



## A "Desperado" on the Loose

A Ross Twin .60 slow-rolls it across the sky. Low tide in the tank? Just droop the flaperons, thermals are for free.

by Gene Rogers

FM photos: Don McGovern

On first impression, a Sailplane powered with a roaring twin cylinder .60 engine seems startling! Upon further consideration why shouldn't a high performance airplane, as a soarer is, be able to handle large amounts of thrust and torque from a powerful engine? Efficient soarers sometimes achieve high speeds in transit from thermal to thermal. Long tapered high aspect wings are a natural for handling large amounts of engine torque, and the more important, "P" factor, incurred in climbing attitudes.

Contrary to many non-sailplane enthusiast's beliefs, sailplanes are not fragile craft. Gliders are subject to extreme aerodynamic forces, the brutal launching stresses of hi-starts and winches, wind shear forces in thermal areas and high "G" forces pulling out of descending dives. This same basically strong construction will handle the high stresses incurred in violent stunt maneuvers. A powered glider's construction, however, must be beefed up to handle a slightly higher wing loading caused by the addition of an engine and more flight controls in the craft.

Gliders are light weight aircraft, though lightness is in no way sacrificed to make them "smash resistant." The concept of the "Desperado," follows this same basic design philosophy. Aircraft design is probably the greatest compromise game in existence, but why throw in a negative factor such as crash-proof? All means should be taken in a design to insure controllability in all flight attitudes and speeds. When this important factor is compromised by

appreciable weight additions, the chance of a mishap becomes much greater. In short, airplanes should be designed and flown with crash prevention foremost. Brick out-houses were not meant to fly anyway!

Due to its high aspect ratio wing and comparatively long tail moment, the "Desperado" flies very gracefully under power, as well as having the traditional smoothness of a soarer when the engine shuts down. The maneuvers are large, and require plenty of sky. With the 100" wingspan, slow axial rolls, are dramatic beauty!

The "Desperado" was not designed for either Pattern or Sailplane competition flying; however, on certain occasions it could be used for either, depending on the competition and the weather conditions existing. Powered touch-and-goes require a smooth runway and precise approach attitude. Even with the single wheel set-up, this is not as difficult as it might seem. The "Desperado" flies very smoothly and is not subject to abrupt heading changes caused by wind gusts or otherwise unstable air.

Spot landings can be difficult with sailplane because of its long flat glide slope. Flaps or spoilers are used to great advantage here. Each method has its own advantage, with the optimum being an aircraft equipped with both. With ease of construction, simplicity and light weight in mind, a flaperon system is used on the "Desperado."

Flaperons are the manipulation of the same control surface to serve as both flaps

and ailerons. This double duty, is accomplished by making both ailerons droop simultaneously to serve as flaps, yet while they are in the lowered or drooped position, they are able to rotate independently for aileron function. This seemingly difficult duty is carried out very simply, by installing the aileron linkage and servo in the conventional manner, as on most planes with strip ailerons alone. However, in this case, the aileron servo is mounted on a sliding tray. This tray is pushed rearward by a pushrod from the flap servo, which is rigidly mounted. When the aileron servo is pushed rearward, both strip flaperons are drooped, yet they are still able to operate independently by the aileron servo in its aft position. This method produces an airplane with flaps, with hardly more building effort than ailerons alone, yet it is a very effective control in flight.

The "Desperado" is amply powered by a Ross .60 twin. This engine, with its twin cylinder heads and polished exhaust stacks protruding from the cowling, gives the nose of the ship a very important suggestion, and with good reason. The engine runs extremely smoothly, due to its opposed firing twin cylinders and precise balancing. Since both cylinders fire simultaneously, most of the vibration cancels itself out. A feature such as this in an R/C engine is extremely important, because of its kindness to the vibration-sensitive electronic gear aboard the plane. I am sure all R/C manufacturers will agree; that vibration is the most detrimental factor in radio system failures. Vibration is also very harmful to the airplanes control surface linkages and even to the basic structure of the plane. Features such as this, tend to reinforce my crash prevention philosophy, instead of the negative crash damage prevention. A truly crash-proof airplane would not fly anyway!

The five channels of radio used in the "Desperado's" controls are supplied by MRC's new Mark 5 radio unit. This moderately priced quality system provided outstanding ground range on pre-flight radio checks prior to the ship's first test

flight. A small, but appreciated feature is their nylon servo tray, with its snap-type servo mounting method. This refinement holds the servos securely, but allows just enough float to absorb servo damaging engine vibration. Another step forward toward crash prevention! The flaps are operated from the toggle switch on the Mark 5's transmitter. This "all or nothing" method flap actuator wouldn't be desirable on a full size airplane, but it works fine on our model plane application. Applying flaps on remotely controlled models is an entirely different game than applying them on a full scale airplane, where fractions of seconds aren't that important. I am sure those modelers who fly both will agree with this.

