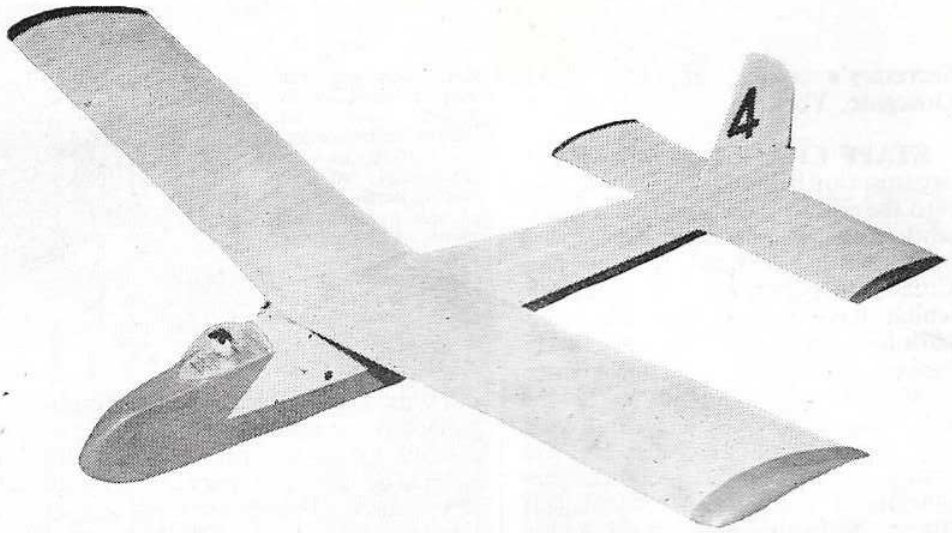
James H. Osborne describes his experiences with

WIZARD of OZ

A 4 ft. simple glider for radio controlled soaring.



THERE are many areas in the British Isles highly suitable for the sport of slope soaring—and sport it is. We in Yorkshire are particularly favoured. The steep, heather-sprung Cleveland Hills offer slopes facing in every direction and they are deserted except for the kestrel hawks and jackdaws.

The moors are excellent for the week end family picnics and we choose our sites according to wind direction and we can always fly as there is always a breeze on these hill tops.

On the slopes no one can complain of the noise or nuisance—no noise, no nuisance and no spectators except the sheep and kestrels—and they disappear the moment we put a glider up. We find the gamekeepers most friendly and very interested in our hobby.

Slope soaring is the ideal way to learn to fly a radio model—steady, stable flying for minutes on end—no engine trouble, and for the expert, aerobatics are real fun—just imagine looping a glider and completing the manoeuvre fifty feet below your position—then climbing steadily upwards for two or three hundred feet.

Bruce and I have enjoyed this sport and relaxation for four years now and we have been fairly successful in interesting other modellers. Unfortunately many power R/C flyers seem to think that there is no challenge. They usually appear when conditions are ideal and throw their power models off the edge. These machines usually climb in the strong lift but are treacherous to handle and inevitably they crash—(no dihedral and not enough rudder movement). The disgruntled power men then stalk off muttering that there is nothing to slope soaring as "anything" appears to soar.

The slope soarer is a highly specialised machine and requires an experienced pilot to put up a reasonable performance.

The models we see flying fall into one of these three categories—they are usually any old power model, or scale types, or functional models for the man who likes flying and lots of it. Our models are in this latter class. Recently I have noticed a number of continental kit models and these combine good performance with semi-scale appearance. My criticism of these machines is that they are either light breeze types or gale force types—they are not versatile enough.

