

# 1 Materials, Tools and Adhesives

## 1.1 Materials

The following list shows the materials you will require to build the MXS. We have made every effort possible to include everything you will need but you may find that certain choices you make during the assembly may require some additional components.

### 1.1.1 Foam

- 2 x Sheets 2mm Depron Foam, 15" x 39".
- 1 x Sheet 3mm Depron Foam 13" x 39".
- 1 x Sheet 6mm Depron Foam 13" x 39".

### 1.1.2 Carbon Fiber

- 2 x Carbon Strip 6.0mm x 1.0mm x 1000mm.
- 3 x Carbon Strip 3.0mm x 0.5mm x 1000mm.
- 1 x Carbon Square Tube 3.0mm x 2.0mm x 1000mm.
- 1 x Carbon Hollow Tube 4.0mm x 3.0mm x 1000mm.
- 1 x Carbon Solid Rod 2.1mm x 1000mm (this is personal preference; you can use larger diameter / smaller diameter / hollow for push rods).

### 1.1.3 Balsa Wood

- 1 X 1/4" Light Weight Triangle stock (You will need about 12").
- 1 X 1/16" Light Aircraft Plywood.
- Optional: 0.5mm Carbon Fiber Sheet.

### 1.1.4 Hardware (made or purchased)

- Firewall components (3) (1/16" plywood or 0.5mm carbon fiber).
- Landing gear mount components (6) (1/16" plywood or plywood & 0.5mm carbon fiber combination).
- Wheel pant mounts (4) (1/16" plywood).
- Tail Wheel Reinforcement Bracket (1/16" plywood).
- Control horns (4) (1/16" plywood).
- Crutch assembly – servo mount reinforcement plates (2) (1/16" plywood or 0.5mm carbon fiber).
- Battery Hatch Latch (optionally magnets or Velcro can be used).

### 1.1.5 Hardware (purchased)

- 4 sets of bolts, washers and lock-nuts for mounting motor (4-40 or 3mm).
- 100mm CF landing gear for Mini Electric Plane.
- 2" Light Weight Foam Wheels.
- 1/16" diameter music wire (for wheel axle – to suit selected wheels).
- 1/16" wheel collets (to suit selected wheel axles).
- Micro Tail Wheel Bracket and Axle (preferably steerable).

- 3/4" Light Weight Foam Tail Wheel.
- 0.032" music wire for making pushrods (diameter is personal preference).
- 4 x Micro E/Z links (to suit selected music wire).
- 4 x Mini E/Z connectors (to suit selected music wire).
- Hinge Tape.
- Packing Tape.
- Wire Keepers (for a well organized plane).
- Double Stick or mounting Tape (for mounting receiver and ESC).
- Velcro.
- Velcro loop (for retaining battery).
- Kevlar Thread.

### 1.1.6 Power System

- Motor 150W - 200W (Hacker A20-20L was used on prototype).
- ESC 20A - 25A (Atlas 20A was used on prototype).
- Battery 3S LiPo 1200 - 1500 mAh (Thunder Power 3S 1320mAh was used on prototype).
- Spinner (1-1/4" electric was used on prototype).
- Propeller (10 X 4.7 APC Slow Fly was used on prototype).
- Any additional necessary connectors / wire / heat-shrink.

### 1.1.7 Radio System

- Receiver (micro / park flyer recommended) (Futaba R616FFM was used on prototype).
- 3 Servos (micro recommended, 1 high torque for Aileron) (Futaba S3114M were used on prototype) – Optional: Second Aileron Servo can be used if flaperons are desired.
- 2 Servo extensions for elevator and rudder servo.
- Any additional extensions and radio accessories.

## 1.2 Tools

Putting together the MXS requires standard hobby construction tools. We provide a list of the basic tools you should expect to use during assembly but you may find that for certain tasks additional tools could be beneficial.

- Hobby knife with #11 blade.
- Extra #11 blades.
- 2 Straight Edges or Rulers, preferably metal, one preferably 36" long.
- Small Square.
- Hobby or Razor Saw.
- Scissors.
- Removable Tape (painters tape works well, do not use standard masking tape as it will tear the foam when removing).
- Screw drivers, wrenches, Allen wrenches and pliers to fit your selected hardware.
- Sanding block and sand paper.
- Pin vise and small diameter drill bits.
- Cutting and bending tools for piano wire.

## 1.3 Adhesives

Adhesives are many times a question of personal preference and/or what is available. We use a variety of different adhesives when building the MXS; here are some guidelines as to what we do.

- Most foam to foam assembly is done using Ultimate RC Foam Glue or UHU Creativ for Styrofoam. This type of glue excels in bond strength flexibility and light weight. Working with these glues requires good surface preparation and application techniques. In addition they do require additional drying time so patience is a must.
- Cyanoacrylates (CA) adhesives are used in certain areas when bonding foam to non foam components and joints are not high stress. In addition, where speed is desired or necessary CA is used. As a general rule of thumb we use only foam safe CA glue and foam safe activator. Activator is required for foam safe CA when bonding foam otherwise the adhesive will not cure. Wherever possible apply the CA adhesive to the small component to be bonded and spray activator to the mating surface, then join the parts. If this is not possible align the parts and place CA adhesive to the joint, when held in position spray activator around the edges to initiate the curing process. Regular CA is used in a few assemblies when made separate to the airframe, these are primarily the pushrods and the landing gear axles.
- Epoxy is used in all high stress areas and when bonding carbon doublers to foam. In addition, a mixture of epoxy and micro balloons is used when forming the wing fillets. Be careful when deciding which type of epoxy to mix (5-6 minute vs. 30 minute) as you don't want to run out of work time. The instructions will give recommendations as to which type to use.

