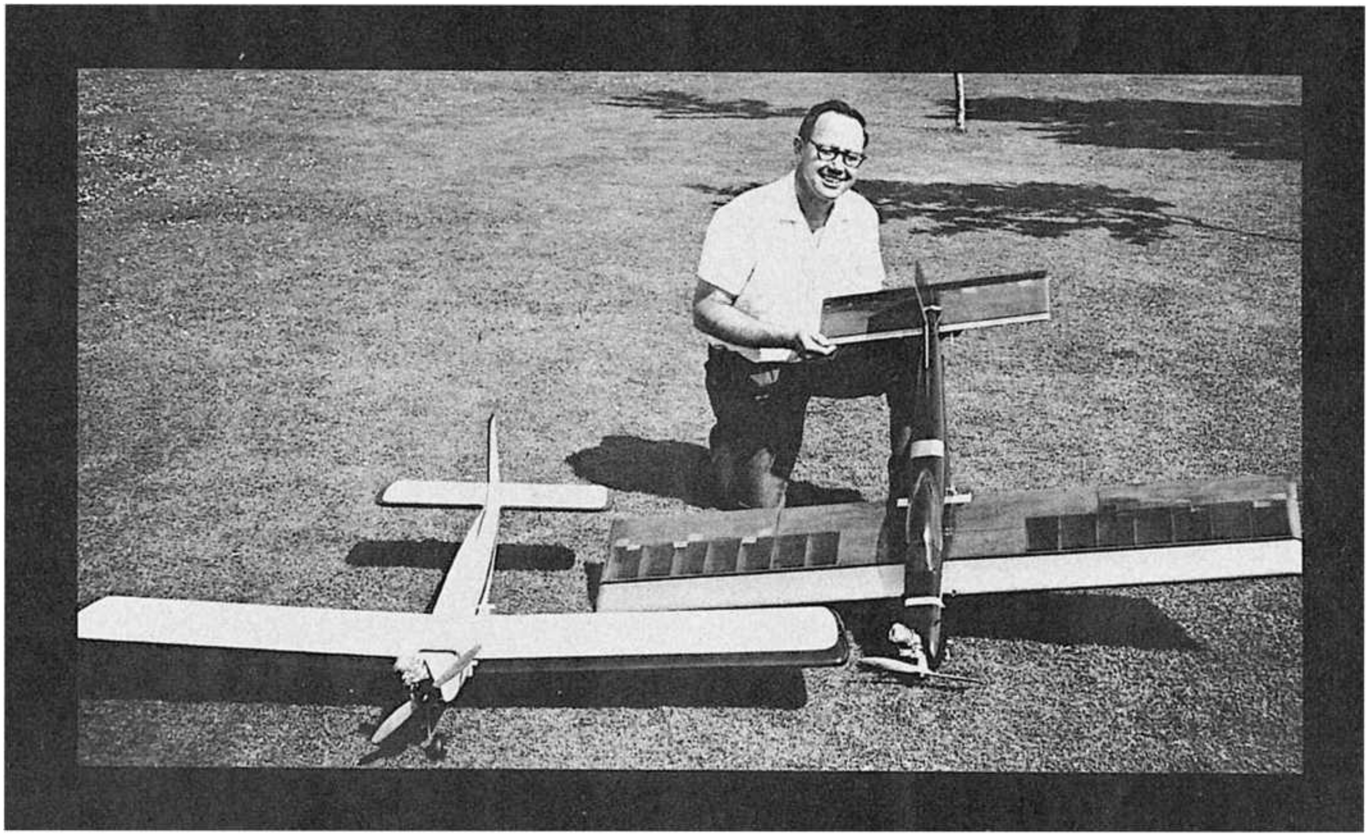
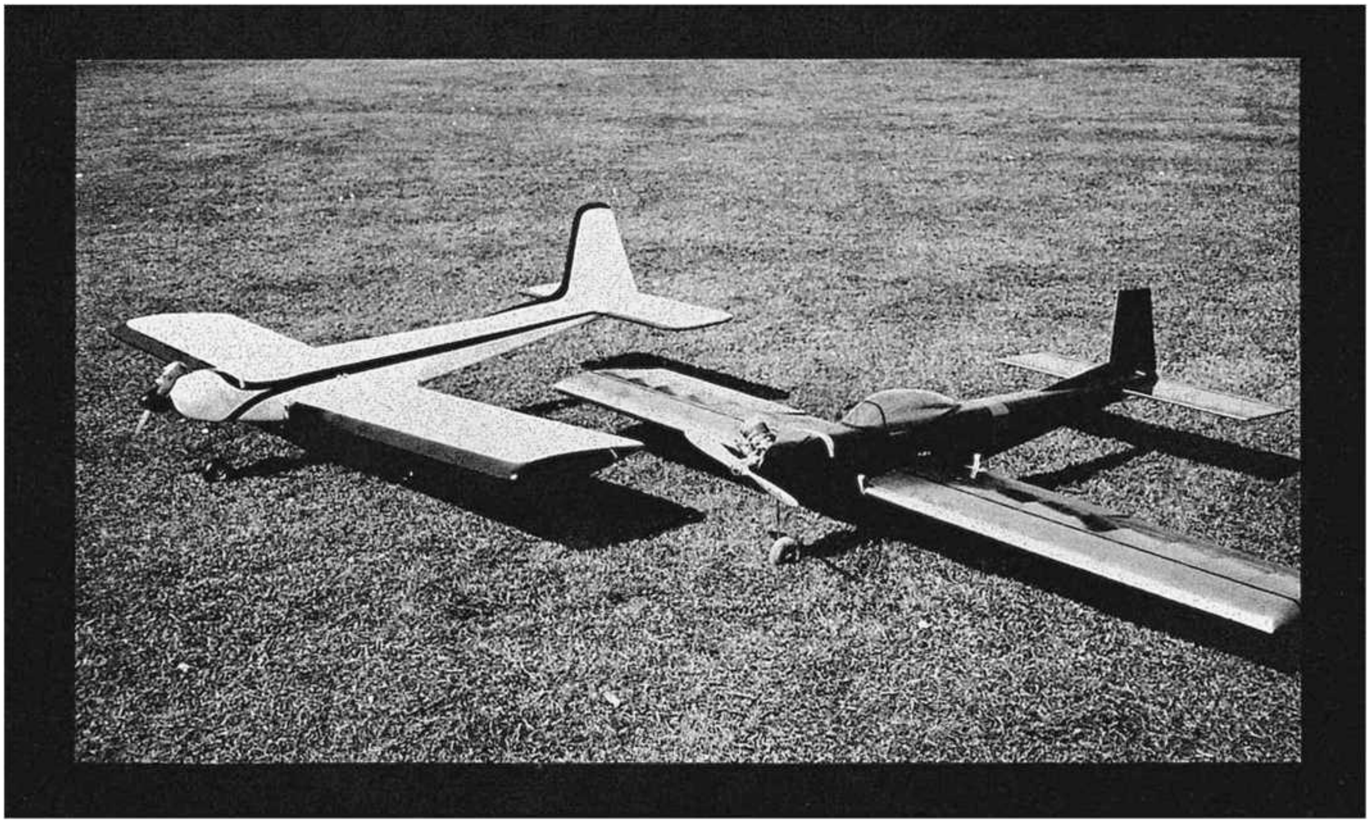
THE KWIK-FLI



