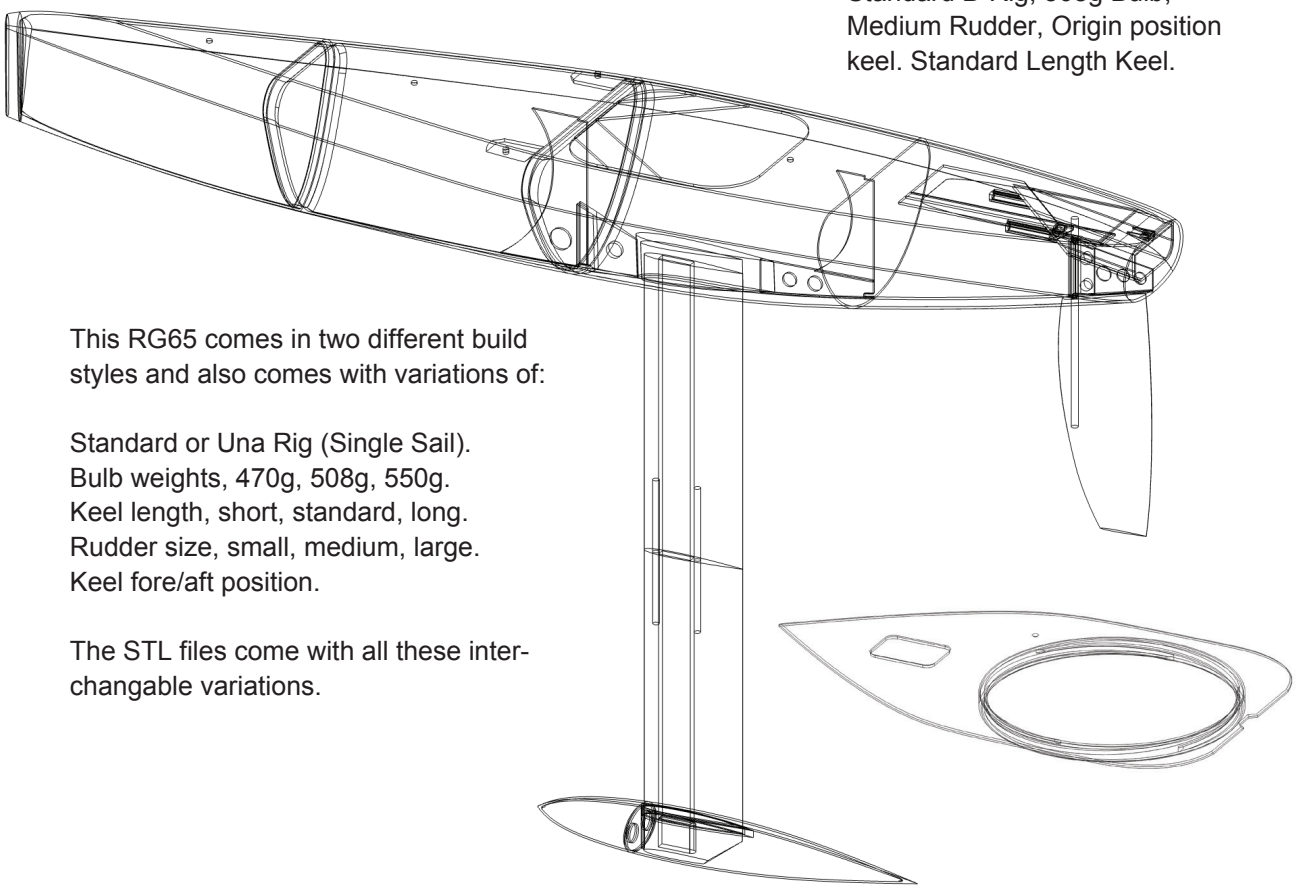
Racing Sparrow RG65-3D RC Yacht

racingsparrow.co.nz

Standard Setup

Recommended Combination
Standard B-Rig, 508g Bulb, Medium Rudder, Origin position keel. Standard Length Keel.



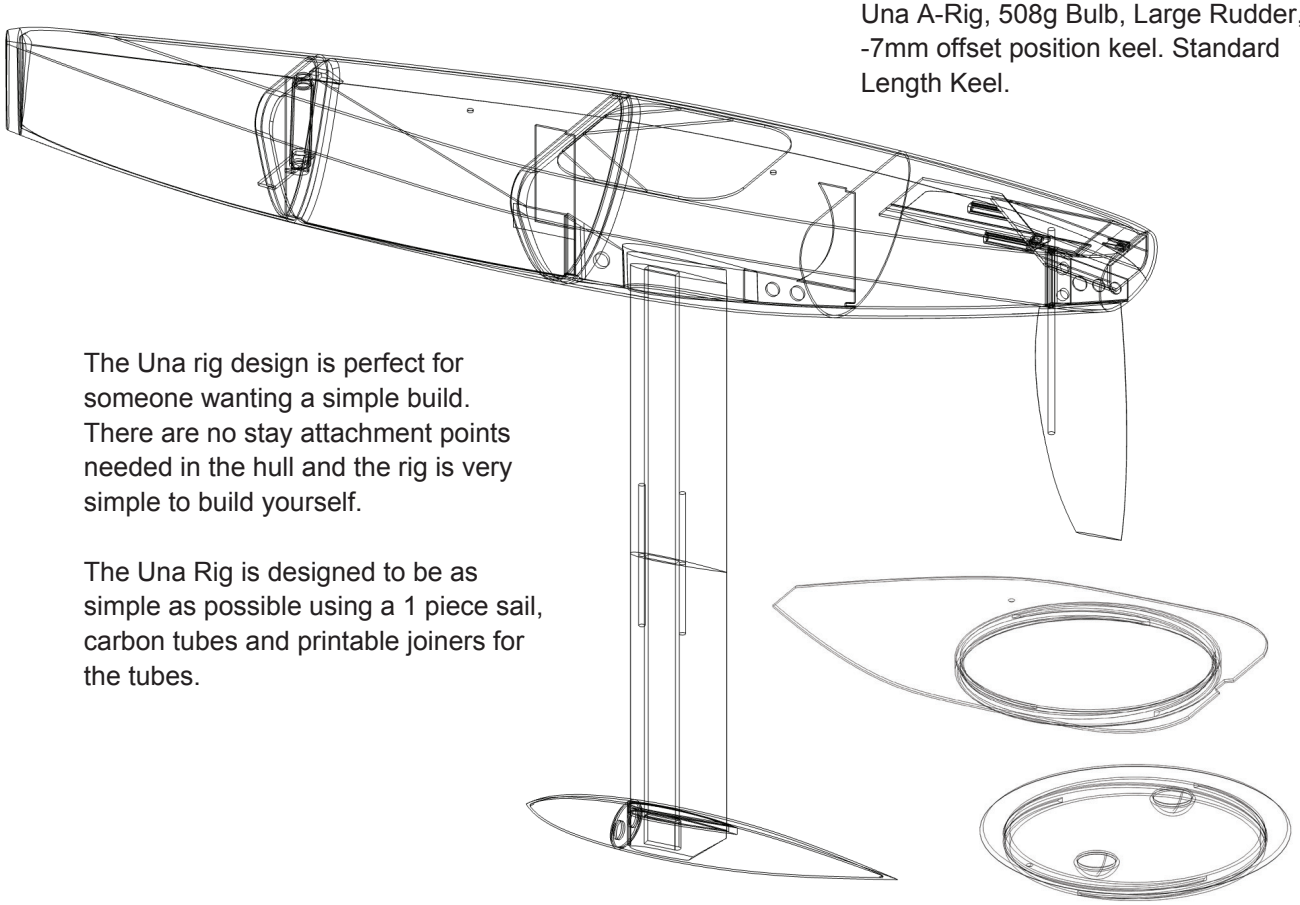
This RG65 comes in two different build styles and also comes with variations of:

Standard or Una Rig (Single Sail).
Bulb weights, 470g, 508g, 550g.
Keel length, short, standard, long.
Rudder size, small, medium, large.
Keel fore/aft position.