Requirements

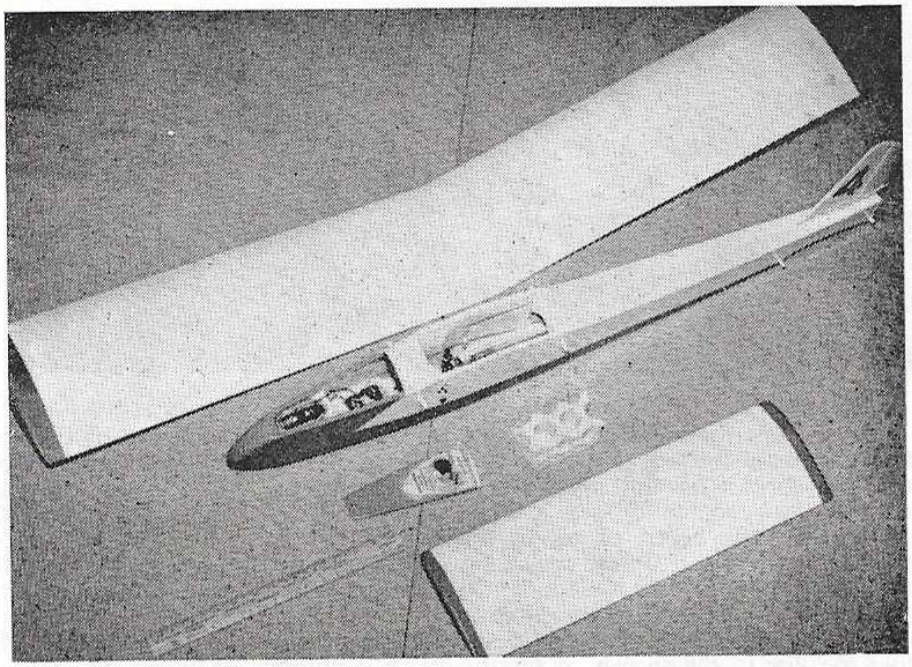
In our views a slope soarer should not exceed four feet in span for single channel control. Larger models tend to be difficult to build, expensive, difficult to repair, difficult to transport and often heavy due to wing strengthening and centre joining methods and devices. I close the case against the large model by pointing out that a small model will turn tighter and needs less height for recovery after manoeuvring.

A glider must be very strong and simple to operate. Radio should be one of the small single channel relayless types operating on a 4½ volt torch battery and using an Elmic Conquest escapement—"bang-bang" control is a must.

The final requirement is that the model must be extremely stable and able to soar over a wide range of conditions *i.e.* from a very light breeze to near gale. This last need is extremely difficult to fulfil as most models seem to have their own rather restricted speed range and hence can only be flown successfully on a few days during the year.

The *Wizard of Oz* is a model specifically designed to meet with the above specification. The model is strong, four foot span, has a sheeted fuselage, sheeted leading edges and large enough compartments for any of the popular receivers and actuators. With a 4½ volt torch battery, *Terrytone*, and *Conquest* actuator the weight is around 1½ to 1¾ lbs giving a loading of 10 to 11 oz per square foot.

