DRUINE TURBULENT

If you're looking for a Stand-Off Scale model that flies as well as it looks, you won't find a better subject than this .15 to .25 powered Druine Turbulent. A magnificent aircraft that will be a winner in Stand-Off Scale contests in the coming months.

By Flt. Lt. Gordon Whitehead

DRUINE TURBULENT
Designed By: Gordon E. Whitehead

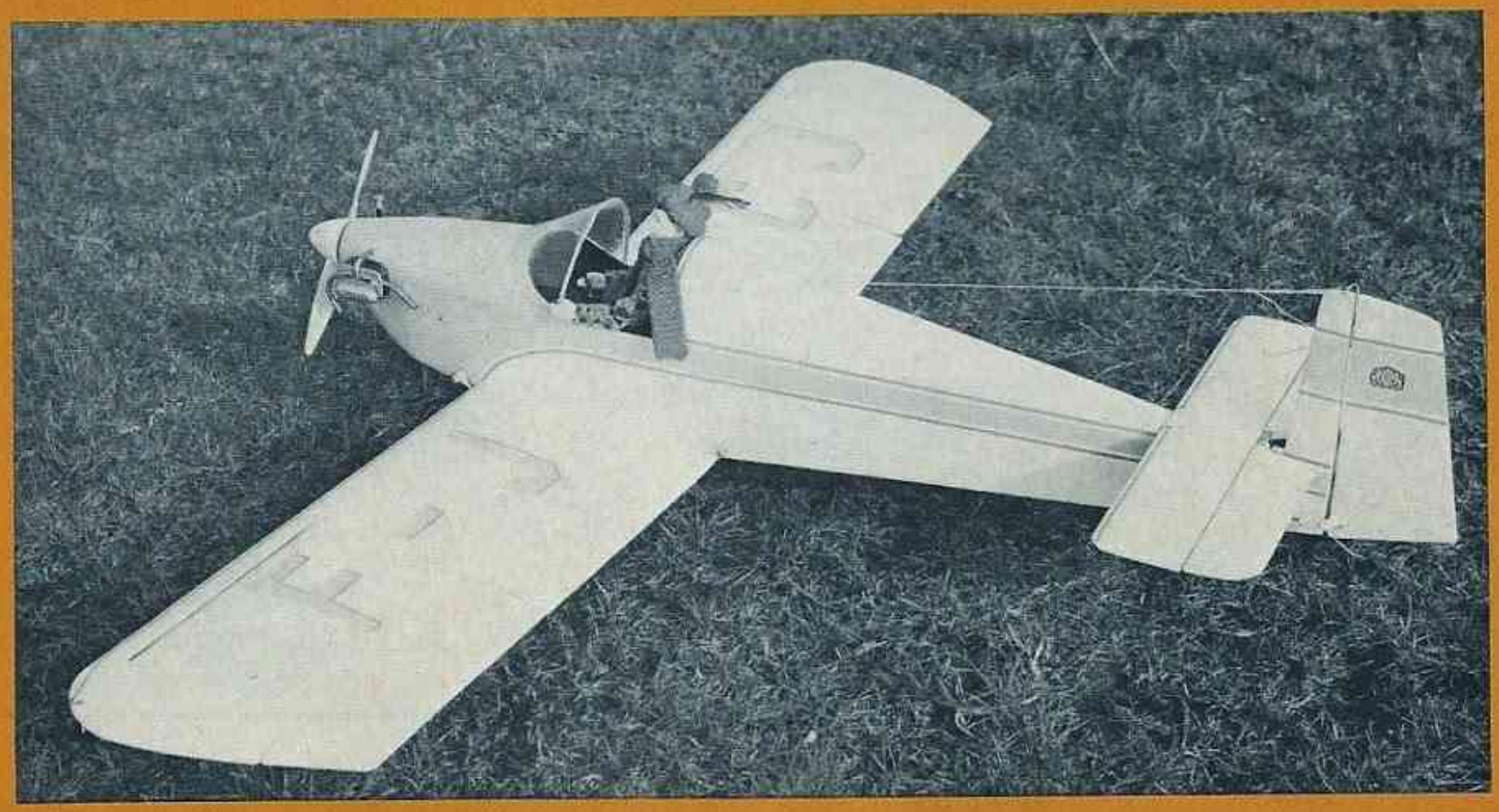
TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
48½ Inches
WING CHORD
9 Inches
TOTAL WING AREA
420 Square Inches
WING LOCATION
Low Wing
AIRFOIL
NACA 2412 (slotted)
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
2 Inches
O.A. FUSELAGE LENGTH
39½ Inches
RADIO COMPARTMENT AREA
(L) 9" X (W) 3½" X (H) 2½"
STABILIZER SPAN
15 Inches
STABILIZER CHORD (incl. elev.)
4¾ Inches
STABILIZER AREA
67 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5½ Inches
VERTICAL FIN WIDTH (incl. rudder)
4½ Inches
REC. ENGINE SIZE
.15-.25 Cu. In.
FUEL TANK SIZE
2-4 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.

