

Owner's Operation and Service Manual

Maritime RobotX Challenge WAM-V® USVx



**Read & Completely Understand this OWNER'S OPERATION AND
SERVICE MANUAL Prior to Operating.**

WAM-V® USVx Nomenclature

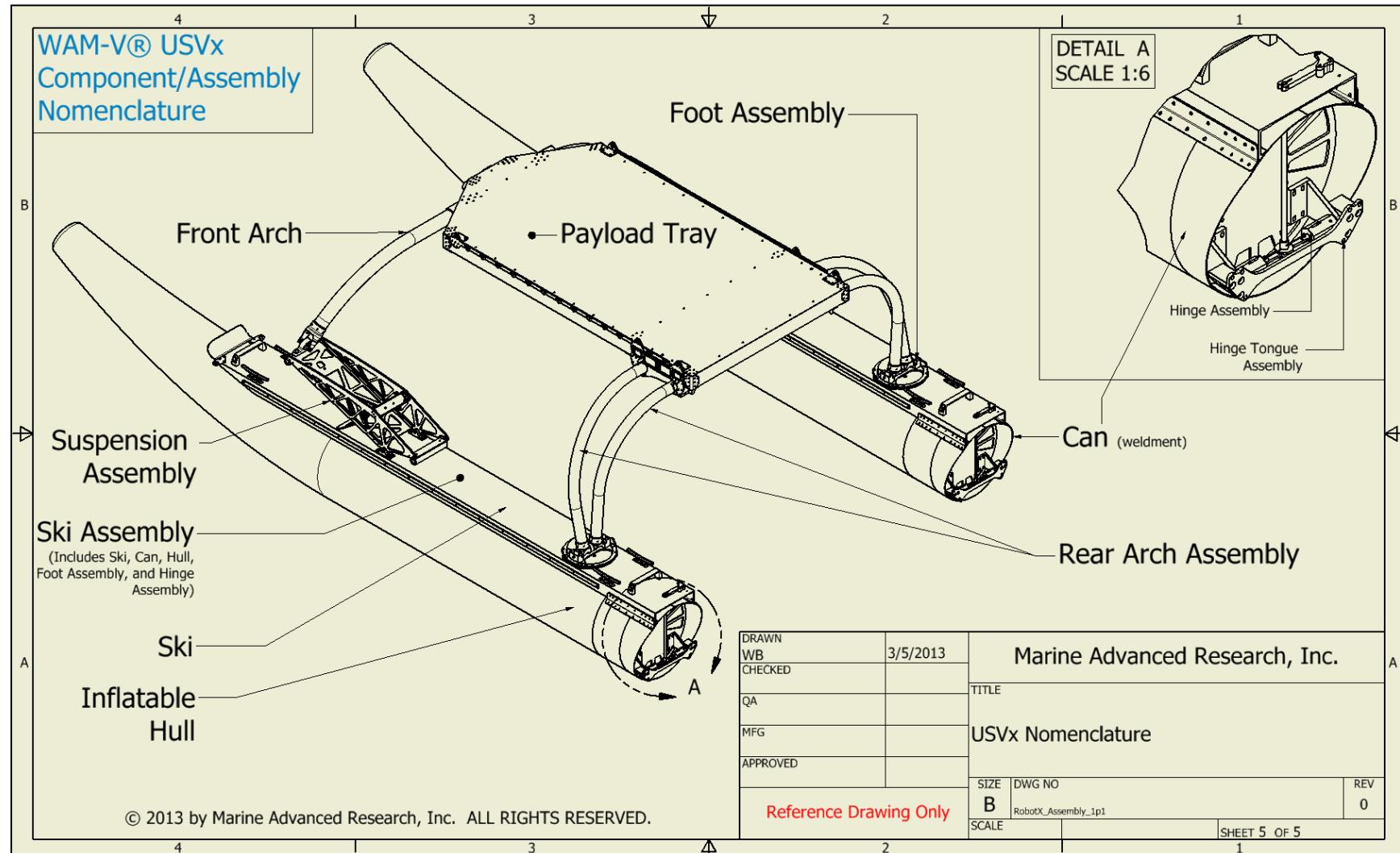


Table of Contents

Safety Precautions	3
Included With Your Vessel	4
Design Specifications and Construction	5
Major Dimensions and Payload Requirements:	5
Sub Assembly Specifications and Construction.....	6
Assembly Procedure:	8
Hull Inflation	8
Assembly Steps	10
Disassembly	17
Hinge System and Propulsion Interface	18
Suspension System and Payloads	23
Setting Your Spring Pressure.....	23
Setting Your Damping Rate	25
Pre-Launch Checklist:.....	26
Vessel Launching.....	27
Trailer Launching.....	27
Side Davit/Hoist Launching	27
Towing:	29
Periodic Maintenance:.....	30
Inflatable Hull Care, Maintenance & Repair.....	32
Packing For Shipment	33
Vendors: Component Specifications and Manuals.....	40
Cane Creek:.....	40
SKS:	40
Gommorizzo:.....	40

Safety Precautions

- This vessel is designed for a maximum payload capacity of 300 lbs (136 kg). **DO NOT EXCEED.**
- The inflatable hulls should be inflated to a pressure of 2.0 – 2.2 psi (140 – 150 millibar). Maximum pressure rating is 3.0 psi (205 millibar), **DO NOT EXCEED.**
- After operation, deflate both hulls to 1.0 psi (70 millibar) to avoid over pressurization and internal baffle rupture due to temperature changes.
- **CRITICAL:** Inspect all push button quick release pins to ensure that the spring loaded retaining ball is functioning properly. Replace immediately if there is any sign of damage or if the internal spring mechanism is not functioning properly. Failure to do so may result in catastrophic damage or loss of the vessel.
- Hoisting: Always lift RobotX WAM-V USVx by securely attaching to all 4 payload tray lift points using hardware and slings that are appropriately rated for the load being lifted. See “Side Davit/Hoist Launching” section of this manual for the location of the hoist points on the payload tray. Do not walk beneath the vessel during lifting. Improper use of hoisting hardware, slings, or lift points may result in injury or death.
- The payload tray has attachment points for securing payloads. Please make sure payloads are always secured prior to operation.

Included With Your Vessel

The following spare parts and tools are included with your RobotX WAM-V USVx.

2 x $\frac{1}{4}$ " diameter, 1.5" long stainless steel quick release locking pin

1 x $\frac{1}{4}$ " diameter, 4.0" long stainless steel quick release locking pin

1 x $\frac{1}{4}$ " diameter, 1.75" long stainless steel quick release locking pin, with lanyard attached

1 x 3/8" diameter, 3.0" long stainless steel quick release locking pin

8 x retaining rings for $\frac{1}{2}$ " shaft size

8 x $\frac{1}{4}$ "-20 set screws w/ nylon patch

4 x 8-32 set screws w/ nylon patch

1 x wrench set: 3/8" – 1"

1 x allen key set w/ vinyl pouch: 11 piece, 0.05" – 3/8"

1 x double open ended wrench, 7/16" – 9/16"

1 x double open ended wrench, 7/16" – $\frac{1}{2}$ "

1 x T27 torx drive bit

4 x 2500 lb load rated lifting sling, 3' length

6 x 1 ton lifting shackle, 3/8" screw pin

1 x 3300 lb load rated high depth shackle

1 x West Marine hand operated inflator pump

1 x SKS SAM suspension pump

2 x replacement fill valves for hypalon hulls

1 x Cane Creek DBair shock absorber w/ adjustment tool [shipped separately]

2 x Cane Creek DBair shock absorber valve cap w/o-ring [shipped separately]

2 x IGUS KSTM-30 pillowblock bearing [shipped separately]

1 x IGUS KSTM-GT35 pillowblock bearing [shipped separately]

Design Specifications and Construction

Major Dimensions and Payload Requirements:

Beam: 96" (244 cm) [outside to outside]

Overall Hull Length: 154" (391 cm)

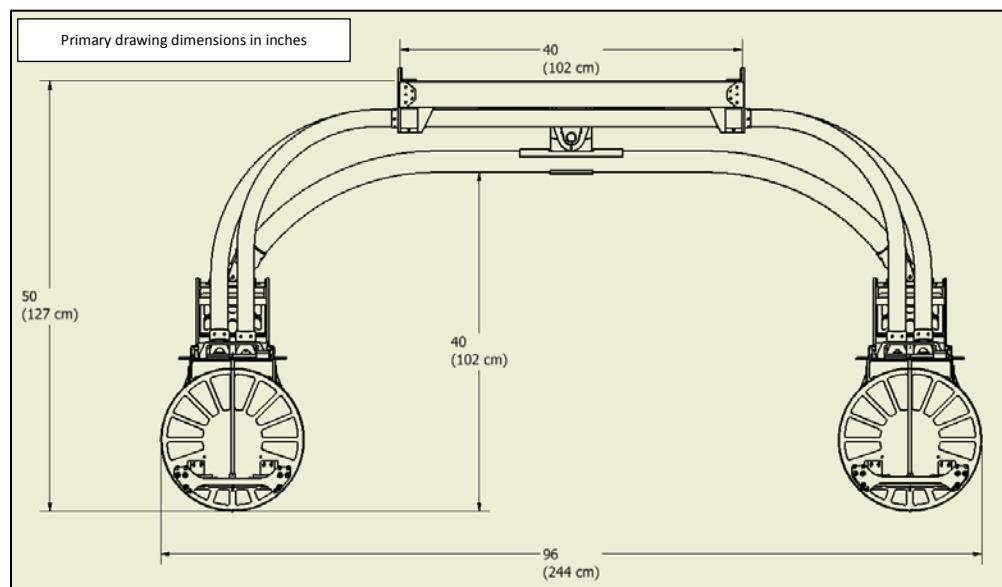
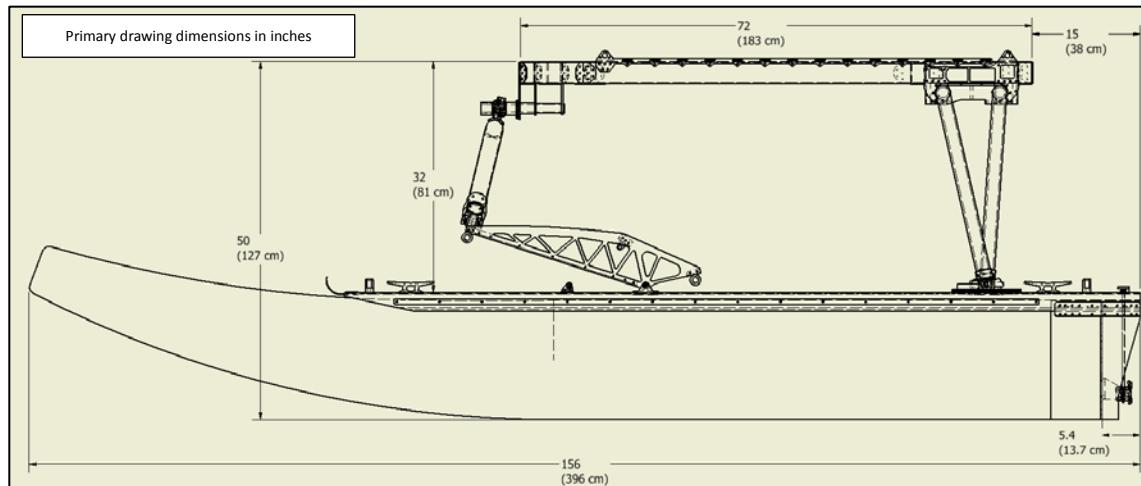
Ski Length: 112" (284 cm)

