

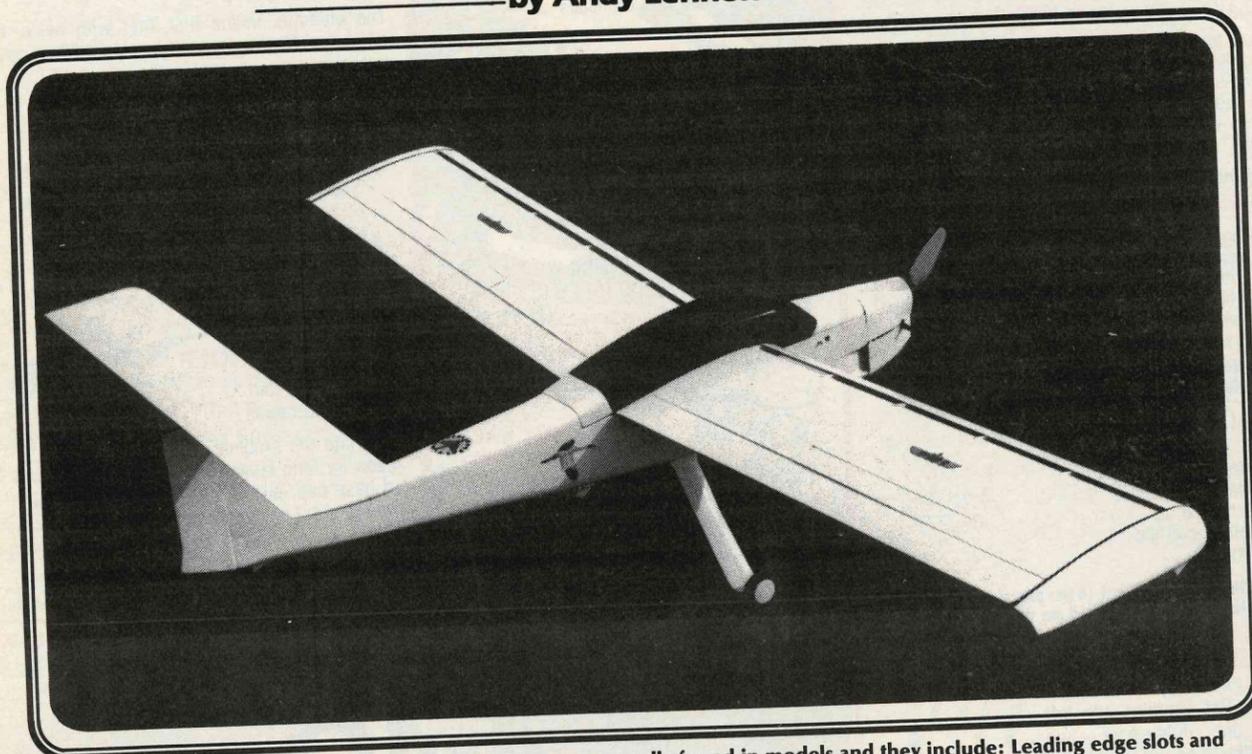
the CRANE

AN R/C S.T.O.L.



The Crane was designed to investigate a variety of aerodynamic devices. The results were fascinating!

—by Andy Lennon—



1. Crane I (it has white wing tips) has control features not usually found in models and they include: Leading edge slots and full-span slotted flaps and spoilers. Ship is true R/C short takeoff or landing (STOL) aircraft.

DESPITE THE ready availability and reliability of radio equipment offering more than four basic channels, R/C modelers seldom utilize the extra control capacity for more than retractable landing gear. The use of aerodynamic devices such as flaps, variable-pitch propellers, slots, spoilers, etc., is not unusual on today's full-scale light aircraft but has not seen much development in R/C models.

The Crane was based on a proven design, the Gull, which, in turn, was a complete redesign of the successful El Seven (*M.A.N.*, September 1980 issue). It employs a variable-pitch propeller, full-

The Crane is capable of almost pattern-ship aerobatics.

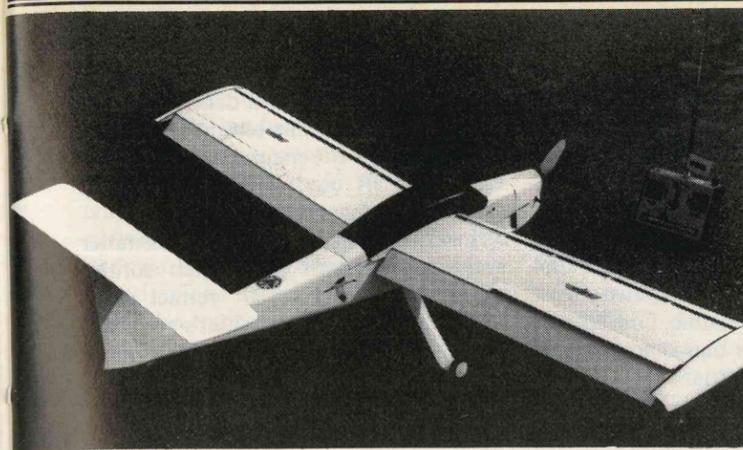
span leading edge slots, full-span slotted flaps, spoilers for roll control, and an inverted semisymmetrical-sectioned, all-moving, horizontal stabilator, the latter partially leading-edge slotted.

