



RESCUE
TRAINING & FABRICATION
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SUBMERGED VEHICLE TRAINER



SWIFTWATER

DIVE

RESCUE
SWIMMER

USER MANUAL V4.3





W AIVER OF LIABILITY KD FABRICATION AND DESIGN LLC.

W AIVER OF LIABILITY AND HOLD HARMLESS AGREEMENT

1. In purchasing and receiving a Submersible Vehicle Trainer otherwise known as an (SVT) produced and manufactured by KD FABRICATION AND DESIGN LLC, you hereby RELEASE, W AIVE, DISCHARGE, AND COVENANT NOT TO SUE KD FABRICATION AND DESIGN LLC, their officers, agents, or employees (hereinafter referred to as RELEASEES) from any and all liability, claims, demands, actions, and causes of action whatsoever arising out of or related to any loss, damage, or injury, including death, that may be sustained by you, or to any property belonging to you, while participating in such activity, while in, on or upon the premises where the activities are being conducted, REGARDLESS OF WHETHER SUCH LOSS IS CAUSED BY THE NEGLIGENCE OF THE RELEASEES, or otherwise and regardless of whether such liability arises in tort, contract, strict liability, or otherwise, to the fullest extent allowed by law.

2. You are fully aware of the risks and hazards connected with the activities of Swiftwater Rescue, Dive Rescue, or other activities utilizing the (SVT) and you are aware that such activities include the risk of injury and even death, and you hereby elect to voluntarily participate in said activities, knowing that the activities may be hazardous to yourself and property. You understand that KD FABRICATION AND DESIGN LLC does not require you to participate in this activity. You voluntarily assume full responsibility for any risks of loss, property damage or personal injury, including death, that may be sustained by yourself, or any loss or damage to property owned by you, as a result of being engaged in such an activity, WHETHER CAUSED BY THE NEGLIGENCE OF RELEASEES or otherwise, to the fullest extent allowed by law

3. By purchasing and taking possession of a SVT you further hereby AGREE TO INDEMNIFY AND HOLD HARMLESS the RELEASEES from any loss, liability, damage, or costs, including court costs and attorneys' fees that Releases may incur due to my participation in said activities, WHETHER CAUSED BY NEGLIGENCE OF RELEASEES or otherwise, to the fullest extent allowed by law.

4. This waiver and Hold Harmless Agreement shall bind the members of your family and spouse, if you are alive, and your heirs, company and or department for which you are employed, assigns and personal representative, if you are deceased, and shall be deemed as a RELEASE, W AIVER, DISCHARGE, AND COVENANT NOT TO SUE the above-named RELEASEES. You hereby further agree that this W aiver of Liability and Hold Harmless Agreement shall be construed in accordance with the laws of the State of W ashington and Pennsylvania, and that any mediation, suit, or other proceeding must be filed or entered into only W ashington or Pennsylvania and the federal or state courts of W ashington or Pennsylvania. Any portion of this document deemed unlawful or unenforceable is severable and shall be stricken without any effect on the enforceability of the remaining provisions.

IN RECIEVING THIS AGREEMENT, YOU ACKNOW LEDGE AND REPRESENT THAT YOU have read the foregoing W aiver of Liability and Hold Harmless Agreement, understand it and receive it voluntarily as your own free act and deed; no oral representations, statements, or inducements, apart from the foregoing written agreement, have been made; You are at least eighteen (18) years of age and fully competent; and you execute this Agreement for full, adequate and complete consideration fully intending to be bound by same.

YOU HEREBY CERTIFY that you are a current member of the Montgomery County PA Urban Search and Rescue Team who has purchased an (SVT) for water rescue activities and agree to this waiver of liability and by taking possession of the purchased SVT along with this user manual you will serve as a representative of Montgomery County PA Urban Search and Rescue Team in holding harmless and releasing liability of KD FABRICATION AND DESIGN LLC.

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	4/27/15	User's Manual Created
Rev. 1	5/3/16	Added SVT Pro-Stainless W (Welded) Model
Rev. 2	7/23/16	Revised Lift Bag Components and operations
Rev. 3	1/20/17	New Images added and exploded views
Rev. 3	3/1/20	Added new configurations and system components
Rev. 4.1	7/2/21	Added configurations for dual lift system

USER'S MANUAL

TABLE OF CONTENTS

	<u>Section</u>
1.0 GENERAL INFORMATION	1
1.1 Product Overview	1
1.2 Acronyms and Abbreviations	1
2.0 INTRODUCTION and SAFETY	2
2.1 System Configuration	2
3.0 SYSTEM COMPONENTS	3
4.0 USING the SVT	
4.1 Static Operations	4
4.2 Remote Operations	4
4.3 System Leakage	4
4.4 Configuration Chart	4
5.0 SUGGESTED RIVER OPERATIONS	5
5.1 Rigging for Vehicles in Water	5
6.0 TRAINING	6
7.0 CONTACT INFORMATION	7

1.0 GENERAL INFORMATION AND WARNINGS

- The SVT utilizes a low pressure (8psi) pneumatically operated lift bag. These bags are designed to be inflated by any type of pressurized device or vessel. However, it is strictly the user/operators responsibility to not over inflate the bag. The lifting action of the vehicle acts on the premise of volume not pressure, meaning it is designed to fill the bag to its full volume capacity and NOT to continue to pressurize the bag past 8 psi.
- The pneumatic lift bags are typically run off of high pressure SCBA bottles commonly exceeding 3000 psi. This system and vessel can be used without a regulator however the operator must ensure that the air released from the SCBA bottle be in a controlled fashion and never left opened and unattended. This will pressurize and try to equalize the pressure within the SCBA to the lift bag resulting in a failure of the bag.
- Only enough air should be applied to fill the bag to its capacity and maintain low pressure (ideally under 5 psi) “Cracking” the bottle and visually watching for the bag to reach its full capacity volume.
- The Lift bag has two Low pressure relief valves that will activate at approximately 8 psi. This can be determined visually when large bubbles start to appear if in water, or an audible hiss starts to be produced if out of water.
- KD Rescue / KD Fabrication recommend never putting live people into the SVT while in water or out of water. (NO LIVE ENTRY)
- Always use the rope strain reliever found within the umbilical to attach to the SVT
- Use caution when transporting the SVT utilizing the transportation wheels. These wheels are to be removed before placing the SVT into the water. They are also not intended to carry any load greater than the weight of an EMPTY SVT.
- Lateral movement, shock loading, and or dropping of the SVT while utilizing the transportation wheels could cause rim failure. Straight or reverse movements are recommended and if turning is needed lifting the front or rear of the SVT to pivot on two wheels is also recommended.
- The male exhaust fitting at the lift bag is permanently fixed to the bag. It is not designed to rotate or spin. Use caution when connecting or disconnecting the female fitting attached to the pony section exhaust to the bag. We recommend utilizing two wrenches, one to hold and stabilize the male exhaust fitting and one to rotate the female fitting.

1.1 Product Overview

The SVT is a submerged vehicle trainer for use by water rescue professionals in both still water and swift water applications. The SVT’s primary use is to facilitate training in the field of victim rescue from a vehicle. The engineering and manufacturing process is designed to accomplish two critical goals; 1. To withstand the harsh environments of flowing water while resisting rust and other environmental factors. 2. To ascend and descend within a water environment to facilitate

manikin reloading and SVT retrieval. These are both accomplished using stainless steel and aluminum components and a proprietary lift bag system. The SVT is designed to be used for Swiftwater rescue professionals, Dive teams and Rapid entry rescue swimmers. KD Fabrication and Design takes pride in their products and every effort has been made to minimize entrapment hazards, sharp edges and snag risks. At KD Fabrication and Design our ultimate goal is to reduce and eliminate injury to the end user by means of product testing and development. We do not advocate nor promote any particular rescue technique while working with the SVT, nor do we recommend a particular rigging technique while training with the SVT in the water environment. We believe it is the rescue agency or the authority having jurisdiction's (AHJ) responsibility to develop and institute safe operating procedures and rescue techniques while training with the SVT.