Hull Diameter: 16.75" (42.6 cm)

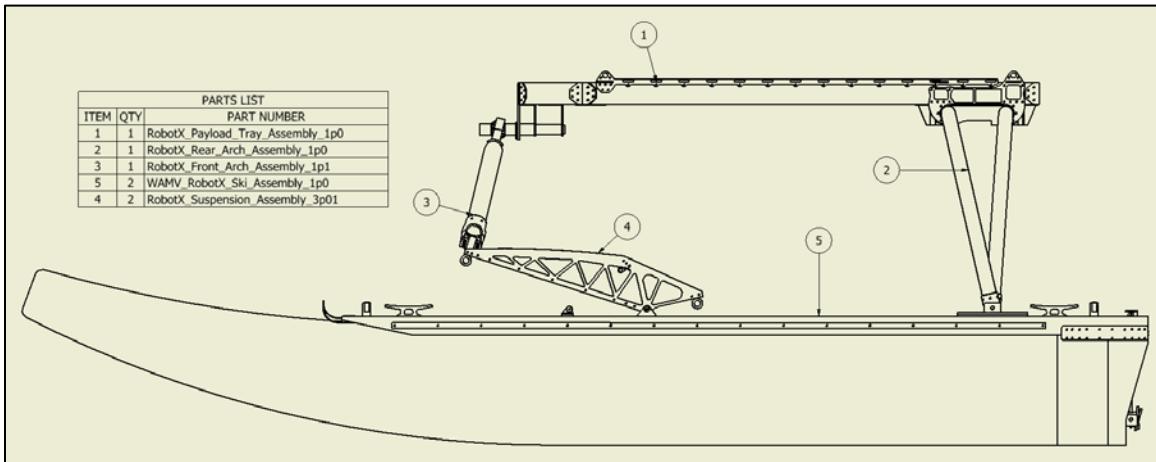
Payload: 300 lbs. (136 kg) maximum

Full Load Displacement: 560 lbs. (255 kg) (estimated)

Draft: 6.5" (16.5 cm) (estimated)



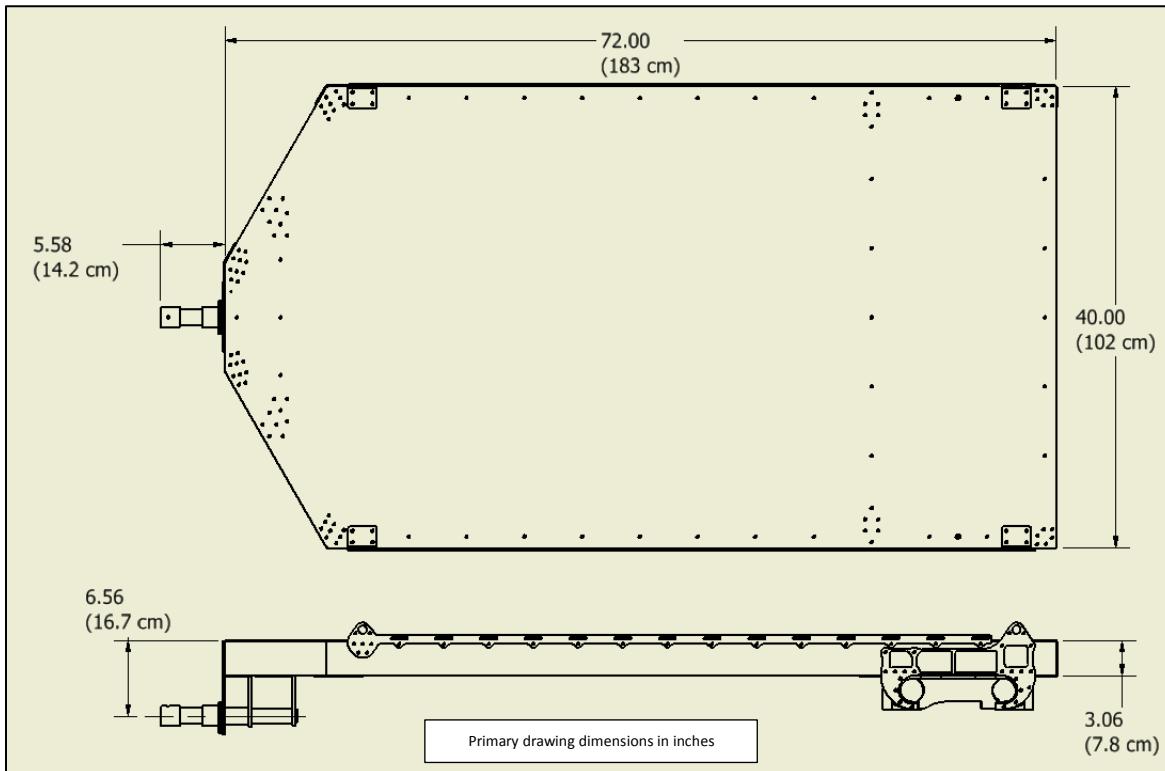
Sub Assembly Specifications and Construction



1. Payload Tray

Material and Construction: Riveted tube frame and stress skin construction using 5086 and 6061-T6 series aluminum components anodized to MIL-A-8625 Type III. Rear Arch and Front Arch Assembly bearing surfaces are Delrin and reinforced nylon respectively.

Weight: 54.5 lbs (24.7 kg).



2. Rear Arch

Material and Construction: CNC bent tube construction using 6061-T6 series extruded and machined aluminum components anodized to MIL-A-8625 Type III. Inserts and reinforcements riveted in place.

Weight: 33.5 lbs (15.2 kg).

3. Front Arch

Material and Construction: CNC bent tube construction using 6061-T6 series extruded and machined aluminum components anodized to MIL-A-8625 Type III. Inserts and reinforcements riveted in place.

Weight: 11 lbs (5.0 kg).

4. Suspension

Material and Construction: Structurally riveted construction consisting of water-jet cut 6061-T6 aluminum plate and extruded sections. CNC machined mounting brackets for all suspension component attachments. All components anodized to MIL-A-8625 Type III. Shock absorbers provided by Cane Creek feature integrated air spring and damper combination with all stainless steel and anodized aluminum construction. Custom valving optimized for WAM-V suspension dynamics featuring external adjustability of spring and damping rates via Schrader valve and barrel adjusters respectively.

Weight: 16.5 lbs (7.5 kg). (each)

5. Ski

Material and Construction: Custom 6061-T6 series aluminum extrusion with water-jet cut and CNC machined mounting brackets and reinforcements. Ski-Can is constructed of rolled and welded 0.080" (2 mm) Aluminum 6061-T6 sheet. Can is attached to Ski extrusion via water-jet cut and bent 5086 Aluminum brackets and structural rivets. All components anodized to MIL-A-8625 Type III.

Weight: 42.5 lbs (19.3). (each)

6. Hull

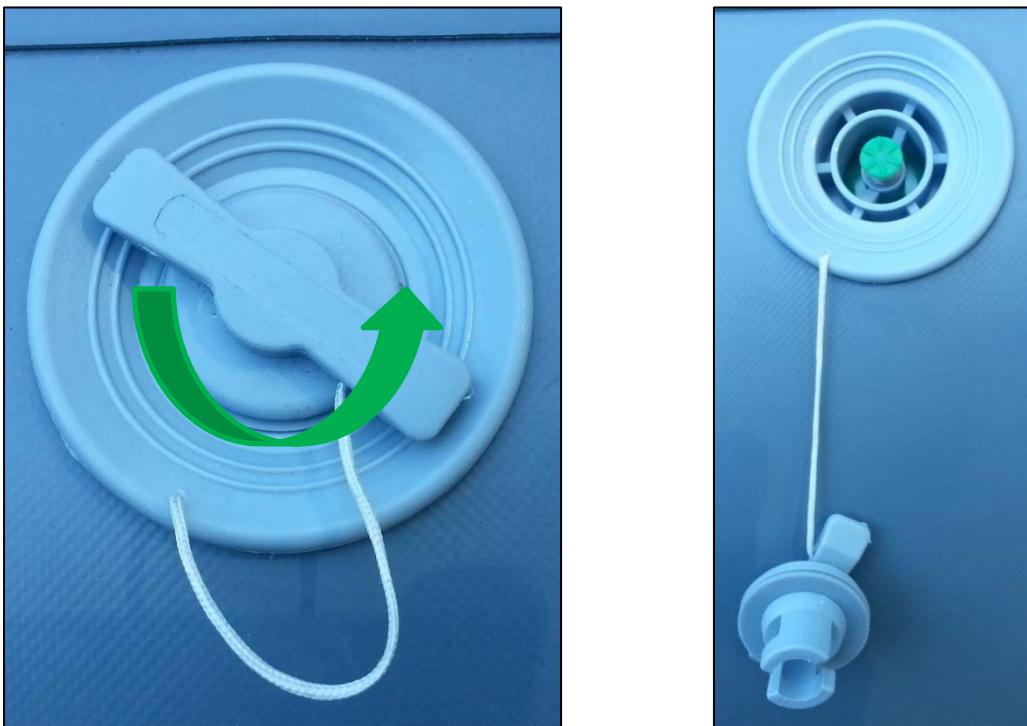
Material and Construction: Hypalon/polyester (Orca 866 manufactured by Pellel & Flipo).

