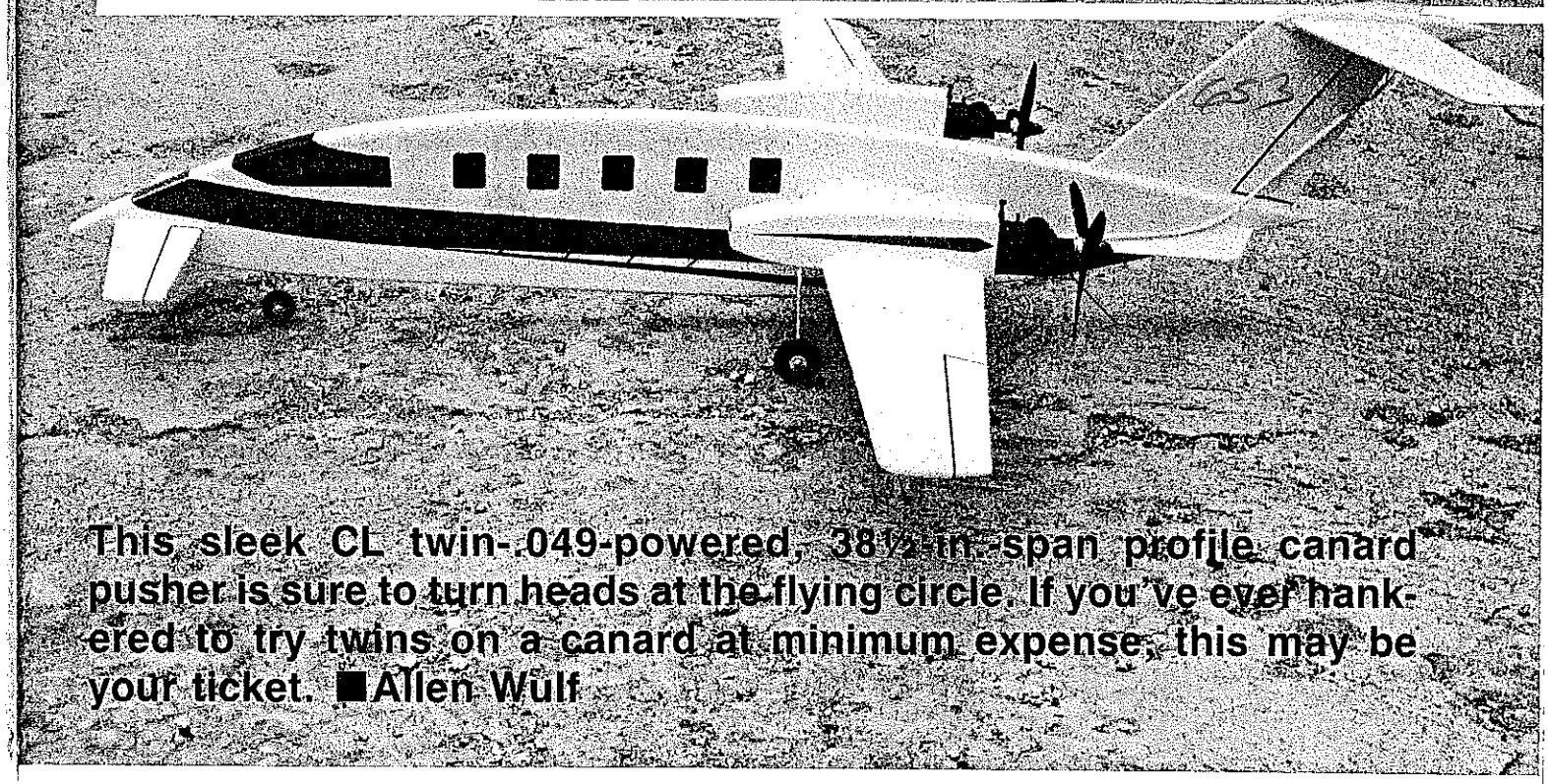
P180 Avanti



This sleek CL twin-.049-powered, 38½ in. span profile canard pusher is sure to turn heads at the flying circle. If you've ever hankered to try twins on a canard at minimum expense, this may be your ticket. ■ Allen Wulf

UNTIL JUST a few years ago airplanes hadn't changed much in their general configuration. A visit to the local airport yielded the same boring rows of Pipers and Cessnas, with maybe a twin or two to break the monotony.

But the emergence of canards with their radical appearance and high-tech composite construction has marked a new era in aviation. Canards crept in amongst the homebuilts in the beginning, and nowadays they're sneaking into the commercial aviation market as well. Today, a few of these new-generation aircraft can usually be seen at airports. Beechcraft's Starship is very near production status, as is the Avanti from Piaggio of Italy. Judging by their appearance and performance, it won't be long before such canard aircraft become a common sight.