1.2 Acronyms, Abbreviations and Definitions

SVT – Submerged Vehicle Trainer.

AHJ – Authority Having Jurisdiction, An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

EH – Exhaust Hose, used to relieve air in the lift bag system facilitating descent of the SVT

EP – Eddy Plate, aluminum sheet that acts as a hood and windshield that helps create a realistic eddy while submerged in swift water.

SCBA- Self Contained Breathing Apparatus, used to inflate the Lift bag system

LBS- Lift Bag System, used to control the ascent and descent of the SVT

WHEELS- The wheels on the SVT are used for transportation purposes only, use in the water environment may lead to damage to the wheel or axle. Ensure ½" Hex head axle bolts are installed threads out so the nut rests against the wheel hub.

SEAT BELT POINTS- used to attach webbing or other software to simulate seatbelts.

SCBA SPRING CLIPS- Located at the rear of the SVT, used to hold a SCBA bottle while in use.

UMBILICAL- This is an add on option purchased separately by customer. Used to remotely transfer air to the lift bag system, it is comprised of a 3/8" fill hose with quick connect fitting, a 3/4' exhaust hose with quarter turn fitting and a strain relieving rope.

2.0 INTROCUCTION AND SAFETY

Before using the SVT, take time to get acquainted with the vehicle and its components and how they work. To protect your investment, we urge you to take responsibility for keeping your SVT well maintained. This includes making sure all fasteners are tight and present and all hoses clamps and connections are tight and in working order.

We also recommend you read this manual in its entirety before training with the SVT. This manual contains facts, instructions, illustrations, safety information, and helpful tips.

Maintenance and cleaning is relatively simple and should be performed before and after each use. A simple rinse using fresh water may be all that is needed depending on your use. Inspection of fasteners, quick links and all hoses for tightness and damage must be performed before each use.

This is a “Green” training adjunct, meaning no lubrication or consumables are used when operating the SVT. This means that the SVT may be used in rivers, pools, lakes or other bodies of water that pollution is of concern.

The SVT is designed to be a light weight alternative to an actual vehicle submerged in water. However, lifting and transportation should always be accomplished using 4 people and always use proper lifting techniques.

The SVT is made out of stainless steel and aluminum components, contact with unprotected skin may result in injury. Always use protection such as gloves, footwear, helmet and other safety items mandated by your AHJ.

NEVER enter the vehicle while in water, this could result in serious injury or death. The SVT was not designed to be occupied IN or OUT of the water. We recommend no more than an arm’s length of entry for manikin retrieval.

The SVT is also designed to be suspended from a rope or other anchoring device. If using such a device always expect rope or anchoring failure and have appropriate escape routes available at all times. If using the SVT without an anchoring device EXPECT MOVEMENT! Treat the SVT as you would a typical car in water and use your AHJ recommended rescue techniques and guidelines.

Like any other inflatable device used for water activities the SVT’s lift bag is a pneumatic operated system governed by a relief valve set at 8 psi. This means you cannot over inflate it. Like other inflatable systems always have a backup plan in case of failure.

The lift bag system is designed to work with a common firefighting SCBA, you may use other inflation methods however you must understand and know their capabilities.

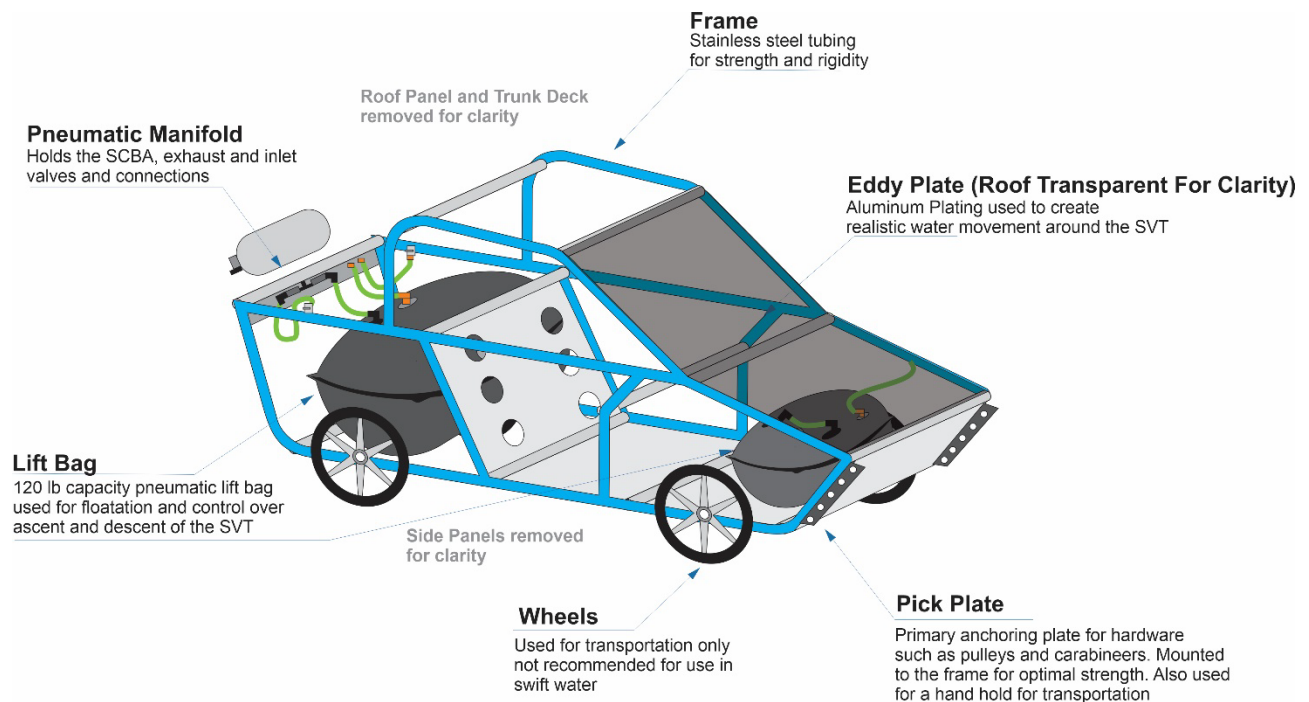
2.1 System Configuration

Your SVT incorporates 3 major systems, the frame, body panels, and the pneumatic lift bag and associated hoses and fittings. The frame is made of stainless-steel tubing and is welded using a Tungsten Inert Gas process for optimal strength and durability. The frame will withstand years of use with minimal maintenance.