For a large airplane, the "Desperado" transports quite easily, due to its three wing, take-apart feature. With the longest wing section being only four feet in length, it can be conveniently transported in small cars. The lack of a landing gear also makes the fuselage easier to tuck away.

If the idea of boring holes in the sky with a Sailplane doesn't necessarily appeal to you, then a smaller engine can be used. A .40 size engine would be ample for graceful powered flight and provide enough power to easily take it to thermal altitudes in short order.

If desired, the whole concept of the "Desperado" can be simplified, when just thermal soaring is primarily the intended use. The plane could be flown with a simple two channel radio system, controlling elevators and ailerons only. If station wagon transportation is available, a single piecewing could be constructed. The wheels could be eliminated. This lighter, basic sailplane would perform well with a .30 size engine.

Flying this design is not difficult at all, and a person with a minimum of R/C flying experience could master it in short order. The construction of the model, does however, require more than a beginner's building talents. With this assumption in mind, only the highlights of the construction will be discussed.

As I have recommended on other designs; the easiest and most pleasurable method of scratch building a model is to fabricate your own custom kit, before sticking things together. In the case of my personal building venture with the "Desperado," two kits were started together. This went very fast, until an encounter with the bench saw while ripping the wing tip planks very nearly cost me two valuable fingers! My best friend in the work shop for many years quickly became a terrifying companion, to say the least! I've always had the utmost respect for the beast, then a careless reach for the plank—and a hand in the blade! As tired as it may sound, "you can't be too careful with those things."

The two kits were completed under a painful, but challenging handicap. Both "kits" were assembled simultaneously. It may sound like a lot of work, but there are obvious rewards and hours saved by constructing in pairs.

After the custom kit has been completed, you will have a complete knowledge of the construction of the airplane. The framework will then go together very fast, and it will be a more enjoyable construction experience.

FLYING MODELS



### The Fuselage

The fuselage utilizes crutch type construction, allowing a clean, fully contoured profile. The crutch frame, together with the lower portion of the fin, is pinned down and constructed over the top view of the fuselage. After completion, the crutch is removed from the plans, and the plywood firewall and bulkheads are epoxied in and the balsa bulkheads cemented in place. Next, the center, upper and lower full length stringers are installed. The tip stringer should be cut partially through for later removal, as part of the hatch. The hatch extends over the wing fuel tank. The stringers and planking can now be installed. Make light cuts in the planking for the later removal of the hatch cover.

The beveling and tapering of the planking strips can be conveniently handled by cementing a continuous strip of sandpaper on a flat board, and scraping the blank strips over it. Sand the entire fuselage as a unit, before cutting the hatch free.

This insures a good match fit of the hatch.

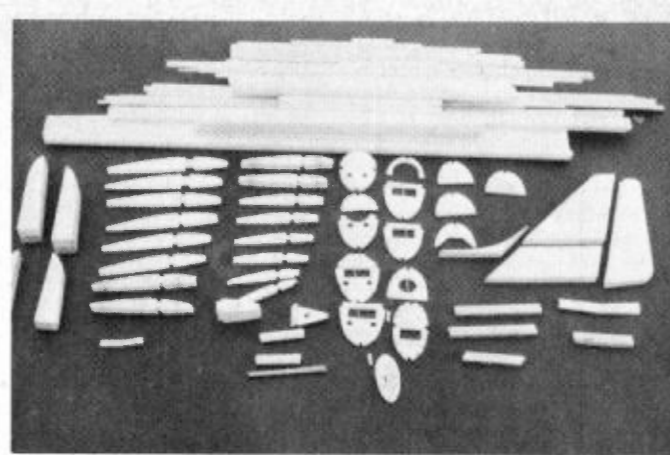
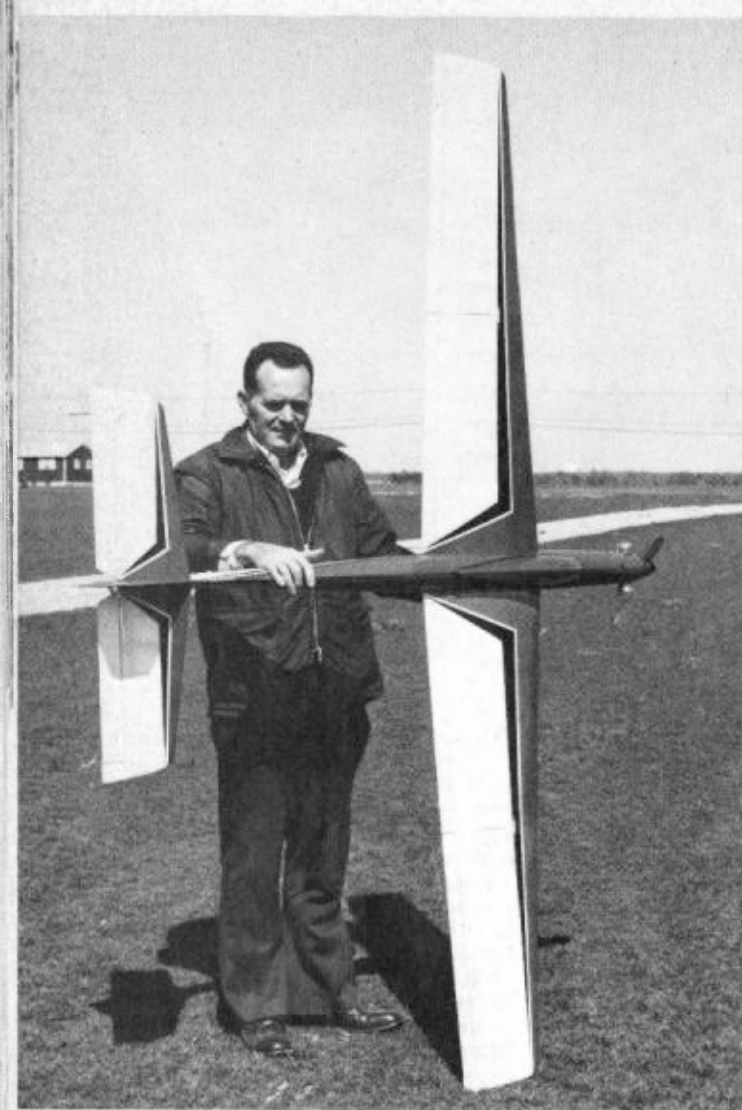
A hole saw can be used for making the cut-outs for the landing wheels. The gear brackets are made of steel, with a steel axle soldered to the brackets. Aluminum could also be used, with a screw and nut serving as an axle.