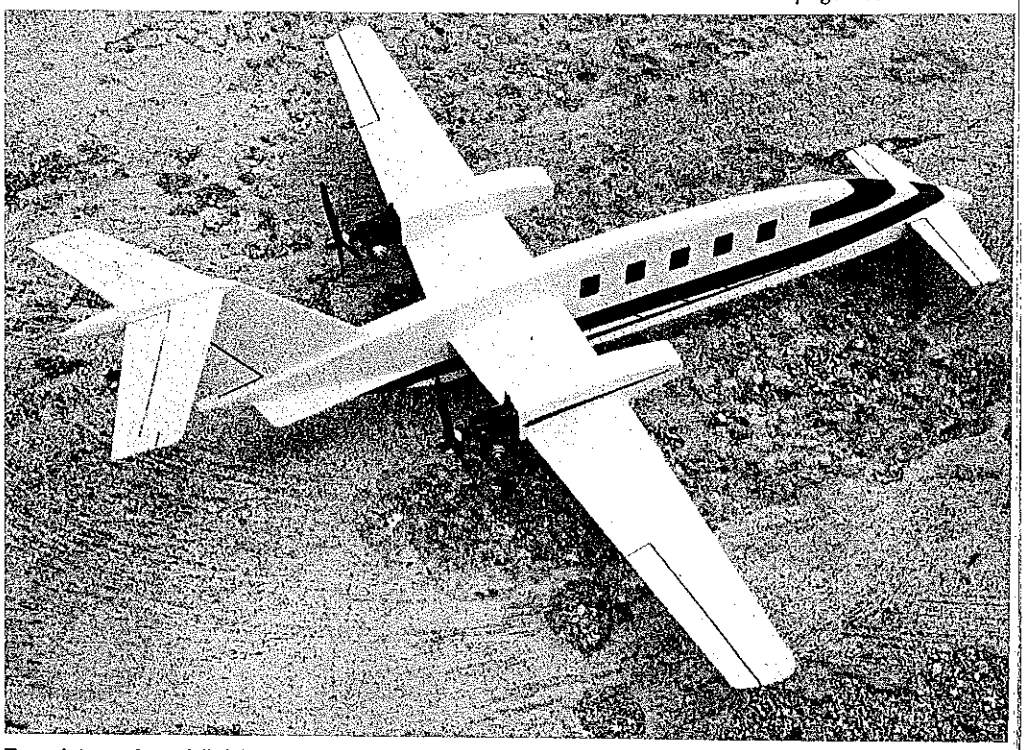
As for the Avanti, just look at those lines! *Flying* magazine calls it the "drag eraser." Showing a little more restraint, the British publication *Air International* praises it as "the shape of efficiency."

One look sold me on the Avanti. The April 1988 issue of *Air International* had a full-feature presentation of the Piaggio airplane with three-views, cutaway, and photos—enough to really set the stage for designing a model. The Avanti's thin wing was my only obstacle; I wasn't persuaded that it could support a flying model.

I also needed to figure out how to capture the elegant fuselage with my planned profile design. I decided on a compromise. A thick, well-rounded (but still profile) fuselage would do the trick.

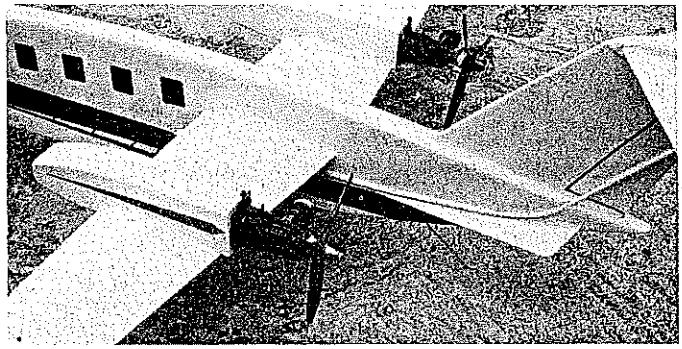
With that decided, other practical model design considerations surfaced. For exam-

