

6.

RECOVERY

gearing up to
coming unstuck

Don't be fooled into thinking that experienced off-roaders don't get stuck - they get stuck more than anyone! This is because they are keen to try the impossible, are not afraid of ridicule nor are they unfamiliar with the processes of getting a vehicle unstuck. It is important to realise that there is no shame in getting a vehicle stuck.

The most important tool required to free a vehicle from a sticky predicament is common sense. I have lost count of the number of times I have come across a bogged vehicle where the driver has taken out his winch or snatch strap without thinking through the problem. Three minutes with a well used spade and a gentle right foot and the vehicle is free. Common sense and a methodical approach often results in little work and a seemingly miraculous escape for the vehicle concerned.

This chapter covers the vast array of recovery equipment available and is followed by tips on using the equipment and a common sense approach to getting unstuck.

Vehicle recovery equipment makes up a large proportion of a typical off-road load. The following is a list of equipment that the serious off-roader should carry to free a vehicle or to get it over an obstacle where normal driving has failed:

WINCHES

Novices sometimes think that a winch makes them invincible. The fact is that the winch is perhaps the most overrated piece of off-road recovery equipment available. This is because a winch relies on anchor points, which in the vast majority of cases just aren't available when you need them. And even if an anchor can be found, additional equipment such as a high-lift jack and a spade are needed to work in conjunction with a winch to extricate a vehicle. In a situation where there is no anchor, one can be constructed, but in most cases it is easier to use a jack and spade and dig the vehicle free than to create an anchor and use a winch. In severe cases, both may be needed.

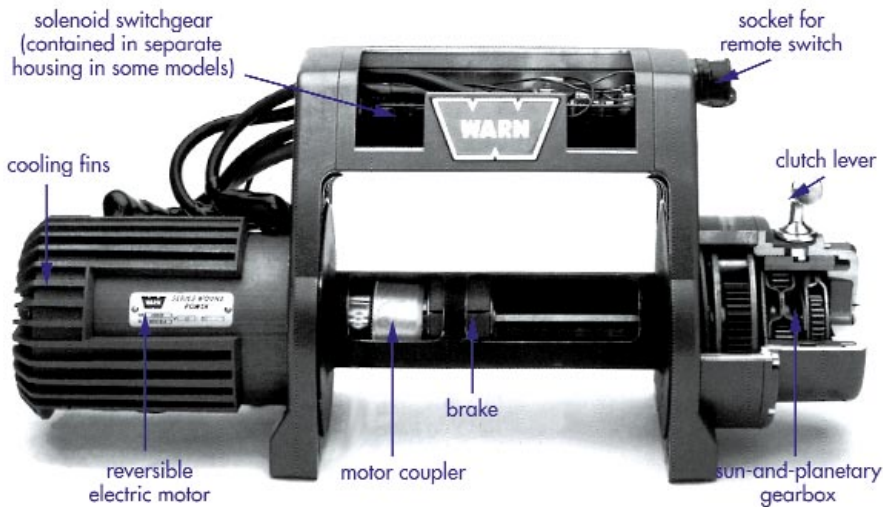
Winches are, however, indispensable for some tasks such as aiding in the recovery of other vehicles and dual vehicle operations where one vehicle can assist another to traverse difficult terrain. Other jobs where a winch is essential are hauling boats up the shores of muddy rivers and for removing obstacles such as fallen trees from the vehicle's path.

WINCH TYPES

Five types of winches are available: electric, hydraulic, engine driven, hub capstan and hand. Hydraulic and electric are either drum (horizontal) or capstan (upright).



Using recovery gear is more common sense than anything else. Here the Trooper cannot move because it has come to rest against a boulder. The high-lift was used to move the boulder away from the Trooper while the Jeep used a tuggum strap to move the boulder out of its path.



Electric drum winches

The most common type of winch is the electric drum winch, manufactured by companies such as Ramsey, Warn and Superwinch.

Drum winches with sufficient capacity for vehicle recovery are supplied with steel cable of between 25 and 40 metres which is neatly stored on the drum. They are heavy, and require high capacity batteries to drive them (preferably deep-cycle). They over-heat quickly in extended use and must frequently be left to cool.

They are supplied with a hand held switch with a long extension lead enabling the operator to stand at a safe distance or sit inside the vehicle while winching. The switch allows the winch to wind forward and in reverse. Safety spring return type switches are fitted to stop the winch if the switch unit is dropped.

Capstan winches

These are normally engine driven and often perform superbly when all else fails. Their biggest disadvantage is that they are best operated by two people. This is because a second pair of hands is required to tail off the winch, a procedure like that used for



operating the sail winches on large yachts. Only a seasoned expert will operate a capstan winch alone and if this is the case, an emergency engine ignition cut-off switch must be fitted so as to enable the operator, who will not be seated in the cab, to shut down the engine if required. I saw a Series One Land Rover fitted with an original Fairey 3000lb-capacity capstan winch haul 14 vehicles across a stretch of axle-deep liquid sand that no vehicle could traverse. The last and fifteenth vehicle proved too much for the small winch and the worm drive stripped. In the same situation, an 8000lb electric drum type would have overheated by the third or fourth vehicle. The rope for the capstan must be stored elsewhere as there is no provision for storing it on the winch.

