LIGHTNING BUG

Tom Binkley has adapted this simple 27" span design by Bill Winter and brought it into the electric age with brushless power guided by 2.4 GHz radio

Bill Winter was a well-known model designer and publisher whose work appeared in popular model magazines from the 1930s through 1960s. His Lightning Bug was published in the July 1961 issue of Model Airplane News. It was powered by the amazing Cox .010 engine and was guided by rudder control via an escapement.

The Lightning Bug presented here is a compact park flyer that is simple, rugged and quick to build. It is powered by the popular 1811 2000 kV outrunner motor, which is the perfect weight, size and power when combined with a 300 mAh 2S LiPo battery and GWS 5043 (125 mm x 110 mm) prop. A small 6 Amp brushless ESC, tiny receiver and two 5 g servos provide rudder, elevator and throttle control.

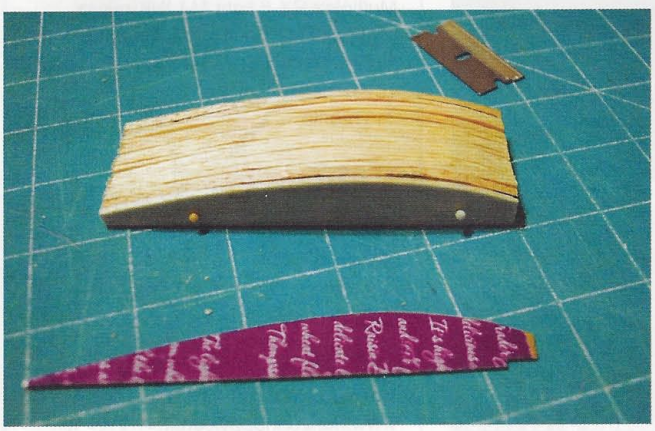
Easy to Build

Start construction with the wing. Using a steel straight edge and sharp scalpel knife, cut the leading and trailing edges out of 1/16" balsa sheet. Buy or cut 1/8" square balsa for the spars and 1/4" square balsa for the leading edge. Cut leading and trailing edges and spars to length.

Photocopy the wing rib, glue the copy to a cardboard cereal box and cut out a slightly oversize rib template. Then cut 18 ribs out of 1/16" balsa sheet. Stack them together as evenly as possible and pin the stack from both sides. Using a sanding stick or rigid sanding block, sand them to the shape of the rib on the plan. Keep everything square and even. This is the sandwich method.

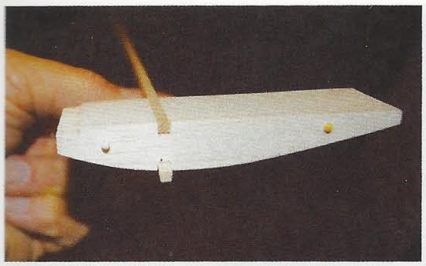
Then mark the spar locations and using a razor saw or file, cut a notch in the top and bottom of the rib stack to fit your 1/8" square balsa spars, keeping upper and lower spars parallel.

To cut the ribs for the 1/16" x 1/2" leading edge and 1/16" x 3/4" trailing edges, saw only the vertical kerfs, then unpin ribs and make the horizontal cuts with a scalpel knife to each rib, or stacks of three or four ribs at a time. It only takes a few minutes to make a set of ribs.