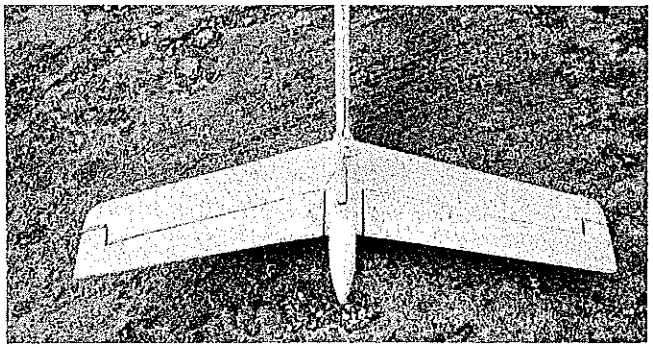
Continued on page 173



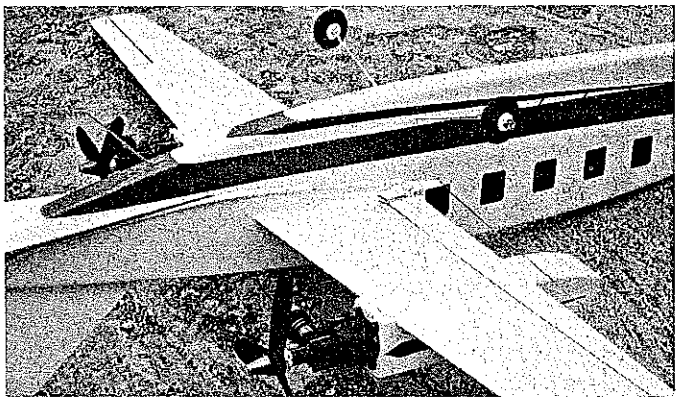
Top picture: Avanti finished and ready to fly. This model was inspired by the Piaggio P180 Avanti being developed in Genoa, Italy as a business plane. Unlike most American canards, the Avanti will be built mostly of aluminum using traditional fabrication techniques. The flapped front canard gives it excellent slow speed and antistall control. Above: Looking down on the model, one can appreciate the sleek lines of its three-surface planform. The anhedraled T-tail offers a clean flow of air and serves as the control surface for the CL model.

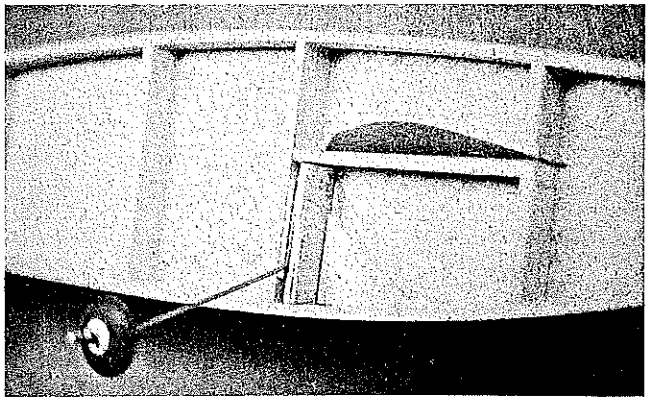
More Construction Photos on Page 60



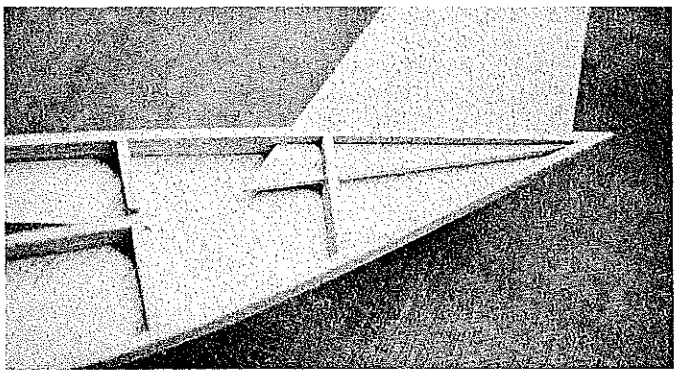


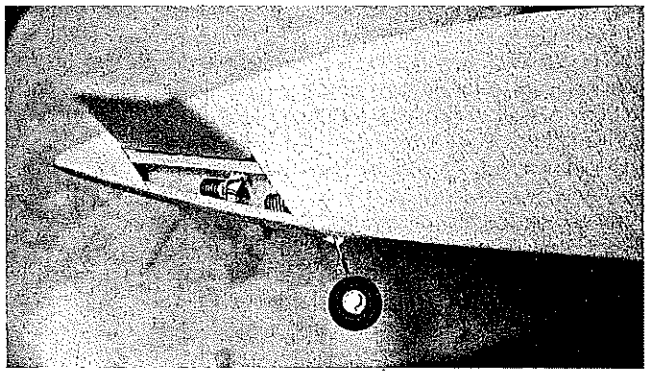
Left: The ventral fins under the tail are a new antistall innovation being incorporated on the full-size Avanti. Being directly in the propwash they soften the stall characteristics at a high angle of attack by lifting the tail and pushing the nose down. Right: Designing the control linkag for the swept-back anhedraled stabilizer was a challenge. The solution was to split the elevators and connect a forked pushrod to two horns



