



Technical Note TN.JS-008

8 June 2012

TITLE

JS1 U606 Performance Enhancement Package

DESCRIPTION

Jonker Sailplanes has been working on a set of performance-enhancing retrofit modifications, in particular to support those JS1 Revelation owners competing in the 32nd World Glider Championship, to be held in August 2012. The JS code name for the WGC2012 performance enhancements is U606.

The package consists of six modifications, which may be specified and installed individually. This includes:

- Recessing the fin Mylar tape and repositioning the fin turbulator tape;
- Increasing the number of turbulator blow holes in flaperon 3;
- Installing fairings on the rudder to close off the rudder control horn fairings;
- Installing a smaller tail wheel;
- Fitting a fairing over the tail wheel; and
- Modifying the wheel door hinges to allow better closing.

PART 1: Recessed Fin Mylar tape and Re-positioned Turbulator Tape

DESCRIPTION

The fin-rudder Mylar tape sealing is recessed by removing a layer of glass fibre, and the turbulator (zigzag) tape is repositioned. This increases the area of laminar flow to reduce drag.

RISK

HIGH: Particular care should be taken not to cut too deep into the glass fibre skin. Also, when peeling away the single layer of glass fibre, be careful not to peel away in front of the cut.

The top layer of gel coat and paint is brittle, therefore cutting and peeling into these layers may cause paint chipping, requiring some repainting and refinishing.

Please note that this retrofit requires extreme care and great skill.

INSTRUCTIONS

With reference to drawing D1B-1.07.98 v2.0

- 1. Remove the zigzag tape from the fin, and clean off any glue residue.
- 2. Remove the outer Mylar tape and capping tape by peeling it off from the top of the fin. Care must be taken to ensure that the tape is peeled off in a direction parallel to the skin. If pulled too hard, the paint may be removed.
- 3. Mark the top and bottom positions of the fin Mylar tape with a marker, locating its position according to drawing D1B-1.07.98 v2.0

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- 4. Place double-sided tape on a 1m-long metal ruler.
- 5. Place the ruler on the fin, aligned with the Mylar tape recess position according to drawing D1B-1.07.98 v2.0.

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- 6. Use a Stanley knife (or an equivalent sharp knife in which the blade length can be set) and set the depth (blade length) so that the ruler maintains the recess at a depth of 0.5mm. Cut along the ruler.
- 7. Use a sharp chisel to remove the top layer of glass fibre. Take note of the direction of the glass fibre. Usually start with the chisel and peel from the bottom of the fin, as the grain of the glass fibre breaks in the direction away from the recess line. If the fibre glass does not easily peel from the cut line, recut with Stanley knife.
- 8. The Mylar tape is to be bonded into the recess using double-sided tape. Because there may be a slight variation in the depth of the recess, the difference can be made up using multiple layers of double-sided tape normally one or two layers should suffice. Use a test piece to define the layer; the Mylar tape top surface must be flush with the fin surface.
- 9. Add Mylar tape according to D1B-1.07.98 v2.0
- 10. Add capping tape over the Mylar tape and fin skin.
- 11. Add zigzag tape according to drawing D1B-1.07.95 v3.0
- 12. Cover the fin tank filler holes with round stickers to avoid tripping the boundary layer.

MATERIAL SUPPLIED

Drawing D1B-1.07.98 v2.0, and D1B-1.07.95 v3.0

MATERIAL REQUIRED

30mm x 0.19mm	White Curved Mylar tape	Fin Outside	2 m
12mm	Red Double Sided Tape	Fin Outside	2 m + extra as required to fill the recess
25mm	White Capping Tape	Fin Outside	2 m
0.8mm x 6mm point	Zig-zag Tape	Fin Outside	2

TOOLS REQUIRED

- Stanley knife or equivalent with blade length setting capability
- 1m steel ruler

MASS AND BALANCE

This modification has no effect on mass or balance.

MANUALS

No change to Flight or Maintenance Manuals

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NOTES

This modification should preferably be performed by an approved AMO.

PART 2: Increased Number of Turbulator Blow Holes

DESCRIPTION

The smaller chord of flaperon 3 renders the standard 10 mm spacing of the turbulator blowholes insufficient to ensure transition of the boundary layer. Increasing the number of turbulator blowholes to yield a 5 mm spacing ensures transition for better aerodynamic performance.

RISK

MEDIUM: The flaperon is thin at the trailing edge. Caution must be taken not to drill through the top skin of the flaperon.

