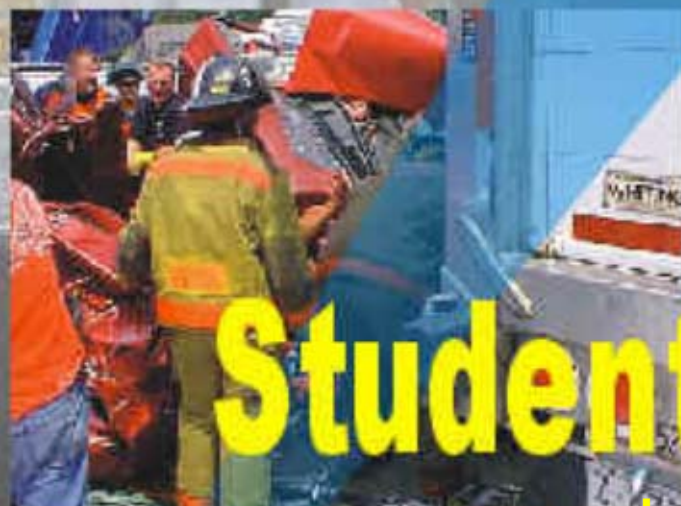


# VEHICLE EXTRICATION



## Student Manual

Len Watson & Ron Shaw

# Motor Vehicle Extrication

## Student Manual

Licensed to:

*extrication.com*

*Vehicle Extrication - Basic Skills Program*

*19 Baldwin Circle,*

*Plymouth, MA 02360*

*USA*

### INTRODUCTION

This manual was developed to augment the Basic Vehicle Extrication Program. We ask that you review this manual prior to the course. This will greatly aid you in the learning process. This manual is a guide to the practical evolutions and will allow you to review techniques when you return to your department.

### LEARNING OBJECTIVES

It is the aim of this course to provide the basic skills on various extrication evolutions and procedures to allow the student to manage and conduct an efficient rescue of entrapped persons involved in a vehicle collision,

In order for a student to be able to accomplish the aim of this course, it is important that they learn the theory and the techniques and evolutions of extrication from experienced instructors.

To have a proper working understanding of these objectives, it is essential that students receive both classroom instruction as well as the 'hands-on' practical experience provided by this basic extrication course within a controlled environment.

### ACKNOWLEDGEMENTS and REFERENCES

We express appreciation and thanks to the following and acknowledge these books as an excellent reference resource.

- Advanced Vehicle Entrapment Rescue - User Guide for Power Rescue Tools - *New revised edition 'RTC extrication RESCUE': resQmed: L Watson: 2005: ISBN 978-09550551-7-1*  
*To view, go to - [www.resqmed.com/RTC extrication rescue.htm](http://www.resqmed.com/RTC_extrication_rescue.htm)*
- Volvo Side Impact Air Bag Emergency Protocol 1996
- High Pressure Rescue Air Bag Operator's Manual Maxiforce Technical Assistance Advisor
- IFST A Rescue Handbook
- Carbuster's Incident Command Module
- Carbuster's vidoes

# Vehicle Extrication - Basic Skills Course

## *Student Schedule*

### **COURSE INTENARY -**

Classroom Theory  
Practical Evolutions

To be advised

### **PLEASE NOTE -**

All Sudents registered on the course will be issued with the course itenary prior to the date of commencement.

As you will appreciate a firm timetable cannot be set for all practical sessions. Therefore your instructor will inform you about breaks during the practical sessions.

Students must bring the following with them for the Practical Sessions. They must meet the required standard and be of servicable condition

- Helmet with full faceshield. Bourke Shields will not be allowed. In addition safety goggles/ glasses must be worn.
- Leather work gloves
- Turn-out coat
- Bunker pants
- NFP A type boots 3/4 boots will only be allowed if issued by your department

If in the opinion of the Safety Officer or Lead Instructor your equipment violates a safety issue you will not be allowed to participate during the practical evolutions; i.e. unservicable personal protection.

Your Lead Instructor has the final say in any dispute. Horseplay will not be tolerated on the drill site. Students will observe all safety rules and will fully impliment them when orderes to do so.

If the student or instructor feels that the student has not mastered a procedure, or the student is unsure about instructions, the procedure will be re-run.

The Instructor may ask the student to revisit the Manual and revise certain areas. An instructor's critique is not to undermine the student but to underpin these new skills.

# Vehicle Extrication - Basic Skills Course

*Student's personal notes*

Drill Site Location

Dates

\_\_\_\_\_ Meet at the fire station

\_\_\_\_\_ Go directly. to drill site

Location

**Directions**



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**Vehicle Extrication - Basic Skills Course**

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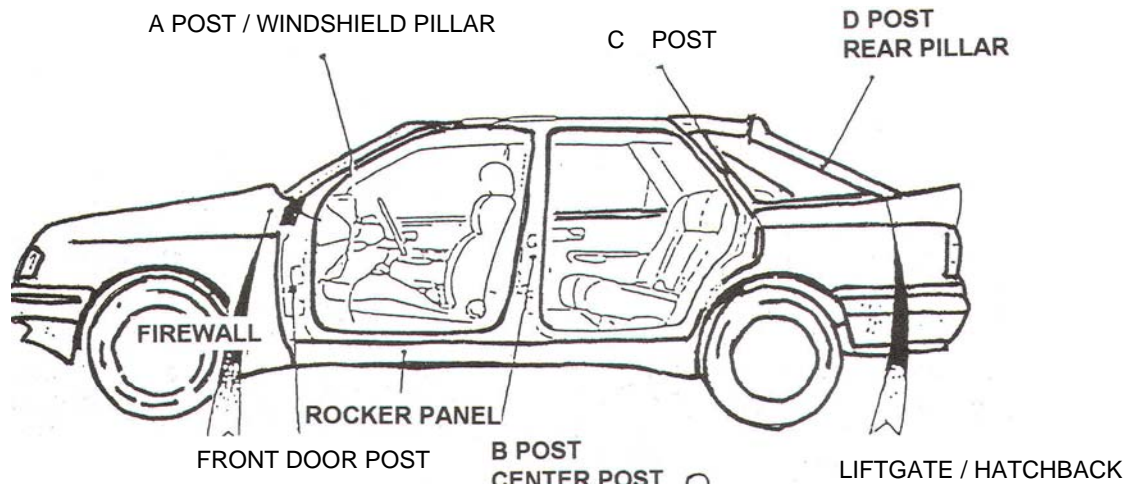
**Special Situations**

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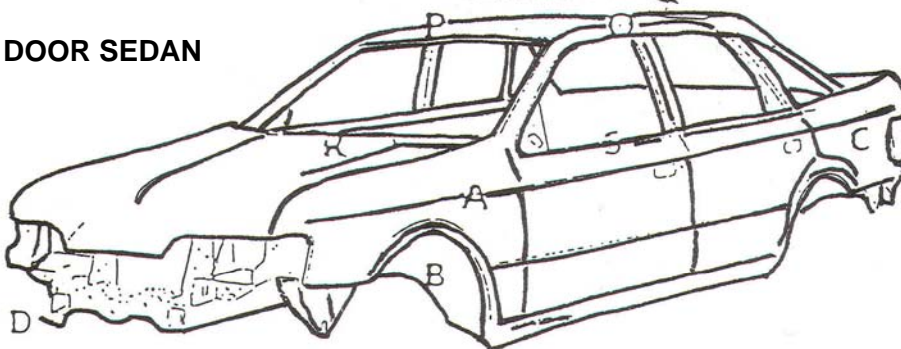
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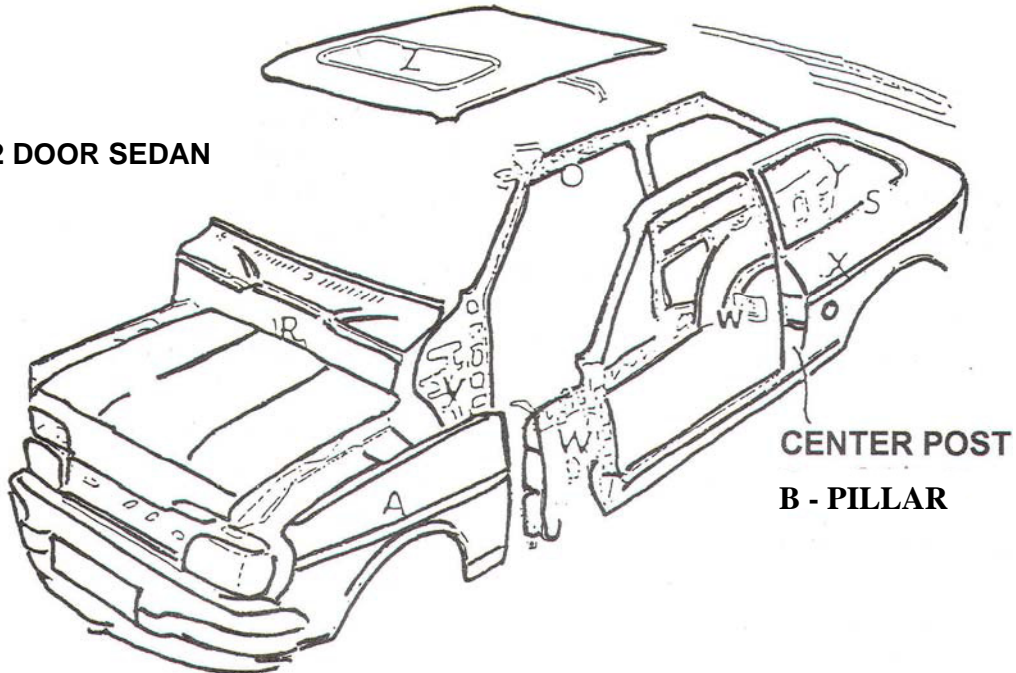
# VEHICLE PARTS



**4 DOOR SEDAN**

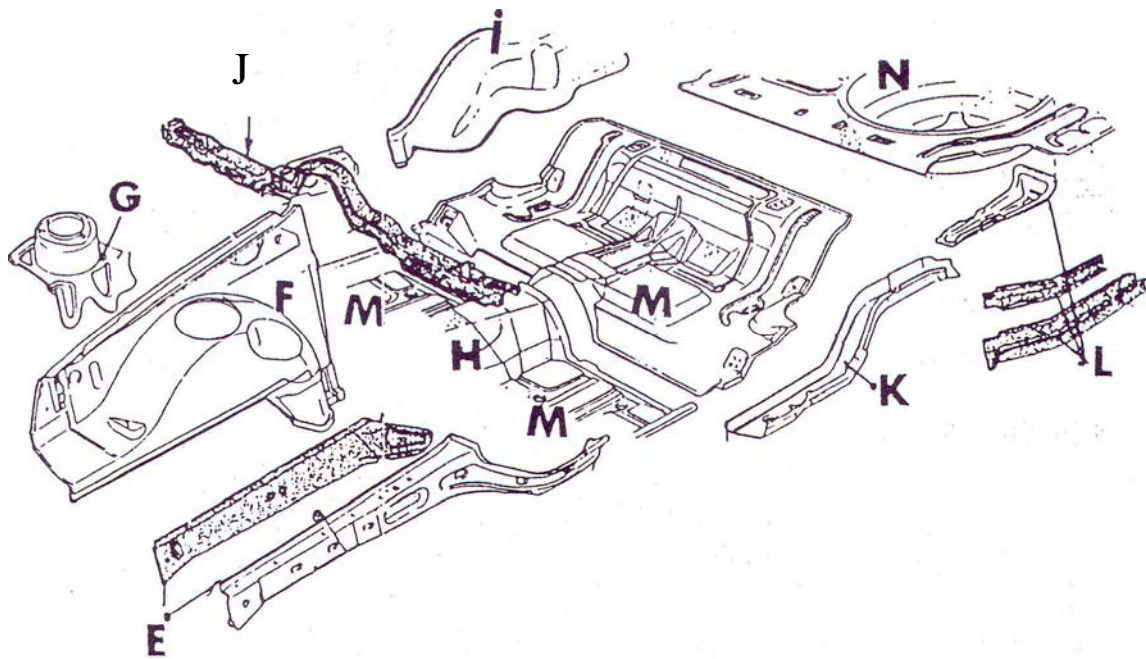


**2 DOOR SEDAN**



**CENTER POST  
B - PILLAR**

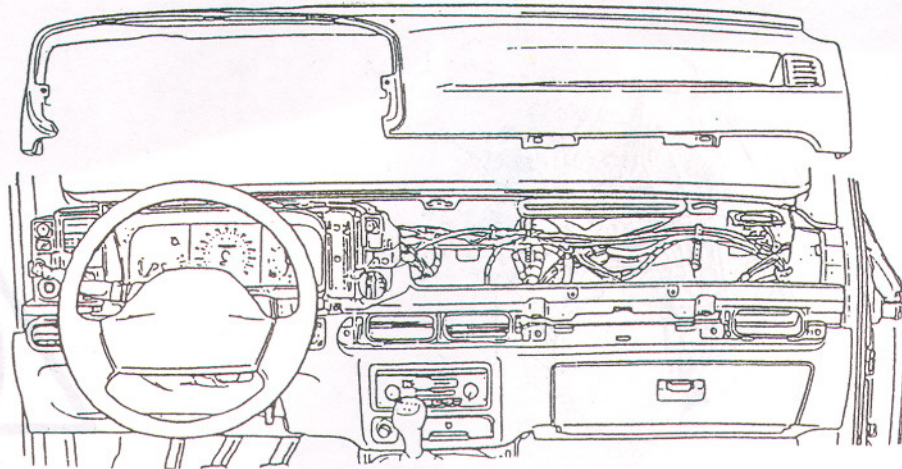
**Components:** (Panels, Linings, Connecting Plates, Reinforcements, Mountings and Bracing Components)



- |  |  |
|--|--|
| A. Front Fender/Wing                                     | N. Trunk Board                                     |
| B. Plastic Fender Lining                                 | O. Roof Siderail/Cantrail                          |
| C. Rear Fender   | P. Front Roof Rail                                 |
| D. Front Crossbeam and Locking Plate                     | Q. Rear Roof Rail                                  |
| E. Front Sidebeam and Locking Plate / Front longitudinal | R. Firewall/Bulkhead                               |
| F. Inner Front fender                                    | S. Window Line                                     |
| G. Independant Strut Location Housing                    | T. Side Panel Assembly                             |
| H. Transmission Tunnel                                   | U. Front Fender Reinforcement                      |
| I. Inner Rear Fender                                     | V. Sidewall  |
| J. Front Seat Crossmember                                | W. Door Hinge & striker Plate Reinforcement Plates |
| K. Side Beam   | X. Rear 1/4 Panel                                  |
| L. Rear Sidebeam, Connecting Plate and Extension         | Y. Rear 1/4 Window                                 |
| M. Floorboard / Floorpan (Front and Rear)                | Z. Sun Roof  |



## ASSEMBLIES



*THE DASH:  
Crash pad top and facia*

### FRONT SEAT BELTS

The front seat belt buckles are mounted to brackets which are attached and secured to the front seat frame by two Torx bolts. The inertia reel retractor assemblies are located at the base of the center post and are concealed behind the pillar trim panels.

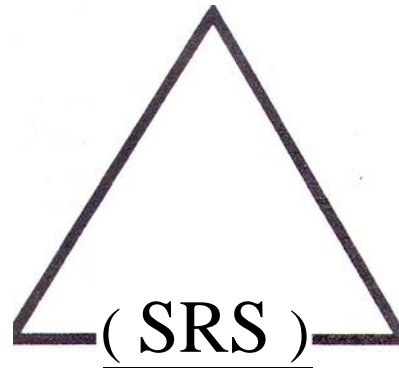
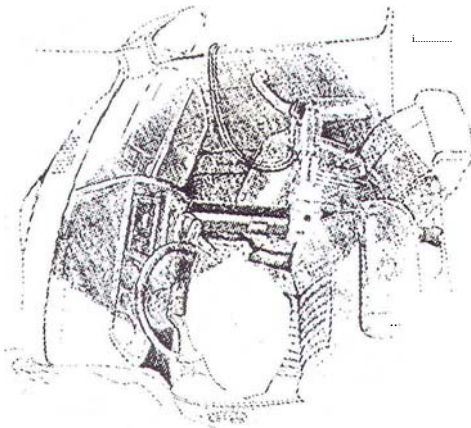
The webbing passes behind the two lower sections of the center post trim and is fed out through the joint between the center and top sections. It then passes through the upper anchor and finally returns on the outside of the trim panels to be secured at the base of the center post.



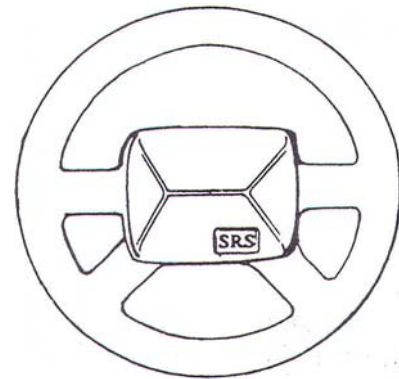
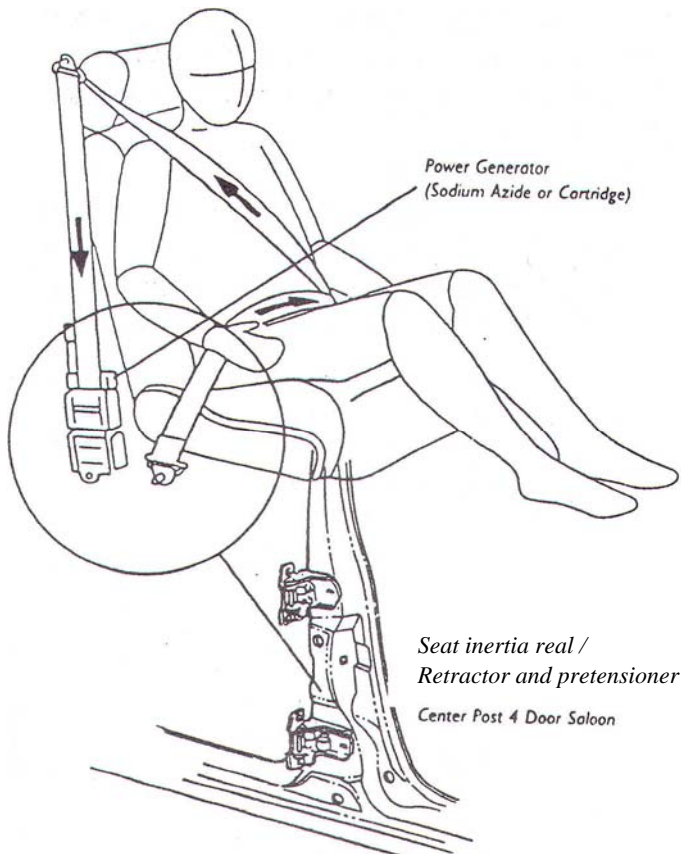
### LAP AND SHOULDER HARNESS

The lap and shoulder restraint assembly incorporates the anchor point and retractor inside the door structure.

SUPPLEMENTARY RESTRAINT SYSTEM (SRS)  
 PASSIVE AIRBAG RESTRAINTS AND SEATBELT PRE-TENSIONERS



**SEATBELT PRE-TENSIONER**



**RECOGNIZING SRS**

IF NOT DEPLOYED:



Check for larger or more rectangular steering wheel hub.

Look for name or initials embossed on steering wheel hub trim cover.

- 'AIRBAG'
- 'SRS'
- 'SIR'





# SIPS BAG

## **SIDE IMPACT AIRBAGS (SIPS)**

In 1995 Volvo introduced the side impact airbags. Beginning in 1996, all Volvo models (850/960) will have SIPS as a standard. The Side Impact Airbag was developed to help increase protection of front seat passengers in certain side impact collisions.

The side impact bags are located in both front seats, and are independent of each other and the SIR (frontal airbags). Each side impact airbag is a self-contained mechanical non-electrical, pyrotechnic system consisting of three main components:

- ~ Sensor Unit
- ~ Pyrotechnic Firing Circuit
- ~ Cushion Module (airbag)

When using extrication equipment, it is possible to deploy the SIPS Bag if the sensor is hit. The side impact airbag will activate if the seat side panel receives sufficient pressure or a hard blow. It may also activate if the door is closed and there is an object between the door and the seat side panel.

According to the manufacturer, this system should only be deactivated in an emergency situation. It is the Academy's opinion this is not a basic vehicle extrication technique and will not be performed in this course.

The system will not normally deploy in the event it is exposed to fire. In the case of severe fire, the gas generators may reach high temperature and ignite after several minutes. The gas composition from the gas generator consists mainly of nitrogen (N<sub>2</sub>), carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>).

Further information may be obtained directly from the manufacturer, Volvo Customer Service at 8 - 458 -1552.



On Windshield  
 Label on the windshield combined with the SRS label. The label indicates that the car is equipped with SIPS bag.

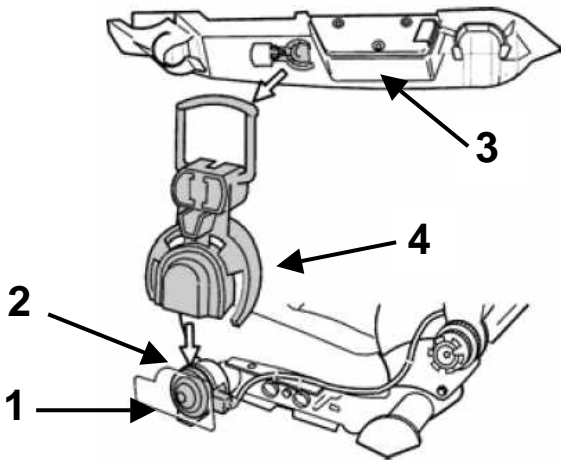
## ~. SIPS BAG



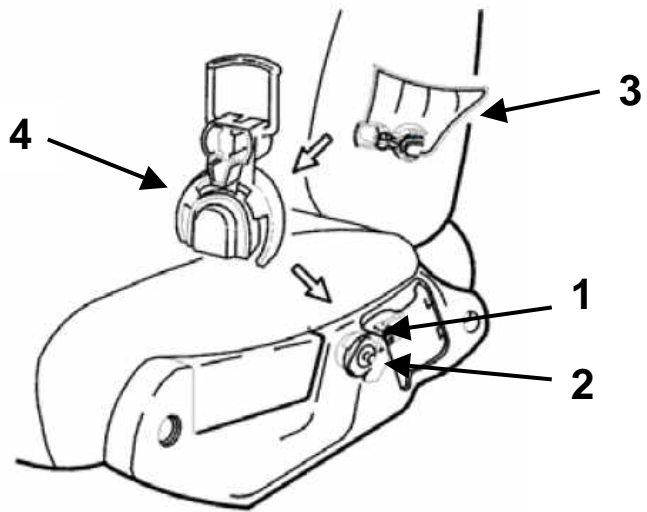
Other Labels  
 Seat panel is marked with SIPS bag symbol.

# SIPS BAG - Side Impact Protection System

### 850 SERIES

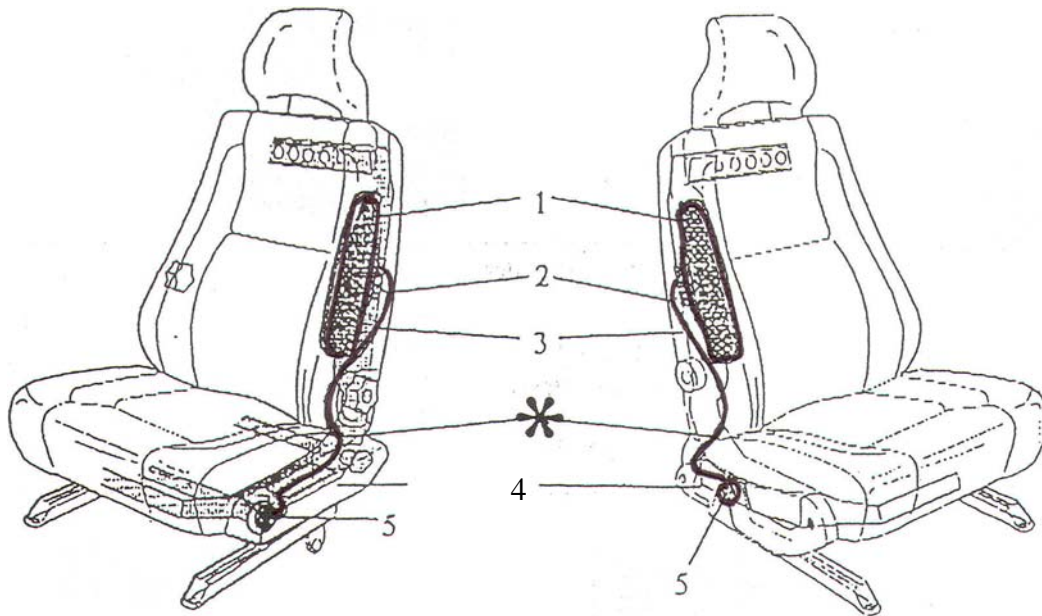


### 960 SERIES



- 1 - Sensor Unit
- 2 - Pressure Plate
- 3 - Seat side pocket/cover panel
- 4 - Red "safety hat" cover

## SIDE IMPACT AIRBAG - DESCRIPTION / FUNCTION OF COMPONENTS



### 850 Series

Driver Side

### 960 Series

Passenger Side

### Components

1. Side Impact Airbag - cushion module
2. Igniter lines
3. Ribbed, black cable - protective sleeve
4. Seat side pocket (850)/Cover panel (960)
5. Pressure plate/sensor unit

The Side Impact Airbag cushion module is mounted on the frame of the front seat backrest and is concealed by the upholstery as shown above.

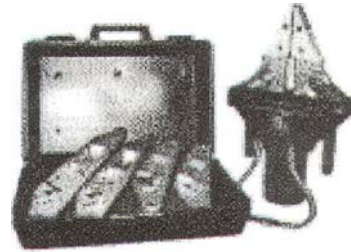
The sensor unit is mounted on the outer edge of the seat and is concealed by the seat side pocket. A pressure plate installed in front of the sensor unit serves to absorb and distribute the force of the collision from the inner skin of the door to the sensor unit.

The igniter lines, which have a common, ribbed, black cable, are run through the backrest and underneath the seat to prevent damage from the backrest folding mechanism.

# HEAVY HYDRAULIC TOOLS



ML-32 Spreader  
 32 inch Spread  
 16,000 Ibs of Spreading Force  
 14,000 Ibs of Pulling Force  
 52 Ibs Total Wt



Transformer Spreader	24 in	32 in	40 in
Spread	24 in	32 in	40 in
Spread Force ( lbs)	31,800	22,300	15,750
Pulling Force ( Ibs)	20,000	13,100	10,100
Length	23.75	28.5	33.25
Total Weight (lbs)	56	59	62



J-11 Straight Cutters  
 25,000 Ibs  
 70,000 Ibs 7.  
 inches 49.71bs

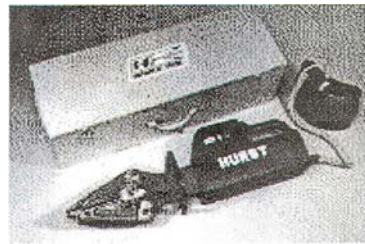


JL - 150 \"0\" Cutters  
 25,000 Ibs  
 70,000 Ibs  
 7.25 inches  
 36 Ibs

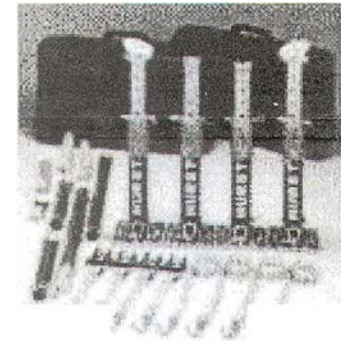
Cutting Force at Center  
 Cutting Force at notch  
 Depth  
 Weight



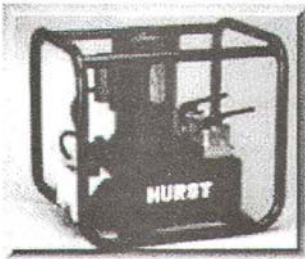
M L-16S Maverick  
 Spread Force 13,000 Ibs  
 Pull Force 8,100lbs  
 Opening Distance  
 inches 9 inches  
 Cutter Opening  
 Dept 7.3 inches  
 Weight 20 lbs



New Battery Operated  
 Combination Tool



Vehicle Stabilization System Warthog H-24 Aluminum locking struts with a crush strength of 24,000 ' Ibs.



**JL-AC-SI 220 Electric**

Features 110 volt, 4 hp, dual lines for simultaneous operation, pump capable of 10,000 psi, but is set at 5,000 psi for operating Hurst equipment total weight is 133 lbs.

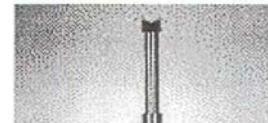
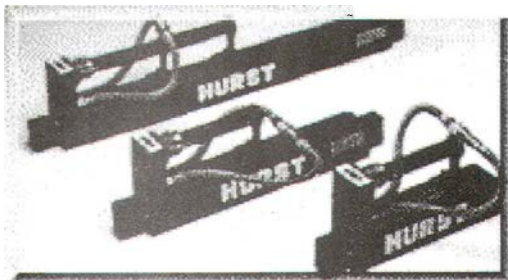
**Mighty Lite Power Unit**

Features two stage pump capable of 10,000 psi, but set to Hurst 5,000 psi operating system. Total weight 55 lbs.



**JL-4GH-SI Simultaneous Power Unit**

Features 5.5 hp four cycle engine, dual lines, pump capable of 10,000, but set at operating pressure of 5,000 psi for use with Hurst equipment. Each tool should be able to operate at full power independently.



**Hurst Rams**

<u>JL-20C</u> Open	
Length Close	22 inches
length Open	15 inches
Force Closing	15,708lbs
Force Total	N/A
Weight	18.11bs

<u>JL-30C</u>	
Open Length	36 inches
Closed Length	23 inches
Opening Force	15,708 lbs
Closing Force	9,572 lbs
Total Weight	24.4 lbs

<u>JL-60C</u>	
Open Length	60 inches
Closed Length	35 inches
Opening Force	15,708 lbs
Closing Force	9,572 lbs

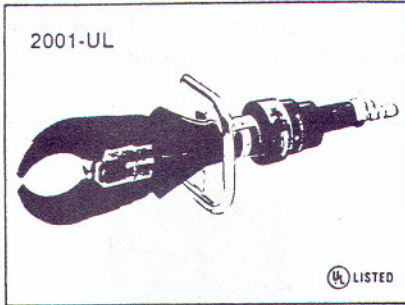
**JL Telescoping 30 Ram**

Opening Force	21,500lbs
Closing Force	N/A
Open Length	40.6 inches
Closed Length	18.1 inches
Width	4 inches

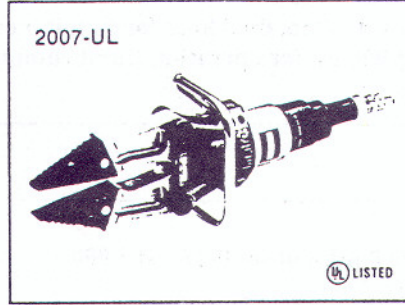
Note: There is a ram extension set for all the JL-30/60 rams. Lengths are 6,10 and 15 inches.



