

TRIKE WING

Sting Ray

OWNER / SERVICE MANUAL



Manufactured by:

AEROS Ltd.
Post-Volynskaya St. 5
Kiev 03061
Ukraine

Tel: (380 44) 4554120
Fax: (380 44) 4554116
E-mail: INFO@AEROS.COM.UA
<http://www.aeros.com.ua>

December 2018

Table of Contents

1. Introduction.....	4
2. Technical Information and Operating Limitations.....	5
3. Sting Ray Reassembly After Shipping procedure.....	5
4. Sting Ray Breakdown For Shipping Procedure.....	9
5. Sting Ray Set-Up Procedure.....	10
6. Preflight Procedure.....	15
7. Speed to Fly.....	18
8. Sting Ray Breakdown	18
9. Wing Tuning.....	20
10. Maintenance.....	21
11. Removing the Sail from the Frame and Re-Installing.....	24
12. Transportation and Storage.....	27
13. In Closing - A Few Words on Your Safety.....	28

Schematics

1. INTRODUCTION

Thank you for purchasing Aeros wing for your trike.

Sting Ray is a kingpostless two-seater trike wing with 86 % double surface, designed for the experienced pilots who want to have fun in powered flying.

Sting Ray wing was designed as a supplement to our kingpostless Profi TL wing to have more fun when flying in rough air. With similar to Profi TL flying characteristics, Sting Ray has superior handling. Yet, it is very stable and comfortable to fly in turbulence.

On landing approach Sting Ray is very easy to slow down which makes it fairly easy to land.

No kingpost means that you can store the wing in a hangar while it remains fixed to the trike. This allows storing the trike with the wing on it in a really limited space in a hangar or even in a garage. Setting the wing that already attached to the trike up for flight is fast and easy.

The structural strength of the Sting Ray is sufficient for different flight conditions with defined wing load.

Please read and be sure you thoroughly understand this manual before flying the Sting Ray. Be sure that you thoroughly familiar with the wing and the contents of this manual before initial operation. If you have access to the Internet, please visit us regularly at <http://www.aeros.com.ua>

In case of any doubts or questions contact your local dealers or Aeros directly.

We wish you safe and enjoyable flying career.

Aeros Ltd.

Definitions

Definitions used in this Manual such as WARNING, CAUTION and NOTE are employed in the following context:

WARNING

OPERATING PROCEDURES, TECHNIQUES, ETC. WHICH IF NOT FOLLOWED CORRECTLY, MAY RESULT IN PERSONAL INJURY OR DEATH.

CAUTION

OPERATING PROCEDURES, TECHNIQUES, ETC. WHICH IF NOT STRICTLY OBSERVED, MAY RESULT IN DAMAGE TO THE AIRCRAFT OR ITS INSTALLED EQUIPMENT.

NOTE

Operating procedures, techniques, etc. which considered essential to highlight.

2. TECHNICAL INFORMATION AND OPERATING LIMITATIONS

Flight operation of the Sting Ray should be limited to non-aerobatic maneuvers, those in which the pitch angle will not exceed 30 degrees nose up or nose down from the horizon and bank angle will not exceed 60 degrees.

Wing area, sq.m. (sq.ft.)	12.85 (138)
Wing span, m (ft.)	9.6 (31.5)
Aspect ratio	6.95
Nose angle, °	128
Weight (with hang bracket and trim device, without bags), kg (lb)	63.6 (140.2)
Number of upper sail battens	26
Number of bottom sail battens	8
Double sail, %	86
Range of operating overloads	+4/-2
Ultimate tested strength, G	+6/-3
Wind speed max, m/sec (mph)	10 (22)
Min. airspeed, km/h (mph)	60 (37)
Range of trim speed, km/h (mph)	90-130 (56-81)
Max. airspeed, km/h (mph)	161 (100)
Max. take-off weight, kg (lb)	472.5 (1041.7)

Aeros recommends that no attempt should ever be made to deliberately spin a trike with this wing or any wing.

The stability, controllability, and structural strength of a properly maintained Sting Ray have been determined to be adequate for safe operation, when the wing is operated within the entire manufacturer specified limitations.

No warranty of adequate stability, controllability, or structural strength is made or implied for operation outside of these limitations.

Operating the Sting Ray outside of the above limitations may result in injury and death.

Flying a trike with the Sting Ray wing in strong or gusty winds or turbulence may result in loss of control of the wing, which may lead to injury and death.

Do not fly in such conditions unless you realize and wish to personally accept the associated risks.

3. STING RAY REASSEMBLY AFTER SHIPPING PROCEDURE

Before beginning, read through the section 5. STING RAY SET-UP PROCEDURE and section 11. REMOVING THE SAIL FROM THE FRAME AND RE-INSTALLING.

While following the instructions in this section, refer to the photos and descriptions in sections 5 and 11 for reference, if necessary.

1. Unzip the wing bag. Undo the Velcro straps. Remove battens, the control bar and the outer leading edge tubes from the wing bag. Remove all packing material.

2. Unfold the sail along the leading edge to its full length. Attach the outer leading edge tubes to the front leading edge tubes according to the markings: L-left, R-right. The triangular marking on the leading edge tube #3 and the triangular marking on the leading edge tube #2 should match together (fig. 1, shown without the sail).

Working on one wing at a time and working with the appropriate leading edge # 3, fold the outer sprog, which is attached to the outer leading edge tube, forward. Slide the inboard end of the leading edge tube # 3 into the sail.

Align the outer leading edge properly so that the sprog bracket is on the inside of the leading edge, and slide the outer leading edge tube forward carefully until it engage completely on the front

leading edge tube, allowing the sprog end to come outside the sail at the access zipper (fig.2 and fig.3).



Figure 1

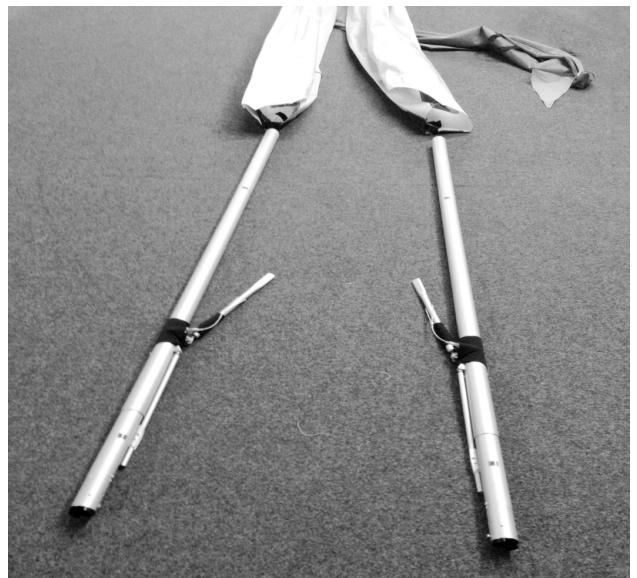


Figure 2



Figure 3



Figure 4

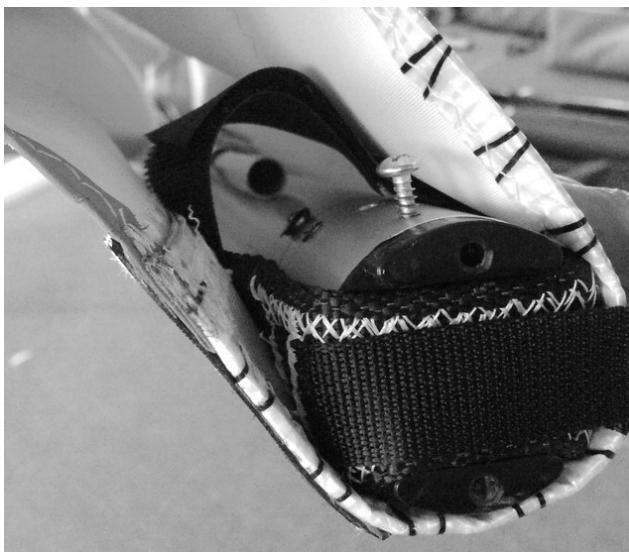


Figure 5

3. Tighten the sail along the leading edge by putting the sail mount webbing into the slot in the end cap of the outer leading edge tube. Secure the sail mount webbing to the outer leading edge with the sail mount webbing Velcro (fig.4 and fig.5).

4. Turn the wing on one side and spread the control frame down tubes. Install the control bar according to the markings. Fix the control bar with bolts and nuts so, that fixing nuts are pointing backwards, against the direction of flight (fig.6).



Figure 6



Figure 7

5. Lift the wing upright on the control frame (fig.7).

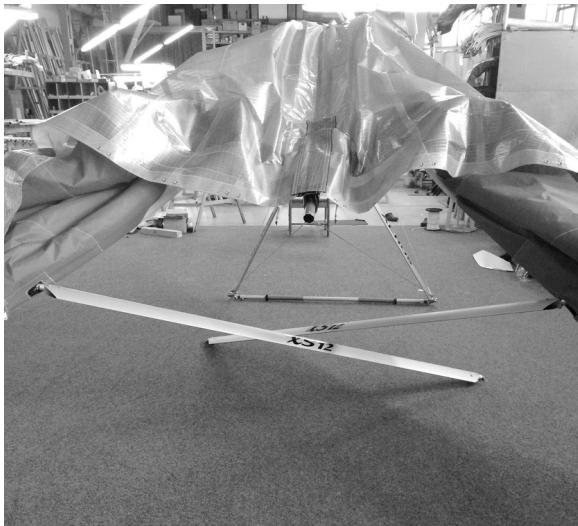


Figure 8

6. Spread the wings approximately 50% from fully open. Attach the struts according to the markings. L-left, R-right marks must be on the control frame side of the struts, on top. Attach the upper part of the strut first, together with the strut safety wire (fig. 8). Tighten the nut and secure with a safety ring (fig. 9). Attach the strut to the control frame bracket. The clevis pin head should be pointing forward (fig. 10). Do not attach the strut safety wire to the base tube for now.



Figure 9

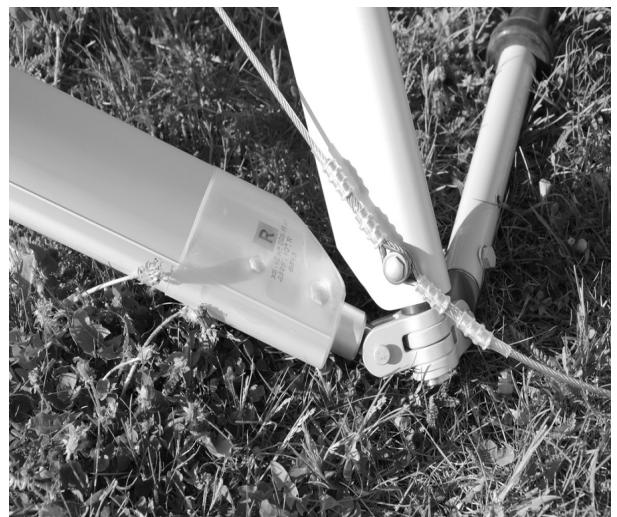


Figure 10

7. Attach the bottom front wires and secure the nose catch of the bottom wires on the nose junction channel using the clevis pin and the safety ring (fig. 11).



Figure 11



Figure 12

8. By lifting up and back of the nose batten strings, push the nose battens fully back into the sail so that the batten tips rest in the holes on top of the keel tube (fig. 12).

9. Check that the sail mount webbing is in proper position in the slot of the outer leading edge tube end cap. Open the main sprog access zipper and look inside, making sure that the leading edge #3 stays in place and the triangular markings on the leading edge tube #3 and on the leading edge tube #2 matches together.

10. Carefully spread the wings all the way, lowering the nose of the wing on the ground. Once the nose of the wing is on the ground the wings spread themselves (fig. 13). You will need an assistant to perform this procedure.



Figure 13



Figure 14

11. Pass the rescue system bridle through the corresponding hole in the sail and all the way through the rescue bridle palm on the top surface of the wing. Pass the rescue system bridle through the keel pocket palms.

12. Attach the strut safety wires (left and right) to the base tube. Tighten the nut and secure with a safety ring (fig. 14). Attach the control frame corner protection cover with Velcro.

13. Wheel the trike behind the wing, rolling the front wheel over the control bar. Check that the ignition switch and the key are in off position. Tilt the main pylon of the trike down.

14. Connect the trike pylon to the hang bracket of the wing. Insert the heart bolt, tighten the nut firmly and secure with a safety ring. Connect the back-up loop, making u-turn around the keel tube. Connect the rescue system bridle.

15. Lift the nose of the wing to allow for the front wheel to be rolled rearward over the control frame so that the base tube is in front of the cockpit and the rear of the keel tube rests on the pylon. Make sure the protection pad on the main upper pylon is in proper position and protects the pylon against bottom rear wires.

16. Install all cambered battens in the sail.

17. Remove the auxiliary bungee from the shackle and the hook.

Check that the pull back (cross tube tensioning) wires are not twisted. Take the shackle with one hand. At the same time with another hand pull the crossbar backwards – this will considerably help attaching the shackle of the pull back wires on the hook, placed on the keel tube. Attach the shackle on the hook.

18. Fix all battens with the **double tensioned** ropes and rubber bands.

Install the tip folded battens.

19. Install the undersurface battens.

20. Deploy both the inboard sprogs and the outboard sprogs and secure them in position.

21. Fix the sail mount tangs at the nose part of the sail to the wing bolts. Do not over tighten the mount nuts. When the fixing nut is properly tightened, the sail mount tang rotate freely on the fixing bolt (fig.15).

