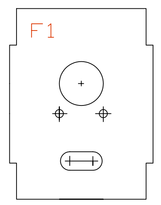
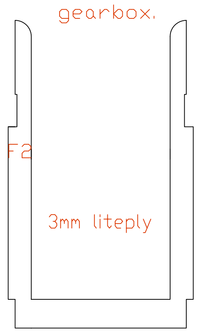


F1: 3mm birch ply (prototype has 3/32" which is also OK). Holes shown match old Astro 15G gearbox.



Wing dimensions not critical but prototype is 630mm from this line to centre of wing

Leading edge: 9x9mm soft balsa set into ribs at approx 45°. Sand front edge round.

Prototype covered in clear Solarfilm

Sheet wing centre only with 0.8mm soft balsa from this rib (mainly to aid carrying and to hide leads)

Extra half rib to strengthen wing for carrying by hand

6mm hardwood dowels (2)

1.5mm ply doublers expoxy'd to both sides of spars (top to bottom of wing) to spread load of mounting screw. Fill inside wing with soft balsa under this plate to further spread load.

Central hole for 1 self-tapping screw to retain wing to fuz

Webbing: 1.5mm vertical grain balsa full length of wing.

Wing tips: 3mm soft balsa. Support with 3 or 6mm balsa triangles at spar and wing trailing edge positions as shown (top & bottom).

Hinges (Mylar after covering)

Spars: One 3x6mm (36" or 1000mm long) spruce top and bottom, with 3x6mm medium balsa to double up (start top spruce from left tip and pass through wing centre without join. Do same with bottom spar but start from other side. This doubles spruce content across centre for max strength, least weight.

Trailing edge of wing and leading edge of ailerons is 6mm medium balsa. Angle to leave gap at bottom for aileron movement, or mount square and bevel aileron leading edge.

Trailing edge of wing capped top and bottom with 0.8x12mm soft balsa to help secure to ribs (not considered essential).

Ribs: 2.5mm balsa is easiest and reasonably light (can use 3mm Depron but then need compression spars or cap strips to take pressure from Solarfilm). All ribs are same size except centre one where wing is joined. Bottom wing is sheeted.

Turbulators: 3mm hard balsa to give wing a little more tortional rigidity and to smooth airflow (2) top and bottom

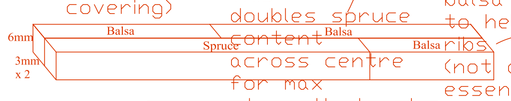
Approx sizes:
0.8mm = 1/32"
1.5mm = 1/16"
2.5mm = 3/32"
3mm = 1/8"
6mm = 1/4"
9mm = 3/8"

Servos: 2 separate shown but 1 with torque arms would be OK unless you too want to mount a camera in the fuz (I also wanted to try aileron/flap mixing but it adds nothing to the flying characteristics). Mount 6x6mm spruce bearers in fuz to take screws for servos.

3mm tight to balsa doubler before sheeting

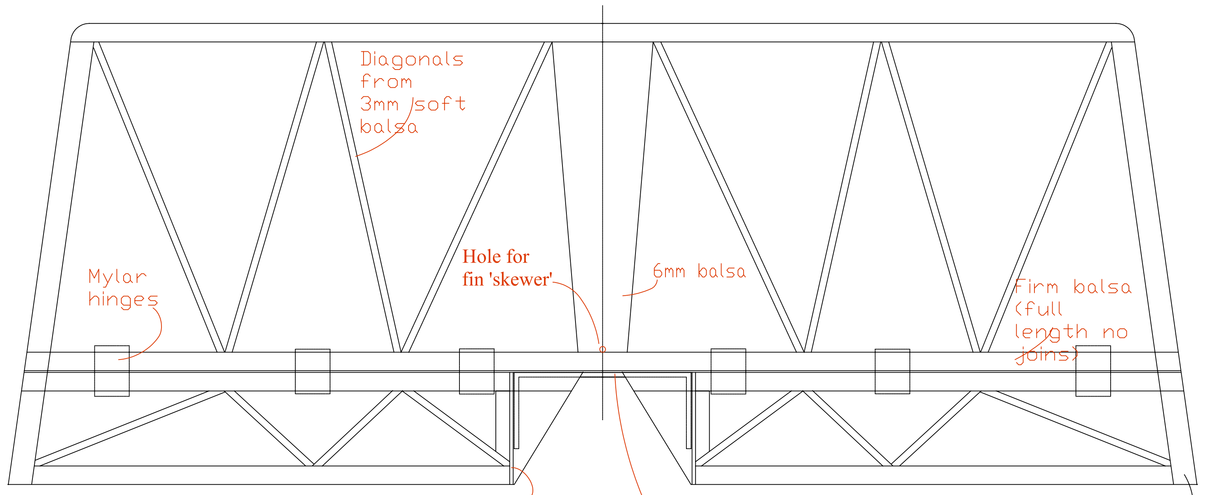
Diagonals from 3mm soft balsa to spread load and stiffen root

Servo horn: 1.5mm ply with tip doubled with 1 layer 0.4mm ply. Epoxy to aileron.