The STL files come with all these inter-changable variations.

Una Setup

Recommended Combination
Una A-Rig, 508g Bulb, Large Rudder, -7mm offset position keel. Standard Length Keel.

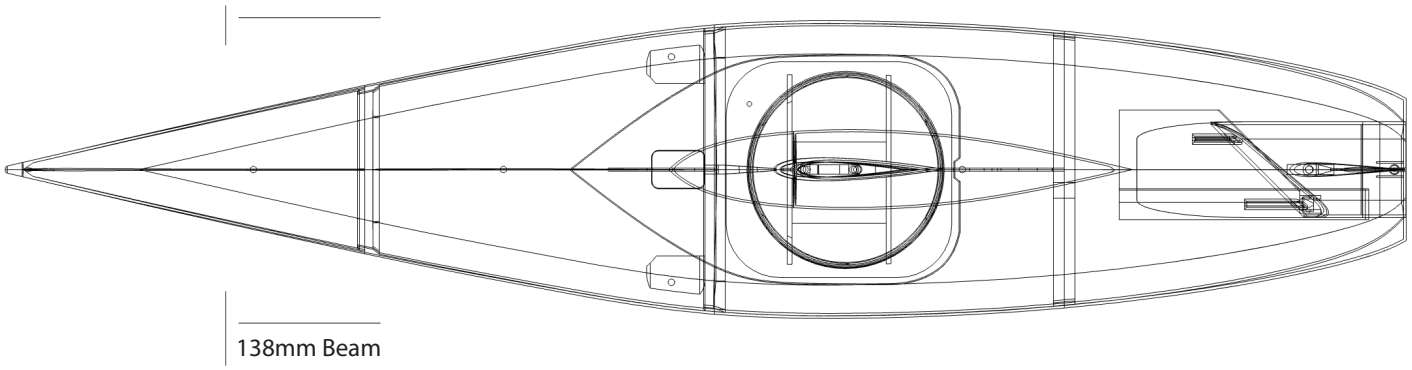


The Una rig design is perfect for someone wanting a simple build. There are no stay attachment points needed in the hull and the rig is very simple to build yourself.

The Una Rig is designed to be as simple as possible using a 1 piece sail, carbon tubes and printable joiners for the tubes.

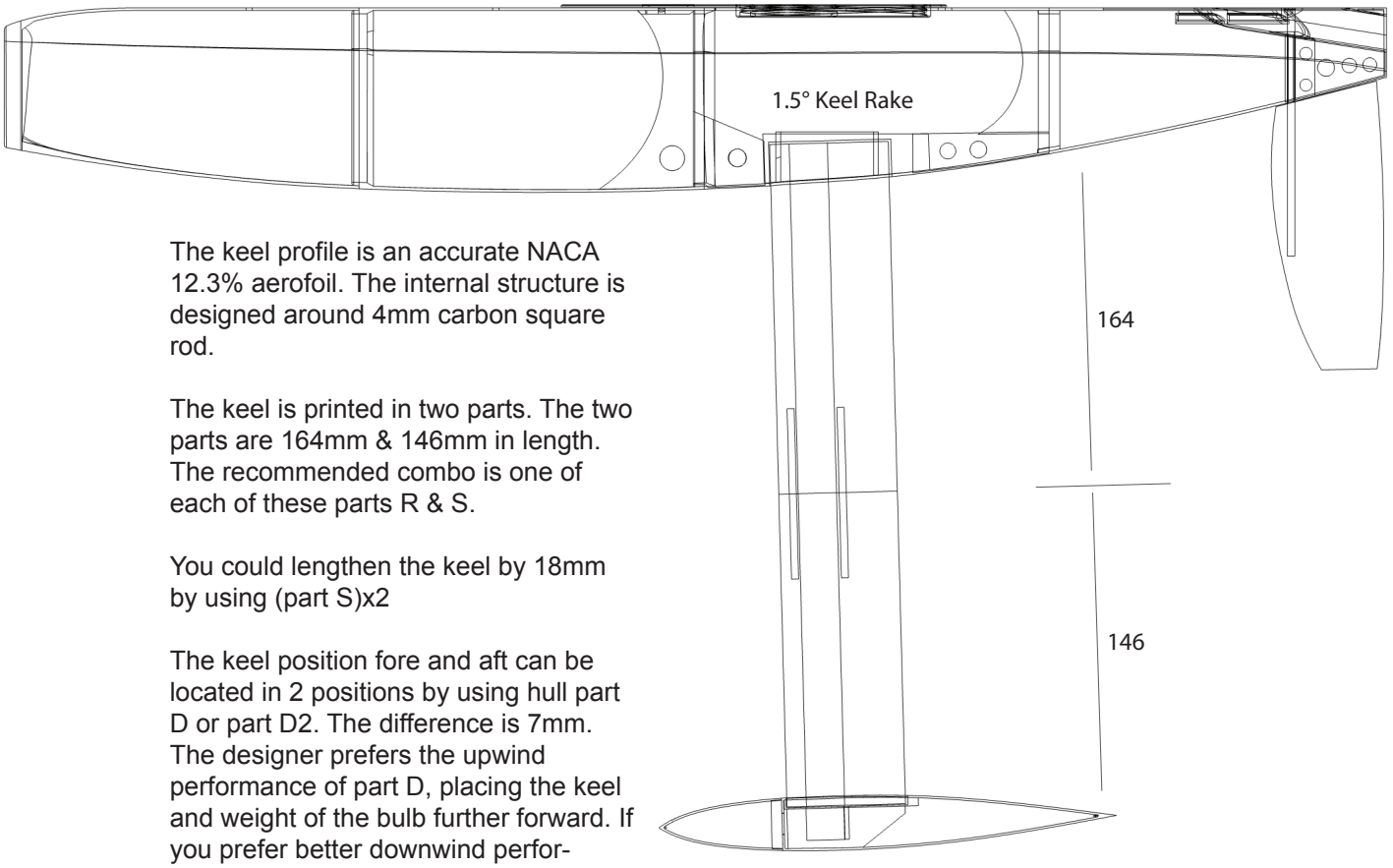
The bulb comes with STL files for 3 different bulb weights: 550g, 508g, 470g.

We recommend the 508g bulb with standard keel length for our preferred combo. If you are really counting grams and want optimal light wind performance try the 470g bulb, it's touchy to sail upwind but has great acceleration down wind.



Showing standard configuration

650mm



The keel profile is an accurate NACA 12.3% aerofoil. The internal structure is designed around 4mm carbon square rod.

The keel is printed in two parts. The two parts are 164mm & 146mm in length. The recommended combo is one of each of these parts R & S.

You could lengthen the keel by 18mm by using (part S)x2

The keel position fore and aft can be located in 2 positions by using hull part D or part D2. The difference is 7mm. The designer prefers the upwind performance of part D, placing the keel and weight of the bulb further forward. If you prefer better downwind performance go for the -7mm part D2.

The rudder also comes in 3 STL sizes. We recommend the large rudder for newcomers as it provides more control. The medium rudder is the designers preference while the small rudder is great for experimentation.