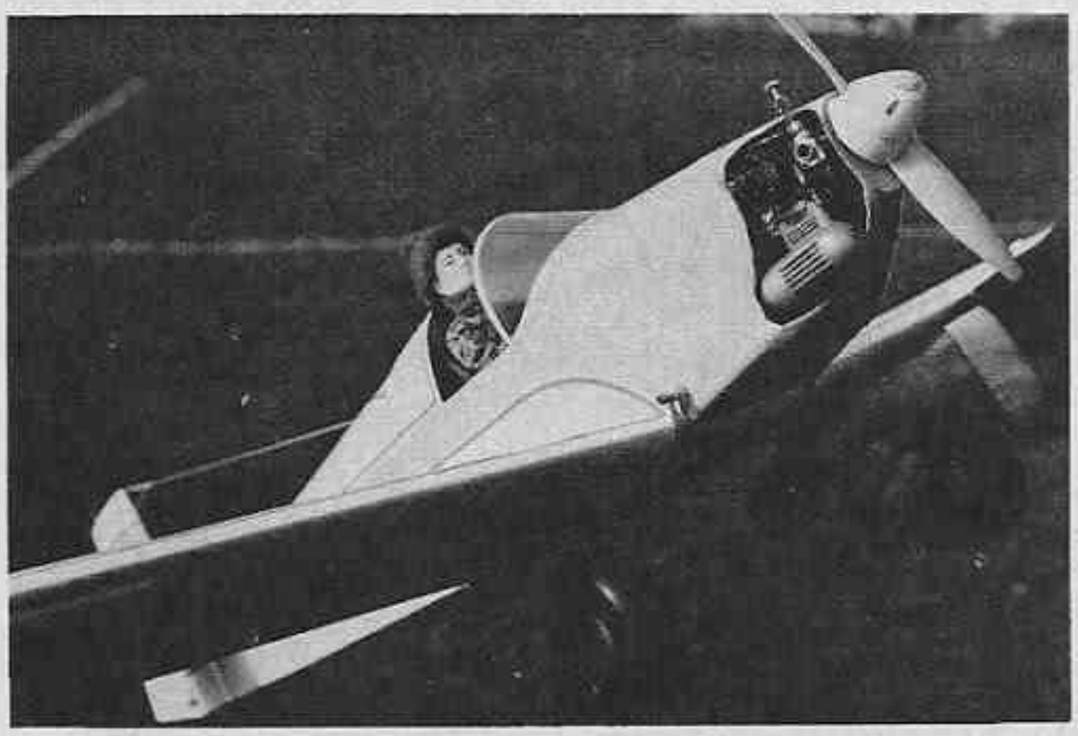
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Weight Ready-To-Fly	50 Oz.
Wing Loading	17.2 Oz/Sq. Ft.