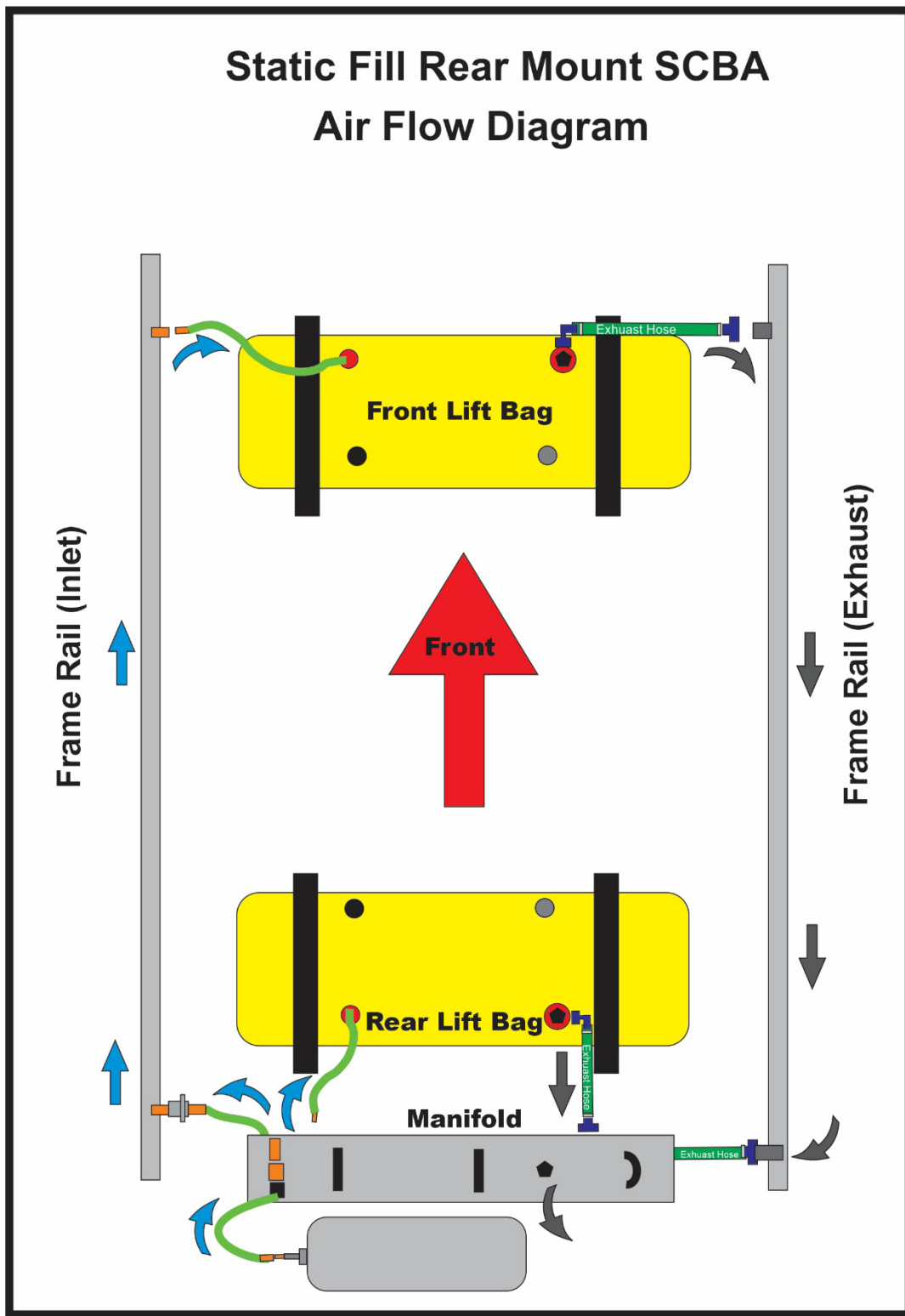
The body panels are made of 5052 Aluminum plating for weight reduction and increased lifespan. Each panel is mounted using hex drive bolts and fasteners. Plates may be removed depending on the application but for safety purposes we recommend leaving all of them in place.

The pneumatic lift system uses a two 120 lb capacity lift bags with a built-in pressure valve that limits the internal pressure to no more than 8 psi. This safety feature must not be tampered with or modified in any way. The inlet pressure is delivered by a 3/8" NPT pneumatic hose with female quick connect fittings. This is attached to a male quick connect mounted on the Pneumatic Manifold or left frame rail. The exhaust valve (EV) is a -12 AN fitting located on the bag and receives a female connection that is attached to 3' section of 3/4" hose that terminates at a -12 fitting located at the Pneumatic manifold. The lift bag itself is secured using quick links that are attached to tabs welded to the frame assembly. This system may be omitted in its entirety depending on your application.

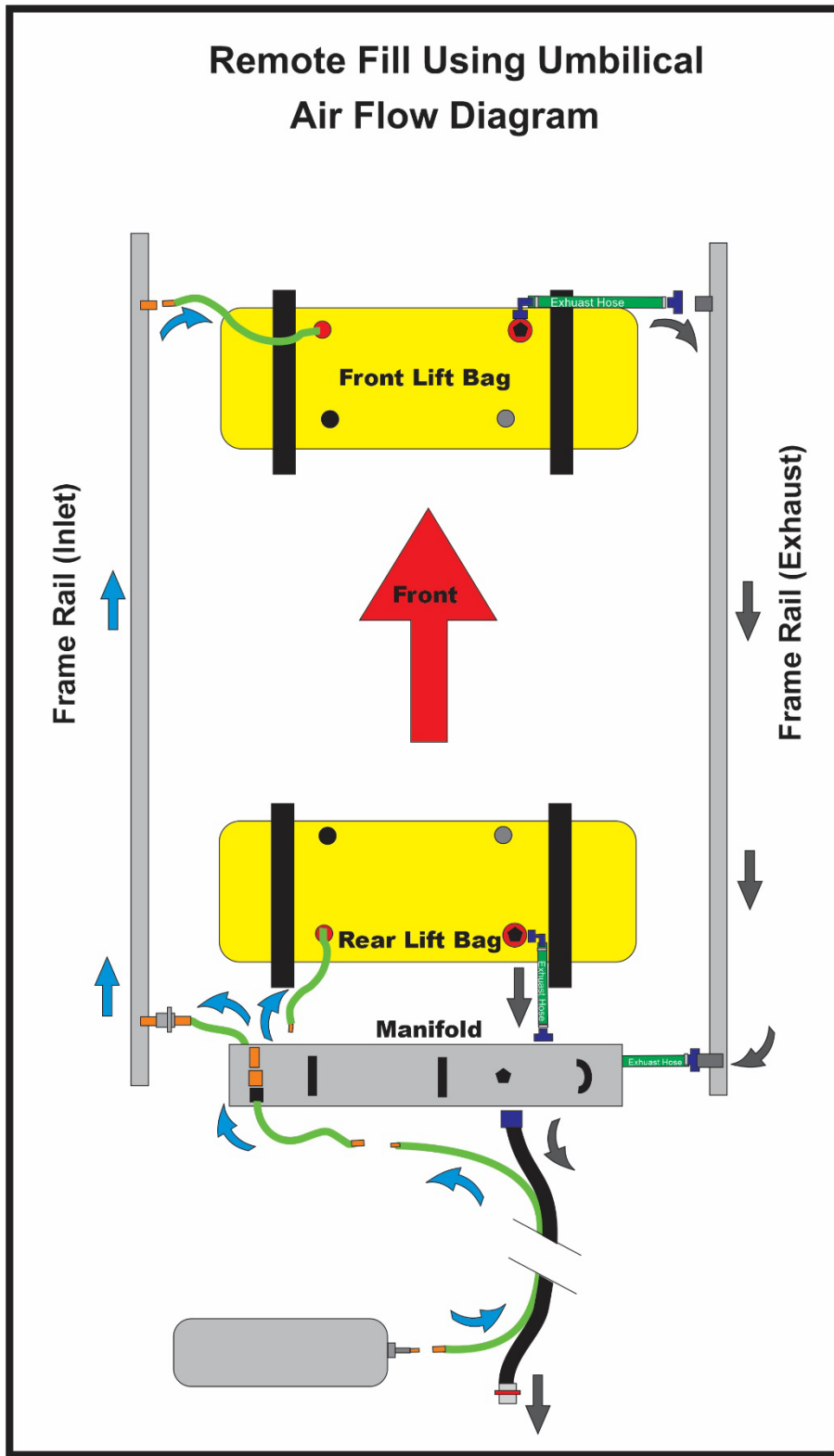
A 30' umbilical is also provided for remote fill and exhaust applications. The umbilical incorporates both inlet and exhaust hoses that attach to the Pneumatic Manifold. Never attach umbilical directly to a lift bag or the pneumatic manifold without attaching the strain relief rope, damage or injury may occur. Always use the strain relief rope that attaches to the ring welded to the Pneumatic Manifold.