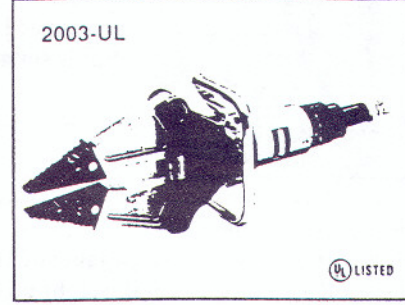
# HEAVY HYDRAULIC TOOLS



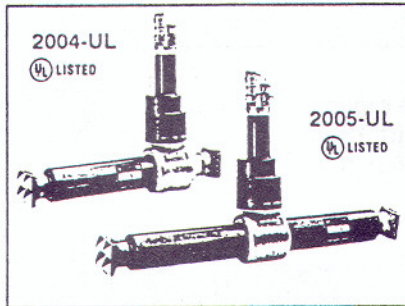
**rescue cutter, model 2001-UL**  
 blade opening : 5 inches  
 max. cutting force : 63,400 lbs.  
 weight : 26.4 lbs.



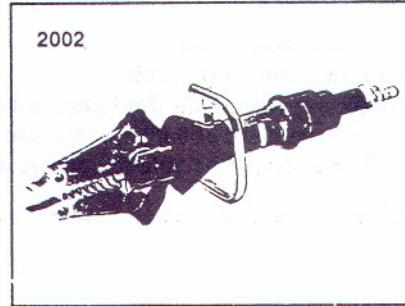
**rescue spreader, model 2007-UL**  
 max. spreading : 27 inches  
 max. spreading force : 18,175 lbs.  
 max. pulling force : 11,200 lbs.  
 weight : 42.13 lbs.



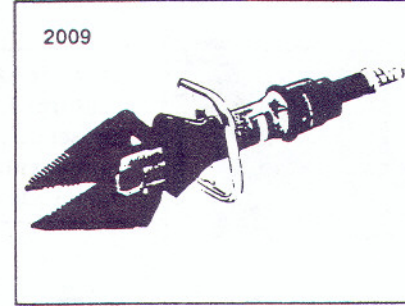
**rescue spreader, model 2003-UL**  
 max. spreading : 32 inches  
 max. spreading force : 33,000 lbs.  
 max. pulling force : 13,600 lbs.  
 weight : 54.5 lbs.



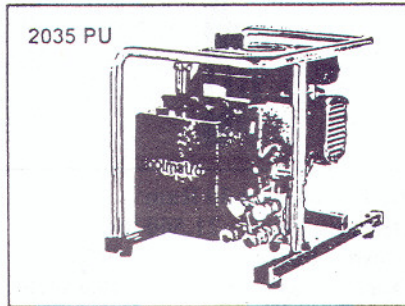
**versatile hydraulic rams, 2004-UL 2005-UL**  
 length closed : 21.25 in. : 30.5 in.  
 length extended : 31 in. : 50 in.  
 max. spreading force : 36,350 lbs. : 36,350 lbs.  
 max. pulling force : 11,200 lbs. : 11,200 lbs.  
 weight : 26 lbs. : 34 lbs.



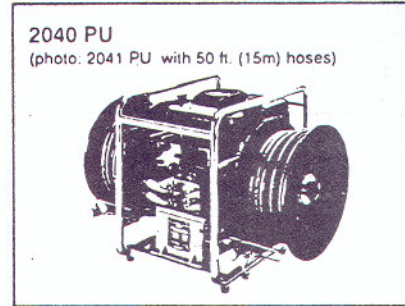
**combi-cutter, model 2092**  
 max. opening at the tips : 12.6 inches  
 max. cutting force : 64,600 lbs.  
 max. spreading force : 9,900 lbs.  
 max. pulling force : 16,100 lbs.



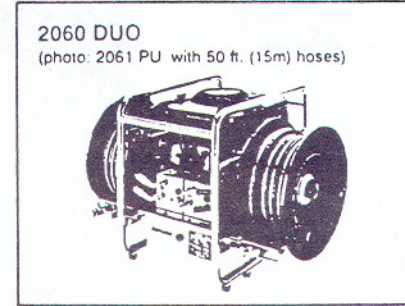
**rescue cutter, model 2009**  
 blade opening : 10.5 inches  
 max. cutting force : 67,200 lbs.  
 weight : 33 lbs.



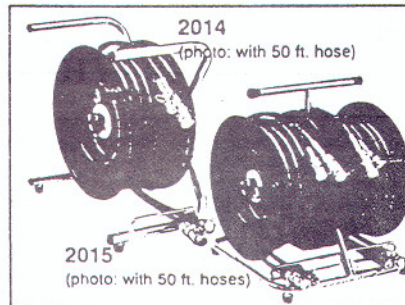
**lightweight mini-pump, 2035 PU mini-plus**  
 4-stroke gasoline engine (Honda)  
 output at max. pressure : 146 cu.in./min. in 1st stage  
 output at max. pressure : 43 cu.in./min. in 2nd stage  
 weight - ready for use : 50 lbs.



**gasoline powered pump, model 2040 PU**  
 (photo: 2041 PU with 50 ft. (15m) hoses)  
 4-stroke Briggs & Stratton gasoline engine  
 output at max. pressure : 52 cu.in./min.  
 weight - ready for use : 75 lbs.  
 also available with Honda engine, model 2040 PHU,  
 or with electric motor, model 2040 GU  
 (115V - 60 Hz)

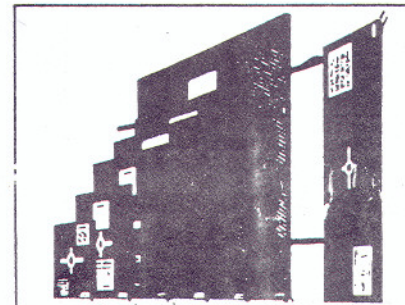


**gasoline powered pump, model 2060 DUO**  
 with Briggs & Stratton engine  
 (operates 2 tools simultaneously)  
 output at max. pressure : 2 x 174 cu.in./min. in 1st stage  
 output at max. pressure : 2 x 43 cu.in./min. in 2nd stage  
 weight - ready for use : 105 lbs.  
 also available with Honda engine, model 2060 PHU, or  
 with electric motor, model 2060 GU (115V - 60 Hz)



**hose reels, models -**

	2014	2015
number of drums	: 1	: 2
max. hose length	: 82 ft.	: 82 ft.
weight (with 50 ft. hoses)	: 38 lbs.	: 62 lbs.



**pneumatic high pressure lifting bags**  
 kevlar reinforced - 7 models available  
 working pressure : 116 p.s.i.  
 test pressure : 297 p.s.i.  
 thickness : 0.75 - 1 inch  
 capacity range : 10,584 to 147,735 lbs.

Please inquire about:

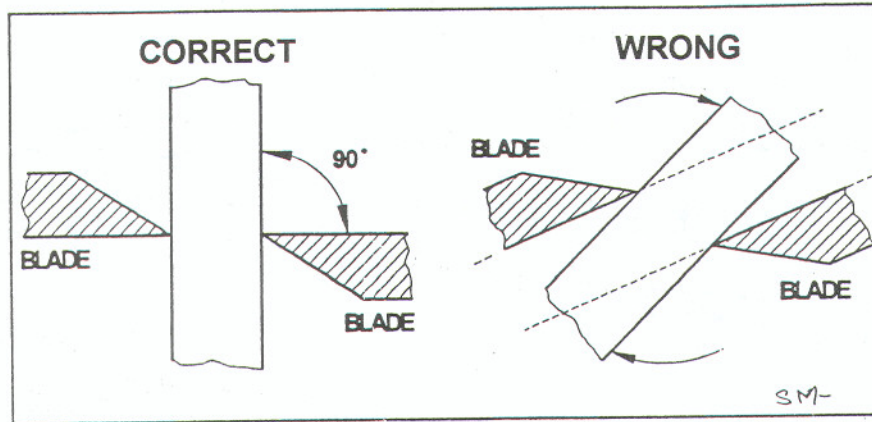
- FTW 1800 foot pump
- HTW 300 hand pump
- pedal cutter kit
- rescue wedges
- hydraulic jack kit
- haz mat equipment

**holmatro, inc.**

FOR A MORE EXTENSIVE LISTING OF OUR PRODUCTS, OR FOR MORE INFORMATION ON THE (UL) TESTS, PLEASE CONTACT **holmatro** TODAY.

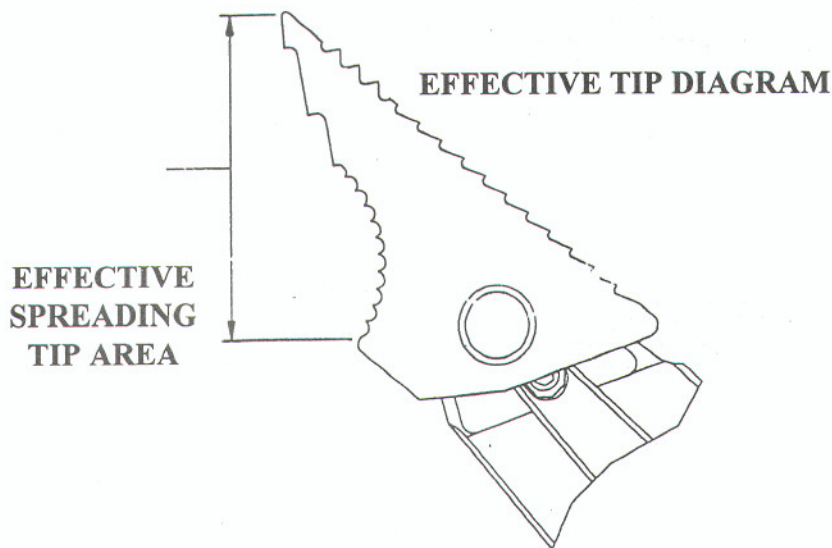


## DIAGRAM OF BLADES AT 90 DEGREES



As illustrated above, the blades should be held at a 90 degree angle to the material being sheared. The material being cut must be secured to prevent twisting.

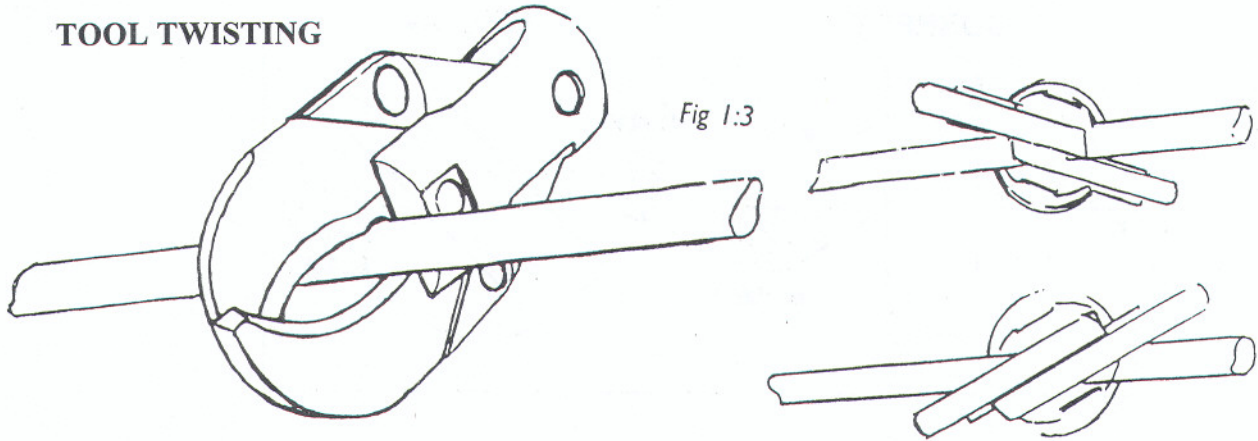
If the tool is not held firmly or if the material being cut is not secured, the blades may be permanently damaged. The material being cut may be forced between the blade flats causing the blades to bend or shear.



The effective tip area should be used to spread and not the arms. If the full effective tip area is not used to spread the vehicle, the tip will shear or tear. **If the access area is insufficient, spread the arms and insert only one tip. Close the arms and bend the fixed material away. Repeat this until both tips can be inserted in the opening and then start spreading.** If the unit twists, or becomes unstable in any way, stop spreading and start again in a different position.

Under no circumstances should the tool be used as a lever or prying device. The spreaders are not designed for bending or prying. The user should never manually force the spreading action. The operator's body must never be between the tool and the vehicle.

## TOOL TWISTING



The stock cutter is designed for cutting bar or rod mild steel up to 1 inch (25mm). The cutting jaw must be kept square to the cut (90 degrees). Where the tool is subject to twisting, the cut should be reconvened when the blades begin to separate.

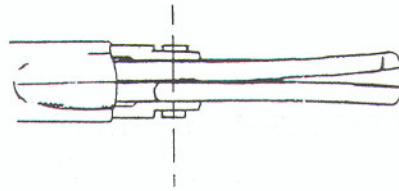
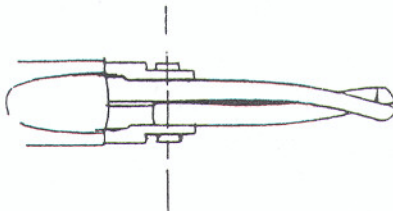


Fig 1:4



## BLADE SEPARATION, CROSSOVER AND SNAGGING

Sufficient care must be taken to prevent blade separation or crossover and snagging when cutting within the confines of hinges, and heavy metal and bolts. Fig 1:4.

**WATCH OUT!!  
AVOID PROPULSION OF PART**

When shearing through protruding parts, forcibly hold the extremity to avoid propulsion of part where the cut concludes abruptly. Fig 1:5.

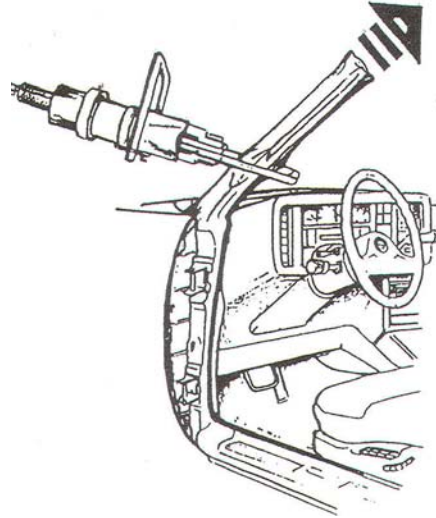
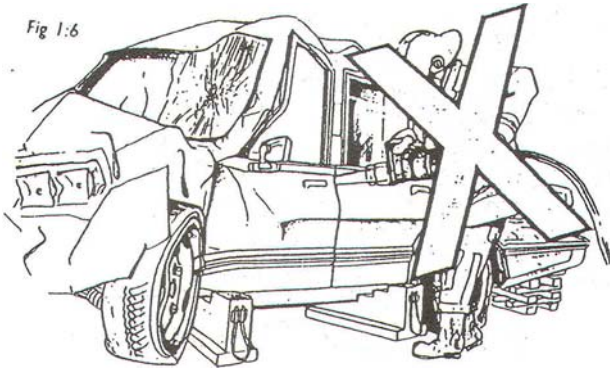


Fig 1:6



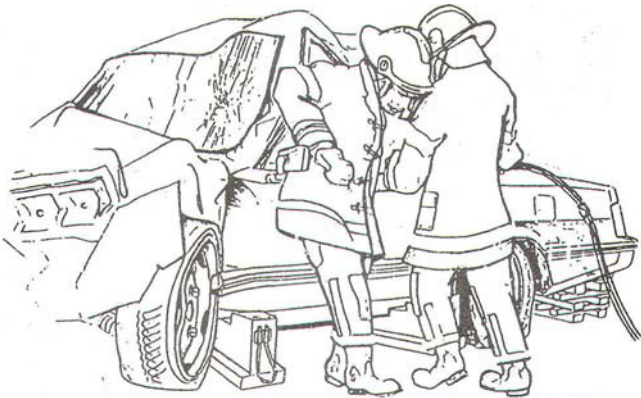
**BEWARE!!  
NEVER STAND ON THE WRONG SIDE  
OF THE TOOL**

The operator must never stand between the spreader and the vehicle as the tool is more powerful than the operator. Fig I :6. Twisting of the tool may trap the operator against the vehicle and prevent the self locating action of the dead man's handle. When the spreader is introduced and force is applied, the operator must never stand directly behind the tool or support it with their body. If the purchase point were to slip and kick out, the operator will be struck by the ejection force of the tool.

Fig 1:7

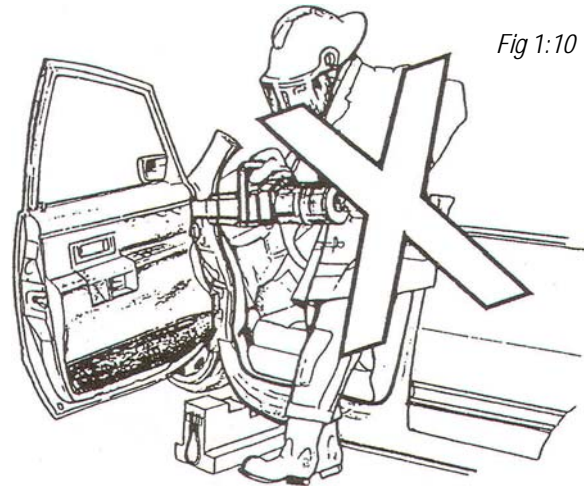


**NEVER ALLOW ANY PERSONNEL TO  
RESTRAIN A VEHICLE WITH THEIR  
BODY PARTS.**





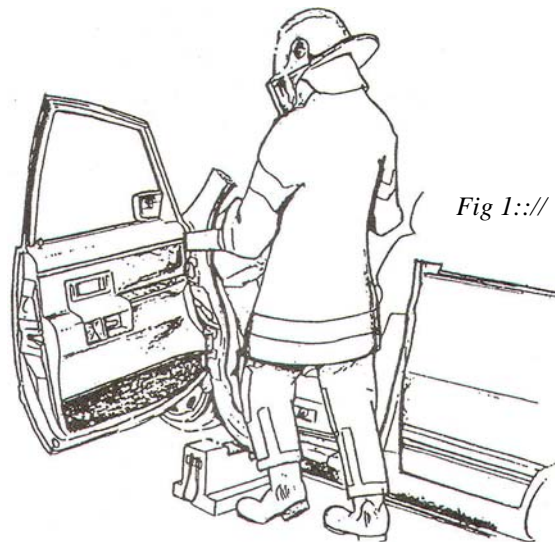
## FORCED DOOR REMOVAL



**BEWARE!!**  
**NEVER STAND ON THE WRONG SIDE**  
**OF THE TOOL**

The operator must never stand between the spreader and the casualty. Fig 1:10. When conducting the forced removal of the front door, the power spreader or combination tool should not be applied before sufficient space is made. Otherwise, where the angle of spreading is wrong, the tool will turn inwards as it takes up the line of least resistance and pushes the operator in on the casualty.

The operator should always stand on the outboard side of the tool. Fig 1: 11.



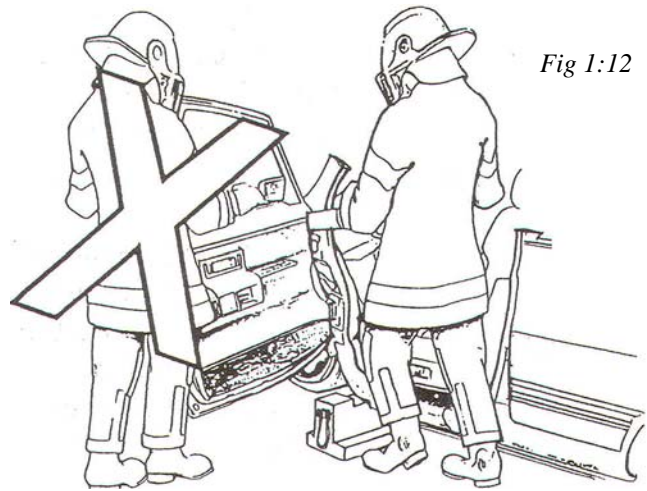


**WATCH OUT!!  
EJECTION OF DOOR**

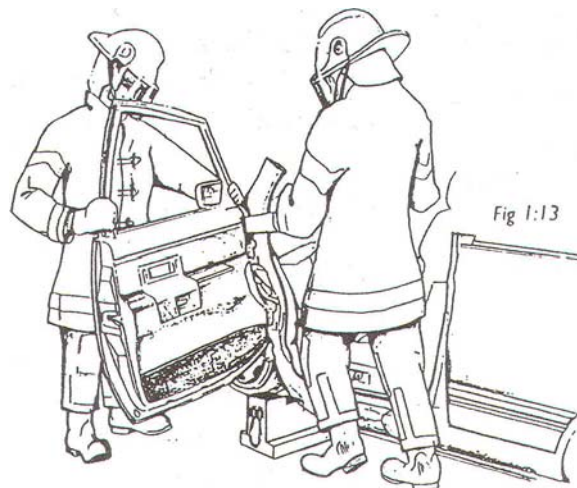
Rescue squad members should not stand in line with the door as it is being forcibly removed. Fig 1: 12. The hinge may give way abruptly causing the door to jettison. The positive double acting capability of the power spreader/combination tool will counteract this effect to a large degree.

In forcing the top door hinge, do not place feet under the door as spreading may force the outside edge onto the ground. In these circumstances, to continue spreading will cause the vehicle to be raised and the stability altered.

Take precautions to never let the door drop onto hydraulic hose, air or oxygen lines or electric leads.



**IT IS UNNECESSARY AND DANGEROUS TO HOLD OR RESTRAIN VEHICLE PARTS!**



## TWISTING AND TURNING OF TOOLS

### Cutting the Seatback Frame

Where no reclining mechanism is fitted or where the assembly has jammed, or the seat only incorporates a seat tilt adjustment, it may prove necessary to forcibly recline or remove the seatback.

Where the cutter is used at this angle to shear the heavier gauge steel of the seatback frame, Fig 1:14, it may turn sharply as it takes up the line of least resistance. Where appropriate, the cutters should be introduced at the back of the seat in line with the cut.

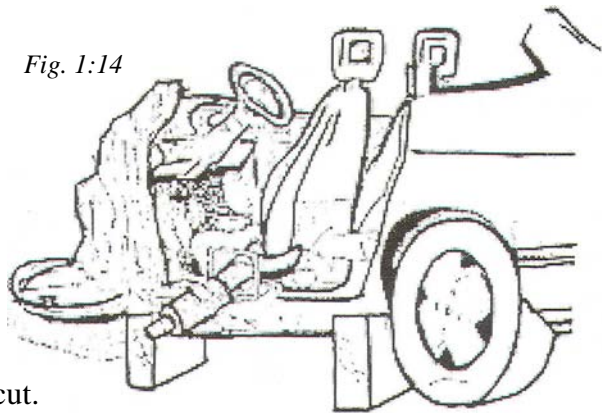


Fig. 1:14

### Cutting the Rocker Panel/Sill

When shearing the rocker panel, downward movement of the cutter can be anticipated, particularly where the blades encircle the locking plate on the underside of the structure. Fig 1:15. Squad members must avoid placing their knees under the cutter when making this cut. Do not cut beyond the rocker panel, fuel lines are located adjacent to the rocker panel. Fig 1:15

## IMPORTANT

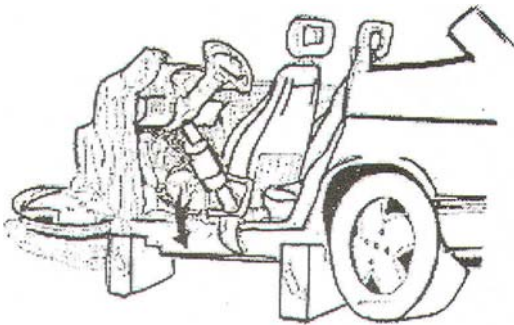


Fig 1:15

A void getting fingers caught when cutting certain pillars and posts. There is a tendency for the cutters or the combination tool to turn in line with the cut, which may allow the operating handle to bind on other structural pillars and posts.

### Using Tools Within the Confines of the Vehicle

When using power operated rescue equipment within the confines of an automobile, the operator must be constantly vigilant. Tool twisting and turning as it takes the line of least resistance, must be anticipated.

The tool must never be allowed to come into contact with the patient and operating lever. Seat fabric and component parts of the vehicle can prevent the safe operation of the operating lever where the twist grip binds or is caught up. Adverse metal movement and creepage must always be considered and any close proximity use of tools, in relation to the patients, must be constantly monitored.

## **HIGH PRESSURE /LOW PRESSURE RESCUE AIR BAGS AIR LIFTING UNITS - SAFETY PRECAUTIONS**

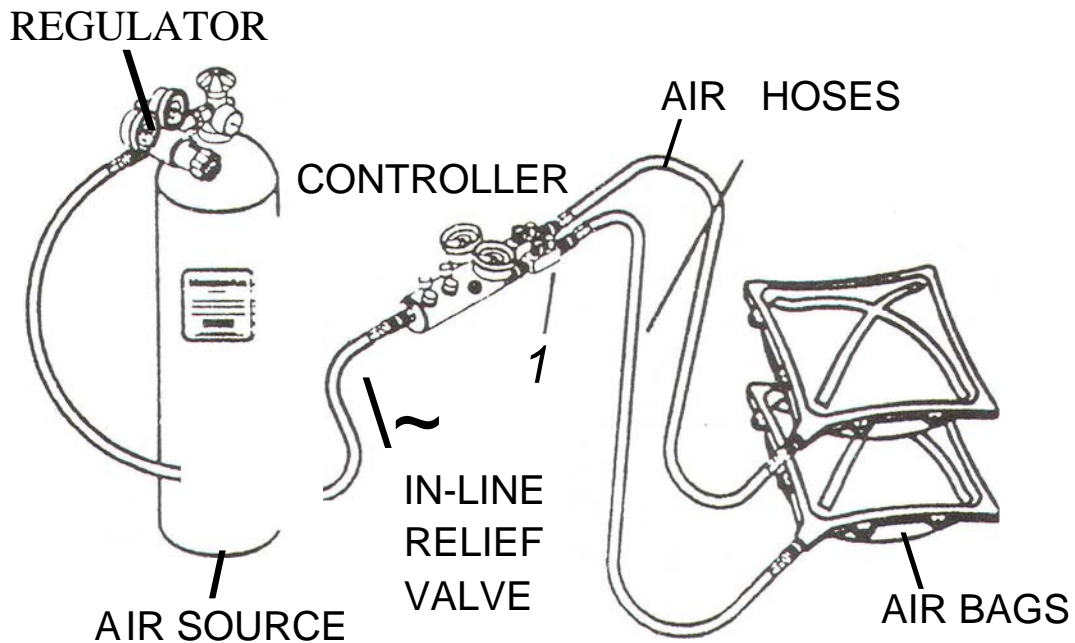
The use of air bags in rescue, particularly heavy rescue, where bags are used near to full capacity, requires a high profile towards health and safety requirements and 'hands-on' knowledge to familiarize the operator.

General use for high pressure air bags in emergency rescue:

1. Used as a starter bag for placing larger bags or low pressure air bags.
2. Stabilizing heavy loads or vehicles in a precarious position.
3. Lifting of heavy loads and commercial vehicles: High pressure air bags offer a distinct advantage in the direct lift of heavy loads in the rescue of trapped persons. Lifting of floors and beams after the collapse of a building, lifting a locomotive or carriage, lifting a truck in the separation of vehicles or a capsized forklift, are to name but a few.
4. Tilting a load or vehicle: High pressure air bags are in a league all their own when it comes to heavy emergency rescue. The rescue or recovery of a victim, trapped under the capsized heavy cargo vehicle, can be undertaken immediately on arrival of the emergency service. Again, the sideways separation of two trucks can be undertaken to free a trapped casualty with the minimum of adverse movement.

Useful Tips When Using High Pressure Air Bags:

1. Never position yourself in front of air bags under pressure
2. Only block or pack underneath the air bag. Never pack on top or between air bags. When using cribbing to pack, only use solid stack.
3. To site, use mark in the center of the air bag.
4. Place lifting bag on level surface. Unless the load needs to be stabilized or shifted sideways, always lift from a level surface.
5. Lifting edge - Ensure that at least 3/4 of the surface area of the air bag is placed under the edge of the object to be lifted.
6. For additional lift, only use the same size or smaller bag on top. Never place a larger bag on top of a smaller one.
7. When using a smaller bag to gain additional height, ensure it has sufficient capacity for the load, that it is placed centrally on the larger bag and in contact with a substantial lifting point.
8. Where appropriate, secure wheels and lock steering of vehicle prior to lifting.
9. Always inflate bottom bag first.
10. Constantly monitor for shifting of the load. Use observers where necessary.
11. When lifting in tandem, always have lifting points in line of sight.
12. When lifting one side or tilting a load, always keep the point of balance in mind. Do not alter or overcome the fulcrum of the load, except intentionally, particularly where liquid loads are involved.
13. Progressively crib/block when lifting or use another air bag, or lift in conjunction with another piece of equipment with sufficient rating to support the load.
14. In the event of failure or the load shifting blocks / cribbing must be of sufficient rating and size to support the load.
15. Never place body or hand/ s under the load when stacking blocks/ cribbing.



Typical High Pressure Air Bag System Hook-up

## CARE AND MAINTENANCE

### Bags -

- A. Inspect after each use.
- B. Remove any foreign objects that may be on bag surface, such as broken glass and debris.
- C. Wash bag in soap and water . Avoid getting water in the bag. If water does get in, allow the bag to thoroughly dry before the next use.
- D. Cuts on the neoprene surface can be repaired with rubber cement, (recommended by the manufacturer).
- E. Leak test the bag by pressurizing to 30 PSI for 30 minutes. If a loss of pressure has occurred, immerse in water or soap solution. The appearance of small air bubbles around the connection pipe/ air inlet is of no significance with regards to the safety and operational readiness of the bag and may be disregarded.
- F. Check for damage on the air inlet nipple.

