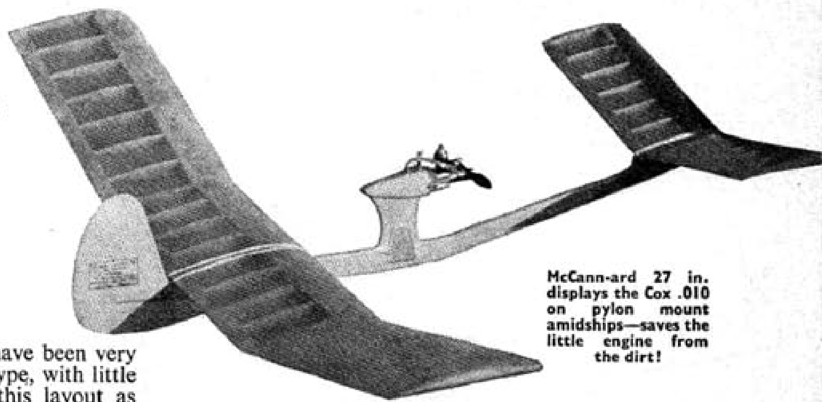
Have fun with CANARDS! introducing

James McCann's
McCANN-ARD 27



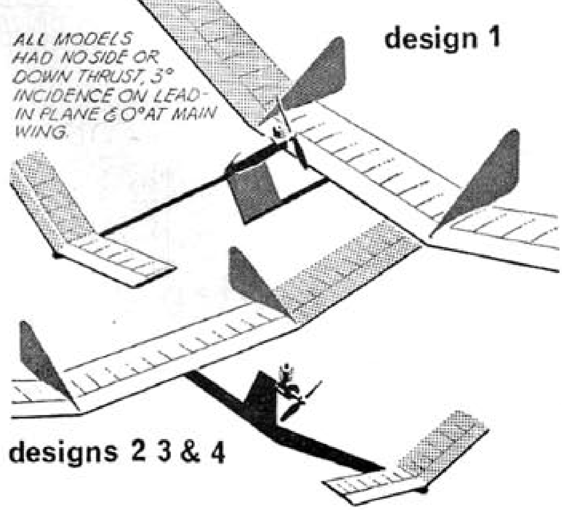
McCann-ard 27 in. displays the Cox .010 on pylon mount amidships—saves the little engine from the dirt!

IN THE PAST, most Canards (and they have been very few) have been of the sports or novelty type, with little done to investigate the possibilities of this layout as regards a duration machine, in spite of the accepted theoretical advantages. There is, consequently very little information available for prospective designers and the development of a design is very much a case of experimentation and learning by experience.

My first model was a modified "Quack" (*Zaic Year Book* 59-61, page 85) with the twin fins moved to just inboard of the dihedral break, and powered with a Cox T.D. .020, with hand-carved pusher prop. This model showed considerable promise, and was trimmed out to give a near vertical, straight climb, with as good a glide as one can expect from such a small model. It was eventually lost in the "jungle" at R.A.F. Elvington (which many know only too well!) after about 30 flights.

The success of this stimulated the building of a larger model of similar proportions, with the exception that the motor was mounted on a pylon, with a tractor prop, a commercial pusher of the size required (6 x 3) not being available. Powered with a T.D. .049, performance was impressive—a rapid steep climb, straight into the wind, and a good glide, comparable to conventional models was realised after initial trimming. With this model, two design features came about. The first, the motor mounted on a pylon over the C.G., and the second, a "cranked" fuselage to elevate the leading plane. Twin fins were still used, with the wing keyed to the fuselage. In very windy conditions this model was doing nearly 2 minutes from 5 sec. motor run.