Hydraulic winches

Hydraulic power is the most efficient method of powering a winch and those that use it offer immense pulling power. Hydraulic winches require an engine-driven hydraulic pump to run them and until recently they were no more than a dream to the ordinary 4x4 motorist, being fitted to very few non-military vehicles.

A new range, powered by a standard power-steering hydraulic pump, is now available for all makes of 4x4. Called Mile Marker, these winches, in comparison with similar specification electric winches, meet if not beat the competition in terms of pulling power while not suffering from rapid overheating at times of high load.

Fitting one of these new hydraulic winches is as simple as fitting an electric type. Instead of requiring heavy-duty battery, alternator, cables or switching solenoids a power steering pipe is interrupted with a valve which supplies power on demand to the winch. The winch gearbox has two speed settings, permitting rapid retrieval of the winch cable. Operating these winches is the same as a regular electric winch, the hand control switch operating the winch by electrically opening and shutting a valve while the engine is idling. Their most significant disadvantage shows itself when the engine stalls and the winch stops working. This could cause a difficulty in a situation on a beach with an incoming tide and an engine failure due to water.



Pulling power

When selecting a drum winch, its rated pulling power represents its pulling strength when the cable is being wound onto the drum itself, not onto layers of cable wound around it. In effect, the smaller the diameter of the drum, the more its pulling power. So, when cable is wound onto a drum and cable is winched in on top of it, the diameter of the drum increases with each layer. For example, a winch rated at 8000 lbs is (theoretically) able to pull 8000lbs on the drum, about 6750lbs with a single layer of cable down, about 5800lbs with two layers of cable down and only about 5150lbs with four layers.

For a winch to be useful to extricate a fully laden medium-sized 4x4 (for example a Isuzu Fronier) from deep mud, a winch of no less than 8000lbs rated pull is required. From this point, a heavier vehicle will require a stronger winch and a lighter vehicle, a lighter-duty winch.

Hub capstan winches

Designed specifically for self recovery, hub capstans bolt directly onto the wheel rims and with a cable attached, the capstan winds up the line and hauls the vehicle out as the wheels spin. To overcome the effect of the axle differential, two capstans must be used simultaneously. Hub capstans can pull a vehicle free in both directions, are lightweight, easy to operate, very effective and are cheap. Because only a portion of the wheel nuts secure the capstan, it is not necessary to jack up the vehicle to remove them and therefore a single set can be used by a number of common vehicles.



Left: A hub capstan winch attached to a Land Rover Defender's standard steel rim. Lightweight, practical and cheap, it is unfortunate that hub capstans are not available for a wider range of vehicles.

Electric versus Hydraulic

One of the most common questions put to me by those wanting to buy a winch is: 'electric or hydraulic?'. The two most important considerations to bear in mind are: The hydraulic has a high duty-cycle. It pulls and never tires. Electric winches tire and must be left to cool. The hydraulic requires that the engine be running. The electric, although it works better when the engine is running, will operate without. Read the comparison table on the following page for more information.

Portable electric winches

Removable winch kits enable a winch to be moved from back to front or from one vehicle to another, the location of which is determined by where a special mounting bracket has been attached. Warn call it the Multi-Mount system.

Mounting a winch

There are a few choices when it comes to mounting a winch. The first and easiest option is to purchase a bull bar with integral winch plate and have the entire thing assembled and attached by the supplier. The second option is to make your own. When I mounted a winch on my One-Ten, no 4x4 workshop had designed a plate that did not affect the approach angle. So I designed a plate and had an engineering workshop make it up for me. A third option is

COMPARISONS: MILE MARKER HYDRAULIC AND ELECTRIC

MILE MARKER HYDRAULIC	ELECTRIC
Can be used only with vehicles that have power steering.	Can be used on any vehicle.
Installation simple. Vehicle can be returned to 'original' state with ease.	Installation simple. Vehicle can be returned to 'original' state with ease.
Powered by power steering pump.	Powered by battery - preferably twin deep-cycle type.
Most non-US vehicles have lower pressure output from steering pump therefore winch does not run at efficiency rated by manufacturer.	No independent test I have ever seen has any winch, electric or hydraulic, meet the manufacturer's claims.
Two-speed retrieve. forward and reverse. High gear for cable retrieve and low for pulling power.	One-speed retrieve, forward and reverse.
Retrieve speed (low) is considerably slower than most electric models.	Retrieve speed is aprox the same as Milemarker set in high gear.
The engine must be running.	Will operate without engine running. The engine should be running for alternator to assist the batteries.
High duty cycle. Will operate at full load, without a break, virtually until vehicle runs out of fuel.	Will operate for a short time - from 1 to 3 minutes under high load when overheating or a shortage of current from batteries will stop it. Alternators are not powerful enough to keep batteries charged.
Operates under water.	Not recommended for use under water however will operate in emergency.
Power steering fluid has been known to overheat when operated at the same time as the power steering. This is an unusual situation and not a cause for concern.	Severe drain on batteries and reduces their life expectancy. When run with deep-cycle batteries, these batteries must not be rapid-charged as it can cause irreversible damage.
Braking effect (when used to control a descent) is not as efficient as electric winches. Winch tends to over-run.	Braking effect superior to hydraulic winch.
Very efficient and even with the decrease in operating power due to lower pump pressures. Pulling power is outstanding.	Electric winches are better established in the marketplace and although not as efficient as hydraulic, work well and have served off-roaders for years.