by Phil Kraft

Phil's Fourth Place Nat's winning design has accumulated an enviable record of contest wins. For proportional or reeds, the Kwik-Fli is the end of the search for a ship that can be built in less than twenty-four hours, and with the consistent performance of an all-out contest machine. This is one for the hot pilot-and for bringing home the hardware.



One of the first prototypes — all while with black trim. Big mill sits at angle for proper fuel flow level. This is the design you'll see in the winners circle.

Last Summer we became intrigued with the idea of developing a contest aircraft combining high performance with the fastest possible construction time. The construction design was also to feature inherently perfect alignment. After a month of head scratching and many sketches, the basic Kwik-Fli configuration evolved.

Aerodynamically, the ship was large with generous moments and stabilizer area. A thick, fully symmetrical airfoil, with sharply radiused leading edge was selected for its constant speed characteristics and superior stability over a wide range of attack angles. This airfoil section is largely responsible for the Kwik-Fli's superb landing characteristics and general flight "groovieness." The original prototype utilized a flat wing, sans dihedral, to speed construction. Except for appearance, we felt that dihedral was most unnecessary and probably detracted from the aircraft's overall performance.

The fuselage was designed so that it could be built from the top down, featuring a minimum number of parts. The entire fuselage may be completed, including mounting the stabilizer, servos, linkages, etc., while it is still pinned to the work bench and the glue drying. Wherever possible, standard wood sizes were selected, requiring very little cutting to shape. For example, the elevator was a piece of 2" x *1/4*" x 24". The stabilizer consisted of two pieces of 1/16" x 6" x 24" built up over a Warren truss framework. The original fin was of 4" x 8" x 1/4" sheet. The radial mounted engine was positioned at an angle of approximately 30 degrees from horizontal to provide the proper fuel tank height in relation to the center of the engine's spraybar.

