



# Simpli-Stik

*Mike Keay's 40" wingspan three channel sports model for .09 to .15 cu. in. engines owes its 'vintage' appeal to a 1940's chuck glider design...*

**A**s a lad of 12 towards the end of the last war, I fell in love with an all balsa pod and boom chuck glider, the name of which has been lost with time, but I have remembered well the method of construction and general layout over the intervening years. The 36" polyhedral wing was made by carving a (very) rough aerofoil section from sheet balsa. Elastic bands secured twin booms to the wing and stabiliser and the booms also carried the fins (no rudders were needed in those heady days!). The pod was shaped from solid balsa block.

When young, model performance and size seem perfect and enormous; I can still remember flying Bill Dean's marvellous control line Phantoms from

the original Keil Kraft kits (as seen at the recent Model Engineer Exhibitions) and they seemed huge! Similarly, my all balsa chuck glider would fly forever but in reality only a few tens of yards! Anyway, I was so impressed with its performance that the thought of flying it still awakens boyhood pleasures some 50 years later.

One night, after a bout of navel contemplating, I awoke like Archimedes with a start: "EUREKA! I'll make a radio version and, perhaps, relive those feelings."

The model had to be simple to build (like the original) and have strong booms (sticks). So it would be simple, with sticks - 'simplistic' in fact, hence the name. It should take stan-

dard sized radio and a small 'cooking' engine to drag it around. The wing would, like the original, be flat bottomed in section but of built up construction to save weight. It would incorporate copious amounts of washout to prevent the twitchiness often experienced with small models. Finally, it should have 'vintage' appeal.

Interestingly enough, I showed the prototype in an unclothed state at last year's Old Warden Vintage Day and was encouraged both by the favourable reaction from modellers and from some of our elder statesmen who swore they built one in the early fifties - I smiled benignly!

*Mike's prototype is powered by a glow motor, but if you fit a small diesel you could do away with the flightbox altogether. A can of fuel and a chicken finger is all you need!*





## On with the construction

There's nothing in the building of this model to frighten anyone who can glue a couple of bits of wood together and finish them to a smooth outline.

It's best to start with the wings. Make up a set of 12 ribs from 1/4 grain 1/16" sheet balsa plus seven from medium 1/8" to the outlines shown on the plan, using the sandwich method and ply or aluminium templates - I prefer the latter. Rather than end up with an untidy joint at the trailing edge where the ribs slot in, you may like to allow for the appropriate thickness of the leading edge of the selected trailing edge (if you see what I mean!) when drawing the rib shape. Take trouble to make the cutouts for the leading edge and main spar a snug fit, as this will improve the strength of the joints and improve the linearity of the completed wing. Note that the top surfaces of ribs R1 and R2 need to be thinned by 1/16" to allow for the centre section sheathing and the 1/8" ribs R5 and R6 need to be widened at the main spar slot to accommodate the 1/16" birch ply dihedral braces.

Fabrication of the leading edge is the first job. Use runny cyano to glue together soft to medium grade 1/2" x 1/4" balsa and soft 1/4" square sections. This may seem like overkill but much of the wood is sanded away after construction, ending up with a strong, light and nicely shaped part. Pin down over the polythene covered plan then add the rib-slotted trailing edge and the 1/2" x 1/8" spruce main spar complete with its 1/16" birch ply dihedral braces. Hold everything in place with the two 1/8" balsa end ribs set at 90° both vertically and to the leading and trailing edges, as alignment of the booms at a later date will depend on this. Cut out suitable sized holes for the servos in 1/8" liteply and white glue in place so that the elevator and rudder snake outers will lie along the undersurface of the ribs. Sheet the top of the centre section ribs with 1/16" medium balsa - the bottoms are infilled with 1/16" balsa with boxes to surround the servo wells. Note the position of the 1/8" liteply wing bolt plate.