INSTRUCTIONS

With reference to drawing D1A-2.11-002 v3.0

- 1. Mark a line running over the centre of the existing blowholes on flaperon 3.
- 2. Mark each hole position midway between the existing blowholes.
- 3. Use a Dremel tool or equivalent to drill 0.8 mm diameter holes, being careful not to drill through the top skin.

MATERIAL SUPPLIED

• Drawing D1A-2.11-002 v3.0

TOOLS REQUIRED

- Dremel tool or equivalent
- 0.8mm diameter drill
- Ruler
- Marker pen

MASS AND BALANCE

The amount of material removed effects a negligible change in mass, so there is no effect on the mass and balance of the aircraft.

MANUALS

No change to Flight or Maintenance Manuals

NOTES

This modification may be performed by the owner, or by any approved AMO.

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PART 3: "Cheetham" Rudder Fairings

DESCRIPTION

The fairings over the rudder control horns are open to allow exhausting of high pressure air within the fuselage. With the cockpit air extractor fitted, these fairings can be closed off. This was a proposal advocated by Russell Cheetham from early 2010.

RISK

LOW: No drilling through the skin is required; however, be wary of the rudder cables in the vicinity of the fin fairings.

INSTRUCTIONS

- 1. Ensure that the edges of the fairings are chamfered smooth. Any roughness should be sanded down with fine grit glass paper.
- 2. Place the fairings on the rudder and under the fin fairing so that the bulge is in line with the fin fairing. Note the upward slant relative to the rudder leading edge. The rudder fairing and fin fairing tips should make a straight line. Ensure that the fairing does not make contact at full rudder deflection.



If the fairing makes contact with the fin fairing, follow steps 3 and 4 to trim the fin fairing slightly forward. Start by trimming it forward from approximately 10 mm ahead of the rearmost point, and trimming continually forward until the fin fairing no longer touches the rudder fairing at full deflection.

3. On the fin fairing, make a mark in line with the fin trim line by placing a ruler or square at the leading edge. Then make marks at 5 or 10 mm intervals towards the rear.



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<u>NB:</u> The rudder cable runs close to the surface, so be sure to not damage the cable during the trimming process.

4. Push the rudder fully to the opposite side to start trimming the fin fairing from the root, barely cutting through the skin. Then push the rudder fully to the working side to allow the cable and rudder horns to clear the cutter near the crest of the fin fairing. Repeat if necessary, fitting the rudder fairings after trimming until the fairing clears the fin fairing, without climbing over the fin fairing at full opposite deflection.



5. Temporarily secure the fairing with masking tape on the rudder. Move the rudder while listening for friction.



6. If unsure, use a narrow strip of paper to check for contact. Where the fairing makes contact with the fin skin, use a round file or hard/rigid glass paper to sand the inner edges of the fin skin. Beware of damaging the fairing surface or the rudder cable.



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7. Once the fairing is positioned properly and clears the fin skin with approximately 0.5 mm, mark the position of the fairing on the rudder.

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8. Remove the fairing from the rudder, clean the fairing and apply double-sided adhesive tape to the tangent surfaces of the fairing.



- 9. Carefully place the fairing according to the markings to check the clearance. If there is sufficient clearance and no friction, remove the non-stick peel of the adhesive tape. Generously apply soapy water to the rudder and the exposed adhesive tape, and then place the fairing on the rudder according to the markings. Secure the fairing by gently pressing down on the fairing.
- 10. Once the water has evaporated, clean the rudder and fairing. DO NOT allow acetone to make contact with the fairings.
- 11. Trim off excess fin Mylar tape so that the Mylar tape clears the edge of the fairing by approximately 1mm. Round or chamfer the Mylar tape corner.
- 12. Cover each fairing with a vinyl sticker. Apply a U-shaped sticker over each fairing such that the fairing's edge forms the centreline of the sticker. Start at the top front of the fairing and lift the fin Mylar tape so that the sticker can pass under the Mylar tape.

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MATERIAL SUPPLIED

- Rudder fairings (1B-1.21.71, 1B-1.21.72);
- Drawing D1B-1.21.71 v1.0;
- U-shaped vinyl stickers

TOOLS REQUIRED

- Fine cutter
- Double-sided tape
- Glass paper
- Round file
- Non-permanent marker or similar
- Trimming knife or similar

MASS AND BALANCE

The fairings have a negligible mass, while the fin fairing gets trimmed off a little; this modification has a negligible effect on the mass and balance of the aircraft.