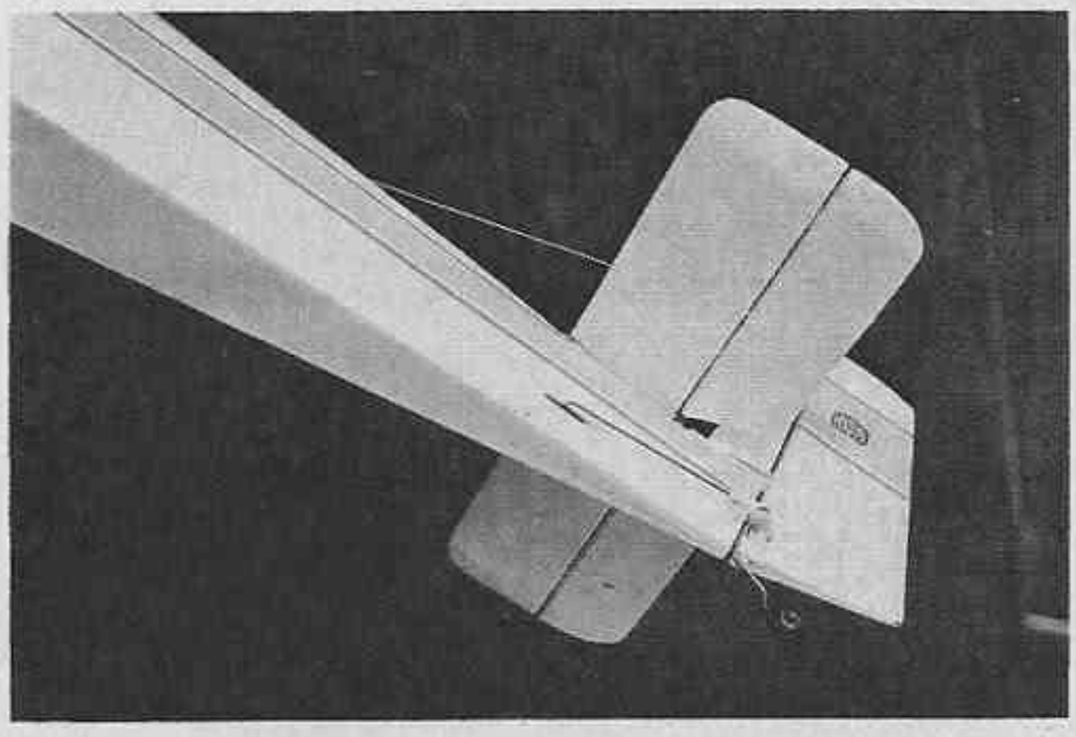
I don't think that the Turbulent will need any introduction to regular RCM readers owing to the article on Franz Meier's beauty which was featured within these pages last year. However, my model of the ship is totally different in concept to Franz's exquisite creation, being for general sport flying. You see, I like aerobatic models, and admire the virtuosity of all who compete seriously in FAI aerobatics. Not having time to practice sufficiently, I can't aspire to joining the ranks of the precision pattern exponents, but still thoroughly enjoy throwing my scale models about. In fact, I think that the best advice to give to a flyer who has reached the 4-function low wing stage using, say, a .40 powered New Era II or similar, is to study the FAI schedule and practice it. Yes! Even for sport flying. By the time he's got most of the maneuvers recognizable, he'll be competent and *confident* enough to fly any ship and rescue almost any situation. Notice that I didn't say he had to perfect the maneuvers - - - just get used to seeing an controlling the ship in all attitudes and through recognizable and reproducible evolutions.

Well, after that harangue, what has it all to do with my Turbulent? Certainly the full size ship isn't noted for its ability to fly Aresti patterns. However, besides possessing very shapely outlines, when built to a fairly light wing loading, using an adequately strong, but not beefy structure, she becomes a fantastic performer. Many modelers would expect to see a .40 in this size of ship, and hope to perform such things as vertical upward rolls until out of sight, and high speed fly-bys that leave the pulse racing. Well, with a .15, this ship will just about do half an upward roll before flopping out. When you perform a fly-by, she trundles past and you can study the pilot's facial expression. But when you start waggling the sticks, she'll perform wonderful antics in slow time that give you satisfaction because you can follow every





Close-up of O.S. Max engine mounted in the Druine Turbulent.



A view of the rudder and steerable tail wheel linkage.

movement. The secret is to use gravity and real wing lift to supplement the flea-power up front, and in using the last gram of energy from every position or movement of the ship.

The fixed slots were an attractive and unusual feature of the full-size ship, intended to inhibit spinning. So all you chaps who are terrified of tip stalls should experiment with this little gem. The purpose of the slots is to maintain unstalled airflow over the wing tips and ailerons at high angles of attack, thus delaying tip stall until well after the center section has lost its grip. They increase their effect as the angle of attack is increased, making turning and landing maneuvers safer. On the model, the effect of the slots is manifested by a marked reluctance to spin upright (even though she'll spin like a top inverted) and by powerful aileron control at slow speeds. Even when the middle section of the wing is stalled, and the model is 'mushing' downwards with full elevator applied, you can pick up a low wing using aileron with no fear of flicking out — with a little practice of course! More on flyability later. The foregoing was just to get you interested!

CONSTRUCTION

General: The structure is rib-for-rib, and sheeted where the full-size is sheeted. The rear decking can be sheeted with light 1/16" balsa, but I preferred the stringered early version. Construction is simplicity itself, but becomes even simpler if you pre-cut all parts. One evening's work will produce a kit of parts and help to keep the building board clear during the assembly stage.

Fuselage: Contact glue F1 to F1a. Glue the 1/8" square and 1/8" x 3/16" longerons to the fuselage sides, followed by uprights and the large doubler at the cockpit/wing seating. Follow the pre-bending procedure described on the plan when fitting the small front doubler. Note the grain directions. Next join the fuselage sides with F4 and the sternpost, then add formers F5 to F9 and crosspieces, ensuring squareness. When dry, draw the nose together and add F1/F1a, F2, F3 and then the ply doublers, holding the latter in place with clothespins until dry.