### Hoses -

- A. Keep couplings clean and dry.
- B. Broken hose must be recoupled or replaced.
- C. Inspect for any cracks or nicks.

### Dual Safety Relief and Control Valve (Controller)

- A. Keep couplings clean and dry.
- B. Replace broken gauges.
- C. Tighten gauge screws.

### Pressure Regulator

- A. Inspect inlet nipple and seal for tightness and damage.
- B. Check for bent gauges, dials, indicator, case screws, cracked lens.
- C. Check for overall tightness and damage.

## AIR BAG SYSTEM COMPONENTS

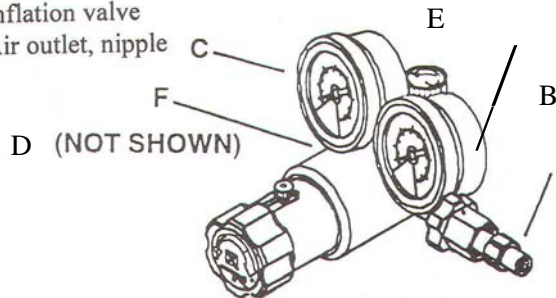
### PRESSURE REGULATORS

The pressure regulator is connected to an air source, such as a standard back pack air cylinder, then adjusted to 135 PSI outlet

#### PRESSURE REGULATOR (PISTON TYPE)

The high pressure regulator reduces pressure from 5,500 to 135 PSI. The high pressure regulator can be used on both 2,200 PSI and 4,500 PSI air cylinders.

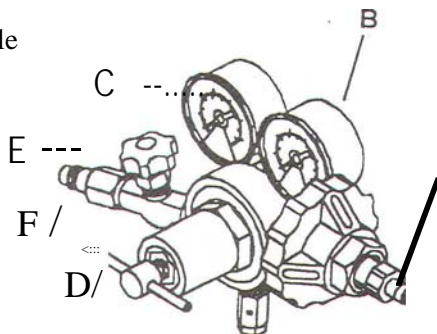
- A. High pressure air inlet
- B. High pressure gauge
- C. Low pressure gauge
- D. Handle to adjust outlet pressure range
- E. Inflation valve
- F. Air outlet, nipple



#### PRESSURE REGULATOR (DIAPHRAGM TYPE)

The standard pressure regulator reduces pressure from 3,000 to 135 PSI.

- A. High pressure air inlet
- B. High pressure gauge
- C. Low pressure gauge
- D. Handle to adjust outlet pressure range
- E. Outlet valve
- F. Air outlet, nipple



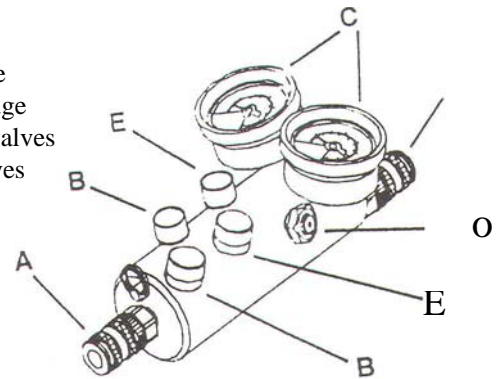
### CONTROLLERS

The controllers are used to inflate and deflate the bags. Both types of controllers come equipped with two pressure relief valves that are factory pre-set at 118 PSI (8.1 Bar) to prevent over inflation of bags. There are separate control valves to safely operate 2 bags independently.

### DUAL "DEADMAN" SAFETY RELIEF AND CONTROL VALVE

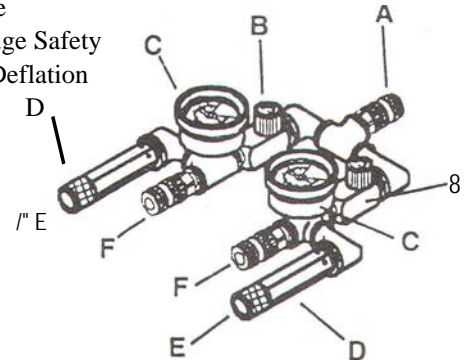
#### VALVE

- A. Air inlet
- B. Inflation valve
- C. Operating gauge
- D. Safety relief valves
- E. Deflation valves
- F. Air outlets



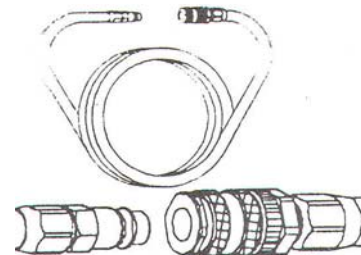
### DUAL SAFETY RELIEF AND CONTROL VALVE

- A. Air inlet
- B. Inflation valve
- C. Operating gauge
- D. Safety relief valves
- E. Deflation valves
- F. Air outlets



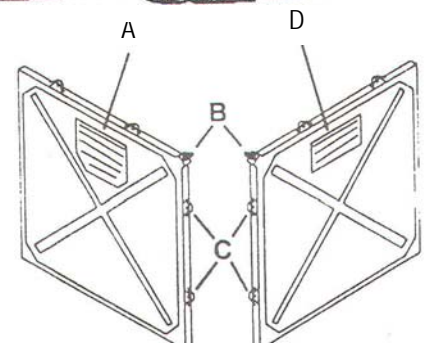
### HOSES

Hoses are used for delivery of air supply to the system. Hoses are equipped with dual locking couplings (locking prevents accidental disconnection of fitting). Additional lengths of hose can be attached to permit remote operation or additional bags and accessories.



### BAG

- A. Safety label
- B. Air inlet nipple
- C. Eyelets
- D. Technical data label

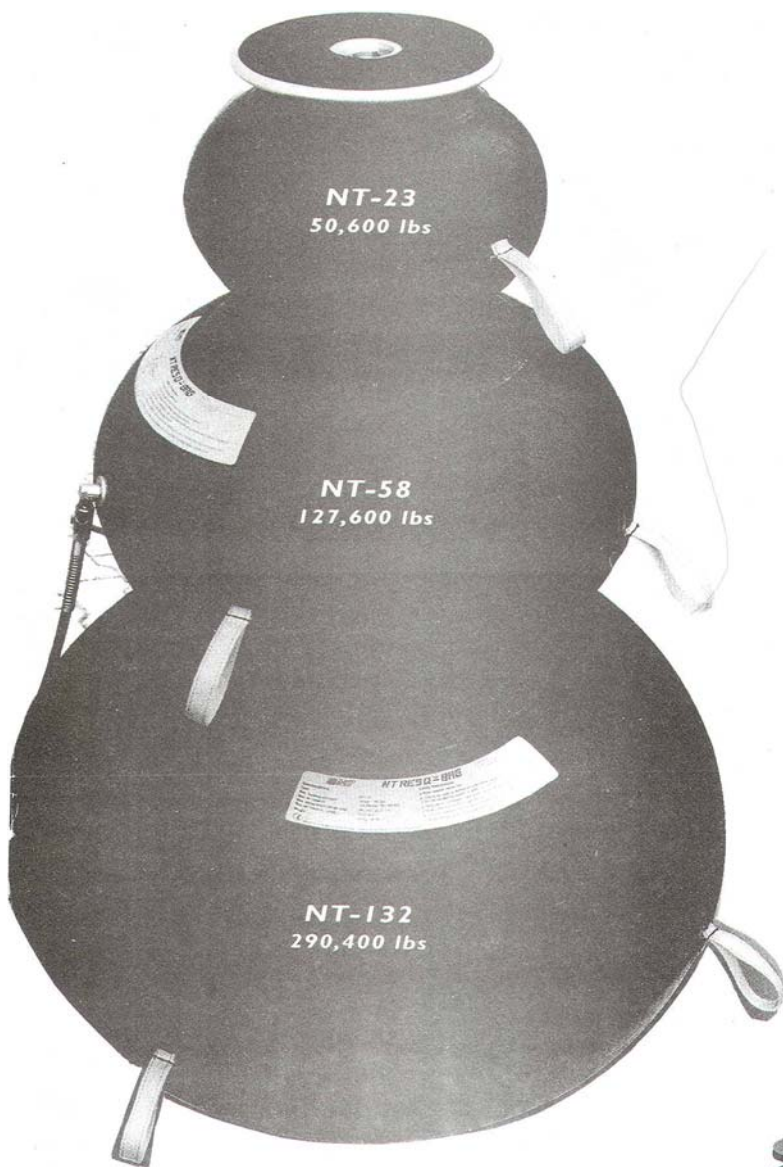




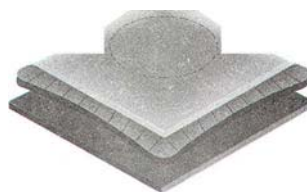
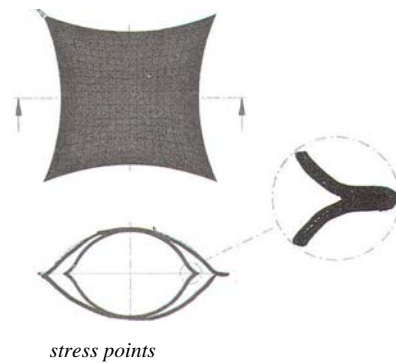
# NT High Pressure Airbags

147 PSI Operating Pressure

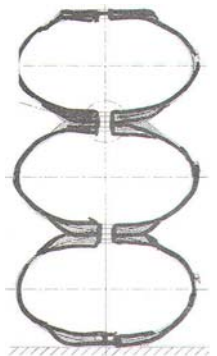
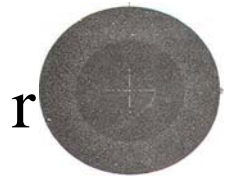
It should be noted that there are now "New Technology" rescue airbags which operate on a working pressure of 147 PSI. The advantage to the NT system is that lift force does not decrease as the height of the bag increases. As the "NT Airbag" is being filled to its maximum height, the surface area in contact with the object being lifted remains constant. "NT Airbags" are stackable connected by a lock screw fitting, large bags inflate to a maximum height of 26 inches each.



Conventional Bag



NT ResQ-Bag



General use for low pressure air bags in emergency rescue:

i. Stabilizing vehicles in a precarious position:  
Officially low pressure air bags are not recognized as a suitable method of stabilisation as they allow stabilization, as they allow movement and are considered unstable, and, as such, need to be stabilized by blocking.

ii. Lifting of vehicles:  
Low pressure air bags offer sufficient controlled lift to realistically remove a casualty trapped under an automobile.

iii. Tilting a vehicle:  
In emergency rescue, where the vehicle has come to rest on its roof, they offer a distinct advantage in conducting inverted side removal, especially where a collapsed roof structure confines occupants within the interior.

Low pressure air bags are often employed well within the limits of their full working capacity and where, in fact, the bag is used to capacity to stabilize a light load, a high degree of stability can be afforded.

Useful Tips When Using Low Pressure Air Bags:

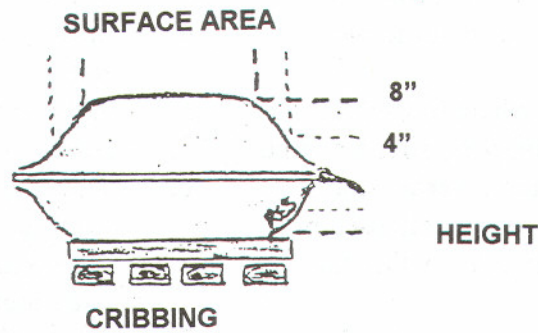
1. Low pressure bags afford high lift over a wide surface area at low pressure for a prescribed tonnage.
2. Only block or pack underneath the air bag. Never block/ crib on top of air bag. When using cribbing to pack, only use solid stack.
3. Place lifting bag on level surface. (Unless the load needs to be stabilized or shifted sideways, always lift from a level surface.
4. Lifting edge - Ensure that 2/ 3 of the surface area of the air bag is placed under the edge of the object to be lifted.
5. Never use one bag on top of another.
6. Where appropriate, secure wheels and lock steering of vehicle prior to lifting. Constantly monitor for shifting in the load. Use observers where necessary.
7. When lifting in tandem, always have lifting points in line of sight.
8. When lifting one side or tilting a load, always keep the point of balance in mind. Do not alter or overcome the fulcrum of the load, except intentionally, particularly where liquid loads are involved.
9. Progressively crib/block when lifting, or lift in conjunction with another piece of equipment with sufficient rating to support the load. The only exception to this rule is when the bag is being used to stabilize a light load or where there is insufficient space for additional safety measures to be added. In the event of failure or the load shifting, blocks/cribbing must be of sufficient rating and size to support the load.
10. Never place body or hand/s under the load when stacking blocks/ cribbing.
- 11.
- 12.

# RESCUE AIR BAGS

## *Height Vs. Weight*

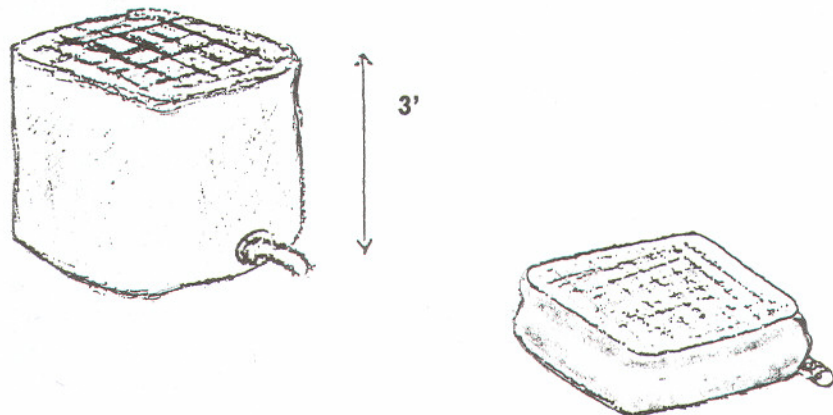
As you inflate a High Pressure Bag to increase the height, you decrease the lifting capacity by reducing the surface area. It should be remembered that the surface area multiplied by the working pressure will determine the lift capacity of the bag. As the bag inflates beyond its rating at approximately 1 inch in height, the surface area in contact with the object now decreases!

HIGH PRESSURE  
RESCUE AIR BAGS  
118 psi



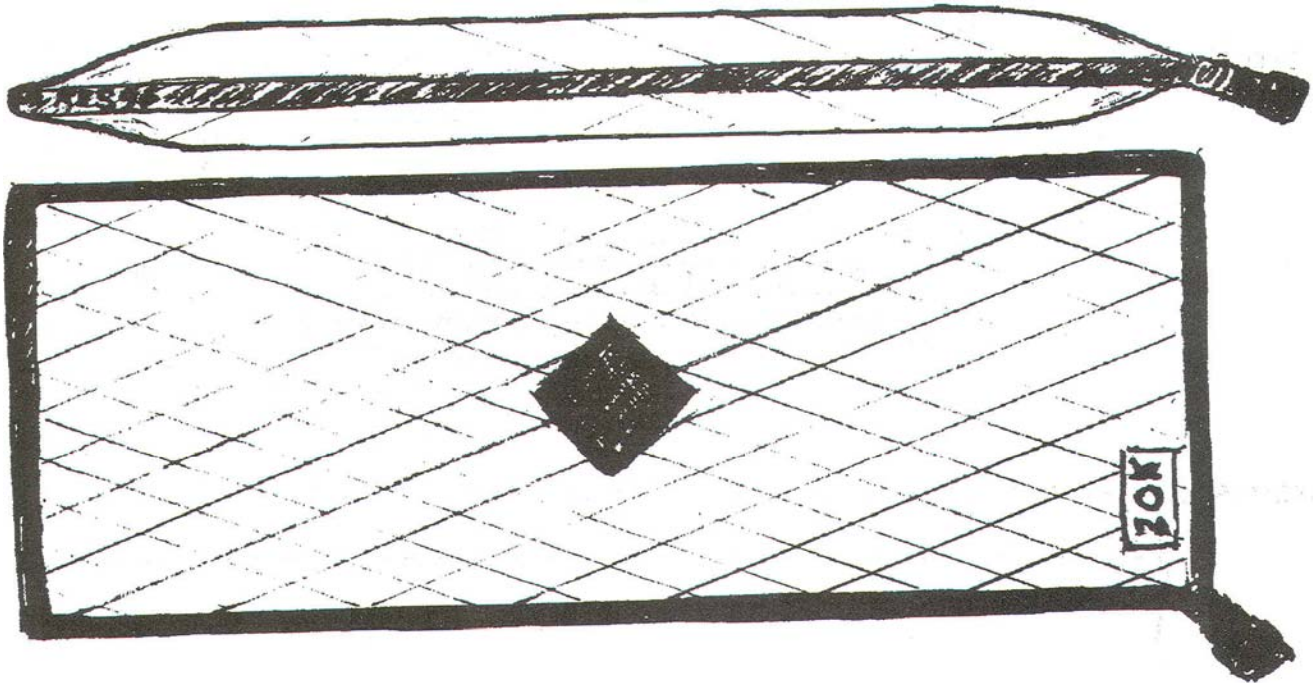
Use proper cribbing under a bag to supply the height needed to decrease the distance between the bag and the object to be lifted.

LOW PRESSURE  
RESCUE AIR BAG  
7 psi

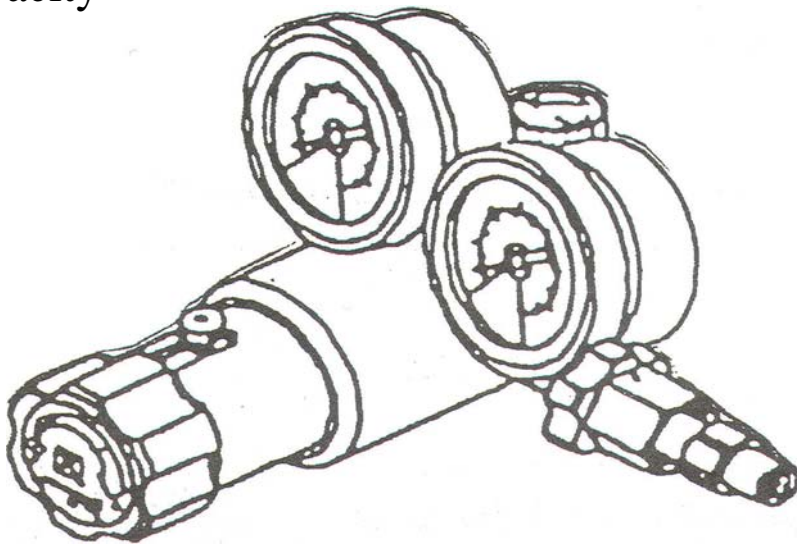


Conversely, the Low Pressure Rescue Bags remain consistent as the bag is inflated. In this system, the surface area does not change, it remains constant as the height increases.

**HIGH PRESSURE RESCUE AIR BAG**  
Determining the Maximum Capacity  $W \times L \times P = \text{Lift}$



Width x Length x Operating Pressure ( 118 psi) = Lift Capacity



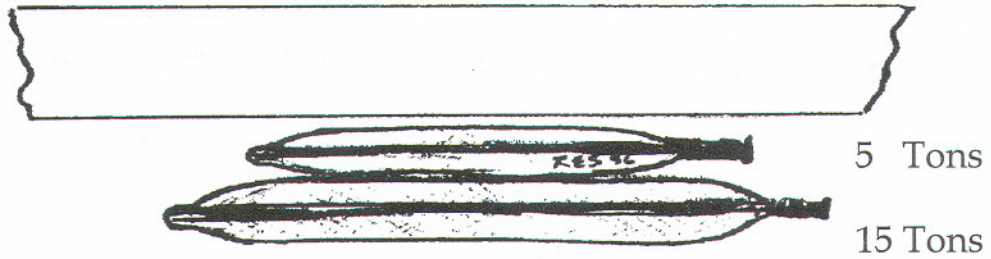
\*Operating Pressures for High Pressure Air Bags are set at 118 psi by the manufacturing industry.



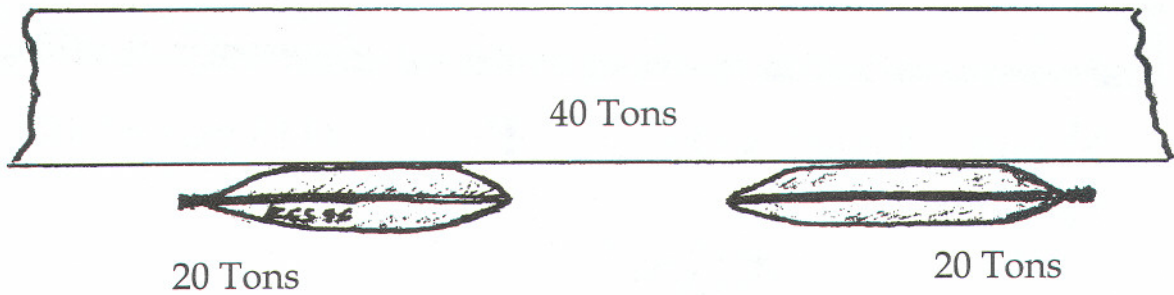
# HIGH PRESSURE RESCUE AIR BAGS

Student Work Section  
Proper Bag Placement

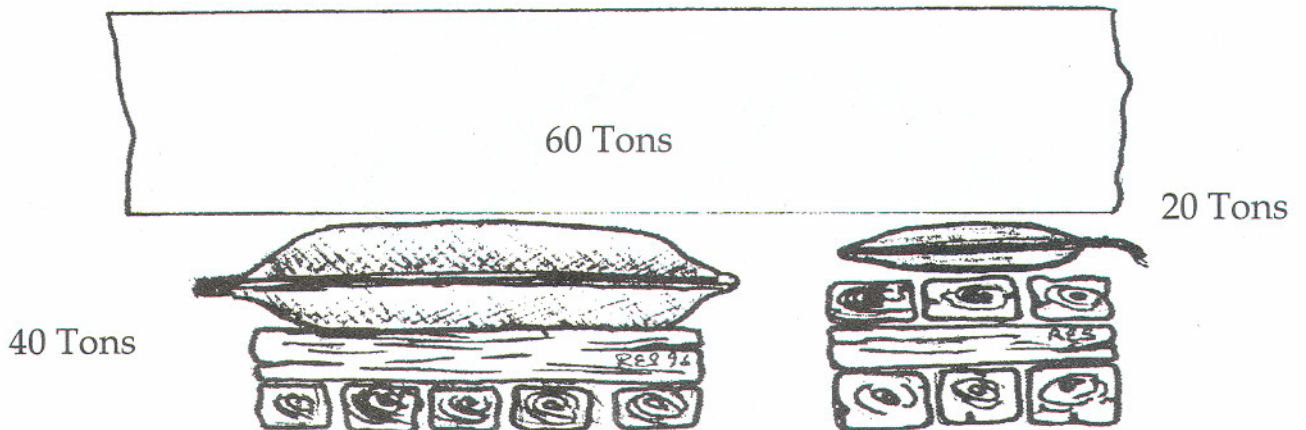
Exercise 1: Can the two bags in figure 1 lift this 20 ton object?



Exercise 2: Can the two bags in figure 2 lift this 40 ton object?



Exercise 3: Can the two bags in figure 3 lift this 60 ton object?

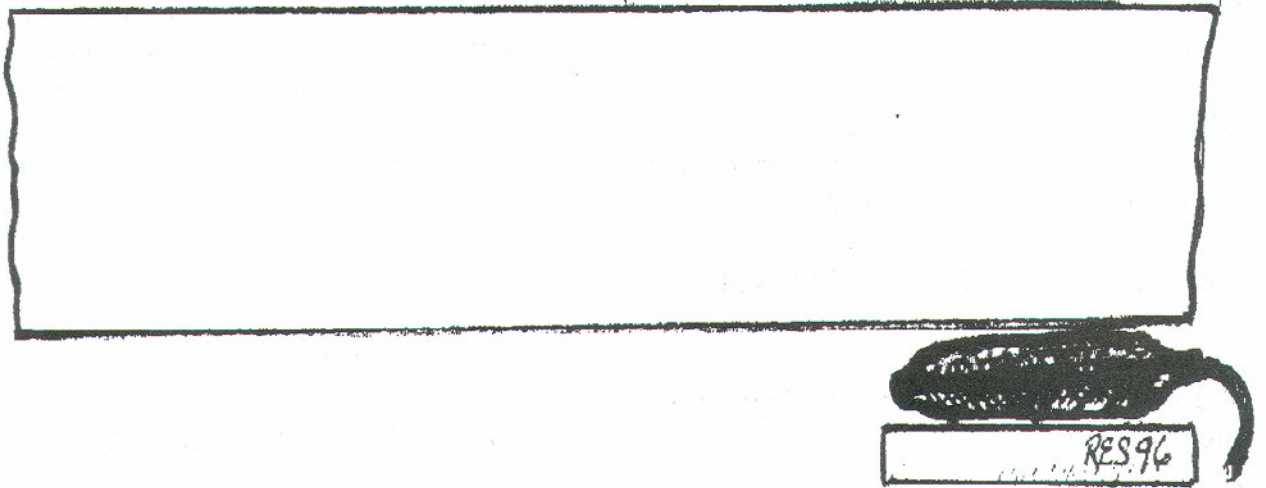


# HIGH PRESSURE RESCUE AIR BAGS

## Proper Placement

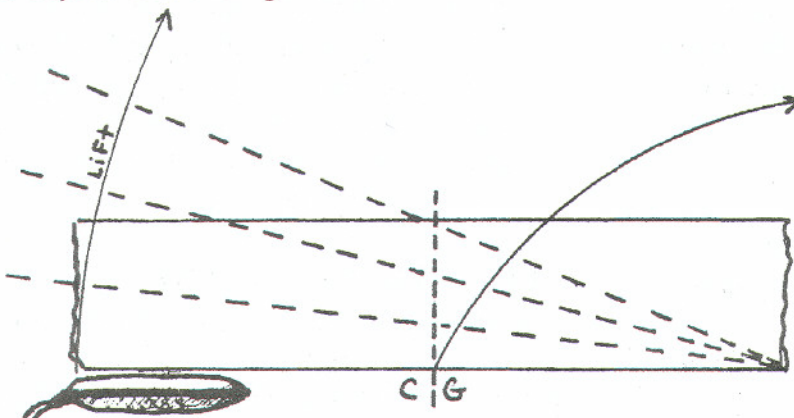
### Student Work Section Continued

Exercise 4: Can an underrated bag lift a larger object of greater weight as shown in figure 4?



#### ANSWERS:

1. No, once the larger bag of 15 tons is filled to its maximum capacity, the small 5 ton bag is trying to lift 20 tons, which it cannot, as set up in this figure. Another way to explain it is once the larger bag is filled, think of it being a solid block to which a 5 ton bag is placed and now you are trying to lift 20 tons!
2. Yes, when bags are setup in a tandem, the lift capacity is added together. True lift will only be one inch.
3. Yes, although the bags are unequal in size, they are setup in a tandem and the larger bag is placed closer to the center of gravity. Maximum lift of the object will be one inch.
4. Yes, by placing the bag away from the center of gravity you are not lifting the full weight of the object. See the figure below:



## SETTING UP A SAFE WORKING AREA

The immediate area around a crash scene must be protected by the strategic positioning of fire trucks. Adequate warning must be afforded to through traffic. Where appropriate, passing traffic must be slowed, stopped or diverted and the whole area closed down.

Although the accident scene can be taken in at a glance, it can be considered professional to pay proper attention to detail.

## VEHICLE ACCIDENT APPROACH

**Vehicle accident approach must consider the following:**

1. Size Up
2. Hazard Control and Safety Considerations
3. Gaining Entry
4. Administering Immediate Life Saving Care
5. Rapid Accessing
6. Controlled Release Management
7. Packaging and Removal of Casualties

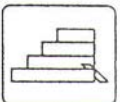
## VEHICLE ACCIDENT SIZE UP - THE WORKING AREA AND CONTROL

Prior to the commencement of any operational engagement, our first action should be to survey the situation. Rescue squad members must bear in mind the types of hazard that can exist and report any risk to the Officer in Charge.



