

There is something fascinating about a twin-engined aircraft, especially when you hear those two synchronized motors humming away. The multi-engine bug thus having bit and stayed, I put away my old De Havilland DH-2 and commenced to flip away through my six-year collection of *R/C Modeler Magazine* and other sources like *Playboy Magazine*, looking for suitable subjects, hints and theories. My conclusion from my study was that I needed a semi-scale subject, with a large rudder to overcome engine failure, motors with out-thrust, a simple and quickly built structure, a wing loading around 26 oz./sq. ft., a high wing, a reasonably long nose for balance of the Center of Gravity, and a tall blond — 36", 24", 36" (would you believe, for cockpit detail)? The latter, my wife explained, would not fit into such a small cockpit, and, after some convincing arguments on her part, we deleted the last requirement!

My imagination was now diverted to a recently developed aircraft call the "Nomad", which filled most of my requirements. The first Nomad flew in 1971, and the second VH-SUR flew for all to see at Farnborough in September 1972. The Nomad is a wholly native product of Australia, and is just now entering the first stages of production at the Australian Government Aircraft Factories, with final assembly taking place about five miles from my home.

The Nomad falls somewhere between a D.H.C. Twin Otter and the Britten-Norman Islander, and was designed with the philosophy of simplicity of structure and systems, flexibility of loading and internal layout to exploit the full load capability for S.T.O.L. performance from rough fields.

The most interesting feature about the whole design is the high lift system which consists of a full span wide-chord double slotted flap installation, in association with a specially developed leading edge design to allow maximum exploitation of the flap capabilities. The lateral control system uses the rear outer section of the double slotted flap as a conventional aerodynamically balanced aileron when flaps are retracted for cruise flight. As the flaps are extended, a mixing mechanism in the control circuit progressively transfers control motions from the trailing edge ailerons to a "slot-lip" aileron so that, as full flap extension is approached, the cruise aileron becomes stationary and acts only as a flap, lateral control being achieved by the highly effective slot-lip surface.

Due to the full span flaps, the Nomad has a fairly small wing area in relation to its overall size. Originally, I tried a scale wing area but, without the scale flaps, the wing loading was too high. I therefore increased the chord to give a light wing loading and used a Clark Y section for ease of construction. I flew the model for some time with inverted engines and flaperons. However, with such a light wing loading, I concluded that the flaperons were rather redundant and were also dangerous to use. If full flap of about 30° was given without full up trim, the model would instantly nose-dive straight for the ground with shattering results! The inverted motors were easily flooded and produced a lot of vibration, even to the extent of breaking off aileron hinges. Hence, after an unfortunate mishap that required extensive rebuilding, I left out the flaps and turned the motors on their sides. This has extensively reduced the vibration and enhanced engine starting, but has raised the carburetor centerline above that of the tank. I therefore pressurized the tanks from their respective mufflers to compensate for this condition.

The resulting craft, as now appearing in this article, exceeds my aims in that it is semi-scale, quick and easy to build, a basic trainer for twin engines, is easy to fly, has plenty of power, and glides extremely well. The best advantage of all is that if one motor fails when on full power, all that is required, when inexperienced, is to quickly close down the other motor and glide down to a safe landing. With experience, the Nomad can be flown on one motor at about 3/4 throttle setting. For the novelty, I added a bomb compartment under the cockpit, a great gimmick for those flying demonstrations!

### CONSTRUCTION

Construction is fairly basic and, as you are at least past the novice stage, I will only emphasize the important details.

#### Fuselage:

The fuselage is basically simple and is constructed mainly from 1mm (1/32") ply to not only save a few dollars over the balsa, but because it makes a good, strong, and simple fuselage. Care should be taken in aligning the hole for the stab pivot. After sheeting the rudder post, reinforce the area of the pivot with 1mm ply and then drill the 3/8" holes. Using the 3/8" diameter aluminum tube, check the holes for alignment to the wing saddle. If there is any misalignment, file out the hole until the tube sits correctly. Now, using two 1/8" thick plywood washers, which snugly fit the tube, epoxy the washers in the correct position using an oiled aluminum tube for alignment. The windows are simply cut out from .01" perspex and epoxied in position. Pin holes around the borders will help to key the perspex in position. If you cannot readily obtain 1mm ply or similar for the fuselage, then I suggest you could try foam board or corrugated cardboard.

#### Elevator:

With the 3/8" outside diameter aluminum tube in position, secure the elevators to the aluminum tube, using music wire keeper pins as shown, and epoxy in position. Don't forget to drill a few holes in the aluminum tube for the epoxy to key to.

#### Rudder:

The rudder is mounted after the elevator, as it is easier to sight along the elevators and align them without the rudder in place.

#### Wing:

Before sheeting the bottom of the wing, install both throttle cables and aileron rods. After the bottom sheet is then complete, the engine pods can be glued in position with epoxy.