Right, Doug Joyce of Reynoldsburg, Ohio, narrowly missed a place on the 1963 U.S. Power team with this potent Cox F.A.I. Canard. Below is author James McCann with Canard 2, using Cox TD .049, 36 x 6 wing, 18 x 4½ leading plane. Model was lost soon after picture was taken at R.A.F. Elvington



This model was also lost at R.A.F. Elvington, but was returned 3 weeks later in a very sorry condition, having been battered about by high winds and rain during its exposure to the elements. It is virtually a write-off.

Canard No. 3 was built, but seemed to have a jinx. Powered by T.D. .15, it was perhaps too small—only 48 in. span, weighing 15 oz. The wings folded during its first power flight—it had tremendous acceleration and a *very* rapid climb for 3 seconds.

The wings were rebuilt and the next outing subsequently showed a snag in this layout. A post-mortem indicated that twin fins on the wing were unsatisfactory, due to the need for extreme accuracy in alignment, and it was felt that the wing tended to "blanket" the fins during the climb. Canard No. 4 was built before No. 3 was flown, and was to F.A.I. specification. As before, a twin fin layout was used, and after a very good glide had been obtained, the first power flight was undertaken. The motor cut prematurely and the model was left in a near-vertical attitude only a few feet up. The resulting dive to earth shattered the fuselage and wing.

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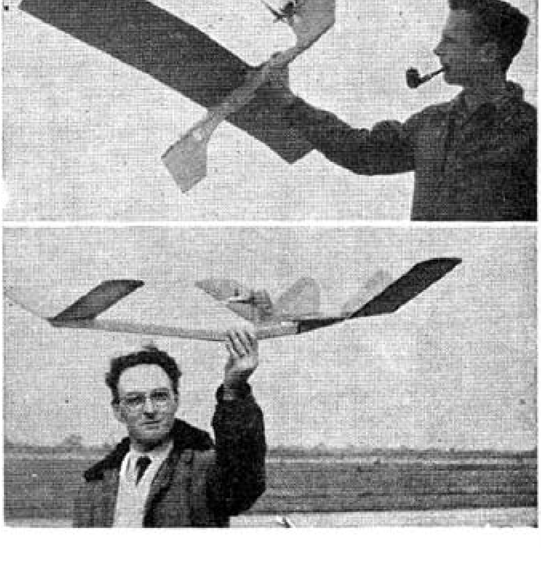

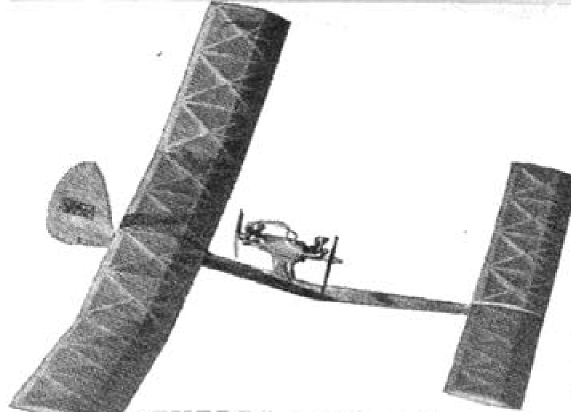

CANARDS continued . . .

With the experience thus gained (the hard way!) a revised design was drawn up, to improve both aerodynamic efficiency and also to make the model easier on the eye. The main change was to abandon the twin fins, and to have a single fin on the extreme rear of the fuselage, with a fairly large underfin, to ensure adequate directional stability during the climb. The fin now in the slipstream made power trim much easier.

To test out this revised layout, a small (27 in. span) model was built powered by T.D. .010 and this model is a real pleasure to fly. It seems to be quite free from any vices and stability is impressive. In spite of such a small engine (which actually develops surprising power) the climb is very steep and "on rails", and the glide very good. The layout thus arrived at seems to be the most promising for duration Canards, and will give conventional models a run for their money. Development is still continuing and the author won't be content until competition results show the Canard to be superior!

