to improve a flight. It is strange to see a prop speed up late in the flight when you know the power has dropped off.

Once the model is flying okay, all flights should be fully wound and the launch torque should be kept fairly constant—you can't tell what to change on the prop from a partially wound motor.I would suggest that you not fall in love with a prop setting that produced a good flight. If I feel that I am close to the optimum settings, I make only 1/8-revolution adjustments. I also log the changes in my flight book so that I can always go back to the old settings.

Performance: Many modelers have asked what secret Super Cat II has for its outstanding performance. This is a tough question to answer, because many factors contribute, in addition to a good design.

It is no secret that I fly a lot. This has helped me to really master partial test-motor procedure, and to learn how to adjust a VP prop. I also seek out the very best rubber available, and use it. I also build a lot, and concentrate on only a few Indoor classes. Lastly, most of my flight tests are in a Cat. I site, where it is easier to observe the model's flight and fine-tune my props.

When built and flown correctly, Super Cat II is capable of very high performance. I'm very proud of the many honors it has collected, and I wish you good luck with your building and flying.

Recommended Suppliers:

Indoor Model Supply
1887 Westhaven NW
Salem OR 97304

Micro-X Products
5200 Seven Pines Dr.
Lorain OH 44053

FAI Model Supply (Tan II rubber)
Box 3954
Torrance CA 90510

Ray Harlan
15 Happy Hollow Rd.
Wayland MS 01778

Model Research Labs (.003 boron, film)
25108 Marguerite #160
Mission Viejo CA 92692

Bob Oppegard (rubber cutters)
140 East Golden Lake Lane
Circle Pines MN 55014