A cowling is made from cloth and plastic resin, formed over a male mold that is carved from a balsa block. "Hobbypoxy" explains this method as their "Easy-Does-It" method. Step by step instructions can be had from the company for the asking. After completion, the cowling is parted in two pieces, making upper and lower halves. This can be done using an X-acto or Zona saw blade.

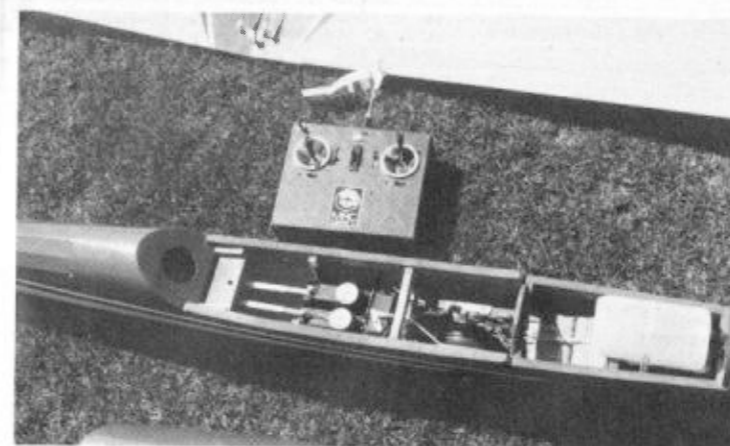
The cowling is fastened to the firewall with machine screws threaded in tapping blocks, that are epoxied to the firewall. The upper and lower portions are joined, using machine screws into metal tabs that are epoxied to the upper portion of the cowling, forward of the cylinder heads.



It stunts, it soars, it snores. The beautiful sound of a Ross Twin .60 hauls it about the blue. At top: The long slide home. Dead stick or power on, the design is feather light on the landing.



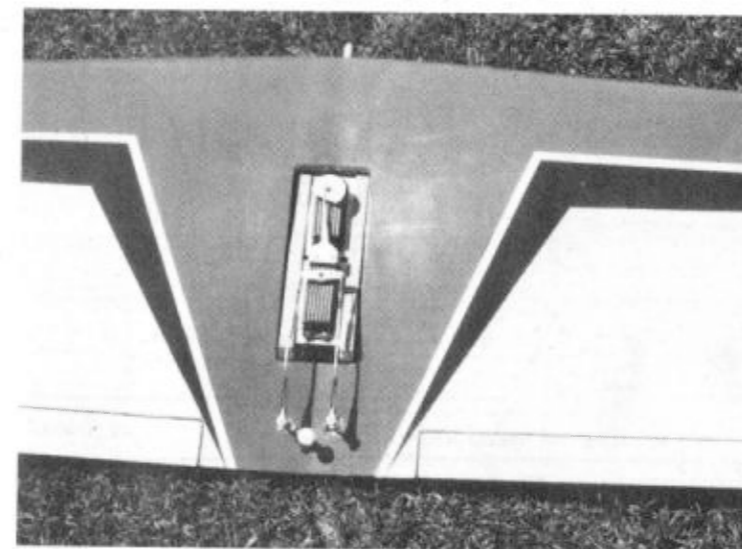
It cuts your building time. Pre-cut all the pieces before you get going. **At left:** An oval stringered fuselage and a tapered high aspect planform. **Below:** Smooth as silk. The opposed pistons dampen down engine vibration.