It was test-flown in late June 1982 by J.S. (Jack) Schroder, a director of the

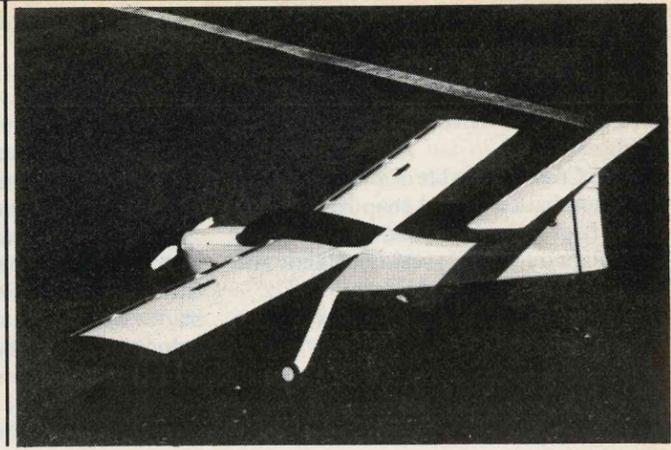
Montreal R/C Club, of which I'm a member. Jack is an R/C pilot of consummate skill and in real life a retired executive jet captain. His assistance and constructive criticism are deeply appreciated. Confidentially, I think he really enjoys the challenge of flying my "creations."

The Crane flew "right off the board," requiring only increased spoiler angle accomplished by moving the mini-links one hole down on the spoiler horns.

During the next five weeks many flights were made and two problems surfaced. The first was a too-narrow tread on the main landing gear, leading to tipping in moderate cross winds unless care was



2. The slotted flaps are deployed and the right-hand spoiler is raised.



3. Rebuilt Crane II (black wing tips); incorporates enclosed muffler, wider tread, stabilator leading edge slots.

taken.

The second, and more serious, was a tendency to enter a shallow dive at top speed in coarse pitch and maximum rpm. This was controllable. Up-elevator, beyond the limits of elevator trim, corrected the situation, but the tendency was disturbing and finally lead to disaster.

In late July we made a flight to further explore this diving phenomena, but the model failed to respond to the up-elevator command and continued its shallow high-speed dive into the ground. Both transmitter sticks were fully back and there was no time to deploy the flaps.

Examination of the radio equipment indicated it had survived this crash and was working. The motor had slowed to "idle" judging from the prop, on which only one blade was damaged, as was the prop hub. The fault was traced to broken gears in the elevator servo.

The impact was so forceful that of the model's structure, only the slats, flaps, and wing tips were salvageable. The motor required a new crankshaft.

Back to the drawing board. I made design changes to correct the faults and built a new model, Crane II, that flew in

CRANE WING AND TAIL SECTIONS

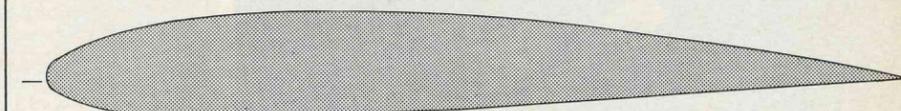


FIGURE 1
BASIC AIRFOIL, NACA 2412, MAXIMUM LIFT COEFFICIENT 1.00 AT STALL SPEED OF 24 MPH, ANGLE OF ATTACK 14°, RN 183.000 AND WING LOADING OF 24 OUNCES PER SQUARE FOOT.

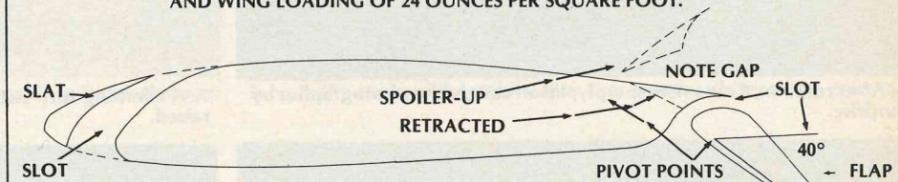


FIGURE 2
SLOTTED AND FLAPPED AIRFOIL, MAXIMUM C_L 2.20 AT STALL SPEED OF 17 MPH, ANGLE OF ATTACK 24°, RN 135.000 AND WING LOADING 24 OUNCES PER SQUARE FOOT. SPEED REDUCTION 7 MPH (29%).

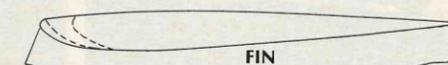
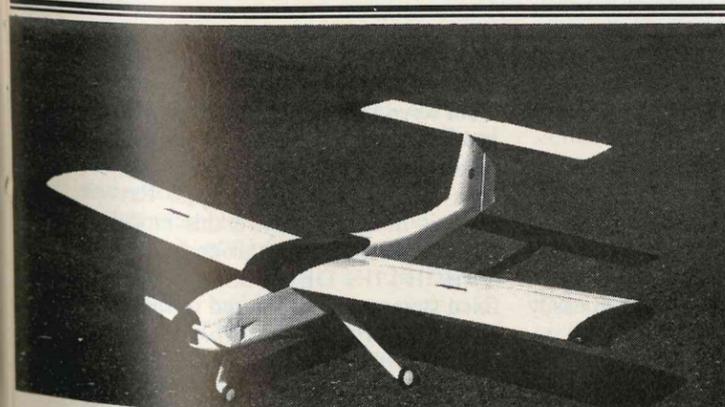
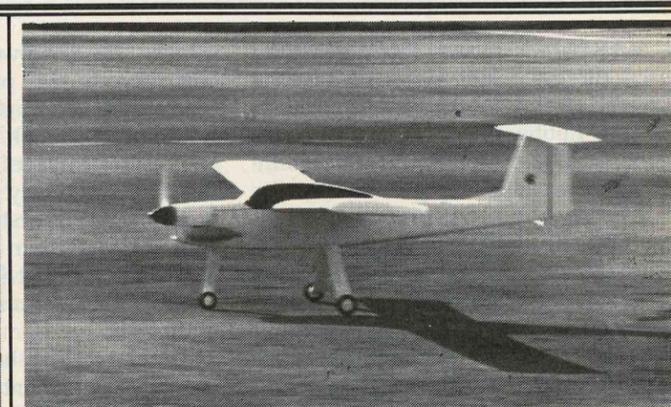


FIGURE 3
HORIZONTAL TAIL PLANE SECTION, NACA 23009, INVERTED AND SLOTTED.