Servo Arrangement

For servos the designer used with great success two cheap servos that are readily available globally:
Sail Arm: Futaba S3003 Standard Size
Rudder: EMAX ES3054 Mini Servo

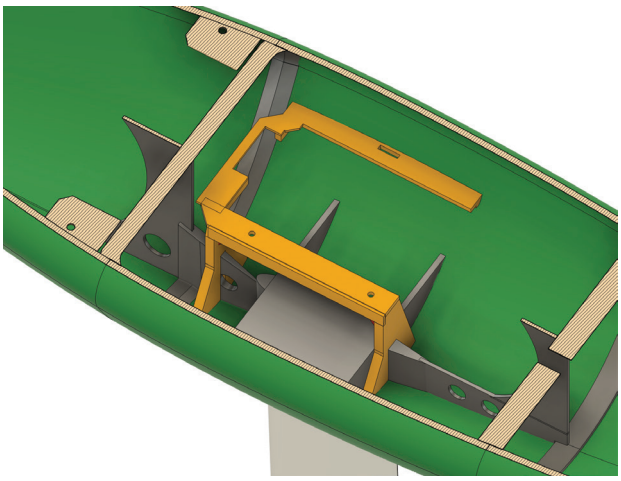
The electrics for this boat are designed to be as cheap and as simple as possible. The electrics are the heaviest part of the boat and the placement has been designed to sit central in the boat and as low as practically possible.

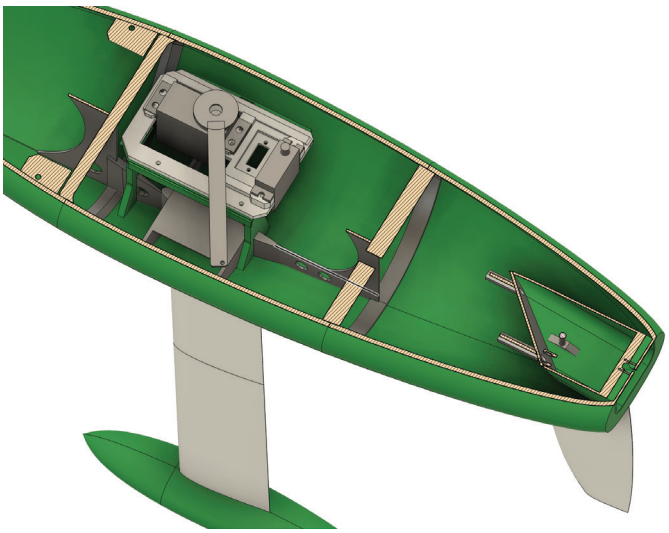
A servo bracket is glued into the hull that also acts as a semi bulkhead for the keel trunk. This bracket is a 2 part component which includes a top tab bar.

The servos get mounted on a printed plate outside the boat and installed as one unit into the hull.

The plate is secured to the bracket with two screws which are easily accessible through the round hatch hole.

The entire electrics assembly can be unscrewed and removed from the boat very easily with this system.

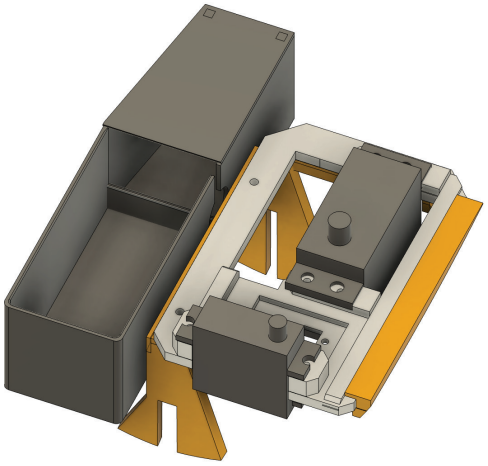




Receiver & Batteries

The receiver and cables get tucked into the front compartment of the battery box which is a simple open design. The battery compartment is designed to fit (4 x AA) batteries in a standard battery holder or any other smaller battery type. The designer recommends a (4 x AAA) battery pack with some simple foam packing beside and in front of the battery.

This is a simple no frills way to have easily accessible batteries but have them snugly sitting in a compartment that is resistant to any water that may find its way into the hull.



Filament & Adhesives
• 1 Roll of filament either PLA+, ASA , ABS , PETG
• CA Glue (Super Glue)
• Resin 100ml (3.4 fl oz) – Polyester or (Epoxy mixed with methylated spirits to thin)

Electronics
• Sail Servo – Futaba S3003 Standard
• Rudder Servo – EMAX ES3054 Mini Servo (20g)
• Battery – Square RX Pack, 4.8V AAA NiMH
• Receiver – Radiomaster R86, (designers favourite)
• Transmitter – Radiomaster Pocket, (designers favourite)

Mechanical & Linkage
• Sheet Tube 5mm Length – Copper Tube K&S 1/8" OD (~3.18mm)
• Tiller Arm Bolt – 2mm Bolt & Nut

Keel & Structure
• Ballast – Lead Shot Size #7.5, 550g (19.4 oz)
• Keel Spine – Carbon Square Rod 4×4mm, (1m x 2). You need 4 lengths of 333mm. Alternatively use 3 x (4x6mm) to fill18mm max size . Others also use Aluminium.
• Keel Joiner, Topper – Carbon Rod 3mm, 300mm

Rigging & Sail Material
• Mast Tube – Carbon Tube 6 mm OD, 1m
• Boom Tubes – Carbon Tube 5 mm OD, 450mm
• Sail Material – Mylar Sheet, 1000 × 500mm (39.4" × 19.7")
• Sail Tape – Spinnaker Repair Tape, 1/2 Roll minimum
• Sheet Line – Braid Line 130 - 300lb, 3m (39.4")

Parts List – Standard Rig Only
• Aluminium Crimps x 10
• Stay Wire – Fishing Lure Wire, 0.8mm x 5m
• Split Pins – 25mm × 5
• Fishing Clips x 5

Parts List – Una Rig Only
• Split Pins – 25mm × 2
• Fishing Clips x 1
• Ripstop Nylon 80x900mm, leading edge only

Optional Parts List
• Pushrod – Du-Bro #108 Steel Kwik-Link with 12" Rod, 2-56 Thread & Tiller Connector – Du-Bro #608 Kwik Grip (optional), can use a double z-bend brass rod.
• Sheet Swivel – Fishing Swivel, 1 Small (optional)
• 3 mm Stainless Rod x 100mm – Rudder (optional), can use carbon rod.
• Power Switch – On/Off Harness with JR Plug (optional), can simply unplug batteries from receiver.

Printing Guide
The Racing Sparrow 3D boats are designed to be printed from PLA+. One roll of filament should be enough to print the hull parts, keel, bulb, rudder, and rig parts. The 3d model has been designed so that no part is too large making this easily printable on most home 3d printers. Minimum Printer Bed Size Required: 150×150×180mm (XYZ)

Simply load the STL files into the slicer software and start printing. All parts are pre-oriented correctly so you should not need to rotate.

The settings the author used on a Creality K1 Max Printer were:
PLA+ eSun
Nozzle 0.4,Wall count of 2: top 4, bottom 4 layers
Brim inside and out for adhesion for hull skins
Use mouse ear: part T1 for problematic lifting edges, (google '3D printing mouse ears')
200°C Nozzle
60°C Bed
34°C Enclosure
35% infill
300mm/s speed

Carbon Fibre
Before gluing any carbon it's best to sand off the glossy outer coating of the spar. These coatings are just thin layers added to the carbon by manufacturers. When gluing this will add much better bond of carbon and PLA+. It's easiest to sand these with a dremel or it can be done by hand with sand paper. Wear gloves to avoid itchy hands from the cut carbon particles. Carbon glues well with both CA and epoxy glues.

Rig Notes
Note that the top spreader is intentionally inverted. This helps keep the mast straight when the backstay is tensioned. Take note the boom dimensions may be shorter than the sail foot as you want some loose curvature in the sails foot. Tie the sails to the attachment points for optimal sail tuning settings. Set and forget!