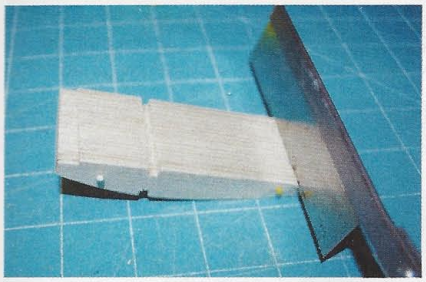


To make things easy, cut out the ribs roughly

Using the sandwich method sand flush to shape

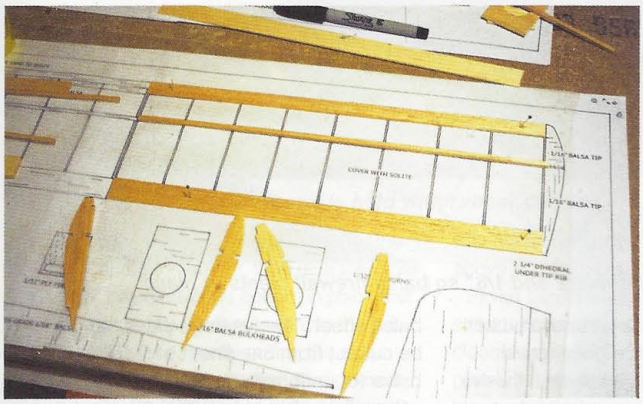


Make sure the cut-outs align and the balsa spars are parallel

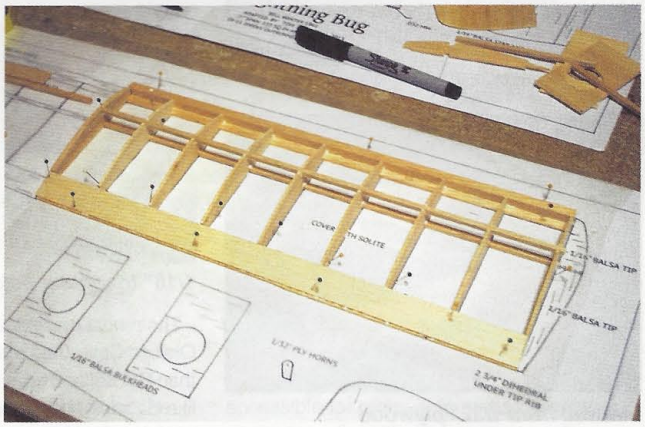


Cut slots for the LE and TE balsa sheet

Remove the waste and you should have ribs ready



Position the lower spar, LE and TE pieces over the plan and pin in place



Lay the ribs and complete the wing assembly

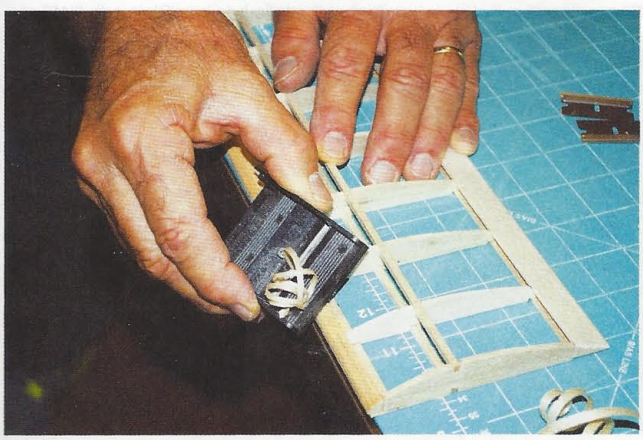
Cut the wingtip parts out of 1/16" balsa and the tip gussets out of 1/8" balsa.

Place the plans on your building board, cover plans with wax paper (or film covering clear backing) and pin 1/16" leading and trailing edges to the plan. Put bottom spar in place and beginning at the tip, glue ribs in place, aligning carefully. Adjust the root rib tilt angle slightly for the dihedral angle. Then add the top spar and 1/4" leading edge and the top trailing edge. White glue is a good choice for wing construction as it is inexpensive, non-toxic, strong, light, and has good tack and good operating time – and it doesn't stick to wax paper!

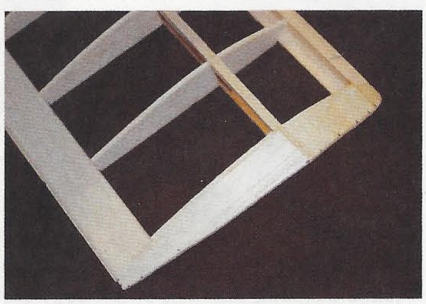
When the wing panels are dry, plane and sand the leading edge to the smooth shape shown on the plan.

Glue the 1/8" tip gusset in place with CA, then glue the rear wingtip to the gusset and then to the rib using CA. Wet the top of the front, cross-grain wingtip to soften it, then glue it with CA to the rear tip and gusset, then gently bend it to the rib curvature and CA in place.

