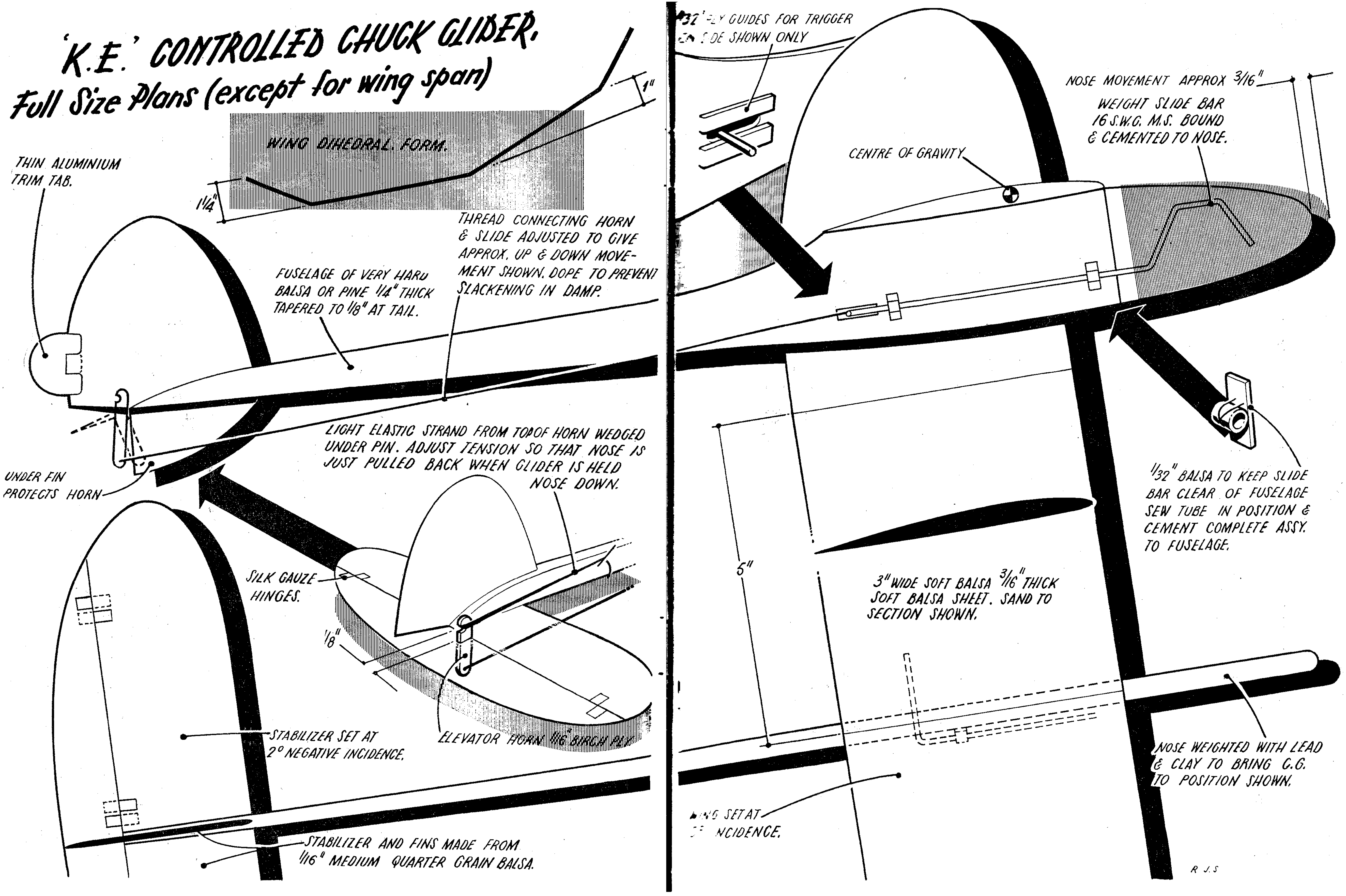
'K.E.' CONTROLLED CHUCK GLIDER.
Full Size Plans (except for wing span)