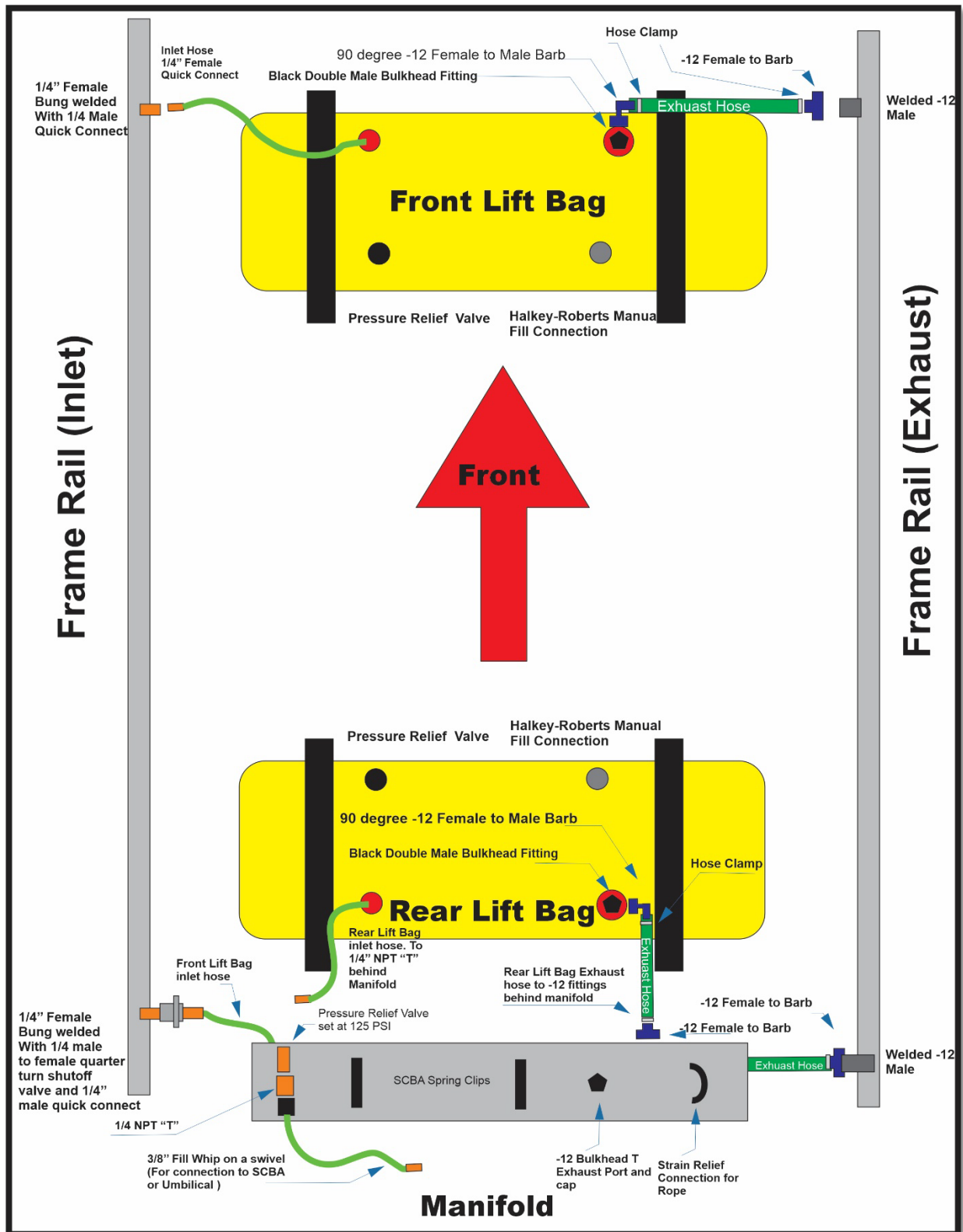
2.1 System Configuration



2.1 System Configuration

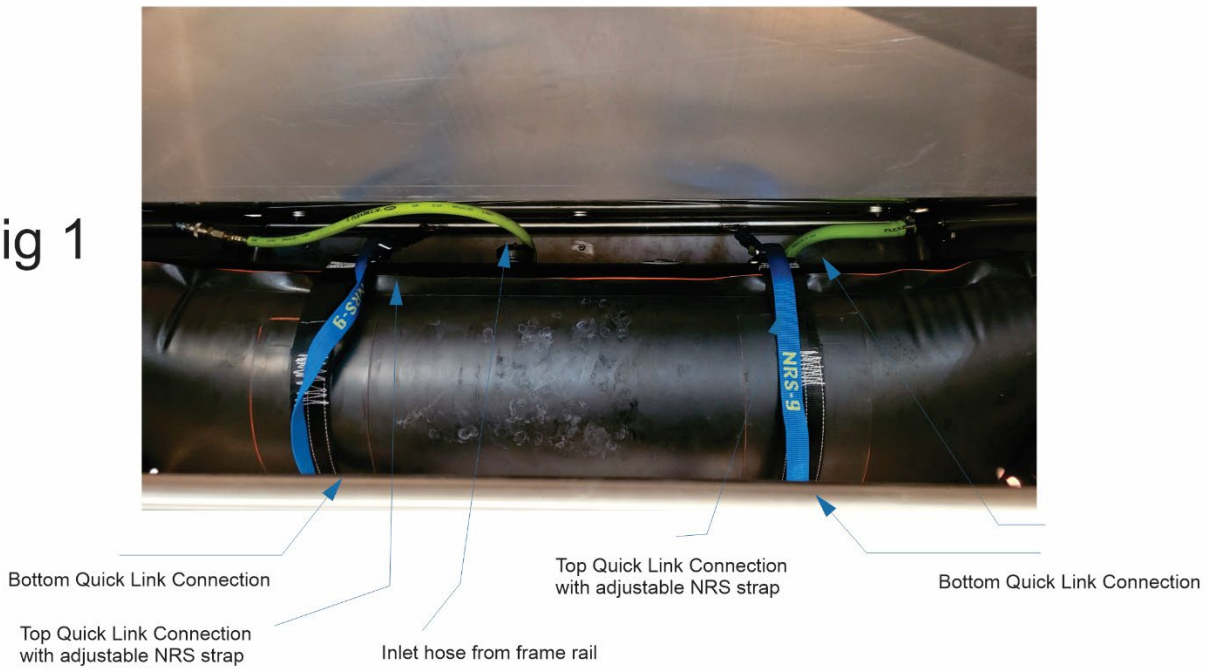


Pneumatic Lift Bag Assembly



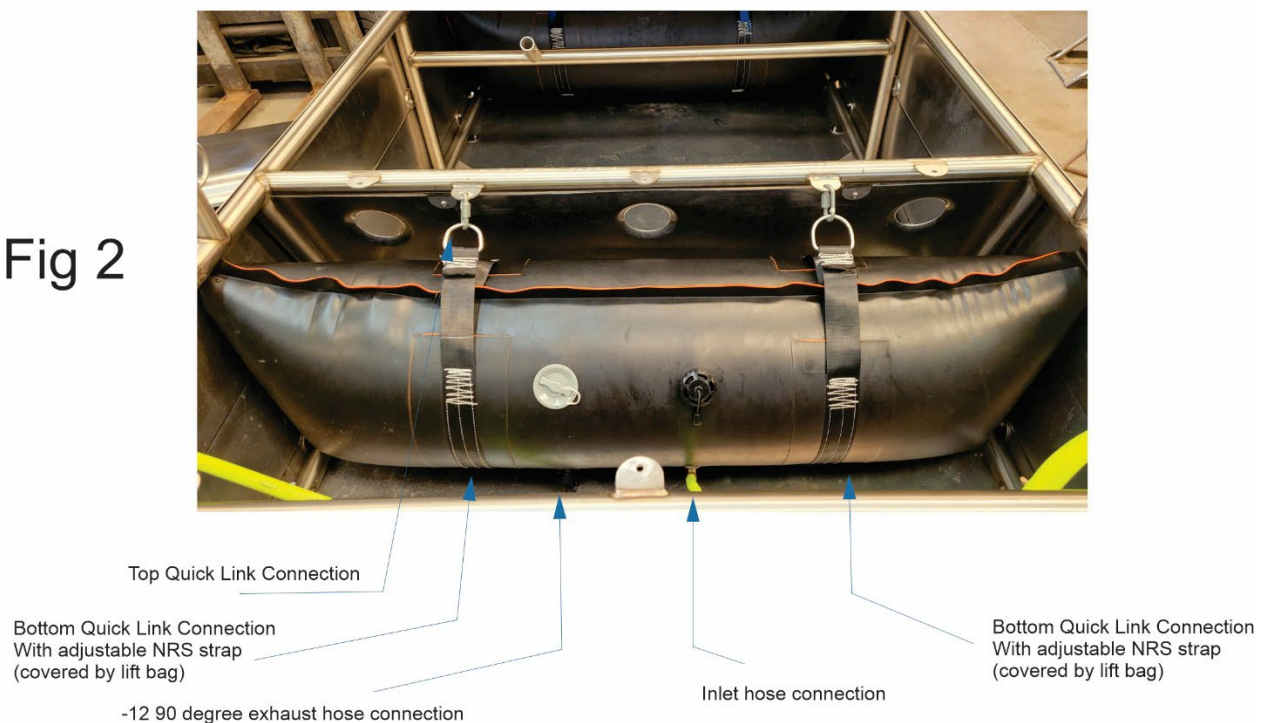
Front Lift Bag Connection (hard connection to lower crossmember)

Fig 1



Rear Lift Bag Connection (hard connection to top crossmember)