For "size up" we need to find out

1. Number and Type of Vehicles and Extent of Damage
2. Number of Persons Injured and Types of Injury
3. Hazards Present



## HAZARD CONTROL AND SAFETY CONSIDERATIONS

The responsibility for organizing events rests squarely with the Officer in Charge of the incident. Lack of control, or the inability to act, will lead to fragmented efforts and time consuming mistakes. The actions of the Officer in Charge can influence the patient's prospects of surviving a traumatic injury. Indeed the patient's future quality of life may be in the balance. Therefore, we must consider the safety of the following:

1. Rescuers
2. Victims
3. Bystanders

## POSSIBLE HAZARDS TABLE 7

1. Traffic Flow  
Control/ divert
2. Gasoline Spills  
*Wash away and/or blanket area with foam*
3. Hazardous Material  
*Implement HAZ-MA T procedures*
4. Ex posed or Downed Electrical Lines  
*Implement appropriate procedure or refer to appropriate authority*
5. Unstable Vehicles  
*Secure and stabilize vehicles*
6. Environmental Conditions  
*Extrication strategy requires we take severe environmental conditions into account. Torrential rain, heavy snowfall and flash floods may alter our normal approach to tackling the incident, and obviously, any action we take must be with the intention of improving the situation*

## SETTING UP THE WORKING AREA

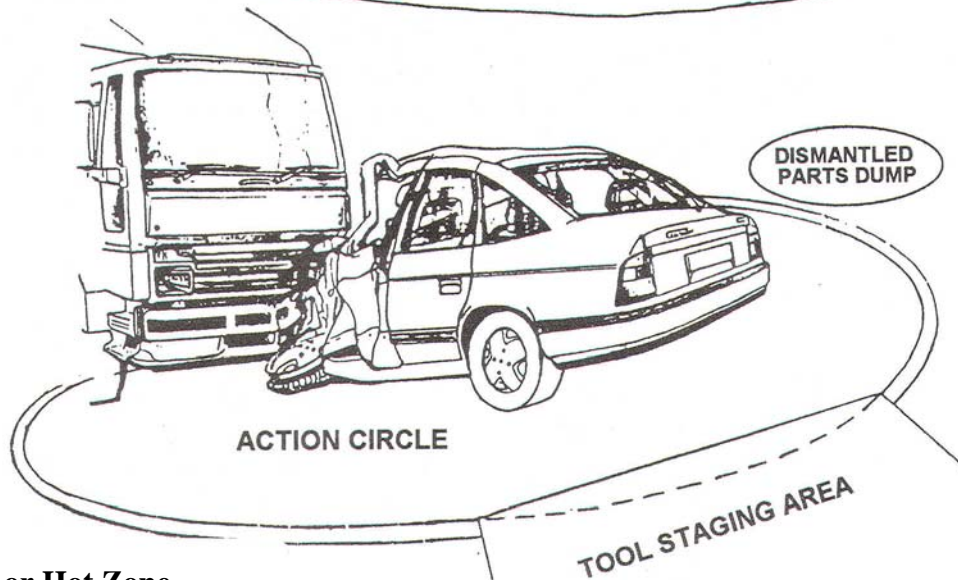
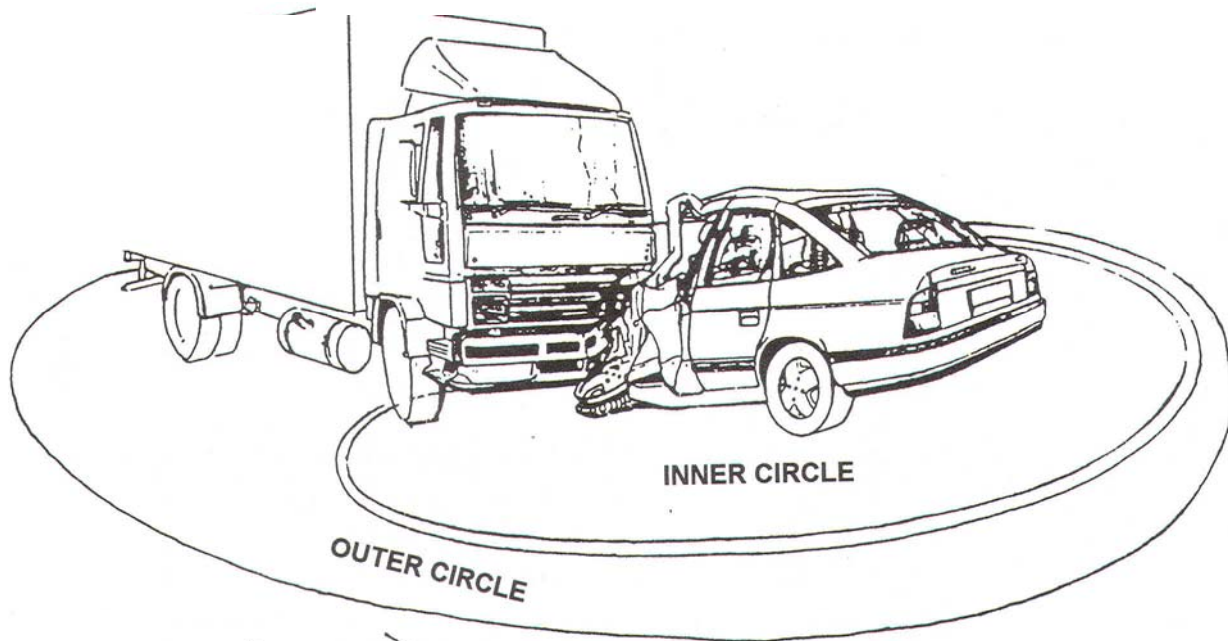
Implementing an outer and inner circle approach will guarantee all risks are recognized. Rescue squad member should quickly encircle the scene looking for hazards.



## OUTER AND INNER CIRCLE APPROACH

The outer circle should encompass the whole accident site and the inner circles the individual vehicle/vehicles containing the entrapment/entrapments.

Setting up the extrication scene will ensure a safe and efficient working area, which will result in the timely conclusion of the operational involvement.



**Action Circle or Hot Zone**



## GAINING ENTRY

Gaining entry into the vehicle is:

1. Process of Reaching Victims Involved .
2. Passageway to Get in
3. To Evaluate and Treat Victims
4. Use Quickest and Easiest Route
5. Doors - Windows - Windshield

Gaining Entry Should Not Be Confused  
With Disentanglement and Always  
Remember to Stabilize the Vehicle

## ADMINISTERING IMMEDIATE LIFE SAVING CARE

Once entry has been effected within the vehicle immediate life saving care can then be administered to the casualty in the form of:

1. Airway with C-Spine Management  
*Open and clear with no obstruction*
2. Breathing - *Give oxygen and, where appropriate, assist*
3. Circulation  
*Circulatory support/stem profuse open bleeding*

## CONTROLLED RELEASE MANAGEMENT

Incorrect handling of extrication entrapment can no longer be considered as acceptable. Only education and advancement in training can stem this unfortunate development and bring about the necessary change in standards. First aid 'grab and handle' and limited extrication techniques must no longer be regarded as sufficient and a concentrated effort towards encouraging and developing 'controlled release' is essential to cope with entrapment extrication.

In-car stabilization of the seriously injured is essential in stemming the patient's deterioration.

deterioration while efforts are made to release them. The degree of release needs to be adequately sufficient to allow for the injured 'patient' s removal from the wreckage. With the advances already made in the field of 'controlled release' it is both important and necessary to realize all possibilities open to controlled release management in all aspects of vehicle entrapment rescue. The following guide has been streamlined and simplified to allow for:

1. Systematic Dismantling of the Vehicle.
2. Slow Release of Crushing and Crush Injury
3. Space Making Techniques to Assist invasive *medical procedures, placement of monitoring and ancillary equipment, extrication devices and casualty packaging and removal.*

Gaining the optimum space in a time effective way will allow the situation to become more manageable. 'Controlled release' is a basic requirement for sound entrapment rescue management. Superstructure entrapment within the compact car makes its adoption mandatory but in making this statement the rescue effort must be efficient and in tune with the patient s treatment.

Where the patient/ s are trapped by the superstructure or by restricted space, by virtue of their injuries, where appropriate the safe systematic dismantling of the motor vehicle will give reasonable access for the medical attendants to tend to their patient and create sufficient space for immobilization/ packaging and casualty handling. Proper removal from the vehicle using safe techniques will protect the patient from further injury and reduce the likelihood of litigation due to mismanagement.

## Glass Removal

It is important to note that all responders should don proper PPE including eye protection and gloves when working in the vicinity of the action circle or hot zone. Rescue workers should also use a protective covering to shield patients from glass fragments prior to glass breakage. Do not use a hard board or device between a non-deployed airbag and your patient or rescue personnel! Glass can be removed in a number of ways using the any of following hand tools commonly found on most rescue trucks:

1. Specialized Window Saws (side, rear and windshields)
2. Spring Loaded Center Punch (side and rear windows only)
3. Large Flat Screwdriver (side and rear windows only)
4. Flat Head Axe (windshields)
5. Reciprocating Saw (windshields)

The most commonly used tools for glass breakage are the spring loaded center punch and the window saw. They are easy to use and provide fast glass removal. Tempered glass will brake with as little as 7-8 PSI exerted on a small contact point. Workers should always brake tempered glass at the comer where the window will be the most rigid. When ever possible do not use a pick head axe which could cause patient injury should the rescuer slip or mis-judge their mark. A Haligan and flat head axe has also been used to clear tempered glass. Due to the noise and movement of the vehicle caused by the action of the tools, this method is being used less through out the fire service. Patient considerations should be a factor when deciding what tools are to be used.

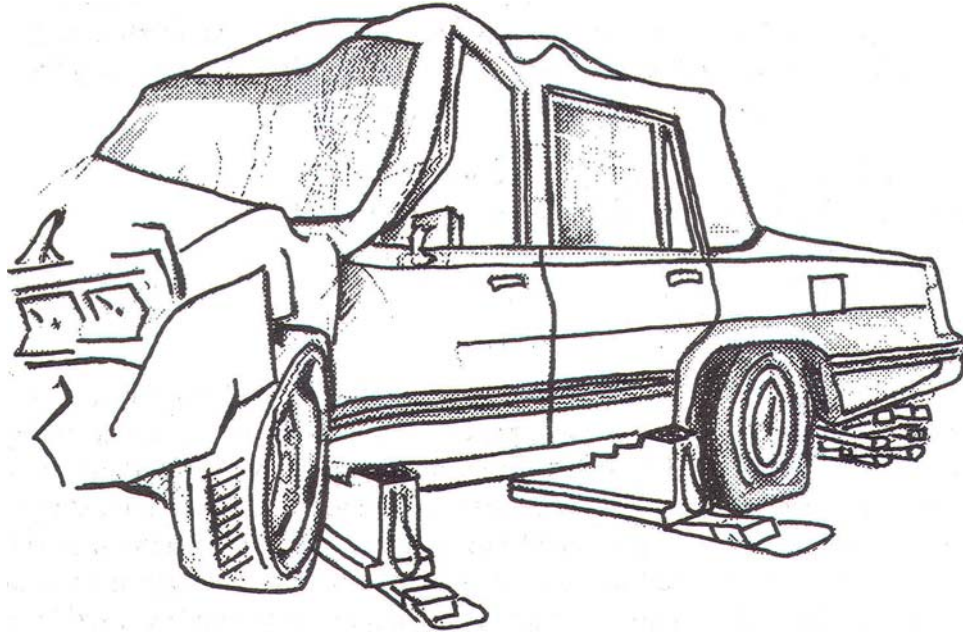
Moveable side windows can be rolled down to one inch of the top, then place a protective covering such as a plastic tarp, cloth or blanket over the glass to prevent debris from causing eye injury. The forked end of the haligan is then slipped over the top edge of the glass and given a quick quarter turn, the glass will easily break inside the window.

The flat head axe is commonly use to remove windshield glazing. Both the axe and window saw create a fine dust as a by-product of the cutting action, be careful not to inhale the dust! When cutting windshields with an axe the rescuer should:

1. Grasp the axe near the head with one hand
2. Angle the tool at a 45 degree plane to cut through the layers of material
3. While using a chopping motion cut back towards the rescuer

This method will cut through the plastic as well as the glass instead of just breaking the glass and not cutting plastic laminate. When cutting, always support any glazing that may come in contact with the patient until it is free of your patient to prevent injury.

Remember leather or specialized extrication gloves should be worn while working with glass or displaced metal. Latex medical gloves do not give adequate protection for broken or cut glass and metal, however the two types of gloves may be worn together for proper universal protection from blood pathogens.



## **SECURING AN UPRIGHT ON ROAD AUTOMOBILE**

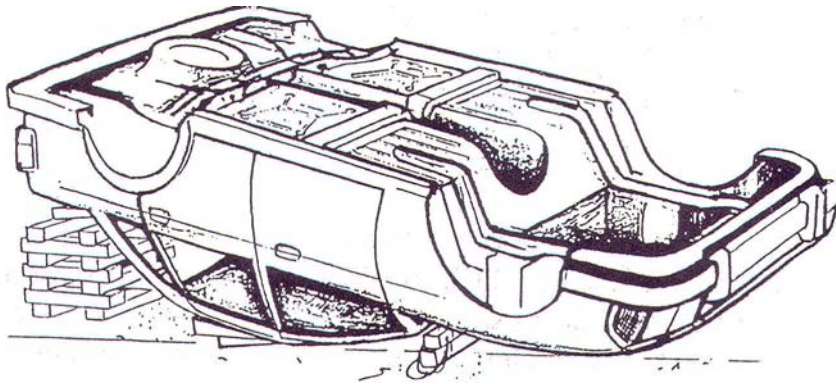
### **FLATTENING TIRES / STEPPED WEDGES**

The use of stepped wedges to block the underside of the automobile are quick, safe and effective.

Flattening the tires will allow the full weight of the vehicle to sit on the blocks/cribbing and this in turn will hold the block firmly in place. The automobile will then be stabilized and interference from the vehicle's spring system and rocking from inflated tires will be prevented.

When the car is secured by flat tire blocking, the physical action of wedging the wheels will not be necessary unless the angle of the gradient dictates that the wheels should be wedged.

## SECURING THE OVERTURNED VEHICLE



The overturned vehicle which has come to rest on its side or on its roof, needs to be adequately secured, particularly where partial or total collapse of the roof structure has been experienced.

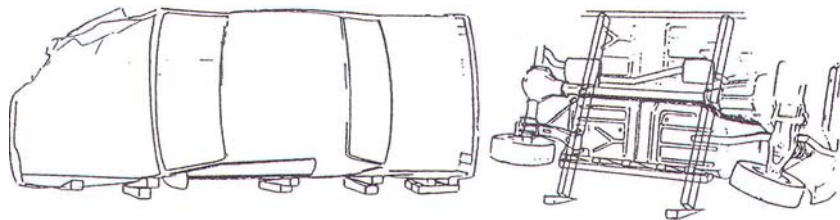
Where the windshield pillars remain relatively intact the automobile will, in most instances, by virtue of the weight of the engine, come to rest at an angle, resting on the hood and the windshield pillars.

Securing the automobile can normally be achieved simply and quickly by packing between the firewall/bulkhead and the ground and wedging between the roof structure and the ground. On the larger and more weighty vehicle, cribbing can be used as a support between the trunk and the ground.

## SECURING THE VEHICLE (precarious position)

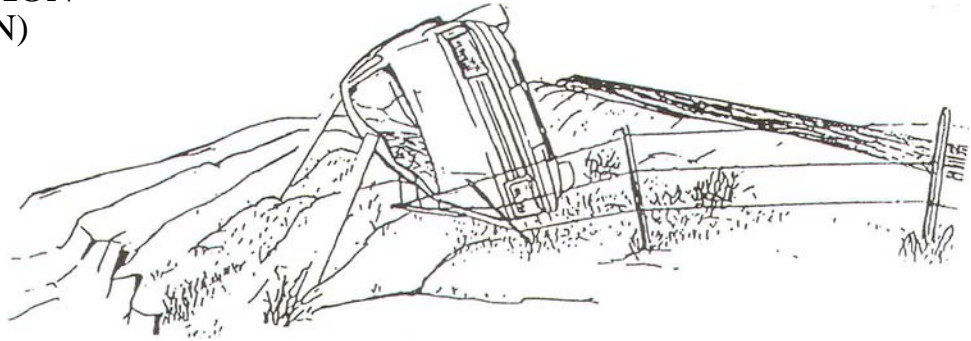
The automobile which has come to rest on its side in an on road position, will be relatively stable in so much as it is extremely unlikely to topple over, even with a heavy push. Nevertheless, it needs to be adequately secured to reduce as much movement as possible. Invariably it takes up a common position where its stability is maintained by the wheels. Where a tire has deflated or a wheel come adrift it will make the vehicle more rickety. Automobiles in this position can be quickly and effectively secured using hi-lift jacks, props, wooden blocks, wedges, or anchoring with rope or chain.

### VEHICLE ON ITS SIDE



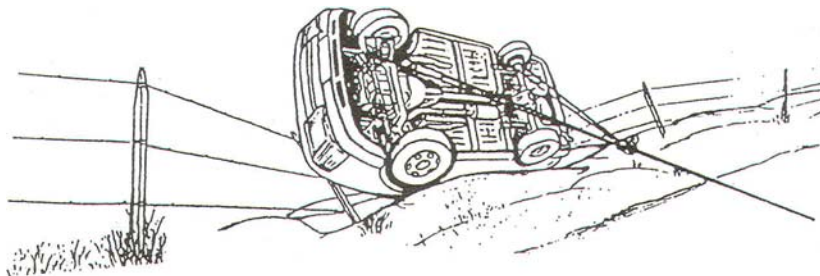


## VEHICLE STABILIZATION (PRECARIOUS POSITION)



BLOCKS/CRIBBING  
AJR BAGS  
PROPS  
LINES/ROPES  
WINCHES

An accident damaged vehicle may have come to rest on its side or roof, on uneven ground, a ditch or incline, or in a precarious position. The circumstances may exist where any movement may alter the balance, further threatening life and limb. It is imperative to realistically secure the vehicle. If to proceed would mean taking a risk, the rescuer would then be jeopardizing their own well-being as well as compromising the situation. We are not in the business to add to any existing danger and will do well to remember that an injured rescuer is of no help to anyone and will detract from the overall efficiency of the operation. At worst, the accident can be turned into a disaster, likely to leave an indelible stigma on the service as a whole.



Air bags, in conjunction with blocks/cribbing, are most suitable in securing a vehicle on soft or uneven ground. Portable or permanently fixed winches are an absolute necessity when faced with a vehicle in a precarious position. It would be unrealistic to secure a vehicle with a rope, except as a temporary measure, as the vehicle's weight may overcome the integrity of the rope. Where there is any shifting in the load, we should realize that the risk will be increased as rescuers climb in or onto the vehicle. Elasticity in the rope/ropes will allow shifting in the vehicle, loosening blocks or cribbage, particularly on soft or uneven ground. Chains may be an effective solution for stabilization.

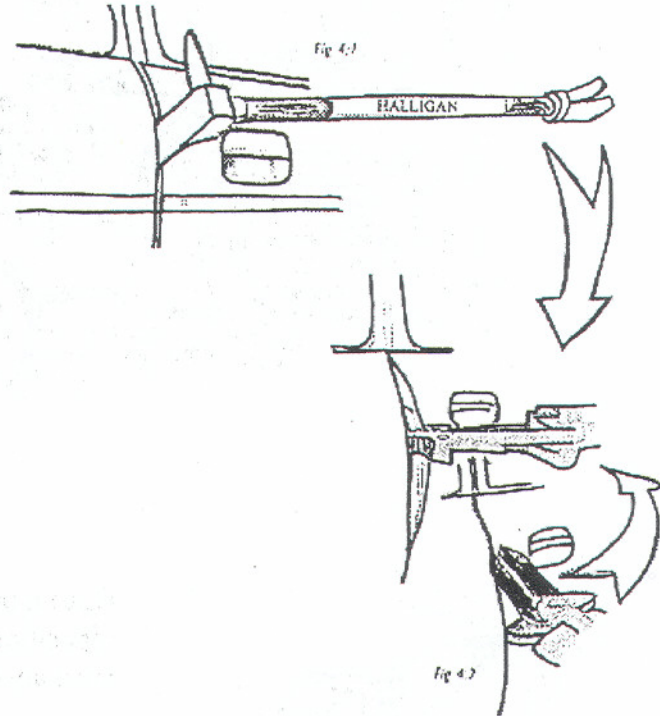
## THE OPENING OF DOORS

Immediate entry into the vehicle will invariably be through the doors on the opposite side of the crash damage. Severe frontal impact is unlikely to affect the opening of the rear doors or liftgate/hatchback/tailgate.

Where accident damage prevents opening and all reasonable efforts fail, the door will have to be opened by force.

### GAINING ACCESS TO THE DOORLOCK

Use of a Halligan to gain entry for the spreader tips. Fig 4:1 When spinal injury is not considered.

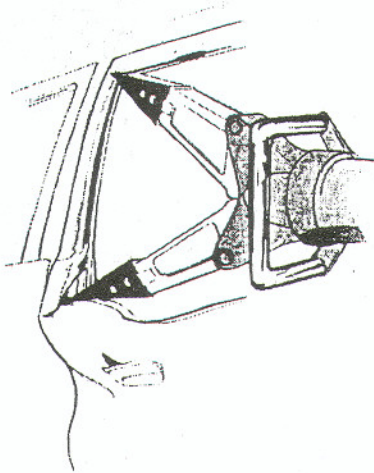
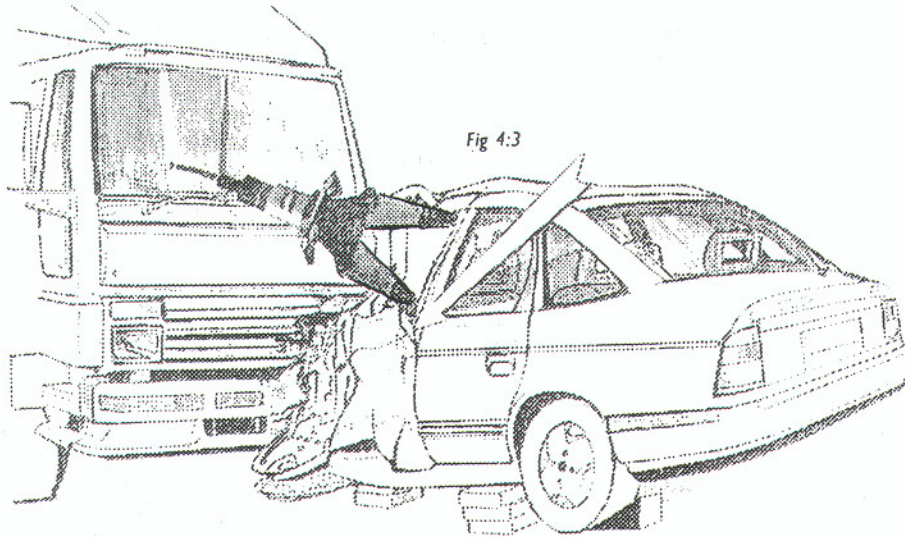


Most spreaders have slender and well serrated tips which afford a good grip. Therefore, they are relatively easy to place in the door opening without jamming or slamming them into position.

To gain entry for the insertion of the spreader tips, open the arms sufficiently to allow one tip to be placed in the doorline. Close the spreaders gripping the edge of the door skin, and use the tool to fold the door edge back. Fig 4.2.

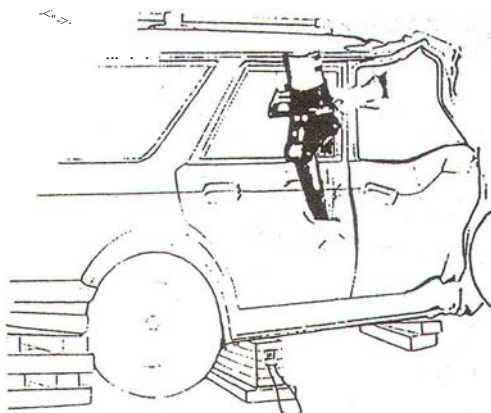
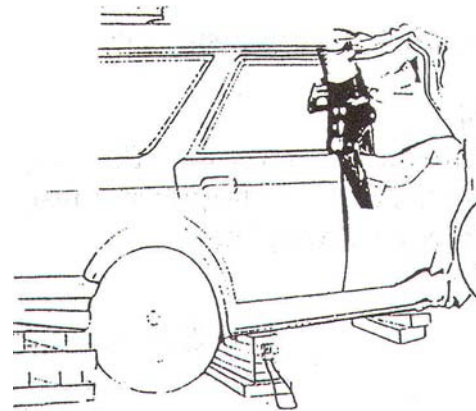
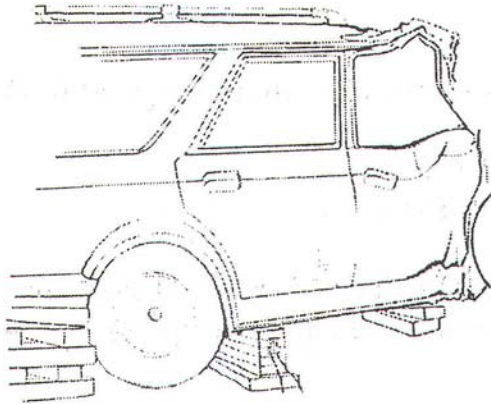
**PURCHASE POINTS,  
GAINING ACCESS TO THE DOORLOCK  
The Forced Opening of Doors**

**SPREADING BETWEEN THE ROOF SIDERAIL  
AND THE WINDOWLINE**



Once a purchase point has been gained, the spreader can be repositioned to gain positive purchase on the latch mechanism.

**PURCHASE POINTS,  
GAINING ACCESS TO THE DOORLOCK  
The Forced Opening of Doors**



*Use of the spreader to squeeze the front or rear door skins together or to pinch the rear 1/4 panel close to the center post will expose the door lock.*



## **EVOLUTION: THE FORCED OPENING OF DOORS FROM THE DOORLOCK**

Remember to protect patient from glass and the forces of the tools, soft and hard board protection is a must.

Cut door mounted seatbelts as close to the ends as possible, this will make good tie down material for roof flaps if rope is not readily available

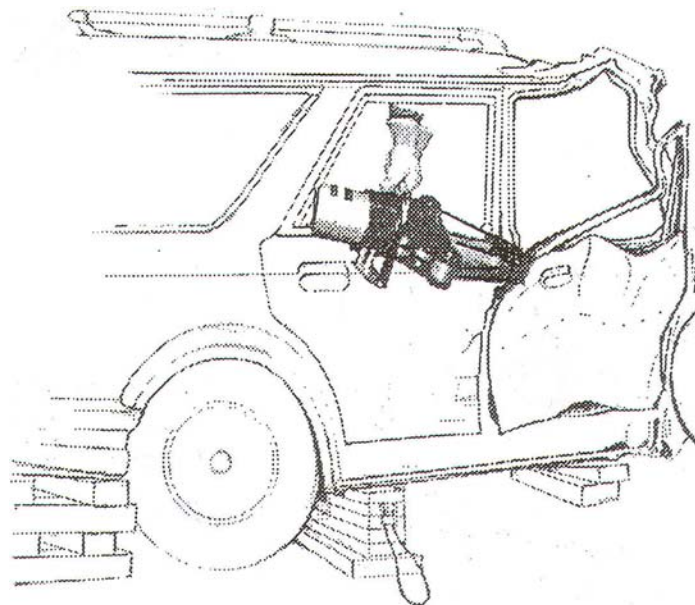
Wind down or break out glass as appropriate. **Protect the Patient.**

Place the spreader tips above the latch and force open the door. A series of spreadings will expose the doorlock and make sufficient space to reposition the tips for the positive forcing of the doorlock.

Where the door skin starts to separate from the inner skin, the spreader should be repositioned in order to gain the best possible position for forcing the latch.

### **CAUTION:**

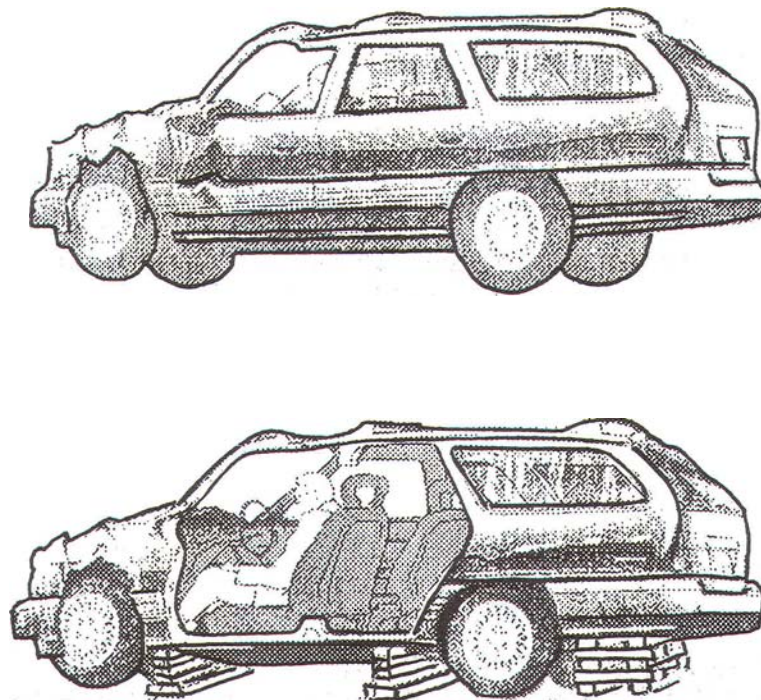
Spreaders are designed to work efficiently and quickly with considerable force. Therefore the folding in of the door on the patient must be avoided. Secure the forced door in the open position or remove completely.



## **SIDE REMOVAL**

### **SIDE REMOVAL 4 DOOR SEDAN/HATCHBACK/VK/STATION WAGON**

**(Removing the rear door and "B" post complete)**



### **SPACE MAKING TECHNIQUE**

#### **Evolution: Removing the Rear Door and Center Post Complete**

Side removal is always advisable when extricating a casualty, especially when providing for suspected spinal injury, internal trauma, and large bone fractures.

- Where possible diffuse all risks.
- Secure and stabilize the vehicle.

## SIDE REMOVAL

SIDE REMOVAL 4 DOOR VEHICLE  
(Removing the rear door and "B" pillar)

### EVOLUTION USING THE COMBINATION TOOL OR CUTTERS:

Open all necessary doors and:

1. Cut away the seatbelt webbing
2. Use the combination tool to spread the hinges and remove the rear door from the center post
3. Cut at point (a) Fig 4:18.

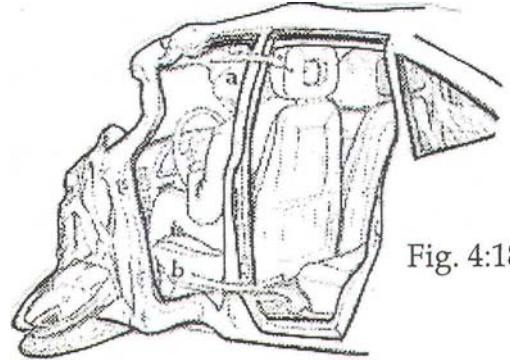


Fig. 4:18

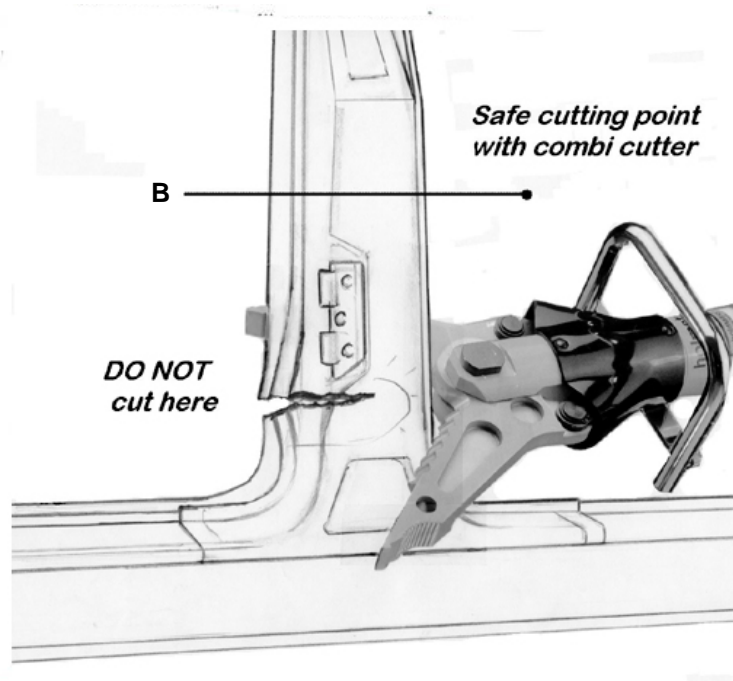
### DO NOT FORGET

Use hard patient protection reference between cut (a) and patient as the cut is being made. Fig 4:18.