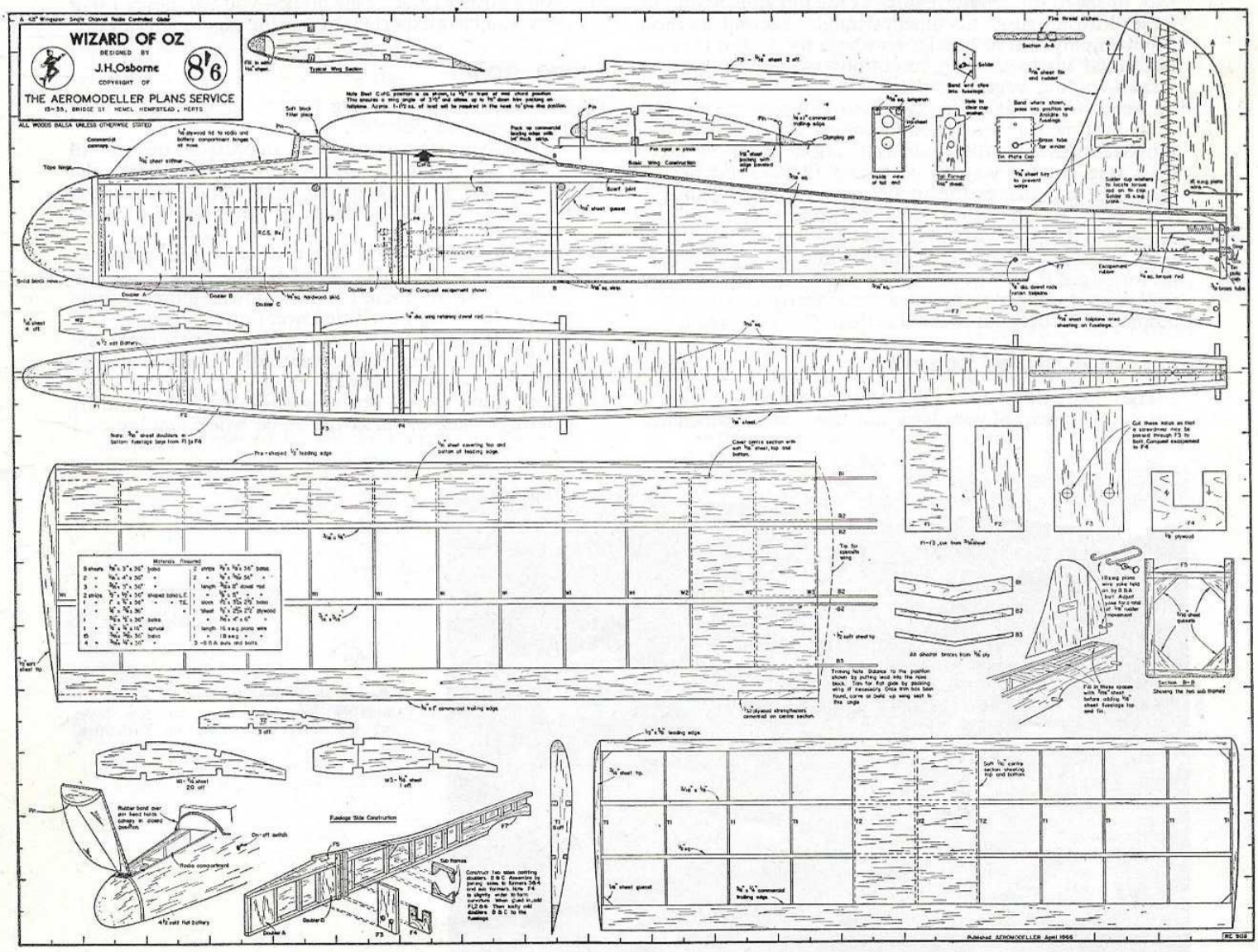
The model is quite orthodox but we have not yet considered stability and performance. Stability is taken care of by adequate dihedral angle and balanced side areas to give smooth turns. A preservation of at least 2° longitudinal dihedral angle ensures stability in this plane.