Other adhesives can be used for assembly and are mainly a question of personal preference. Remember, adhesives listed in this manual are recommendations and if you have different experiences you may substitute your own choice.

## 2 Parts List

The following is a list of all the parts that will be used for the build. This list outlines the Depron Foam, Plywood and Carbon parts. For additional hardware please see Chapter 1.

### 2.1 3 MM Depron Parts, Foam Sheet A

- A1 Ailerons (2)
- A2 Rudder
- A3 Vertical Stabilizer
- A4 Fuselage Front Bottom
- A5 Horizontal Stabilizer
- A6 Elevator
- A7 Wheel Pant Centers (2)
- A8 Wheel Pant Right Side (2)
- A9 Wheel Pant Left Side (2)
- AD1L – AD11L Left Fuselage Doublers
- AD1R – AD11R Right Fuselage Doublers
- AXX Scrap foam from Sheet A will be used to make wing tip caps as well as some miscellaneous doublers and hatch components.

### 2.2 6 MM Depron Parts, Foam Sheet B

- B1 Wing Spar
- B2 Main Fuselage Crutch Element
- B3 Wing Spar Front Crutch Element
- B4 Wing Spar Rear Crutch Element
- B5 Aileron Servo and Receiver Tray
- B6 Firewall
- B7 Landing Gear Bulkhead Top
- B8 Landing Gear Bulkhead Bottom
- B9 Rear Bulkhead
- B10 Wing Rib 1 Front (2)
- B11 Wing Rib 2 Front (2)
- B12 Wing Rib 3 Front (2)
- B13 Wing Rib 4 Front (2)
- B14 Wing Rib 1 Rear (2)
- B15 Wing Rib 2 Rear (2)
- B16 Wing Rib 3 Rear (2)
- B17 Wing Rib 4 Rear (2)
- B18 Wheel Pant Spacers (4)

## 2.3 2 MM Depron Parts, Foam Sheets C and D

- C1 Left Fuselage
- C2 Right Fuselage
- C3 Fuselage Front Top and Battery Hatch
- C4 Cockpit Filler
- C5 Fuselage Bottom and Radio Compartment Hatch
- C6 Landing Gear Bulkhead Top Front Doubler
- C7 Landing Gear Bulkhead Bottom Front Doubler
- C8 Landing Gear Bulkhead Top Rear Doubler
- C9 Landing Gear Bulkhead Bottom Rear Doubler
- D1 Right Wing Skin (2)
- D2 Left Wing Skin (2)

## 2.4 1/16" Plywood Parts, Sheet E

- E1 Firewall Front Doubler (Optional CF component)
- E2 Firewall Top Rear Doubler (Optional CF component)
- E3 Firewall Bottom Rear Doubler (Optional CF component)
- E4 Tail Wheel Bracket
- E5 Crutch assembly – servo mount reinforcement plates (2) (Optional CF component)
- E6 Landing Gear Mount Cross Element (2)
- E7 Landing Gear Mount Cross Element Spacer
- E8 Landing Gear Bulkhead Front Doubler
- E9 Landing Gear Bulkhead Rear Doubler
- E10 Landing Gear Fuselage Doublers (2) (Optional CF component)
- E11 Control Horns (4)
- E12 Wheel Pant Brackets (4)

## 2.5 Carbon Parts

Note: The length of these components is given here for reference purposes only. Do not cut your components to these lengths, when they are required mark the length to be cut directly by laying the part in position and marking the actual length on the part for the cut.

- CF1 Spar Element, 6mm x 1mm Strip x 37" (2)
- CF2 Wing Front Alignment Pin, 4mm x 3mm Tube x 3"
- CF3 Wing Rear Alignment Pin, 6mm x 1mm Strip x 3"
- CF4 Wing Leading Edge Doubler, 4mm x 3mm Tube x 17" (2)
- CF5 Wing Trailing Edge Doubler, 3mm x 0.5mm Strip x 17 ¼"
- CF6 Aileron Torque Rods, 3mm x 2mm Square Tube x 17.64" (2)
- CF7 Aileron Reinforcements, 3mm x 0.5mm Strip x 2.84" (4)
- CF8 Horizontal Stabilizer Reinforcement, 3mm x 0.5mm Strip X 8.98"
- CF9 Elevator Reinforcements, 3mm x 0.5mm Strip x 3.54" (2)

- CF10 Vertical Stabilizer Reinforcement, 3mm x 0.5mm Strip x 5.26"
- CF11 Rudder Bottom Reinforcement, 3mm x 0.5mm Strip x 2.92"
- CF12 Rudder Top Reinforcement, 3mm x 0.5mm Strip x 3"
- CF13 Radio Hatch Reinforcements, 3mm x 0.5mm Strip x 5" (2)
- CF14 Battery Hatch Reinforcements, 3mm x 0.5mm Strip x 6.92" (2)
- CF15 Aileron Push Rods, 2.1mm Rod x 6" (2)
- CF16 Elevator Push Rod, 2.1mm Rod x 3.55"
- CF17 Rudder Push Rod, 2.1mm Rod x 6.4"