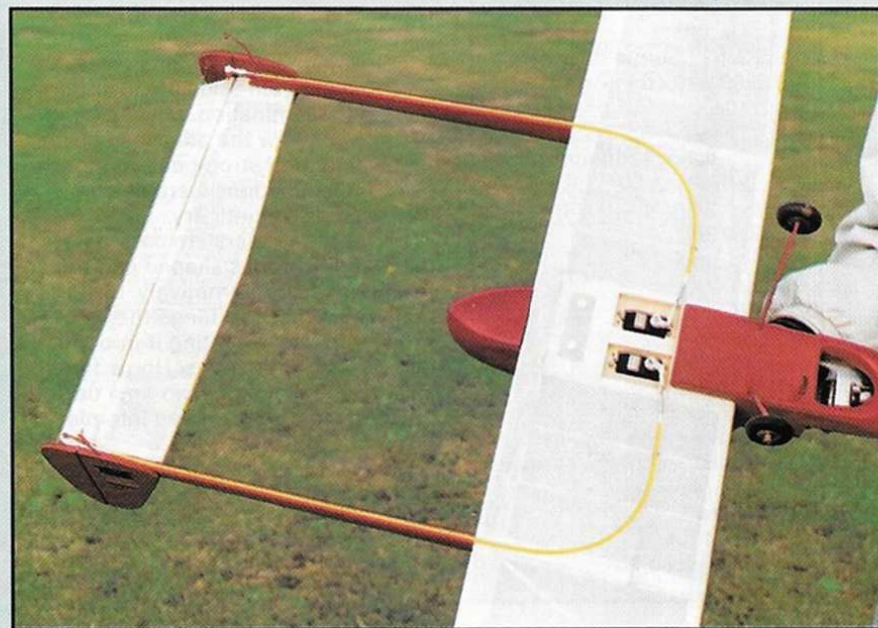


*Far left: Simpli-Stik trim is cut from Solarlex and ironed on.*

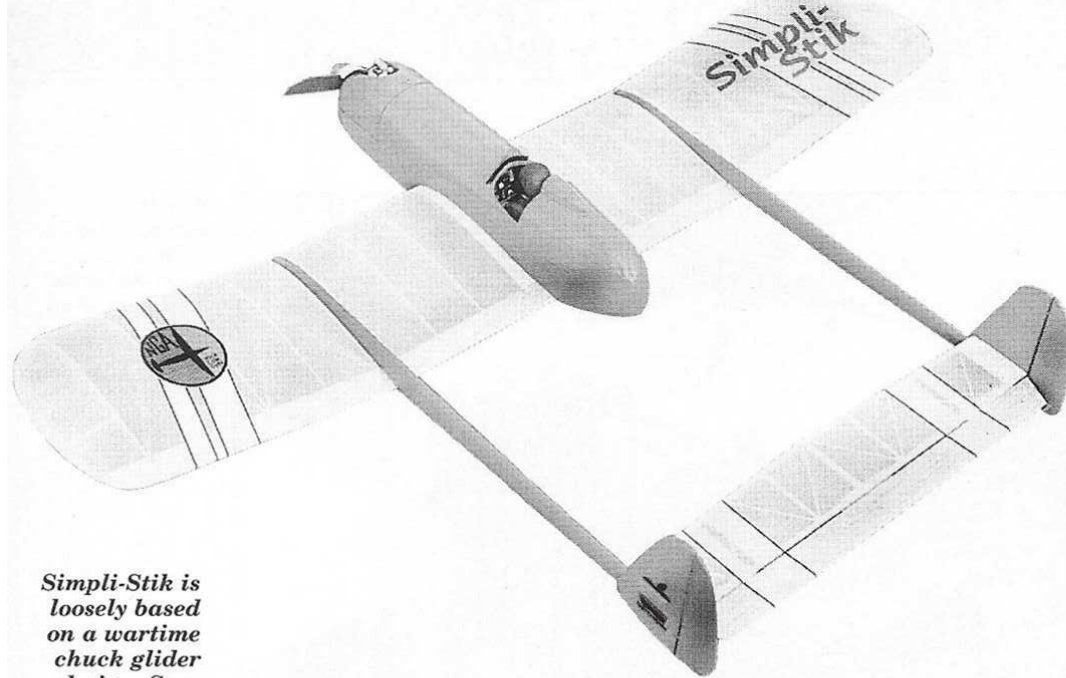
*An ASP 12 provides more than enough power for this delightful model.*



*The aluminium engine mounting plate allows for quick and easy changes of the powerplant and is also a real boon when servicing the model.*



*Rudder and elevator snakes simply run along the underneath of the tail booms.*



*Simpli-Stik is loosely based on a wartime chuck glider design. Says*

*Mike: "Deadstick approaches are a doddle as the model glides beautifully with no-stall, flat turns, very reminiscent of its 1940s ancestor."*

So far so good - on with the outboard sections! Construction is similar to the centre section with the exception of the washout that needs to be built in using the template shown on the plan and locked there with the 3/16" x 1/8" cross braces.