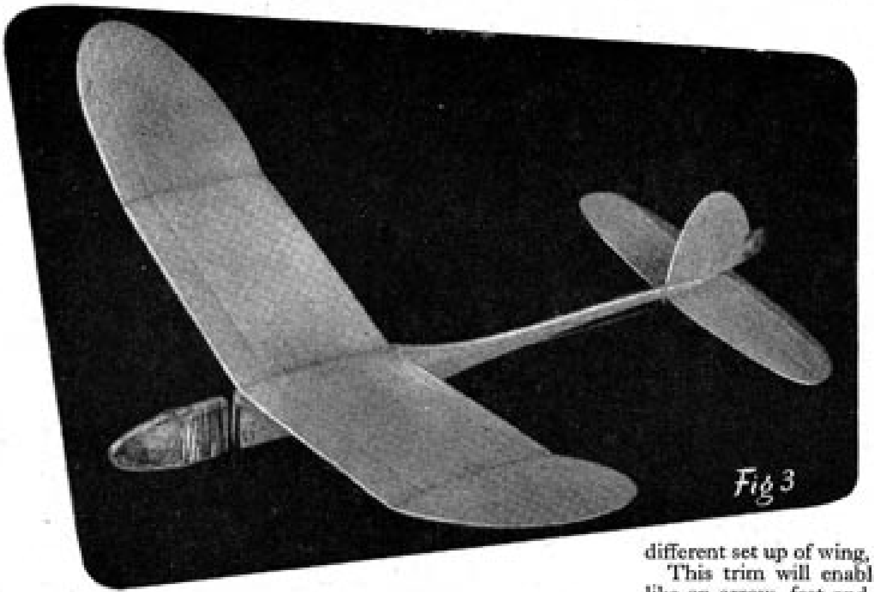


Fig 3

Chuck Gliders —introducing

A NOVEL DIVERSION FOR BETTER CHUCK GLIDER PERFORMANCE

FROM *George Woolls*

OF ALL FORMS of Model Aircraft, the chuck glider is the simplest and cheapest. However, for the aeromodeller, novice or otherwise, of an enquiring nature, this elementary type of aeroplane can be most instructive, and at the same time provide a lot of fun.

Despite its simplicity such a glider is really a high powered aeroplane. The human arm that can hurl cricket balls at fantastic speeds, and throw weights and javelins tremendous distances, can also impart enough power to a chuck glider to make it comparable to a V.T.O. type of power model—with the attendant trimming difficulties.

This is not an article on advanced aerodynamics, the author does not claim the qualifications to be able to write one, but a résumé of the basic problems involved in stabilising such high powered models will be helpful at this point.

Two main requirements are called for in a model aircraft; as much stability as possible and as long a glide as can be achieved.

The latter is generally achieved by trimming the aeroplane to glide just below the stall, which means slowly with the mainplane operating at a fairly large angle of attack. Stability is at its highest when the centre of gravity approaches 25% of the chord from the Leading Edge of the wing.

The C.G. being in front of the Centre of Lift of the wing, a download is required on the tail to bring the aeroplane into balance. (*Fig.* 1).

As soon as the plane is launched under power the speed is very high, and the wing develops excess lift, so that the aeroplane just loops. The more the power the better the loop, and the harder the contact with the ground.

Development over the past 20 years or so to counteract this regrettable tendency has resulted in the very different set up of wing, tail, and C.G. as shown in *Fig.* 2.

This trim will enable the aircraft to shoot upwards like an arrow, fast and smoothly to a great height, and also—unless great care is taken, to descend just as rapidly and spectacularly, to impale itself firmly and destructively in the ground.