#### Engine Pods:

The engine pods are made from two side walls of 1mm ply as are the respective formers. On completion, they are trimmed to accommodate side mounted radial motors. After trimming, the fuel tank compartments were covered, using aluminum capping folded at the edges and secured with small self-tapping screws. This cover also served to retain the fuel tank in each pod. The fuel tanks, about 6 oz. capacity, were made from tin sheet and solder and pressurized from the muffler. A simple means of pressure fitting was used in that a hole was drilled in the muffler-to-motor manifold, which snugly accepted some brass tubing. The brass tubing was then glued in position with epoxy. Note that the brass tubing is bevelled before insertion, so that the opening is pointing into the exhaust port of the motor, thus ensuring maximum pressure. When mounting the motors, make sure there is some out-thrust and down-thrust on each motor in the range (0° to 3°).

### FINISHING

This I leave to you. If of any interest, I covered the open structure only with heavy weight tissue, and hand-painted with Estapol paints. This I consider ideal and quick for a plane that will be suffering from learner's fatigue and long hours of fun type flying.

### SET UP

Ensure that the Center of Gravity is close to 25%, otherwise it will be too sensitive to the controls. I had to add about 6 oz. of lead to the nose. Originally, I had my elevator too sensitive, combined with a rearward Center of Gravity, and it was like driving a buck-jumper in the sky. So — keep the elevator movement to within the limits specified and the Center of Gravity well forward. Ensure that both throttles open up evenly and do not bind. I used 1/8" inside diameter nylon tube and 1/16" diameter wire for the controls. This is easy to install and works quite well, provided it is done before the wing is covered.

## FLYING

Before taking-off, ensure that both motors run correctly and can be throttled low and high in unison. I have found that about a 100 rpm difference in motors is not really worth worrying about and is easily trimmed out. A tachometer is handy for tuning, but is not absolutely essential. I find that I still do my final tuning by ear, as you can easily recognize that note when both motors are running in unison. I am using two Enya .35's, which have both seen service before and supply ample power.

In fact, the take-off is a real S.T.O.L. performance. Like the original plane, it is not fully aerobatic, but can loop, spin, and roll to some degree. Its best performances are "touch and go's", fly-by's, parachute dropping, plus S.T.O.L. take-offs and landings. When initially flying your twin, be on a constant lookout for motor failure, especially at full throttle, and be ready to cut back that throttle if one motor should die. This is the safest way to compensate for motor failure when learning and the model can then be glided safely to the ground.

The model has proved to be extremely rugged and is not too hard to repair if this becomes necessary. I have rebuilt mine three times so far, all due to those flaperons I have now removed. I have been experimenting with mock-ups of the mixing mechanisms to simulate the original double slotted flap system and "slot-lip" aileron for an exact scale model. It now looks as though it can be done and, if I ever finish my current four-engined project of a Handley-Page Halifax (full scale), I may also get around to developing a true scale Nomad.

Well, if you have any problems, write to me at 4 Ruhamah Avenue, North Geelong, Victoria 3215, Australia. □

## NOMAD N22

Designed By: Alexander W. Meek

### TYPE AIRCRAFT

Stand-Off Scale Twin

### WINGSPAN

72½ Inches

### WING CHORD

11½ Inches

### TOTAL WING AREA

833¾ Square Inches

### WING LOCATION

High Wing

### AIRFOIL

Flat Bottom

### WING PLANFORM

Constant Chord

### DIHEDRAL, EACH TIP

(2°) 1-3/16"

### O.A. FUSELAGE LENGTH

56½ Inches

### RADIO COMPARTMENT AREA

(L) 5" X (W) 6" X (H) 6"

(servo and receiver)

(L) 3½" X (W) 3½" X (H) 2½"

(battery pack)

### STABILIZER SPAN

23¼ Inches

### STABILIZER CHORD (flying stab)

5½ Inches

### STABILIZER AREA

125¼ Square Inches

### STAB AIRFOIL SECTION

Symmetrical

### STABILIZER LOCATION

On Vertical Fin

### VERTICAL FIN HEIGHT

12 Inches

### VERTICAL FIN WIDTH

7¾" (Avg.)

### REC. ENGINE SIZE

.25-.40 cu. in.

### FUEL TANK SIZE

(2) 6 oz.

### LANDING GEAR

Tricycle

### REC. NO. OF CHANNELS

4-5

### CONTROL FUNCTIONS

Rudder, Elevator, Ailerons, Throttle

(auxiliary bomb or parachute drop)

### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage ..... Balsa, Ply, Spruce

Wing ..... Balsa, Ply, Spruce

Empennage ..... Balsa and Ply

Weight Ready-To-Fly ..... 160 Oz. (less fuel)

Wing Loading ..... 27.6 Oz./Sq. Ft.