MANUALS

No change to Flight or Maintenance Manuals

NOTES

This modification may be performed by the owner, or by any approved AMO.

PART 4: Smaller Tail Wheel

DESCRIPTION

JS1 is equipped with a 210x65 tail wheel and a Vesconite hub or brass hub for rough terrain. For smooth tar runways the JS1 now offers the option of a 200x50 tail wheel from Tost, with either a blue aluminium hub or brass hub. The benefit of the 200x50 tail wheel is a reduction in drag and mass, with the option of a carbon fibre tail wheel fairing to reduce drag even further.

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RISK

LOW: The retrofit is limited to disassembly and reassembly.



INSTRUCTIONS

To replace the 210 x 65 tail wheel with the 200 x 50 tail wheel:

- 1. Inflate 200 x 50 tail wheel to 2.5 bar.
- 2. Remove the tail wheel axle nuts (Item 4) and slide out the stud (Item 3).



- 3. Slide the tail wheel out of the wheel well. The 210x65 tail wheel (items 6 to 10) is assembled.
- 4. Slide the tail wheel and spacer washers (Item 5) off the axle (Item 1).
- 5. Replace the 210x65 tail wheel with the 200x50 tail wheel. The 200x50 tail wheel (items 12 to 18) comes pre-assembled. Replace the 1mm spacer washers (Item 5) with the supplied 10mm 200x50 spacers (Item 11).

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6. Slide replaced parts back onto the axle, with the tail wheel in middle and a spacer on each side of tail wheel.

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7. Slide the tail wheel back into wheel well and insert axle, using something such as Mylar tape to protect the fuselage.



Note that if the tail wheel fits too tightly, the spacers have to be machined until they fit flush with the compression tube. If the assembled tail wheel and spacers are just short of the compression tube ends, the 1mm spacers can be added to both sides of the assembly on the outer ends of compression tube. The 1mm spacers will damage the bearing casings if placed against the tail wheel bearings.

8. Assemble and tighten the M8 nuts to safe locking position.

MATERIAL SUPPLIED

- Assembled 200x50 tail wheel
- 2x Tail wheel 200x50 spacer
- 2x M8 Nuts

TOOLS REQUIRED

- Two Spanners for axle nuts
- Tyre Pressure Gauge
- Tyre Inflation Pump

MASS AND BALANCE

The mass of 210 x 65 Tail wheel with Vesconite hub and spacers \pm 1052g.

The mass of 200 x 50 Tail wheel with aluminium hub and spacers \pm 918g.

The mass of 210 x 65 Tail wheel with brass hub and spacers \pm 2663g.

The mass of 200 x 50 Tail wheel with brass hub and spacers \pm 2663g.

By changing the 210 x 65 Tail wheel with Vesconite hub to the 200 x 50 Tail wheel with aluminium hub. Recalculate the mass and balance of the aircraft by subtracting the weight of 134g from the previous tail weight scale reading (M2) measured with the 210 x 65 Tail wheel with Vesconite hub.

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MANUALS

The flight manual and maintenance manual will be updated to allow for the effects on mass and balance, as well as installation and removal.

NOTES

This modification may be performed by the owner, or by any approved AMO.

PART 5: Fairing for Smaller Tail Wheel

DESCRIPTION

JS offers the option of a fairing for the smaller tail, to reduce drag even further. The fairing is easily removable to prevent damage while on the ground. This fairing is designed for use with the 200x50 tail wheel only.

RISK

MEDIUM: Holes are required to be drilled through the skin, in the vicinity of the drain pipe and control system drivers.

INSTRUCTIONS

1. Align the tail wheel fairing in position for best fit, curved side towards rear of aircraft. Check for the curved side by aligning the edge with a ruler.



2. Use a Dremel tool to grind holes into the fairings.



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3. Mark the positions of the attachment holes. Ensure that the holes will clear the drain pipe.

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Note: If the rear attachment hole interferes with the tail tank water dump pipe:

- 3.1 Pull the water pipe out
- 3.2 Fill the hole
- 3.3 Drill and grind a new hole (Dremel tool recommended)
- 3.4 Finish (optional)
- 3.5 Mark new positions for the rear fairing attachment hole
- 4. Make sure that the tail tank water dump pipe is removed from the area to be drilled for the attachment bolts.
- 5. Drill a 6mm hole 12mm deep into the fuselage at the mark. A Dremel tool might be the easiest way to make the rear hole.