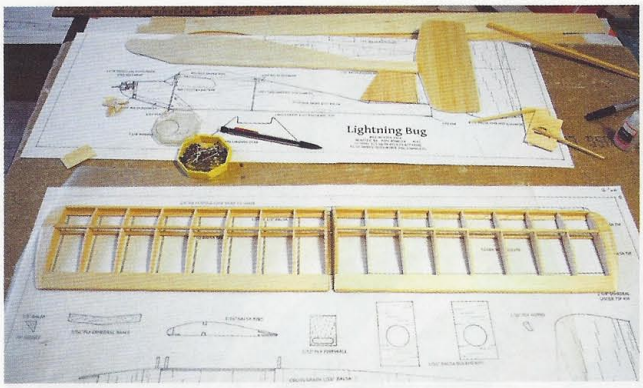
Cut a dihedral brace out of 1/16" ply. Using a sharp hobby knife, cut a vertical slot in the root ribs centred between top and bottom spars for the 1/16" ply dihedral brace. Trial fit and trim as needed. Install and glue the dihedral brace and glue wing panels together, aligning carefully. Clamp as needed at the desired 2¾" dihedral angle shown on the plan.



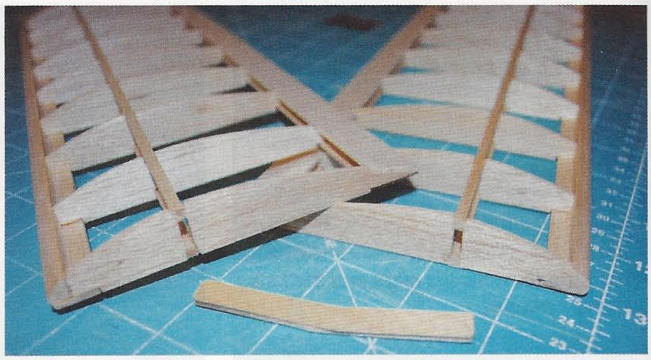
Plane off edges to shape and sand smooth



Wingtip finished and sanded



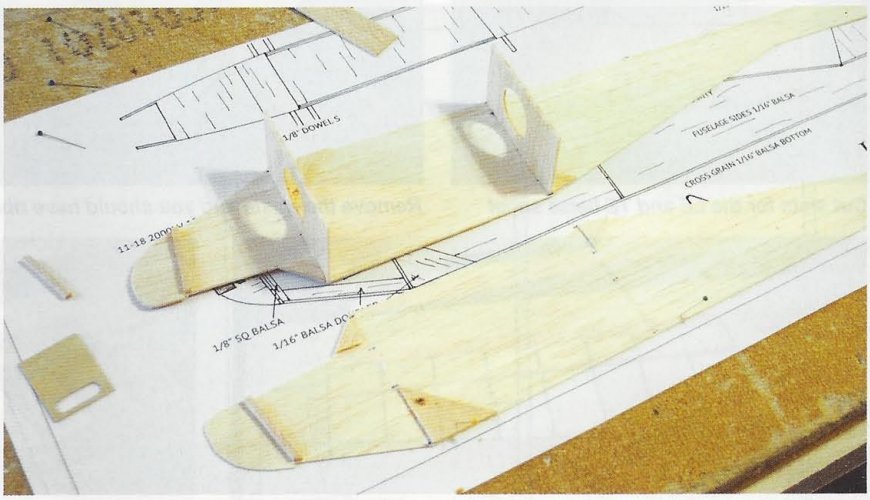
Wing panels completed



Join the wing panels with a 1/16" ply dihedral brace between the spars

Clamp the wings and allow glue to dry

Firewall from 1/32" plywood



1/16" triangular balsa doublers and 1/8" sq balsa firewall cleats in place

Sand the wing prior to covering. Check the wing for lateral balance by holding the wing upside down with your fingertips at the root ribs – it should balance. If one wingtip is heavy, add weight to the light tip until it balances. Then cover the wing with either SoLite or CoverLite. A SoLite tutorial can be found on the Internet (see Contacts), or Google SoLite Covering Tutorial.

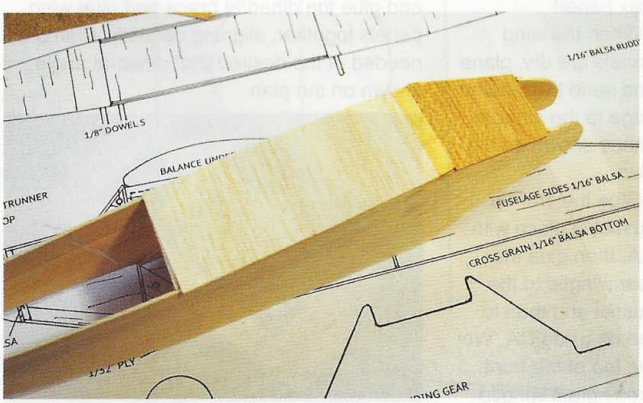
The model presented here was covered with Orange CoverLite, which is slightly heavier than SoLite, and requires a brush-on adhesive, like Balsarite, but it has a great vintage look, perfect for a 1961 model design. CoverLite comes with good written instructions.