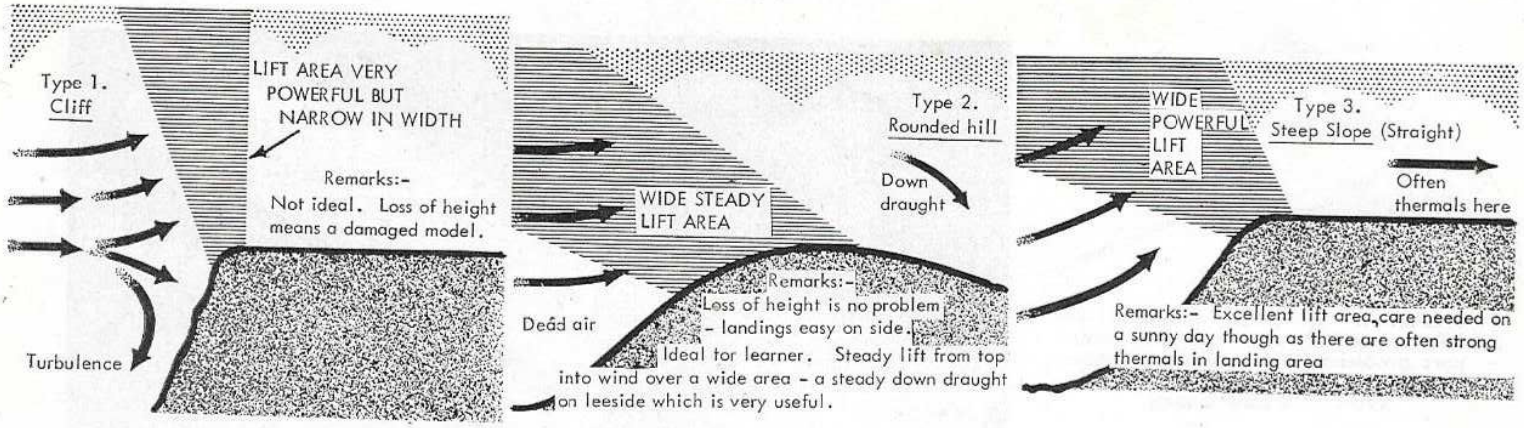


Breakdown of parts ensures your "Wizard-of-Oz" does not have transport problems. Note the foam rubber cushion to protect R/C gear in the event of a hard landing.

Until recently it was the author's opinion that the minimum size for a model that would fly in varying conditions was about six feet. His models have always been this size and smaller models seem to have an inferior performance which is due one supposes, to scale effect.

Full size copies of this 1/6th scale reproduction are available through Aeromodeller Plans Service, Plan as RC 903. Price 9/0d. inc. post. Border scale represents 1 inch divisions.





The high performance of the '*Wizard*' hinges on the fact that every trainee pilot is amazed to learn, namely that the control column *controls* the air speed of the aircraft. Our soarer utilises a thick undercambered section, with the centre of gravity forward of the mid point of the chord. Trimmed for calm weather this wing flies at an angle of attack of about 5° thus allowing 3° adjustment on the tailplane for extra speed in rough conditions. The wing section and C.G. position is therefore the key to the success of this model. The author personally disagrees with the flat aerofoil section design. To obtain a good glide with this type section one of two methods can be used—either of which I cannot accept. First the flat section can be used when the C. of G. is kept well aft of the centre of the chord, but whilst the glide is excellent under these conditions the penalty is lack of speed for rough weather as the model is bound to have little longitudinal dihedral angle. Second method often employed is to build a very light model but they do not stand up to varying conditions as they are always weak—leading edge not sheeted and so on. The best approach to the flat section type is to employ some method of ballasting for windy conditions so that C. of G. is moved forward and the model is therefore under-elevated. This is a clumsy way of obtaining the desired under-elevation and makes the model very prone to damage. The thin section follower would appear to have the answer to the problem but he has to fly his wing at a very high angle of attack to get his lift and the light breeze performance is very poor because the wing is so near the stall that the inner wing on a turn nearly always stalls despite washout: apart from this their wings are weak.