4. Three-quarter front view of the rebuilt Crane II; the wider tread main landing gear is evident here.

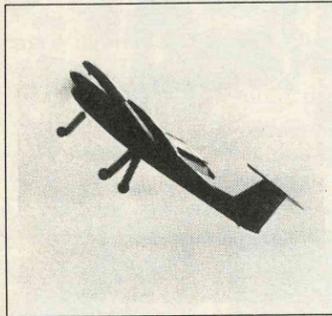


5. At the start of the takeoff run the flaps are deployed halfway; ship becomes airborne quickly.



Part II CRANE

by Andy Lennon



Last month we had the "why" for Crane—this month the "how."



Crane II proved highly successful in flight and provided a great deal of insight into slotted wings and stabilator, variable pitch props, control spoilers, and flaps.

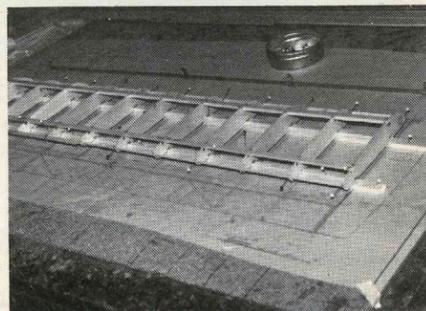
WITH CONSTRUCTION, my personal preference is to make all parts before assembly is initiated, starting with metal parts, then plywood and balsa, and lastly any component requiring fiberglass and epoxy.

You have your own preferences, so you'll do it your way. There is, however, a sequence of assembly to follow that makes the job easier. For example, in bending flap torque arms in 3/32-inch music wire, put on the brass bearings before the final bends. It's hard to force brass tubing to flow around a 90° bend!

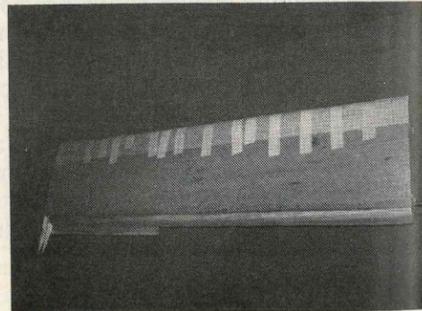
Assemble the slotted flaps first. The mid-span flap support locates the rib in the wing to which it must be epoxied, as you'll see in photo 4. A left and a right are needed.

Silver-solder the spoiler arms to the torque tube after sliding on bearings and stops, and solder the stops where indicated. Make left- and right-hand versions.

Assemble the wing halves—again, left



1. Basic structure built on balsa rails over plans; background spoiler torque tube.



2. Sheeted wing. Masking tape is used to hold front skins while cement is drying.

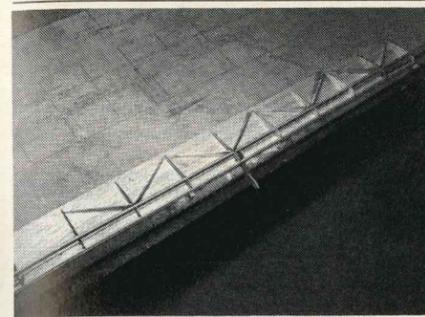
and right—locating flap support ribs as indicated above (photos 1 and 2). Sub-assemble the three components of the center section main spar. Figure 3 shows how the wings' leading edges are in line.

Sub-assemble the stabilator pivot and control horn in the solid balsa of the center section and proceed to assemble and skin

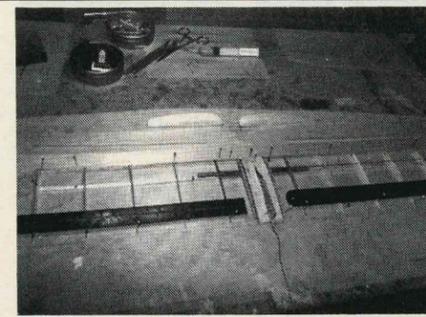
the stabilator as shown in photos 5, 7, and 8.

Assemble the fuselage balsa bulkheads (photo 14) and apply the landing gear fairings on all three legs, as described in the drawings (plate I) and in photos 11 and 12.

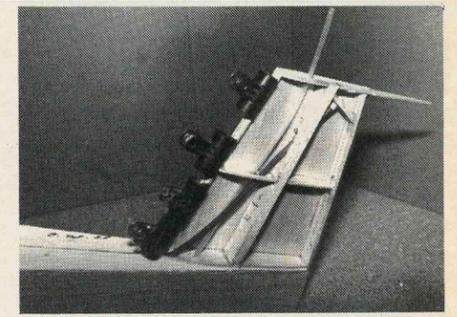
The lower legs will need balsa "elbows" at the wire bends, cut from block balsa.