The 1/8" rib adjacent to the boom slot should **not** be fixed until the booms are made. This avoids an untidy gap. Use the same washout template when constructing the second outboard panel so both adopt precisely the same angle - important when you don't have ailerons to cor-

rect building errors in flight!

The 1/16" birch ply wingtips and their braces can now be glued into place, aligned with the bottom edge of the tip rib. You will need to remove 1/16" from the bottom of the leading and trailing edges and the main spar to do this. Both outboard tip panels can now be fitted to the centre section using epoxy to glue the spar into the dihedral braces, making sure that the tip dihedral of 2" is maintained for each. Sand the leading edge to section and clean up any mismatch where the ribs fit the spar and trailing edge. A 1/16" sheet box can be made up to cover the servos if required. This is secured with a 1/8" dowel in the front end and small woodscrews into the wing bolt mounting plate.

## Back end

The stabiliser and elevator are quite straightforward and need little description other than to build light and flat. Tidy up with a wide sanding block. One important point: check that your building has produced tips that are square to the trailing edge so that when the fins are fitted, they end up parallel to one another. The fins and rudders are made in one piece by laminating two 3/32" medium balsa sheets together with grains crossed. The 18 gauge tail skids are incorporated into the lamination. I used Scotch Photo Mount for the adhesive, being lightweight and strong enough for the job. The laminations were heavily weighted down until dry.

Next the rudders are cut away, their leading edges shaped and drilled for pin hinges. Alternatively, Mylar tape can be used to hinge the fin and rudders by incorporating it into the fin and rudder laminations. Horns for linkage and actuation can now be made up and epoxy glued into place.

## Tail booms

The prototype booms were made from a multi lamination designed for considerable strength, particularly at the wing trailing edge, in the event of

an untidy arrival. Construction is not difficult but important requirements when shaping dictate that the wing sits at +2° to the datum line and the stabiliser at 0°. The plan shows the cross sectional construction with a central core from 1/8" liteply with outer laminations from 1/8" soft balsa. Additionally, and at only a small sacrifice to lightness, carbon tows were included in the sandwich, three each side of the core along the top and bottom edges. Note that the core is just over 1/8" shallower over its length between the wing trailing edge and the elevator seat. This is to accommodate the elevator and rudder snakes between the side laminations. White glue or cyano will hold everything together but it's worth driving a couple of panel pins through each end to prevent slippage whilst drying. If using white glue, press the laminations together with a heavy weight until dry.

Pack up the leading edge of the wing by 3/16" and trial fit the completed booms. The channel formed in the bottom should align with the trailing edge lower surface and the tailplane seat must be at 0°. Ideally the bottom of the boom should be flush with the bottom of the rib, but any error here can be sanded or filled later. Check also that the booms align with each other so that the stabiliser lies parallel to the wing centre section. This operation is a bit fiddly but patience will pay dividends in the quality of the model's flying performance. The R6 ribs can now be glued outboard of the booms, leaving enough room for the top covering to be ironed into the boom slot. The booms can now be sanded to an ovoid shape but retain the square section between the wing ribs and also where the fins will go. Try to keep the tail end light by sanding away more of the 1/8" balsa sides towards the rear.

## The big middle bit

Cut out the two fuselage sides from 1/8" medium balsa and add the wing seat 1/8" balsa doublers, ensuring a left and right hand set. Cut out the rib shape using the rib sandwich template ensuring this is set to 2° to the datum line. Make up former F1 from 1/8" birch ply, F2 and F5 from 1/8" liteply and F3 and 4 from 1/8" hard balsa. Make up the undercarriage from 12 and 16 gauge piano wire and lace with strong thread to the front of F2.