Fig 2



Exhaust Manifold Fittings (Fig 3)

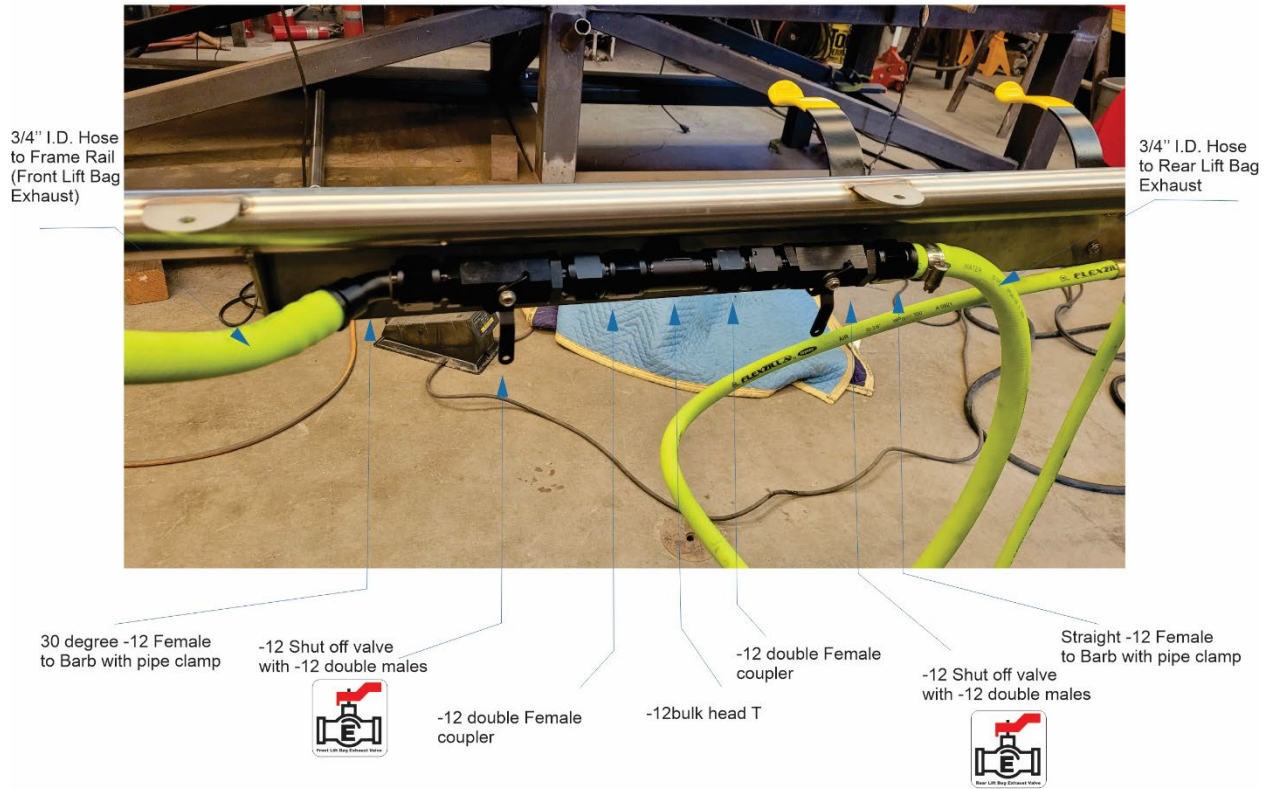
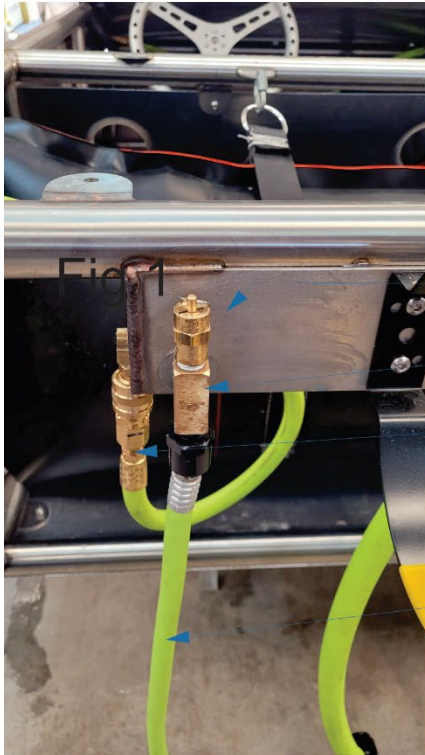


Fig 4

Rear View



Inlet Manifold Fittings

Fig 5

Pressure relief valve set at 125 psi

1/4" T NPT

3/8" Inlet hose with Female quick connect to frame rail (front lift bag supply)