Build the ply exhaust duct and add the bottom sheet before and aft of the wing, noting that you will have to measure up your particular engine/silencer combination to ensure the duct lines up. The O.S. .25 silencer just fits inside the cowl lengths as drawn, but different silencers may need different holes!

After fitting the stringers, the top sheeting and cowl may be added — careful with those stringers! The fin and rudder are built up as shown, for lightness. Do not use solid sheet for two reasons — weight and cost.

When fitting the throttle linkage, note the re-positioned throttle arm on the engine, which keeps the Bowden cable run neat and along the fuselage wall.

Tailplane: This is of scale area, but gives no stability problems. The structure is very strong, light and easy to make so, again, do not use solid sheet. The elevator joiner is simple and solderless, and rugged. The tailplane and elevators are covered before hinging together, and then stuck to the covered fuselage. Remember to leave some bare wood for the glue to adhere to — tailplanes tend to go awry when just glued to covering! The cradle for the tailplane should be fairly soft, so as to break before anything else when cartwheel type maneuvers are being performed.

Wings: Both panels are built separately, joined by the dihedral braces, and the rest of the center section completed. The overall building sequence is shown on the plan. If you like the model, but do

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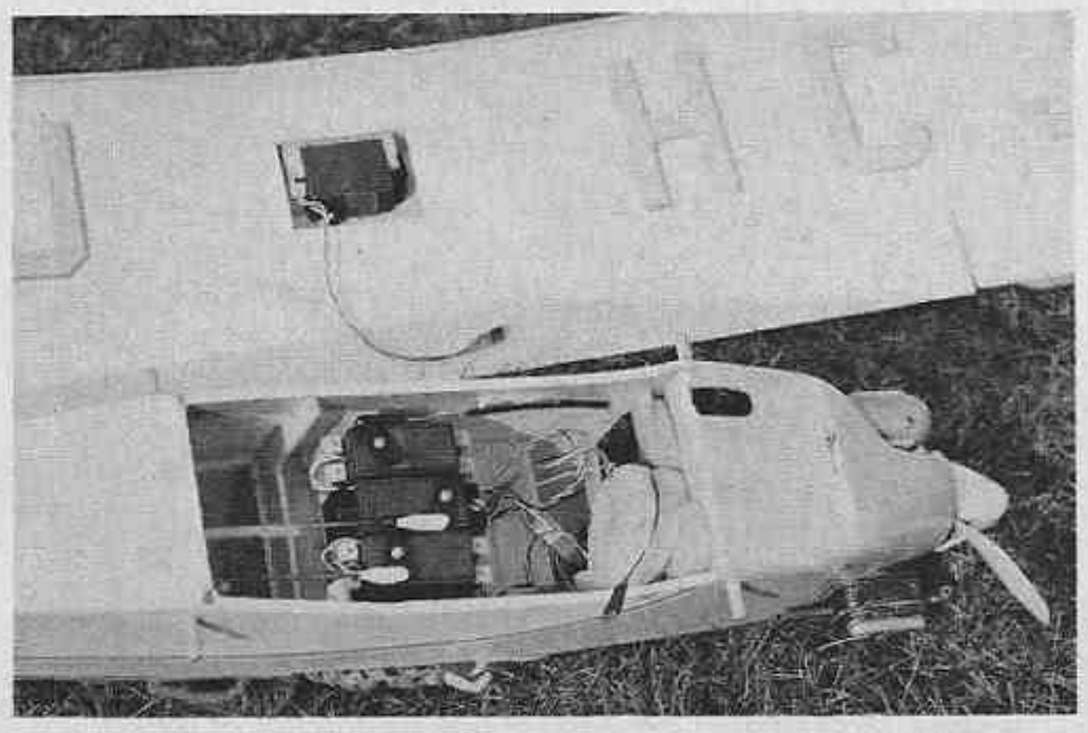

Plenty of room inside the radio compartment for your 4-channel rig.

. . . and you're ready to go. Try a low fly-by and have a ball!

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not fancy the slots, then omit them! If you are incorporating slots, merely tack-glue them in place during shaping and sanding, and remove before covering is commenced. The ailerons are built integrally with the wings and cut out afterwards.

Covering: Although the outline is pretty well scale, and is good enough for Stand-Off events, I would recommend the use of transparent film on the structure. Those scallops on the wing sheet look gorgeous and it's a shame to cover them up.