Weight: 20 lbs (9 kg). (each)

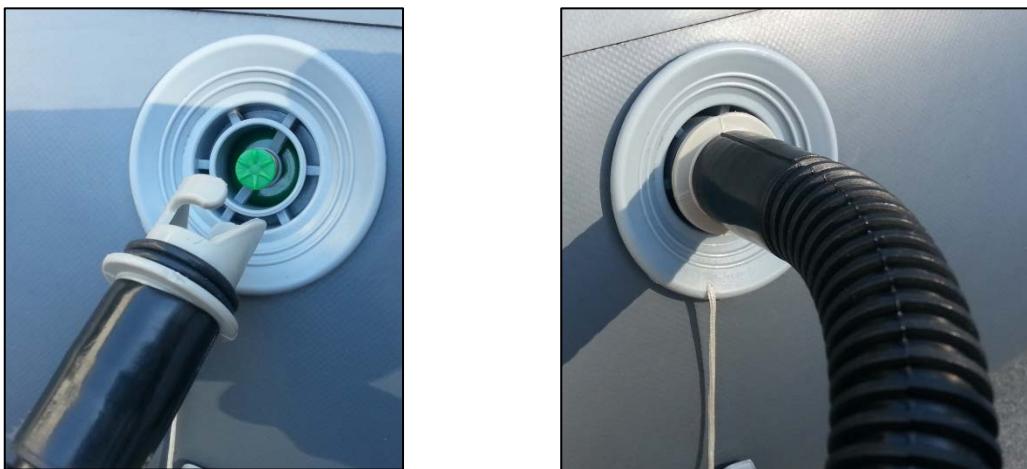
Assembly Procedure:

Hull Inflation

The RobotX WAM-V USVx is equipped with hypalon fabric hulls mounted to a rigid aluminum ski. Your RobotX WAM-V USVx was shipped with hull valves locked open. Hull valves must be unlocked before inflation. To unlock the valves, depress and rotate the green button clockwise until green button extends fully. The hulls must be inflated before assembly. Each hull contains a central baffle separating two independent inflation chambers. To inflate, remove the valve cover by rotating the cover counterclockwise.



Insert the hand pump valve and rotate clockwise to lock and seal the pump to the hull valve.



Inflate each chamber to 2.0 – 2.2 psi (140 – 150 millibar). Replace valve covers by inserting cover and rotating clockwise until locked. In the event of over inflation, depress the green valve release button until desired pressure is reached.



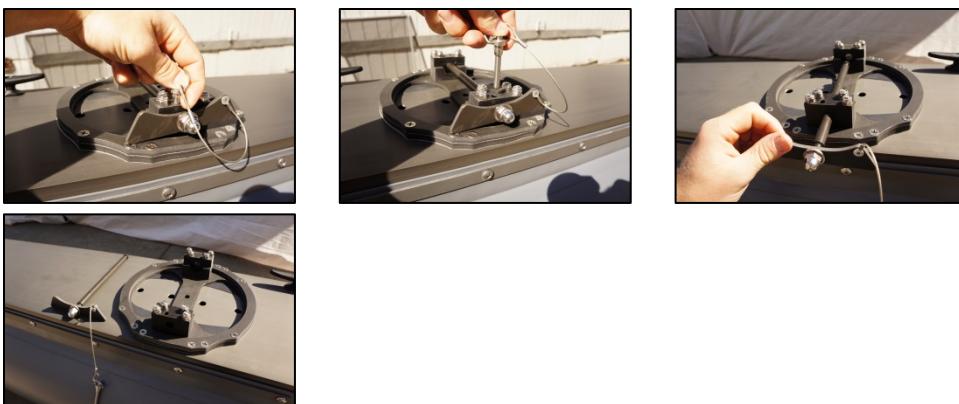
To deflate fully, depress the green release button and rotate clockwise until release valve is locked in the open position. After deflation, rotate green release button counterclockwise to close valve.

Assembly Steps

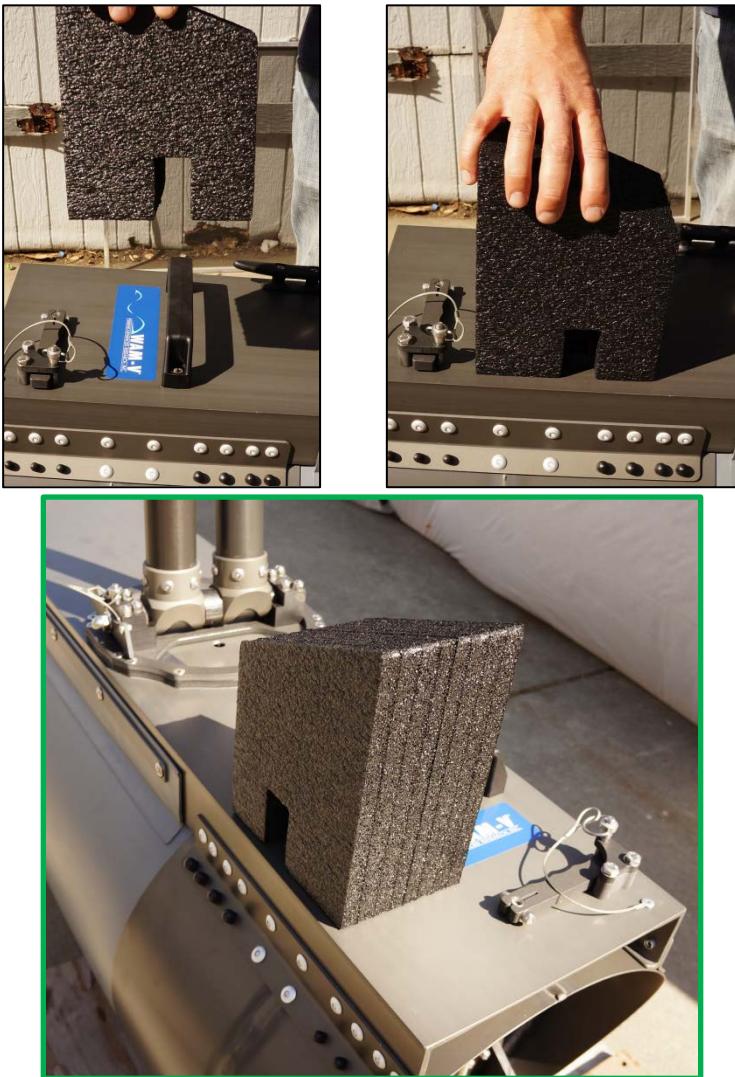
1. Clear an 8' x 14' (2.4 m x 4.3 m) space on the ground (or trailer) and lay out both hulls roughly 80" (2 m) apart (centerline to centerline).



2. Remove both foot pins by retracting the $\frac{1}{4}$ " (6.3 mm) locking pin and pulling the pin free from the foot clevis. Set foot pin aside.

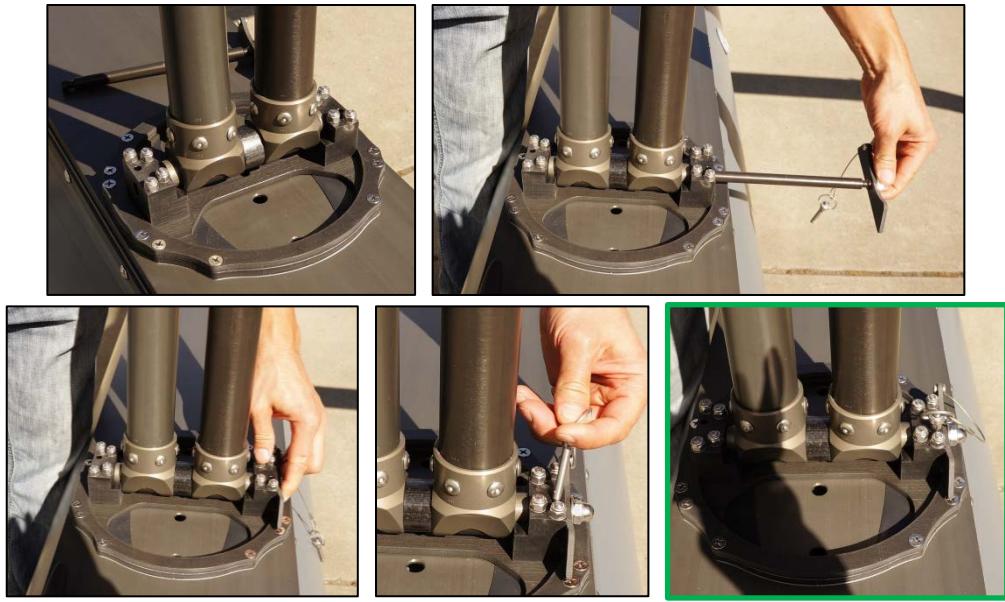


3. Set both rear arch foam wedges over the aft most handle on the top of each ski. Line each wedge up with the inboard edge of each ski.



4. Carefully insert the base of the rear arch into the each foot clevis until the pin hole is aligned. Insert foot pin through both ends of the clevis and lock by inserting the $\frac{1}{4}$ " (6.3 mm) locking pin vertically into the locking side of the foot clevis.

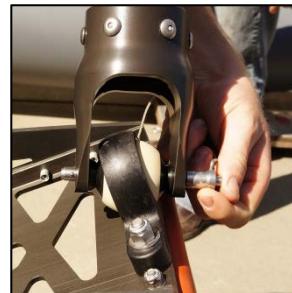




5. **IMPORTANT:** Lay the rear arches back until they are resting on the rear arch foam wedges installed in step 3. Failure to do so will result in damage to the rear arch and/or foot assemblies.