The first Kwik-Fli went together exactly as planned and with amazing speed. The fuselage structure proved not only to be very accurate and fast to build, but exceptionally light and strong. However, the airplane was, as expected, about as ugly as it was fast to build! The straight wing gave an impression of anhedral, while the overall effect of the airplane was that of a monstrous control liner with all-square surfaces! When first placed on the flight strip, the Kwik-Fli caused quite a few raised eyebrows among the local flyers, while others practically rolled on the flight line with laughter. The comments came thick and fast—"Man, that airplane sure is tired . . . look at the wings droop . . . even the engine can't stand up straight!" "Hey, Phil — you forgot your control lines!" "Are you sure you've got the wheels on the right side?" etc., etc., etc. Doug Spreng's comment was that somebody finally developed an airplane uglier than the Stormer!

Inasmuch as we weren't too sure as to how much control movement would be necessary, we moved the linkages up to give more than the designed control throw. On the first takeoff, the Kwik-Fli went screaming down the runway — we eased back on the stick, it shot straight up, and we quickly found that we had too much throw on the elevator — the ship rolled so fast we practically lost count! Other than that the performance looked very promising. The ship was carted back to the shop, the wings opened up, and the aileron throw cut in half. The elevator linkage was also put back in the last hole where it belonged. We then returned to the local field where the troops were still laughing.

After the next flight, everyone stopped laughing. This ship was the best aircraft we ever had the opportunity of flying! It tracked through inside and outside loops with almost unbelievable precision and with no corrections necessary. The Kwik-Fli could be put into gentle turns either to the left or right without tightening to either direction, and its rolls were very axial. Landings, too, were beautiful — the ship could be brought in and slowed up until it reached a very high angle of attack, very similar to a Navy carrier type landing — rear wheels settling gently to the runway with the nose wheel holding two to three inches off until the ship slowed, followed by the nose wheel gently rocking forward on the runway.

Several hundred flights were racked' up on this first Kwik-Fli before it met its demise in a mid-air collision. The second prototype followed, and was finished within five days after commencing construction. This ship was much lighter, weighing in at 6 pounds, and was subsequently pow ered by a Veco .45. While it flew well enough, it was far below the standards of the heavier original with the Super Tigre .56. It was obvious that this size airplane needed to weigh approximately 7 pounds, and that even at 6 pounds, the Veco did little for the aircraft's performance. This prototype was flown for hundreds of flights until it became so moldy and oil-soaked that even we couldn't stand its appearance. It was decided that perhaps a little concession to appearance wouldn't add substantially to the building time, so we sanded down the Kwik-Fli, rounded the tips on the stab, and added a new and larger vertical fin, A new wing was constructed with just enough dihedral to take away the flat droopy appearance. The addition of these modifications, plus colored dope, brought the weight back up to *7¼* pounds and the Super Tigre was re-installed. The ship then flew in the same manner as the first prototype. While still no raving beauty, at least its appearance didn't make the spectators shudder!

The curious thing about the basic Kwik-Fli design is that every change we have made from the original configuration has detracted from its performance. A larger vertical fin did nothing for the aircraft, except perhaps, make it more difficult to spin. Even the slight dihedral sacrificed some of the axial qualities of the roll.

The dihedral did make the airplane slightly easier to fly and had less tendency to show up minor errors in wing attitude during loops, vertical eights, etc. Consequently, and except for appearance, the final version as shown in the plan, is very close to the original except for concessions toward a better appearance.

Construction accuracy is probably more important than minor design differences in the contest aircraft. Thus, the plane shows a built-up wing jig to insure that accuracy.

All of our flying with the Kwik-Fli has been done with proportional gear. However, several other Kwik-Fli's have been built utilizing reeds, and fly outstandingly well. The reed versions, however, have one-third of the elevator area removed and a longer horn ini' (*Continued on page 28)*

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stalled for smoother elevator response.

For contest performance, the Kwik- Fli does depend on large displacement engines, such as the Super Tigre .56 or .60. Unfortunately, the Super Tigre is notoriously unreliable in its standard configuration. However, some of the West Coast fliers, such' as Cliff Weirick and Willie Smith, began modifying their Tigres with Johnson carburetors substituted for the standard plumber's nightmare, achieving excellent results. Adaptors were machined to properly fit the Johnson carb to the Super Tigre. Some also added an adjustable air bleed drilled into the adaptor just below the carburetor. This allows minor low speed adjustment to suit particular weather conditions. A spring must be installed in the Johnson unit to take out the slop in the mechanism which moves the needle valve in as the throttle is retarded. We understand that Super Tigre's latest model of the week will incorporate a throttle similar to this modification.

Because of the general unreliability of today's large engines (with the possible exception of certain of the modified Johnson carburetor Super Tigre's) we decided to build a smaller version of the Kwik-Fli. The fuselage is practically identical with the exception of the1 1/2" shorter tail moment. The stabilizer and elevator are approximately the same except that they are now tapered. The wing has an 11" chord and 60" span for an area of 660 square inches. All up weight came to 5% pounds. We still really haven't racked up enough time on the little version to decide whether we like it better than the big one or not. However, it is a nice size for transportation (Ed's note: Phil drives a prestige type Isetta convertible powered by the aforementioned Super Tigre), and quite possibly flies as well, or better than its larger predecessor. However, at 5% pounds and with the Veco .45, it does not bore through the maneuvers as well as the 71/2 pound Super Tigre versions. Therefore, as this article is being written, we are installing a .56 in the little ship and expect its performance to be most interesting.