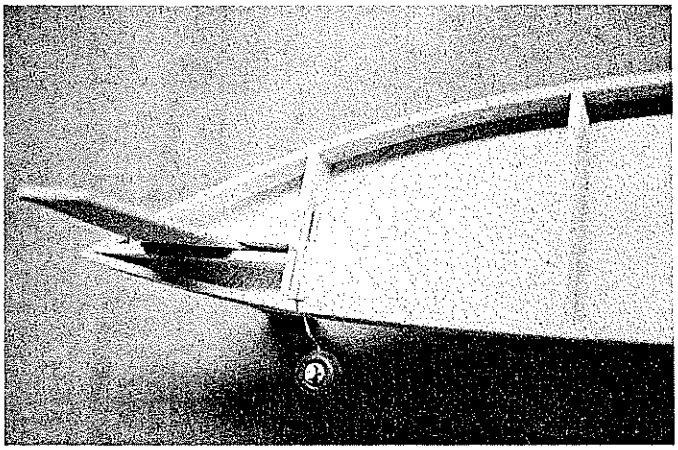


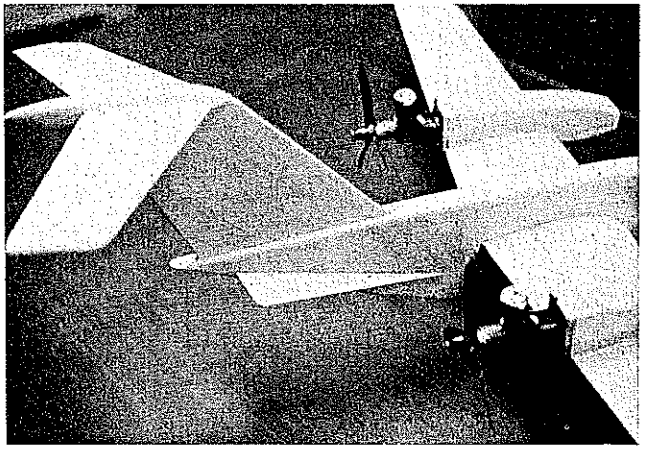
Left: Since the forward lead-out line had to be positioned forward of the wing leading edge, the entire bellcrank was externally mounted, bu still out of sight under the wing. The pushrod casing runs along the top of the ventral fin on its way to the elevator. Right: The partially com pleted fuselage showing the well-gusseted main landing gear installation and the wing slot. This slot is best cut out before sheeting the sec ond side to ensure that it will properly nest with the bulkhead and supports. This prototype photo shows the main gear mounted too far for ward, causing the model to tip back on its tail. The plans show the correct location. Notice how the sheeting grain runs at 45° from horizontal





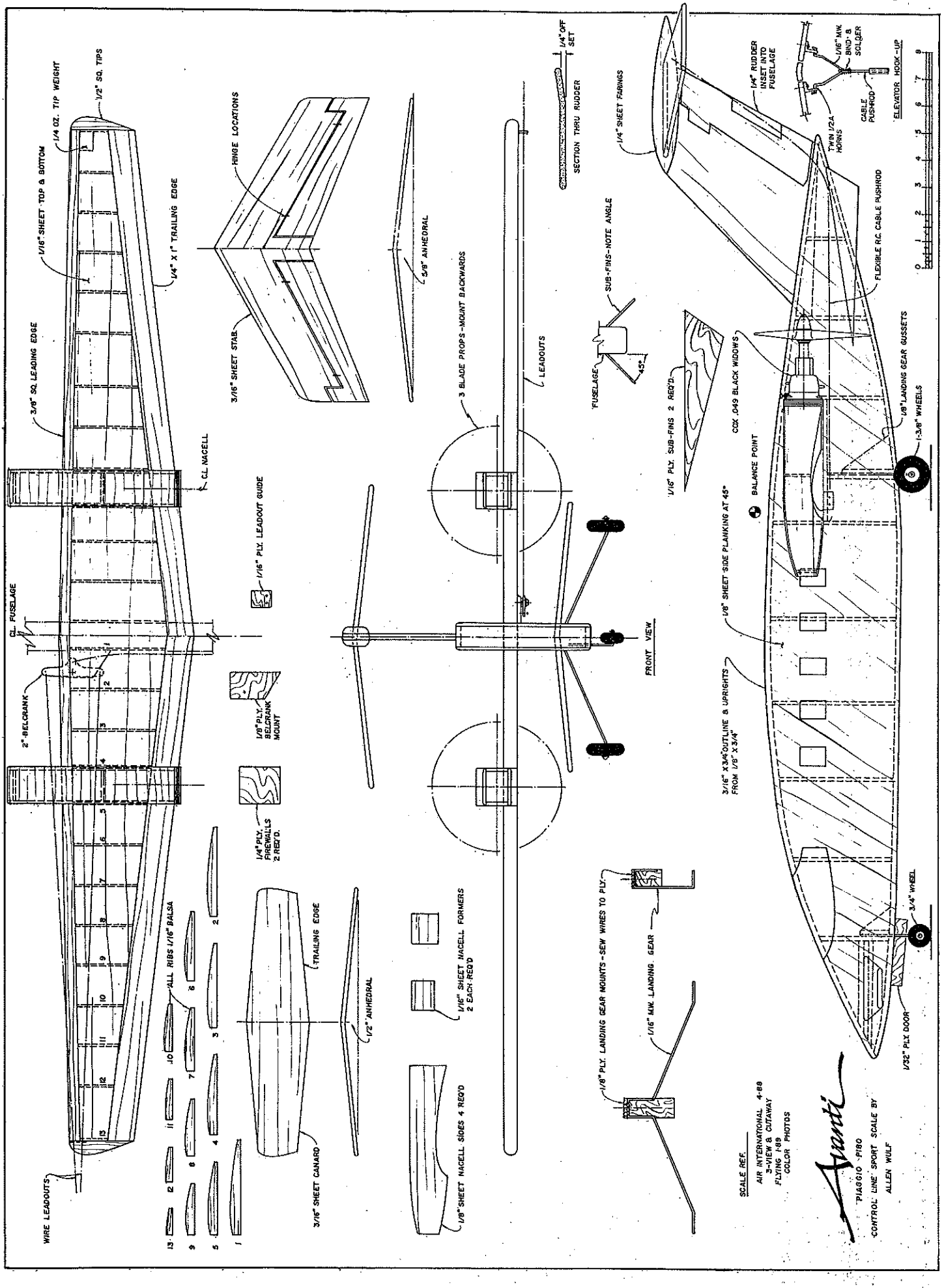
Left: Standard procedure for all twin-engined models is rugged vibration-resistant construction. Note the hefty longerons and uprights. Al note how the fin is set deeply into the fuselage to keep it firmly in place. Right: The massive fuselage is built up over a crutch outline with ⅛-i sheet sides glued on at 45° to the horizontal and at 90° to each other. This makes a torsion-resistant structure. Here you can see the no wheel and the cavity under the canard that's left unsheeted until the model has been balanced and the correct amount of weight installe