Flying a slope soarer

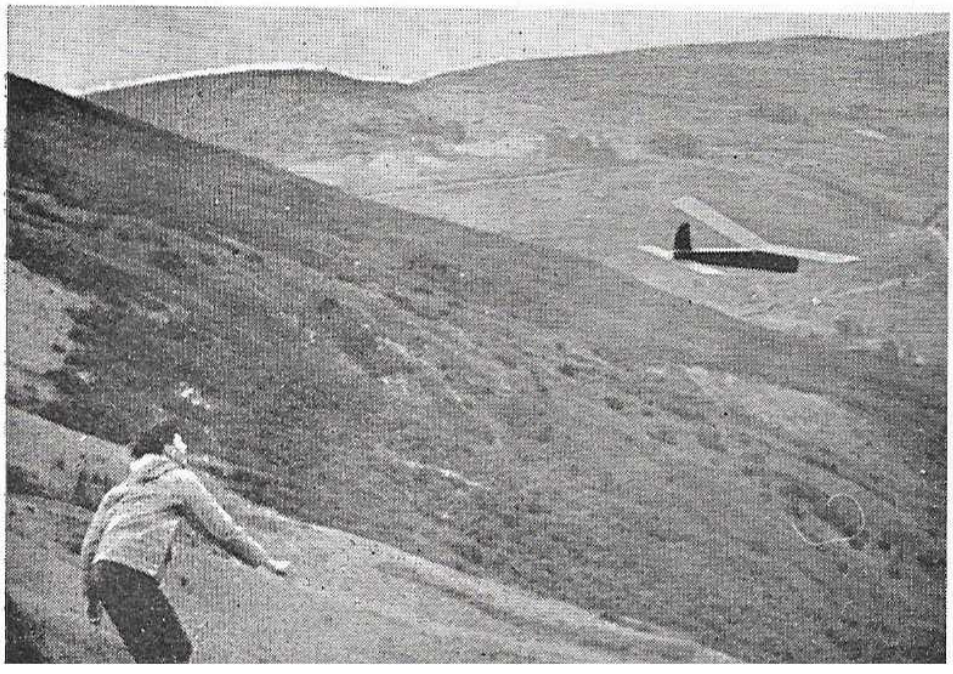
The best way to find suitable slopes is to examine a quarter inch map of your area and select ridges which are indicated by the closeness of the contours. Height is not of great importance but the slope angle should be 45° to 60°. It is best to select different ridges for different wind directions. The author has four such slopes nearby and the Sunday picnic situation depends entirely on the prevailing wind—slopes are chosen most carefully—the road must run over the top and not along the bottom of the hill!

Some don'ts

1) Don't fly over cliffs until experienced, the air is very turbulent and loss of height means a crashed model.
2) If the wind is more than 15° off the slope don't fly—the wind starts to corkscrew **i.e.** model goes up quickly and vice versa.
3) Don't bother to fit a tow hook—you will never use it once you have experienced soaring flight off a ridge.

Some do's

1) Use appropriate packing for the breeze and err on the under-elevation side.
2) Before flying choose a nearby depression on the hill so that if the wind drops or trim is incorrect the model can be flown "straight" in after launch, without it disappearing over the ridge, or tumbling to the foot of your slope.
3) An alternative method is to drift the model sideways towards the hill then turn and lift the wing at the last moment. If it doesn't touch down, simply circle round and try again a little lower down the slope.
4) Fly from the highest point on the hill otherwise the model climbs high and eventually disappears over the back of the hill—lost!
5) Never turn model down wind—always let it drift sideways back towards the ridge when landing and



Peter gives the Wizard a good old heaving launch below the top level of the Cleveland Hills in Yorkshire.

An early Wizard about to be launched over the Tees Valley, note the altitude.

when possible land well away behind the ridge and out of turbulence.

6) When the wind is strong, launch lower down the slope.

7) Before setting out for a flying session check wind direction—I use a small compass—as illustrated in the recent Model Recovery article (AEROMODELLER, July '65).

First flight with "Wizard of Oz"

1) For the first flight, wait until the wind is on one of the slopes of the type recommended and the wind strength could be described as a stiff breeze. An excellent guide to wind strength is the flight of crows and gulls. If these birds are just able to "penetrate" into wind then this is the maximum wind strength you can fly in. If the crows keep peeling off downwind, then put your model away.

2) Test glide well away from the ridge where the wind is steady. Pack the wing until the slowest, flattest, glide is obtained then carve wing platform away so that these packings can be dispensed with.