Empennage and Fuselage Construction

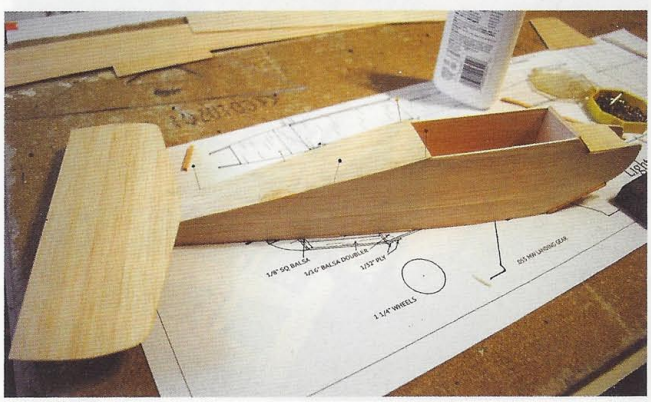
Cut the fin, rudder, stabiliser and elevator out of lightweight 1/16" balsa sheet. Sand a bevel on mating edges for a hinge point, and sand the edges to finish. Cut the fuselage parts out of 1/16" medium/hard balsa sheet. The fuselage sides can both be cut out from one sheet of 1/16" x 3" x 30" balsa for uniformity.

Cut a firewall out of 1/32" (0.8 mm) plywood. Drill and shape the firewall opening, making it large enough for the ESC to pass through. Cut 3 3/16" x 1¾" strips from 1/16" ply for landing gear mounts.

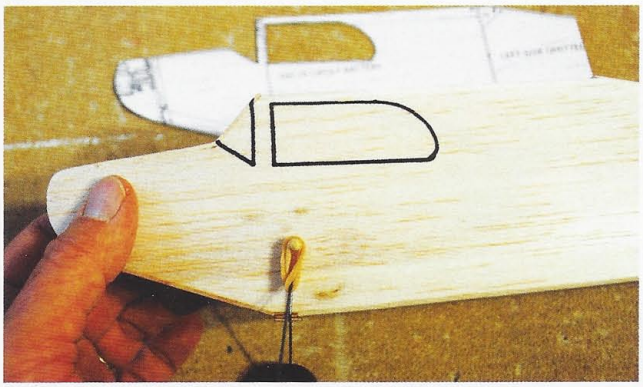
Glue the 1/16" balsa doublers in place on both sides. Glue the 1/8" square firewall cleats in place. Glue the bulkheads on one fuselage side, then join the fuselage sides by gluing bulkheads to the second side. Pull the sides together at the tail and glue. Glue one 1/16" ply



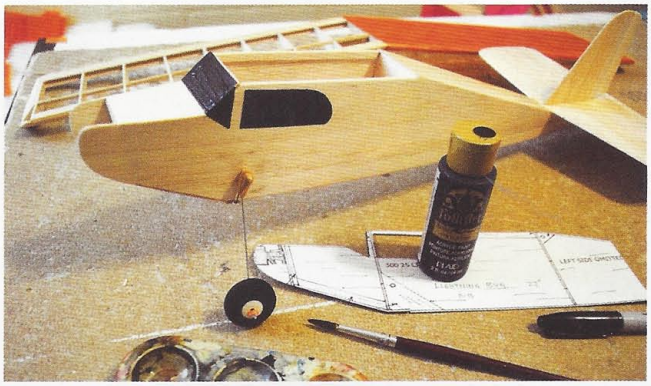
Cross grain 1/16" balsa sheet added to the fus bottom