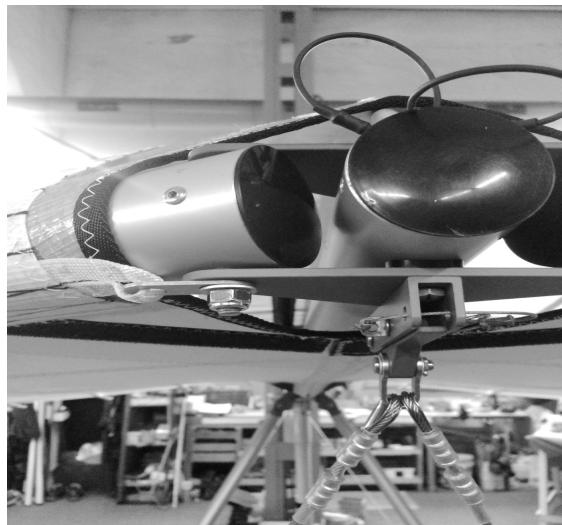


Figure 15

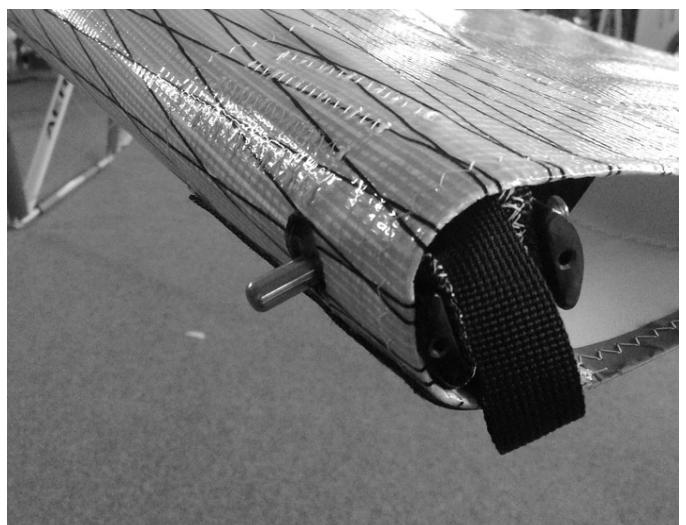


Figure 16

22. Take the winglets and find the winglet fixing rods packed inside. Install the winglets fixing rods to the leading edges #3 (fig. 16).

23. Install winglets.

24. While the base tube of the trike is still on the ground install the nosecone.

4. STING RAY BREAKDOWN FOR SHIPPING PROCEDURE

This process will basically be the reverse of reassembling after breakdown for shipping. Before beginning, read through the section above. Refer to the photos in the section above for reference, if necessary.

5. STING RAY SET-UP PROCEDURE

1. Lay the wing on the ground, with the bag zipper up. Lay the struts and the winglets next to the wing.
2. Undo the bag zipper and take out battens and the control bar.
3. Untie Velcro straps. Open the control frame apex protection bag (fig. 17).
4. Turn the wing on one side and spread the control frame down tubes. Install the control bar according to the markings. Fix the control bar with bolts and nuts so, that fixing nuts are pointing backwards, against the direction of flight (fig. 18).
5. Lift the wing upright on the control frame. Try to set the control bar on level ground.



Figure 17



Figure 18

6. By lifting up and back of the nose batten strings, push the nose battens fully back into the sail so that the batten tips rest in the holes on top of the keel tube (fig. 19).



Figure 19



Figure 20

7. Remove protection bags from the keel, from the control bar apex, from the hang bracket and from the crossbar central unit.
8. Remove all Velcro ties and spread the wings approximately 50% from fully open (fig. 20).
9. Attach the struts according to the markings. L-left, R-right marks must be on the control frame side of the struts on top (fig. 21, fig. 22 and fig. 23). Attach the upper part of the strut first, together with the strut safety wire. Tighten the nut and secure with a safety ring (fig. 22). Attach the strut to the control frame bracket. The clevis pin head should be pointing forward (fig. 23). Do not attach the strut safety wire to the base tube for now.

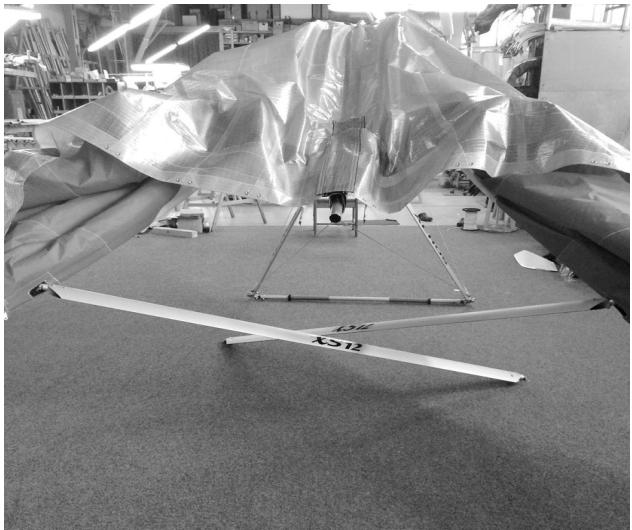


Figure 21



Figure 22

10. Attach the bottom front wires and secure the nose catch of the bottom wires on the nose junction channel using the clevis pin and the safety ring (fig. 24).

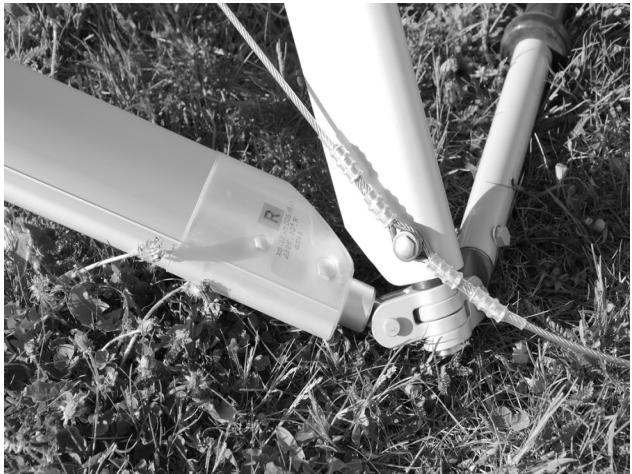


Figure 23



Figure 24

11. Carefully spread the wings all the way, lowering the nose of the wing on the ground. Once the nose of the wing is on the ground the wings spread themselves (fig. 25). You will need an assistant to perform this procedure.

12. Position the wing on its control frame, facing into the wind, with the nose on the ground (fig. 26).



Figure 25



Figure 26



Figure 27

13. Attach the strut safety wires (left and right) to the base tube. Tighten the nut and secure with a safety ring (fig. 27).

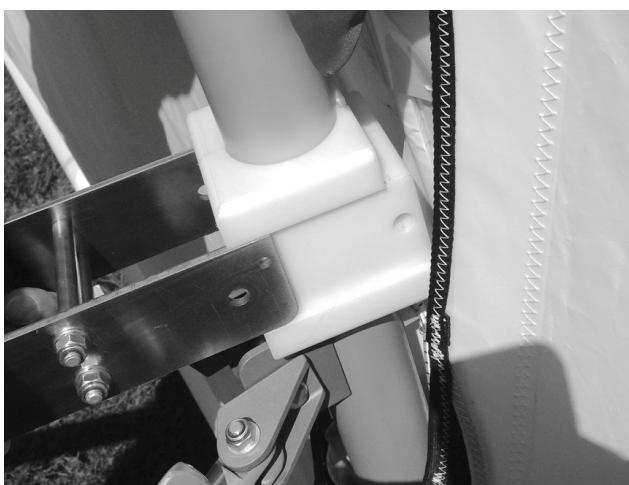


Figure 28



Figure 29

14. If you have a French type hang bracket, assemble the hang bracket as shown on the figure 28 and attach it to the wing. Attach the trim device to the hang bracket. Skip this procedure if you have Antares hang bracket (fig. 29).



Figure 30



Figure 31

15. Pass the rescue bridle through the corresponding hole in the sail and all the way through the rescue bridle palm on the top surface of the wing (fig. 30). Close the bridle palm cover. Pass the rescue system bridle through the keel pocket palms (fig. 31).



Figure 32



Figure 33

17. Connect the trike pylon to the wing hang bracket (fig. 33). Insert the heart bolt, tighten the nut firmly and secure with a safety ring. Attach the back up loop, making u-turn around the keel tube. Connect the rescue system bridle.

Lift the nose of the wing to allow for the front wheel to be rolled rearward over the control frame so that the base tube is in front of the cockpit and the rear of the keel tube rests on the pylon. Make sure the protection pad on the main upper pylon is in proper position and protects the pylon against bottom rear wires.

18. Remove the wingtip protection bags. Remove battens from the batten bag and check each batten for symmetry against the corresponding batten from the other wing. Align battens at their front tips, and at about the 60% of the chord point. There should be no deviation of more than 3mm (1/8") from one batten to the other along the full length of battens.

If you choose not to check your battens for symmetry before each flight, you should, at a minimum, check them once a month.

Aeros convention is that the red marked battens go in the left wing and green marked battens go in the right wing. Battens are numbered from the center outwards, and the longest battens in a Sting Ray are designated as the "No. 1" battens. Install all cambered battens in the sail.

CAUTION: INSERT BATTENS CAREFULLY, SO AS TO MINIMIZE STRESS AND WEAR ON THE SAIL.

Never insert or remove battens with the cross tube tensioned (except for up to the last three on each side) and never insert or remove battens with heavy wind pressure on the top of the sail or in any condition which causes battens to slide with great resistance in their pockets.

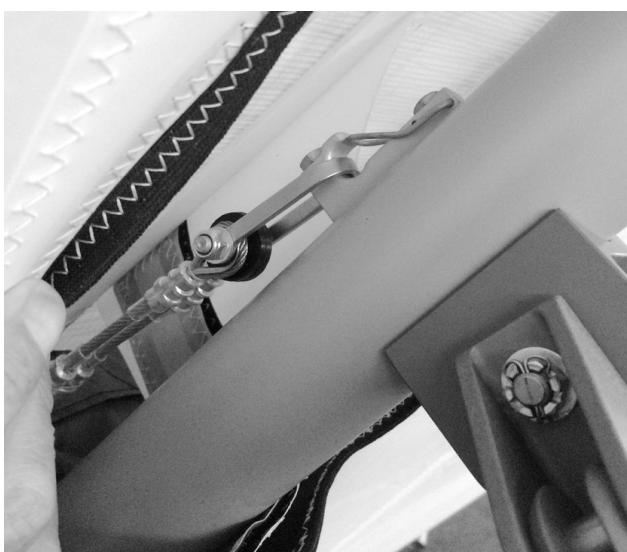


Figure 34

19. Remove the auxiliary bungee from the shackle and the hook.

Check that the pull back (cross tube tensioning) wires are not twisted. Take the shackle with one hand. At the same time with another hand pull the crossbar backwards – this will considerably help attaching the shackle to the hook, placed on the keel tube. Attach the shackle on the hook (fig. 34).

20. Connect two parts of the tip batten so that the sharp (angled) part of them, when connected, is pointed towards the outer part of the wing. Push the tip batten on the hinge with a hand until the tip batten fixates in the kinematic lock.

Fix all the battens with the **double tensioned** ropes (fig. 35) and rubber bands (fig. 36).

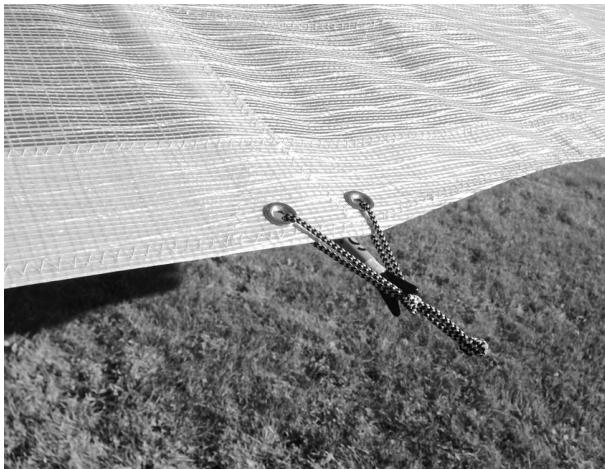


Figure 35



Figure 36



Figure 37

21. Install the undersurface battens (fig.37).

22. The next step is to deploy both the inboard sprogs and the outboard sprogs and secure them in position (fig. 38 and fig. 39). Before doing so, working through the sprog access zippers, pre-flight check the following items:

- internal ribs to confirm that they are fully zipped up;
- the sprog hardware, and the sprog cable attachments at both ends of each sprog cable;
- make sure the sprog is not twisted 180°;
- the leading edge / cross bar junction unit is properly secured and has no damage.

To deploy and secure each sprog, swing the sprog away from the leading edge and align it in the center of the rear end of the sprog access zipper.

Fully close the sprog access zipper and this will secure the sprog in the proper position underneath the transverse batten and capture it in position.



Figure 38



Figure 39

23. Install the strut / control frame protection cover (fig. 40).



Figure 40



Figure 41

24. Install winglets and secure them with pins and safety rings (fig 41 and fig. 42).

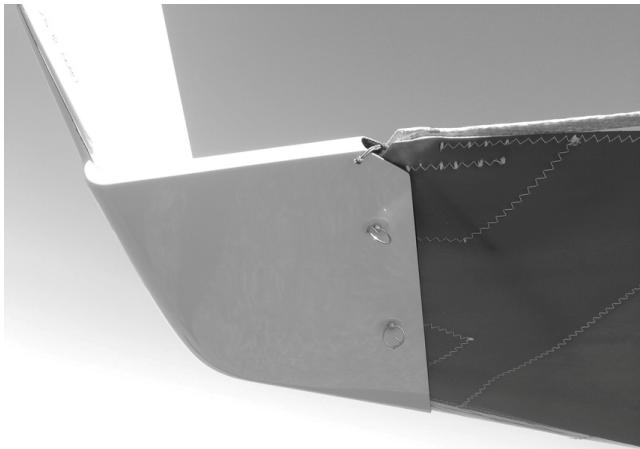


Figure 42



Figure 43

25. When the wing is attached to the trike with the base tube still on the ground install the nosecone, taking care to align it so that it lies flat on top and bottom of the sail (fig. 43).

WARNING

DO NOT FLY WITHOUT THE NOSECONE!

6. PREFLIGHT PROCEDURE

Conduct a complete preflight inspection of the wing, checking all assemblies, which have not already been checked. Every bolt, nut, pin, safety ring, and fastener of any kind should be checked during every pre-flight. A full pre-flight inspection should precede every flight you make, not just the first flight of the day.