During the year the following points have been noted about Canard building and flying:—

1. Side area ahead of the C.G. should be kept to a minimum, with a single large fin to be most satisfactory.
2. An elevated leading plane increases stability, and reduces need for large angles of incidence, which bring the leading plane nearer to the stall. Canards are sensitive to leading plane alignment, it must be "square" in all respects. The reason for the cranked fuselage, is to raise the leading plane without having to use a pylon, which would increase side area.
3. Wing to be at 0° incidence. Various angles have been tried, with compensating increases to leading plane incidence to maintain longitudinal dihedral. Increasing wing incidence makes the model hang back on the climb and appears to increase sinking speed on the glide.
4. C.G. position. Various formulae have been put forward to determine C.G. position, but these seem to give only an approximate position. Rigging angles also determine C.G. position, and it is only finalised during trimming. Trimming is merely a matter of locating the C.G. by gliding tests then producing a left turn by rudder tab alone. Warps and offsets are not required.
5. Angle of climb. It appears that this can be varied by altering the leading plane incidence, with a compensating correction of C.G. position. Increasing incidence steepens the climb and vice versa. Providing extremes are avoided, the author's Canards have not shown any looping tendencies, possibly due to the high thrust line.
6. Wind penetration. Increasing wind velocity has, in the author's models, produced a slightly shallower climb, the high thrust leaning the model with the wind. The straight into wind climb is no doubt aided by the wing being at the rear. This is the largest component producing drag, and being well behind the C.G., gives weathercock stability.

The McCann-ard 30 in. twin has two Cox .010 engines in tandem fed from same tank, rear prop laminated from 1/32 ply to make 3 x 2 in. pusher. Wing has 209 parts—not for the novice! Whole model seen at top of column. Engine sound said to be terrific. Shows possibilities with this basic McCannard layout

It is hoped that interest may be stimulated in Canards. They have proved a stimulating mental exercise and arouse interest whenever they are flown. The author is convinced that a little more effort devoted to Canards will produce a duration machine capable of rivalling the performance of conventional pylon models, which, even though they have had many years development, still have a lot to be desired. All the author's larger models have used GÖ 795 for both wing and leading plane sections, which in practice have proven to be excellent.

For those wishing to build a Canard, full size plans of "*McCann-ard* 27" are given here. This model incorporates the lessons learned during a year of Canard flying and is simple to fly and success assured.

The following notes will assist the building and flying of "McCann-ard 27."

Fuselage. Medium hard, ¼ in. thick straight grained balsa is used. Carefully pre-cement all fuselage joints for maximum strength. The two parts forming the fuselage are first assembled, followed by the motor pylon and nacelle sides, carved and sanded to section. At this stage the tank is installed (an old lipstick case cut down, on the original), and then the ply disc against which the motor is mounted. Ensure that the thrust line is 0°—0° and carefully check that the fin is accurately in place.

Wings and Leading Plane. Medium balsa is used for spars and edges, while soft is used for the ribs, webs, and especially the sheeting. If really light balsa (4—6 lb. stock) is not available for sheeting, sheet cover on upper surface only. It is, however, preferable to build as per plan, with a full torsion box leading edge as this gives a rigid wing structure. Cover with superfine Jap tissue; 2 or 3 coats 50-50 dope/thinners and fuel proof.

Assembly. When assembled, check that rigging angles are as shown on plan. If required add ballast to bring the C.G. to position shown and test glide over long grass. Add or remove ballast as required to give a flat glide.

Flying. Test flights should be made with a short motor run. Trim the climb either straight ahead or slightly turning to the left. Gradually increase motor run, adjusting as necessary, but remember to make adjustments a little at a time—these small models are more sensitive than larger ones. However, the inherent stability of the Canard is quite forgiving and a satisfactory performance should be arrived at quite easily. Best to date is 2 minutes 25 secs. from a 12 seconds engine run.

Come on, now, raid your scrap box for little materials are required, build the "*McCann-ard* 27" and join the ranks of those "backward" people who fly Canards!