3/8" Inlet hose and swivel with female quick connect (attaches to SCBA or Umbilical)

Front View



Fig 6

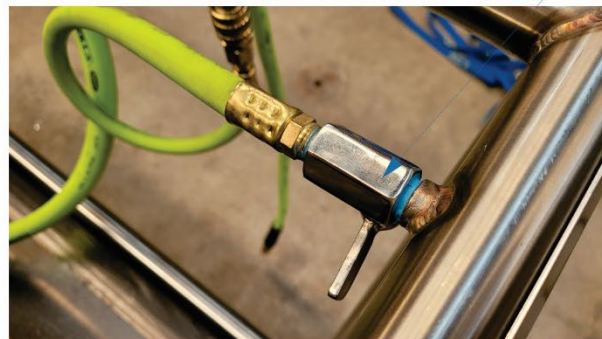
1/4" female T NPT

1/4" 90 degree NPT with Male quick connect

Female quick connect and hose (supplies rear lift bag)

Fig 7

Front Lift Supply Valve

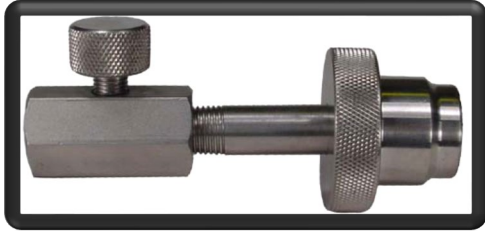


Our Lift bag comes with 4 connection points and “D” rings for mounting similar to fig 1 and 2 above. The SVT is designed to be used in one of two modes, Static and Dynamic. The static mode that may be used in lieu of the umbilical, is the mode primarily used in swiftwater environments where the umbilical may become damaged or is not needed. The SCBA connects directly to the Pneumatic Manifold and no exhaust hose is used. This allows for inflation and deflation manually. This mode is a good choice when representing a partially submerged vehicle in a river. The SVT sits in a trunk up configuration and stays floating until retrieved.

CRITICAL! Never tighten the -12 Female exhaust hose fitting to the lift bag without securing the jam nut with a second wrench. Damage, failure, and increased leakage may occur. If this happens, the lift bag will have to be sent back to KD Fabrication for repair at the customer's expense.



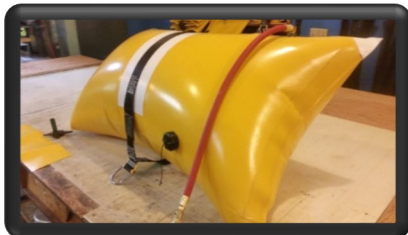
3.0 SYSTEM COMPONENTS



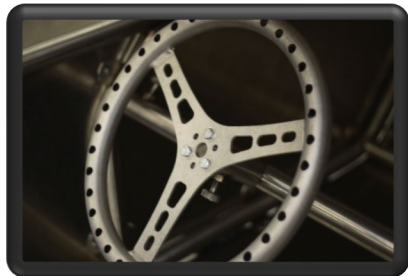
CGA-347 Fitting
Provided CGA-347 fitting to connect an SCBA bottle to
The Inlet hose of the umbilical or directly to the bag



30 'Inlet / Exhaust Hose
For use as umbilical
And manifold sections



(2) 120 lb Low Pressure Lift Bag
Bags shown in yellow for clarity



(1) Aluminum Removable Steering Wheel

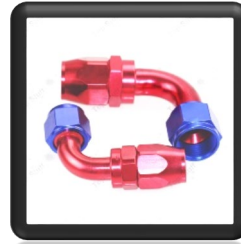


**(4) 13'' Steel Non-Flat 1/2'' Bore Tires and Rims
With 1/2'' X 5.5'' Steel Axle Bolts**

3.0 SYSTEM COMPONENTS



(1) Exhaust hose Bulkhead Fitting (Black)



(1) 90 degree Elbow (Black)



(1) 30" Pony Section Inlet Hose



(1) NRS Straps



Hex Drive Fasteners And nuts



(1) 3/4" PVC T Handle Ball Valve



(4) Steel D Rings



Bulkhead T

We supply all replacement parts, pricing subject to change and availability. Frame work and replacement aluminum panel pricing is subject to current metal pricing and must be shipped back to our facility for repair or duplication. Call 253-350-5631 for pricing and lead times

4.0 USING THE SVT

After all system safety checks have been done you are ready to start training with the SVT. First you will have to determine what capacity and environment you want to train in. As said before, the SVT can be used in two different configurations, Static and Remote. Also, what water source will you be training in, swiftwater, pool, or lake? Will it be Dive, Rapid entry swimmer, or Swiftwater rescue? Once you have determined the water source and capacity you can configure your SVT for the safest operation and optimal performance.

4.0.1 SAFETY

The SVT is supplied with two styles of pressure relief valves. Each Lift bag has 2 built in pressure relief valves that are set to 2 psi. These valves can be identified by the pull strings attached to the raised black fitting on each bag. These valves can be manually operated or will start to release as the bag reaches the 2-psi mark. A second pressure relief valve is located on the inlet hose "T" mounted to the manifold. This valve is set to 125 psi and can also be manually activated. This valve is the overall safety mechanism for the inflation system, activation of this valve usually indicates a blockage in the pressure side of the lift system, commonly a pinched hose. **IF REAR PRESSURE RELIEF VALVE ACTIVATES, STOP OPERATIONS IMMEDIATELY AND CHECK HOSES AND CONNECTIONS FOR BLOCKAGE.**

The SVT is designed to float on the surface of the water in two configurations, flat (if using the two lift bag model, both lift bags inflated) or engine down, rear lift bag inflated only. It is also designed to dynamically submerge by exhausting air within the lift system. Dynamic submerging and lifting the SVT may result in uncontrolled positioning or listing (car may come to rest on its undercarriage, side, or roof) This can be minimized by the controlling the flow rate of the lift system exhaust or by deflating one lift bag at a time. Many training scenarios demand that active swimmers help position and manipulate the controls of the SVT while in the water, this is common in both swiftwater and stillwater environments. **SWIMMERS MUST EXERCISE EXTREME CAUTION WHEN WORKING AROUND THE SVT IN WATER, UNCONTROLLED MOVEMENT AND SUDDEN SUBMERSION CAN OCCUR. THE SVT IS NOT DESIGNED FOR HUMAN ENTRY, NEVER SWIM INTO OR UNDER THE SVT WHILE CONDUCTING IN WATER TRAINING DEATH OR INJURY MAY OCCUR. ALWAYS ENSURE SHARP EDGES ARE NOT MAKING CONTACT WITH THE LIFT BAGS AND THEIR COMPONENTS. LIFT BAGS SHIFT PERIODICALLY AND MAY COME IN CONTACT WITH PANEL FASTENERS. SILOCONE CAULKING OR OTHER PROTECTIVE PRODUCTS ARE RECOMMENDED TO COVER THE PANEL FASTENERS AND NUTS THAT PROTRUDE INTO THE LIFT BAG COMPARTMENTS.**

4.1 STATIC OPERATIONS

The SVT static operations mode refers to eliminating the umbilical and pressurizing the lift bag using the SCBA. Once desired lift is achieved the SCBA is closed and can remain in the spring clips or removed all together leaving an inflated lift bag and no other components. This is usually done in fast moving water or river operations. This eliminates the chance for

entanglement or damage to the umbilical. It also orients the SVT in a trunk up position which is common on sinking vehicles or vehicles afloat.