Example of 1 assembled spar full length of wing (not to scale).

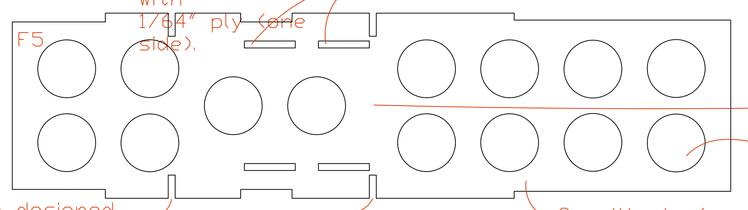
'Bubbles' name on wing done with 'Snap ITC' font in MS-Word 2000.



Elevator control horn from 1.5mm birch ply. Reinforce tip with 1/64" ply (one side).

2.5 or 3mm piano wire elevator joiner

Stab and Elevators: Mostly 3mm soft balsa laminated to make 6mm. Overlap joints where possible (corners).



Velco under battery as well to prevent battery sliding

These slots are designed to 'key' with F2 and F3 to create a crutch around which the rest of the fusalage is built.

3mm liteply (appears light and fragile until glued between fuz sides).

Control Movements:
Ailerons - 15mm each way
Elevator - 20mm each way
Rudder - 45mm each way

Fin and Rudder: Mostly 3mm soft balsa laminated to make 6mm. Overlap joints where possible (corners).

Mylar hinges

2.5mm bamboo skewer doubler through to bottom of fuz.

With bamboo skewer, fin post can end at stabiliser.

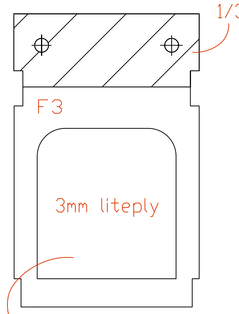
Cut opening in rudder for elevator joiner and reinforce rudder around this opening.

Rudder and Elevator control horns from 1.5mm birch ply. Reinforce tips with 1/64" ply (one side).

1" 'free' light plastic wheel

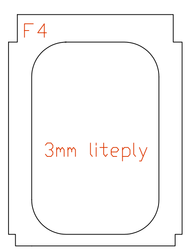
1.2mm piano wire (no collets req'd - just bend end to retain wheel)

Half hinge to support tail wheel wire.



1/32" (0.8mm) ply doubler

Insert F5 diagonally through opening in F3, match up locating slots and push to bottom of F3 to create snug fit.



Soft balsa nose section. Note: if direction of grain is horizontal from F1 to spinner (instead of vertically) and the gap to the spinner is kept as small as possible, this nose section can support the spinner in the event of a crash and possibly help prevent motor breakaway.

1° down thrust

1/32" (0.8mm) ply doubler

Cooling hole #2 (triangular opening in hatch)

Hatch: 6mm Depron although blue foam or soft balsa is OK. Support foam with 6x6mm balsa around circumference on inside (not shown). Add 2 front locating pins and rear sliding catch to hold to wing.

CG is on spar although can be varied safely.

1/32" (0.8mm) ply doubler

Prototype has Rx battery mounted here immediately beneath wing (may need to move cooling hole #1).

3mm lite ply through fuz sides for wing mounting screw. Add 1/32" hard ply at hole position. 3mm lite ply supports front and back.

0° incidence

3mm liteply

3mm liteply

3mm lite ply brace

F1

F2

F3

F4

F5

Cooling hole #1

Triangular balsa filler

Support plate for Astro 15G motor (cross-grain 3mm liteply through sides)

Fuz sides 3mm liteply (2mm per prototype is also OK)

3mm soft balsa cross-grain

1/64" ply reinforcement

3mm piano wire

50-60mm wheel

3mm liteply u/c supports (cross-grain)

3mm balsa filler around u/c wire

3mm medium balsa longerons

Most diagonals and uprights are 3mm medium balsa from here to the tail.

Camera (inside fuz): In theory this can be made to point left, right or down, but in practice one direction is adequate. Omit one side diagonal and construct simple hatch for when camera is not installed.

Rear flotation point if (extra weight!) required (3mm cross-grain liteply)

Cooling exit hole with balsa plate beneath to make hole look more attractive.

3mm balsa cross-pieces and diagonals top and bottom (similar to sides)

6x6mm spruce servo bearers

Install servos before covering. Cut through bottom covering later if access is required. Alternatively build a single hatch

Use closed loop control mechanism for rudder and the same for elevator. Or laminate elevator pushrod from three 3x6mm firm balsa lengths (or a single hardwood dowel would be easier) with threaded metal ends.

3mm medium balsa longerons

Stabilisor (0°)

1.5mm ply reinforcement

6mm balsa filler

Bubbles - Copyright: David Theunissen - August 2000
(Version: 2000d)