6. Use a 10 mm drill bit to countersink the hole 1mm deep for the rivet nut's flange (Dremel tool recommended).



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7. Assemble the tail wheel fairing with M4 cap screws and rivet nuts and check for correct fit. If the fairing isn't flush the holes may need to be reamed.

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8. If the water dump pipe hole is to be repositioned, mark the water dump pipe's position on the fairing and use Dremel tool to grind the edge away to allow the pipe to be pulled out past the fairing.



- 9. Apply release agent onto the areas around the attachment holes on the fairing and fuselage. NOTE: Do not apply release agent on any bonding surfaces.
- 10. Prepare the bonding surfaces by sanding the rivet nuts' bonding areas.
- 11. Mix some epoxy (40grams of resin: 16 grams of hardener) with a small amount of Cab-o-Sil[®] filler. Prime all bonding surfaces with epoxy mix.
- 12. Apply the bonding mix to all bonding surfaces, taking care not to use too much bonding material as this will prevent the fairing from sliding into position.
- 13. Press the tail wheel fairing into position and ensure correct alignment.
- 14. Temporarily secure the fairing in position with masking tape and allow bonding to cure.
- 15. Remove the masking tape and unscrew the M4 cap screws.
- 16. Remove the fairing.



- 17. Apply Loctite to the threads of the M4 cap screws.
- 18. Assemble the tail wheel fairing with M4 cap screws.
- 19. Cut the drain pipe flush with the fairing and the tail boom profile.
- 20. Apply capping tape around the tail wheel fairing and fuselage intersection and cover the cap screw holes with round stickers.

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MATERIAL SUPPLIED

- Tail wheel fairing
- 2x M4A12_12 cap screws
- 2x M4 Rivet nuts
- Round stickers

MATERIAL REQUIRED

- Mixing stick
- Masking tape
- Epoxy and hardener
- Cab-o-Sil[®] filler
- Masking tape
- Loctite 243
- Capping Tape

TOOLS REQUIRED

- Stanley knife or similar
- Dremel or similar
- 10mm drill bit
- 6mm drill bit
- Pen or marker
- M4 Allen key

MASS AND BALANCE

No change to mass or balance (Need to check mass of fairing installation first)

MANUALS

The flight manual and maintenance manual will be updated to allow for the effects on mass and balance, as well as installation and removal.

NOTES

This modification may be performed by the owner, or by any approved AMO. Note that tail wheel fairing has a clearance of 9mm from the ground without water ballast; it is therefore recommended that the tail wheel fairing is mounted on the aircraft just before take-off, as towing-out and ground manoeuvres could damage the tail wheel fairing. Similarly rough runways, outlandings, and hard landings on the tail wheel could damage the fairing.

PART 6: Wheel Door Hinges

DESCRIPTION

The wheel doors may not close properly, resulting in a drag penalty. This may be caused by the doors pressing against the fuselage when open, and consequently bending the hinges. The following modification of the wheel door hinge lines enables the wheel doors to open wider without pressing against the fuselage.

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RISK

MEDIUM: Holes are required to be drilled through the skin, in the vicinity of the instrument pneumatic tubes.

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INSTRUCTIONS

The following modifications could be made to the hinges in cases where the wheel doors fail to open and/or shut properly.



- 1. Trim the wheel doors and fuselage in the applicable areas where they are pressing against each other. ((a), (d))
- Drill out the rivets on the wheel door's outer skin and replace with countersunk rivets. ((b))
- 3. Position the rivet gun on the vertical edge of each hinge, on the inside of the fuselage skin, approximately 4 to 5 mm away from the hinge line and as close as possible to the centre of the hinge. Mark the position of the gun tip.
- 4. Drill a hole for the 3 mm rivet.

Note that the pneumatic tubes for the instruments are located in the vicinity of the wheel doors. DO NOT drill the holes deeper than the rivets are long. Masking the drill bit up to the length of the rivet is recommended.

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5. Install the rivet into the hinge; this will prohibit the hinge from bending forward. ((c), (d)).

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TOOLS REQUIRED

- Small grinder or similar
- Rivet gun
- Power drill
- Drill bits

MATERIAL REQUIRED

- 4 3 mm x10 mm pop rivets
- 8 4.2x10 mm countersunk pop rivets

MASS AND BALANCE/MANUALS

The addition of rivets, as well as the removal of material from the doors, happens close to the centre of mass while having a negligible effect on the mass, so the mass and balance of the aircraft is unaffected.

NOTES

This modification should preferably be performed by an approved AMO.

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