4.2 REMOTE OPERATIONS (Umbilical option if supplied)

Remote operations refers to the addition of the supplied umbilical hose to facilitate ascent and descent of the SVT remotely. This is a common practice with Dive and Rapid entry rescue swimmer operations and helps position the SVT in still water, pools and lakes. The ability to remotely fill and deflate cuts evolution reset times dramatically and allows for a dedicated controller to operate the movement of the SVT.

4.3 SYSTEM LEAKAGE

As with most inflatable adjuncts and hoses, leakage is common, however the rate at which leakage occurs can vary depending on connections, age of components and proper setup and usage. Small bubbles coming from the seams of the lift bag itself is common and should be monitored for an increase in velocity and quantity. Leakage from fittings may indicate a loose or improper connection. Nothing in this system is completely air tight, always double check your fittings and monitor the airbag before calling our customer service line.

4.4 CONFIGURATION CHART

Recommended Configuration

USE	STATIC	REMOTE
DIVE (Still water)		✓
DIVE (Current)	✓	
SWIFTWATER	✓	
RAPID RESCUE SWIMMER (Still Water)		✓
RAPID RESCUE SWIMMER (Current)	✓	

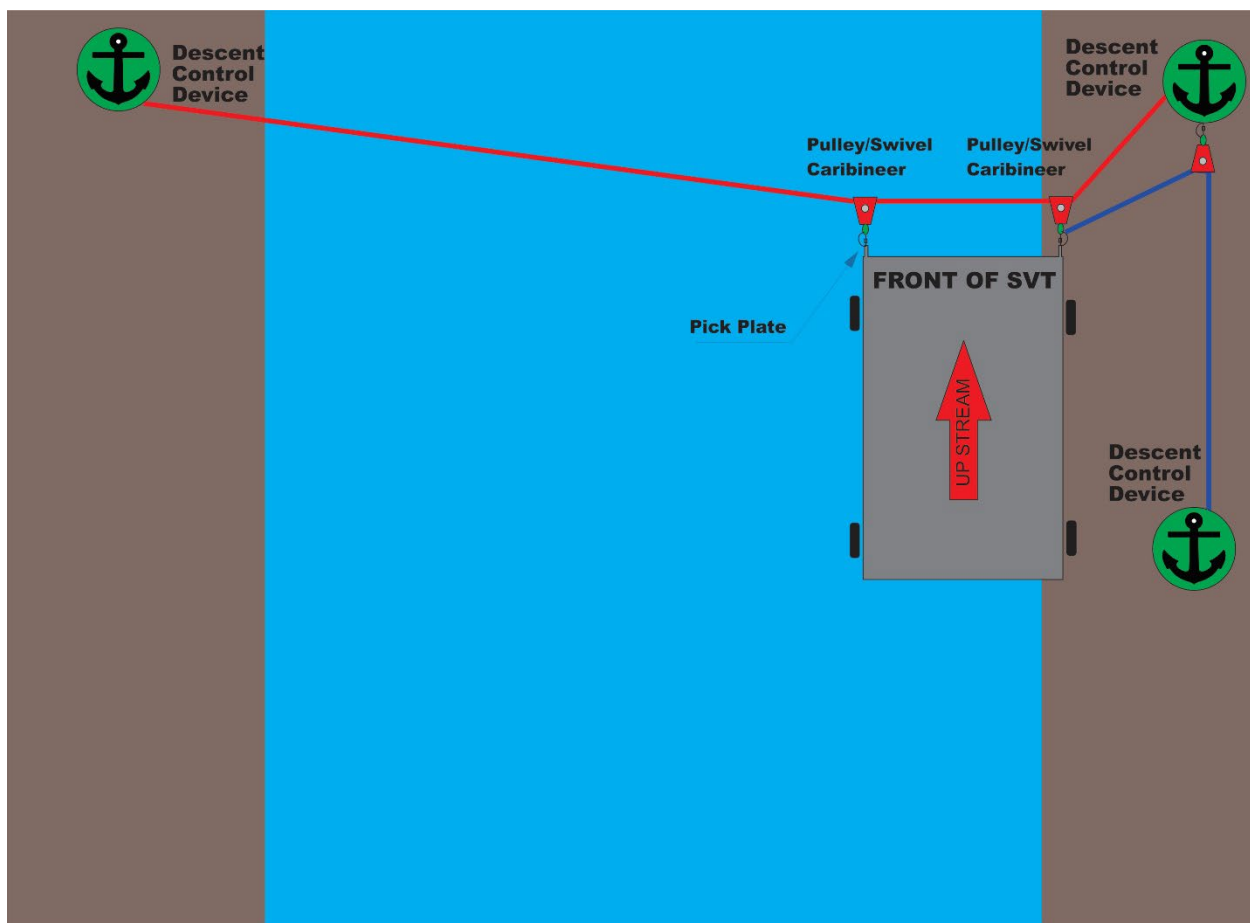
Current = Greater than 1 Knot

This chart is based solely on our research and development and is a recommendation only with regard to product damage and rescuer safety. operating outside this chart is done so at the users own risk and must be done so using extreme caution.

5.0 SUGGESTED RIVER OPERATIONS

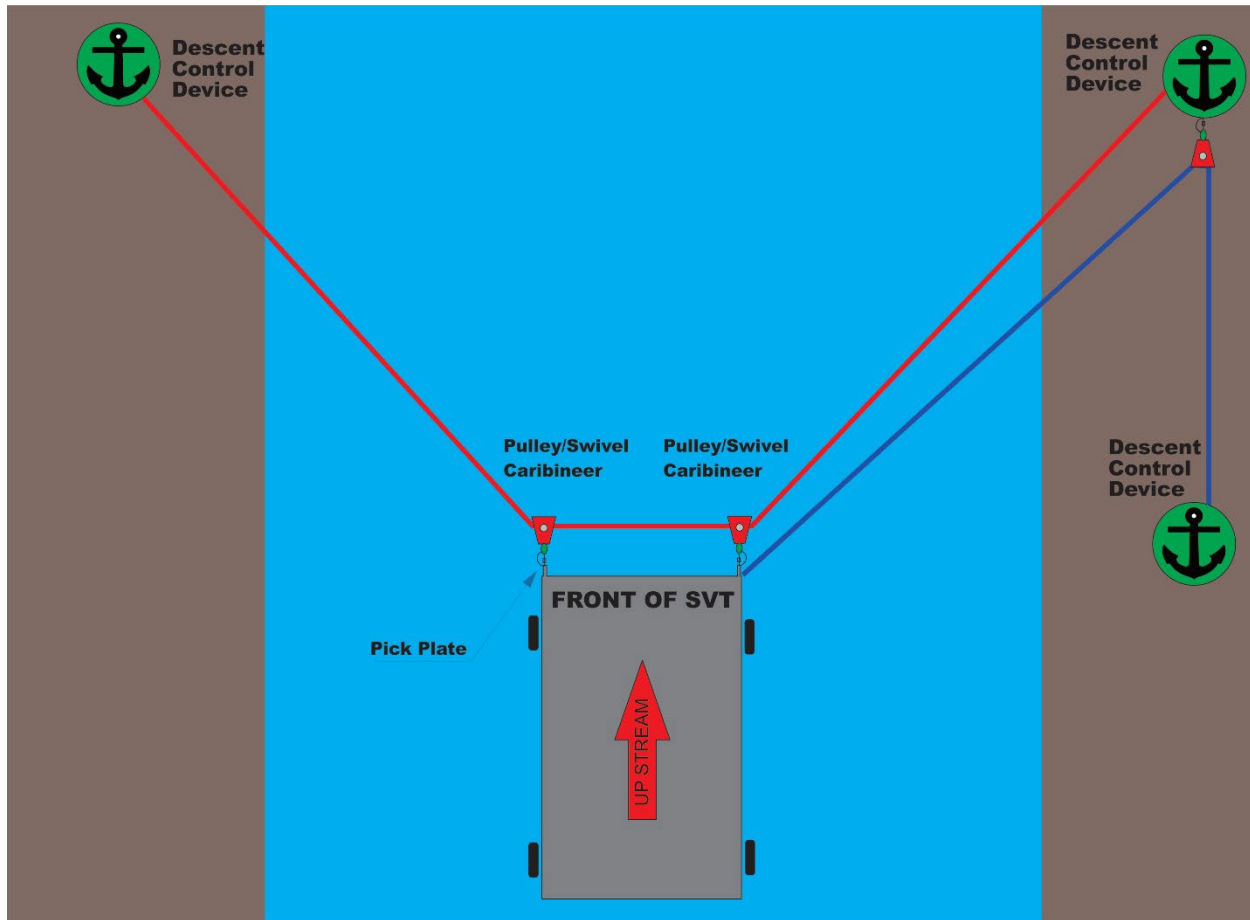
We here at KD Fabrication and Design take training seriously. We are comprised of Water rescue professionals, fabricators, fireman, rope technicians and above all Safety officers. We make our products as safe and realistic as possible. We have spent countless hours in and around rivers, pools, lakes and other bodies of water. Given that, we have developed rescue techniques rigging applications and training adjuncts that deliver real life training scenarios. The following is a recommendation for setting up your SVT in a dynamic body of water such as a river or canal. It is by no means the only way to do it but has served us well in our training endeavors.