Carefully check the entire length of the leading edge pocket to insure that the Mylar insert is lying flat in the pocket. If any section of the Mylar is folded under, de-tension the crossbar, remove as many battens as necessary and unfold the Mylar.

At the nose, with the nose cone removed:

Check that the nose junction hardware is tighten, the front wires catch is secured, the nose battens are engaged in the corresponding holes on the keel tube (fig 44 and fig. 45).

Don't forget to install the nosecone before raising the wing up on the trike.

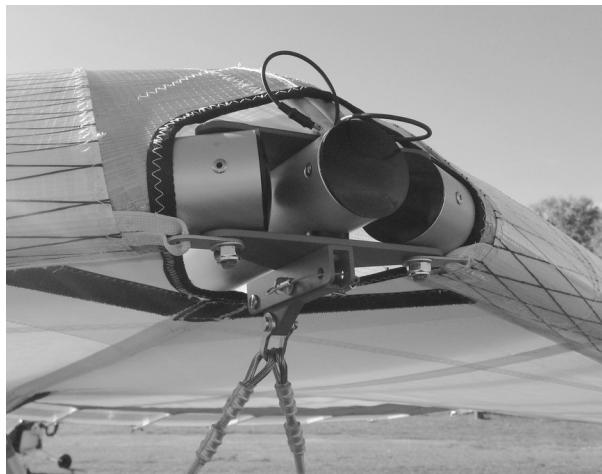


Figure 44



Figure 45

Along the left leading edge:

Open the main sprog access zipper and look inside, making sure that the crossbar, the main sprog and the main sprog wire are properly secured (fig. 46).

Check that the strut is properly secured, safety wire is engaged and the safety ring is installed (fig. 47).

Check the sprog hardware, and the sprog cable attachments at both ends of each sprog cable. Close the main sprog access zipper.

Open the outer sprog access zipper and check the sprog hardware and the sprog cable attachments at both ends of the sprog cable.

CAUTION

REMEMBER TO SLIDE THE NEOPRENE COVER BACK ON PLACE TO COVER THE JOINT.
CLOSE THE ACCESS ZIPPER.



Figure 46



Figure 47

At the left wingtip, with the left winglet removed:

Check that the tip folded batten is properly installed (fig. 48).

Check that the sail mounting strap is properly installed and secured with Velcro (fig. 49).

Install the winglet back on place.



Figure 48

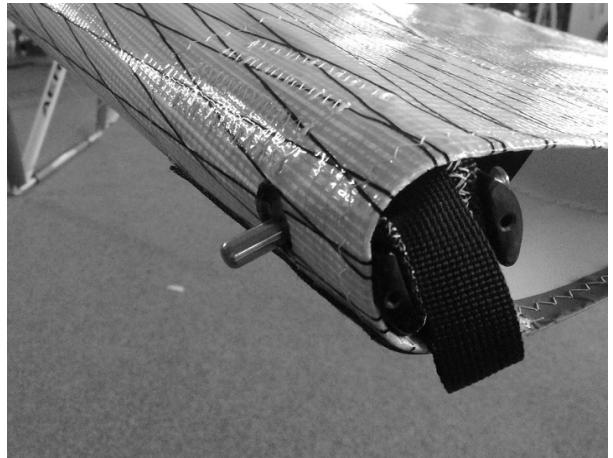


Figure 49



Figure 50

Along the trailing edge, left wing:

Check that there are no tears in the sail material along the trailing edge.

Check that all battens are properly secured.

Check that the inboard and outboard sprogs are properly secured in their position supporting the appropriate transverse battens.

Make sure all zippers are closed.

From the rear keel:

Check that the keel mount webbing and bottom rear wires are safely secured to the keel tube (fig. 50).

Check the rear wires cables making sure there are no kinks or twisted thimbles.

Under the wing at the control frame apex:

Check that the cross bar tensioning cables are tight, there are no kinks or twisted thimbles, no signs of wear and make sure that they are secured to the hook on the keel tube.

Check the control frame apex and the hang block bracket hardware. Check the wing to the trike attachment, the back up loop attachment, the trim mechanism attachment, the rescue system bridle attachment (fig. 51).



Figure 51



Figure 52

Check the crossbar center channels assembly including the pull-back wires/X-bar junction and the center bolt (fig. 52).

Visually inspect the crossbar tubes by sighting along the length of the crossbar tubes looking for any evidence of damage.

Along the trailing edge, right wing: Same as for the left wing.

At the right wingtip: Same as for the left wingtip.

Along the right leading edge: Same as for the left leading edge.



Figure 53

Under the wing at the control bar:

Sight down the downtubes, making sure that they are straight.

WARNING

DO NOT FLY WITH BENT DOWNTUBES!

Check that the strut is properly secured to the control frame and the safety ring is installed.

Look under the protection cover and check for proper installation of all nuts and safety rings at the control bar corners (Fig. 53).

7. SPEED TO FLY

The range of **trim speed** for the Sting Ray is 90-130 km/h ((56-81 mph)).

The **stall speed** for the Sting Ray is 60 km/h (37 mph). The wing is stable at the beginning of stall. While pushing out the base bar, the bar pressure is progressively increase.

The Sting Ray, depending on the wing load, speeds up to 161 km/h (100 mph), being essentially roll neutral, with no tendency to yaw. The bar pressure will increase progressively as the speed increases.

WARNING

ALL SPEEDS ARE MEASURED WITH AEROS-2 TRIKE.

8. STING RAY BREAKDOWN

Breakdown of the Sting Ray is the reverse of its assembly. Please follow these instructions when breaking down the wing. Please read all the instructions for each operation before beginning. Refer to the section **5. Sting Ray Set-Up procedure**, if necessary.

1. Set the trim device to the aft position and then move it 10mm forward.
2. Disconnect the socket connector of the trim device from the corresponding connector on the trike.
3. Remove the bolt from the front support compression tube.
4. Remove the bolt from the main pylon joint.
5. Lower the wing until the control bar is on the ground.

6. Remove the nose cone from the wing.
7. Remove winglets.
8. Unplug the tip folded battens. Remove the undersurface battens.
9. Unzip the sprog access zippers all the way to the leading edge end of the zippers and put out the inboard and outboard sprogs.
10. De-tension the crossbar pull back wires. Attach the auxiliary bungee to the shackle and to the hook.
11. Remove the top battens except for the top battens #1. Pack battens into the batten bag.
12. Lower the nose of the wing to allow the front wheel to be rolled forward over the control frame.
13. Detach the rescue system bridle from the carabiners.
14. Detach the back up loop.
15. Unbolt the trike from the hang bracket of the wing and lower the nose of the wing on the ground.
16. If you have a French type hang bracket, disconnect the trim device from the hang bracket, disassemble and remove the hang bracket from the keel tube. Fit the protection bag on the trim device mount fitting. Skip this procedure if you have Antares hang bracket.
17. Undo the Velcro of the strut / control frame protection cover and slide the cover towards the middle of the control bar. Detach the strut safety wire from the control bar.
18. Install the wingtip protection bags.
19. Fold the wings approx. 50 % from fully closed rotating it around the control bar until the wingtips are on the ground.
20. Detach the front wires from the nose junction channel.
21. Detach the struts. Disconnect the bottom first, than disconnect the top together with a strut safety wire. Stow the struts in their bag.
22. Install protection bags on the control frame apex, hang bracket, if it stays on the wing (with the hang bracket positioned down) and on the crossbar central unit.

WARNING

FOLDING THE WING WITHOUT PROTECTION BAGS WILL CAUSE THE TUBES DAMAGE.

23. Fold the wings completely. Pull the sail out away from the keel until it is even on top and bottom. Roll the sail gently and carefully.

NOTE

Try to roll the sail in such way that the leading edge portion remains as smooth as possible. Do not attempt to stuff the sail between the Mylar pocket and the leading edge tube at any point where you feel resistance, and do not attach the Velcro ties tight so as to induce creases in the Mylar or leading edge sail material.

Working from the trailing edge, roll the sail tightly to the leading edge. Finish rolling the sail in the area of the outer sprogs and install the wing tip cover bags.

24. Stow battens in the batten bag in the front part of the wing. Install Velcro ties around the wing.

25. Install the wing bag. Lower the wing on the ground.
26. Detach the control bar.
27. Fold the control frame tubes, install the control frame bags and lay the control frame against the keel. Lay cables between down tubes.
28. Fit the control bar in the protection bag and stow it between the leading edges in the aft part of the wing. Stow the nosecone under the most forward Velcro.
29. Zip up the wing protection bag.

9. WING TUNING

Properly tuned, the wing is safe, comfortable and fun to fly. The wing has been tested and tuned by Aeros. However, in case you have sufficient experience, you may tune the wing by yourself, as written below, if necessary. There are a number of adjustments that affect the flight characteristics.

WARNING

DO NOT PERFORM MORE THAN ONE ADJUSTMENT AT ONCE. IF YOU DO NOT HAVE ENOUGH EXPERIENCE TO TEST FLY THE WING, ASK MORE EXPERIENCED PILOT TO DO IT FOR YOU. TEST FLIGHT SHOULD BE PERFORMED IN SMOOTH AIR AND WITH CAUTION.

BATTENS

The battens will need to be compared and adjusted to match the batten profile template at regular intervals. Small variations in batten camber (± 5 mm at the trailing edge) will not have significant effect on flight characteristics.

BATTEN TENSION

With some airtime batten tension may get loose, this may cause the trailing edge to flatten. If the battens tensioned too much, the handling will become harder. Make sure the battens are tensioned on the left and right wings identical.

The top battens on the Sting Ray are tensioned by ropes and elastics.

To check batten tension measure the distance from the batten end saddle to the knot when pulling the rope (elastic). This distance should be 1 cm for rope and 3cm for elastic.

To change batten tension it is necessary to undo the knot, change the rope (elastic) length and tie the knot on the rope or swage the elastics again.

TURN CORRECTION

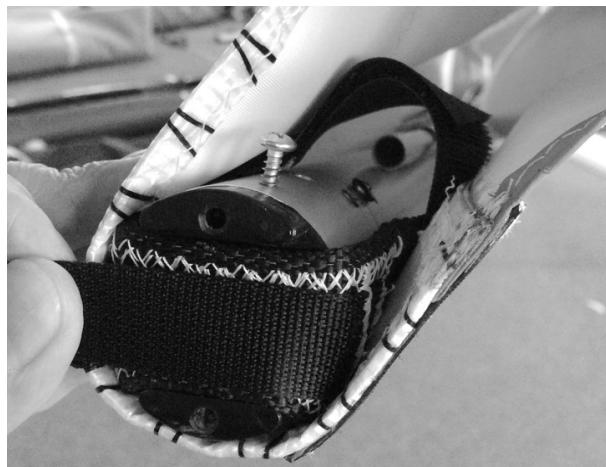


Figure 54

There is a self-tapping screw for the turn adjustment at the outer part of the leading edge # 3 (Fig. 54)

By rotating a wingtip down, the lift on the end of that wing will increase and this half-wing will rise in flight. Adjust the self-tapping screw up by 2.5 mm at a time.

When rotating a wingtip up, the lift will be decreased on that side and the half-wing will drop on that side. Adjust the self-tapping screw down by 2.5 mm at a time. It is preferable to rotate the wingtip up first rather than down.

Adjust one wingtip at a time and test fly after each adjustment.

CG ADJUSTMENT

CG adjustment is done by changing the location of the hang point along the keel. The farther forward your hang point is, the faster the wing will trim, the less effort will be required to fly fast, and the more effort will be required to fly slow.

On Sting Ray the hang point position is adjusted by trim device, repositioning the hang block along the keel tube in flight and on the ground.

10. MAINTENANCE

This section contains a recommended schedule of periodic maintenance. None of the items in this section are a substitute for the continual and consistent practice of proper pre-flight inspections and immediate maintenance of any items on the wing, which require it. Safety requires that your wing be fully airworthy for every flight. Nuts and bolts must always be secure, safety rings must always be in place, and damage to any part, which could compromise the airworthiness of the wing, cannot be tolerated. If you have a question about the need to repair or replace some part of your wing, feel free to contact your dealer or Aeros directly. It is not always obvious which item may require attention and which may not. Minor dents or dings in a non-critical location on the airframe tube may not require any repair or maintenance. On the other hand, a wire that has been kinked one time can fail very quickly after that, and should be replaced immediately.

We recommend that you have all maintenance work done by your Aeros dealer.

EVERY SIX MONTHS

1. Check the sail washout as described in the SPROG MEASUREMENT section.
2. Check all battens on a flat level floor against the batten diagram provided, and correct any that deviate from the pattern by more than 5 mm (1/5").
3. Have a complete inspection performed on the wing and replace any suspension system component that shows any wear and any cable that shows any kinks, wear, damage, corrosion, etc.
4. Inspect all bolts for tightness, all safety rings for proper installation and possible damage. Inspect plates and fittings for damage, holes in tubes for elongation.
5. Inspect the sail for wear, tears, UV damage, loose stitching, etc.
6. Lightly spray all zippers on the wing with silicone spray lubricant. Also spray your battens before you install them in the wing to lubricate the insides of the batten pockets. Do not use any other type of lubricant. Wipe off any excess silicone so that it does not attract dirt.
7. Inspect the inboard and outboard sprogs and sprog cables for possible damage.

EVERY YEAR

In addition to the normal six month service items, also perform the following:

1. Have the sail completely removed from the frame and disassemble all frame components. Inspect every part of the wing for any damage or wear. Inspect the tubes for straightness and for signs of corrosion.
2. Anytime you have the sail off the frame, inspect all of the batten pockets and batten pocket stops.
3. Replace the hang block heart bolt.