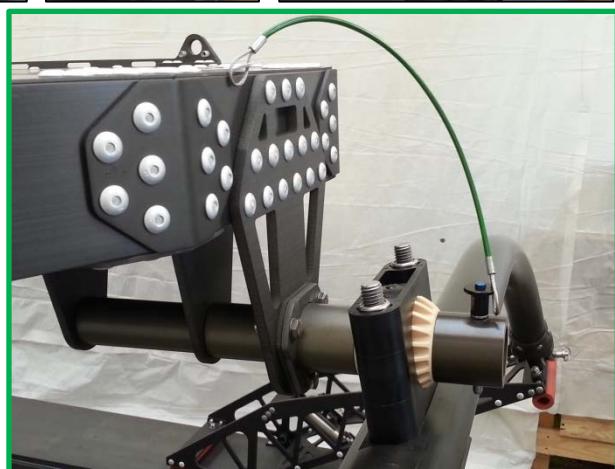
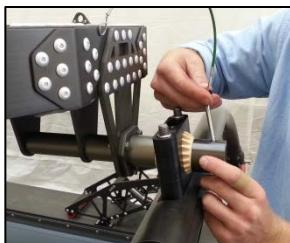
6. While holding the front arch in between the forward portion of the hulls, slide the front arch clevis over the forward balljoint of the suspension assembly and insert 3/8" (9.5 mm) locking pin.



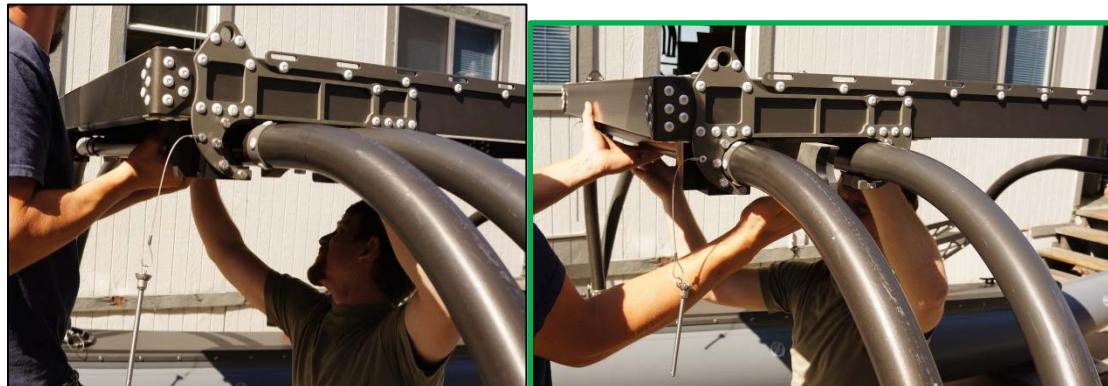
7. Repeat this procedure (6) for the opposite hull, laying the front arch forward after both pins are in place.



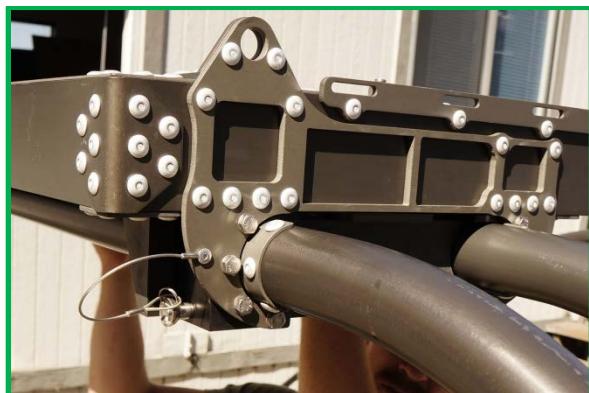
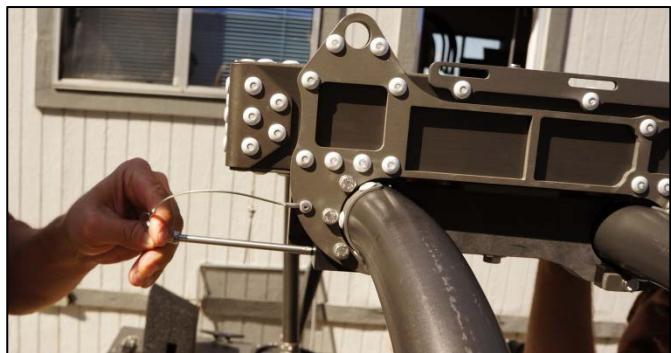
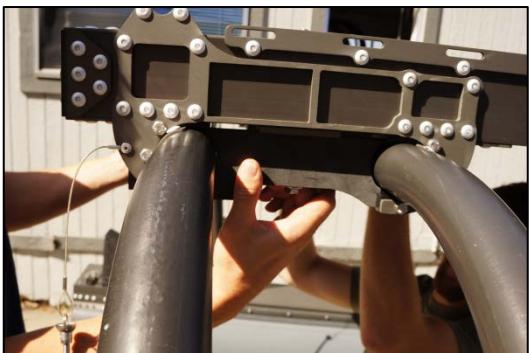
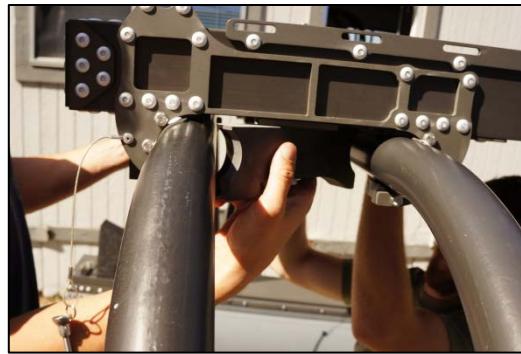
8. Lift the payload tray in between the two arches. Insert the front balljoint shaft into the pillowblock balljoint mounted in the center of the front arch. Place the balljoint shaft cap on the front of the shaft, and secure with the $\frac{1}{4}$ " (6.3 mm) retaining pin attached to the payload tray by inserting the retaining pin vertically through both the shaft and shaft cap.



9. Lift the aft end of the payload tray until it is roughly level with the ground. While holding the tray, rotate the rear arch into place. Secure each arch tube in the C-shaped arch mounts.



10. Rotate the plastic clamp so that it makes contact with the inside walls of each arch tube. Insert the $\frac{1}{4}$ " (6.3 mm) locking pin into the pin guide hole at the aft-most arch mounts, locking the clamp in place.



11. Remove and store the rear arch foam wedges.

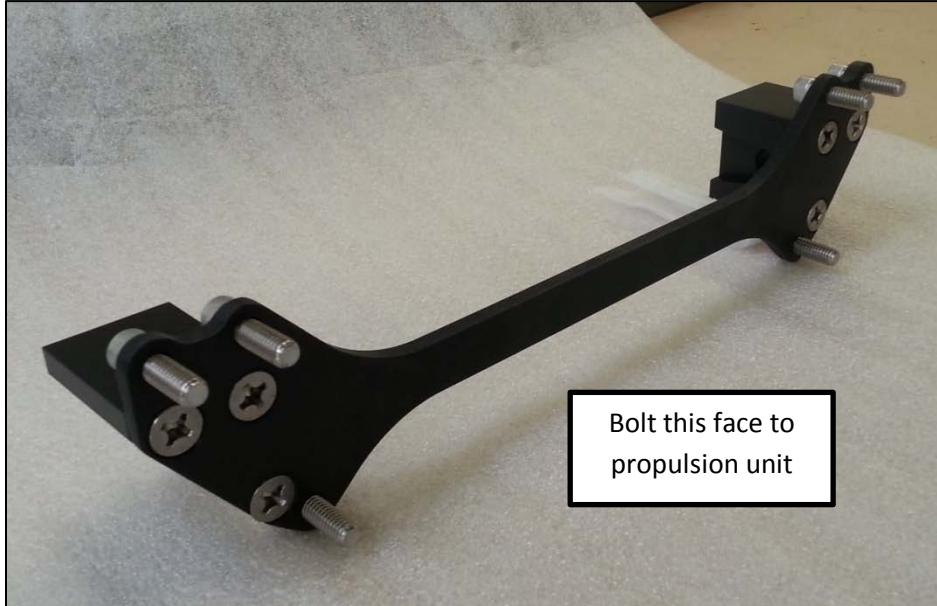
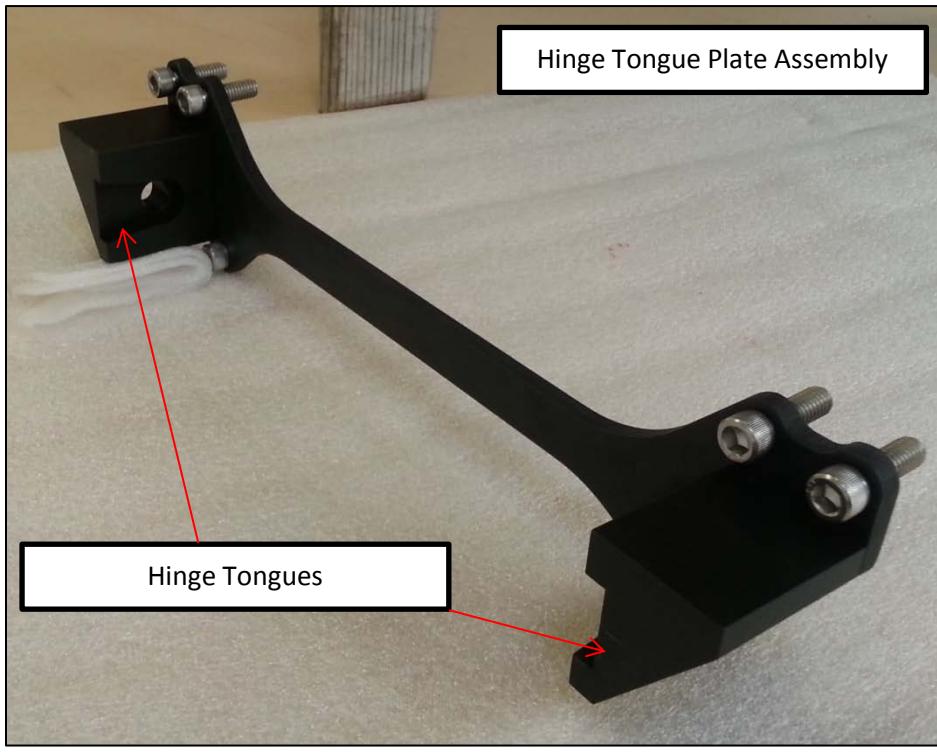