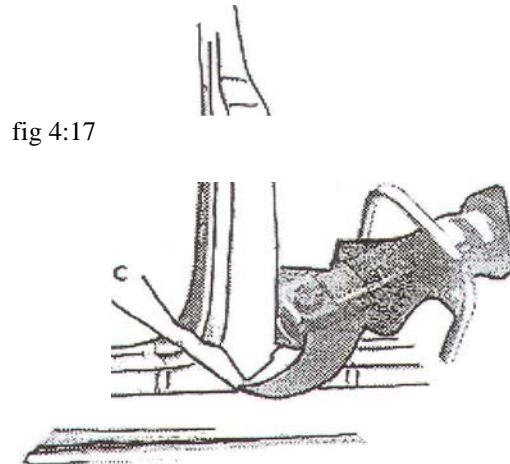
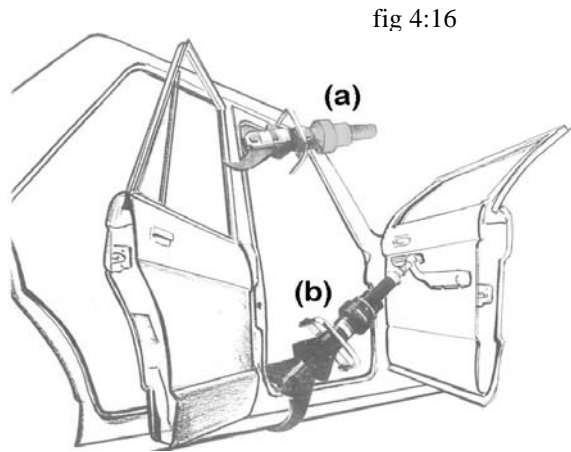
4. Cut at point (b) above the bottom door hinge. Fig 4:18 & 4:19. This cut will avoid an active undeployed SRS pre-tensioner fitted in the B pillar.

## SIDE REMOVAL

Fig. 4:19



## SIDE REMOVAL 4 DOOR SEDAN



### EVOLUTION USING THE CUTTER

#### Open all necessary doors and:

1. Cut away the seatbelt webbing
2. Cut at points a, b, and c Fig 4:16 & 4:17. Where additional cutting is required, bodily twist the rear door and "B" pillar to gain additional space and complete the cut to the base of the "B" pillar.

#### DO NOT FORGET

*Use hard protection between cut (a) and patient as the cut is being made. Fig 4:16. It is important to note that if there are side impact air bags present, DO NOT USE A HARD DEVICE BETWEEN ANY AIRBAG and a patient or personnel!*

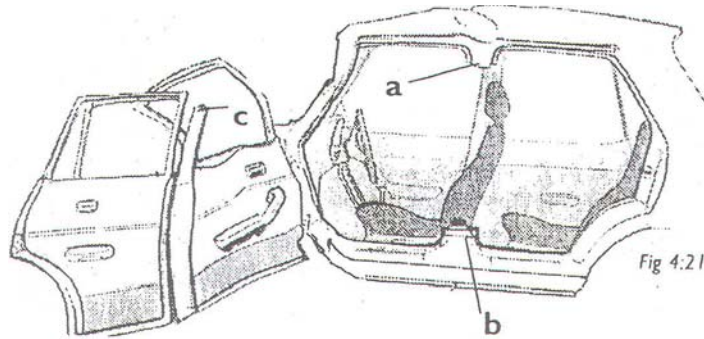
This technique is SRS friendly. Where a side impact fails to activate the pre-tensioner housed in the base of the center "B" pillar, to disassemble the side of the vehicle in this way will avoid the assembly. When dealing with an active system, we should anticipate a loud bang as the system deploys when the cut at point (b) is made. Fig 4:16.



## SIDE REMOVAL

### SIDE FLAP - T BONE, CRASH DAMAGED SIDE

(Side removal by opening the rear door, "B" pillar and front door on the front door hinges.)



### EVOLUTION USING THE CUTTER:

Open the rear door and:

1. Cut away the seatbelt webbing
2. Cut the center post/"B" pillar at point (a) Fig 4:21.

### DO NOT FORGET

Use hard protection between cut (a) and patient as the cut is being made. Fig. 4:21.

3. Following the line of the rocker panel, cut the base of the center post/"B" pillar at point (b) Fig. 4:21. To gain additional space to re-insert the cutter, forcibly pull the "B" pillar outwards using the top of the post as a lever (c) Fig 4:21, and conclude the cut to the base of the doorpost. Open the rear door, "B" pillar and front door outwards on the front door hinges.
4. Secure in the open position or remove altogether from the front door hinges.

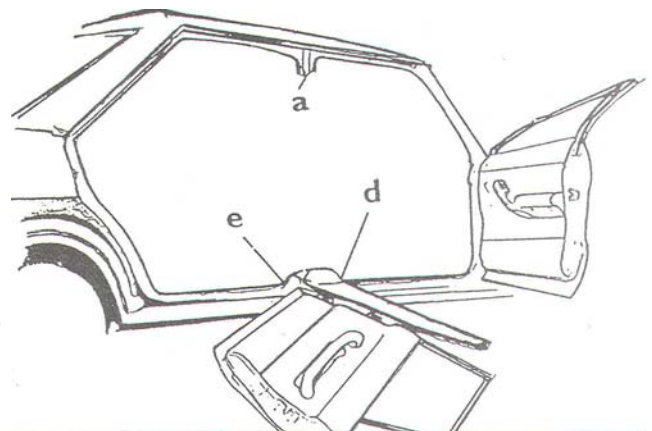
**WARNING:** Where SRS electronic pre-tensioners are incorporated in the base of the center post/"B" pillar, inadvertent cutting at point (b) Fig 4:21, may sever through the pre-tensioner discharge tube or liberate the propellant in an undeployed system, creating an additional hazard for patient and rescuers alike.

## SIDE REMOVAL

### SIDE FLAP - T BONE, ACCIDENT DAMAGED SIDE

(Side removal by opening the rear door, "B" post and front door on the front door hinges.)

Fig  
4:20

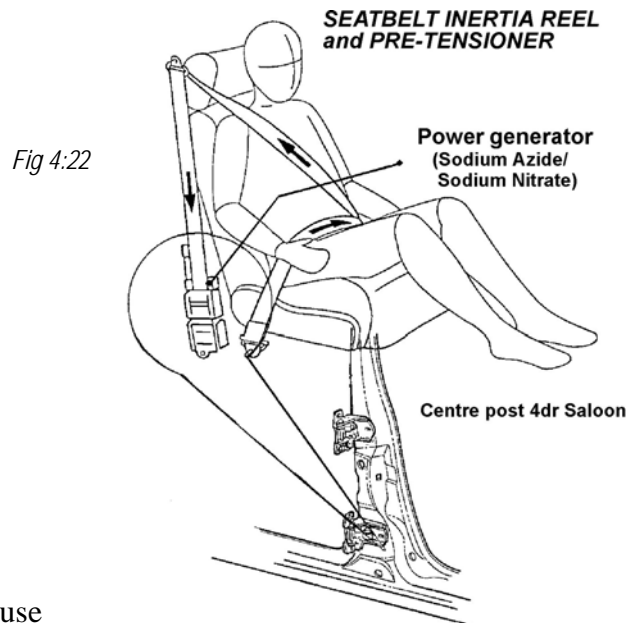


## Third Door Conversion

The third door conversion is another space making technique. By folding the rear occupant quarter panel back/ down, technicians will gain additional space for greater patient access.

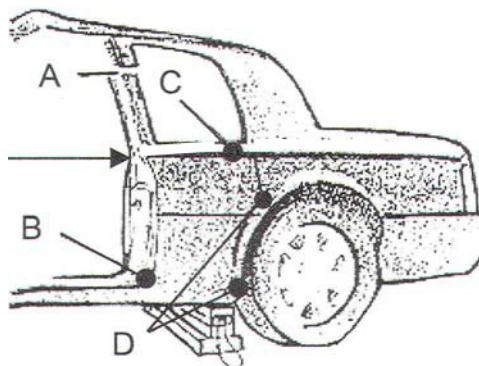
### Fold Down Technique

1. Stabilize the vehicle and remove glass as required.
2. Open or displace the door to expose the B-pillar.
3. Scan the vehicle for icons and telltale signs of pretensioners and side impact airbags systems.
4. Remove the interior trim from B-pillar and quarter panel to locate; pretensioners, airbag systems and possible cutting zones.
5. Carefully, cut the seatbelt off near the base of pretensioners as shown in figure 4:22. Cutting the seatbelt at the pretensioner will reduce the risk of injury from the accidental deployment of a pretensioner. Should the pretensioner be deployed, the seatbelt will not be able to whip across the patient or strike a rescuer.



6. Cut (sever) the B-pillar at points A & B as shown in figure 4:22.1
7. Cut the quarter panel at points C & D as shown in figure 4:22.1.
8. Quarter panels with double walls may cause resistance to folding. Additional cuts may be necessary on the interiorside of a double wall to allow the metal to fold.
9. Clamp the hydraulic spreaders high on the B-pillar along the outer edge as noted in figure 4:22.1. Fold down third door.

Place the spreader tips upright and high at this point to gain leverage.



## Third Door Evolutions

### SIDE REMOVAL ON THE 2 DOOR VEHICLE

#### EVOLUTION USING THE CUTTER OR HAND TOOLS:

Fig 4:23

Open all necessary doors and:

1. Cut away the seatbelt webbing.
2. Protect the patient and remove rear 1/4 window glass.
3. Where possible, remove the interior trim to the 1/4 panel.
4. Cut the center/"B" pillar at point (a) Fig 4:23.

#### DO NOT FORGET

Use hard protection between cut (a) and patient as the cut is being made. Fig 4:23.

5. Following the line of the rocker panel channel, cut the "B" pillar at seat cushion level at point (b) Fig 4:23. Where fitted, avoid the pre-tensioner.
6. Cut the window line at point (c) Fig 4:23. 7. Support the 1/4 panel and using a cutting tool, cut between points (b) and (c) as shown in (e) Fig 4:23 and remove the cut away section.

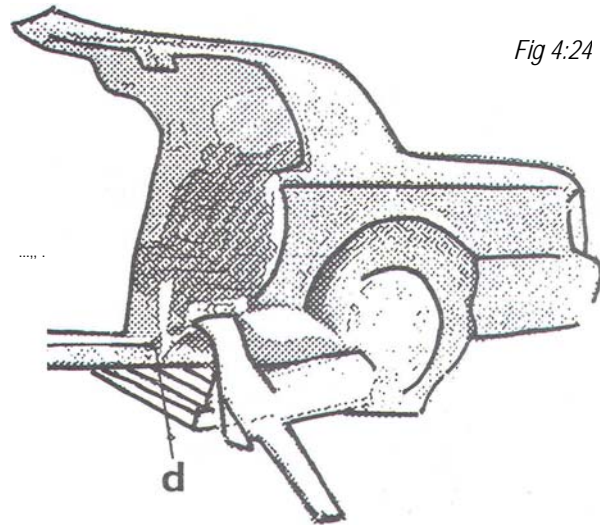


Fig 4:24

**NOTE:** When dealing with a rear seat entrapment, instead of cutting at point (b) Fig 4:23, an alternative method is to cut the rocker panel at point (d) Fig 4:24. The "B" pillar can then be used as a lever to pull the cut away section down to the ground. This action will reduce confinement, due to the wrapping over of the rocker panel and the rear floorboard on the rear seat casualty.

This technique is SRS friendly. Where a side impact fails to activate the pre-tensioner housed in the base of the "B" pillar, to disassemble the side of the vehicle in this way will avoid the assembly. When dealing with an active system, anticipate a loud bang as the system deploys when the cut at point (d) is made. Fig 4:24.

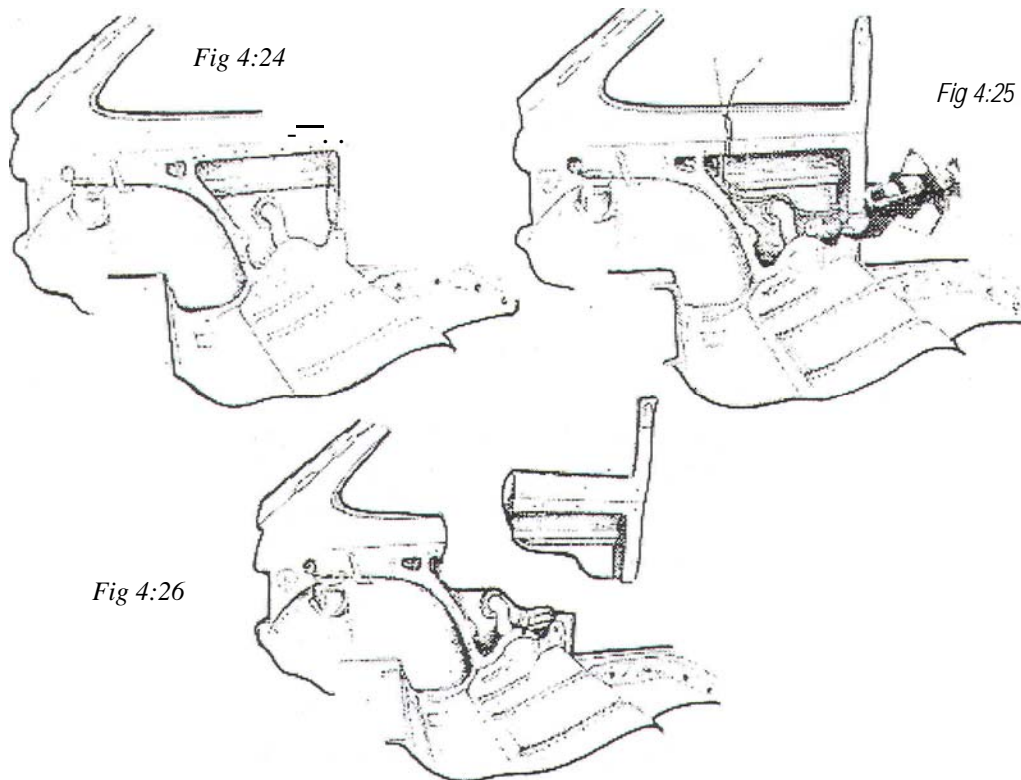
## THIRD DOOR CONVERSION

### PART REMOVAL OF THE REAR 1/4 PANEL

#### Incorporating the Installation of the Fuel Filler Pipe

On many current models of 2 door sedans, coupes and convertibles the fuel tank will be located underneath the rear seat, separated from the interior of the automobile by the floorboard. The fuel filler cap may be found on the rear 1/4 panel, underneath the side window.

Where the cutting away of the rear 1/4 panel is necessary, the fuel filler pipe may have to be avoided, particularly when the fuel tank is full of gasoline and, absolutely, when the vehicle has come to rest on its roof.

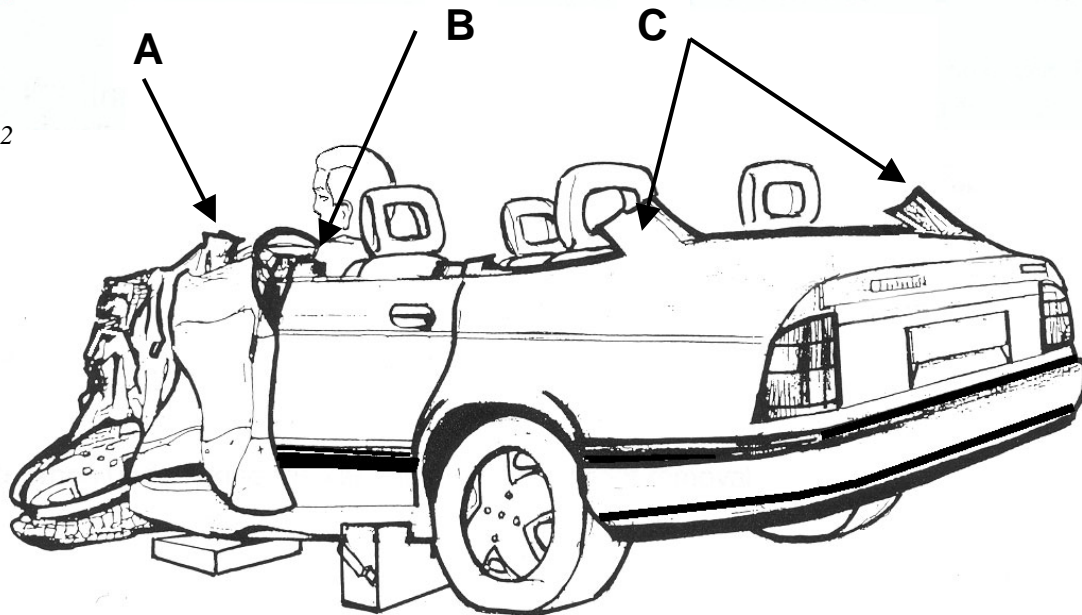


In avoiding the fuel filler pipe, partial removal of the rear 1/4 panel will normally afford sufficient space for the reclining of the front seat back. This operation will allow the front seat patient to be lifted in the sitting position onto the seatback, thus withdrawing their legs from the footwell and will also afford reasonable side access for patient packaging and handling.



## ROOF REMOVAL 'Complete'

Fig 4:42



### EVOLUTION: REMOVAL OF ROOF 'COMPLETE'

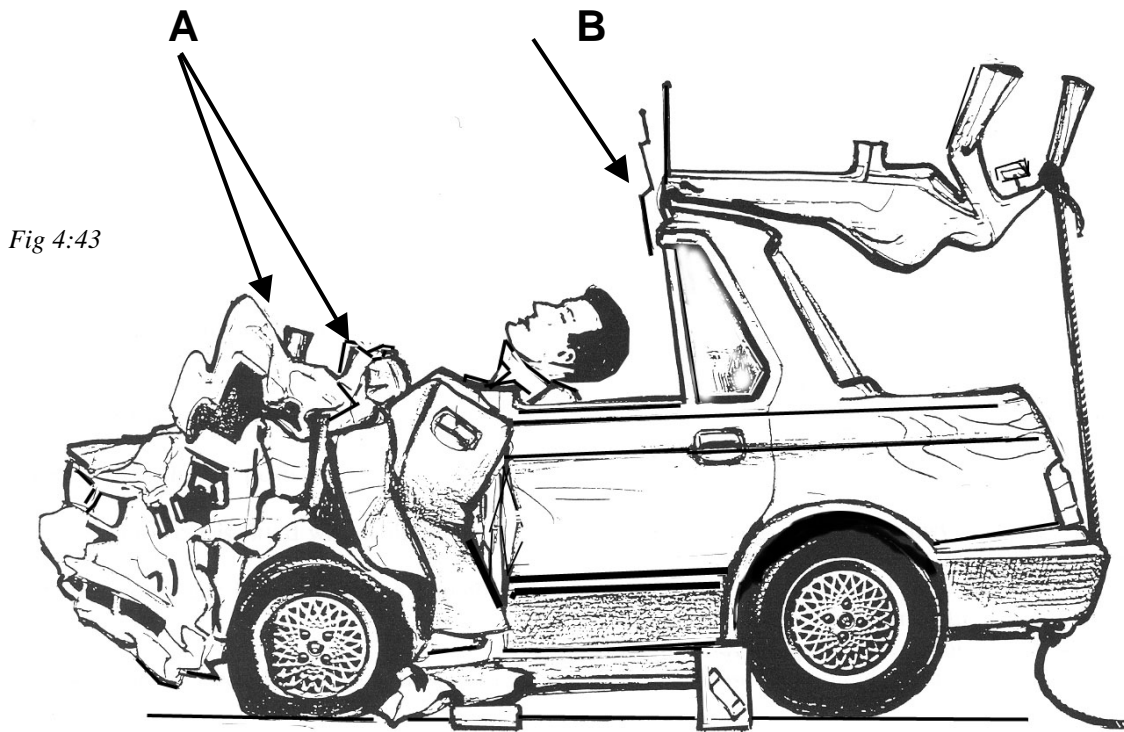
1. Open all doors operable by hand.
2. Protect the patient and remove as much windshield and window glass as considered necessary.
3. Cut front and rear seatbelts.
4. Cut both "A" pillar at point (a) Fig 4:42.
5. Cut the "B" pillar at point (b):
  - Where realistic rapid access to the patient is required for aggressive resuscitation and advanced airway therapy, the "B" pillar should be cut at point (f) Fig 4:46. Where doors cannot be immediately opened, door window housings must be supported by hand and removed as roof pillars are cut.

### DO NOT FORGET

*Use hard protection ONLY WHEN IT IS SAFE TO DO SO when cutting in close proximity to the casualty.*

6. Cut the rear 1/4 pillars at point (c). Rear seatbelt retractors should be avoided when making these cuts. Support the whole roof structure as the final cut is made. Remove the roof structure either over the rear of the vehicle or the front of the vehicle as appropriate.
7. AFTER cutting metal, sharp edges should be properly covered to protect patients and rescue personnel.

## ROOF REMOVAL 'Flap Back'



### EVOLUTION: ROOF FLAP BACK

1. Open all doors operable by hand.
2. Protect the patient and remove as much windshield and window glass as considered necessary.
3. Cut the front seat belts only.
4. Cut both A-pillar at point (A) Fig 4:43.
5. Make relief cuts at point "B" on both sides of roof. The deeper the cut the easier it will be to fold the flap back.

### DO NOT FORGET

*Use hard protection ONLY WHEN IT IS SAFE TO DO SO when cutting in close proximity to the casualty.*

### NOTE:

It is beneficial to make a second deeper cut into the roof side rails at point (B) Fig 4:43. Place a long pole across the roof to coincide with the cuts to the side rails and, while pulling down on the ends of the pole, fold the roof structure over the rear of the vehicle. Do not forget to remove pole before making the fold.

## ROOF REMOVAL 'Flap Forward'

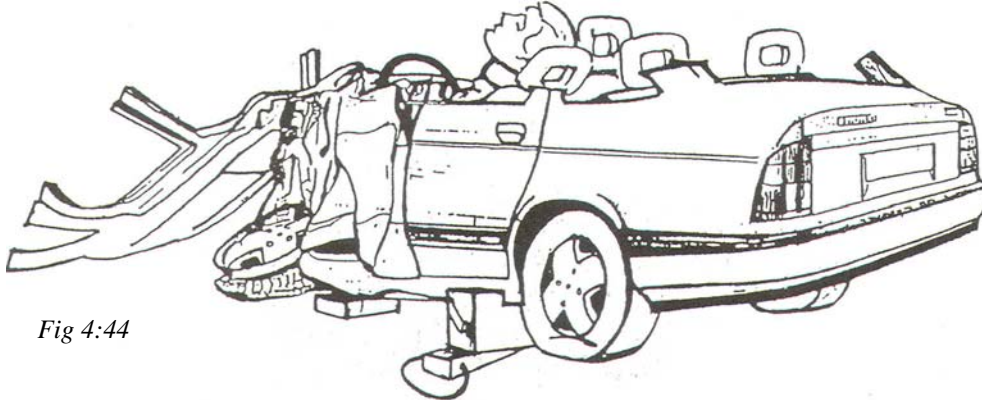


Fig 4:44

### EVOLUTION: ROOF FLAP FORWARD

A most suitable evolution for automobiles incorporating direct glazing, with small cross sectional rear 1/4 posts.

1. Open all doors operable by hand.
2. Protect the casualty and remove as much window glass as considered necessary.
3. Cut the front and rear seat belts.
4. Cut the rear posts at point (e) Fig 4:46, or at point (c) Fig 4:46. Rear seat belt anchor securing plates and retractors should be avoided when making these cuts.
5. Cut the "B" posts at points (b) Fig 4:46. Alternatively: Where realistic rapid access to the casualty is required for aggressive resuscitation and advanced airway therapy, the center posts should be cut at point (f) Fig 4:46. Where doors cannot be immediately opened, door window housings must be supported and removed as roof pillars are cut.
6. Cut the A-Post at point (a) Fig 4:46 and fold the roof structure onto the hood/bonnet.
7. Cut the windshield pillars at point (g) Fig 4:46 and lay the roof structure forward.

### DO NOT FORGET

*Use hard protection ONLY WHEN IT IS SAFE TO DO SO when cutting in close proximity to the casualty.*

**NOTE:** Because of the difficulty in removing a direct glazed windshield, 'roof flap forward' will obviate the separate action of bonded windshield removal. However, where a laminate windshield saw is available, preference should be given to 'complete' roof removal, as it is only necessary to cut the laminate glass between the cuts to the A-Posts at point (a) Fig 4:46, removing the need for cutting at point (g) (sub-section 7).

Where suitable rapid access to the casualty is required for aggressive resuscitation, speed in gaining adequate space will be essential.

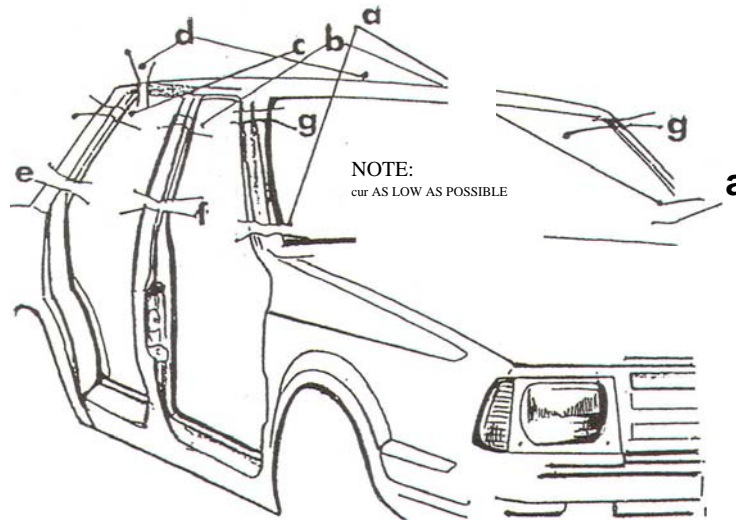
## ROOF REMOVAL

### 'SIDE FLAP'

Technique suitable for "RAPID INTERVENTION"

**NOTE:** Whenever possible cut pillars as low as possible to avoid sharp stubs

Fig 4:46



## EVOLUTION: ROOF SIDE FLAP

1. Open all doors operable by hand.
2. Remove as much window glass as considered viable.  
(Windshield and rear glass must be removed or cut)
3. Cut seat belts on side affected by cutting.
4. Cut the "B" pillar on the affected side at point (f). Where doors can not be immediately opened, door window housings must be supported by hand and removed as roof pillars are cut.
5. Cut the "B" pillar on the affected side at point (f) Fig 4:46. Where doors can not be immediately opened, door window housings must be supported by hand and removed as roof pillars are cut.
6. Cut the rear pillar on the affected side at point (c) or (e) Fig 4:46, as appropriate and fold the roof structure over to one side and secure, Plate 4:11.

## DO NOT FORGET

*Use hard protection ONLY WHEN IT IS SAFE TO DO SO when cutting in close proximity to the casualty.*

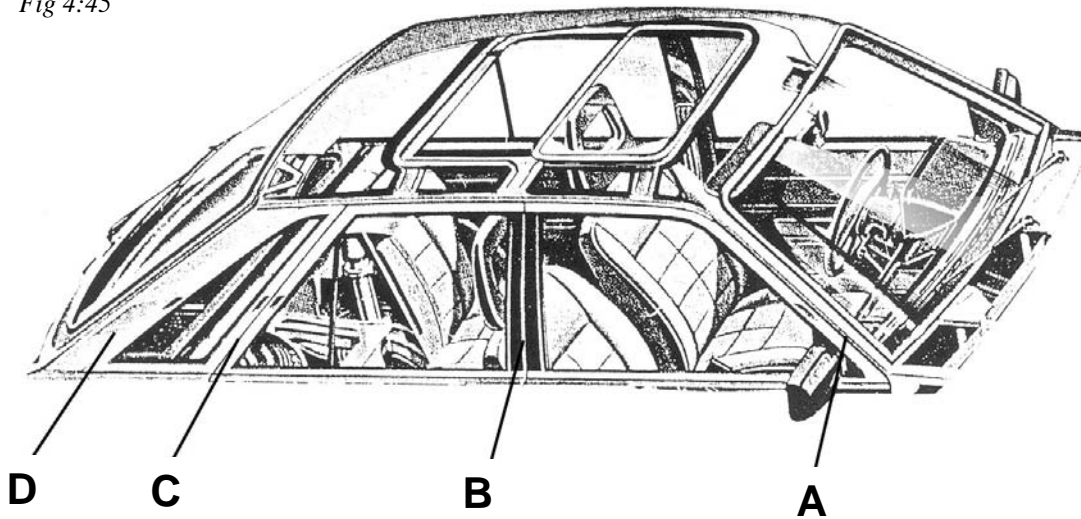
**NOTES:** The importance of adequately stabilizing the vehicle must not be overlooked as roof side flap will necessitate personnel climbing onto the vehicle. Where access to one side is obstructed, stabilization will need to be placed, from the front and the rear, on the affected side.



## ROOF REMOVAL

### CUTTING POINTS FOR ROOF REMOVAL

Fig 4:45



### STEEL SLIDING SUN ROOF ASSEMBLY

Where an automobile is fitted with a steel or reinforced glass sliding roof, 'roof flap back' becomes less advisable. The sliding frame will protrude into the rear of the roof, affording additional strength to the structure. In addition, the roof structure will have a second skin encasing the whole sun roof assembly. When the sun roof is in the open position 'roof flap back' may not be possible, unless cuts made to the roof side rails are to the rear of the whole sun roof assembly.

## DASH RELOCATION

### Dash Roll Up

This technique adopts the use of the power operated hydraulic rams, to push between the base of the center post and the front door post, where it meets with the windshield pillar at dash level, to relocate body part intrusion and to gain additional space for casualty release and immobilization. The design of these rams allows for this avenue of approach and affords rescue squads a very useful procedure when dealing with certain aspects of entrapment rescue. The ramming effort can afford a progressive spreading effect of 10" (250mm), 20" (500mm) and 28" (700mm), with up to 16.8 ton capacity. In the event of the casualty being firmly pinned against the transmission housing by the enfolded front door post and/or front footwell, the legs/feet will have to be freed before this evolution can be considered.

Any rescue capability cannot be considered complete without the availability of the necessary equipment to carry out this technique for dash relocation. Fig 6:12.

This technique is ideally suited for medical intervention. It allows the whole front footwell of the automobile to be opened up. Additionally, side removal can be conducted on the accident damaged entrapment side of the vehicle as the main purchase point for ramming can usually be maintained on the opposite side of the automobile. Fig 6:13, Fig 6:20 & Plate 6:12.