SPECIAL CIRCUMSTANCES

1. Any time your trike suffer a heavy landing you should have an “annual” inspection done on your wing to insure that you find all damaged parts.
Heavy landings may also impose very high loads on the sprogs and sprog cables. Inspect them accordingly.
2. If your wing is ever exposed to salt water you will need to have the wing completely disassembled in accordance with the recommended annual inspection procedure. All frame parts will need to be disassembled, including the removal of all sleeves and bushings, flushed liberally with fresh water and dried completely.
3. If you fly in a dusty or sandy environment, it will help to prolong the life of your batten pockets if you wipe each batten with a rag before you install it in the sail.
4. A wet wing must be dried before storing. Do not leave your wing wet for more than one day, because corrosion may result.
5. Take special care to avoid ice-covering the wing, particularly the leading edge in wintertime.
6. If you fly regularly at the coast in windy conditions, be aware that the sea mist spray can have the same effect. Hose down your wing after such flights, and keep a special lookout for corrosion.
7. Keeping your sail clean will extend the life of the cloth. When cleaning the entire sail you should generally use only water and a soft brush. You may clean small spots or stains with any commercial spot remover that is labeled for use on polyester.

A NOTE ABOUT CABLES AND CABLE MAINTENANCE

The cables which support the wing’s airframe are critical components of the wing’s structure, and must be maintained in an airworthy condition. It is a general practice in the design of aircraft structures to design to an ultimate strength of 1.5 times the highest expected load in normal service.

The wing’s cables, like other structural components on the wing, are typically designed with a structural safety factor of only about 50% above the expected maximum load. No significant loss in cable strength can be tolerated.

A cable with even a single broken strand must be replaced before the wing is flown again. A cable which has been bent sharply enough to have taken a permanent set must also be replaced immediately. Some degree of fatigue due to repeated bending of cables is almost unavoidable in an aircraft that is assembled and disassembled regularly.

It is recommended that cables be replaced based on technical condition, or that all cables on the wing be replaced once every four years, regardless of condition (whichever comes first).

SPROG MEASUREMENT

The Sting Ray uses inboard and outboard sprogs in combination with one transverse batten on each sprog. Each transverse batten spans two top surface battens, so a total of eight top surface battens are supported. The sprog system is the primary component of the system, which provides pitch stability.

The function of the system is to support the trailing edge of the sail at low angles of attack, and thus provide a nose-up pitching moment. The inner and outer sprogs are adjusted at the factory to their proper settings.

The sprog angles should be checked regularly. This can be done with any digital electronic angle meter as follows:

1. Fully set up the wing on a reasonably level surface.

2. Rest the keel tube on a support with the keel tube horizontal. Attach the keel extension to the keel tube. Using the angle meter, as shown on fig. 55 and fig. 56, check that the keel extension is set to horizontal position. Maintain the keel tube angle during further measurements. Set the angle meter to zero (fig.56).

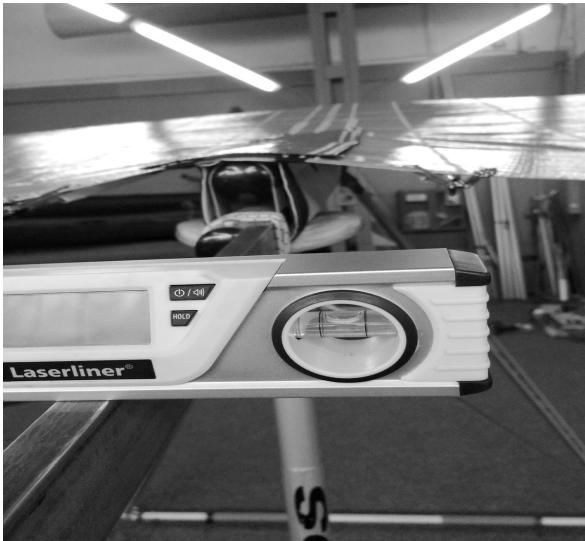


Figure 55

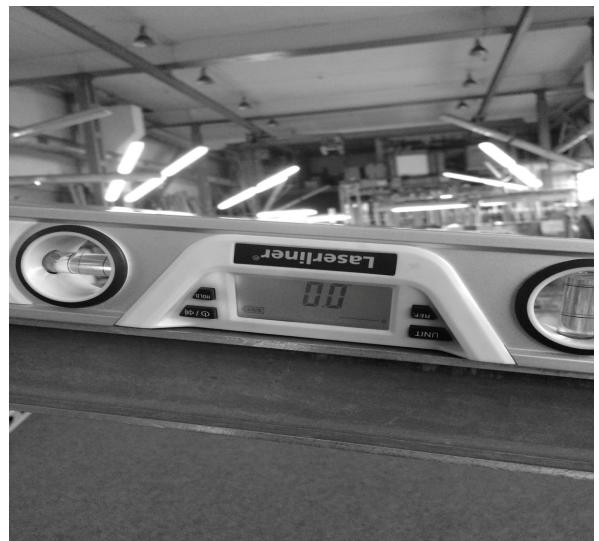


Figure 56



Figure 57

3. Place the worktop of the angle meter under the middle part of the sprog close enough to the sprog wire attachment point so that the entire worktop surface of the angle meter touches the sprog (Fig. 57). The scale of the angle meter will show the sprog angle.

The main sprogs for Sting Ray should be set to 10 deg.

The outer sprogs for Sting Ray should be set to 14.5 deg.



Figure 58

To adjust the sprog angle:

1. Using the wrench as shown on fig. 58 unlock the sprog threaded adjuster.
2. Remove the pin from the sprog threaded adjuster at the front of the sprog. To raise the sprog turn the end of the sprog threaded adjuster counter clockwise. To lower the sprog turn the end of the sprog threaded adjuster clockwise.
3. Re-install the pin to the sprog threaded adjuster, install a safety ring and lock the adjuster with a nut. Press down firmly on the rear end of the sprog to seat the cable before checking the measurement again.

4. Using the wrench as shown on fig. 58 lock the sprog threaded adjuster.

11. REMOVING THE SAIL FROM THE FRAME AND RE-INSTALLING

Many maintenance and repair procedures will require the removal of the sail from the frame. Please follow these instructions when removing and reinstalling the sail. Please read all the instructions for each operation before beginning. Refer to the section **8. Sting Ray Brakedown**.

SAIL REMOVAL

You will need an unobstructed area 2 m by 9 m (6x30 ft). Make sure the surface is clean. If it is abrasive, you should either cover it with protective tarp or be extremely careful not to scrape your sail.

1. If you have a French type hang bracket, disconnect the trim device from the hang bracket, disassemble and remove the hang bracket from the keel tube. Fit the protection bag on the trim device mount fitting. If you have Antares hang bracket you will need to disconnect the trim device rear mount fitting and move the hang bracket with the trim device all the way forward.
2. Remove winglets. Unplug the tip folded battens. Remove the undersurface battens. Unzip the sprog access zippers all the way to the leading edge end of the zippers and put out the inboard and outboard sprogs.
3. Unscrew the sail mount fixing nuts at the nose of the wing (fig. 59). Remove the sail mount tangs from the bolts and screw up the fixing nuts back on place.

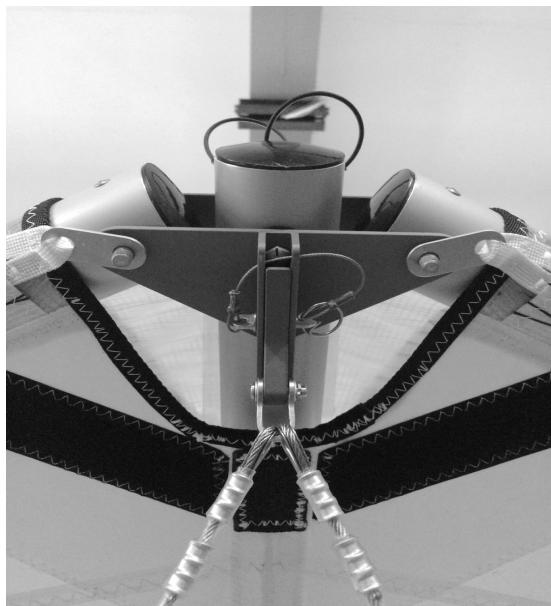


Figure 59



Figure 60

4. Remove the winglet fixing rod (fig. 60).
5. De-tension the crossbar pull back wires. Attach the auxiliary bungee to the shackle and to the hook.
6. Remove all top battens except for the keel battens.
7. Fold the wings approx. 50 % from fully open (fig. 61). Detach the bottom front wires from the nose junction channel. Detach the struts: disconnect the bottom first (fig.62), than disconnect the top. Stow the struts in their bag.

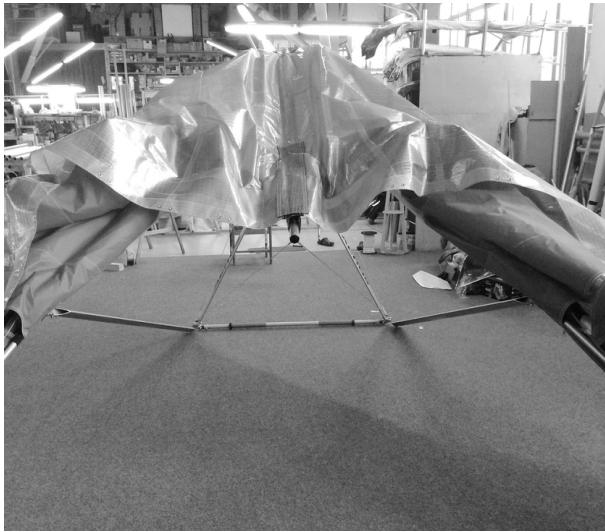


Figure 61

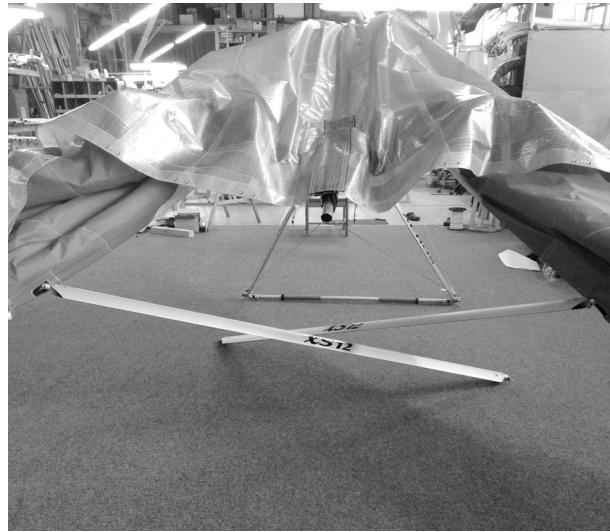


Figure 62

8. Fold wings completely (fig. 63). Lower the wing on the ground or on the support.

9. Remove keel battens from the wing (fig. 64).



Figure 63

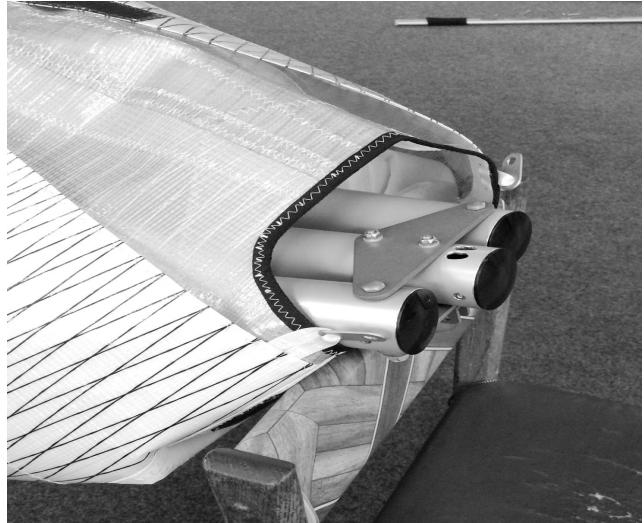


Figure 64

10. Disconnect the rear wires and the keel pocket mount tang from the keel tube (fig. 65).



Figure 65



Figure 66

11. Undo the sail mount webbing Velcro and remove the sail mount webbing from the leading edge end caps (fig. 66).

12. Detach the control frame from the keel tube.



Figure 67

13. Secure main sprogs from rotation with a nut outside the main sprog threaded adjusters (fig. 67). Remove main sprogs from the sprog threaded adjusters. Detach the main sprog wires from the main sprogs. Take the sprogs out of the sail.

14. Rotate outer sprogs 180 deg. forward so, that they are pointing towards the nose of the wing. Slide the sail along the keel tube forward (fig. 68). Bring the nose junction of the frame out through the nose opening of the sail (fig. 69). Rotate outer sprogs 180 deg. rearwards so, that they are pointing towards the outer part of the wing.



Figure 68



Figure 69

15. Lower the wing from the support on the ground.

16. Slide the sail rearwards and out of the frame completely. If you encounter resistance, stop and find out what is hanging up.

17. If you need to send the sail to the factory for repair, remove the Mylar inserts and the transverse battens. The Mylar insert is to remove from the front end of the Mylar pocket. It helps to

secure the opposite end of the sail to something solid, so that you can lay the leading edge out straight and pull the Mylar straight out of the pocket.

18. Fold and pack up the sail carefully if you plan to ship it out for repair. Be sure to include written instructions of what you want done, your name and a phone number.

RE-INSTALLING THE SAIL ON THE FRAME

Install the Mylar inserts, if they were removed before, in the sail. Make sure you install it right side up; the slit edge is at the front and on the bottom. The easiest way to install the Mylar insert is to push it into the pocket using a long lofting batten attached to the end of the Mylar insert, which is first inserted in the pocket.

You will have to stop from time to time to make sure the Mylar insert is properly lying flat in the pocket. Do not push the Mylar insert too far into the pocket (the front edge of the insert should be aflush with the front edge of the insert pocket or the insert should stay approx. 5 mm out). Make sure there are no folds in the Mylar insert, especially at the tips. Make sure the insert wraps in the proper direction to follow the sail around the leading edge as it enters the pocket.

The procedure of the sail re-installing on the frame is basically reverse of the sail removal. Read and make sure you understand the written above procedure before re-installing the sail on the frame.

12. TRANSPORTATION AND STORAGE

With good care and correct maintenance your wing will retain its good conditions for many years. We recommend that you do not expose your wing to any more direct sunlight than necessary. Do not leave the wing under the sun for long periods of time when you are not flying.

Do not leave your wing for a long period of time against strong wind otherwise it will decrease the life of the sail.

The wing may be transported in its bag in any vehicle that offers protection from mechanical damage, soiling and long exposure to rain. During transportation, or when stored on supports, the wing must be supported not less than in three points: at its center and at two more points.