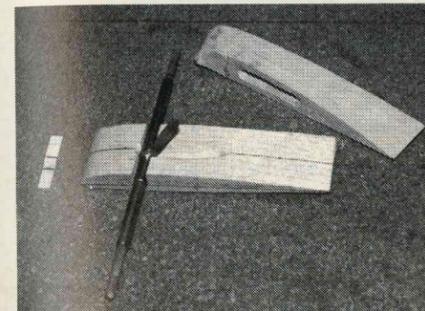
4. Flap assembly awaiting top skin. Note mid-span support.



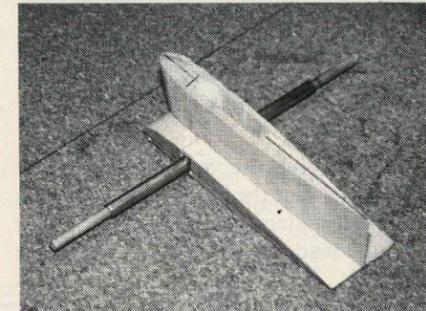
5. This is the stabilator assembly for Crane I; careful alignment is important.



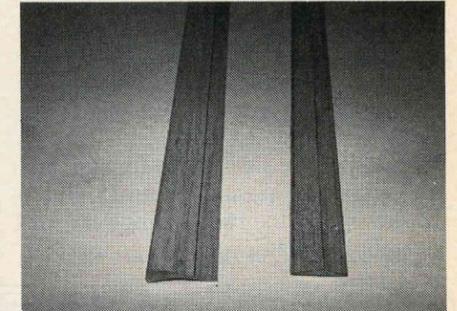
6. Skinning of fin structure; dark tube is elevator rod sleeve, light is antenna.



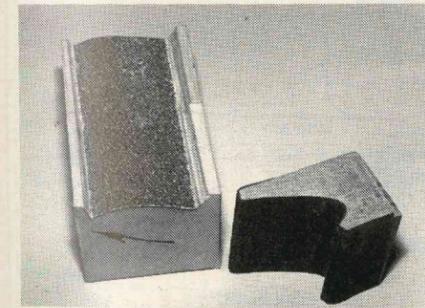
7. Stabilator center section made of solid balsa; note pivot arrangement.



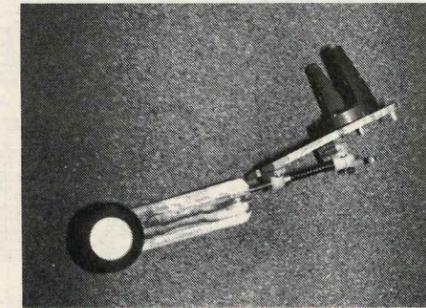
8. Parts joined, but not cemented, to check fit; note slot for horn and Nyrod.



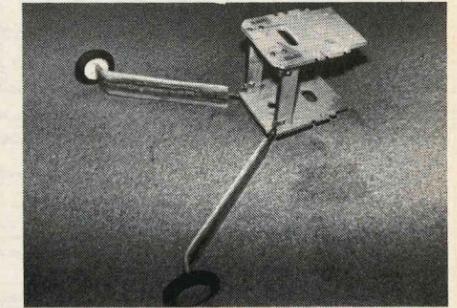
9. End view of leading edge slat and of the spoiler.



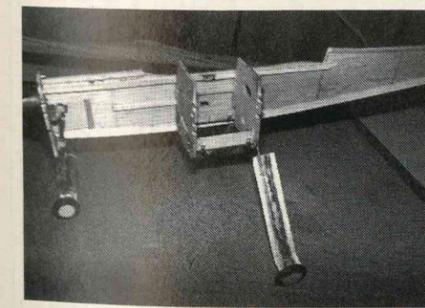
10. Sanding blocks to give final shape to leading edge slat.



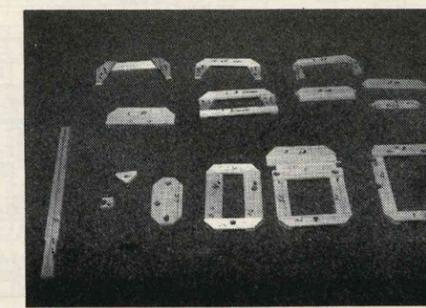
11. Nose wheel, firewall, and motor mount assembly.



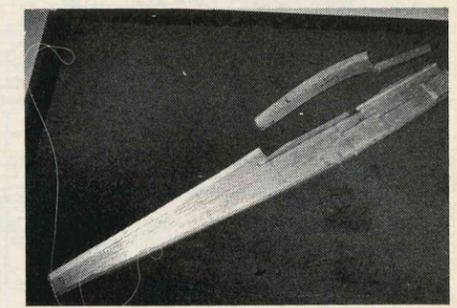
12. Main landing gear assembly with bulkheads 3 and 4 and landing gear beams.



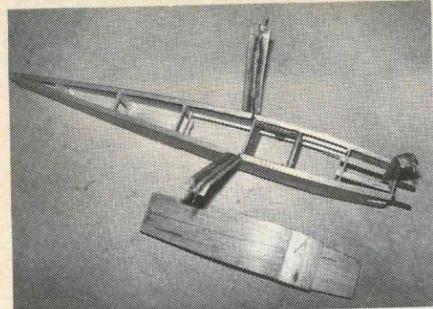
13. Landing gear assemblies positioned on one side of the fuselage.