Electrics
The batteries used for this model are a 4 cell AAA eneloop pack with a JR plug. It is a 4.8V battery setup.

The prototype used are inexpensive servos, a standard Futaba S3003 for the sail arm and an EMAX ES3054 mini servo 20g. Both servos are inexpensive. The receiver and transmitter can be anything but the designer chooses RadioMaster brand for both. Their products have been great throughout the years, faultless and great prices.

Sail Materials
You can use a number of different materials for making sails. I use foil mylar for my prototype boats as it's very cheap. For my final models I prefer to use architectural drafting film. You can also use rip stop nylon and sew the edges. For sail tape I use spinnaker repair tape.

Racing Sparrow RG65-3D Printed Parts

Standard Parts

Hull - Standard & Una

A - RG65 - Bow Bumper.stl

D - RG65 - Mid - Origin.stl

E - RG65 - Stern.stl

F - RG65 - Mid-Stern Joiner.stl

G - RG65 - Floor Brace.stl

I - RG65 - Anchor Points x 5.stl

J - RG65 - Stay Washer x 5.stl

Standard Hull Only:

B - RG65 - Bow.stl

B2 - RG65 - Bow - All-in-one.stl

C - RG65 - Hull Foredeck .stl

H - RG65 - Mast Step.stl

Electrics:

N - RG65 - Battery Case.stl

N2 - RG65 - Battery Lid.stl

O - RG65 - Servo Bracket.stl

O2 - RG65 - Bracket Grip Tab.stl

P - RG65 - Servo Tray.stl

Q - RG65 - Sail Arm.stl

Hatch:

L - RG65 - Hatch Lid.stl

M - RG65 - Hatch Plate Standard.stl

Keel:

R - RG65 - Keel Bottom.stl

S - RG65 - Keel Top.stl

Bulb 550g:

Bulb A - RG65 - Bulb Main 550.stl

Bulb B - RG65 - Bulb Nose 550.stl

Rudder:

T - RG65 - Tiller Arm.stl

U - RG65 - Rudder Blade - Medium.stl

Standard Rig:

Rig A - RG65 - Gooseneck Set.stl

Rig B - RG65 - Mast Crane.stl

Rig C - RG65 - Spreader Set.stl

Rig D - RG65 - Boom Attachments x 7.stl

Rig E - RG65 - Standard B Rig Battens.stl

Rig F - RG65 - Bowsie.stl

Tools, Variants & Una Parts

D2 - RG65 - Mid - Keel Offset -7mm.stl

Una Hull Only:

B3 - RG65 - Una Bow.stl

B4 - RG65 - Una Bow - All-in-one.stl

C2 - RG65 - Una foredeck.stl

Tools:

T1 - RS - Mouse Ear.stl

T2 - RG65 - Bow Bumper Mold.stl

T3 - RG65 - Bulb Twin Funnel.stl

T4 - RG65 - Hull Build Stand.stl

T5 - RG65 - Keel Print Supports.stl

T6 - RG65 - Main Hull Shape Whole.stl

T7 - RS - Test Print Part.stl

Una Hatch Only:

M2 - RG65 - Hatch Plate Una.stl

Bulbs 475g:508g:

Bulb C:D - RG65 - Bulb Main 475:508g.stl

Bulb D - RG65 - Bulb Nose 475g.stl

Bulb D2 - RG65 - Bulb Nose 508g.stl

U2 - RG65 - Rudder - Small.stl

U3 - RG65 - Rudder Blade - Large.stl

Una Rig:

Rig D2 - RG65 - Boom Attachments x 2.stl

Rig G - RG65 - Crane Una Rig.stl

Rig H - RG65 - Una Rig Spar Joiner.stl

Rig I - RG65 - Una Mast Disk.stl

Rig J - RG65 - Una Battens.stl

Racing Sparrow RG65-3D Build Instructions

Follow the instructions below in the exact order as follows. Both the Una and Standard boats are made with this list of instructions.

Build instructions for both boat designs, standard & una versions.

Hull

- Print all pre-oriented STL files, either standard or una parts - see diagram/s.
- Clean up parts with craftknife - test fit.
- Make and glue in 3 rectangle anchor points, 2 for the sidestays (standard boat) and 1 for the mainsheet. (Part I) (Fig 1)
- Make and glue in 2 round split pin anchors (standard). Una has 1 round, 1 rectangular, see web photos for correct placement. (Part I) (Fig 1)
- Super glue mid joiner to hull mid. (Parts F,D/D2) (Fig 2)
- Join hull parts bow-foredeck-mid-stern. (Standard Parts B,C,D,E) (Una Parts B3,C2,D2,E)(Fig 3). Mask join edges with tape for cleaner joins.
- For the bow bumper you can choose either all-in-one bow parts or separate printable 10mm bumper printed from TPU for club racing. Parts B,B2,B3,B4.
- Cut/remove hatch print supports. (Fig 4)
- Super glue in floor brace. (Part G) (Fig 5)
- Glue bracket tab to bracket. (Parts O,O2) (Fig 6)
- Super glue servo bracket into hull. (Part O) (Fig 7)
- Cut and remove temporary triangle from mainsheet exit hole then cut and install brass tube into gap. Add super glue to trough then press fit into place. (Fig 8)
- Install electrics on servo tray. (Part P) (Fig 9)
- Super glue battery box lid to box then glue into the hull. (Parts N, N2)(Fig 10)
- Install servo tray to bracket and screw in place. (Fig 11)
- Install rudder & push rod with z bends or Dubro fittings. (Part T) (Fig 12)
- Glue round servo horn that comes with servos to the printed sail arm. (Part Q) (Fig 13)
- Main sheet to arm and install, feed the thick braid line from the stern into the hull and out the hatch. Tie the end to the sail arm outside the hull then attach the arm to the servo, then over the brass tube and tie to a swivel. (Part Q) (Fig 14)
- Super glue hatch plate onto deck. (Part M/M2)(Fig 15)
- Super glue the mast step in place (Part H)
- Add Araldite glue in and around the stay holes to block water ingress, then place stay washers in place, for standard sidestays heat on the printer bed and bend to shape of the hull curve. (Part J) (Fig 16)

Keel & Rudder

- Super glue keel halves with 3mm rods - 75mm long, you may need to drill out and clean the holes first to get a good fit, gently hammer in place if needed. (Part R&S-suggested, or R&R or S&S) to have different lengths keels.(Fig 17)
- Super glue keel into main bulb slot. (Parts Bulb A/ Bulb C:D)
- Cut carbon square 4x4mm rods to full keel length then epoxy in place. (Fig 18)
- Fill bulb main and nose with lead shot & either polyester or epoxy runny resin. (Parts Bulb#) (Fig 19)
- Wait for resin to set then, super glue bulb nose to bulb main. (Fig 20)
- Araldite epoxy the keel into the hull - hull upside down. (Fig 21)
- Super glue carbon into rudder hole, or use stainless rod. 115mm in length.
- Attach push rod to tiller and use 2mm bolt to secure to rudder stock (Part T) (Fig 22)

- Standard and Una Rig and Sails on the next page.

Racing Sparrow RG65-3D Build Instructions

Follow the instructions below in the exact order as follows. Both the Una and Standard boats are made with this list of instructions. Choose the correct parts to use from the parts list on the previous pages. Note the electrics setup is identical for both boats.