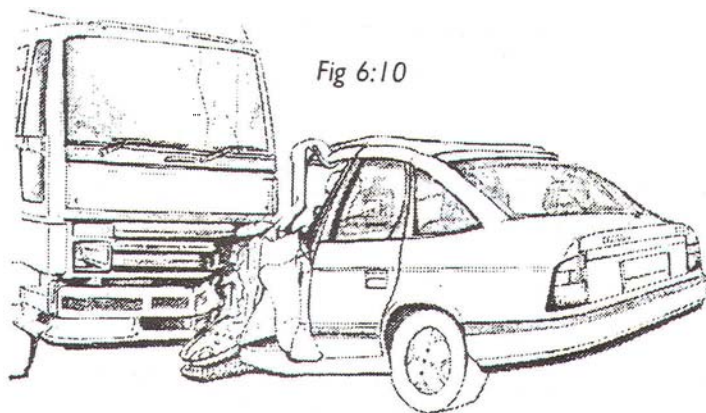


Fig 6:10

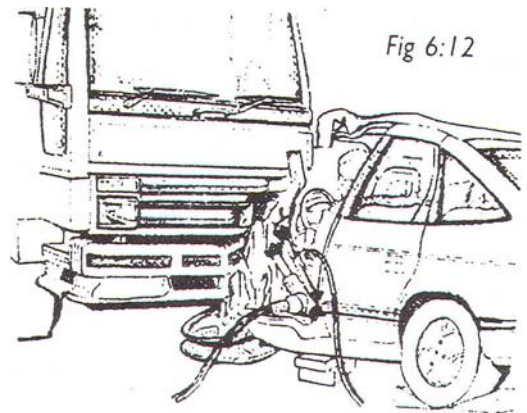


Fig 6:12

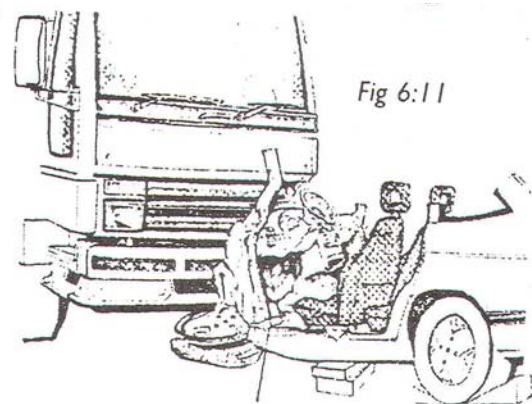


Fig 6:11

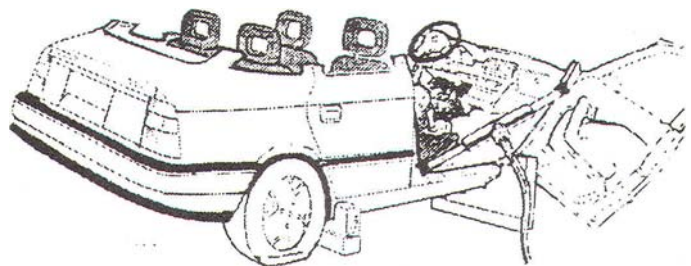
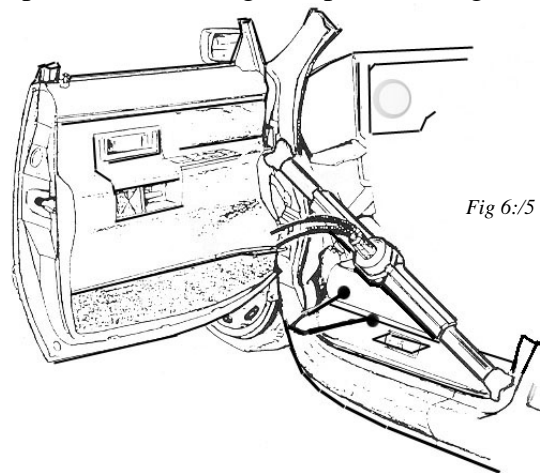
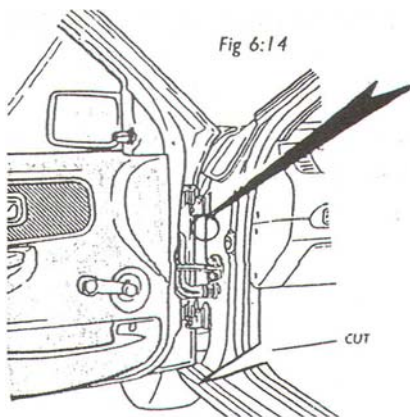


Fig 6:13

## EVOLUTION: DASH ROLL UP

This strategy is normally adopted in the controlled release of the patient, after or during side and roof removal.

1. Open the front door nearest the trapped front seat occupant.
2. Crib/block underneath the "B" pillar between the rocker panelj channel and the ground.  
This action becomes advisable on the more substantial automobile, where side removal has already been conducted.
3. Cut horizontally into the base of the doorposts on either side, in order to ease restrictions and allow the shifting accident damage to take up a more advantageous position. Fig 6:14.



4. When using a large hydraulic ram, position the through at the ram between the top hinge and transition (curve) of the upper A-pillar at the dash level. In other words at the base of the windshield (arch). See figure 6:14 and 6:15.

**NOTE:** The through of the ram should be positioned on the curve of the front door post where it joins with the "A" pillar at dash level. On rare occasions it can be beneficial to place the ram lower on the front door post but this really is a matter of experience.

5. Operate the ram to take up its position.

**IMPORTANT:** Where appropriate, the power ram must be positioned and tensioned prior to making relief cuts to prevent any adverse movement affecting the patient pinned by the steering wheel and column.

6. Use hard or soft protection between the dash area and the casualty, except in the case of an undeployed airbag.
7. Operate the ram, **IN LINE WITH MEDICAL INTERVENTION**, to push the front door post, dash and firewall off the trapped patient. Fig 6:9.
8. Progressive cribbing/blocking of the vehicle is essential to prevent collapse in the event of the ram slipping. Fig 6:16.



**NOTE:** This procedure should be performed on the opposite side from the patient if at all possible. To release the ram, with a view to repositioning/superimposing a larger ram or its removal, may allow the superstructure to spring back onto the front seat casualty, even though the vehicle is adequately supported by cribbing. Where the vehicle is free standing (disentangled and free of other wreckage) to place wooden wedges into the strategic cut to the base of the front door post will give additional assurance where the ram needs to be removed/replaced. Fig 6:16.

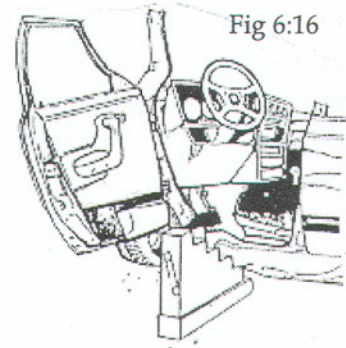


Fig 6:16

**ADDITIONALLY:** A higher degree of success can be achieved by using two power rams in conjunction. To place the larger ram on the opposite side to the accident damage, dash roll up can be achieved by systematically extending both rams. The smaller ram, being more appropriate in size to the accident deformity, can be extended in stages in conjunction with the larger ram. When the smaller ram is fully extended it should be supported and the larger ram fully extended. In this fashion the front end of the automobile can be pushed completely forward onto its nose and the smaller ram removed.

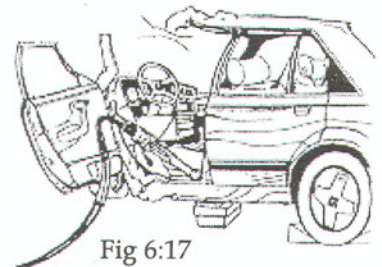


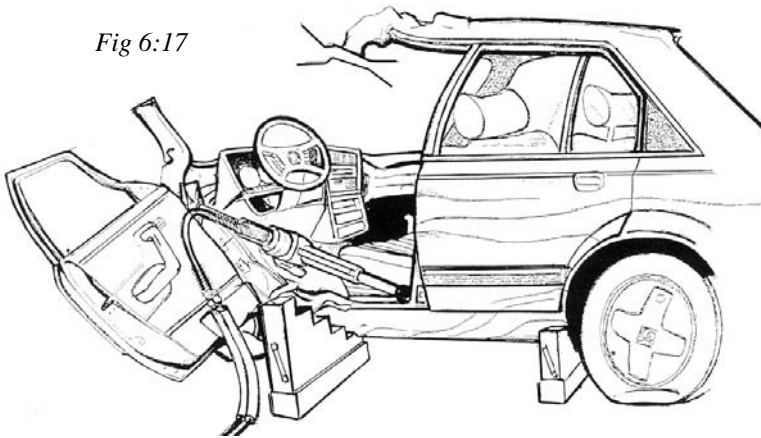
Fig 6:17



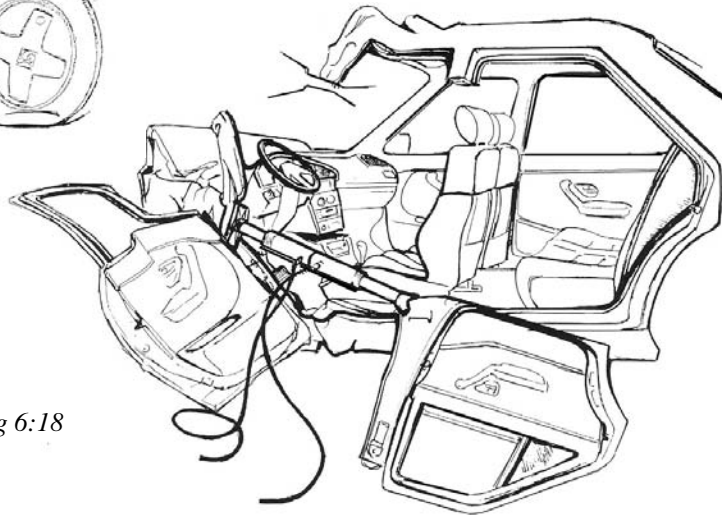


**NOTES:** Dash relocation can be considered alongside other methods of quick release, particularly when dealing with the front wheel drive, transmission automobile. It is important to remember that the structural strength of the vehicle must not be depleted by opening the rear door, Fig 6:18, or by indiscriminate cutting, before ramming takes place and the objective achieved. If the rear door has been opened and cannot be closed, the "B" pillar would be unlikely to afford sufficient purchase in pushing a collapsed dash, firewall and front door post off a trapped driver or front seat passenger without first cutting relief cuts, particularly where the "B" pillar and rocker panel/channel has suffered severe accident damage, and where the floorboard is supported by a large transmission housing.

*Fig 6:17*



*Fig 6:18*



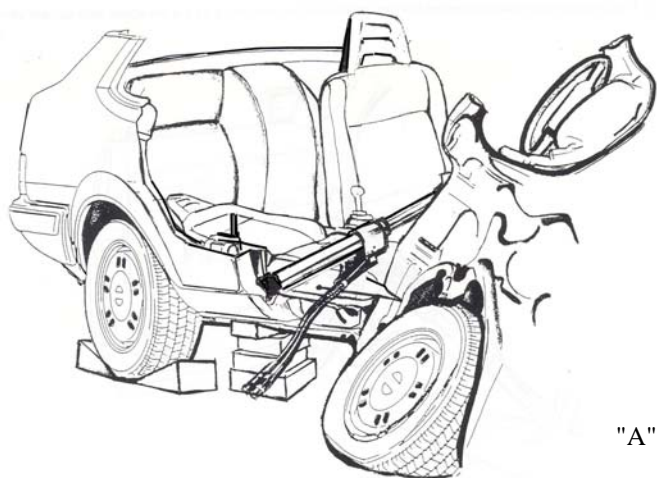
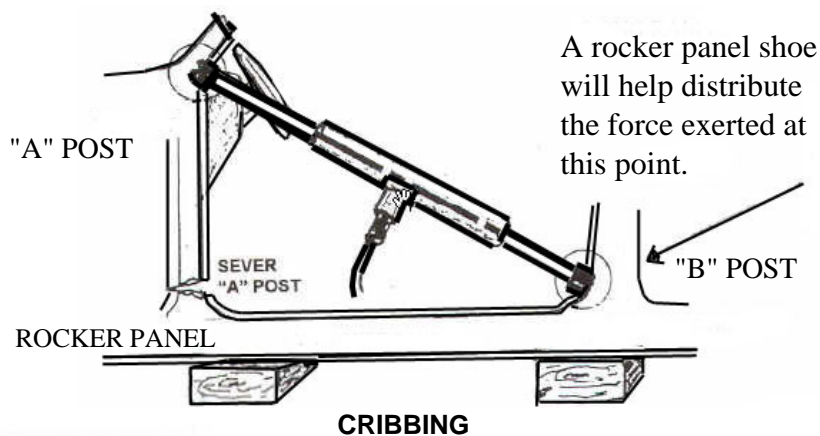
Another notable advantage of this technique is that it allows for the release of the front seat entrapment where the rear seat occupant has slid forward during the impact, their legs forcibly submarined underneath the front seat.

This will necessitate the release of the front seat patient first, so that the front seat can be forcibly removed in order to release the rear occupant's trapped legs. Fig 6:18. The position of the ram, when conducting dash roll up, will obstruct the removal of the front seat (seat track installation). Forced seat removal may then no longer be available as an option unless the ram is removed.

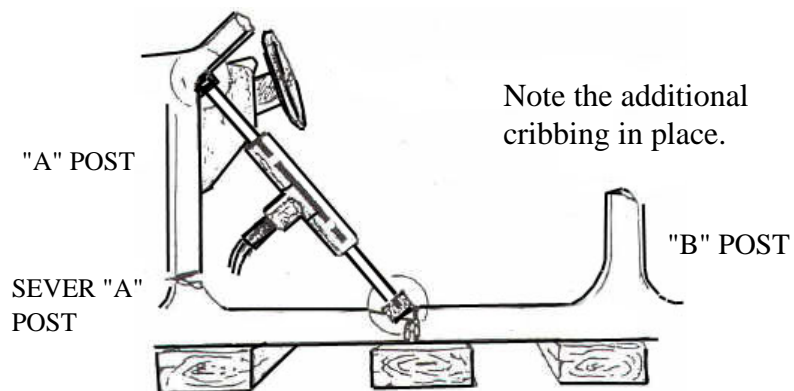
## PROPER RAM POSITIONING

*Dash Roll Up*

### LONG RAM PLACEMENT



### SHORT RAM PLACEMENT



Cut rocker panel. This will serve as a stop for the foot of the ram. This is used when a rocker panel shoe is unavailable.

<sup>1</sup> "Rocker panel" and Rocker Channel are synonymous; however the modern proper terminology is **ROCKER CHANNEL**.

<sup>2</sup> "Post" and "Pillar" are synonymous; however the proper modern terminology is **PILLAR**.

<sup>3</sup> Do not cut completely through the rocker channel as indicated in the depiction above. Cut only the upper quarter; severing the rocker channel may cause the dash roll to fail. Also, fuel, brake and wiring may be hidden in the lower half of the rocker channel.

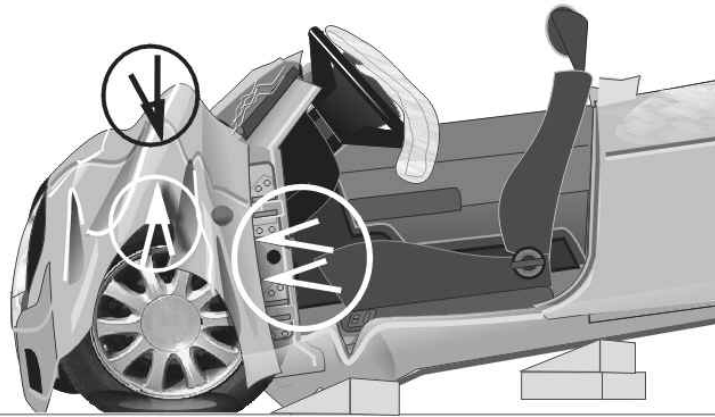
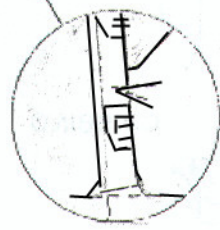


Fig 6:19

**NOTE:** Small pie cut no greater than 1 inch in depth



### Creating Relief Cuts

When using the spreaders or any lifting tool to jack the dash, it is extremely important that proper relief cuts be made. This allows the metal to move more freely and cause less resistance for the hydraulic tools.

To set up this task, remove the front door. When making your cuts, start at a front wheel well and make a cut below the top door hinge and above the bottom hinge.

Next, place the lifting tool into the top and bottom cuts and lift the dash and A-pillar. If using a power spreader, you can squeeze the section between the cuts and walk the piece forward. This makes a large opening to position your lifting tool.

**NOTE:** When using the rams this is not as critical, but with the spreaders you will not have the reach nor the power that a large ram has.

If you look at the figure above you will notice the placement of a large block or cribbing. The proper placement of cribbing is vital for this maneuver to work. The weight is transferred down on to the rocker panel once the spreaders start to open and force the two points apart. If the cribbing was not directly under the spreader tip, the pressure would then bottom out the rocker panel.

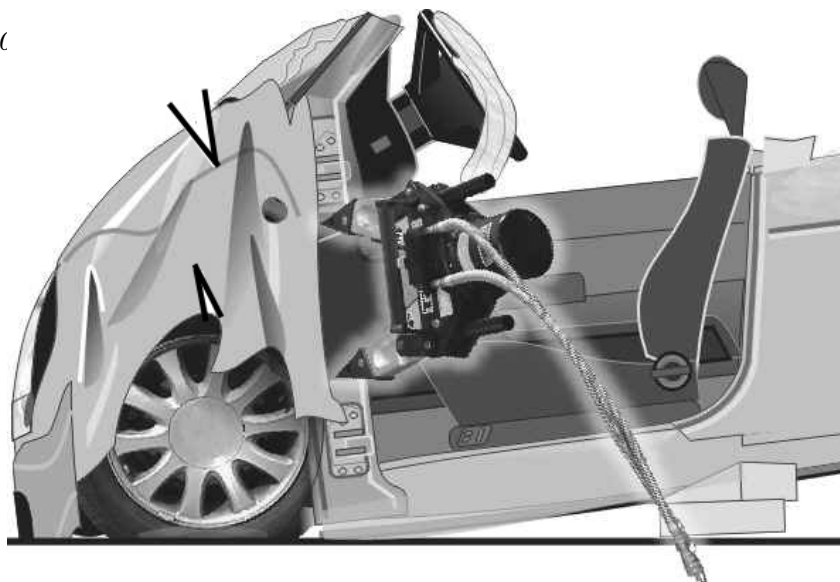
You should also remember that you may consider making mirror cuts to the opposite side of the car. Why should you make mirror cuts? The simple reason is this, if you have a failure performing this maneuver on one side you will be ready to immediately switch to the opposite A-post and repeat the procedure.

### Performing the "Dash Roll-up" with Spreaders

There is no question that a medium or large set of rams will outperform the spreaders in a dash displacement (dash roll-up). For those communities that don't have a complement of a ram(s) we have incorporated the maneuver using spreaders. Always be alert to perform a maneuver using alternate tools should the primary tools fail.

Before doing this maneuver, are all proper safety steps in place such as cribbing? Is there a heavy duty block or cribbing in place directly under the bottom position for the spreaders? Remember as discussed before, this is vital for proper performance of the maneuver.

*Fig 6:20*



**NOTE:** The position of the tips in Fig 6:20 and then compare to Fig 6:21. In Fig 6:21 the anchoring tips are offset from the A-post resting on the rocker panel. In Fig 6:20 above, they are in line, this is called "Jacking the Dash."

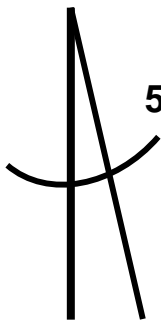
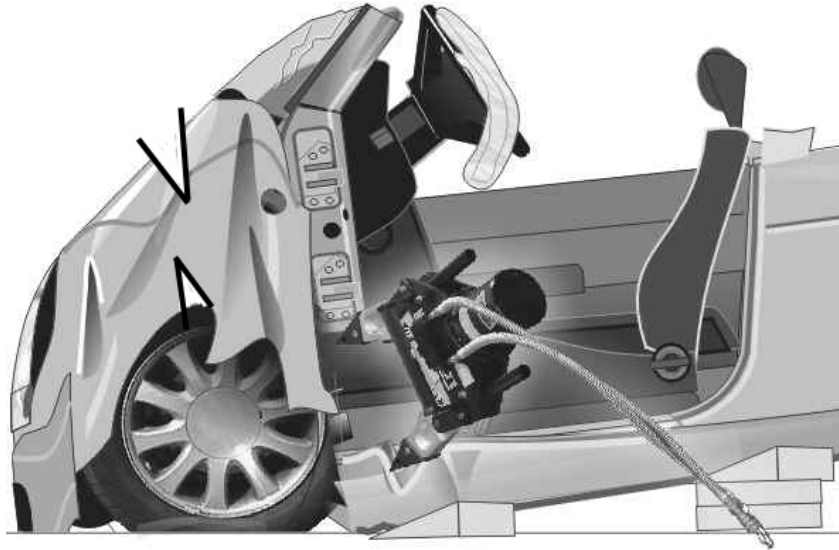
Place the anchoring tip either at the cut in where the A-post meets the rocker panel or just adjacent to the A-post on the rocker panel itself. Slowly raise the upper spreader arm so that the tip is inserted into the cut made in line with the dash on the A-pillar. Once in proper position extend the arms until the desired lift is reached.

Although you may do this lift on the opposite side as with the rams, you will gain more lift if done on the side of the patient. Remember you don't have the spreading capacity you would have if using the rams.

One question to remember, do you need 18 inches distance between the patient and the dash or steering wheel, or will a few inches do? Even with the rams, it is not necessary to extend the through so that the car breaks in half and the front grill rides on the surface of the pavement.



**NOTE:** The position of the tips in Fig 6:20 and then compare to Fig 6:21. In Fig Here the anchoring tips are offset from the A-post resting on the rocker panel. In Fig 6:20 they are in line and this is called "Jacking the Dash."



**5-10°**

Place the spreader at an angle of between 5 to 10 degrees off parallel to the front doorpost/A post. As shown in Fig 6.21, to minimise the initial opening and to maximise the spreading effect, the pie cut to the A post has been made just below the bottom door hinge.

## VEHICLE ON ITS SIDE

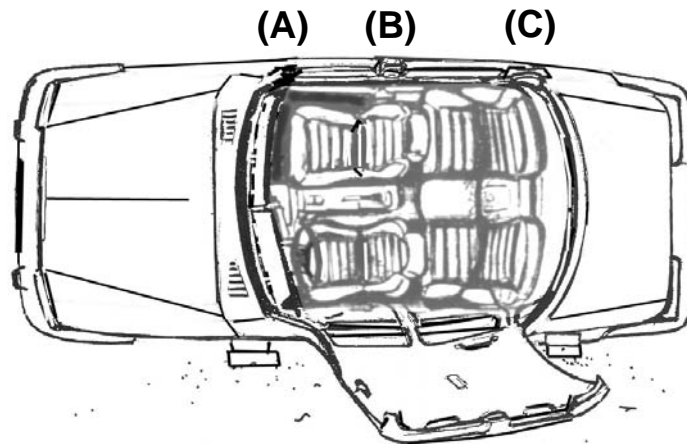
When the vehicle has overturned, there is a very real risk from fire. Apart from the burst fuel tank, gasoline may leak from the filler cap. Accident damage may have removed the cap or split or dislodged the fuel filler pipe. Let no one be in any doubt, even a small quantity of gasoline can prove a severe threat, needing urgent action to reduce the risk.

**NOTE** - If the battery has remained intact, by virtue of the fact that the vehicle is on its roof, the battery will not be accessible to disconnect.

In this type of incident, persons will mainly be trapped by virtue of their injuries. The situation may be complicated by the partial or total collapse of the roof structure. Where the vehicle is a hatchback or station wagon, it will further complicate operations.

At this type of incident, to cut the pillars/ posts and fold the roof structure down will allow sufficient access to effectively deal with casualties. The problems associated with the partial or total collapse of the roof structure will be overcome by taking this action.

*Fig 7:1*



### EVOLUTION: FOLDING THE ROOF DOWN

1. Stabilize the vehicle.
2. Protect your patients.
3. Remove windshield and window glass as necessary. This action will gain initial entry to the patients and prepare the roof pillars for cutting.
4. Ensure the patients are physically supported.
5. Cut at points (a), (b) and (c) Fig 7:1. Cutting the top of the A-pillar, B-pillar and rear pillar, will liberate the cut away section of the window housing on front and rear doors. To prevent the cut away section falling into the interior onto the patients the top of the window housing needs to be held by hand and removed as shearing concludes.
6. Cutting and removing the roof will reduce movement to the vehicle.

In the event that the vehicle is a hatchback or a station wagon, ideally the liftgate should be opened or, together with the rear quarter post pillar, it can be cut. Where the rear quarter post and liftgate are substantial, it may be wise to shear into the post/liftgate on the opposite side. When cutting in this way, the liftgate will present a hazard. As the cut concludes, the remainder of the hatch/liftgate may eject open.

In the interests of safety, protruding roof pillars should be covered or cut away.

**CAUTION:** When shearing or cutting the rear quarter post or liftgate/hatchback, where installed, care must be taken to avoid the gasoline filler pipe.

7. Bodily fold the roof structure to the ground and remove the patients. Fig 7:1. All sharp edges should be covered to protect patient in rescue personnel.



Rescuers' performing a 'Roof Fold Down' while a Medic is administering to the casualty

## VEHICLE ON ITS ROOF

At the vast majority of entrapments, where the automobile has come to rest on its roof, opening the door nearest the patient can be considered first. When a patient is severely injured and is considered to be trapped by restricted space, then it will be necessary to expose the interior of a vehicle by removing the side structure of the vehicle including doors and pillars.

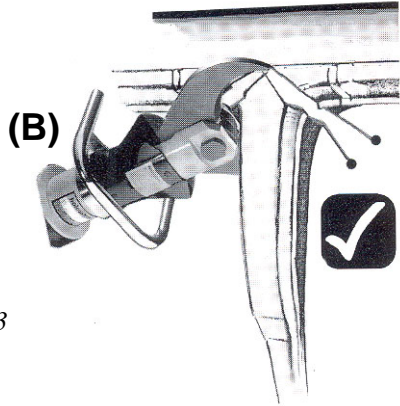
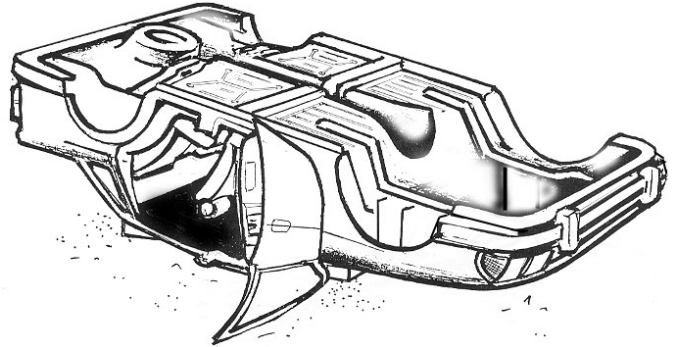


Fig 7:3

Fig 7:2

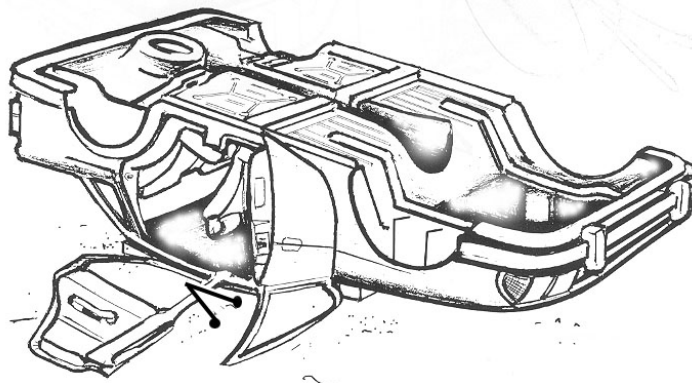


### EVOLUTION: INVERTED SIDE REMOVAL 4 DOOR SEDAN (Removal of the Rear Door and the Center Pillar).

1. Stabilize the vehicle.
2. Gain entry and support and protect the patient.
3. Unfasten or cut the seatbelt.
4. Remove glass as necessary.
5. Open the front and rear doors.

NOTE: When a vehicle is fitted with door mounted seat belts (lap and shoulder belt), support the patient as best as possible and cut the seat belt prior to any attempt at forcing the door. The likelihood exists that the seat belt can jam under load or accident damage, and any subsequent movement will be transferred to the casualty.

Fig 7:4



6. Cut away the window housing and relocate the front door.
7. Cut the base of the center post at points (a) and (b). Fig. 7:2 and 7:3.



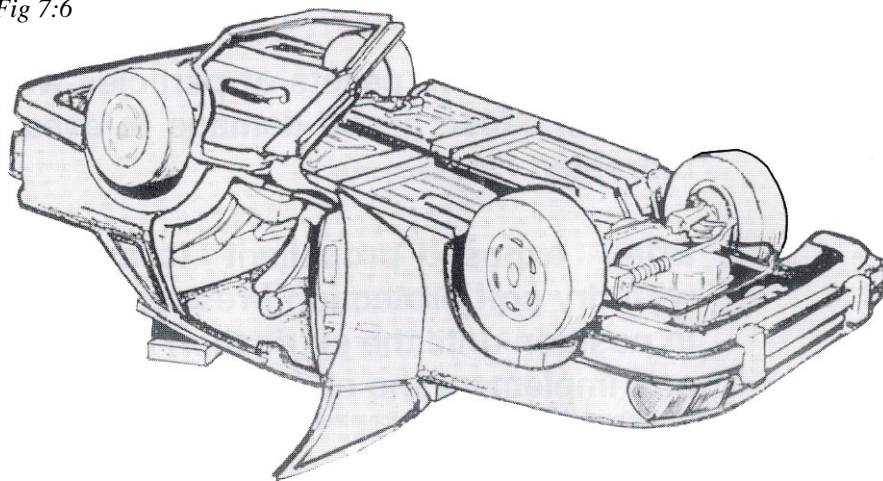
This technique is SRS friendly. Where a side impact fails to activate the pre-tensioner housed in / the base of the center post, to disassemble the side of the vehicle in this way will avoid the assembly. When dealing with an active system, we should anticipate a loud bang where the system deploys when the cut at point (a) is made. Fig 7:4.

8. Bodily force the rear door and center post down.
9. Avoiding the seat belt anchor plate, cut the center post close to the roof side rail and remove the center/B post complete with the rear door. Fig. 7:5.
10. "Sharps" protection, cover any cut metal that could cause injury.

ALTERNATIVELY: Crews can cut the top of the center post (B-pillar) at the roof rail. The rear door and B-post can then be folded up and over the floorboard of the vehicle. Fig. 7:6.