When dry, use epoxy glue to position former F1, checking that all is square. Pin F2 into position but don't glue yet. The 1/8" birch ply engine mount should be made next and glued with epoxy to F1 and the sides, incorporating 2° of downthrust, but no sidethrust. Supporting 1/4" triangular section balsa strips are added beneath the engine mount. Alternatively, a

## DATAFILE

### Plan Specifications

Name.....	Simpli-Stik
Designed By.....	Mike Keay
Aircraft Type.....	Sport
Wingspan.....	40"
Wing Chord.....	7.5"
Wing Area.....	300 sq.ins.
Aerofoil.....	Flat bottom
Dihedral At Each Tip.....	2"
Fuselage Length.....	28.1/2" (inc. booms)
Tailplane Span.....	16.3/4"
Tailplane Area.....	69 sq.ins.
Tailplane Section.....	Flat plate
Fin Height.....	3.1/2" above datum
Engine Range.....	.09 - .15 cu.ins.
Fuel Tank.....	40cc
Rec. Number of Channels...	Three
Control Functions.....	Elevator, rudder, throttle
C.G. (from L.E.).....	2.1/4" - 2.1/2"
Elevator Throws.....	+/- 3/8"
Aileron Throws.....	+/- 3/4"
Rudder Throws.....	+/- 3/4"
Sidethrust.....	2°
Downthrust.....	2°

### Materials Used in Construction

Fuselage.....	Balsa, birch ply, lite-ply
Wing.....	Balsa, birch ply, spruce, lite-ply
Tail Surfaces.....	Balsa
Weight, Ready to Fly.....	2.1/4 lbs.
Wing Loading.....	17 ozs./sq.ft.

removable ali engine mount fitted to hardwood bearers glued to the fuz sides and through F1 and 2 will allow for change of engine type and ease of servicing. Decide on the position of the throttle servo and fit to hardwood rails glued to F1 and F2. Arrange the servo to throttle linkage.

Leave room for the fuel tank alongside the servo. This can be made up from tinplate as shown on the plan and, as the model is not designed for complex aerobatics, the fuel feed can be made from brass tube extending from the lower bottom rear joint and through F1. Vent and filler tubes pass out of the fuselage bottom and into the engine compartment respectively. The latter can be used as an exhaust pressure tube if required. F2, with the undercarriage attached, can now be glued in place with epoxy, together with the 1/2" triangle balsa fillets. Formers 3, 4 and 5, together with the wing wing mounting plate and its supports, are glued in place next, pulling the rear of the sides together until set. Fit the 1/8" x 1/4" former top rails between F1 and F3 and between F4 and F5. Sheet between F4 and F5 with 3/32" soft balsa.

The rounded rear end of the fuselage is made from 1/2" soft balsa sheet (or block balsa) hollowed out to about 3/16" wall thickness. The interior can be used to house some of the radio gear to effect balance on completion. Try the wing for fit and alignment and if OK drill through the wing bolt ply plate and the fuz mounting plate then use epoxy to glue on the captive nuts. To stop the wing leading edge from moving sideways, glue a piece of 1/2" x 1/4" balsa, cut to fit between the fuselage sides, to the centre section top sheeting after covering.

Fit the 3/32" sheet balsa cockpit floor with its grain crosswise. Using 3/32" soft balsa, sheet the top deck between F1 and F4 and after the glue is dry, carve out the cockpit shape. Sheet the lower front of the fuselage between F1 and F6 with 3/32" hard balsa, with its grain across the fuselage width. The lower cowling is made from 1/2" soft balsa shaped to fit the chosen spinner diameter (a 1.3/4" diameter one was used for the prototype). Carve and sand a drainage and cooling duct into the rear section. The top cowling is also made up from 1/2" stock and is carved to a pleasing shape, allowing for good cooling and access to the engine controls. Two 1/8" dowel pegs glued into F1 position it and it's held in place with a wood-screw through the top of the cowling into a small hardwood block stuck to F1.

Finally, prepare the acetate cockpit windshield and headrest for fitting after the paint job is completed.

## Radio installation

As previously mentioned, the model was designed to use standard sized radio and with careful planning there is ample room for this and a 225 milliamp/hour battery. Obviously, mini or micro equipment will give more air space inside. A socket can be fitted to the fuselage exterior and this will save dismantling the model when charging the battery.