Standard Main & Jib Rig & Sails Instructions

Standard Rigging

- Cut and glue 3mm carbon rod into the stay topper, tap in place with a hammer. (Part Rig B)
- Prep mast, measure & sand glue area
- Super glue in place spreaders, attachment points & fittings. (Parts Rig D, Rig C, Rig A)
- Rig wires/stays crimping in place. (Fig 23)

Standard Sails

- Cut sails as per the plan bounding box then trim offsets. (Fig 24)
- Tape batten corners and triangle attachment points in place. (Part Rig E)(Fig 25)
- Cut small holes through leading edge for braid with craftknife.
- Tie sail tie points. (Fig 26)
- Tie & super glue knots to mast / trim. (Fig 27)
- Rig braid lines, ideally a thicker line from arm to swivel. (Fig 28)

Final Prep

- Tune: Jib trailing edge to match side stays. Main sail centred. (Fig 29)
- Bind Receiver to Transmitter and setup the servo inputs. See youtube
- Sail: test range, tighten hatch, relax!

Una Rig & Sails Instructions

Una Rigging

- Cut and glue 3mm carbon rod into the stay topper, tap in place with a hammer. (Part Rig G) (Fig 30)
- Prep mast, measure & sand glue areas.
- With the mast sitting in the hull hole, place the disc in the correct place. Super glue in place. (Part Rig I) (Fig 31)
- Glue in place Rig H - una rig spar joiner and glue in boom spar as well. (Fig 32)
- Measure and superglue boom two attachment points. (Part Rig D2) (Fig 33)

Una Sail

- Cut sails as per the plan bounding box then trim offsets.
- Tape batten corners and triangle attachment points in place. (Part Rig J) (Fig 34)
- Tape 3 luff battens to sail, space evenly apart. (Part Rig J)
- For the leading edge wrap a width of sail material around the mast and tape to the sail on each side, so the sail can rotate freely on the mast. (Fig 35)
- Tie & super glue knots to mast. (Fig 36)
- Rig braid lines, ideally a thicker line from arm to swivel.

Final Prep

- Bind receiver to transmitter and setup the servo inputs, see youtube.
- Tune: The boom should be pointing at the back corner on each tack, so just off centre to generate efficient power.
- Sail: test range, tighten hatch, relax!

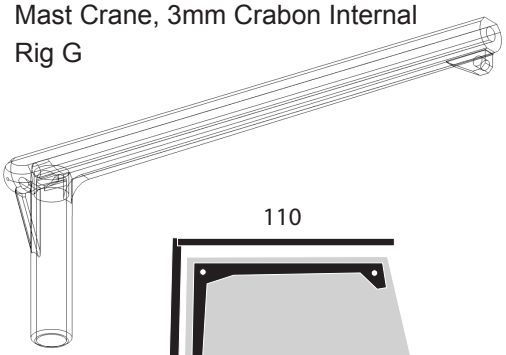
Racing Sparrow RG65-3D
Una Rig B - Rigging Specs

All measurements in millimeters

Spars
6mm Mast Carbon Tube 850mm Tall
5mm Boom Carbon Tube
3mm Topper Carbon Rod

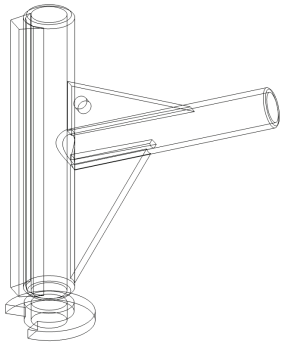
Printed Parts Needed
Rig D2 - RG65 - Boom Attachments x 2.stl
Rig G - RG65 - Crane Una Rig.stl
Rig H - RG65 - Una Rig Spar Joiner.stl
Rig I - RG65 - Una Mast Disk.stl
Rig J - RG65 - Una Battens.stl

Mast Crane, 3mm Crabon Internal
Rig G



Two Part Mast Boom Joiner and
stopper disc

Rig H



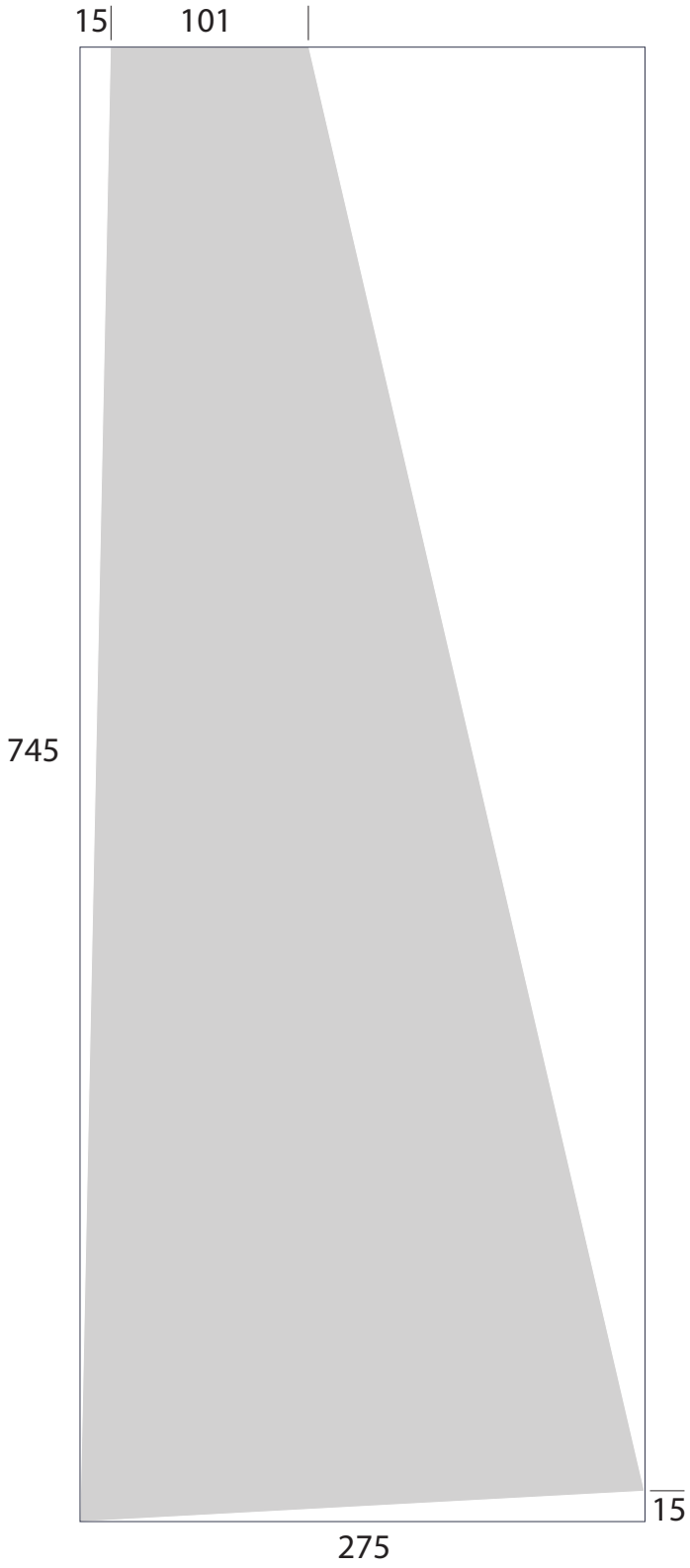
Rig I

Rig D2

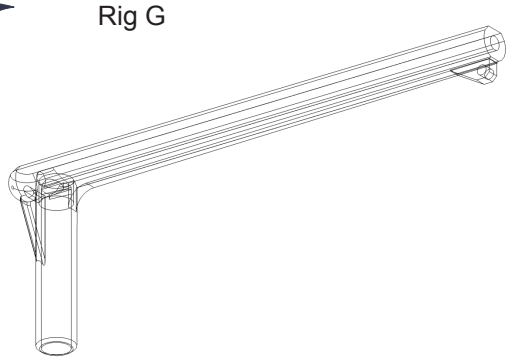
Racing Sparrow RG65-3D
Una Rig B - Sail Dimensions

Here are the sail dimensions with bounding box dimensions. Cut the bounding box shapes out first then measure the offsets and trim.