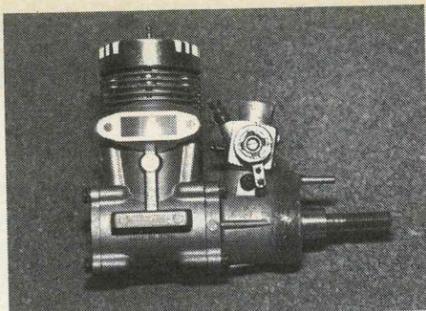
14. Fuselage bulkheads here assembled as is the fin spar.



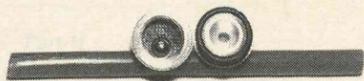
15. These are the fuselage and canopy sides sub-assemblies.



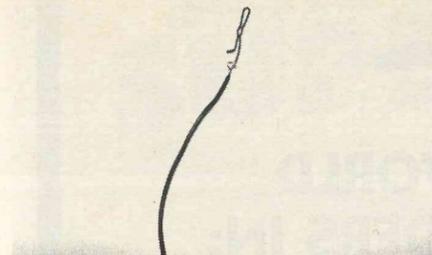
16. Fuselage partly skinned and canopy. All Nyrods must be installed at this time.



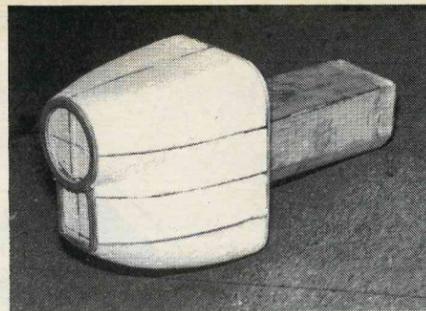
17. O.S. Max .45 FSR engine with propeller pitch control pin epoxied in place.



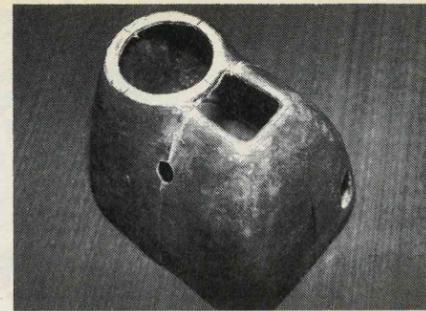
18. Fuel strainer converted to ball check valve for muffler pressure line.



19. Glowplug clip of silicon bronze wire available at local garage as valve spring.



20. Cowl plug. Note the ply pieces forming the spinner ring and cooling air entry.



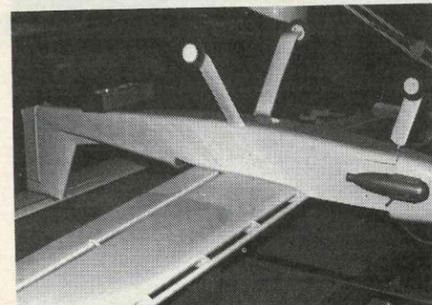
21. Finished fiberglass cowl; note the parting line and cutout for exhaust stacks.

The ply and balsa outer layers are easily bent to follow the curves.

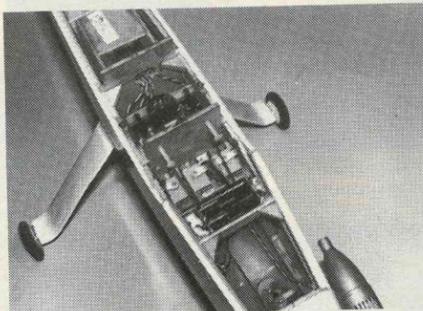
Install nose-wheel gear, its mounts and shock-absorbing spring, and the motor mount on bulkhead 1. Recess the blind nuts of the upper landing gear support to permit the motor mount to lie flat against the firewall (photo 11).

The main landing gear is assembled to bulkheads 3 and 4 and landing gear ply beams as in photo 12. The wheels were slipped on the axles in this photo, for looks.

Assemble the sides of the fuselage and the canopy as shown in photo 15. Photo 13 shows how the two landing gear sub-assemblies and fuselage sides go together.



22. Final assembly of stabilator to fin is done with model inverted.

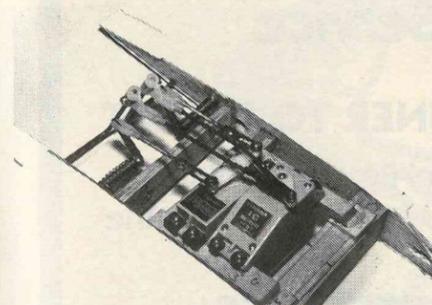


23. Servo installation in fuselage; note push-rod from prop pitch servo.

At this point, use your wing to locate the sides so that the under-wing contours fit the wing undersides, and simultaneously that bulkheads 3 and 4 lie flat against the

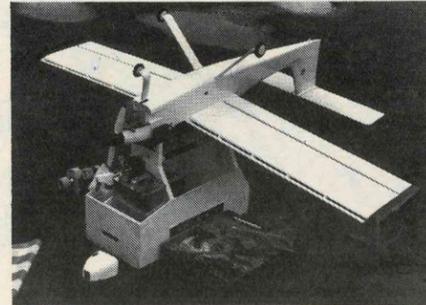
main and auxiliary spars in the wing center section. Insure that the wing is at right angles to the fuselage center line.