Left: The unsheeted left side of the fuselage showing the strongly gusseted nose wheel structure and the braces for the canard. Right: T unpainted model showing the Black Widow engines. Try to match your engines as closely as possible, mounting the hotter one on the inboa side. Epoxy the ventral fins securely, as they take a beating in normal handling and flying of the model. The prototype was painted with au motive acrylic enamel over seven coats of clear dope, then detailed with automotive pinstriping tape. MonoKote was used for the windo

Full-Size Plans Available . . . See Page 202



Control Line

Scale

Bill Boss
77-06 269th Street
New Hyde Park, NY 11040

COMPETITION RULES are once again in need of discussion. First, a finalization of the CL Sport Scale Scoresheet project that I talked about in detail in my July '89 column; second, the Sport Scale Rule change for Para. 4.6 that has just been passed and included in the 1990-91 rule book; and finally, some CL Scale rule changes from the 1987-88 rules cycle that did not make it into our 1990-91 rule book.

The CL Scale Scoresheet Committee has concluded its efforts and has produced a scoresheet that they hope will be accepted as a standard and be published in the *Competition Regulations* book. The completed scoresheet has been sent to AMA for processing in the current rules change cycle.

As you'll remember, there were two scoresheet parts: Part 1 for static judging, and Part 2 for flight judging. While Part 2 of the completed scoresheet is essentially the same as published last July, Part 1 has changed considerably, especially in the approach to static judging.

The committee's original approach to static judging was to break the model down into various sections; i.e., fuselage, wing, landing gear, and engine, cowl, and propeller. This is generally the way we were used to seeing models judged.

However, committee member Charlie Bauer suggested that in light of the increasing number of jet-type aircraft being flown in Scale events the committee might take a different approach. That is, statically judge a model by looking at the overall model in *plan views* (top and bottom), *side views* (right and left), and *front* and *back views*.

By using the "view" approach we eliminate the disparity between judging a jet model and judging a propeller-driven one. When judging a jet under the committee's original concept, there is the question, "What kind of a score could be awarded to the Engine, Cowl, and Propeller category?" Does a judge award a full score in the category, or is the jet downgraded because it doesn't have what the category specifically calls for?

How could a flying wing be judged under the original approach when the wing doesn't have a fuselage or tail section as we commonly understand them?

The accompanying revised static judging portion of Part 1 reflects the change in approach to static judging, and shows the assigned point values for Outline Accuracy and Craftsmanship for each "view" category.

Also, note that "Finish" has been changed from four categories as shown on the previously published scoresheet to only two, "Authenticity of Degree of Gloss" and "Color and Markings." These changes were made for much the same reason as the changes relating to Outline Accuracy and Craftsmanship—an attempt to offer all model types a fairer chance in the judging process.

The original scoresheet called for looking at lettering, insignia, and small markings separately. It was decided that this approach would cause problems in judging models with a great number of insignia and markings, such as military aircraft with all the lettering around access hatches and the like, vs. a lightplane such as a Taylor Cub that would have a minimum number of markings.

"Authenticity of Degree of Gloss" was felt to be important by the committee and would require the modeler to prove why he painted his model in high gloss, semigloss, or matte finish. Shouldn't there be a penalty for putting a high-gloss finish on a model that is camouflaged and should have a matte finish?