Radio Installation: The home-made radio gear used in the prototype is old hat by the modern micro standards, and weighs 1 pound all-up. There is so much room inside the fuselage that no difficulties should be encountered by even the tyro looking for a first low winger (if he dare tackle the slight added complexity of the slotted wing).

FLYING

This is the bit I like discussing most, especially regarding this ship. Make no mistake, despite its low power and relatively large size, the ship is highly aerobatic. The main characteristic to beware of is the relatively slow climb rate. You can't point the nose up, and expect the mill to haul the airframe up to the clouds; you ease the elevator up and let the wings fly her up there, just like the real Turbulent (or Tiger Moth, Chipmunk, or PT 20 — all of which are considered to be aerobatic!). When you stop climbing and level off, the ship will pick up speed and will loop from straight and level. As mentioned above, height and lift are the main tools you use to aerobat this ship, so rolls and Cuban Eights need a slight dive to provide enough speed.

A second prototype was made by one of my colleagues, who fitted an O.S. .25. Needless to say, the performance is much more sprightly, climbs are faster, and she doesn't wallow when inverted, as does my O.S. .15 powered job if I feed in too much down elevator when in this attitude. Both prototypes needed about 3 ounces of weight inside the nose cavity to balance. With no down or side thrust (or warps), about 1/8" up at the T.E. of the right aileron was required on both machines. She will cruise on half throttle, and if the taps are opened, she starts to climb — so if you prefer a "neutral" zero-zero set-up, don't be caught out. A couple of degrees downthrust could be incorporated at the building stage, but I

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have never thought the effect marked enough to modify the completed model. Initial trimming flights should be straight-forward. At take-off, she'll need slight right rudder to stay straight, and slight up at the start of the run will prevent nose-over. As she accelerates, let the tail rise, and a slight pull of "up" will fly her off. Do not try to zoom straight up. She'll go up alright, but more like a Fournier than a Bearcat! When trimmed for straight flight, and when you've got used to her, you can start experimenting with the model's behaviour. All the following relates to the .15 powered ship.

Take-Offs: These can be automatic. Set a little up trim, open up gently and watch her rise off all by herself, with a couple of gentle hops for good measure! Alternatively, open the throttle wide and, once rolling, push the stick forward to lift the tail. With the model in flying attitude, she'll accelerate fast and you'll be able to haul her off in record short length. In a strong wind, whe lifts off immediately and confounds the owners of big trike-geared .60 powered jobs.

Climbs: The best description of the climb lies in the inscription on the RAF crest — *Per Ardua Ad Astra!* If you must fly here out of sight upwards, then set the elevator stick trim to give the best climb angle and just steer. The .25 gets here up quicker!

Landings: With this ship, landing is fun. In a strong wind, I can pick my landing speed from anything forwards to a couple of mph backwards. In flat calm, I can juggle up-elevator and throttle so that she descends in a controlled stall from about 30 feet altitude. The ailerons are effective to pick up a dropping wing, and I've often thought of seeking out someone with an autogyro to have a slow landing competition!

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Aerobatics: The usual Stand-Off Scale schedule can be performed with ease. If your engine throttles well, such maneuvers are made more enjoyable. Control-line style flying round and round with the odd wing-over thrown in is a gas. Upright spins are impossible when entered at low speed, but a dive, followed by full up-elevator, and full right aileron-rudder sometimes works, probably due to creating a G-stall condition.

One peculiar evolution which makes people gulp when they see it done, is executed as follows: Dive to maximum speed and level off. Immediately roll to the right and, as the wings reach vertical, slam in full down stick and full left rudder, keeping engine and aileron at full whack. She does a sort of tumbling outside flick-roll or two, before losing all headway and flopping into an inverted spin. Centralize the controls, and exit in a half loop. If you try that one, don't become too mesmerized, and don't try to delay your exit from the inverted spin to below about 40 feet altitude or you might not make it! In windy weather, try hanging her on her prop, semi-stalled with about 1/3rd throttle and see if you can fly her backwards. This gives you a most unusual sensation, especially if she disappears over a hedge as nearly happened to me the first time I tried this.

CONCLUSIONS

All the above aeronautical antics are easily attainable provided you practice. I have made nothing up, and I haven't even changed the name of the plane to protect the innocent late Roger Druine! I get a lot of pleasure from my Turbulent; she's big enough to be seen easily at a distance and slow enough to stay in sight a long time. She's ideal for school field flying, due to the low noise output of the silenced engine. Perhaps most other models can manage the evolutions I've described. But I reckon that this job takes some beating if your flying space is restricted! □