NOTE: Live pre-tensioners will activate with a loud bang and attached seatbelt webbing may whip where a connect is broken or cut.

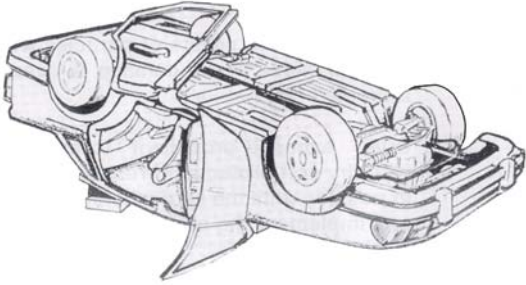
*Fig 7:6*



## INVERTED SIDE REMOVAL

Fig 7:6

VEHICLE ACCIDENT RESCUE  
ACTIVE UNDEPLOYED SRS &  
SEATBELT PRE TENSIONERS



**NOTES:** Where the roof pillars have remained relatively intact, the side of the vehicle can be removed. Stabilization must always be adequate to support the vehicle without concern for movement or collapse.

Remember to adjust the front seatback fully in order to obtain additional space for patient handling.

A tarp /blanket should be spread on the ground to cover the immediate working area, in order to protect squad members from kneeling on fragmented glass and to offer a clean, dry surface for patient packaging and removal.

## INVERTED SIDE REMOVAL (2 Door Sedan and F/H Coupe) Fig 7:8 .

It should be appreciated that the cutting away of the rear 1/4 panel is relatively simple, quick to perform and effective, in that the space gained can be vital in freeing and maneuvering the patient.

Where the 2 door sedan has come to rest on its roof, inverted side removal will expose the interior of the automobile, affording sufficient side access for subsequent operational involvement.

On the 2 door sedan or the F /H coupe, inverted side removal Fig 7:8, will necessitate the removal of the B-post and the cutting away of the rear 1/4 panel.

Fig 7:7

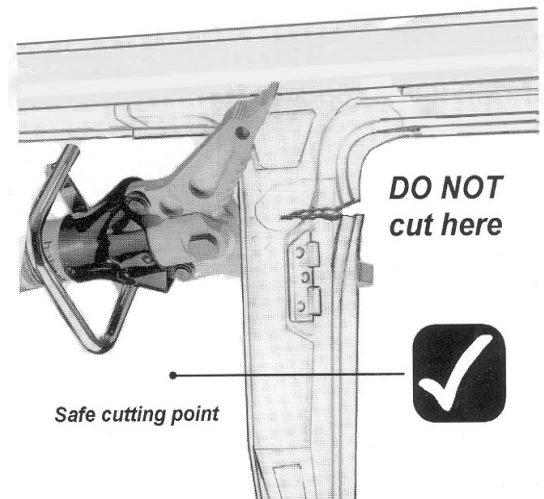
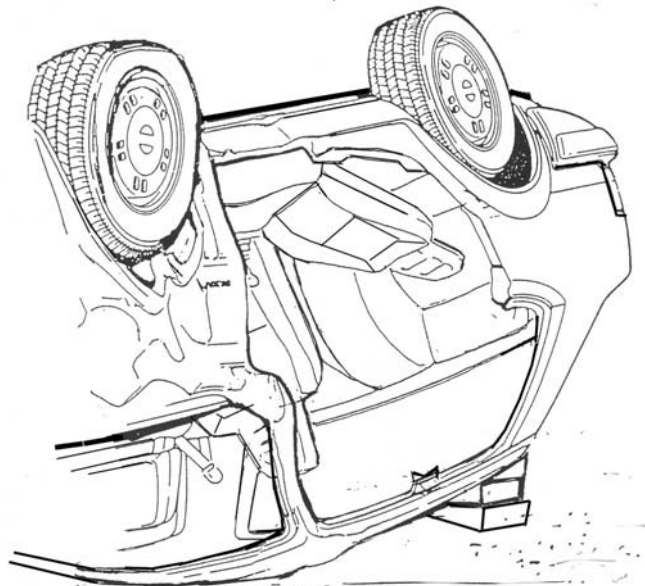


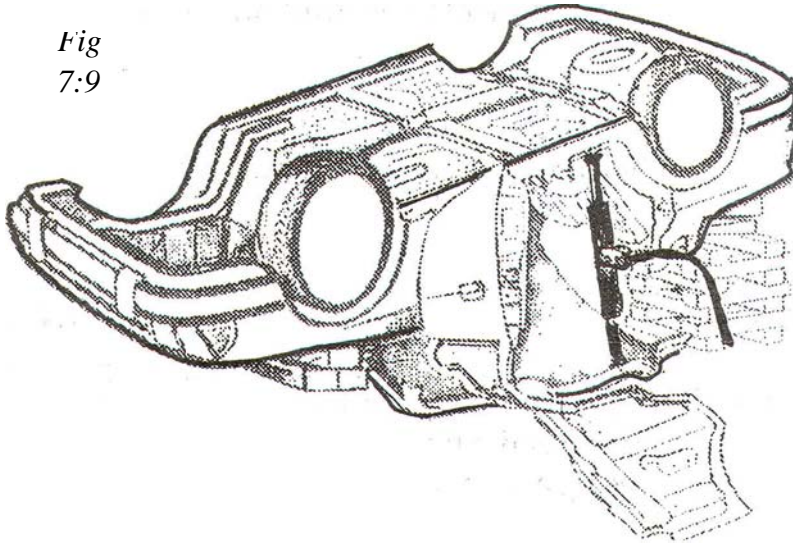
Fig 7:8



## VEHICLE ON ITS ROOF (Trapped by the Collapse of the Roof Structure).

Where a vehicle has come to rest on its roof and the roof structure has collapsed, to conduct inverted side removal is not likely to create sufficient space to release the patient. This type of entrapment may hold several patients within the confines of the vehicle's interior. Spreading vertically with power cams, spreaders, or jacks in conjunction with strategic cutting will offer tremendous scope for patient handling and removal. Fig 7:9.

*Fig*  
7:9



### EVOLUTION: RAMMING AND STRATEGIC CUTTING

1. Remove the side of the vehicle. Fig 7:5.
2. Place a tool such as a ram or jack between the roof side-rail and the rocker panel and extend to take the strain. Ensure it is placed so as not to prevent the removal of the patient. Fig 7:9. Cut the windshield pillar, center pillar and rear pillar as necessary.

**CAUTION:** If fitted, avoid the gasoline filler pipe where it is installed in the rear quarter post. If the vehicle is a hatchback or a station wagon, open the liftgate/hatchback or cut in conjunction with the rear quarter post. Prior to cutting, the liftgate/hatchback should be taped to the rear quarter post to prevent the gas strut kicking the cut away section out.

4. Extend the lifting tool and, where appropriate, maneuver the suspended patient in unison out of the vehicle.



## THE MINIVAN RANGE

### EVOLUTION: ROOF FLAP BACK AND BULKHEAD/DASH RELOCATION

1. Secure the vehicle. Wedge the wheels and block/crib behind the front wheels, and at the rear between the chassis and the ground.
2. Where appropriate, remove the remains of the windshield and locate drop windows within the confines of the doors or remove as necessary.
3. Open/force the front doors.
4. Shear the windshield pillars close to the roof structure. Ensure that shearing points avoid the grab handles mounted on the A-post/pillar (a) Fig 8:2.
5. Shear the roof siderail, at the rear of the front door opening, on either side of the vehicle (b) Fig 8:2. With the high sided panel van, it will be necessary to re-introduce a cutter and continue cutting to overcome the shaping on the side of the roof structure prior to attempting roof flap back.
6. Flap and secure the roof. Fig 8:4.

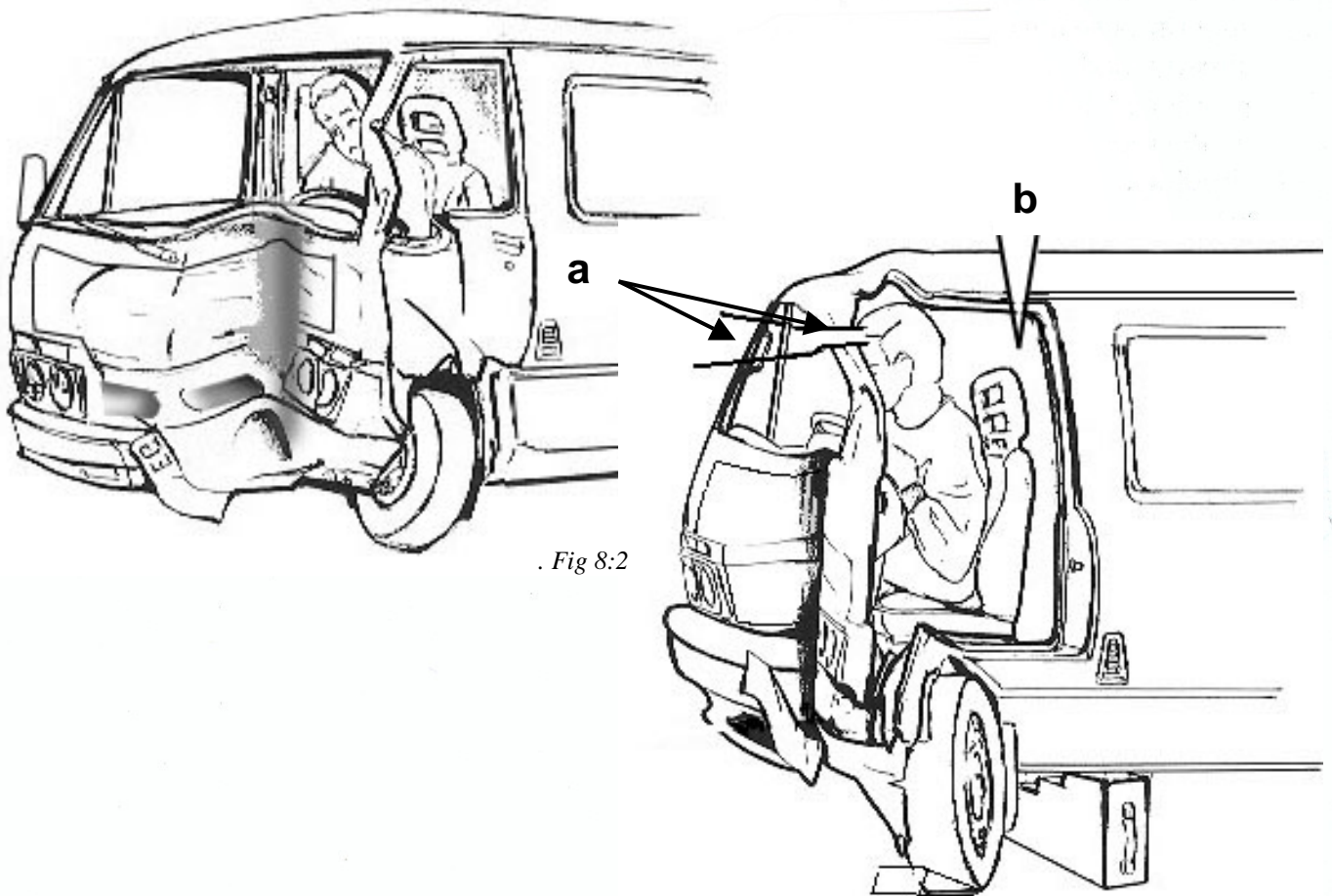


Fig 8:2



## RAMMING AND STRATEGIC CRUSHING/CUTTING

7. Cut or crush the base of both front door posts (a) Fig 8:3.
8. Ram between the rear of the door opening and on a suitable purchase point on the front door post.

It may prove necessary to utilize the power hydraulic spreader to obtain sufficient space to introduce the small power ram. Fig 8:3.

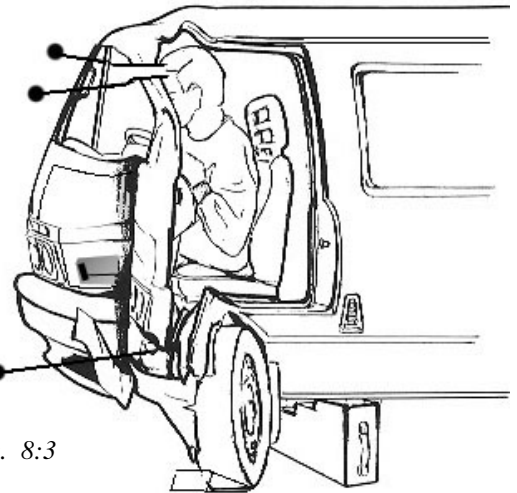
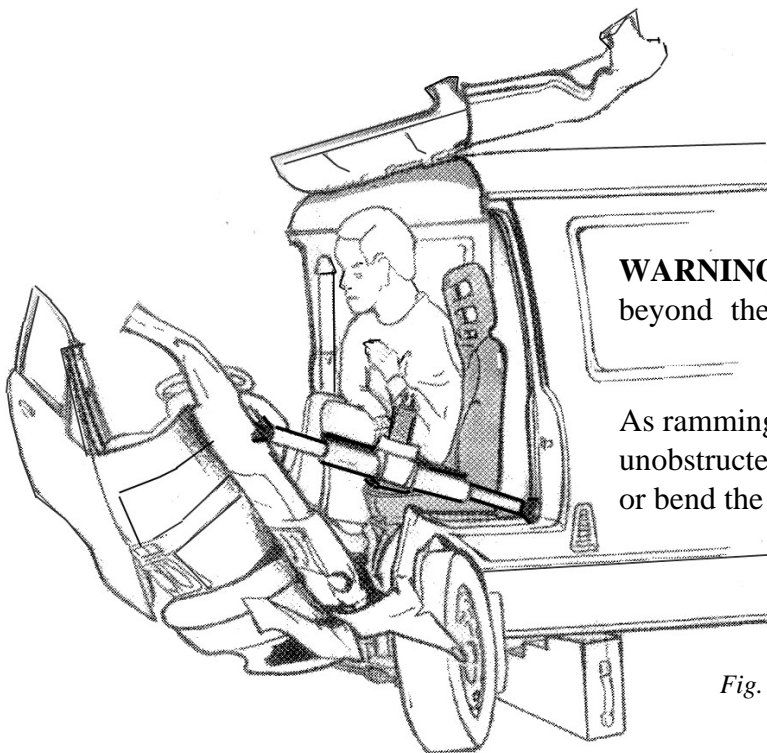


Fig. 8:3

9. Once the power ram has taken over the initiative, the spreader can be removed and, where necessary, reapplied between the engine housing and the heater/bulkhead on the inboard side of the patient.
10. Extend the power ram gradually and, where applied, the spreader, in line with medical intervention.
11. In the interest of gaining optimum space, a second ram should be made ready to superimpose the existing ram. Where necessary, the spreader will maintain the space already made and the small ram withdrawn. Invariably the intermediate ram can be positioned at the base, to the rear of the door opening, with its opposite claws/head located on the top door hinge. Fig 8:3. When extending the ram, this will help to prevent the ram slipping as the angle in relation to the uppermost purchase point becomes more acute. Fig 8:4.



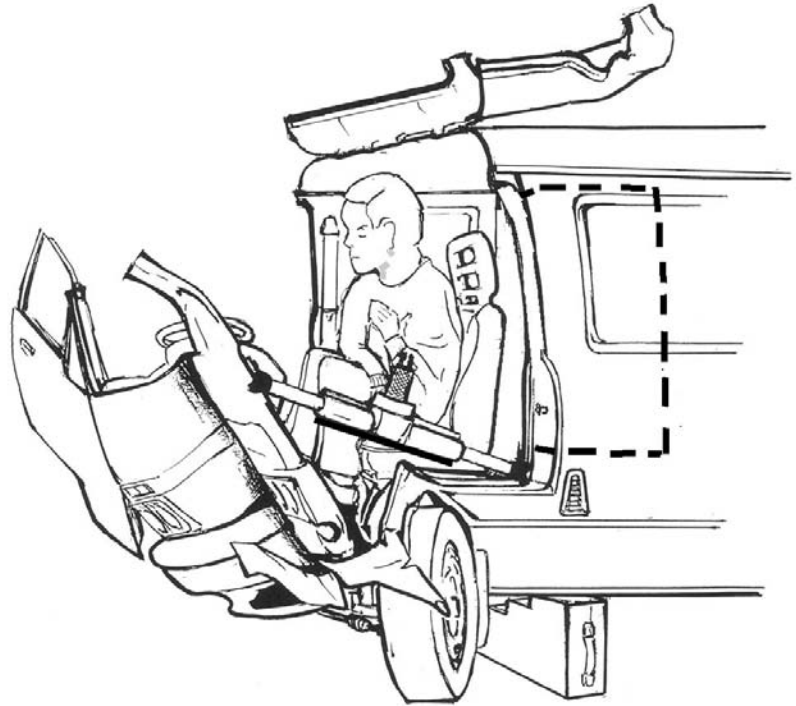
**WARNING:** It is imperative not to extend the ram beyond the integrity of the purchase point.

As ramming progresses, ensure the casualty's feet are unobstructed by the pedals. Where appropriate, remove or bend the offending pedal(s) out of the way.

Fig. 8:4

## PART SIDE REMOVAL

. Fig 8:5



1. Use a cutting tool to cut the panel as shown in (c) Fig 8:5. Where necessary, the cutter can be employed to cut rolled steel channel reinforcing, ribbing the sidewall of the van.

NOTES: Although side removal presents little or no difficulty, the advantage gained can be outweighed in removing a valuable purchase point for ramming.

Where the side loading/ unloading door and adjoining post need to be removed, it is only a matter of opening the sliding door and cutting the post away. Where the door is jammed it can be forced at the lock and subsequently forced backwards on its runners using the spreader. Alternatively, the sliding brackets can be sheared through and the door removed.

If the fuel filler pipe is 'incorporated' in the center/B post, the cut to the base of the post will have to be made above the installation. Where the assembly includes a metal filler pipe, it can be sealed using the power spreader to crush the post together with the pipe" and the post cut at the most convenient point.

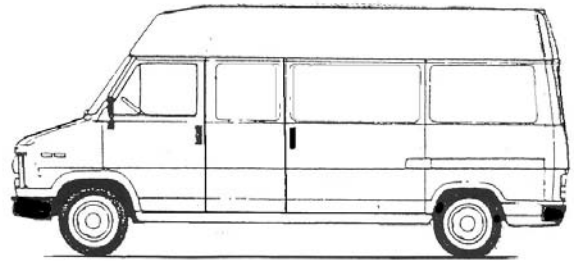
## ALL PURPOSE VEHICLES (APV) AND CARGO VANS

Cargo vans have a common feature in their design. The floorline usually runs at the same level, from the cab through to the cargo area. Although the cargo area on some vans is at a lower level to the cab, the advantage remains the same, allowing a specific approach in dealing with the entrapment.

The significance, then, of the level floorline is in the advantage it affords in removing the front seating through the rear of the cab with the casualty in situ. Fig 8:6.



Fig. 8:6



## The Cargo Truck - Stabilization, Access and Dash Displacement for a Cargo Truck

The wedging of the wheels should be done in a systematic way. Two wedges should be used, one to wedge the other, and tapped with a hammer to provide purchase between the tire and the ground. On level ground, wedge the wheels in both directions.

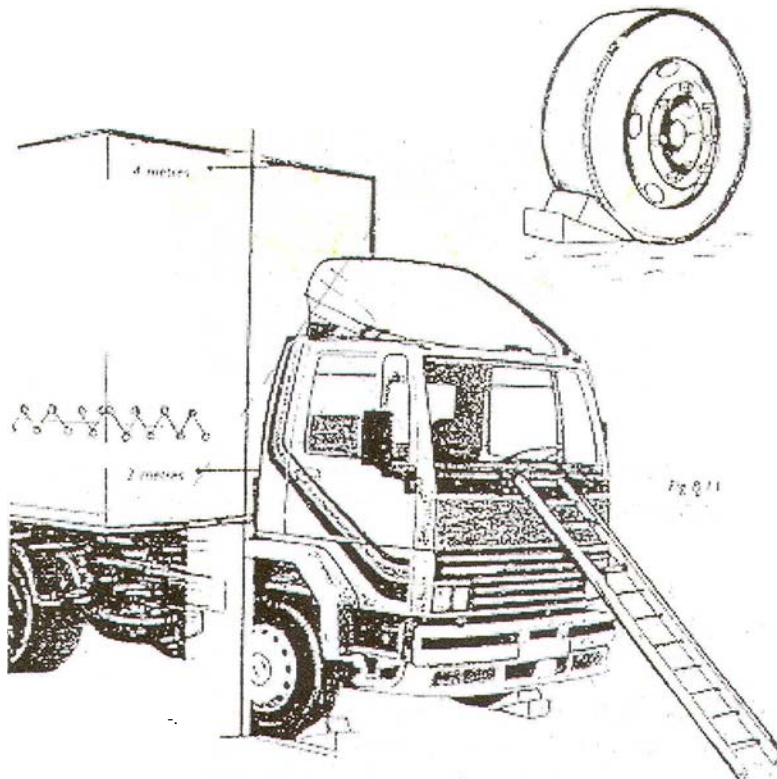


Fig. 8:7

*A truck cab can be some 9 feet in height. The forced opening of a jammed door or the removal of the windshield will be difficult and will have to be carried out using ladders.*

*Stabilize the truck by: blocking/cribbing/high pressure airbags*

## SUITABLE ACCESS FOR MEDICAL INTERVENTION

Much will depend on the individual nature of the incident. Gaining entry to assess the casualty can be very different to achieving suitable access to allow for invasive life support. Normally the availability of the co-driver's / teamster's seat offers considerable advantage as, again, does access through the windshield. However, the windshield opening requires a platform to work from, otherwise we can find the rescuer perched on the tangled wreckage at the front of the flat fronted cab in the direct line of attack.

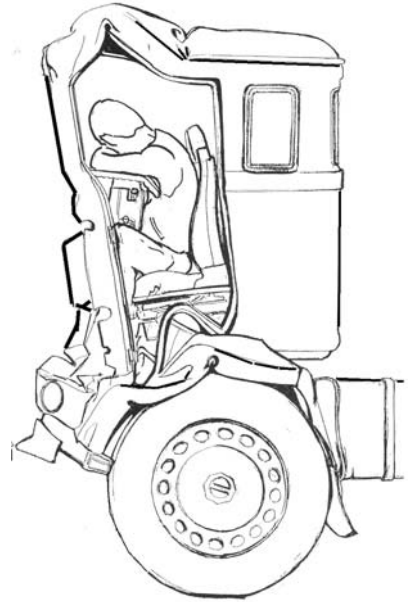
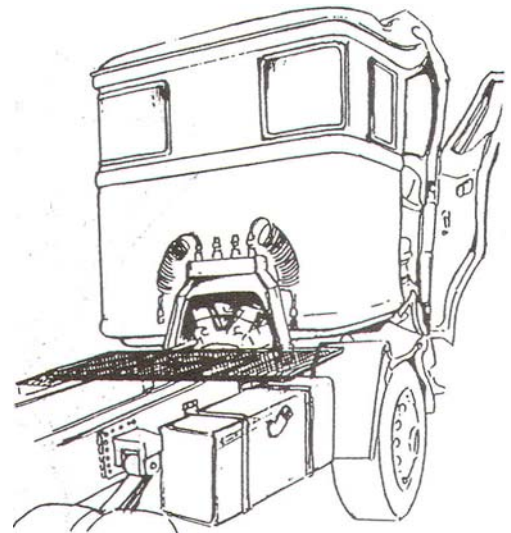


Fig 8:12

Where the option to quickly remove the roof structure exists, it will offer a sizable advantage in conducting critical care management; particularly with the flatbed or tractor unit.



Large areas of fixed glazing *and/or* single skin paneling will allow for fast and efficient roof removal. Fig 8:12. On the other hand, some sleeper cabs will necessitate a concentrated effort, as it can be found that structural ribbing requires multi cut shearing. Therefore, when viewing the wreckage, you must satisfy yourself as to the most realistic plan of attack and impart this to the paramedics. Their input may well alter your strategy and, ideally, it will pay dividends to be flexible, especially where other options exist.

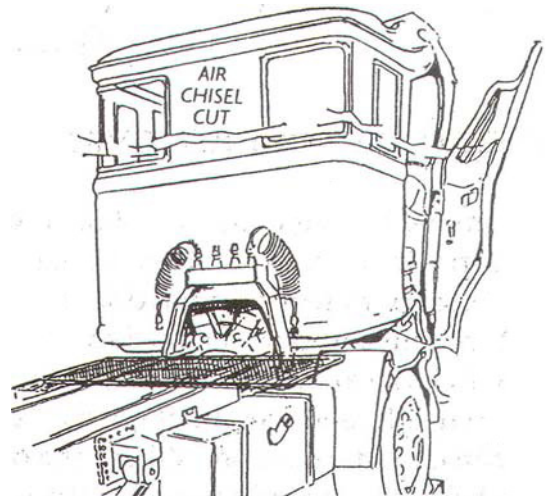
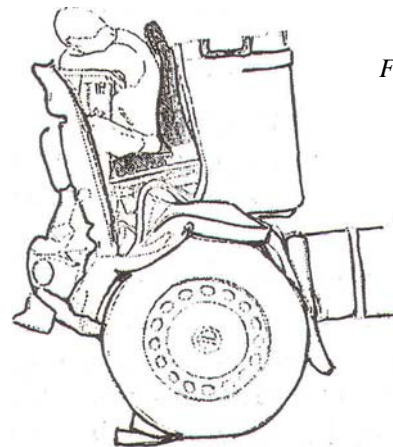
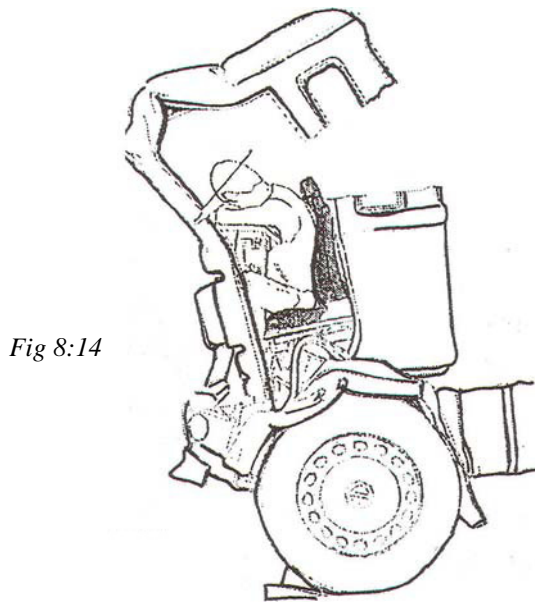


Fig. 8:13





*Fig 8:15*

*Fig 8:14*

## **EVOLUTION: ROOF RENOVAL**

1. Remove the windshield and fixed glazing to the cab. Where appropriate, remove or locate drop windows within the confines of the doors. Because of the height of the cab it will be necessary to work from ladders. Fig 8:11.
2. Physically support the roof structure and cut the rear roof pillars. Fig 8:13.
3. With large areas of paneling, use the air chisel to cut between shearing points. Fig 8:13,
4. The height and weight of the roof structure will make it necessary to remove the structure, with extreme caution. Where the option exists, the windshield pillars need only be partly' cut close to the bulkhead and the roof structure flapped forward. Fig 8:14.
5. Once flapped forward, the cuts to the windshield pillars can be completed and the roof placed in a convellient position away from the immediate area. Fig 8:15.

## EVOLUTION: BULKHEAD/FIREWALL RELOCATION

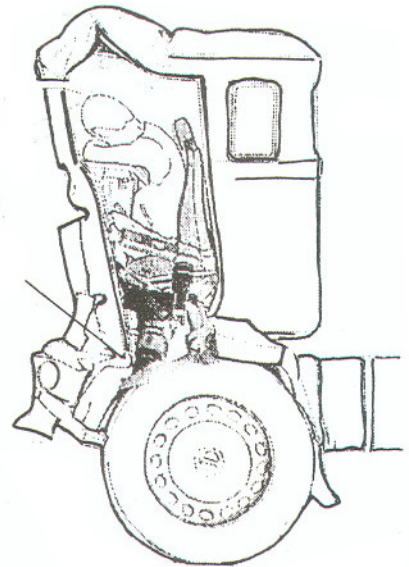
1. Position the power ram in the door opening and extend to take the strain. It may be necessary to use the spreader to obtain sufficient space to introduce the power ram. Fig 8:16.
2. Cut the windshield pillars at the top, near to the roof structure (a) Fig 8:16.
3. To weaken the superstructure, cut the door post level with the floor. This will require a multi cut operation as the cross-sectional area of the doorpost is substantial (b) Fig 8:16.
4. Extend the power ram gradually.

**WARNING:** It is imperative not to extend the ram beyond the integrity of the purchase point.

In the interest of gaining optimum space, a second ram should be made ready to superimpose the existing ram. In this way the ramming effect can be increased and a suitable extrication achieved. Fig 8:17.

5. A winch can be used to take the strain. This will give added security where a larger ram needs to replace a smaller ram or in the event of the ram slipping. Fig 8:18.

**IMPORTANT:** When dealing with the tilt cab, the securing mechanism must be monitored at all times during winching.



**NOTES:** As ramming progresses, it is imperative not to allow heavy gauge moving metal to come into contact with the ram, as this may dislodge the purchase point and put undesirable strain on the plungers. Plate 8:6 & 8:7.

Ramming must be carried out slowly, cautiously and conducted in line with medical instructions. The advantage of gaining the optimum space in this way will be realized when lifting a casualty out of the truck's cab.

## CUTTING AWAY THE REAR 1/4 SECTION OF THE CRUSH RESISTANT CAB

Where a casualty is trapped within the confines of the cab and access to the front of the vehicle is not available, then the only approach may be through the rear of the cab. Cutting away the rear 1/4 section on most truck cabs will be a relatively easy maneuver, as they consist of a single skin with strengthening to door frames and window openings only. However, the built-in crush resistance to the larger truck cab will complicate this approach and add to the time factor.