The remaining fuselage bulkheads can



24. Flap and spoiler servos installed in wing center section.

now be installed and the fuselage ends pulled together. Sheet the fuselage top behind the canopy (photo 16). Install pushrod casings and aerial tubing before



25. This depicts the inverted engine starting procedure.

sheeting the fuselage bottom. Now examine photo 6 for the fin assembly. Make certain that the fin rear spar and fuselage bottom are at the 95°

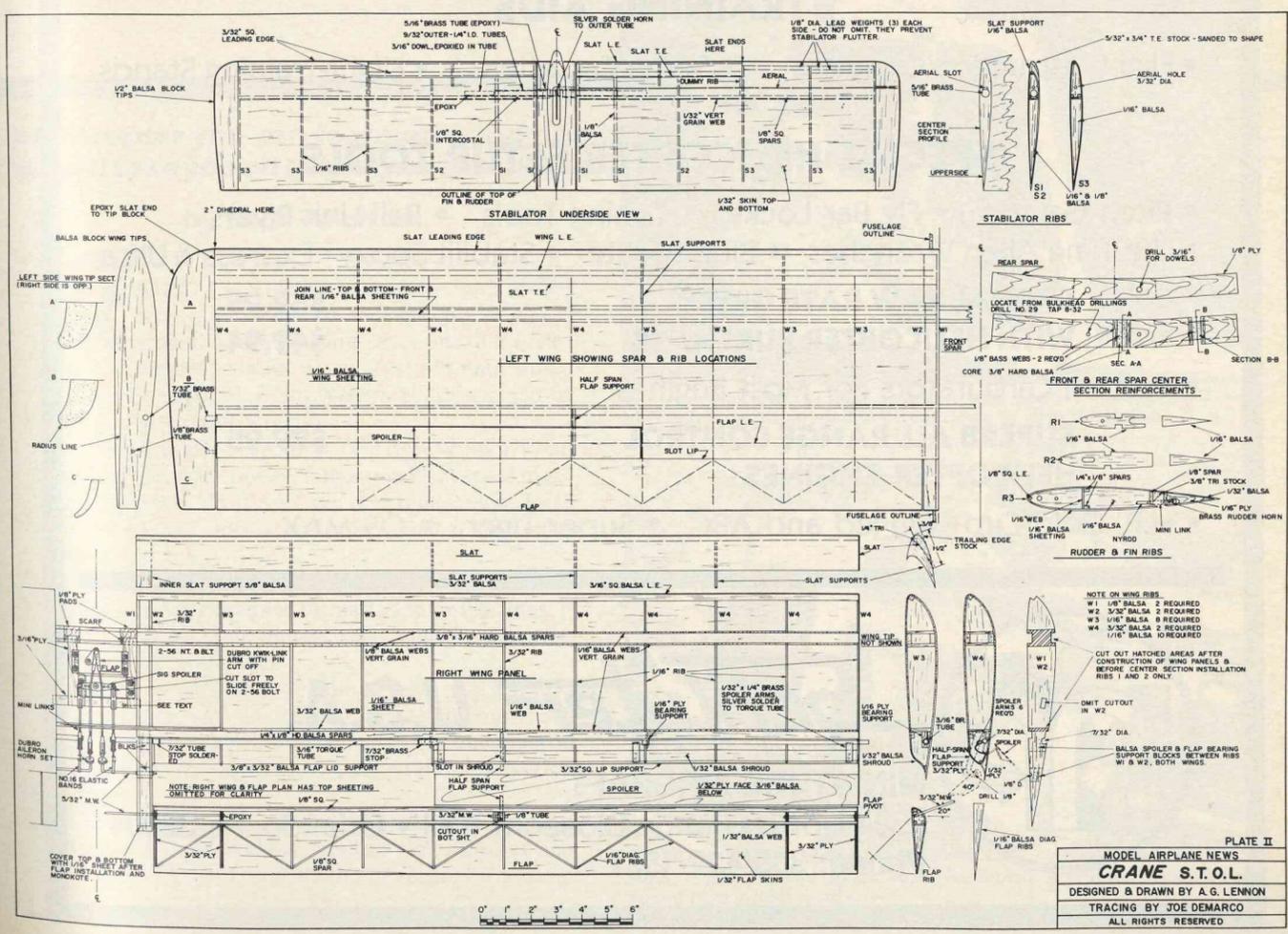
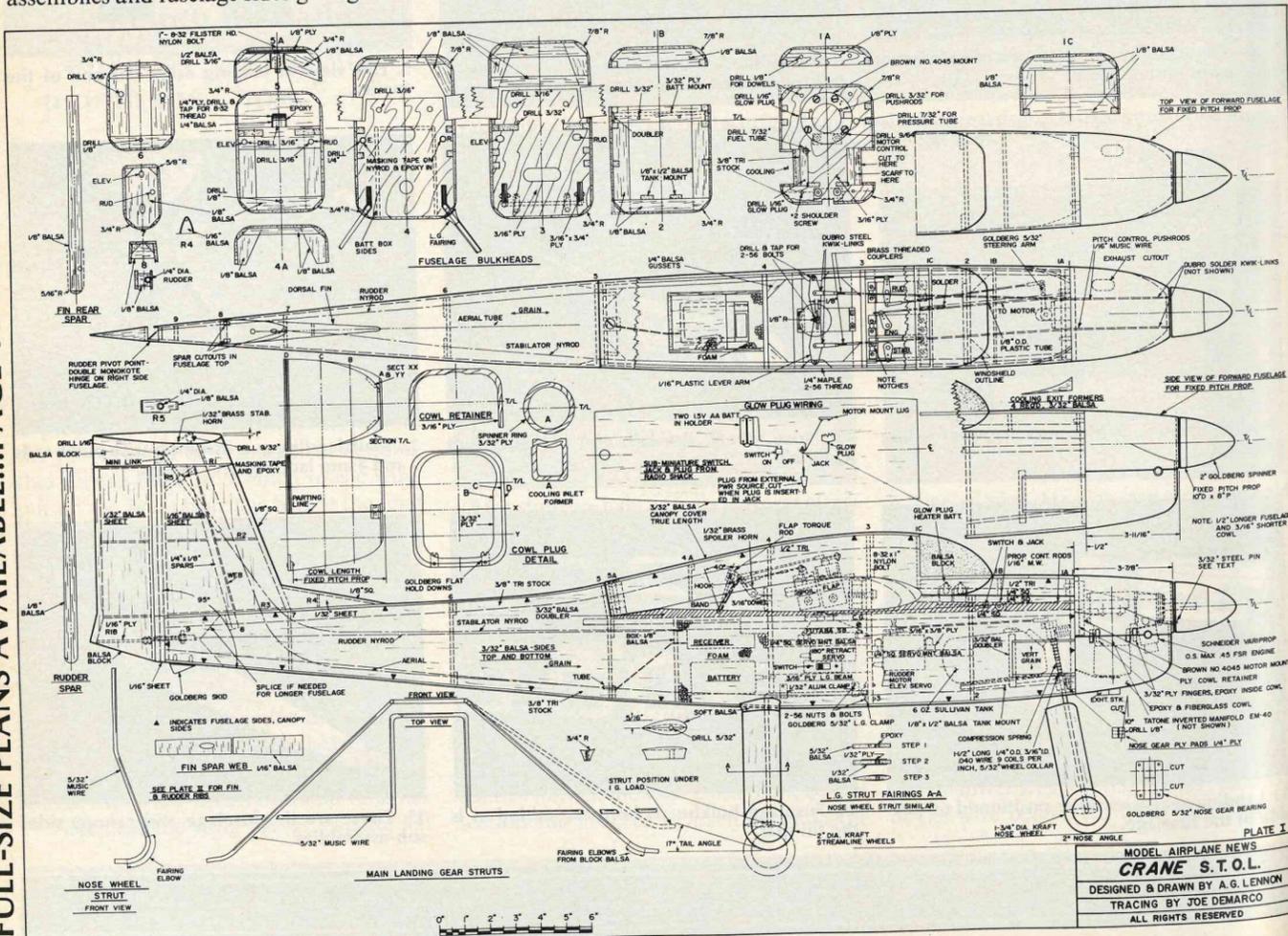
angle shown on the drawing, and that the rear fin spar is vertical when viewed from the rear.