From tank to trailing edge, things are accessible. Model balances well. **Beneath:** The flap servo is fixed, the aileron servo slides on tray deal. A simple dual function. Flaperons respond as ailerons, deflect as flaps.



It's half way between a glider and stunt machine, does all things well. **Below:** A close in view of the fiberglass cowl. Carve an undersized form, lay fiberglass cloth and resin over it, mash balloon over the exterior.



The stabilizer is constructed over the plans, with the leading and trailing edges blocked up to the proper height with sheet balsa shims. After removal from the plans, the tops of the ribs are contoured to shape using a long sanding block. Sheet cover the leading and trailing edges and cap the ribs on one side, before sanding the other surface. Note the stabilizer has a symmetrical airfoil, with its thickest section as shown on the plans.

#### The Fin

The upper portion of the fin joins the lower portion at the center line of the stabilizer chord thickness. Notch the fin for the stabilizer leading and trailing edges, as was done on the fin's lower portion. Use soft balsa for the fin's upper portion, rudder and elevators, keeping the empenage as light as possible.

#### Wing Construction

The wing is assembled in three take-apart sections for easy handling and transporting. If storing and transporting is not a problem, the wing can be made in one piece, enabling easier construction and lighter weight.

As mentioned earlier, the wing features flaperon controls, and if the radio channels are available, flaps are well worth

the small extra effort. These could be added later, without much additional work.

The three piece wing's center-section is made first, using a plywood building board, hinged at the center-section, with the ends propped up for the recommended dihedral slope, of one inch per foot, on each side. The leading and trailing edges are propped up, using balsa strips as shims. It should be  $\frac{3}{8}$ " thick at the trailing edge, and measure  $\frac{5}{16}$ " at the leading edge. Make certain the two pieces of brass tubing used for joining the outer panels are absolutely parallel to each other, or the panels will not slide apart!

After the center panel has been completed, the two outer panels are made. Construct each outer panel separately, against the center-section, to assure a good match. Build the panels on a flat board with the tubular splice pieces in place to assure an exact fit. Make certain everything is aligned to allow the joint to slip apart easily.

The outer wing panels are kept from sliding apart by using rubber bands, stretched between hooks, as shown on the plans. These hooks are on the top and bottom surfaces of the wing. The rubber bands allow the joint to flex slightly in flight and allow shock absorbing qualities when landing on rough terrain.

The flaperon connection where the wing panels join, uses a "tongue and slot arrangement". This set-up works well. Use care in slotting the ends of the flaperons, making sure that the mating flaperons are even at their splices. Line the inside surfaces of the slots with a thin coat of epoxy for strength and wear resistance.

The two original "Desperado's" were covered with Silron. It was originally intended to use silk. However, when a current price check was made for nine square yards of silk, (two airplanes) the more economical Silron was chosen! The ships were sparingly trimmed with a sprayed colored dope to keep the weight at a minimum. A lighter job could be made by using MonoKote or silk.

#### Flying Time

Carefully pre-flight check the plane for warps, and the true alignment of all flying surfaces. Make certain all control surfaces are at a neutral setting, and return to neutral after being actuated by radio command. The engine position should not need any thrust adjustments, as the "Desperado" is designed for a neutral thrust setting. Make certain the radio is range checked, and that a control surface check be made, with the engine running at all speeds. Check the engine needle valve adjustment by

pointing the ship's nose up at a steep angle, and hold it up for a while, making sure the engine doesn't sag. A fuel mixture that is too lean causes a hot running engine and can wear it out very quickly.

With a landing wheel set-up, as on the "Desperado," propeller ground clearance is at a minimum. This fact doesn't hinder excellent R.O.G.'s, if a paved runway or mowed strip is available. When releasing the model for take off on a grass field, use a considerable amount of elevator for a nose high prop clearing angle. After the model breaks ground, gently release the elevator and proceed to a normal climbing attitude. If a partial flap position is available, use that too. This technique as used on full scale airplanes, also works well with this design, with little danger of stalling at low air speeds.

Due to the "Desperado's" large size, the ship, when airborne, appears to be flying much slower than it actually is. A few full power, low passes over the runway made me aware of this phenomenon, very shortly! The ship is a real joy to fly, and behaves in a completely neutral manner, at an extremely wide range of speeds. Using full flaps and a low power setting produces an almost hovering type of slow flight. This is a majestic sight when low fly-bys are made. Good soaring!