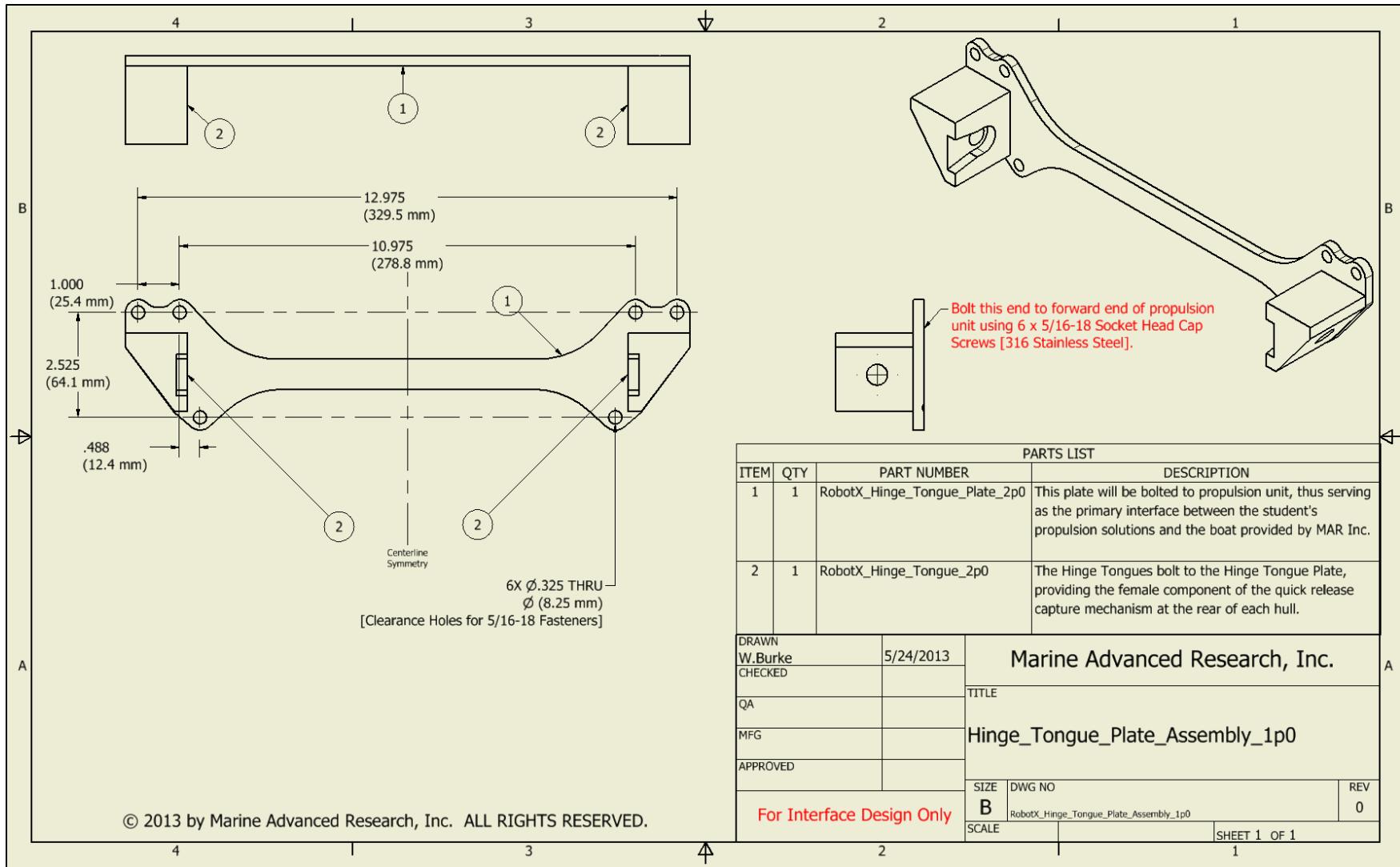
Disassembly

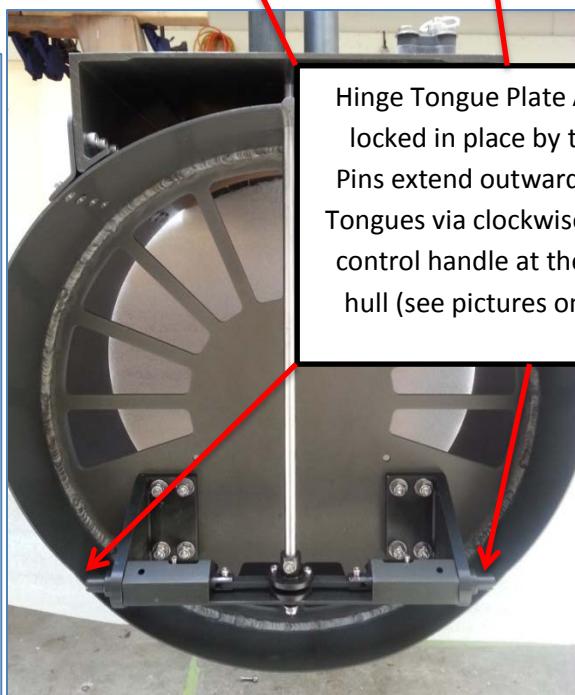
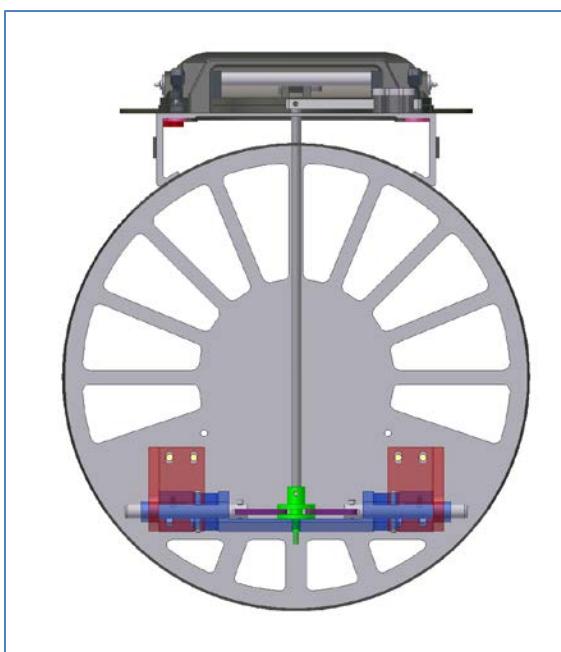
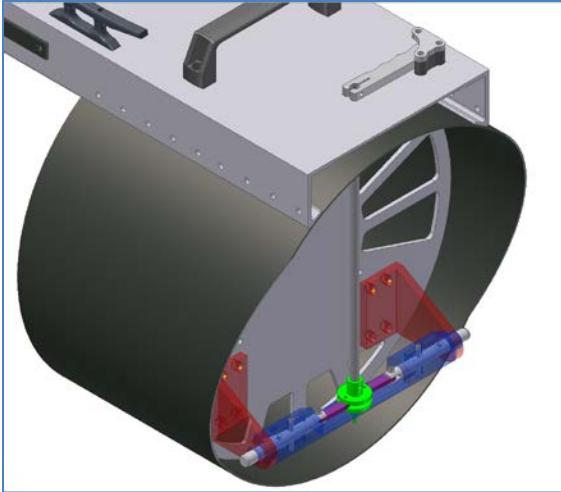
Disassembly of the RobotX WAM-V USVx is conducted in the reverse order from the Assembly procedure. For step by step directions, follow the procedure laid out in the “Assembly Procedure” portion of this manual in reverse.

Hinge System and Propulsion Interface

The RobotX WAM-V USVx is equipped with a quick release hinge system at the transom of each hull. This system allows easy and secure attachment of various propulsion units, independent of propulsion unit design. Each hinge system is composed of a locking handle, accessible on the upper aft portion of the ski, which controls the extension of a pair of locking pins. These locking pins extend into a pair of hinge tongues, mounted on the hinge tongue plate (show below), which is bolted securely to the propulsion unit.