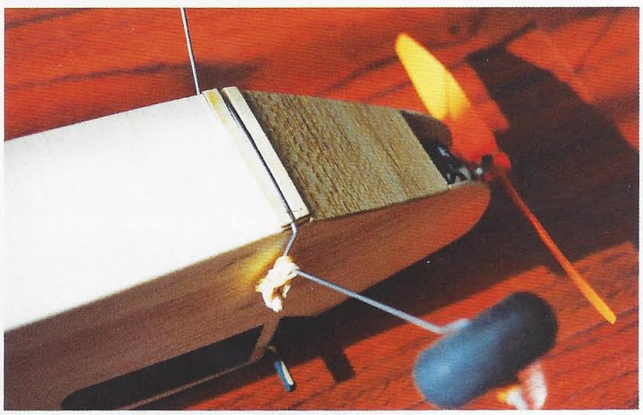
Top balsa sheet now added, and 1/16" balsa sheet stabiliser



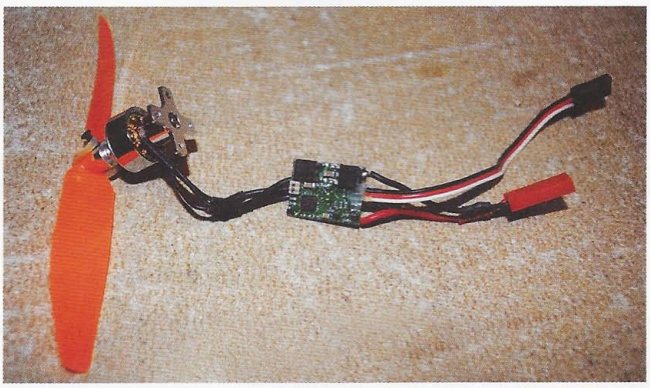
Use the plan template to mark the windows then paint in



Windows painted in and U/C fitted



U/C fits between ply plates and is held with rubber bands



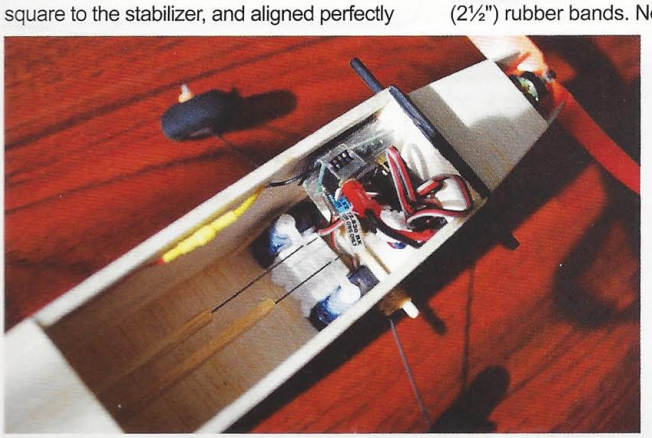
The 20 Watt bell motor and 6A ESC with shortened wires for ease of fitment (see text)

strip across the bottom of the fuselage for the landing gear reinforcement, then glue the cross grain 1/16" balsa fuselage bottom in place first between bulkheads, then rearward to the tail. Put firewall in place, gently pulling the sides together paying careful attention to alignment, and glue with CA. Glue cross grain 1/16" balsa bottom from bulkhead to firewall, then add the two 1/16" ply landing gear doublers to the fuselage bottom over the first plywood strip, spaced to fit the landing gear wire. Add the cross grain fuselage top from the leading edge to the firewall. Next, carefully align and glue the stabiliser in place and then the rear fuselage top from the trailing edge to the stabiliser. Finally, glue the fin on the stabiliser. It must be square to the stabilizer, and aligned perfectly with the fuselage centreline as viewed from above and from behind.

Finish sand the fuselage with 220-grit sandpaper and spray with 2 or 3 coats of clear lacquer. After the lacquer is dry, use the plan template to mark windows with a dull black marker then paint the windows on the fuselage with black acrylic craft paint and an artist's brush.

Drill 1/8" holes in the fuselage for the wing and landing gear dowels. Cut 1/8" hardwood dowels to length, round the ends off with sandpaper and install in fuselage.

Bend landing gear from 14 SWG piano wire, add a pair of 1¼" lightweight wheels and wheel retainers. Install with two #16 (2½") rubber bands. Note that a little bit of toe-in helps the wheel tracking.