The rudder and elevators are operated via yellow snakes epoxy glued to the underside grooves in the booms and to the underside of the wing after covering. It could be argued that the snakes do not improve the aerodynamic quality of the wing but in practice there seems

no adverse effect! Adjustable clevises are used at the servo ends and ball link connectors join the snake inners at the horns. The two rudders are joined with 16 gauge piano wire - see the plan for details.

## Finishing and covering

Much of the charm of this small model results from the care taken in its finishing and covering. The fuselage, booms, fins, rudders and elevators were shaped with Perma-Grit tools and finished with progressively finer grades of wet and dry paper, used dry. Two coats of sanding sealer and further fine sanding gave a silky smooth surface ready for spray painting. A couple of misty coats of primer (and still more sanding!), followed by two light coats of car gloss paint gave the required finish.

Solartex was chosen as the open frame covering. I know this is a bit on the heavy side for a small model but it does give a wonderful 'vintage' look. You may well choose something lighter, especially if using a smaller engine than the prototype.

Due to the booms, the covering method is a bit unusual. The sequence is as follows:

1. Cover the stabiliser top and bottom but leave balsa exposed where it seats on the booms and faces up to the to the fins.
2. Cover the top surface of the wing between the booms, ironing the covering a little way down the boom slots. Do **not** iron the covering around the leading and trailing edges just yet. Do the same for the outer panels.
3. Glue the booms and stabiliser

in place with epoxy, checking once more that all's square.

4. Clean up the lower surfaces of the booms by filling and/or sanding.

5. Cover the bottom of the wing, then complete the wrapping round of the top covering in the usual way.

The trims and model name were scalpel cut from coloured Solartex and ironed on.

The fins and rudders just need fixing to the end of the stabiliser and to the outside of the booms, and the 2" wheels fitted to the undercarriage, and it's built and covered. Just a quick coat of fuelproofer and it's off to the field!...

Hang on a minute, a decent model needs a realistic pilot! A suitable one was selected from Pete's Pilots extensive range and the small windscreen and headrest fitted to prevent his socks blowing off!

## Boom! Boom!

The first flight was delayed by a duff engine (subsequently replaced with an ASP 12) and 'orrible weather. As usual, the only available test flying days produced gales, rain and snow and we sure had an abundance of those last winter, but a clear and wind-free day eventually dawned.

Fuelled up, checked out and off we went! I must admit to being caught out by the absence of prop wash over the rudders as my usual two clicks-and-a-bit anti torque adjustment was too much and Simpli-Stik veered off to the right. No problem however, and I quickly found that the designed-in stability really worked and milliseconds later the model was off and away.

Several exciting flights later, when the flight envelope had been explored, I could report to my flying colleagues that the model flew just as I had hoped. It zapped around on full throttle and pottered about on half. Three pointers (or should that be four?) are commonplace. Dead stick approaches are a doddle as the model glides beautifully with no-stall flat turns, very reminiscent of its 1940's ancestor.

## Finally, a couple of "What if's?" ...

*"What if the engine was put at the back of the fuz as a pusher? Would it fly, mister?"*

Don't see why not. It should look nice and be an easy conversion. Make F1 and F4 from 1/8" liteply and F5 and

the engine mount from 1/8" birch ply. Set this up with no down or side thrust. Hollow out F1 and F2 and what was the engine cowling so the radio and battery and the throttle servo can be located right up front to maintain the centre of gravity.

*"Would it be more aerobatic with straight dihedral wings?"*

Sure it would, especially if the wing section was made more symmetrical - keep the washout though for easy handling - maybe do away with the rudders and use ailerons instead. I'd reduce the dihedral to 1.1/2" at each tip as well. To keep things even lighter, you could dispense with the undercarriage and hand launch.

So why bother to change the design at all? Well, we probably all change something in published plans, so I've given some alternative but unproven ideas! Nothing is sacrosanct in model building!

If you are as happy as I am with the published design, or are a modeller keen on experimentation, let me know how you get on with yours by writing to me and sending a pic or two, care of the Nexus office. Safe flying and many hours of enjoyment with your Simpli-Stik, whatever the version! ●