The Color and Markings category includes judging for authenticity of color and placement,

Continued on page 175

C/L SPORT SCALE WORKSHEET (PART 1)

CONTESTANT DATA: Name: _____

Age: ____ AMA Number: _____ ☐ Open ☐ Senior ☐ Jr

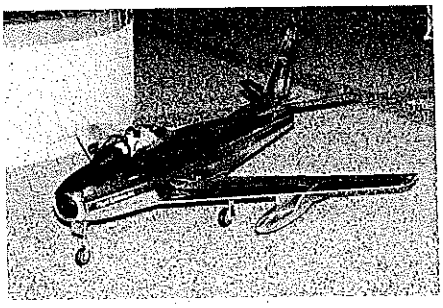
AIRCRAFT REQUI[illegible]

8. REPLICA OF AIRCRAFT THAT MADE FLIGHT

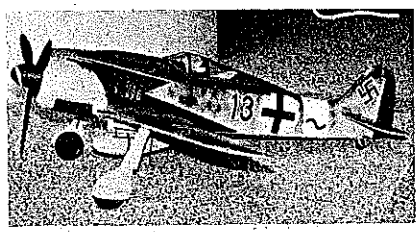
STATIC JUDGING (15 FEET FROM MODEL)			OUTLINE ACCUR. (40 Max)	CRAFT-MNSHP (30 Max)	FINISH (30 Max)
1. PROOF OF SCALE: ☐ 3 (or more)-view Drawing ☐ Photos ☐ Plastic Model			☐ O.K.		
2. PROOF OF COLOR SCHEME: ☐ Photos ☐ Color Painting or Dwg ☐ Written Doc.					☐ O.K.
3. SIGNED DECLARATION OF NON-BUILT COMPONENTS ☐ OK				—	
4. DROPABLE STORES (In-flight Items)			☐ O.K.		
5. SCALE DOCUMENTATION (8 pages Maximum)			☐ O.K.		
6. PLAN VIEWS (Top & Bottom)	(OUTLINE) (0 - 15)	(CRAFT) (0 - 10)			
7. SIDE VIEWS (Left & Right)	(0 - 15)	(0 - 10)			
8. FRONT & BACK VIEWS	(0 - 10)	(0 - 10)			
9. AUTHENTICITY OF DEGREE OF GLOSS		(FINISH) (0 - 10)			
10. COLOR AND MARKINGS (Authenticity of color, placement, size, and shape of insignia/markings)		(0-20)			
11. TOTALS					
12. TOTAL STATIC POINTS (100 points maximum)					

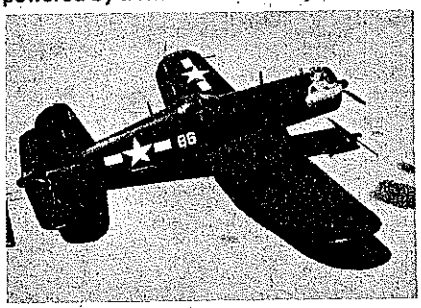
I hereby certify that I am the builder of this aircraft. I also certify that I have test flown this aircraft prior to this competition and that I have previously and am now capable of performing an unassisted takeoff, two laps of level flight, and a normal landing within the designated flying circle.

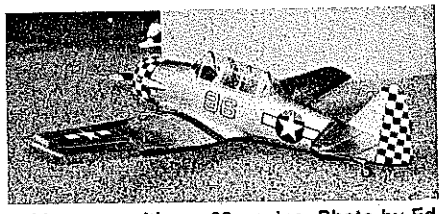
This CL Sport Scale scoresheet updates Part I (see *MA*, July 1989). Judging by View is a new method for more uniformly judging Outline Accuracy, Craftsmanship, and Color and Markings.



Beautiful F-86 Sabre Jet is by Charlie Bauer. It has a 58-in. span, weighs 11 lb., and is powered by a K&B .61. Photo by Ed Rhoads.







Left: Focke-Wulf FW 190 A-8 is the work of Lyn Green. Plane has a 60-in. span, weighs 12 lb., and is powered by a .60 engine. Photo by Ed Rhoads, CL Scale team trials. Center: Corsair by Ted Cronenwett, Canoga Park, CA. The Corsair is Ted's first three-line Scale model. This Sterling kit-based model is powered by an OS .25. The metal plate seen behind the model weighs about 5 lb., has rubber feet, is equipped with a Fourmost bomb release mechanism, and is used as a stooge for one-man flying sessions. Ted Cronenwett photo. Right: SNJ-5 Texan is by Dick Byron. Weighs 11 lb., has a span of 42 in., and is powered by a .60 engine. Photo by Ed Rhoads, taken at 1989 FAI CL Scale team trials.

proaches well-doped Japanese tissue in tightness.

The material's puncture resistance is excellent, and there's no tendency to rip or tear. Frankly, this material is essentially like a vastly improved MicaFilm in most of its characteristics. It is well suited to smaller Old-Timers, Electric models—and certainly RCSD.

On the negative side, Litespan is a bit more tricky to use than the materials with the adhesive built in. It also doesn't add as much torsional strength as the films, and my samples had some color-blotch troubles.

But all in all, Litespan definitely has a place in our area of the hobby, and I recommend it. You might also want to check out the rest of Charlie's product line. They specialize in Electric flight, Free Flight, and RC products.

True confessions: Normally I use short captions with the photos and don't write more about the subjects in the main part of my column. However, this month I just have to say a few extra words about the Howard DGA from Bob Maurer. I have had the photo in my file for several years awaiting just "the right time" to use it. I often do this, since the columns tend to be thematic.