In order to prevent this unfortunate occurrence, the glider is trimmed to circle on the climb and thus lose a little of the excess lift that was the start of all the trouble. This turn opens out at the zenith of the climb and the little extra lift created enables a fast glide to be made. However, the C.G. is still in an unfavourable position for good stability.

The problem therefore, is how to combine the set up in *Fig.* 1 (for best glide and stability) with *Fig.* 2 (for safe, fast, climb) and get the best of both worlds.

This may be done, in the case of power models, by connecting a two-position elevator to the engine timer, permitting a change in angular set up between wing and tail, to occur when power ceases.

The motive power of our chuck glider is provided by the kinetic energy imparted to its mass or weight while being thrown. A considerable portion of this weight lies in the weighted nose required to balance the aeroplane, and this can be easily imagined as flying forward and dragging the rest of the aeroplane behind it. Loosely connect the two, and that is exactly what would happen.

Here then is what we are looking for. Something that moves in relation to the main body of the aeroplane and has enough energy to operate our elevators.

All we have to do is to mount the weighted nose of our glider in such a way that when it (the weight) is thrown it will move forward a little before towing the rest of the plane behind it.

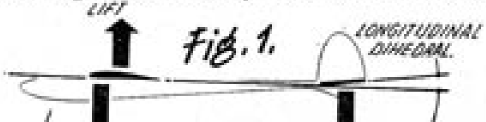


Fig. 1.

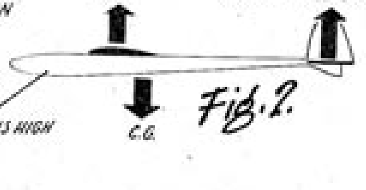


Fig. 2.

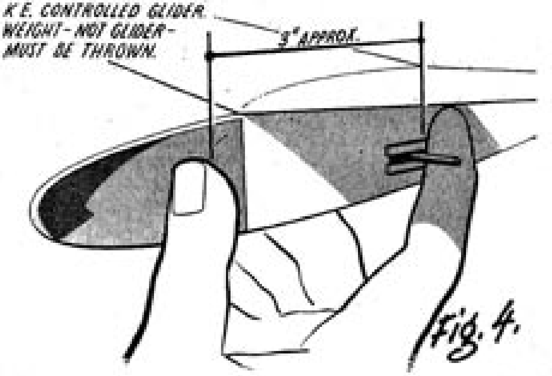


Fig. 4.

with a difference
Kinetic Energy Control

The nose is connected by thread to the elevator which is pulled down against the tension of a light rubber spring. When the energy in the nose weight subsides, this return band lifts the elevator to gliding trim, at the same time returning the nose to its rearward or static position. *Fig.* 3.

With the aeroplane trimmed to glide with optimum set up, *i.e.*, 2 or 3 degrees angular difference between wing and stabiliser, (weight back), the "Power on" climb (weight forward and elevator down, giving the familiar 00 setting), is fast and arrowlike.

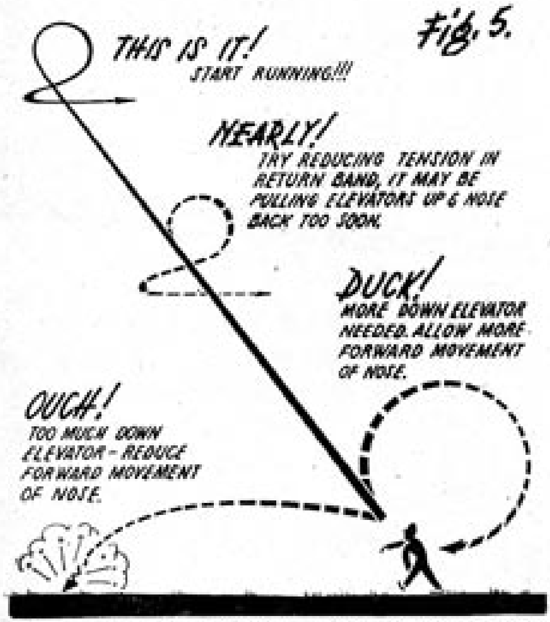


Fig. 5.