When the fin is fully sheeted, trim the sides and the top rib even, making sure the top rib is at 90° to the fin spar (rear). In both side and front views, since this controls horizontal tail plane incidence, epoxy the upper right-hand balsa part in photos 7 and 8 to the top of the fin. A thin layer of 1/2-inch wide Hobbypoxy II centered on the joint will add strength.

The canopy assembly is done on the fuselage for a good fit.

The rudder assembly is straightforward, as shown in plate I.

(Continued on page 76)



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MRC LAND JUMP

(Continued from page 74)

equipment area.

When it came time to run the Land Jump 4D, I was thwarted by a need for a drive ring to fit my starter, I finally obtained one, an accessory manufactured by Kavan. The drive ring is pressed against a knurled flywheel beneath the vehicle. As with everything, this took some learning on my part. I quickly learned that short bursts of starter urge were much better than trying to hold a sustained turnover.

The Enya 19X had been previously run-in on a propeller, a recommended procedure, and it started well in the vehicle. It is obviously well suited to the vehicle—*performance was certainly all I needed!*

A heat sink should be bolted to the engine head to insure good cooling and an air cleaner must be added to the venturi opening. Both are available as options from Altech.

I've run a number of R/C cars over the last two years and, in every case, I always felt a need for a racing buddy. The kick with cars comes from racing. In time, individual running becomes a bit of a bore.

Not so with the Land Jump! It can be run virtually anywhere. In fact, the rougher the better. It was such a challenge to get around a rough course, it consistently holds your attention. Frankly, it is more fun than the proverbial "barrel of monkeys." The vehicle can practically climb a wall! It stops on a dime, accelerates quickly, and turns precisely as commanded. And when it comes to jumping, the Land Jump 4D seems to have a fair piece of airplane blood!

It is a lot of fun and, I'm sure, in racing competition with another one (or several), the "fun quotient" would really be high.

The next step is to play with gear ratios and tires (a variety are available) and then a Davis Diesel conversion. But that's another story!

I'm sure I haven't extracted maximum performance from the car, I am, after all, a rank novice. But I can say I had a great time assembling and running it. I learned a great deal about suspension, steering, shocks, and clutches, and I honed those mechanical skills just a bit. It really gave me what I had wanted—an exciting change of pace.

I can completely recommend the Altech Land Jump 4D to anyone looking for a similar change of pace. This is not your run-of-the-mill vehicle—it's a real "grabber"! Just be careful. You may end by skipping a few flying sessions to run the car!

*The following are the addresses of the companies mentioned in this article:

Altech Marketing, Inc., P.O. Box 286,
Fords, NJ 08863.

Pactra Industries, Inc., 420 S. 11th
Ave., Upland, CA 91786.