The slight offsets allow for a small amount of mast rake. All measurements are in mm.



Mast Crane, 3mm Crabon Internal
Rig G



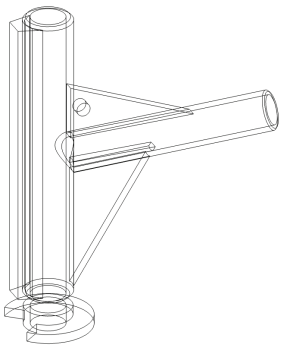
Racing Sparrow RG65-3D
Una Rig A - Rigging Specs

All measurements in millimeters

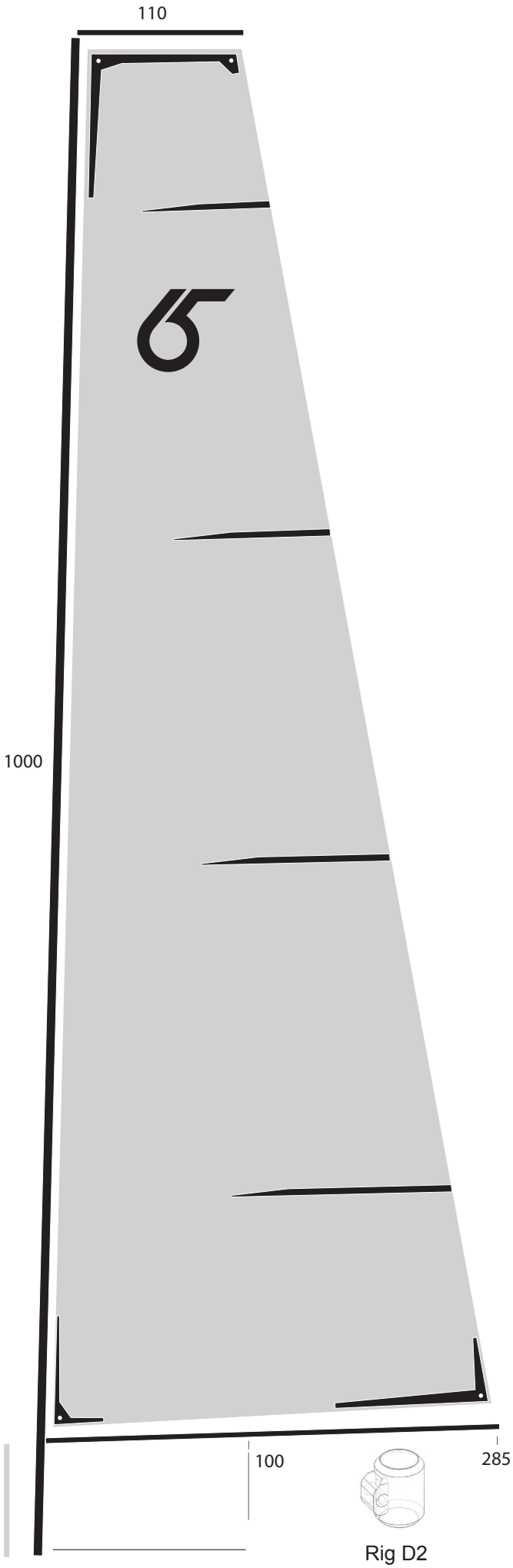
Spars
6mm Mast Carbon Tube 1000mm Tall
5mm Boom Carbon Tube
3mm Topper Carbon Rod

Printed Parts Needed
Rig D2 - RG65 - Boom Attachments x 2.stl
Rig G - RG65 - Crane Una Rig.stl
Rig H - RG65 - Una Rig Spar Joiner.stl
Rig I - RG65 - Una Mast Disk.stl
Rig J - RG65 - Una Battens.stl

Rig H



Rig I

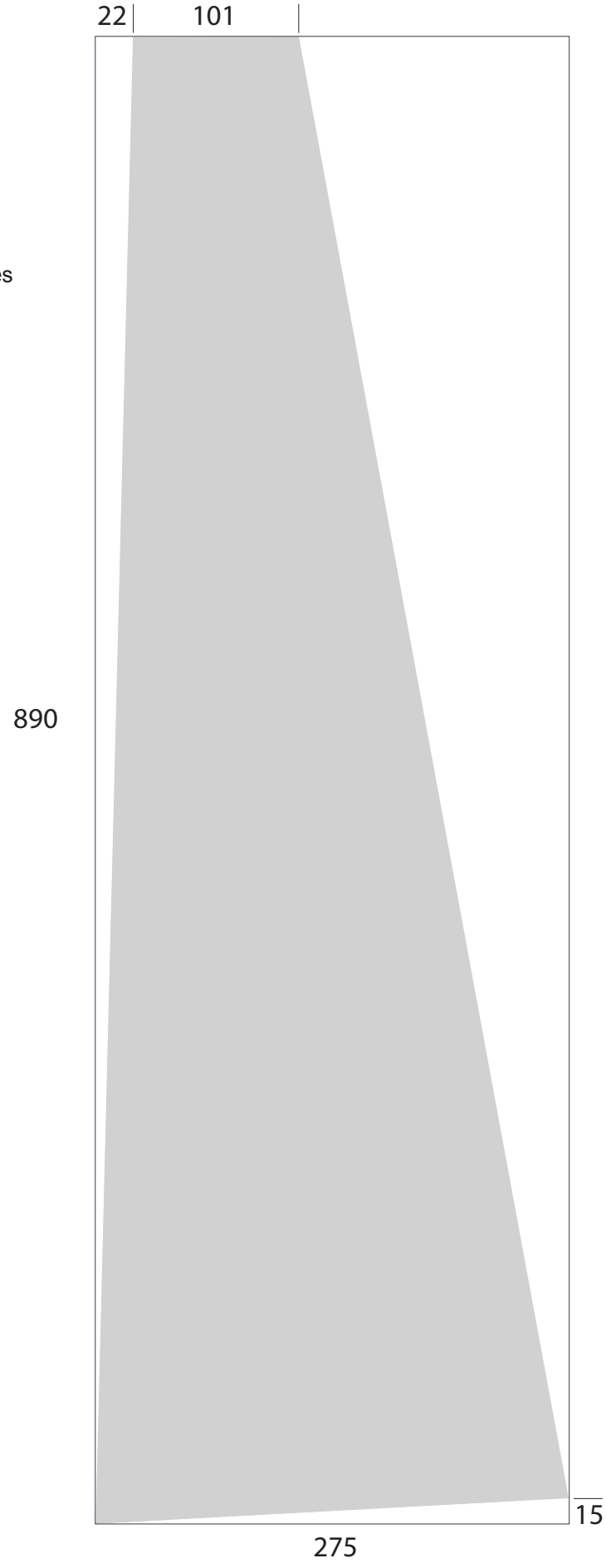


Rig D2

Racing Sparrow RG65-3D
Una Rig A - Sail Dimensions

Here are the sail dimensions with bounding box dimensions. Cut the bounding box shapes out first then measure the offsets and trim.

The slight offsets allow for a small amount of mast rake. All measurements are in mm.