At the top of its trajectory the kinetic energy in the nose weight dies off and it returns to its normal position and the elevator goes up. The result may be a stall or snap loop, either of which is easily controlled by the very stable trim. Actually neither need occur, as the glider may be adjusted to go into a turn at the top of the climb. *Fig.* 3.

On the practical side a few points should be borne in mind. The weight and not the model as a whole, must be thrown. In order to achieve a similar grip to that used on orthodox chuck gliders, *i.e.*, thumb and middle finger holding the fuselage with forefinger behind the wing, an extension to the weight terminating in a trigger is used. The forefinger rests against this to add to the force of the throw. *Fig.* 4.

The return band must be adjusted so that the nose is only *just* pulled back when the aeroplane is held vertically. The bearings of the weight-slide should be as friction-free as possible and oiled to maintain this. Trim the glide by launching the entire model, not just the weight, and adjust it until a smooth slow flight results. It will be slower than that usually associated with chuck gliders, so launch fairly slowly.

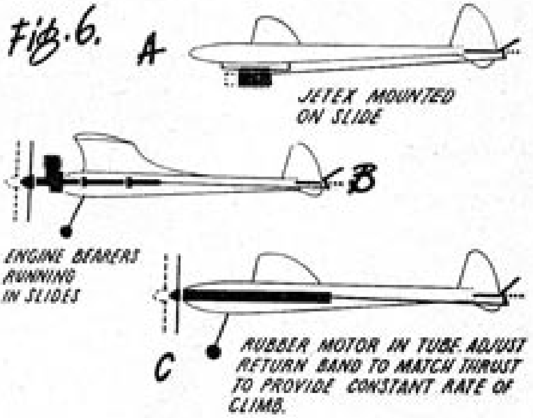


Fig. 6.

For initial "power" flights at least, use an *overhead* throw, *not side arm*. This will cause a straight climb which, now no longer automatically associated with a loop, is safer than a bank and under-elevated turn, possibly straight into the ground. Refer to the trimming diagram for "power on" adjusting. *Fig.* 5.

The chuck glider shown forms a practical demonstration of the idea, and turns in flights well in excess of thirty seconds in non-thermal conditions without particularly fine trimming. It has a very short nose so that a rather heavy weight is required. However, this provides lots of kinetic energy to work the elevators. Also the short nose-moment provides rapid recovery from the possible stall at the top of the climb.

Obviously this design can be cleaned up and developed. The weight slide could be built into the fuselage for a start. There is a practical limiting factor to be remembered when designing a glider incorporating this kinetic-energy control. The distance between first finger and thumb and forefinger is about three inches. This positions the trigger in relation to the moving nose.

Devotees of a catapult as a means of propulson may have been wondering whether there is anything in this idea for them. Of course there is. Just loop the catapult over a hook fixed to the movable nose, and haul back on the tail end. On release, the weight will be thrown forward thus operating the elevators.

The principle underlying this idea may be applied to all types of powered models. A Jetex unit could be mounted in such a way that it could slide forward slightly under the action of its thrust, and thus operate the elevator. This may prove more effective than the frequently used vane placed in the jet stream. *Fig.* 6*a*.

Power models could have their motors mounted on sliding bearers, thereby operating the elevator. *Fig.* 6*b*.

Rubber models present more difficulty, but it is conceivable that the motor could be mounted on a separate stick in the fuselage and the whole slide forward a little under the action of the thrust. Careful adjustment of the return band could balance the varying thrust and so maintain a steady climb throughout the power run. This could also hold true in the case of Jetex models. *Fig.* 6*c*.

Whether kinetic-energy controlled chuck gliders will eventually prove to be superior in performance to the present standard type with 0-0 setting, remains to be seen, but experiments definitely indicate that they are safer to fly and less critical to adjust.

Full-size Plans Overleaf ➡