5.1 RIGGING FOR VEHICLE IN THE RIVER



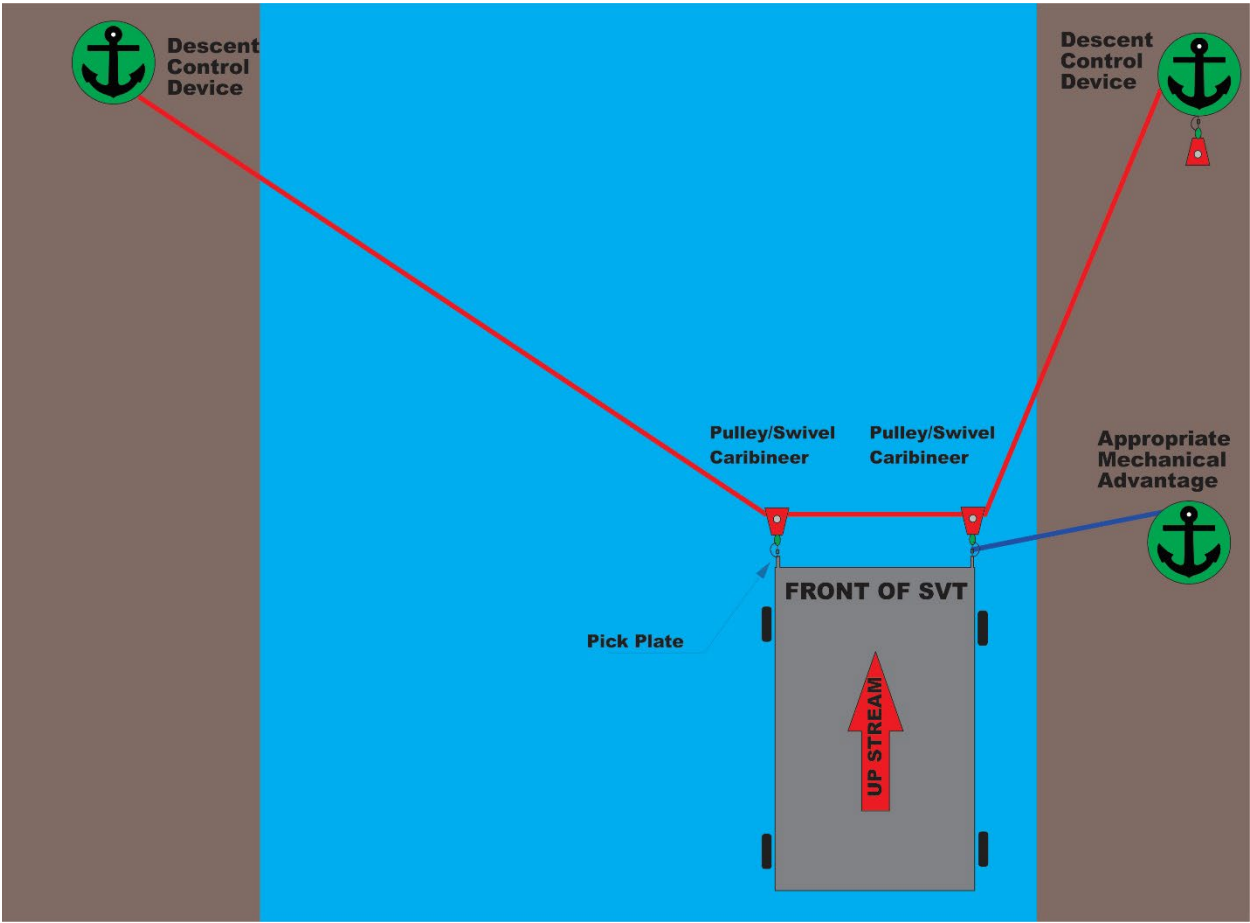
Stretch a Tracking line across the river (Red), this should have a descent control device rigged to both sides on a bomb proof anchor. Rig a control line (Blue), through a change of direction on the Track line anchor, then to a separate anchor downstream where the SVT is intended to stop. This line will lower the SVT into position. Adjust the Tracking line to account for critical angle and distance downstream.

5.1 RIGGING FOR VEHICLE IN THE RIVER



Allow for the SVT to find the middle of the current vector, this will allow for limited lateral movement and provides the most stable position. Once this is done remove the control line from the tracking line pulley and rig an appropriate hauling system.

5.1 RIGGING FOR VEHICLE IN THE RIVER



To retrieve the SVT, simply start to haul on the control line while simultaneously letting out the Tracking line on near side. This will use the current to help push the car into shore while hauling on the control line.

6.0 TRAINING

Utilizing safe rigging and basic water rescue concepts the SVT can safely be operated in most bodies of water giving the rescuers valuable training that otherwise is logistically very hard to incorporate into training evolutions. As with any training adjunct or discipline the SVT takes a requisite knowledge of basic components and functions as well as a knowledge of its limitations. Along with product knowledge, the operators of the SVT must train on the rigging component and safe handling and operations of said SVT. Classes are available through KD Fabrication and Design that instruct trainees how to safely operate the SVT in a dynamic environment as well as in pool and still water operations. Train the trainer classes and basic vehicle in water classes that concentrate on rescue techniques for vehicle in water evolutions are also available upon request. We can also customize classes to your needs. We can't stress enough the value of training with the SVT prior to in water operations. Please contact us with any questions regarding training, replacement parts, vehicle customizations, and general operation questions. Thank you for your business, train hard, train realistic and above all keep training.

7.0 CONTACT INFORMATION

Mailing Address: P.O. Box 1566 Buckley, WA 98321

Phone: 253-350-5631

E Mail: KnuckleDragger1@gmail.com

Website: www.knuckle-dragger.com

Facebook: <https://www.facebook.com/KnuckleDraggerFabrication/>

Patrick O'Brien - Owner/Operator/ Customer service and support

Jeff Hartjoy - Owner/Operator

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