Model Rectifier Corporation, 2500
Woodbridge Ave., Edison, NJ 08818. ✈

CRANE II

(Continued from page 19)

Wing and tail leading-edge slats and spoilers were sanded to shape using contoured sanding blocks of the kind illustrated in photos 9 and 10. The drawings in plate II give cross sections of all three units.

Photos 20 and 21 show steps in cowling manufacture. I used a layer of coarse automotive repair fiberglass overlaid with 6-ounce cloth, all bound together with Hobbyoxy II. The photo captions tell the story. Acetone will dissolve the foam.

Photo 17 shows the steel pin epoxied and fiberglass-corded to the motor. After lightly installing the Variprop on the motor shaft; the round hole in the pitch plate serves to locate the pin while a light epoxy bond is firming up. Then more epoxy and fiberglass cord are applied to provide a strong assembly.

Incidentally, for bending balsa, brush on clear ammonia to the side you want convex. It works wonders on wing leading edge skins, flap skins and shrouds, etc.

At this point I assume you have now completed assemblies or parts for wing-flaps, spoilers, fuselage, fin-rudder, tail plane, canopy, slats and slat supports for the wing and tail, and the cowling, and these have all been sanded to their final shapes and the motor and its cowling have been fitted and installed after fuel-proofing the firewall.

I used MonoKote covering. The landing gear, flap supports and slat supports, legs, cowling, and wing tips were painted after a coating of Hobbyoxy II.

The slats and flaps, the top surface and the edges of the spoilers, the fuselage, canopy, rudder, wings, and tail plane are MonoKoted as separate units. The rudder is installed with a double MonoKote hinge during covering of the fin.

The receiver and its battery are next for installation. The aerial is threaded through its tube down the lower fuselage and up the fin. I use fine music wire inserted through the length of the tube and lightly epoxy the aerial to it, the end of the wire to the end of the aerial, and the latter can then be eased the length of the tube and carefully pulled out as far as it will go.

To assemble the stabilator on the fin, install the wing on the fuselage. Invert the plane over a flat surface and support the

wing on bricks topped with foam, as shown in photo 22. I used a fuselage centerline drawn on the flat surface to align the fuselage, and several lines parallel and at right angles to the fuselage centerline to align the tail parallel to the wing and horizontal. It was wedged to the correct angle of incidence. (Photo 22 is of Crane I so leading-edge slots are non-existent.)

At this point it is necessary to:

A. Connect the stabilator and the nyrodr mini-link.

B. Thread the aerial through one half of the stabilator using the fine wire procedure. A gentle pull will break the light epoxy bond between the wire and the aerial.

C. Carefully epoxy the stab to the fin as shown. Avoid getting epoxy on the pivot—you could end up with a "fixed" surface.

D. Cover any bare areas on the stabilator underside and the fin top with MonoKote.

The flaps are installed by inserting the in-board pivot and bearing in the groove in ribs W1 and W2, and epoxying the out-board pivot slides into the wing-tip bearing, simultaneously sliding the spoiler torque tube into its bearing in the tip. Epoxy the wing tip blocks to the out-board wing rib and skin.

The MonoKote covering of the wing and tail leading edges and slat undersides are carefully pin-pricked where the slat supports fit so that epoxy will penetrate the covering and adhere to the balsa below or above.

The spoilers are lightly epoxied to the spoiler arms, after being carefully aligned in the wing so they will operate freely. Light pressure on the spoiler horn will keep the arms in contact with the spoiler

For bending balsa, brush on clear ammonia to the side you want convex.

underside while the epoxy solidifies.

The servos and linkages are next, as shown in photos 23 and 24 along with the fuel tank, battery holder, etc.

The prop servo wheel is drilled and tapped for the 2-56 bolt actuating the pitch control arms, at a radius 1/8-inch from the center. The wheel hub is reinforced with epoxy and fiberglass cord before drilling, similar to the pin on the motor.

The prop pitch control rods and the Variprop are installed last. Un-thread the

steel Kwik-Links at the servo end, slide the wires through holes in the motor mount, firewall, and bulkheads. Engage the solder Kwik-Links in the holes provided in the pitch control plate. Mount the prop on the motor shaft and simultaneously engage the pin in its hole.

Re-thread the Kwik-Links at the servo and engage them with the pitch arms (clear plastic in photo 23), and adjust so that the arms are in the forward position when the prop is in coarse pitch (in photo 23 the arms are in the fine-pitch position). The travel of the wheel screw will be 1/4 inch (i.e., 1/8-inch radius) so that the prop rods move 3/32-inch backward or forward.

Should you order a Variprop, specify make and displacement of your motor so you will receive the correct cone and prop nut.

The photos in part I will give you a good idea of how to fly this model.

Good luck, and write and let me know how it goes! ✈



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34K30C- Ace CVC, Assembled **\$29.95**

ACE HIGH MK II

For the person who wants to get his feet wet in R/C assist gliding, the Ace High MK II is ideal. This all time favorite has been updated to a 2 channel, trainer/sport model. The fuselage is die cut pop ply, and goes together in minutes with cyanoacrylate adhesives and Cyano-Set. The polyhedral foam wings are pre-cut. Lots of room for your favorite radio system.

Designed by Owen Kampen

Span: 69"
Length: 34"
Weight: 30% oz.
Power: .049 - .051 engines
Functions: 2 channel

50L202- Ace High MK II, Kit **\$21.50**

ACE R/C, Inc.

Box 511C, Higginsville, MO 64037 (816) 584-7121

Send \$2.00 for our complete catalog. All Ace products are available at your dealer. If you must order direct, please add \$1.00 handling fee.