Bob Maurer built the model from a Paul Lindberg kit in 1938. Lindberg had been a prolific designer for several magazines, particularly *Flying Aces*. The popularity of those designs led Paul into the kit business for a short—and apparently unsuccessful—time. Maurer powered his with a Sky Chief (a cheap Dennymite) but never flew it. To bad there wasn't an RCSD event back then! It certainly would have been reassuring to know the model wasn't going to crash or fly away.

Bob went on to medical school and served in the U.S. Army, settling in San Antonio after the war in 1946 as one of only two anesthesiologists. A long and successful career followed. Dr. Maurer remained active in modeling and is well loved in the San Antonio area for his generosity and support of the local clubs.

The sad part of the story is that Bob passed away before I got around to publishing the picture. In his memory, a shelter has been erected at the club field. Bob Maurer represents what makes our hobby so attractive. He was involved and supportive, with no interest in any national recognition or any desire for fame. He just simply loved modeling and modelers. He will be missed by many of us.

Vibration/Abbott

Continued from page 58

knew for certain that a particular engine was underbalanced or overbalanced, it might be possible to reduce the overall vibration by installing an unbalanced propeller. However, that's probably not the most practical approach to take.

As long as the single-cylinder reciprocating engine remains the predominant power plant for model airplanes, vibration will remain a constant concern. We can best cope with the problem by building solid airframe structures and providing vibration isolation for sensitive components such as radios. As technology improves, vibration isolating engine mounting seems very promising.

CL Avanti/Wulf

Continued from page 59

ple, how does one control a configuration like the Avanti? Reading a few articles on the airplane reassured me that I could use the same basic control system as on the full-scale ship.

The Avanti has a unique three-surface design. The forward canard helps lift the long nose and fuselage, while the placement of the wing far to the rear lifts the main weight of the aircraft. Another reason for placing the wing so far back was to allow for the maximum length of passenger and cargo area without interruption from wing spars and braces. The high stabilizer is well out of the path of any fuselage turbulence and makes a good bite into clean air.

The small canard is flapped for slow-speed flight and landing. It doesn't act as an elevator. Altogether, this is a singularly neat and efficient package for a twin-engined business craft. *Cont 174*

Contrary to expectations, this sleek design doesn't employ the super-high-tech materials used in the Starship. The Piaggio engineers specified that the aircraft use conventional materials and construction methods that would be easier to certify and sell. As a result the Avanti is mostly aluminum, with some 20% of its structure devoted to composites.

Though conventional in some areas, the Avanti sports several new inventions. The delta fins, for example, located below and to the rear of the fuselage, are designed to prevent stalls. It's a feature that we can expect to see on a lot of twin-engined craft in the future. The shape of these fins provides stabilizing lift at the high angles of attack typical of a stall environment. Since they're placed in the direct blast of the propellers, their constant airflow generates constant lift, forcing the tail up and the nose down and greatly softening any tendency to stall. At low angles of attack they help in directional stability. Delta fins of this type are nice friends to have around.

Several articles about the Avanti are referenced on the plans.

Construction

Wing. It's always easier to kit the parts before beginning construction. Cut out the ribs, leading edges, and trailing edges. Lay a sheet of 1/16 sheet balsa over the wing plan, and mark it for the wing taper. Cut it to shape, and transfer the rib spacing onto it. Pin it down over the waxed paper-covered plans, then glue the leading and trailing edges and the ribs in place. When dry, plank the top of the wing with 1/16 sheet balsa, add the tips, and finish off the leading edges. Sand the wing assembly smooth.

Cut out the canard, rudder, and stabilizer parts. Sand all edges round. Slice the canard in two at the centerline, and sand in the bevel at the dihedral joint. Glue in ½ in. of anhedral (down angle). Slice the fin along the rudder joint, and glue in ¼ in. of offset. Glue in ⅝ in. of anhedral in the stabilizer.

The fuselage sides are built much like a stick-and-tissue model, except with wide longerons and uprights. Begin by soaking the 3/16 x ¾-in. top and bottom longerons in hot water for half an hour, then pin them in place over the plan. I found long sewing pins from the fabric store to be a great help here. Cut the uprights, and fit and glue them in place. Carefully set the wing and canard supports in position, making sure that they are vertical. Let the fuselage frame dry overnight. Meanwhile, bend the landing gear struts to shape and sew them to the ply formers.

When the fuselage frame is dry, remove it from the workbench and sand the sides smooth. Sheet one side with medium-light 1/8-in. sheet balsa with the grain running at 45° to the length of the fuselage. Install the landing gear mounts as well as the gussets that support them.

Cut the front slot for the canard and the wing opening in the side you've just sheeted. Cut a long slot for the rudder just as on a small ready-to-fly Glider. Slide the rudder into this slot, making sure that it's a snug fit and lines up straight. Glue it in place, checking that the stabilizer slot is parallel to the wing bottom.

The other side of the fuselage is sheeted next, with the grain running 90° to the first side. This makes for a very rigid fuselage box. Sand all the corners nice and round, then cut the openings for the canard and the wing. Leave an open space under the front canard for adding nose weight (see photos).