To sum up, we believe the Kwik-Fli is about all you can ask for in performance for contest type aircraft. The framework, ready for covering, can be built in 16 hours. It is extremely rugged and easy to service. Outside of appearance, we don't think you can ask for much more.

Wing Construction

Wing construction is entirely straightforward. Actually, you don't need the wing jig as shown on the plan, but it is highly recommended since accuracy is all-important in a contest airplane. Note that the wing is constructed outside down on the jig. This allows installing the landing gear mount during framing in order to minimize the construction time. We used structural epoxy cement for mounting the landing gear and in other areas subject to high stress. All servos are mounted with wood screws which we found to be entirely practical, saving a lot of time in fiddling around with the usual blind nuts or other types of hardware.

Fuselage Construction

The fuselage must be constructed following the outlined steps exactly — each having been carefully planned to eliminate errors and for the fastest possible building time.

(1) Cut 3/16" fuselage sides and doublers and glue together. Drill 5/16" holes for wing mounting dowels.

(2) Laminate V4" motor mount bulkhead from 5 ply, V&" plywood.

(3) Cut 2 pieces 1/16" x 6" x 24" for stab* Mark rib positions and complete stabilizer.

(4) Cut elevator from 2" x 1/4' stock, 24" long, and sand to shape.

(5) Cut all fuselage bulkheads exactly as shown.

(6) Splice a small piece at the rear of %" x 4" x 36" soft balsa to make top sheeting, starting rearward from hatch. Cut the front hatch from %" x 4" x 5%".

(7) Mark positions of bulkheads and servo mounts on rear top sheet. Pick the straightest edge of a 3/8" top planking sheet, then draw a line lengthwise on this sheet 3 1/2" from edge. Cut a 1/4" slot on this center line for the fin. Using dividers, mark at F-5 and F-6 the position of outer edge, ½triangular longeron. Pin the hatch block (front of F-2 forward) and rear top sheets (front of F-2 to rear) to a flat work surface.

(8) Cement the *y<*'* triangular longerons to the top sheets 3/16" from the straight edge of the sheets and 3/16" from the straight line previously drawn *&/o"* from the edge of the sheet. (Fuselage is straight to F-4) and bend around at rear to conform to marks at bulkhead positions. Taper at rear is indicated on top view of the plans.

(9) Notch 14" into triangular longerons and install servo mounts. Position servos and mark mounting holes.

(10) Cement in place all formers except F-l. Be sure they are vertical.

(11) Set in place the 1/16" I.D. tubing push rod guides on the bulkheads.

(12) Cement the fuselage sides in place, then add the 3/16" x 1/2" soft doublers to the rear on the *1/2* triangular longerons.

(13) The stabilizer should now be sanded to shape and glued to the fuselage.

(14) Install F-l with structural epoxy cement.

(15) Add the 3/16" x *1/2* hard bottom longerons and 1/8" x 3/8" stringers.

(16) Install servos with wood screws, make up and install all push rods except to the rudder.

(17) Add 1/16" ply front and 1/8" rear planking.

(18) Fit finished wing to fuselage, checking for perfect alignment and proper decalage. The wing should be mounted with the leading edge approximately 3/32" lower than the trailing edge in the inverted position.

(19) Remove the fuselage, carve and sand to shape, as shown. Cut out hatch.

(20) Install the fin in slot previously cut in the top sheeting.

(21) The engine is mounted on a 1/8" thick aluminum plate. The Super Tigre · .56 and .60 and Veco engines all fit the same plate, except that 6-32 flat head screws are used to attach the mount to the Veco, while 5-40 are used for the Super Tigre. The engine is' mounted to the bulkhead with three 6/32 screws and double-nutted to prevent loosening. No side or down thrust is used. The final covering and painting of the airframe is up to the preference of the individual modeler.

Flying

Before flying, it is important that the wing be balanced. If anything, it should be slightly heavy on the right hand side to help compensate for torque at low speed or under high-G loads. We, however, have merely balanced ours evenly. So far, all of the Kwik-Fli's have flown with no adjustments or trim whatsoever. Most of mine have come out either perfectly balanced or slightly nose heavy. You will not that the plans show a 2 to 1 reduction in aileron throw at the aileron bell cranks. Total aileron deflection is only about However, the ailerons are very large and very effective. The small deflection of the large area probably accounts for the aircraft's smoothness on aileron plus freedom from yaw during rolls.

The Kwik-Fli has worked very well for us and has been more or less adopted as a standard design for the immediate future. We hope that it performs as well for you.