Layout in the radio compartment with battery tucked up front

Fitting Out

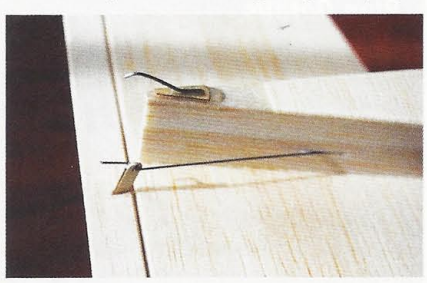
Shorten the ESC to motor wires to a minimum so that the ESC fits forward of the front bulkhead. Install motor, prop and ESC. Determine where to place battery, servos and receiver so that the Lightning Bug will balance without added weight. The prototype balanced on the spar with the servos and receiver mounted against the front bulkhead and the battery attached with Velcro to the fuselage, forward in the nose, and this required trimming the bulkhead on one side. The LiPo should be accessible for removal to recharge or store.

Install servos with servo tape. Install receiver with Velcro. Make 1/32" ply control horns, glue in place on elevator and rudder. Attach elevator to stab and rudder to fin with clear cellophane tape hinges. Make and install pushrods using 1/8" sq x 7" long balsa with .025 (22 SWG) wire pushrod ends.

Attach wing with four #16 (2½") rubber bands.

Flying

Set rudder and elevator travel to 1/4" each direction. The model should balance under the spar. Remove any warps in flying



Elevator and rudder controls have plywood horns and wire pushrod ends; note tail skid

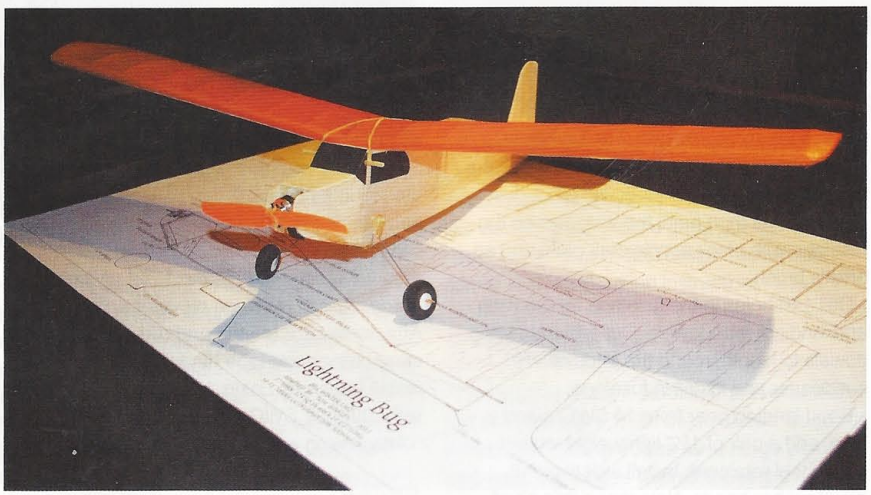
A gentle little park flyer that is capable of basic aerobatics

surfaces. Range check the radio, and pick a calm day for the first flight.

Lightning Bug will ROG in a few feet, or it can easily be hand launched. The climb performance is very good as is control response. It handles like a trainer, is easy to fly and it is very stable and self-righting. The model will loop from level flight and with a bit of speed it will roll to the right or left. A little rudder input at the top of a loop will result in a pretty Immelmann turn. It is steady, predictable and nimble enough to fly in confined spaces, including a gym. It is a real pleasure to motor around the park on a calm day, but it will handle a steady breeze fairly well, too.

Happy landings!

Q&EFI



A cute little trainer or parkfly model

DATA

Lightning Bug
Model Type: Small RET Electric Parkflyer
Motor: 1811-2000KV 10 g
ESC: Turnigy Plush 6 A
Prop: GWS EP-5043
Battery: 2S 300 mAh LiPo
Power: 2.8 A 7.2 V 20 Watts
Construction: Balsa and plywood
Flight Time: 10 minutes
Servos: Two BA 4.3 g
Wingspan: 27"/685 mm
Wing Chord: 4⅞"/122 mm
Wing Area: 123 sq in
Wing Loading: 4.7 oz/sq ft
Length: 19½"/495 mm
Target Weight: 4 oz/113 g

Contacts

Email Tom Binkley at
binkhouse@gmail.com
SoLite Covering Tutorial
www.rcgroups.com/forums/showthread.php?t=711624

Plan Details

Plan:	Lightning Bug
Build Category:	Beginner/Advanced
Plan Number:	MW3687
Plan Price:	£11.99/US$20.99

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