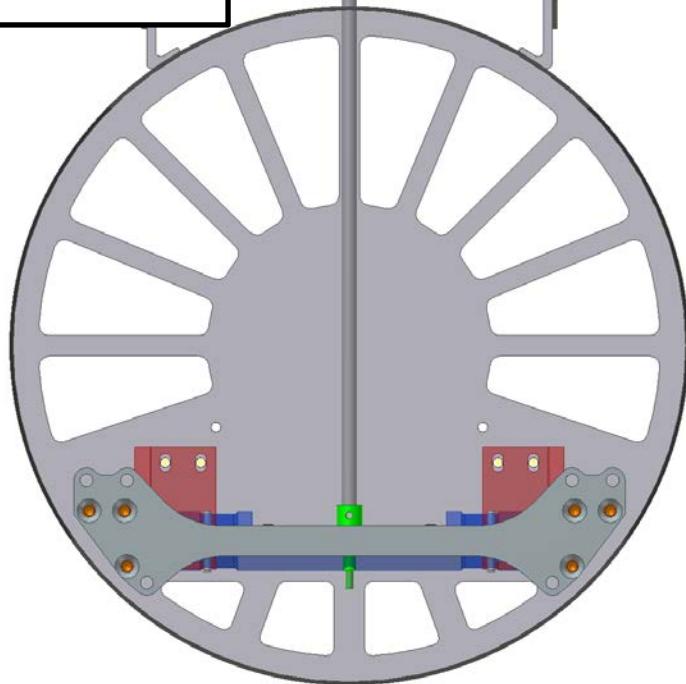




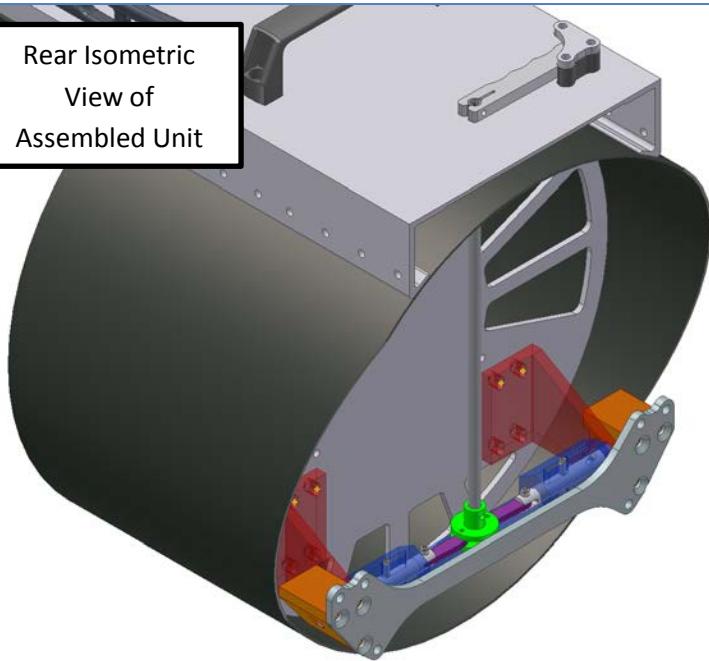


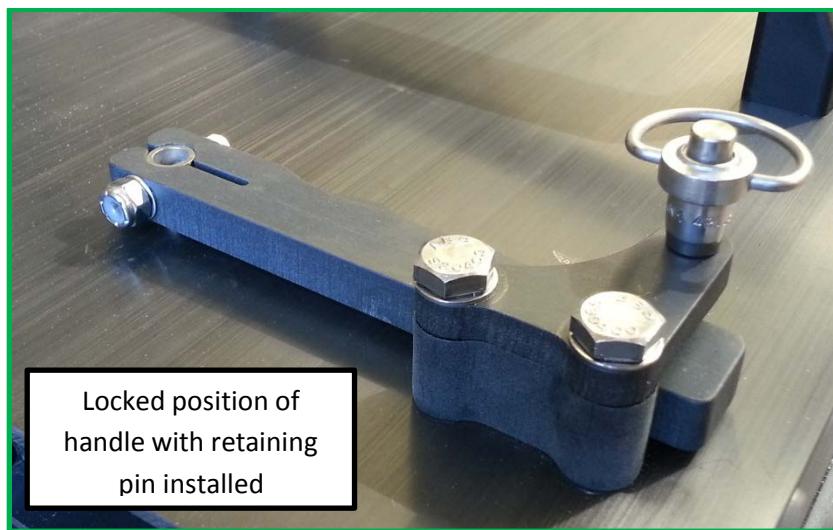
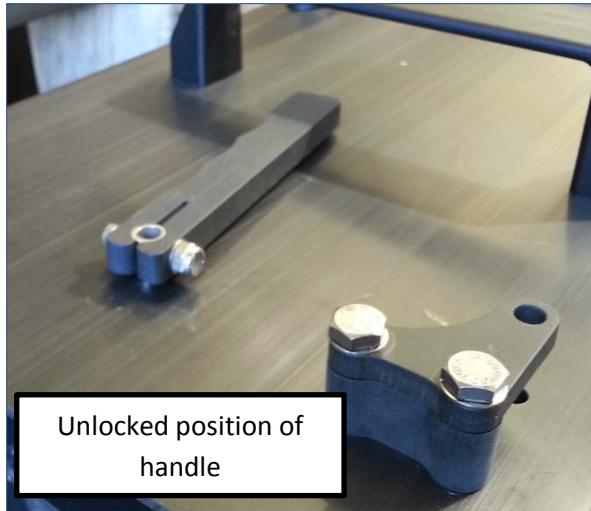
Hinge Tongue Plate Assembly is locked in place by these pins. Pins extend outward into Hinge Tongues via clockwise rotation of control handle at the top of the hull (see pictures on page 22).

Rear View of
Assembled Unit



Rear Isometric
View of
Assembled Unit





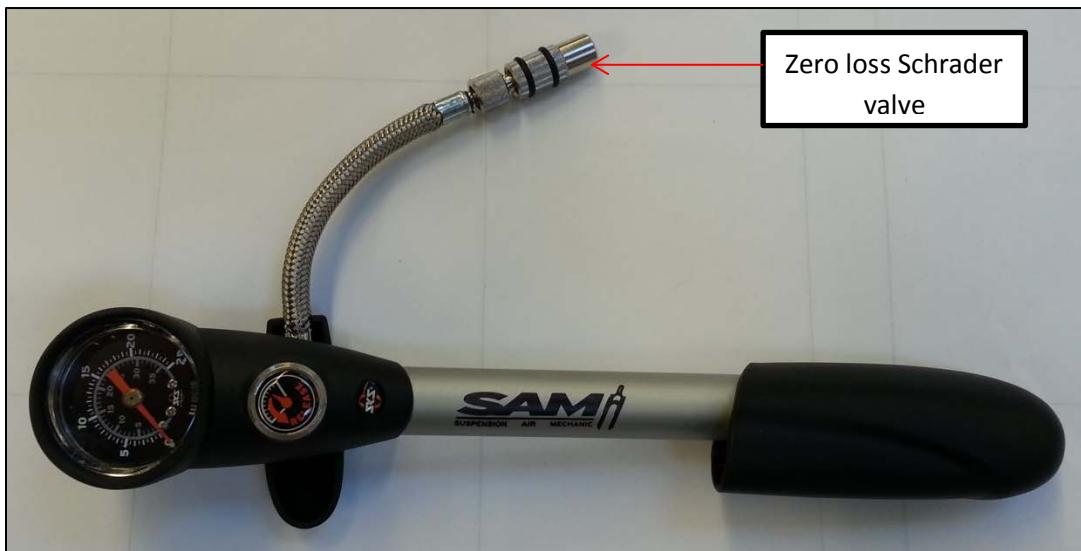
Suspension System and Payloads

The RobotX WAM-V USVx is equipped with a highly adjustable suspension system. Both the spring rate and damping are adjustable through the Cane Creek DBAir shock absorbers equipped on each hull. The RobotX WAM-V USVx can accommodate payloads up to 300 lbs (136 kg). All payloads should be securely fastened to the payload tray via straps or other load rated fasteners.

Setting Your Spring Pressure

NOTE: When removing the valve cap to your DBAir shock absorbers, ensure that the sealing o-ring stays in the cap body. Replace o-ring immediately if lost or damaged.

Due to the variability of the payload and payload weight distribution, suspension air pressure must be adjusted to accommodate various payloads. Air pressure can be adjusted using the SKS SAM Schrader valve hand pump supplied with your vessel. **IMPORTANT:** This pump is outfitted with a zero loss Schrader valve. Please refer to the SKS SAM pump packaging for instructions on the proper use of this valve. Proper use of this valve is essential to charging your DBAir spring to the desired pressure.



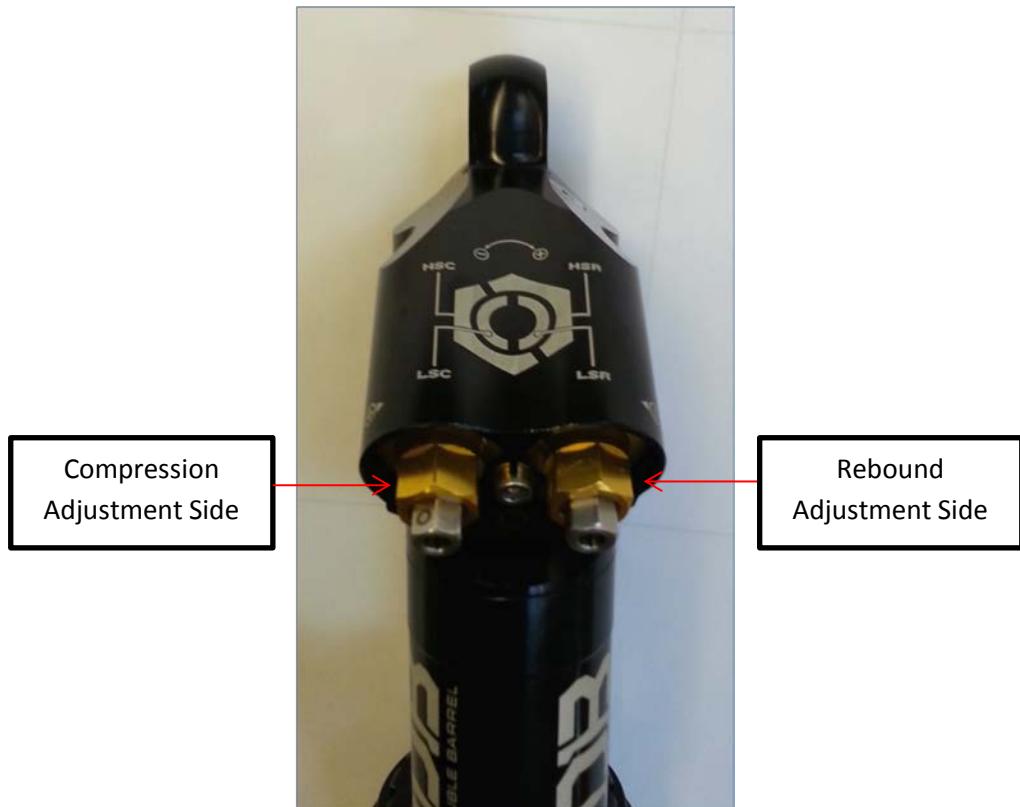
Please refer to page 19 of the DBAir owner's manual for instructions on how to pressurize the shock. The DBAir contains an internal negative air spring, so care must be taken to set the suspension pressure accurately. Additional service and adjustment information can be found in the DBAir manual included with your vessel or via the link included in the "Vendors: Component Specifications and Manuals" section of this manual.

Port and Starboard suspension pressures must be matched such that there is no front view rotation of the front arch.



Setting Your Damping Rate

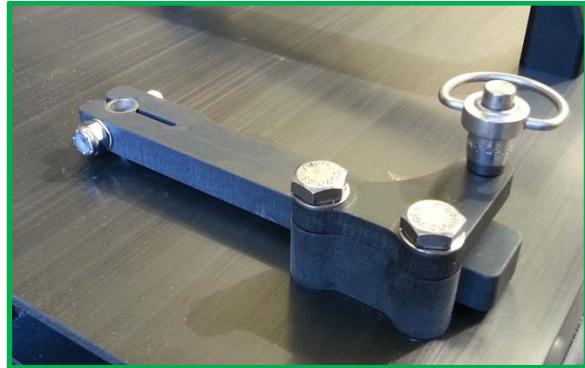
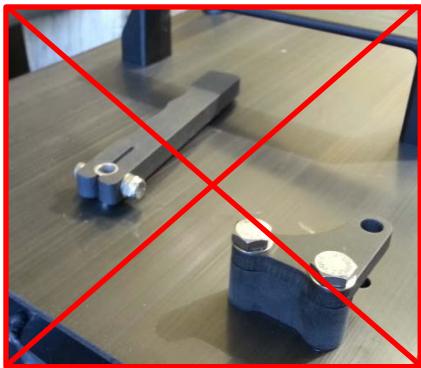
The Cane Creek DBAir shock absorbers allow simple external adjustability of compression and rebound settings for both high and low speed damping. The DBAir dampers on your vessel have been adjusted to the following initial setting: HSC – 2 turns +, LSC – 1 turn +, HSR – maximum +, LSR – maximum +



Please refer to the Cane Creek DBAir Tuning Field Guide included with your vessel for information on how to adjust your damper settings. Adjustment tools can be found in the spare parts box included with your vessel.