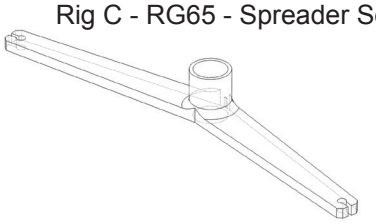


Racing Sparrow RG65-3D
Standard Rig B - Rigging Specs

All measurements in millimeters

Spars
6mm Mast Carbon Tube 900mm Tall
5mm Boom Carbon Tube
3mm Topper Carbon Rod

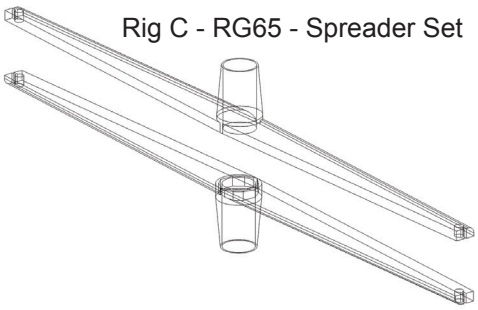
Rig C - RG65 - Spreader Set



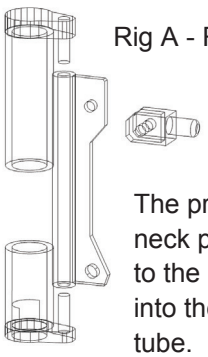
The top spreader has inverted rake, which helps to reduce mast rake under rig tension.

The larger spreader has the same part printed twice and glued opposing each other for exra strength.

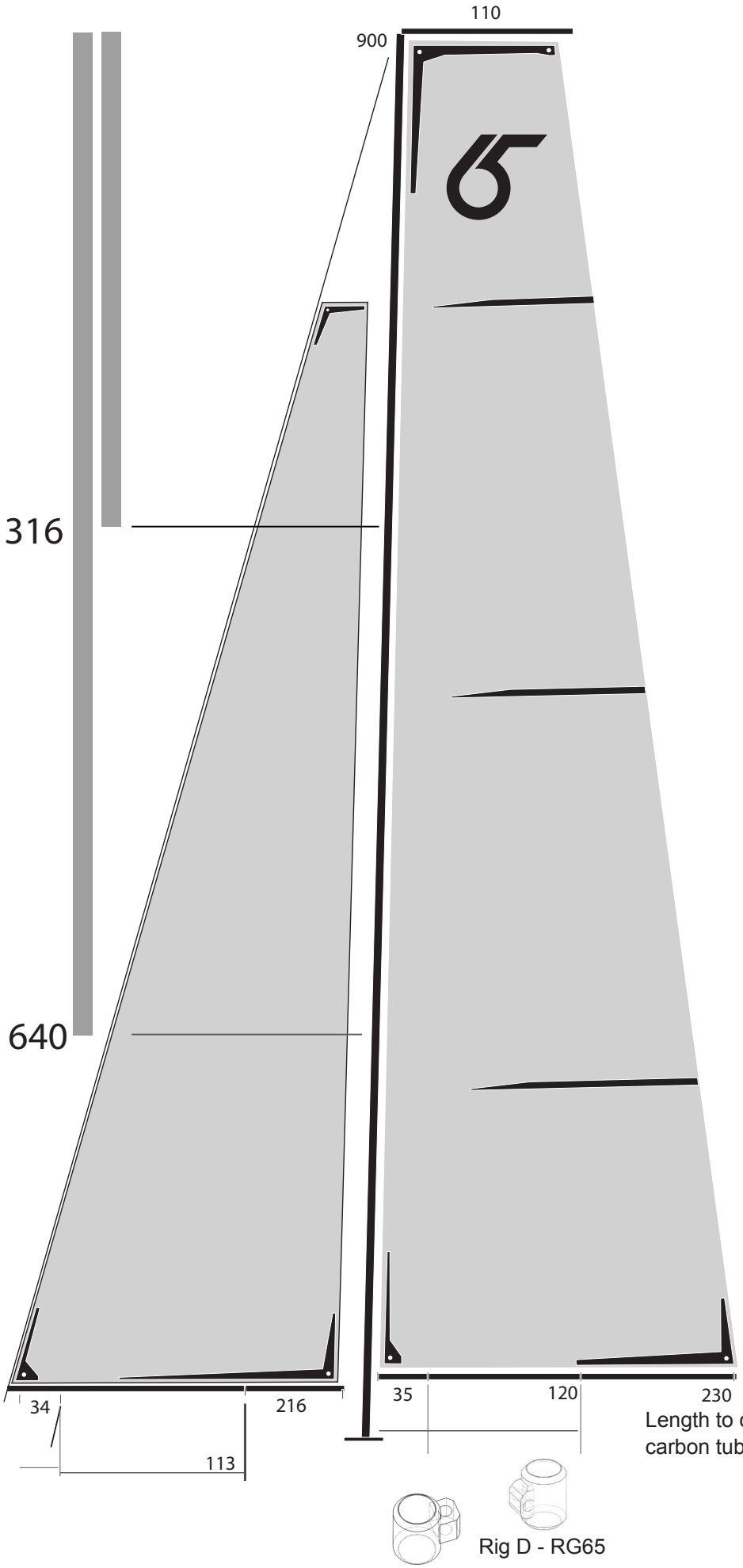
Rig C - RG65 - Spreader Set



Rig A - RG65 - Gooseneck Set



The printed gooseneck parts are glued to the mast and glued into the boom carbon tube.