Supports should be softly padded, and any support systems used for transport, such as roof racks, must use attachment straps that are sufficiently secure to eliminate the possibility of damage from vibration and movement. Flat straps should be used for tie downs to avoid damage to leading edge Mylar.

Store the wing in a dry room off the ground; air it out regularly to avoid mildew, and never store wet.

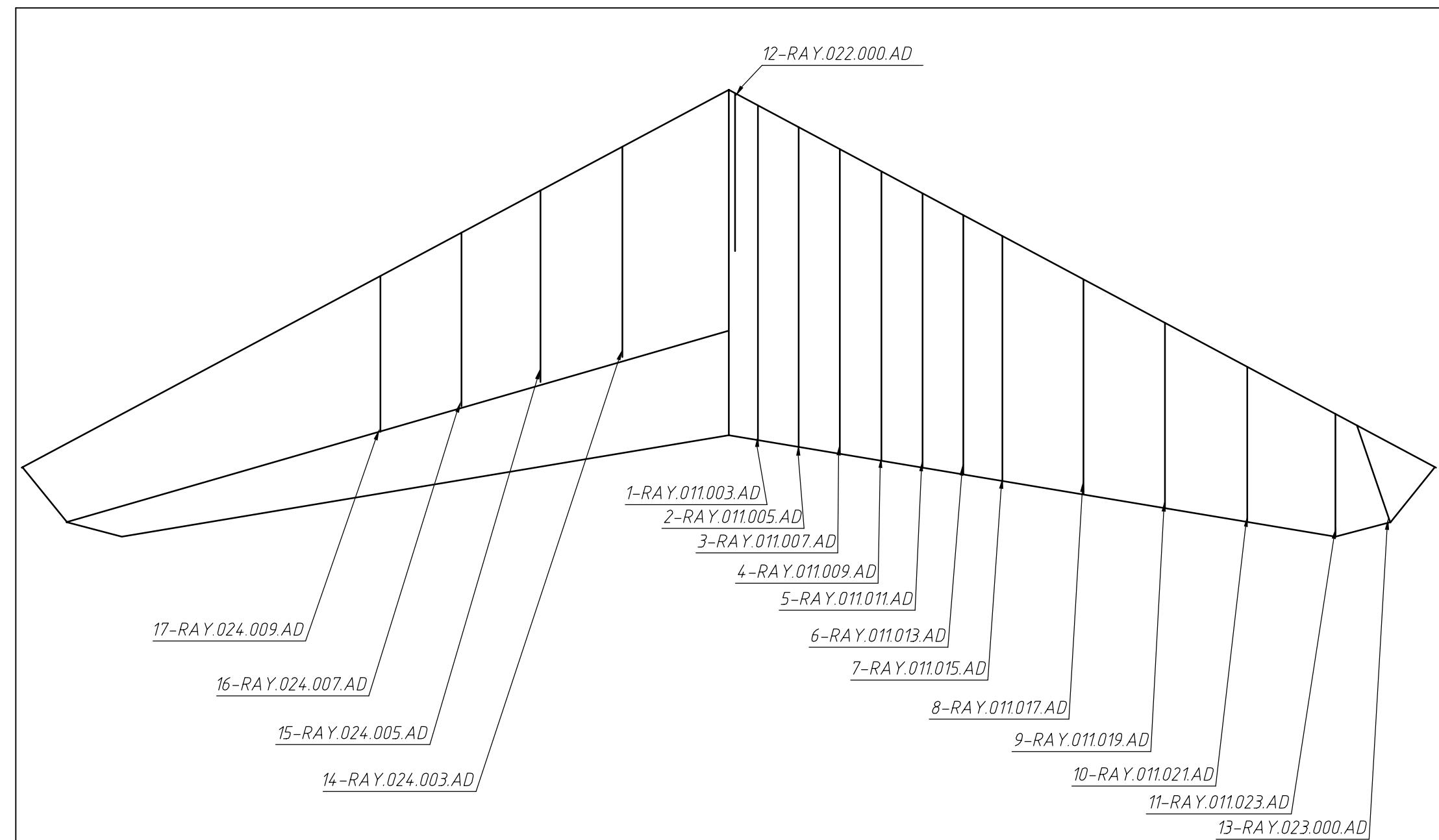
If you fly at the costal area or your wing has been exposed to salt water rinse it with tap water thoroughly before storage. If you fly frequently at the costal area it is necessary to wash the wing with tap water at least once a month to prevent all aluminum parts from corrosion.

The recommended storage temperature is from +5 to +25° C.

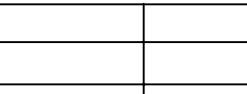
13. IN CLOSING - A FEW WORDS ON YOUR SAFETY

- Flying trikes is a great fun but it is, as any form of flying, associated with risks. Your safety can be greatly enhanced by following a few simple rules:
- Your wing is delivered to you ready to fly. Do not make any adjustments, which are not described in this manual.
- If you are in doubt about any aspect of your wing, you should consult your dealer or Aeros for advice.
- Fly a wing suited to your level of ability. A new risk may arise when you first fly a new type of the wing.
- The reactions of your new wing may well differ from those you have used to. In order to keep this risk low, we recommend that you gradually become familiar with your new wing.
- Before every take-off always do both an assembly check and a pre-flight check of your wing and a trike unit.
- Do not take off if the sail is wet or covered with ice, especially the leading edge, as the stall speed will increase significantly.
- ***Always fly with a dry sail!***
- A wet wing must be dried before storing. Do not leave your wing wet for more than one day because corrosion may result.
- Don't push your luck; it is your responsibility to know the limits of your wing and the limits of your own experience. Remember that ultimately your safety is your responsibility.
- Fly only in places that are suitable for flying.
- With proper care and maintenance, your wing will retain a high level of airworthiness for many years.

Have fun. Fly safely.
Aeros Team

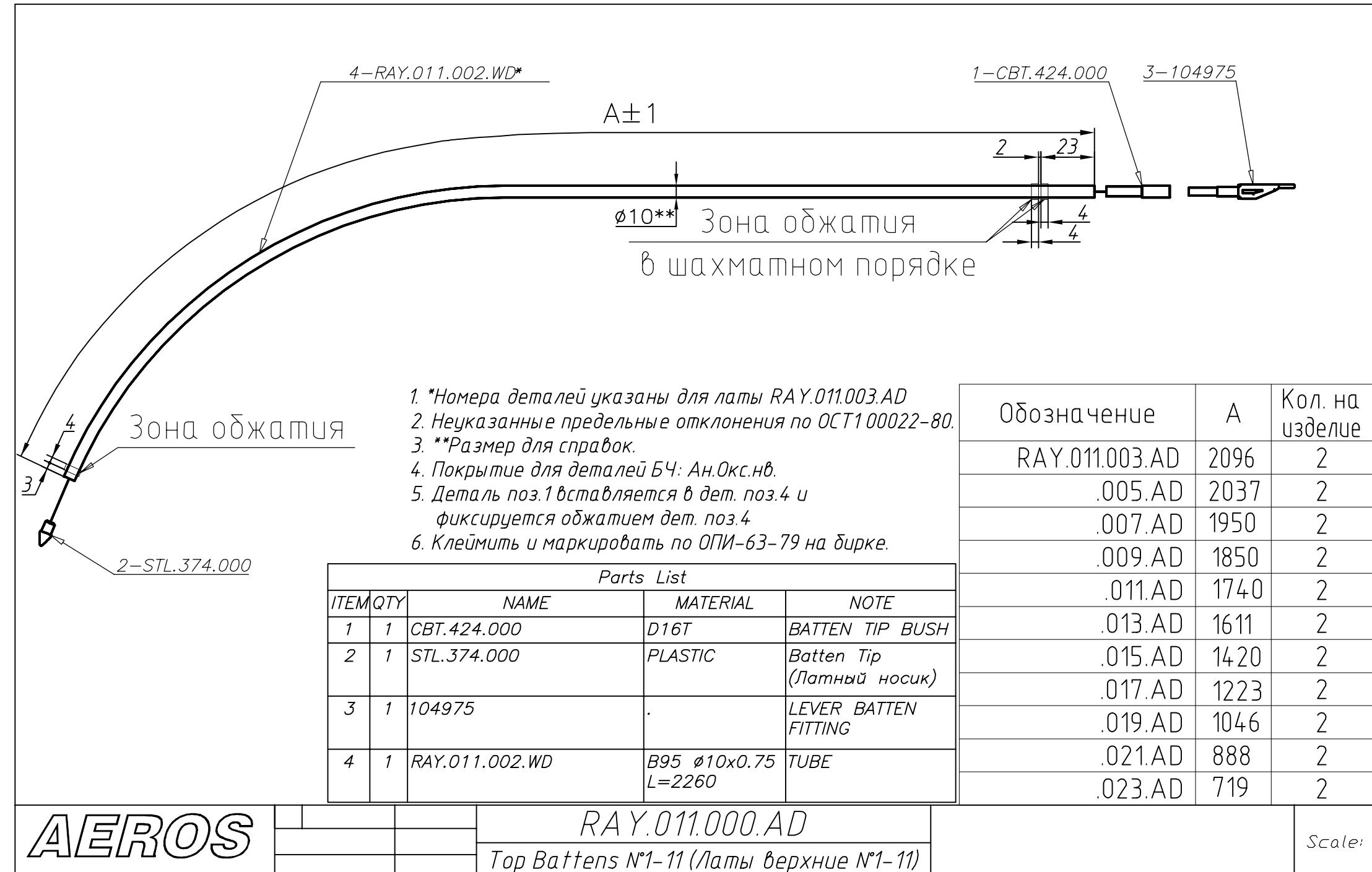


AEROS



RAY.010.000.AD
Battens Set (Комплект лам)

Scale:



RAY.023.000.AD

Кол. на изделие - 2 шт.

Первич. примен.

Справочныи №

Инв.№

Подп. и дата

Взам. инв.№

Инв.№

Подп. и дата

1-PRF15-11.028.000.AD

2-RAY.027.000.AD

4-Nut M6, self-locking (DIN 985)

3-CBT10.13.602.000

Таблица применяемости

Наименование № крыла

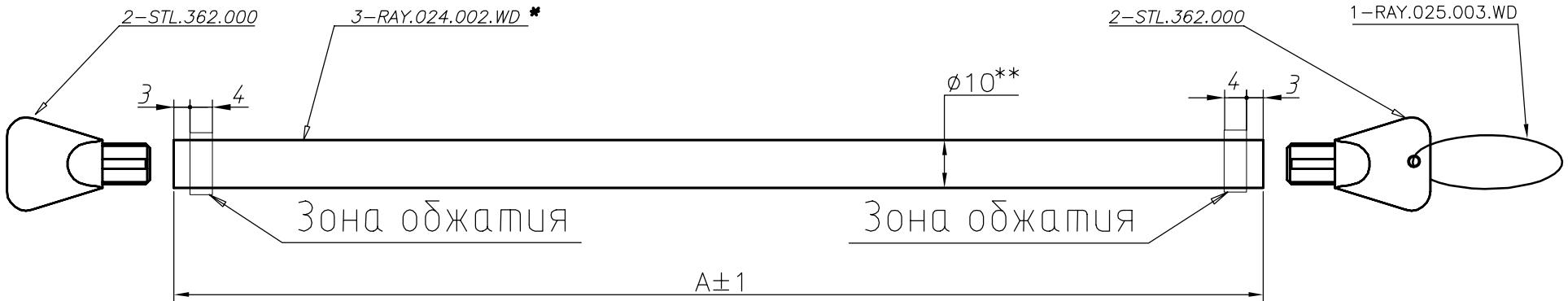
StingRay

Поз.	Обозначение	Наименование	Материал	Кол.
1	PRF15-11.028.000.AD	Plug-on Batten Rear Part (Лата упорная задняя часть)		1
2	RAY.027.000.AD	Plug-on Batten Front Part (Лата упорная передняя часть)		1
3	CBT10.13.602.000	Plug-on Batten Fitting (Ухо упорной латы)	Сталь 12Х18Н10Т ГОСТ 5949-75	1
4		Nut M6, self-locking (DIN 985)		1

RAY.023.000.AD

Plug-on Batten
Assembled
(Лата упорная СБ)

Литера	Масса	Масштаб
		1:2
Лист	Листовъ	1



1. Покрытие деталей БЧ: Ан.Окс.нв.
2. Неуказанные предельные отклонения по ОСТ 100022-80.
3. * Номера деталей указаны для латы RAY.024.003.AD.
4. **Размер для справок.
5. Шнур поз.1 вязать двойным прямым узлом.
6. Клеймить и маркировать по ОПИ-63-79 на бирке.