Pre-Launch Checklist:

- ✓ All locking pins are properly installed and retaining mechanism is functioning properly.
- ✓ Hulls are inflated to 2.0 – 2.2 psi (140 - 150 millibar).
- ✓ Payload is secured to payload tray.
- ✓ Hinge system is properly greased and in locked position with retaining pin installed correctly.



- ✓ Suspension system is properly charged and greased with Schrader valves and O-rings installed correctly.
- ✓ Suspension system pins are installed correctly with C-Clips in place.
- ✓ All fasteners are tightened fully with nuts in place.

Vessel Launching

Trailer Launching

1. Before backing down launch ramp, ensure that all tie-down straps holding the vessel to the trailer are removed and stowed.
2. Reverse tow vehicle down the launch ramp until both hulls are sufficiently submerged to lift the vessel off the trailer deck.
3. Push or pull the vessel off the trailer and secure to the dockside.

Side Davit/Hoist Launching

The RobotX WAM-V USVx is equipped with four (4) hoist point connections on the corners of the payload tray. Additionally, a hoisting bar, lifting straps and shackles are included with your vessel.



The hoisting bar is designed such that the center lifting shackle can be moved fore and aft to accommodate the change in vessel center of gravity due to various payloads and propulsion unit configurations. When lifting, be sure to secure all payloads as the boat may tilt depending on shackle location. A properly load rated lifting strap must be secured at each hoist point connection in such a way that the majority of the load through the hoist point is in the vertical direction. An example of proper lifting rigging is shown on the following page.



Towing:

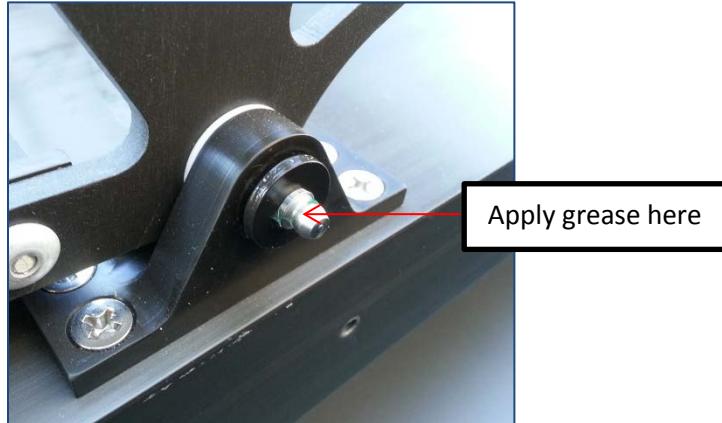
The RobotX WAM-V USVx is equipped with tow point connections on the front inboard side of each ski (shown below).



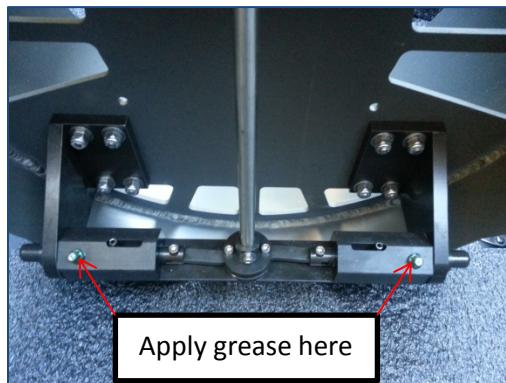
In order to tow the RobotX WAM-V USVx, a tow bridle must be connected to BOTH tow point connections. Do not attempt to lift the vessel using the tow points.

Periodic Maintenance:

1. Spray down the boat thoroughly after each use.
2. Wash down Cane Creek DBAir shock absorbers with soapy water. Rinse clean.
3. Ensure all suspension pins are properly greased. If not, apply fresh marine grease via pin mounted zirc fittings.



4. Ensure hinge system is properly greased. If not, apply fresh marine grease via hinge shaft mounted zirc fittings.



5. Inspect suspension system C-Clips. Replace if damaged or not seated properly.



6. Inspect all quick release retaining pins for proper spring retention mechanism function. Test by trying to remove each pin without depressing the release button. If the pin comes free, replace immediately.
7. Every three months, thoroughly clean both hulls and apply an inflatable hull protectant for hypalon boats.



Inflatable Hull Care, Maintenance & Repair

Hulls are made of hypalon fabric. In the unlikely event of damage or puncture, please contact a local inflatable hull service center or manufacturer for repair. Do not attempt to patch the hulls. Every three months, thoroughly clean both hulls and apply an inflatable hull protectant for hypalon boats. This will reduce fading and drying caused by repeated UV exposure.

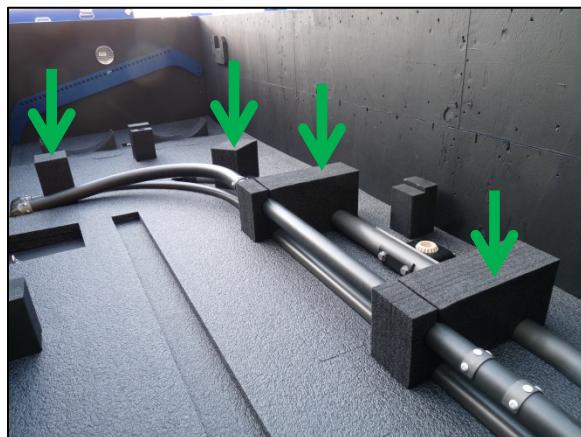
Packing For Shipment

Please refer to the following instructions when packing your RobotX WAM-V USVx for shipment.

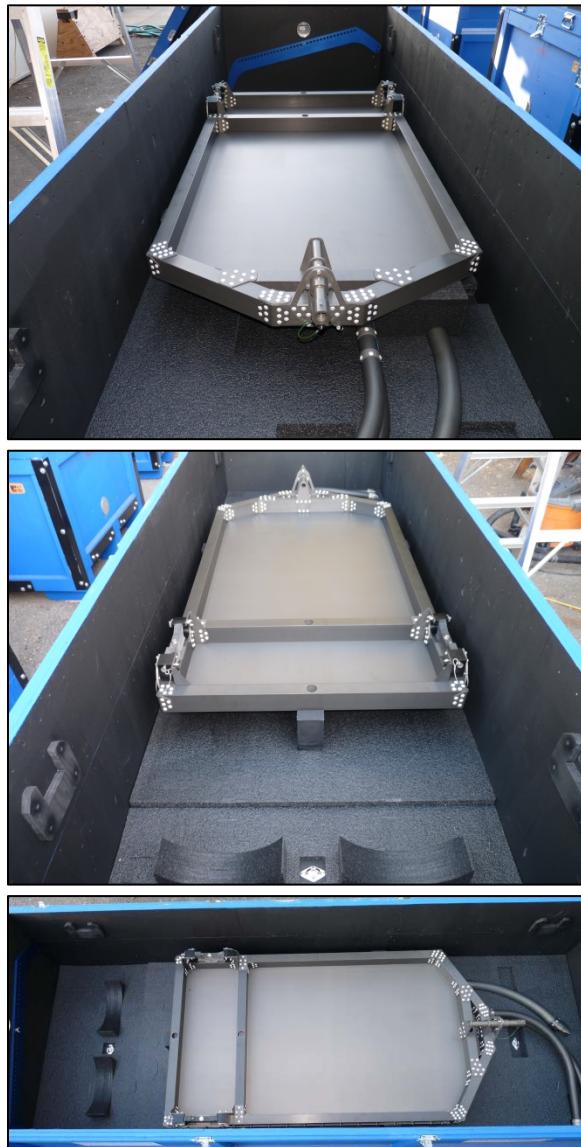
1. Lay front arch and rear arch into shipping box.



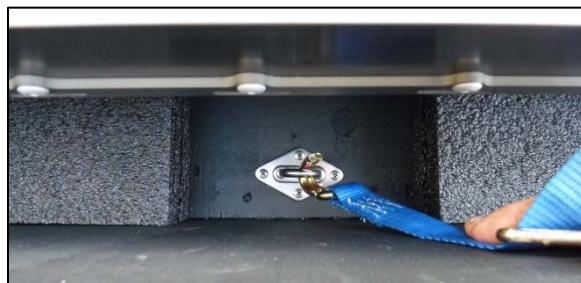
2. Insert arch foam supports.



3. Place payload tray upside down on 4x4 wooden standoffs, ensuring that the tray is constrained laterally and longitudinally.