Two nacelles must be constructed. Since both engines are set at 0-0°, the nacelles can be identical. Begin by cutting out the four sides. If you have a band saw, all four sides can be cut out simultaneously. Glue the nacelle formers to the sides, then add the ply firewalls and top balsa sheeting.

Cut two 2½-in.-sq. pieces of light glass cloth, and CyA (cyanoacrylate glue) each to a firewall. Trim off the corners, and fold the remaining glass around the top, sides, and bottom of the nacelle, firmly wrapping the firewall in place.

Trial fit the wing into the fuselage, trimming the opening for a snug fit. Carefully glue the wing in place, making sure it's properly aligned.

Glue the bellcrank in place.

Add the bottom sheeting to the front of the nacelles, then glue the nacelles to the wings. Make sure the nacelles are equidistant from and parallel to the fuselage, and that they don't have any upthrust or downthrust. Mix up some epoxy, and put in a nice, light fillet in the wing/fuselage and wing/nacelle joints.

Glue the canard and stabilizer in place. Sight them from the top and front to make sure they're level before the glue sets. At this point your bird looks a bit odd, but there are a few things yet to do before it becomes a real airplane.

Hinge and install the elevators, checking them for free movement. They must be capable of freely moving ⅜ in. up and down, which may require some trimming and sanding. Install the two ½A horns on the *trailing edge* of the two elevators.

Bend up the pushrod Y parts. Mount the bellcrank and the flexible RC cable pushrod attached to it with a clevis and threaded rod. Run the flex cable tube down the fuselage and up to the elevator pushrods in a nice, gentle radius. Tack glue the tube in place, and hook up the pushrods to the elevators.

Bind the pushrods to the cable with copper wire, then slip the cable out of the tube and solder it to the wire pushrods. Slip the cable back into the tube, fit the threaded rod back on, and hook the clevis cable to the bellcrank. Adjust the clevis until the correct elevator up-and-down throw is achieved. Try to keep the movement as smooth as you can.

The lead-outs and lead-out guide can now be fitted.

Cut the delta fins from ply, locate their position, and epoxy them in place. Apply a good epoxy fillet along the full length of the cable tube to make sure it stays in place.

Engines. The cornerstone of all successful twin installations is a good engine match. Hunt down two .049 engines that have good starting characteristics and similar power. Check the latter with a tachometer, and plan on placing the hotter of the two engines (no two engines are absolutely identical in output) on the inboard side.

Bolt the engines in place, and mount the wheels for test balancing. You'll have to add quite a bit of lead to the nose, so try to get it in the opening provided. Once the model balances, add the last bit of sheeting, remove the engines and wheels, and give the entire airplane a good sanding.

I applied seven well-sanded coats of clear dope, then sprayed on a can of auto acrylic enamel, to achieve a high-gloss finish. Using a variety of automotive pinstriping tape, I had a great time trimming the model. The windows were cut from MonoKote trim sheet and simply stuck on.

Before remounting the engines, remove the tanks and reroute the fuel pickup tubes to the five o'clock position of the front of the engine when viewed from the rear of the model. Set both tanks identically.

Reinstall the engines and wheels, and check the balance point again. You shouldn't need to add too much additional weight. Use lead solder wrapped around the nose wheel strut for final balance.

Flying. On the way to the flying field, stop and pick up some 35-ft. steel flying lines (if you don't have them already). I recommend a paved or hard dirt flying surface. Test run the engines, and instruct your pit crew to hold the Avanti by the fuselage just ahead of the wing. This helps keep their hands clear of the prop arcs when the model is released.

With its small wing and two engines, the Avanti moves out in a sprightly fashion. Besides being a "drag eraser," it's also quite a crowd pleaser.

CL Scale/Boss

Continued from page 62

size, and shape of insignia/markings. In this approach the overall model is considered regardless of its type or number of markings.

I urge you to review the proposed scoresheets and direct any comments you might have to your AMA District Scale Contest Board member for his evaluation. His name and address appears in the "Competition Directory" item in the "Competition Newsletter" section of this magazine.

I believe the scoresheets, as proposed, are a significant step toward better judging of the CL Sport Scale event.

A rambling thought: If the "view" approach to static judging is accepted for the Sport event and works well . . . shouldn't we consider revision of our Precision Scale rules in the future?

The last item changed on this section of the scoresheet is on Line 3: "Declaration of Non-Built Components." Note that a *minus* sign appears on Line 3 under the "Craftsmanship" column, and relates to a change made in CL Sport Scale rule 4.6. The new rule requires a copy of the Declaration shown on Page 109 of the 1990-91 *Competition Regulations* to be filled out, signed, and submitted by the contestant with his model. The declaration lists negative point adjustments for purchased or supplied equipment on the model.

This rules change appeared in the last rules change cycle as an RC rules change, when in fact it was intended for both RC and CL. Discussions with Dave Platt (originator of the rules change) indicated that from its inception the proposal was meant for both RC and CL Sport Scale events. Somehow it got interpreted for magazine publication as RC only.

Continued on page 176