Parts List

ITEM	QTY	NAME	MATERIAL	NOTE
1	1	RAY.025.003.WD	Ø4 L=200	Rope
2	2	STL.362.000	PLASTIC	BATTEN TIP
3	1	PRF15.024.002.WD	B95 Ø10x0.75 L=1442	TUBE

AEROS

RAY.024.000.AD

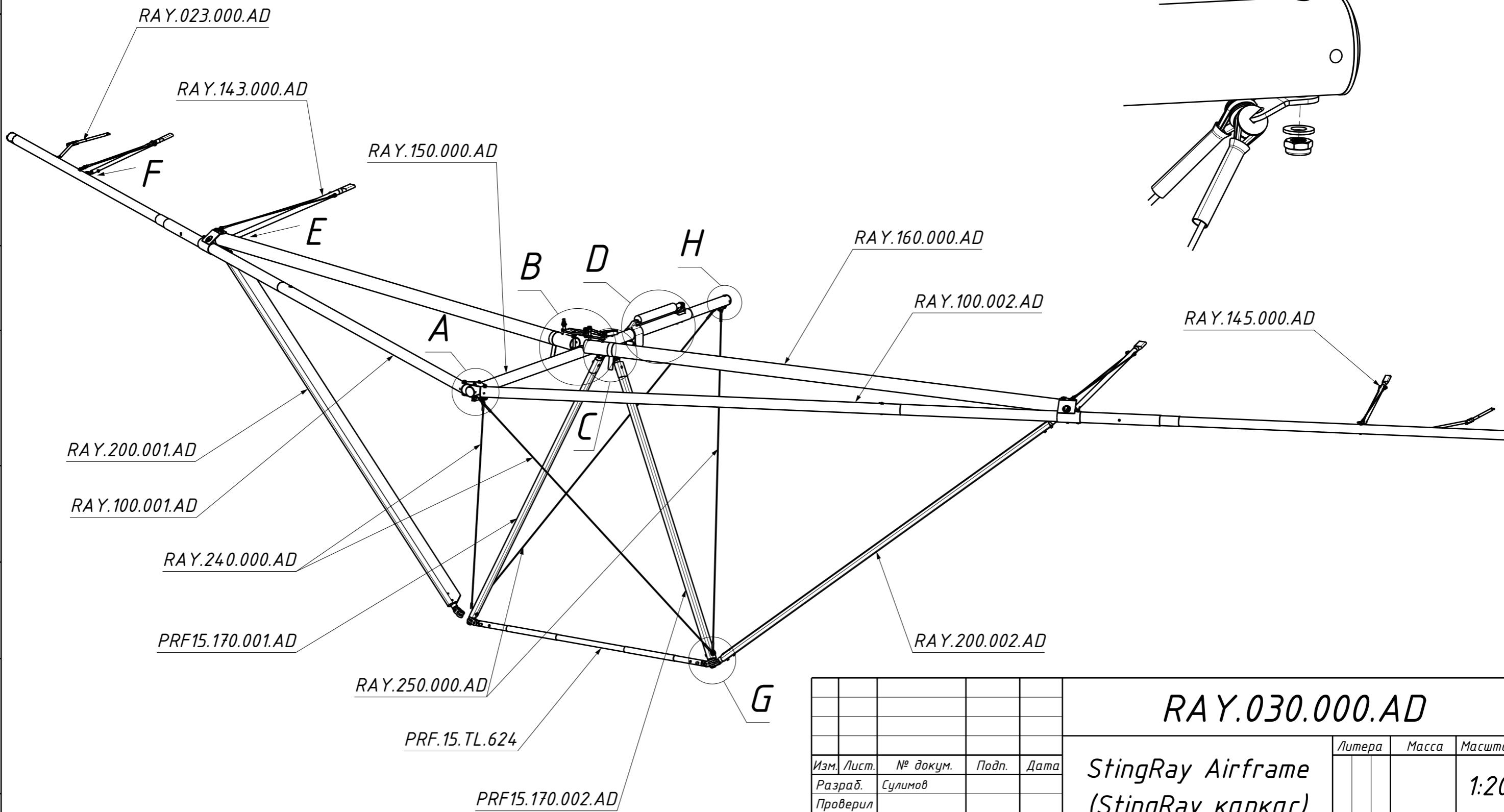
Bottom Battens №1-5 (Латы нижние №1-5)

Обозначение	A	Кол.на изделие
RAY.024.003.AD	1560	2
.005.AD	1450	2
.007.AD	1295	2
.009.AD	1140	2

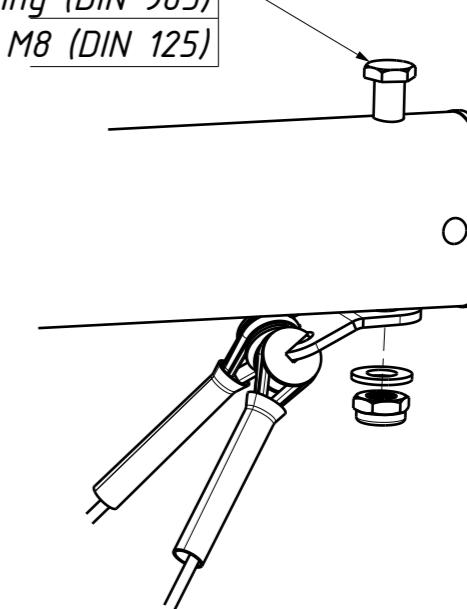
Scale:

RAY.030.000.AD

H (1:2)



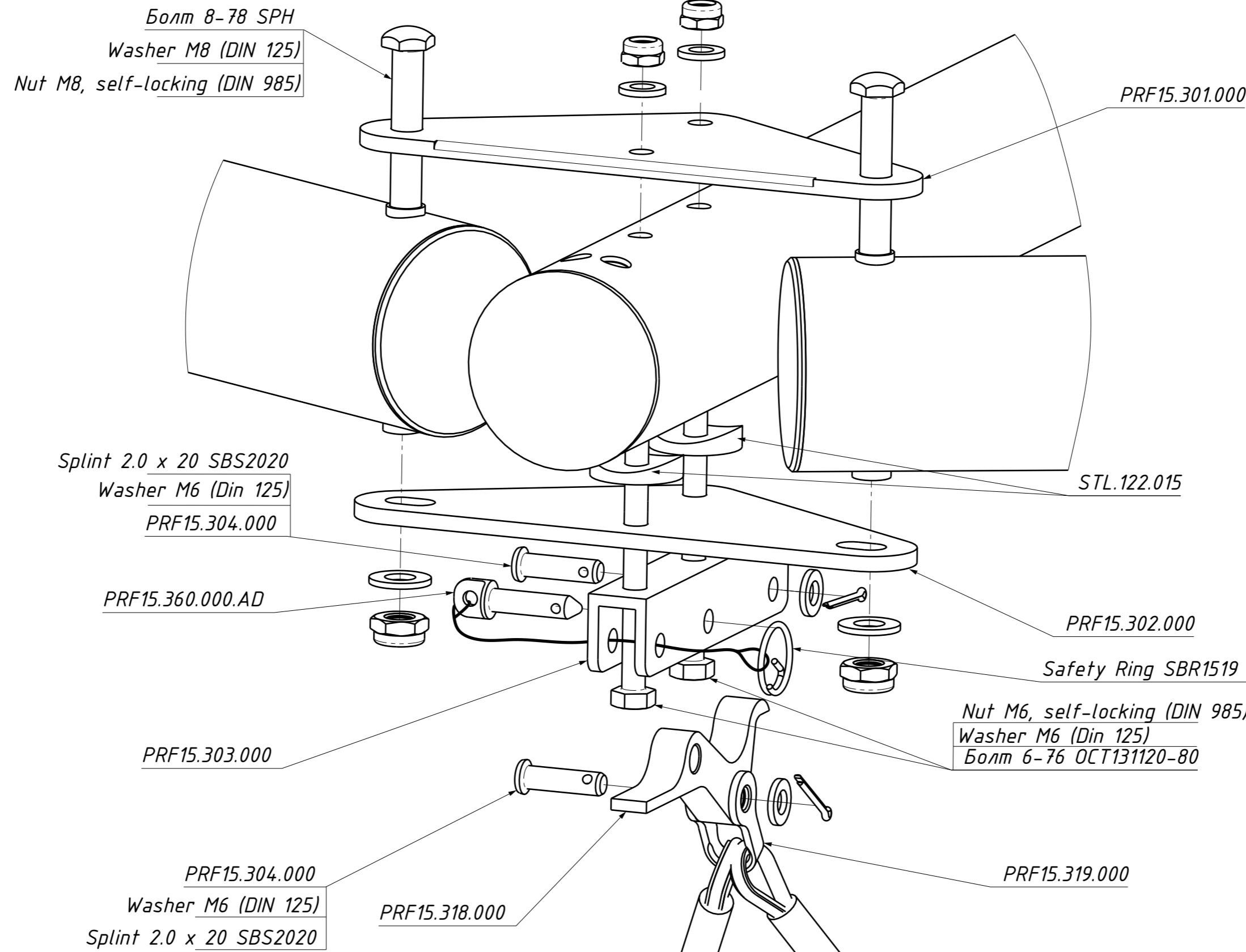
930.317-67
Nut M8, self-locking (DIN 985)
Washer M8 (DIN 125)



RAY.030.000.AD				
StingRay Airframe (StingRay каркас)				
Изм.	Лист.	№ докум.	Подп.	Дата
Разраб.	Сулимов			
Проверил				
Т.контр.				
Нач.бюро.				
Н.контр.				
Утв.	Дробышев С.			
Литера	Масса	Масштаб		
		1:20		
Лист	Листов	1		

RAY.030.000.AD

A (1:1)



Изм. Лист.	№ докум.	Подп.	Дата
Разраб.	Сулимов		
Проверил			
Т.контр.			
Н.контр.			
Утв.	Дробышев С.		

RAY.030.000.AD

StingRay Airframe
(StingRay каркас)

Литера	Лист	Листов
	2	8

RAY.030.000.AD

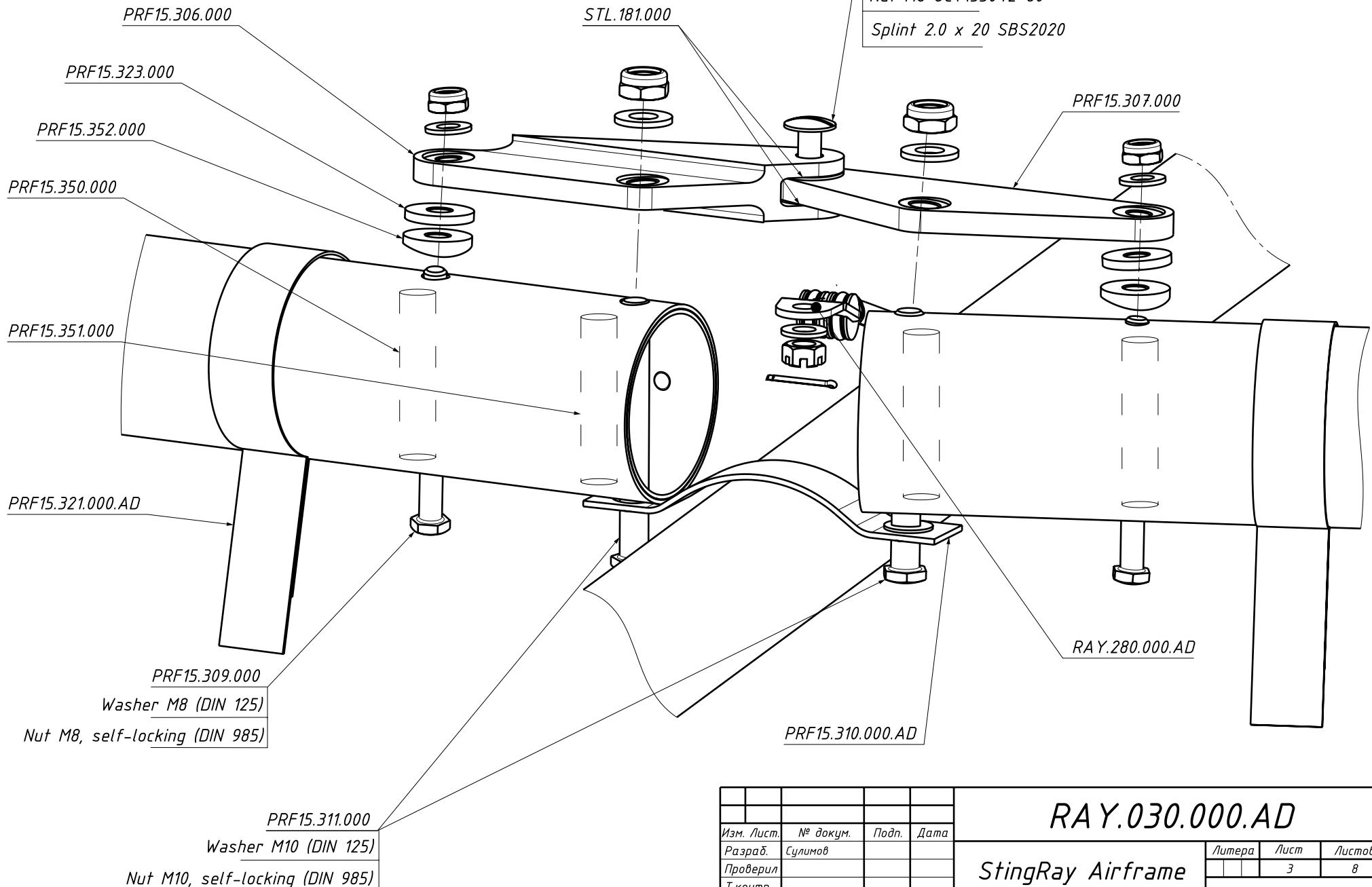
B (1:1)

PRF15.308.000

Washer M8 (DIN 125)

Nut M8 OCT133042-80

Splint 2.0 x 20 SBS2020



Изм.	Лист.	№ докум.	Подп.	Дата	Литера	Лист	Листов
Разраб.		Сулимов					
Проверил							
Т.контр.							
Н.контр.							
Утв.		Дробышев С.					

RAY.030.000.AD

*StingRay Airframe
(StingRay каркас)*

RAY.030.000.AD

Первич. примен.

Справочныи №

Подп. и дата

Взам. инв.№

Инв.№

Подп. и дата

Инв.№

Болт 6-86 OCT131120-80

Washer M6 (DIN 125)

Nut M6, self-locking (DIN 985)

RAY.280.000.AD

960.061

920.110-01.AD

RAY.315.000

PRF15.323.000

Болт 6-76 OCT131120-80

Washer M6 (DIN 125)

Nut M6, self-locking (DIN 985)

PRF15.359.000

Болт 6-40 OCT131120-80

Washer M6 (DIN 125)

Nut M6, self-locking (DIN 985)

C (1:1)

PRF15.354.000

Washer M8 (DIN 125)

Болт(2) 8-70 OCT131120

Washer M8 (DIN 125)

Nut M8 OCT133042-80

Splint 2.0 x 20 SBS2020

PRF15.316.000

Болт 8-40 OCT131120-80

Washer M8 (DIN 125)

Nut M8, self-locking (DIN 985)

PRF15.353.000

PRF15.355.000

Изм.	Лист.	№ докум.	Подп.	Дата	Литера	Лист	Листов
Разраб.		Сулимов					
Проверил							
Т.контр.							
Н.контр.							
Утв.		Дробышев С.					