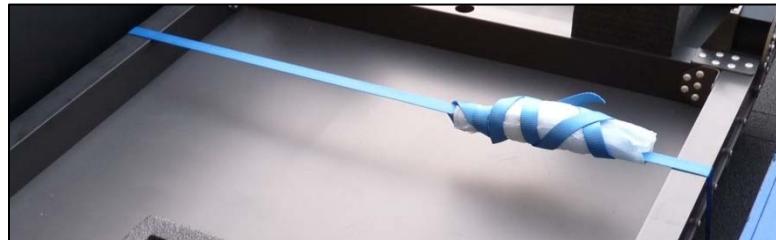


4. Secure the payload tray and arches with a single ratchet strap around the payload tray.

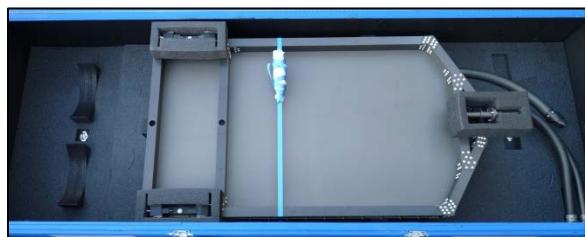
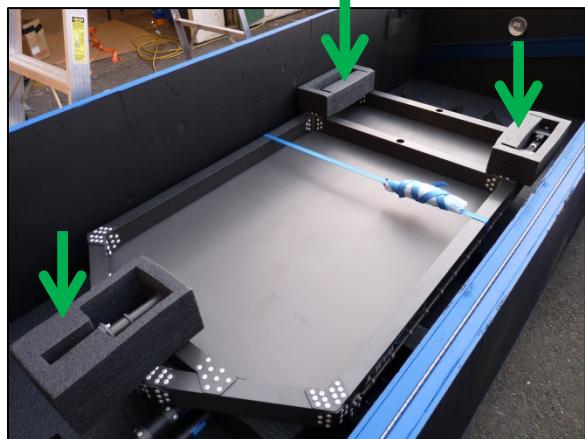




5. Wrap ratchet strap handle to prevent scratching and damage to hulls during transit.



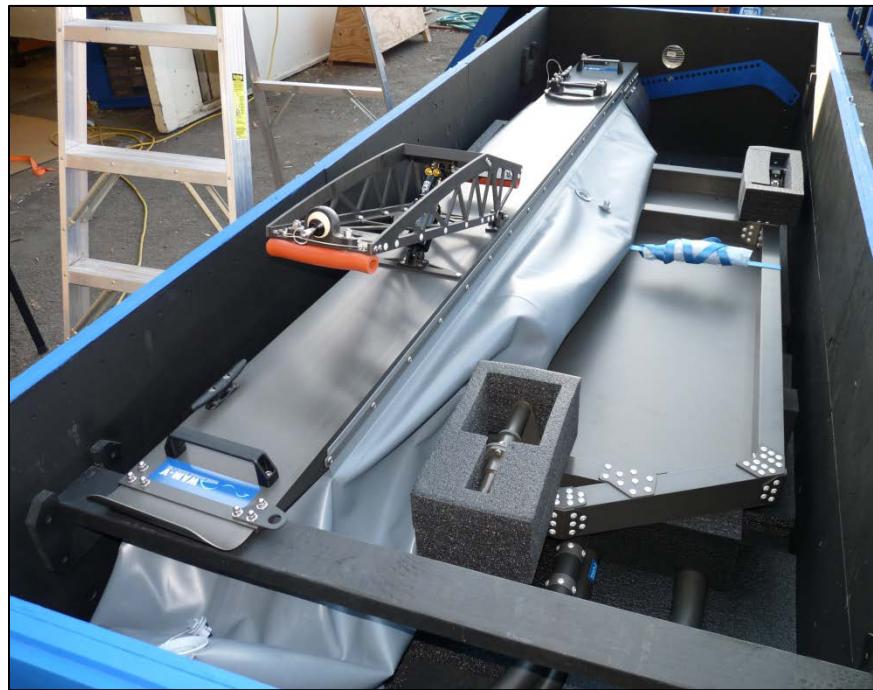
6. Attach hull protection foam to the payload tray.



7. Install front cross brace.



8. With hulls deflated and suspension air pressure removed, rest skis in the foam saddles with forward portion resting on the cross brace.

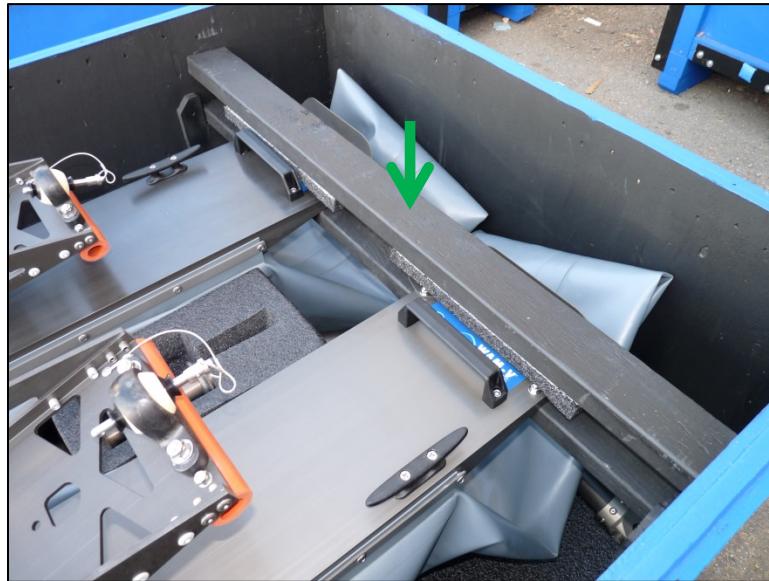


IMPORTANT: Ensure that the hull is not pinched when ratcheting down the skis.

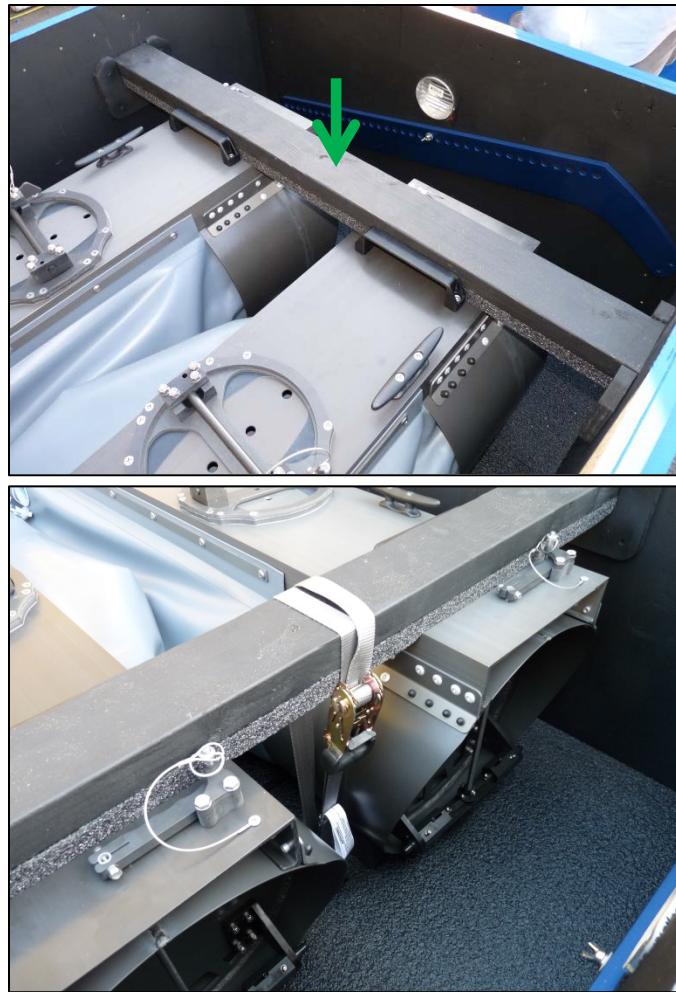




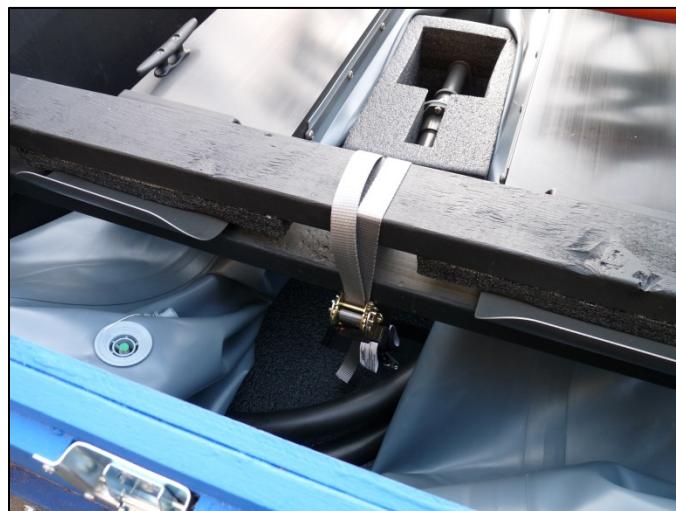
9. Place the front capture crossbar (foam side down) on top of the skis, just forward of the front lifting handle.



10. Place the rear capture crossbar (foam side down) into the guides on the side of the shipping box. Secure the rear capture crossbar with a ratchet strap.



11. Secure the front capture crossbar with a ratchet strap.



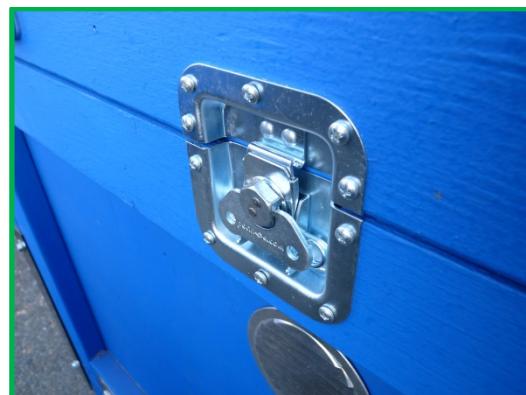
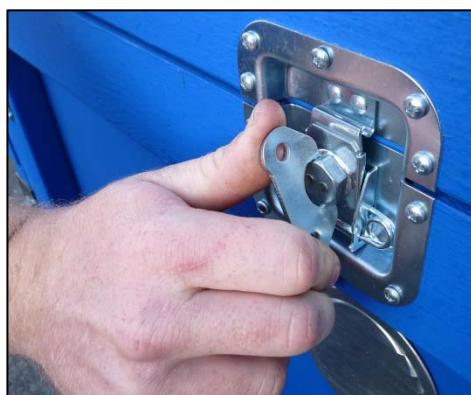
12. Check to make sure all components are secure and that suspension systems are deflated enough for lid clearance.



13. Place lid on shipping box. Be sure to line up the lid properly as indicated by the black paint marking at the corner of the box



14. Secure the lid by locking all fasteners.



Vendors: Component Specifications and Manuals

Hardcopies for all commercial off the shelf components are included with this manual. If hard copies are unavailable, digital copies may be downloaded via the links provided below (if available).

Cane Creek:

DB Air: <http://www.canecreek.com/tech-center/suspension/manuals>

SKS:

SAM Pump: See backside of included packaging for instructions on how to use, or contact an SKS representative via <http://www.sks-germany.com/index.php>.

Gommorizzo:

Hulls: <http://www.gommorizzo.it/index.asp>