Fig 8:17

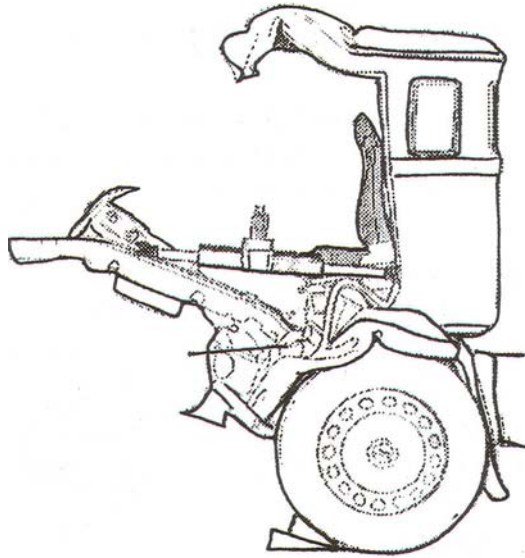
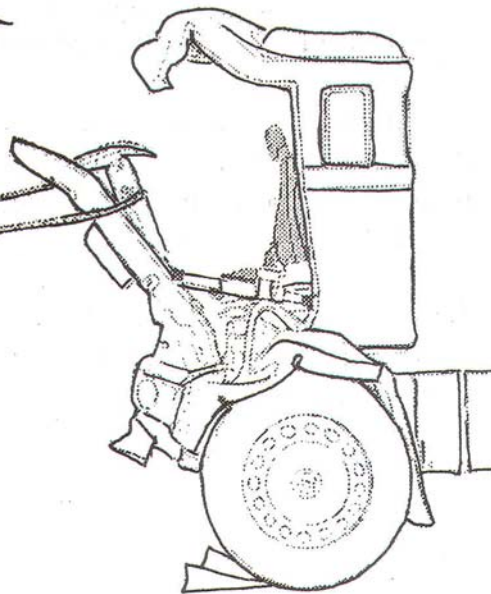


Fig 8:18



## Student Manual Patient Consideration

### Predicted Injuries Based On Type Of Collision

Front End	A-post deformed back Dash down Steering wheel down Doors compressed Broken windshield (front inside out)	Fractured lower extremity Abdominal injuries Head injuries Cervical spine injury Chest injuries
Broadside	Door( s) crushed inward Dash/steering wheel displaced	Blunt trauma to trunk Spinal injury Dislocated shoulder Internal (abdomen) Pelvic fracture Head injury Breathing compromised
Rear end	Doors compressed Back of bucket seat broken Broken windshield (from inside out)	Cervical spine injury Head/facial lacerations Lumbar spine Chest trauma (driver)
Rollover	Roof crushed Fuel spill	Victim ejected Lacerations
Any Accident	All of the above damages	Crushing injuries Inhalation/contact with gasoline Breathing compromised Unconscious All of the above injuries



## AUTO EXTRICATION INCIDENT COMMAND

It should be noted that "Incident Command System" is a separate *MFAjNFA* course, this portion of your student manual will focus on ICS as it pertains to Vehicle Extrication Incident Command.

### Pre-Plan Required

Determine from your department SOP, who will assume command and the transfer of command. This may be the *senior member/person in the right front seat* of the apparatus arriving on scene.

Evaluate the potential incident you may be called to versus the resources you can provide. Do you have a high speed limited access highway, are you prepared for an aircraft incident and what about possible incidents in remote locations? Address any discrepancies, and periodically update your pre-plan.

### On Arrival

Life safety is our number one priority, this includes the safety of emergency responders. An "Inner and Outer" circle check gives the IC a better picture of what the incident will require. *Good information equals good decisions!*

The establishment and announcement of command allows all members working at or responding to know who has command. This allows the IC to focus on the big picture, while other team members address their tactical objectives.

It is important for the IC to develop an action plan, communicate tactical objectives, define and monitor the action circle. Working with Tactical objectives vs. Tack assignments will assist the IC and help to avoid tunnel vision. The IC should remain outside the action circle unless the situation requires combative vs. stationary command.

Entry into the action circle is controlled by the IC who must require the following for entry:

- ~ Full personal protective equipment
- ~ An assignment task
- ~ Tools to accomplish tasks

### On-Scene Operations

Good command will enhance safety by minimizing freelancing and keeping the team(s) working toward the established common goal(s). It is the IC that coordinates simultaneous functions such as; rescue efforts, equipment requests and arrivals. Good pre planning will help ~limate redundant requests and tasks being made. Remember the IC makes decisions for the team direction! A good commander will coordinate and support the team. While it is important to have one person in charge, it is equally important to consider suggestions from subordinates and not be a dictator. This can be shown where a

task is not progressing at a reasonable rate and a subordinate suggests an alternative which may work better to reach the common goal. The IC should always be watching for firefighter safety and stop the action task if there is an unsafe practice before an injury occurs.

The IC should have a working knowledge and understanding of the principles of extrication. This allows for anticipation of what will be needed next, how and what will be used if the current procedure does not work. It is important to think of how to perform a task if the current one fails, and again if the progress is too slow.

Incident Command is constantly evaluating size up and addressing issues that affect the safety and progress of the incident. The following are among some of those issues, but not limited to:

- ~ Keeping the "Action Circle" clear of unused tools, vehicle parts and unassigned personnel
- ~ Crowd control, traffic and bystanders
- ~ Rescuers on hand and those needed; tools, special equipment, personnel, etc.
- ~ Categorize problems, determine severity and develop solutions
- ~ Lighting

### **Vehicle Extrication Command Concepts and considerations.**

The IC will be handled by one member in most cases, IC is responsible for the five ICS functions. For complex incidents; sectoring, branching divisions, groups are all available to IC for the incident management.

A "Narrow Based Command" structure makes the IC very susceptible to tunnel vision. These faults would not be limited to the following:

- ~ Members working on one aspect of extrication without preparing for the next step ~
- Members standing by with no assignments or direction, this invites the potential for freelancing and personnel may watch and not prepare for the next step
- ~ Most firefighters are action oriented, danger seekers, and self starters!

A "Broad Base Command" makes for a strong Incident Commander who monitors incident progress, anticipates needs, initiates actions, and calls for needed resources. IC has hands on the incident without having his fingers in it!

### **Varying Extrication Incidents.**

Refer back to preplanning, identifying potential incidents and training for them will reduce stress at the scene. Using the systematic approach which can be built on as necessary depending on incident complexity.

The following are command and special situations that may be encountered:

- ~ On/ off roadways
- ~ Special situations; head on, t-bone/broadside, under-rides, on roof, on side, vehicle vs. immovable object
- ~ Multi vehicle
- ~ Mass Casualty (MCI)
- ~ Hazmat

#### Specific Incident Consideration for IC

While reviewing this section, keep in mind your tactical objectives to be accomplished, these would include; scene safety, patient assessment, vehicle stabilization, vehicle separation, patient considerations and disentanglement/ removal.

*Head On* crash impacts may cause the vehicles to bounce apart, creating separate locations where tools and IC sources are needed. Additional resources may be required for sectoring of the operation such as mutual aid for medical and rescue apparatus for use on both vehicles.

*T-Bone or Broadside* situations are more complex when vehicles are unequal in size, the smaller vehicles usually lose. Larger vehicles may be on or cause the folding down of the smaller vehicle sides. Possible solutions to consider for tactical objectives would be, vehicle separation and pulling wreckage free of the victim. Techniques used for this tactical objective may include; dash roll-up, side removal, third door conversion, or any combination.

*Vehicle vs. Immovable Object*, such as a utility pole or building may cause limited access and reduce the working area. Vehicle stabilization can be difficult. Watch for hazards associated with the immovable object and secure or address the same.

*Vehicle Underrides* are more common accidents involving tractor trailer trucks and busses, this will most likely be a rescue airbag operation. Additional tactical benchmarks would include:

- ~ Identify occupant and load
- ~ Crib and lift the upper vehicle
- ~ Separate vehicles; consider towing vehicle underneath

*Vehicles on the Side/Roof* present a greater hazard with regards to fuel leaks and stabilization. Safety to the rescuers and the patient(s) is very important. To prevent movement, as with any situation, it is important to stabilize the vehicle well before entry is made. This may be done by building a cradle, the use of high lift jacks, chains, and airbags all in conjunction with cribbing. Keep rescuers off vehicles, maintain low center of gravity to limit movement.

When trying to gain access to a pancaked roof, the following should be considered:

~ If the vehicle is upright...

. Remove or flap the roof

- En

• Stabilize vehicle as needed

~ If the vehicle is on the roof...

- Ensure the safety line is in place and charged 1 1/2 or greater

- Stabilize the vehicle as needed.

- Side removal, remove both doors and "B" pillar.

- Third door conversion if the vehicle is a two door

- If needed, enter through floor

*Hazmat Incidents* can occur at any accident. When a suspected incident occurs, the following are steps you can follow, but not limited to:

~ Identify before entry

~ Manifest, bill of lading, air cargo sheet, interview operator

~ Use DOT book for guidance and initial action. Don't attempt to handle an incident you are not equipped for

#### Value of Staging for IC

When managing an incident, call for resources when you think you may need them. Don't wait until you are sure you need them. Move your resources closer to the incident to reduce response time. Staging reduces congestion at the scene and maintains span of control. IC should employ a staging area for additional resources that are responding. If in a safe zone, one to two blocks would be considered a good staging site for additional apparatus; personnel, and equipment. This principle can present all of these. When dealing with an MCI, you may have enough EMS Personnel on scene for treatment, but need additional ambulances for transport. Staging ambulances gives the reduced response time and at the same time controls the number of rescuers on site.

Critical Incident Stress is a factor which the IC should prepare for. The fire service is now learning more about the effects of injury from CIS, and should recognize the value of Critical Incident Stress Debriefing (CISD). For more information with regards to CIS/CISD, contact the Federal Emergency Management Agency, United States Fire Administration, County CISD Teams, Local Hospitals, Mental Health Agencies and Doctors.

#### Summary

Incident Command must be established early and maintained for the duration of the incident. The basic principle of IC is that it can expand with the complexity of the incident. Size up gives an indication of what will be required to mitigate the incident. A proactive commander will identify hazards and employ an action plan to address them improving safety for all involved. *Remember to call for help before you actually need it!*



# TACTICAL WORKSHEET

First Alarm  Second Alarm  \_\_\_\_\_

INCIDENT NO. \_\_\_\_\_

TIME \_\_\_\_\_

Address: \_\_\_\_\_

Initial Report

By \_\_\_\_\_

Occupancy: \_\_\_\_\_

CMD Location

N

S

A

All Clear

E

W

B

Standpipe

Radio Channel:

1  2  3  4  5  6  7

Investigator

Pumped Water

P.D.



STAGED

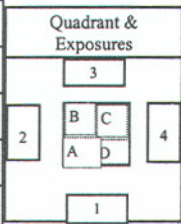
Gas

Elect.

Level 2 Staging Location \_\_\_\_\_

Under Control \_\_\_\_\_

E																			
E																			
E																			
E																			
L																			
L																			
H																			
R																			
U																			
BC																			
SECOND ALARM																			
E																			
E																			
E																			
E																			
L																			
L																			
H																			
R																			
U																			
BC																			



COMMAND

INCIDENT COMMANDER				INCIDENT COMMANDER			
INCIDENT:				INCIDENT:			
TIME:				TIME:			
ADD:				ADD:			
IC:				IC:			
	UNIT	MANPOWER	ASSIGNMENT		UNIT	MANPOWER	ASSIGNMENT
E				E			
E				E			
E				E			
E				E			
E				E			
T				T			
T				T			
AMB				AMB			
AMB				AMB			

TASK	NOTIFICATIONS, ETC.	TASK	NOTIFICATIONS, ETC.
Rescue	Chief	Rescue	Chief
Primary	Deputy	Primary	Deputy
Secondary	Fire Marshal	Secondary	Fire Marshal
All Clear	Elect. Insp.	All Clear	Elect. Insp.
Fire Attack	Bldg. Insp.	Fire Attack	Bldg. Insp.
Exposures	Health Insp.	Exposures	Health Insp.
Extension	Gas Co.	Extension	Gas Co.
Extinguishment	Power Co.	Extinguishment	Power Co.
Ventilation	D.P.W.	Ventilation	D.P.W.
Salvage	Fuel	Salvage	Fuel
Overhaul	Red Cross	Overhaul	Red Cross
Support	EMS	Support	EMS
Liaison	Comm.	Liaison	Comm.
Relief (Manpower)	Triage	Relief (Manpower)	Triage
Staging	Extrication	Staging	Extrication
Rehab	Treatment	Rehab	Treatment
Water Supply	Transport	Water Supply	Transport
Safety	Spec. Resc.	Safety	Spec. Resc.
P.I.O.		P.I.O.	
Police		Police	
Haz Mat		Haz Mat	

# GLOSSARY

## The Techniques of Extrication

This glossary is provided for students in order that they may have an explanation of the terms and abbreviations for ease of understanding this program.

**ACTION/INNER CIRCLE** - A "zone" around the vehicle, established in the early stages of an extrication of some ten to fifteen feet away from the vehicle that is being worked on.

**AIR CHISEL/GUN** - An industrial metal cutting hand tool that is also used at the extrication scene. It comprises of an air chisel gun, air hose, pressure regulator and compressed air supply.

**AIR LIFTING BAGS** - Purpose made rescue air bags with inflation hoses, air regulator, control valves, and a supply of compressed air. They can be either high pressure air bags (HAB) or low pressure air bag (LAB) units

**AIR BAG RESTRAINT DEVICE** - A supplementary restraint system fitted in the steering wheel, the front passenger dash area and can also be either seat or door mounted. In the event of a crash the bags will fill instantly with Nitrogen, either electrically or mechanically deployed on impact. Air bags offer additional protection to occupants in the event of a crash

**BASE CRIB** - Cribbing used as a base to support rescue tools to either prevent them sinking into soft ground or lessen ground clearance. Usually made of 2/1 x 8/1 boards of set lengths.

**BIEL TOOL** - A rescue tool that has an ax head with a purpose designed metal cutting edge, similiar to a can opener, at the opposite end of the handle.

**BLANKET ROLL** - A method using a rolled blanket to immobilize the C-Spine of a patient lying on a long spine board.

**BODY POSITION** - A general term given to the positioning of the rescuer's body when operating or assisting in the use of rescue tools

**BOX CRIB** - Constructed of wood normally 4" x 4" x 24" or 2" x 4" x 24". The cribbing is stacked in parallel pairs at right angles to the pair immediately below and so on.

**BROAD-BASED COMMAND** - A concept developed for vehicle extrication that makes the best use of rescue personnel. allowing more than one task to be performed at the same time, thus speeding up the rescue process

**C-SPINE** - Abbreviation for cervical spine

*CARGO COMPARTMENT - The rear, (or front area on rear-engined car) that is used to store or carry items. Commonly known as the luggage compartment/trunk*

*CATALYTIC CONVERTER - The passenger car's pollution control system that super heats the exhaust fumes reducing emission levels. This device can be extremely hot and should be avoided when using air lifting units or when placing equipment on top of the overturned car.*

*CERVICAL SPINE IMMOBILIZATION - Procedure for immediate patient care where the cervical spine is placed in the in-line neutral position and manually maintained with as little movement as possible in order to prevent further injury to the cervical spine.*

*CIRCLE SURVEY - Procedure adopted by rescuers to conduct a thorough survey of the crash site where they walk in a circle around the entire scene.*

*COME ALONG - A portable hand operated winch for lifting or pulling. Comprising of a gripping mechanism within a casing, cable, and hooks and an operating handle, it is often used in conjunction with chains or a sling to relocate or secure parts of a vehicle.*

*COMMAND - A term given to the control of emergency personnel, which also denotes the person in charge of the operation controlling the scene.*

*COMMAND POST - The position where the overall scene commander establishes or sets up his 'control' vehicle where he can direct operations and be easily located.*

*COMMUNICABLE DISEASE - Contagious diseases that can be transmitted from one person to another through body fluids, inhalation, ingestion, or direct skin contact.*

*CRIBBING - Constructed of wood normally 4" x 4" x 24" or 2" x 4" x 24". Can be used for a variety of purposes - build a box crib, support objects, to build a base on soft ground and as block to support chains or cables while moving objects.*

*CROWD CONTROL - The cordoning off, moving or removing of unnecessary people from in and around the vehicles involved in an accident. This is usually undertaken by first due rescuers and law enforcement officers.*

*DASH ROLL-UP - The relocation of the dash, steering wheel and column using heavy hydraulic powered rams.*

*DASH LIFT - A procedure used to lift the dash assembly up and off the trapped front seat occupant. This is normally achieved with heavy hydraulics - spreader, cutters and/ or rams.*

*DISASTER BOX - A large box that is stocked with basic first aid supplies for use at larger multi-casualty incidents.*



*DISPLACEMENT - A term often used to describe the relocation of a door, by force, beyond its normal opening range, or making space for gaining access to or removal of the casualty.*

*DOOR LATCH ASSEMBLY - Also called a door-lock, A mechanism that secures the door closed. It consists of a Nader pin on the door jamb where the door latch assembly clasps onto when the door is closed.*

*D.O.T. - Abbreviation for the Department of Transportation.*

*ENGINE COMPARTMENT - The area of the vehicle in which the engine is fitted. It is separated from the passenger compartment by a metal bulkhead known as the firewall.*

*EVOLUTION - Literally meaning 'full cycle' the term is used to denote the completion of an extrication procedure, e.g. 'roof removal' or 'side removal'.*

*EXTRICATION - To remove from danger. This term is used in rescue circles to describe the procedures used to cut away and displace vehicle wreckage, to release and remove casualties trapped by metal deformity or their injuries.*

*EXTRICATION SECTOR - As a sub section of the area of command, control for supervising rescue efforts within the extrication sector can be handed over to a subordinate officer who is directly responsible for extricating the casualty.*

*FREEZE - Internationally recognized, the term freeze can be called by any rescuer where he recognizes imminent danger in order to immediately stop what they are doing.*

*FUEL SYSTEM - This includes the fuel tank, fuel pump and the feed and return lines to the fuel injection system. Fuel is pumped from the tank through the feed line to the injector pump where it is metered to the engine in the exact proportion as dictated by the accelerator pedal.*

*FULL FRAME - Vehicle construction design that is used in some large sedans, station wagons and light trucks.*

*FULL PROTECTIVE CLOTHING - includes head, hand, foot, and body protection and usually relates to full structure firefighters kit the standard of which depends on local preference as long as it meets the national standard.*

*GOLDEN HOUR - This term is given to first hour after the incident, where the trauma patient has the best chance of recovery if they are delivered to the appropriate emergency medical facility.*

*GPM - Abbreviation for Gallons Per Minute .*

*HATCH BACK - Term given to the rear access door to both the luggage and passenger compartment in the 2/3 door or 4/5 door car.*

*HAZARD CONTROL - The term for controlling and reducing risk at the extrication scene. It can also be used within the extrication sector where specific risk needs to be managed.*

*HAZARDOUS MATERIALS - Any material or substance at an emergency scene that is flammable, explosive, toxic, carcinogenic, or an environmental pollutant. The abbreviated term 'HazMat' is generally used.*

*HIGH LIFT JACK - A mechanical lifting device designed to lift a vehicle which sits high off the ground. Often used in extrication for vehicle stabilization and jacking.*

*HOSE LINE - A special hose line in use by the fire service to carry water under pressure to the emergency scene from the fire pump.*

*INCIDENT COMMAND - A standard operating procedure to control the emergency scene through a chain of command for complex operations such as fires and crashes etc.*

*INNER CIRCLE SURVEY - A procedure for recognising and assessing risk after a vehicle has been in a collision. A full 360 degree survey is made around the vehicle looking for any hazards including under, on top or in the vehicle.*

*JACKING THE DASH - Also known as a 'dash lift' this evolution is used to force the dash, steering wheel and column up and off the casualty.*

*JOINT COMMAND POST - A command post that is used by all emergency services and agencies on the scene of an incident.*

*KENDRICK EXTRICATION DEVICE - A specially designed device to protect the C-spine when removing a trauma patient from an awkward position. It comprises of a semi rigid, harness with body and head straps, and a pad for the neck.*

*LAMINATED GLASS - Manufactured for the windshield of vehicles it consists of plate a glass sheet, clear plastic membrane and another layer of glass all bonded together.*

*LOADED BUMPER - A term used to describe bumpers fitted with shock adsorbers whose pistons become compressed and jam in an impact. The danger then exists whereby they may release without warning and injure the rescuer.*

*LOG ROLL - A technique for turning a trauma patient causing the minimum of stress when handling a suspected spinal injured casualty.*

*LONG BACKBOARD - A rigid board designed for ease of use for sliding the trauma patient onto minimizing stress to the spinal column.*

*MANUAL HYDRAULICS - Hydraulically operated rescue tools where the hydraulic power is generated by a manually operated pump.*

*MAY - This term is used to state an alternative to a specified requirement.*

*MECHANISMS OF INJURY - The actions, reactions and objects that cause trauma injury to vehicle occupants during a vehicle collision.*

*NADER PIN - A burst-proof mechanism designed to keep doors closed during a collision Also referred to as the striker bolt.*

*NARROW BASED COMMAND - A command concept developed for vehicle extrication which describes the use of rescue personnel. Simply stated it means that multiple rescue personnel perform only one task at a time.*

*100 PERCENT TECHNIQUES - A descriptive term that denotes the anticipated success for individual tasks used to move metal and wreckage. The theory being that we should try the more successful procedures first, and go to less successful options if these fail.*

*OBJECTIVES - Outcome achieved through the application of skill or knowledge, or both.*

*OVERALL SCENE SAFETY - Terminology describing the safety concerns of rescuers for the entire scene of a vehicle accident. It is subdivided into personal safety, patient safety, hazard control, traffic control, crowd control, and agency control.*

*PANCAKED VEHICLE - A term used to describe crash damage where the vehicle has come to rest on its roof where the roof structure has collapsed in on the occupants.*

*PATIENT ACCESS - A descriptive term for the action of getting a rescuer within the vehicle so as to administer life saving care to the casualty.*

*PATIENT SAFETY - A term describing the protection that is necessary when extricating trapped casualties.*

*PERSONAL SAFETY - This term describes the well-being and protection of oneself during extrication operations.*

*PILLAR CRIB - Term describing a long piece of wood, usually 4" x 4" x 5'-6", used to stabilize vehicles that are on their sides.*

*PILLAR/POSTS - A vehicle anatomy term meaning the rolled sheet metal assemblies on vehicles that attach the roof to the main body of the vehicle, i.e., (A-Post, B-Post, etc.). Although post was a common term for years, it is now called a pillar by the car industry.*

*PNEUMATIC POWER - Compressed air power. Any power source that delivers compressed air for the operation of pneumatic tools or equipment.*

*POWERED HYDRAULICS - Hydraulically powered rescue tools where the hydraulic pump is powered by a gasoline engine, electric motor, or power take off (PTO).*

*PRIMARY SURVEY - Initial patient assessment for airway, breathing and circulation (A+B+C) when administering pre-hospital care.*

*PROCEDURE - The series of actions, conducted in an approved manner and sequence, designed to achieve the intended outcome.*

*PTO - An abbreviation for the term Power Take Off. This refers to tools and equipment that are attached to the rescue apparatus and operate off the engine of that apparatus.*

*PURCHASE POINT - A nook or small opening made in the vehicle's wreckage that allows a substantial point for the rescue tool to be positioned so that it achieves its objective.*

*RAPID PATIENT REMOVAL - A procedure for a casualty's quick removal if necessitated by the patient's condition or exposure to hazards present at the crash site.*

*RECIPROCATING SAW - A saw designed for cutting wood and metal. Usually electrically powered it moves the blade in a continuous in-and-out motion.*

*RESCUE CHAIN SLING ASSEMBLY - Purpose designed chain assemblies, which are used in conjunction with spreading and pulling tools to move metal. These assemblies include chains hooks, connectors, links, chain shorteners, and carry identifying marks or tags. They can be used for securing, anchoring, attaching heavy hydraulics for pulling or lifting.*

*RESCUE CHAIN ASSEMBLIES - See rescue chain sling assemblies*

*ROCKER CHANNEL SHOE - Purpose designed heavy duty metal buttress for use in conjunction with rams. Disperses the force from the ram and allows the shorter ram to be moved closer along the rocker channel when conducting a 'dash-roll'.*

*ROOF FLAP - Relocation evolution that involves the cutting of strategic roof pillars and conducting relief cuts so that a proportion of the roof structure can be lifted and folded away from the casualty. Depending on the cuts made the roof can be flapped back, to the side or forward over the front of the car.*



**SAFETY** - *To achieve an objective without risk of injury to self or to others.*

**SECTORIZATION** - *The subdivision of the area of command at an operational scene into smaller areas for more concentrated control.*

**SECTORS** - *Subdivisions of the incident command that place specific tasks or areas of the scene under direction of individuals who report to command.*

**SHALL** - *Indicates a mandatory requirement.*

**SHORT SPINE BOARD** - *A shorter version of the long backboard, (see long back board). Also known as a 'short back board' it is used to immobilize the injured casualty in the sitting position.*

**SPACE-FRAME** - *A design of vehicle construction that uses a "cage" type frame to which body panels and component parts are attached.*

**SPINAL IMMOBILIZATION** - *The area of patient care that mainly involves the maintenance of the spinal column. The concept that in-line immobilization will prevent further injury to the spine when handling and removing the casualty.*

**SPINAL TRAUMA** - *Physical injury to the spinal cord.*

**SPLIT STEERING COLUMN** - *A steering column made up of two or more pieces connected by universal joints when the column is assembled.*

**SPREADER** - *Hydraulic rescue tool used to force and remove doors, spread or pull wreckage apart. It can be manually powered or powered by petrol or electric power unit.*

**SPRING LOADED CENTER PUNCH** - *An engineering tool adopted by rescuers that is used to break tempered glass for its controlled removal. It is a small spring loaded cylinder with a pointed tip that loads into the handle as it is being pressed down and fires out rapidly as pressure is applied until it automatically releases breaking the glass.*

**STABILIZATION** - *In vehicle rescue this refers to the immobilization and blocking of the wrecked vehicle in which a casualty is trapped. It can also refer to the casualty or the control of and handling a chaotic emergency scene or hazardous condition.*

**STACK CRIB** - *Also known as a box crib. Wood blocks of 2"x4"x24" or 4"x4"x24" are placed in a stack formation to support an object that is being lifted by tools.*

*STAGING AREA - A designated area away from the extrication scene where additional apparatus and personnel are kept in reserve until needed at the scene.*

*STANDARD OPERATING PROCEDURES - Formal pre-planned procedures to assist in the management of emergency operations.*

*STEERING DISPLACEMENT - The forcing or relocation of a steering wheel and column in order to provide space for patient access and removal.*

*STEP CHOCKS - Purpose built blocks made out of wood and constructed in a step configuration. Normally used to quickly stabilize vehicles.*

*STRADDLE SLIDE - A method of placing a prone or supine patient on a long spine board by sliding them onto the board.*

*STRADDLE LIFT - A method of placing a prone or supine patient on a long spine board by lifting the patient and sliding the long backboard under the patient.*

*TEAM APPROACH - A modern tactical approach where fire-fighters and paramedics practice and perform as one team where their efforts are coordinated so as to extricate and administer advanced care to the casualty safely and efficiently.*

*TEAM/ GROUP - Two or more individuals who are in communication with each other visually, verbally, physically, attached to a safety guide rope, electronically or by other means to coordinate their activities and provide assistance in case of emergency.*

*T -BONE - A descriptive term that describes a certain type of vehicle accident where one vehicle impacts into the side of another vehicle - 'Side-on impact'.*

*TEMPERED GLASS - Specially manufactured glass used in automobile side and rear windows that is very resistant to breakage.*

*THIRD DOOR CONVERSION - A term that describes an evolution used to open the side panel of a two door automobile creating a "third door" or access opening to the trapped rear seat casualty.*

*TILT WHEEL STEERING - A type of steering column assembly that adjusts both up and down to suit the driver's preference.*

*TOOL REACTION - This term describes the movement of rescue tools as they are being used to force or cut vehicle wreckage. This is normally experienced as turning and twisting under load or where the tool slips off the purchase point.*

*TOOL STAGING - A designated staging area where tools and equipment are placed ready for potential use at the extrication scene.*

*TRACK CRIBBING - A cribbing 'set up' that entails the placing of 2"x4"x24" or 4"x4"x24" cribs with a block across the top so that it slides on the cribbing as the chain or cable passes over it when relocating the steering wheel - also referred as slide cribbing*

*TRAFFIC CONTROL - The term used to describe the safe rerouting or halting of vehicle traffic in order to protect the rescue team and keep traffic moving.*

*TRAFFIC CONTROL SECTOR - the command designation of that person assigned to coordinate the control of traffic at a vehicle accident scene.*

*TRAINING EVOLUTION - Learning operations that develop hands-on skills for fire rescue personnel and where appropriate the rescue team.*

*TRANSPORTATION SECTOR - The command designation of that person assigned to provide for the transportation of injured patients from a vehicle accident scene.*

*TRAUMA - Injury. A medical term that denotes injuries to a person as a result of blunt or penetrating force such as being struck, hit against, subjected to a high deceleration force.*

*TRIAGE - To sort. A system used for categorizing and sorting casualties according to the severity of their injuries.*

*TRIAGE SECTOR - the command designation for persons assigned to determine the priority of treatment and transportation of injured patients on a vehicle accident scene*

*TRUNK ACCESS - The procedure for opening up or gaining access via the luggage compartment/trunk of a vehicle.*

*UNIT-BODY - (Also known as Uni-Body). A type of vehicle construction that uses the floor panels, undercarriage and all structural parts of the vehicle welded into a single unit eliminating the need of a full chassis for vehicle body support. Also known as 'monocoque'.*

*WEDGE CRIBBING - Cribbing shaped in the form of a wedge and used to tighten and secure cribbing assemblies supporting weight. Can be used as a "gap" filler.*

*WORKING LOAD LIMIT - The recommended limit of force, measured in pounds of weight, that rope, chain, or cable can be safely operated under. It denotes how much weight the rope, chain, or cable can lift safely. (Also denoted by abbreviation, W.L.L.).*

## About this Student Manual Compilation.

This compilation has been drawn from various sources with the kind permission of their authors and copyright holders. Ron Shaw has adapted and designed this manual as a 'student' guide to compliment a Basic Skills training program for vehicle extrication rescue.



### Ron Shaw -

Ron Shaw has been a career fire lieutenant on the Plymouth MA Fire Department for 29 years and founder of Extrication.Com providing emergency responders World-wide with vehicle extrication training.

Ron has made the study of extrication his speciality and is currently in the throws of completing a definitive text book on extrication rescue and hopes to have it completed by the end of this year.

You may contact Ron with questions about this compilation or other extrication related topics at [rshaw@extrication.com](mailto:rshaw@extrication.com)

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**About the author:**

As an operational firefighter, 26 years riding a rescue vehicle in London's East End and finishing his 30 years of service as a special skills trainer at the Capital's central training school, Len Watson has written several books on crash rescue. He is currently involved with the production of e-Learning programs and instructor multi media training aids for both technical and medical rescue and is committed to servicing the internet based collection and sharing of information study program – see [www.resqmed.com/Study1.htm](http://www.resqmed.com/Study1.htm)