RAY.030.000.AD

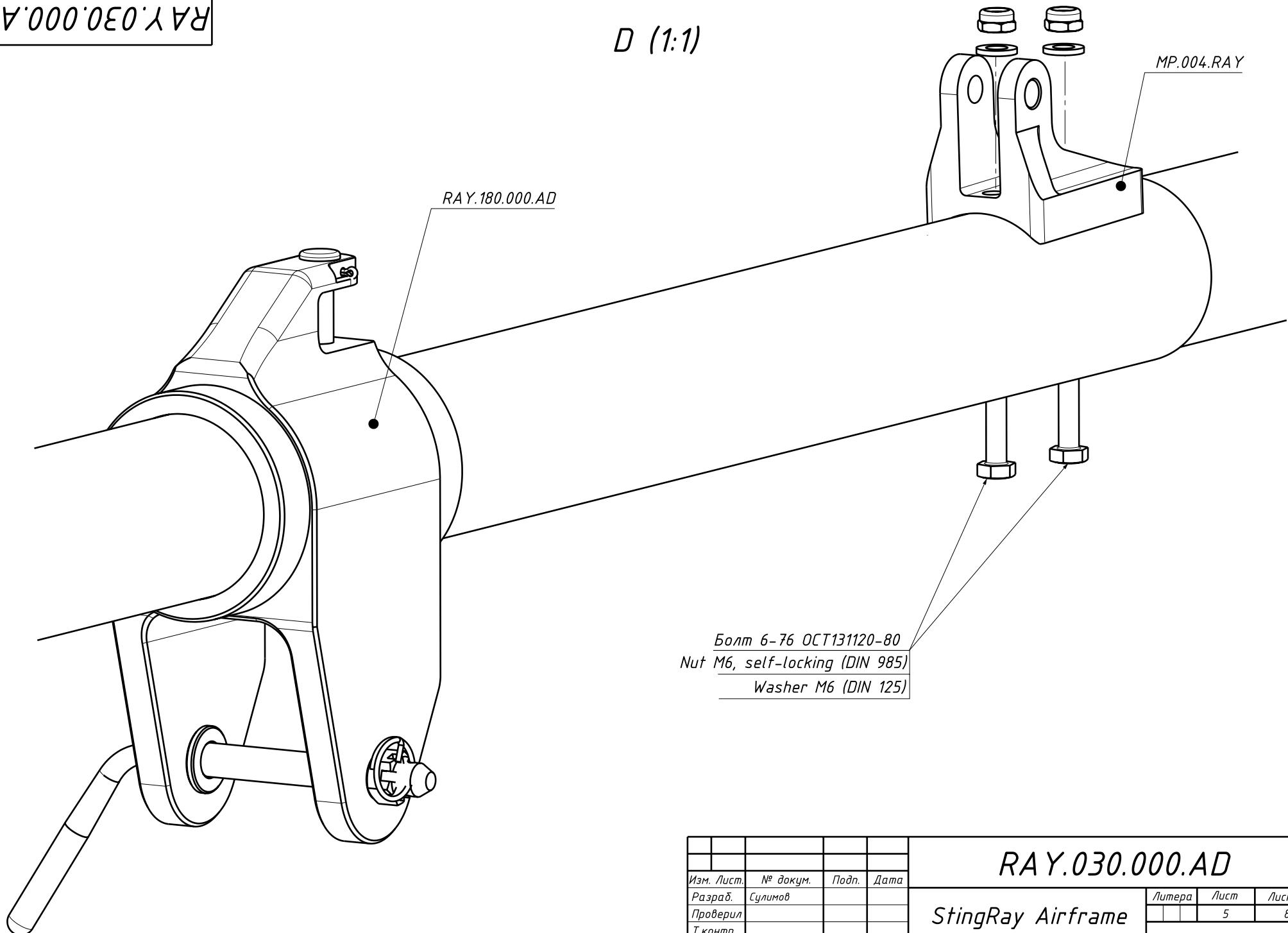
StingRay Airframe
(StingRay каркас)

4	8
---	---

Формат А3

RAY.030.000.AD

D (1:1)



Первич. примен.

Справочный №

Подп. и дата

Инв.№

Подп. и дата

Инв.№

Взам. инв.№

Инв.№

Подп. и дата

Подп. и дата

Изм. Лист.	№ докум.	Подп.	Дата	Литера	Лист	Листов
Разраб.	Сулимов					
Проверил						
Т.контр.						
Н.контр.						
Утв.	Дробышев С.					

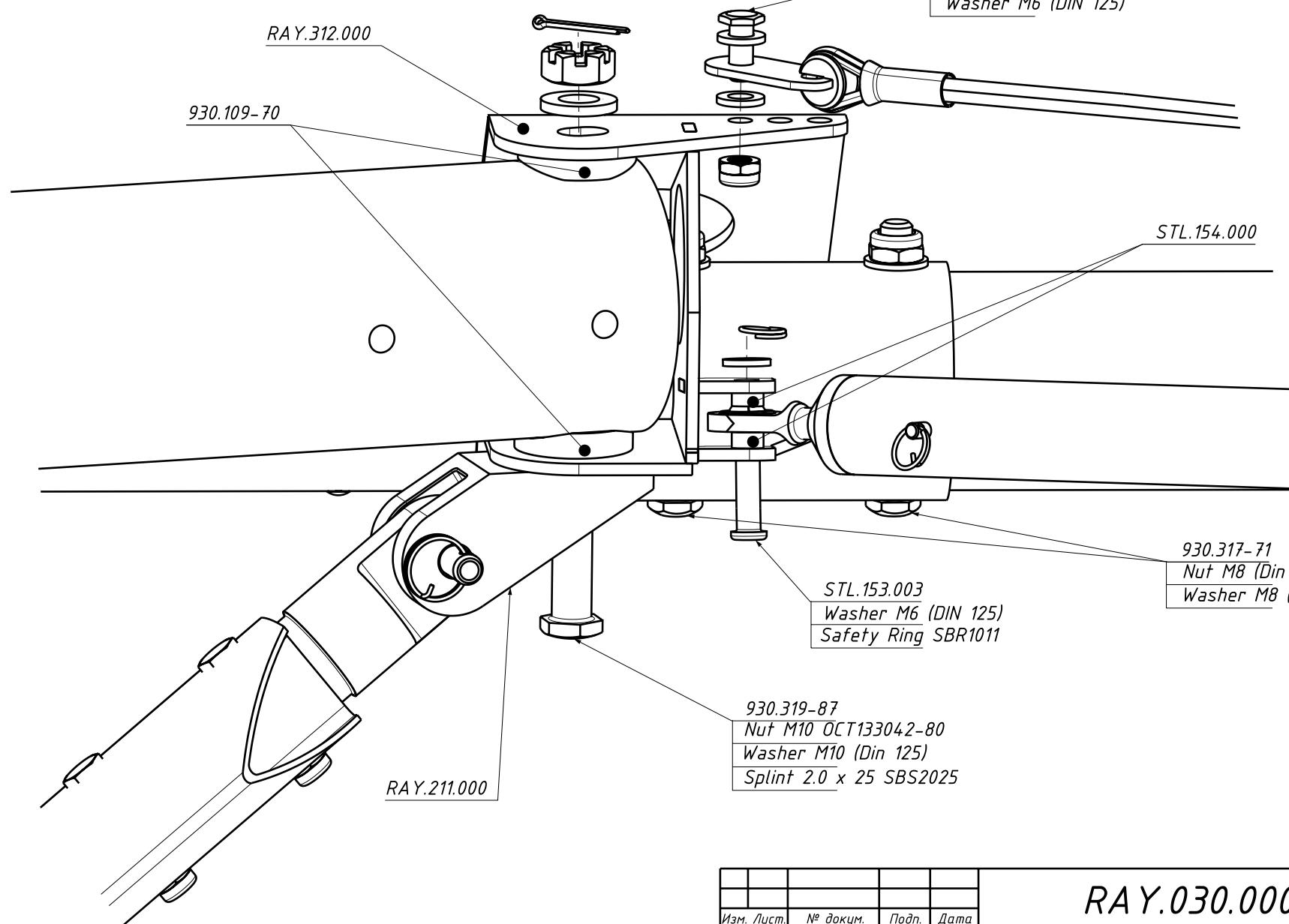
RAY.030.000.AD

StingRay Airframe
(StingRay каркас)

5 8

RAY.030.000.AD

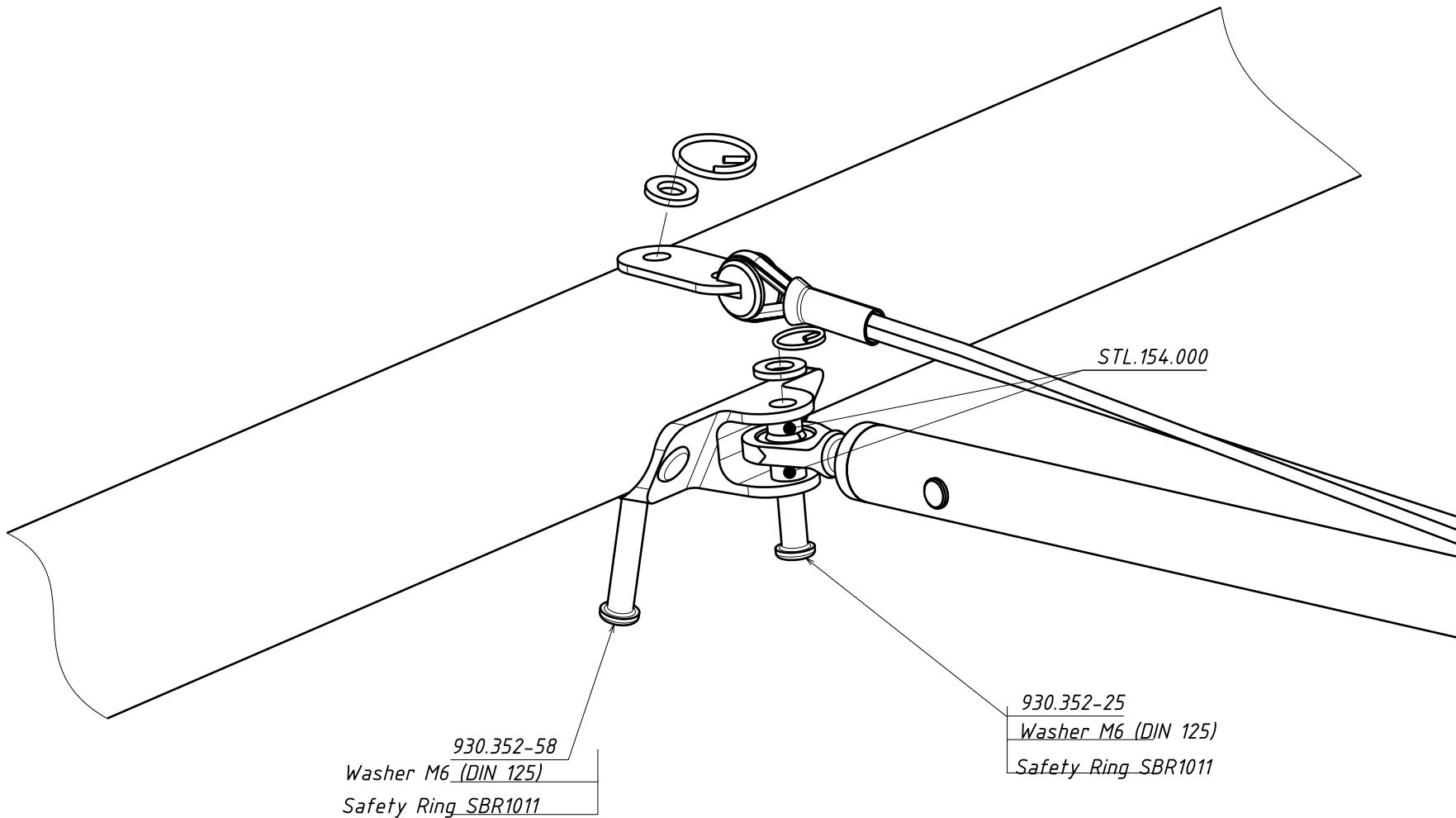
E (1:1)



Изм.	Лист.	№ докум.	Подп.	Дата	RAY.030.000.AD	Литера	Лист	Листов
Разраб.		Сулимов			StingRay Airframe (StingRay каркас)			
Проверил								
Т.контр.								
Н.контр.								
Утв.		Дробышев С.						

RAY.030.000.AD

F (1:1)



Первич. примен.