3) Decide on the trim for the wind strength but do not exceed ⅛in. down trim. As a guide to trim.
   - **A.** Swallows and larks flying on the ridge—no packing required on model—this is light breeze.
   - **B.** Smoke from fires nearly horizontal. Tall trees swaying at the top just a little, crows and gulls penetrating quite steadily—medium breeze—conditions ideal—1/16in. packing down trim.
   - **C.** Smoke horizontal, trees swaying, model is becoming difficult to hold. Strong breeze conditions—(one begins to keep away from the ridge for personal comfort).
     Add ⅛in. down trim packing. One should not try first flight under these conditions.
     N.B. *Trim packing is placed above the trailing edge.*

4) Get a helper to launch the model with the nose well down. Check that first signal will be left and stick to procedure for subsequent flights.

5) Allow the model to fly straight out for 50 ft. to 100ft. and correct with rudder if it tries to turn.

The model will now do one of three things:—

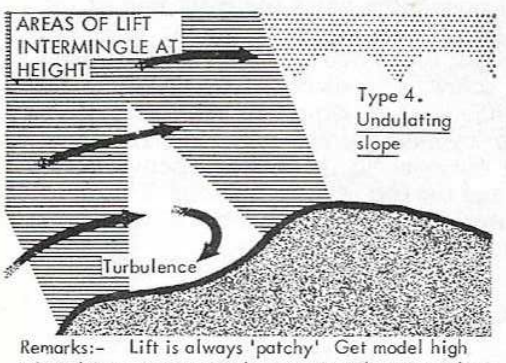
- **A.** It may lack speed, climb and be blown "backwards". In this case keep it straight into wind and it will descend behind the hill close to you. Pack 1/16in. "down" on rear of tailplane and try again.
- **B.** It may go straight out and gradually lose height. Fly the model parallel to the slope and the breeze will drift it back on to the hill. If the surface is rough let it descend to the bottom and go down for it. You may be quick enough to fly up a little valley or depression mentioned previously and a downwind landing won't matter here but *don't* let it fly straight downwind into the hill-side.
- **C.** If the model climbs steadily, keep it straight and well ahead for about five minutes, then fly to and fro parallel to the ridge until it drifts back behind you. Straighten the model up and make your first approach and landing—it takes longer than you think. If you overshoot, fly straight out over the ridge and let it gain height on the "wave" before trying again. You will soon discover that the problem with this glider is getting it *down*—not up.

Conclusions

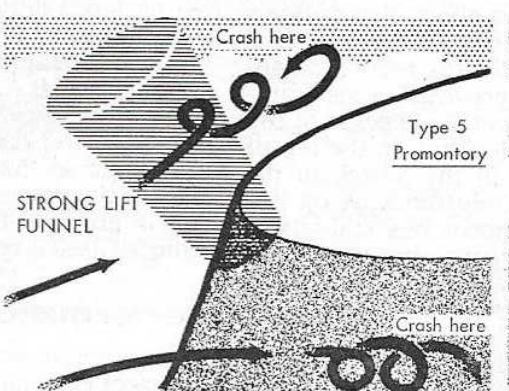
Slope soaring is a sport which requires a very carefully designed model and considerable skill and experience on the part of the pilot. The model should be small, strong and utilise a high lift undercambered section with the C.G. well forward, thus giving a high angle of attack allowing for under-elevation in windy conditions.

Single channel radio gear is considered to be adequate and ideal for getting plenty of flying time. The author and his son Bruce usually fly for about three hours *each* (airborne time) on the average day out and limit flight times to 20 minutes each launch.

We change batteries after about four hours flying time and don't bother checking them now. There can be no doubt that slope soaring is an ideal introduction to R/C flying, indeed to aeromodelling, and we feel that the *Wizard of Oz* fulfils a distinct need.



Remarks:- Lift is always 'patchy' Get model high where lift areas intermingle - don't try low passes here



Remarks:- Dangerous - if you risk it keep in turns all the time to keep in lift area.

Fig.8.