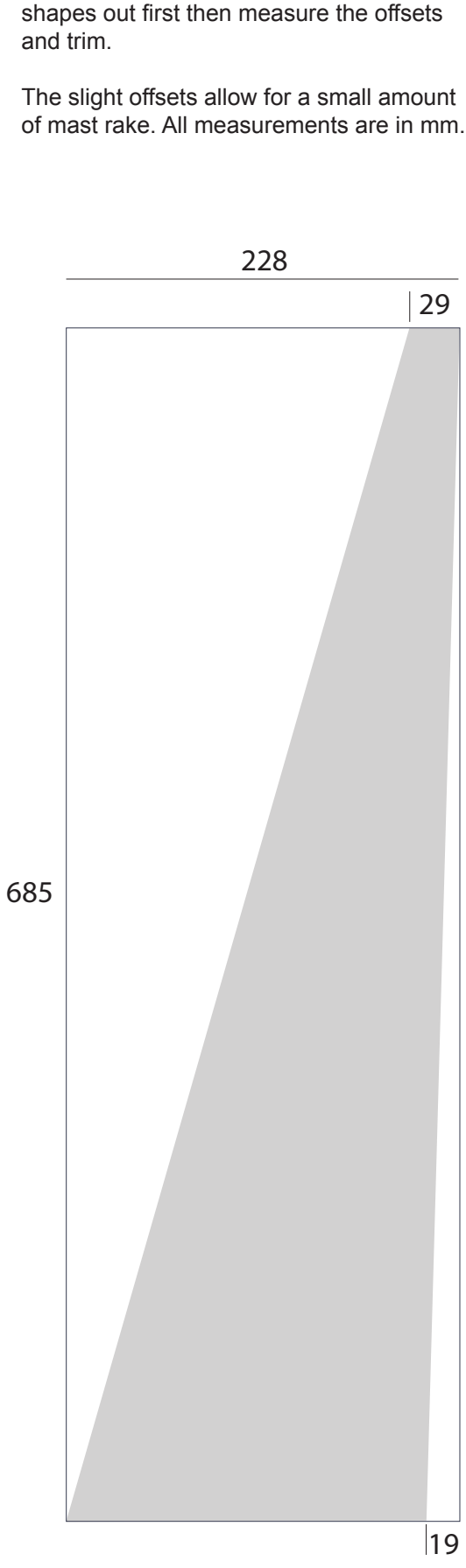


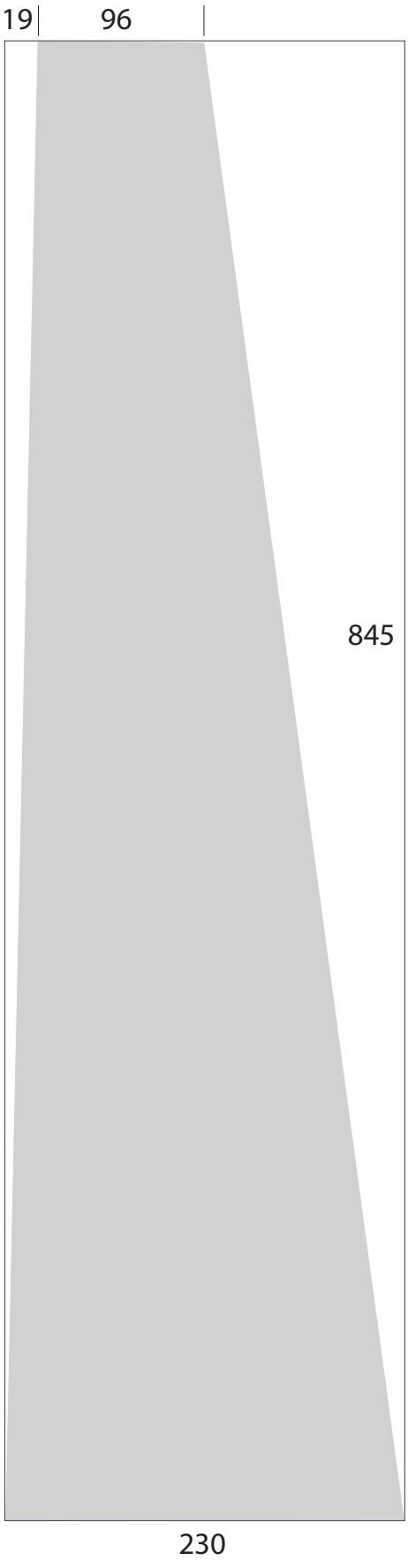
Rig D - RG65

Racing Sparrow RG65-3D
Standard Rig B - Sail Dimensions

Here are the sail dimensions with bounding box dimensions. Cut the bounding box shapes out first then measure the offsets and trim.

The slight offsets allow for a small amount of mast rake. All measurements are in mm.



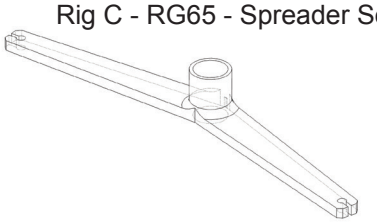


Racing Sparrow RG65-3D
Standard Rig A - Rigging Specs

All measurements in millimeters

Spars
6mm Mast Carbon Tube 1000mm Tall
5mm Boom Carbon Tube
3mm Topper Carbon Rod

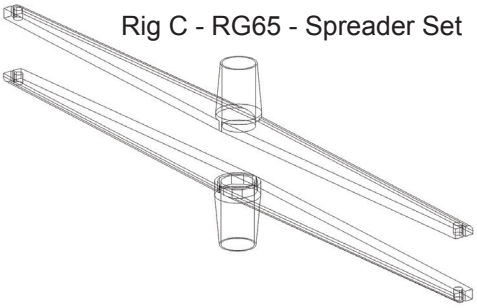
Rig C - RG65 - Spreader Set



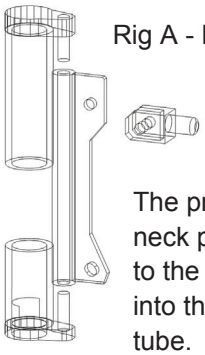
The top spreader has inverted rake, which helps to reduce mast rake under rig tension.

The larger spreader has the same part printed twice and glued opposing each other for exra strength.

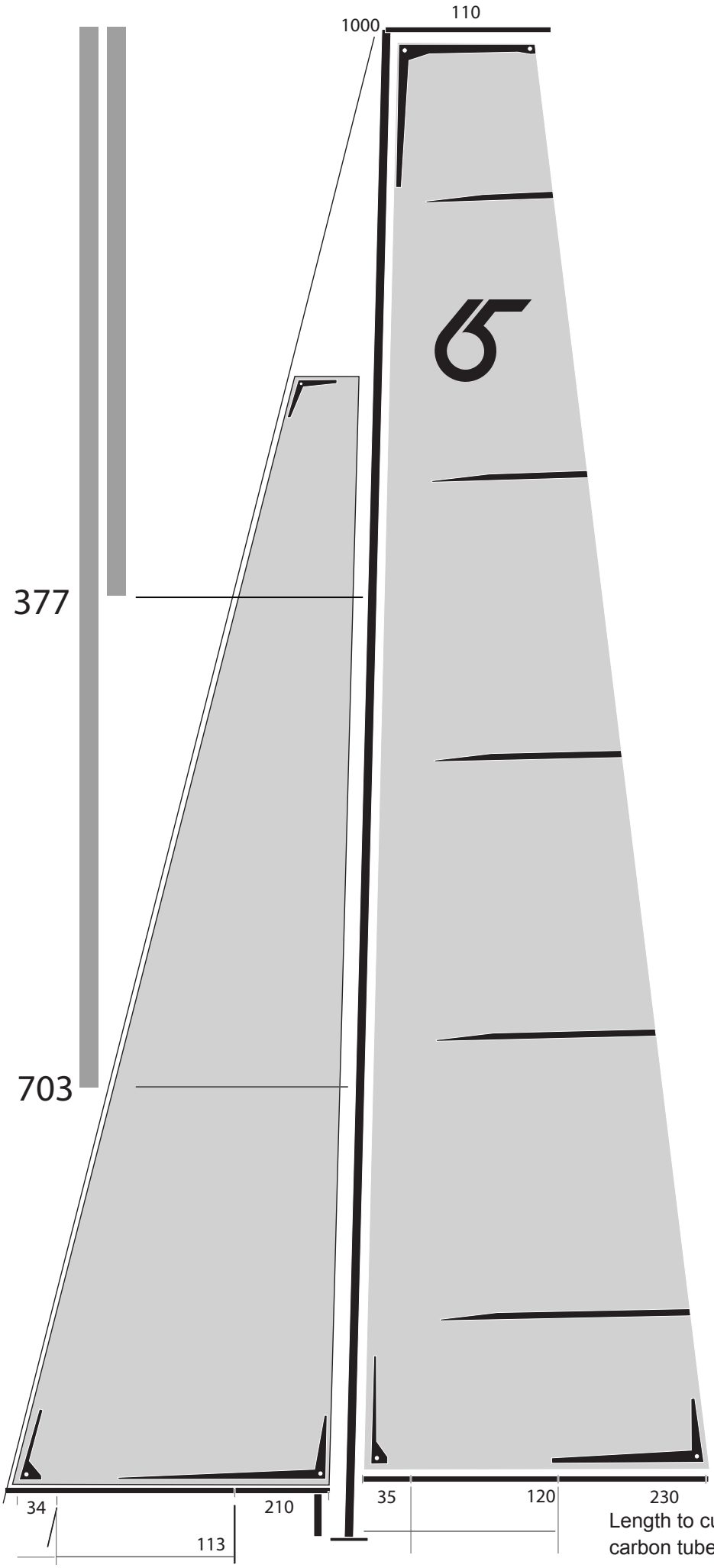
Rig C - RG65 - Spreader Set



Rig A - RG65 - Gooseneck Set



The printed gooseneck parts are glued to the mast and glued into the boom carbon tube.



Racing Sparrow RG65-3D
Standard Rig A - Sail Dimensions

Here are the sail dimensions with bounding box dimensions. Cut the bounding box shapes out first then measure the offsets and trim.

The slight offsets allow for a small amount of mast rake. All measurements are in mm.