Справочныи №

Подп. и дата

Инв. №

Взам. инв. №

Инв. №

Подп. и дата

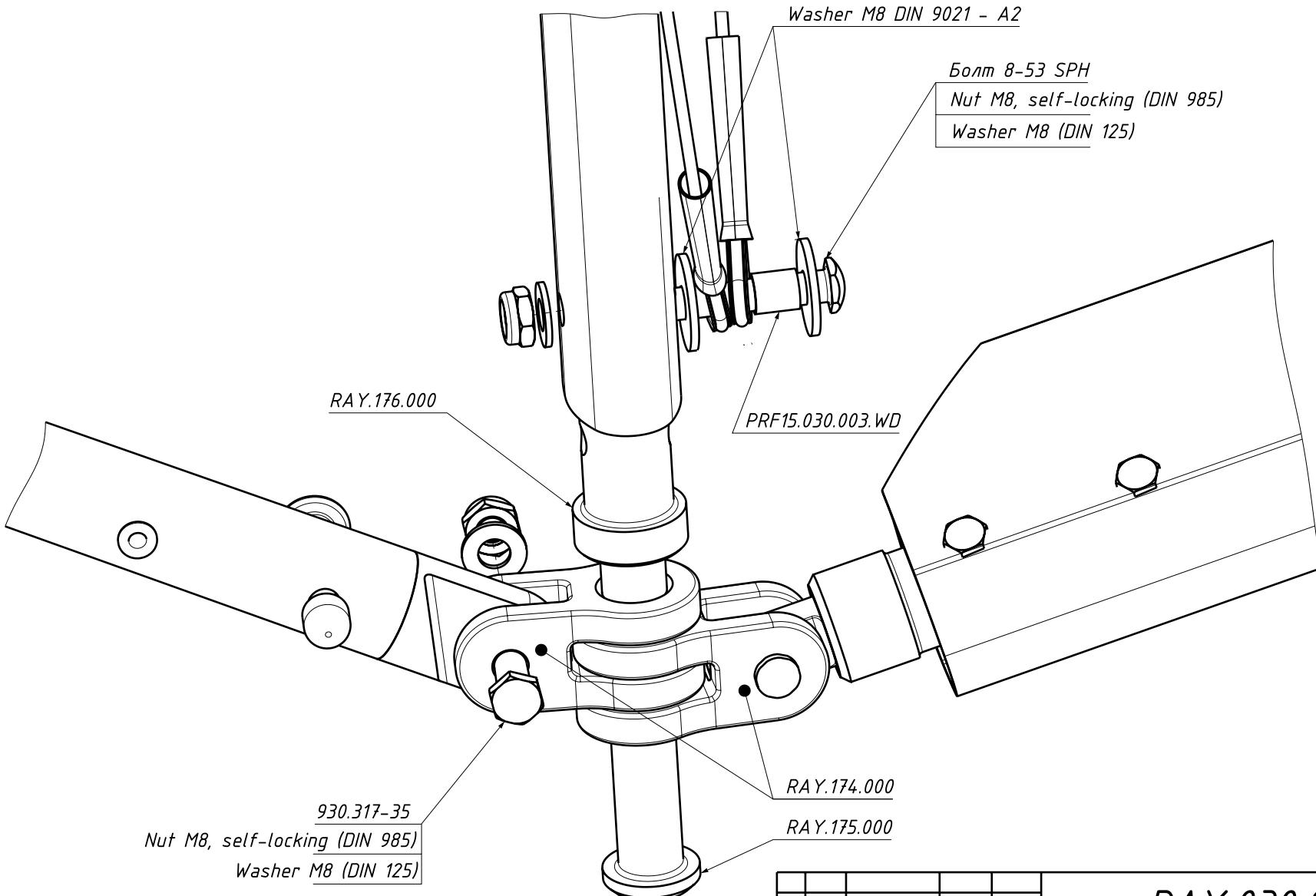
Изм. Лист.	№ докум.	Подп.	Дата	Литера	Лист	Листов
Разраб.	Сулимов					
Проверил						
Т.контр.						
Н.контр.						
Утв.	Дробышев С.					
<i>StingRay Airframe (StingRay каркас)</i>				7	8	

RAY.030.000.AD

Формат А3

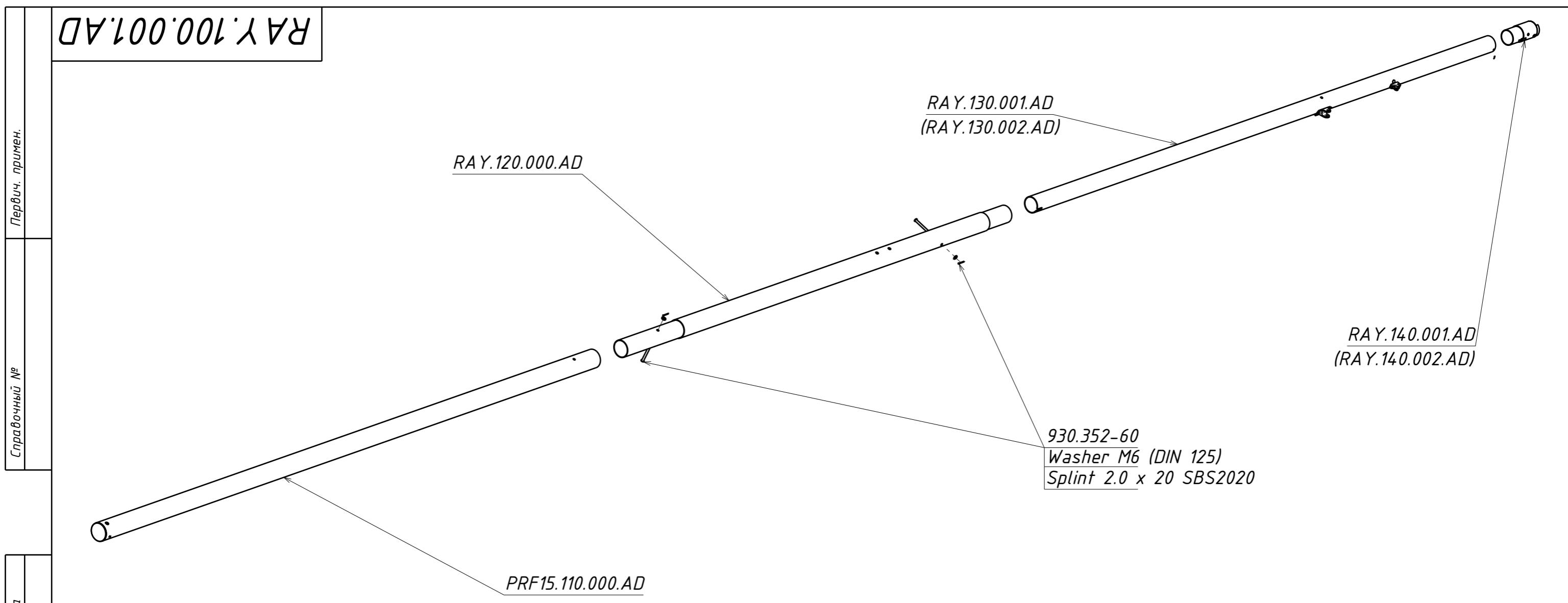
RAY.030.000.AD

G (1:1)



Изм.	Лист.	№ докум.	Подп.	Дата	RAY.030.000.AD	Литера	Лист	Листов
Разраб.		Сулимов						
Проверил								
Т.контр.								
Н.контр.								
Утв.		Дробышев С.						

*StingRay Airframe
(StingRay каркас)*



Инд.№	Подп. и дата	Взам. инв.№	Инв.№ дубл.	Подп. и дата
Поз.	Обозначение	Наименование	RAY.100.001.AD /к-бо	RAY.100.002.AD /к-бо
1	PRF15.110.000.AD	LE Tube №1 (Труба боковая №1)	1	1
2	RAY.120.000.AD	LE Tube №2 (Труба боковая №2)	1	1
3	RAY.130.001.AD	LE Tube №3 Right Assembled (Труба боковая №3)	1	-
3	RAY.130.002.AD	LE Tube №3 Left Assembled (Труба боковая №3)	-	1
4	RAY.140.001.AD	LE Tube №4 Right Assembled (Труба боковая №4)	1	-
4	RAY.140.002.AD	LE Tube №4 Left Assembled (Труба боковая №4)	-	1
5	930.352-60	Clevis Pin (Валик)	2	2
6		Washer M6 (DIN 125)	2	2
7		Splint 2.0 x 20 SBS2020	2	2

Изм.	Лист.	№ докум.	Подп.	Дата	Литера	Масса	Масштаб
Разраб.	Сулимов						
Проверил							
Т.контр.							
Нач.бюро.							
Н.контр.							
Утв.	Дробышев С.						

RAY.100.001.AD
LE Assembled Right
(Боковая труба в сборе прав.)

Лист

Листов 1

1:10

RAY.130.001.AD

Первич. примен.

Справочники №

Подп. у дата

Инв. № 256.

Инф. № *Подп. и дата* *Бздач.*

This diagram shows an exploded view of a cylindrical component assembly. The main part is a long cylinder. At the top, there is a small rectangular base plate with two pins extending upwards. A safety ring (SBR1011) is positioned around the cylinder just below the base plate. A screw (5-Screw 5x16, half-countersunk) secures the base plate to the cylinder. A label indicates the base plate is part number 1-CBT10.13.601.000. Another label specifies 2-Pin 4x17(15). A callout at the bottom points to part number 7-RAY.131.001.AD and (7-RAY.131.002.AD).

2-Pin 4x17(15)

4-Safety Ring SBR1011

5-Screw 5x16, half-countersunk

1-CBT10.13.601.000

7-RAY.131.001.AD
(7-RAY.131.002.AD)

Поз.	Обозначение	Наименование	RAY.130.001.AD /к-во	RAY.130.002.A /к-во
1	CBT10.13.601.000		1	1
2		Pin 4x17	1	1
4		Safety Ring SBR1011	1	1
5		Screw 5x16, half-countersunk	1	1
7	RAY.131.001.AD	LE Tube №3 Right (Труба доковая №3 пр.)	1	-
7	RAY.131.001.AD	LE Tube №3 Left (Труба доковая №3 лев.)	-	1

RA Y.130.001.AD - Труба боковая №3 правая СБ - показана
RA Y.130.002.AD - Труба боковая №3 левая СБ - зеркальное отображение

RAY.130.001.AD

RAY.200.001.AD

Первич. примен.

Справочныи №

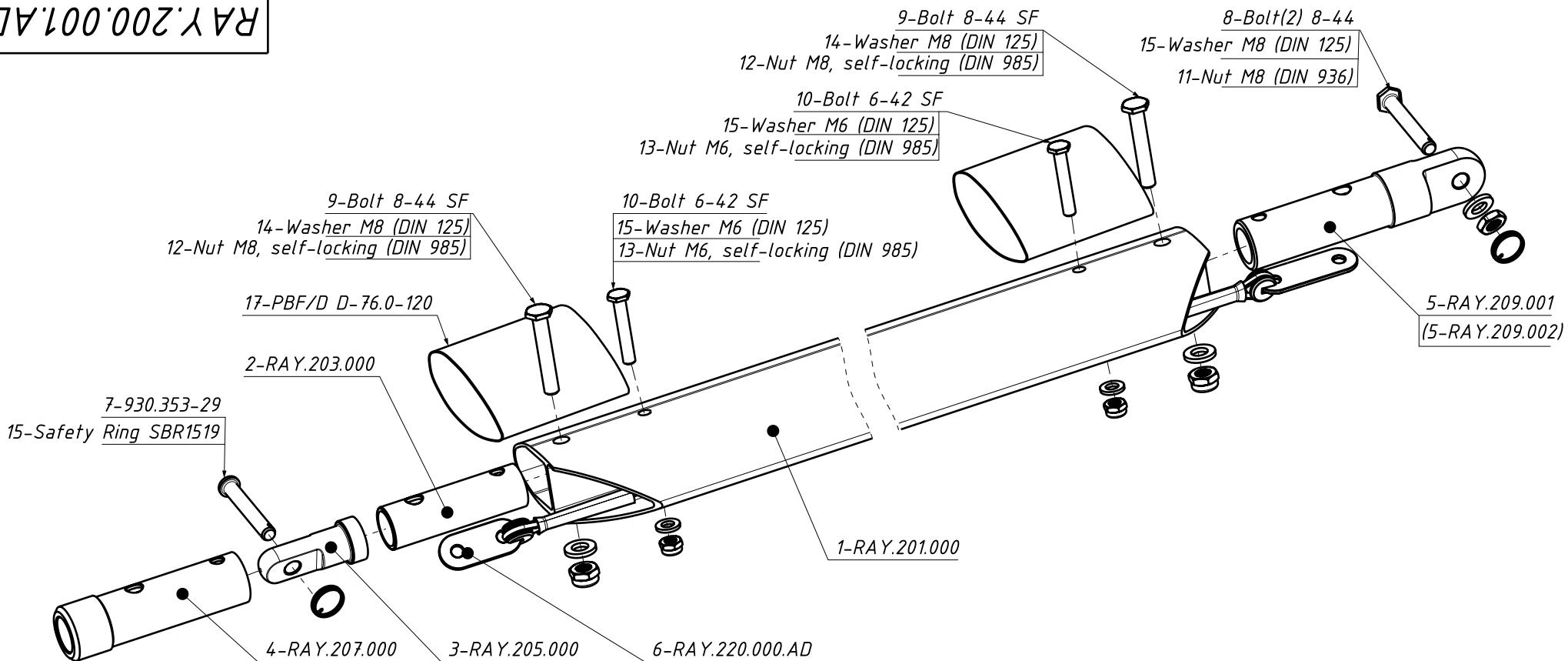
Взам. инв.№

Инв.№

Подп. и дата

Инв.№

Подп. и дата



RAY.200.001.AD - Подкос в сборе правый-показан

RAY.200.002.AD - Подкос в сборе левый-зеркальное отображение

Поз.	Обозначение	Наименование	RAY.200.001.AD /к-бо	RAY.200.002.AD /к-бо
1	RAY.201.000	Strut Tube (Труба подкоса)	1	1
2	RAY.203.000	Strut Bottom Insert (Вставка подкоса нижняя)	1	1
3	RAY.205.000	Strut Bottom Fitting (Вертлюг подкоса нижний)	1	1
4	RAY.207.000	Strut bottom Sleeve (Втулка подкоса нижняя)	1	1
5	RAY.209.001	Strut Top Fitting Right (Фитинг подкоса верхний правый)	1	-
5	RAY.209.002	Strut Top Fitting Left (Фитинг подкоса верхний левый)	-	1
6	RAY.220.000.AD	Safety Strut Wire (Страховочный трос подкоса)	1	1
7	930.353-29	Clevis Pin (Валик) 8-29	1	1
8		Bolt(2) (Болт(2)) 8-44	1	1
9		Bolt (Болт) 8-44 SF (сферич.)	2	2
10		Bolt (Болт) 6-42 SF (сферич.)	2	2
11		Nut M8 (DIN 936)	1	1
12		Nut M8, self-locking (DIN 985)	2	2
13		Nut M6, self-locking (DIN 985)	2	2
14		Washer M8 (DIN 125)	2	2
15		Washer M6 (DIN 125)	2	2
16		Safety Ring SBR1519	2	2
17	PBF/D D-76.0-120	Hot Shrink Tube (Термоусадка) L=120	2	2

Изм.	Лист.	№ докум.	Подп.	Дата	Assembled Strut Right (Подкос в сборе пр.)			Литера	Масса	Масштаб
					Разраб.	Сулимов	Проверил			
					Т.контр.					
					Нач.бюро.					
					Н.контр.					
					Утв.	Дробышев С.				
								Лист	Листов	1

RAY.200.001.AD

1:2

Формат А3