to buy a winch plate and do the installation yourself. This is without doubt the most cost effective. An ideal plate for such an installation is Front Runner's winch plate. The plate is common to all vehicles, very strong and designed to restrict airflow as little as possible. The mounting brackets are vehicle-specific. The winch plate fits all common electric and hydraulic winches and just about every 4x4 on the market.



Front Runner winch plate with vehicle-specific mounting brackets.

DRUM WINCH BUYER'S GUIDE

Mile Marker

Mile Marker is the first commercially available hydraulic winch powered by the vehicle's power steering pump. It is modelled to fit most existing winch mounting brackets and bullbars. Like a conventional electric winch it has a clutch and can be operated in reverse. Two gear ratios permit rapid retrieval of the cable and higher pulling power than any drum winch available today. The cable is also thicker than that fitted to similar-rated electric drum winches. Pipes, valves and all fittings included and the price is comparable to the electric alternative. Once sold only by Safari Centre, Mile Marker is now available at all 4x4 equipment outlets.



Superwinch

Famous for their contribution to the Camel Trophy, Superwinch make a range of 22 hydraulic and electric winches although the brand seems poorly supported in Southern Africa. For this reason only the Camel Trophy 'Husky' model is featured here. Superwinch's vehicle recovery winches feature a slower retrieve than others, making them more suited to heavy-duty use. Superwinch are manufactured in Connecticut, USA, and Devon, England.



Ramsey

Ramsey electric drum winches are manufactured in Tulsa Oklahoma, USA. The range is the broadest in the business, from the Standard Duty REP series, Performance Duty PRO series and worm geared Heavy Duty RE series. All winches are supplied with a fairlead, remote switch, battery cables and mounting bolts. Ramsey is sold by many off-road equipment suppliers.



Warn

Warn electric drum winches are made in Milwaukee, Oregon, USA and are one of the top selling winches in the world. They are reliable and easy to service, which needs to be done fairly frequently if the winch is well used or has been immersed in water. The solenoids are either integral with the winch or housed in a separate box. Supplied with fairlead, remote, cables and mounting bolts.

Warn also produce the Multi-Mount system which consists of the winch frame and the front receiver, which are sold separately. The winch frame plugs into any standard 2" class-3 receivers which give the added option of winching from the rear and are available for many vehicles. It is suitable for M5000, M8000, X8000i and XD9000i models.

MILE MARKER 2-SPEED HYDRAULIC

Pulling power (kg) low gear	4772 at 1500psi with a flow rate of 4GPM
Pulling power (kg) high gear	727 at 1500psi with a flow rate of 4GPM
Amp draw at full load	2 amps
Gears	3 stage planetary
Rope	30metres/9,5mm diameter aircraft wire rope
Motor	Uses vehicle's power steering pump
Gear ratio	6:1
Weight	approx 30kg
Drum diameter/length	n/a
Dimensions (LxDxH) mm	550x160x230
Switchgear	separate valve and socket

SUPERWINCH HUSKY (CAMEL TROPHY MODEL)

Pulling power (kg)	3863
Amp draw at full load	360 amps
Gears	worm
Rope	38metres/9mm diameter aircraft wire rope
Motor	1,9hp 12-volt DC electric
Gear ratio	294:1
Weight	43 kg
Drum length	225mm
Dimensions (LxDxH) mm	618x233x247
Switchgear	integral

RAMSEY REP 5000/PRO 5000

Pulling power	2260 kg
Amp draw at full load	230 amps / 220 amps
Gears	3 stage planetary
Rope	24metres/6mm diameter aircraft wire rope
Motor	1,3hp 12-volt DC / 1,4hp 12-volt DC
Gear ratio	294:1 / 210:1
Weight	27 kg/31 kg
Drum diameter/length	63mm / 140mm
Dimensions (LxDxH) mm	452x152x162/458x156x200 mm
Switchgear	separate housing / integral

RAMSEY REP 6000/PRO 6000

Pulling power	2720 kg
Amp draw at full load	230 amps / 250 amps
Gears	3 stage planetary
Rope	30metres/6mm diameter aircraft wire rope
Motor	1,6hp 12-volt DC / 1,4hp 12-volt DC
Gear ratio	294:1 / 210:1
Weight	30 kg 33 kg
Drum diameter/length	63mm / 228mm
Dimensions (LxDxH)	540x152x162 mm / 545x156x204 mm
Switchgear	separate housing / integral

RAMSEY REP 8000 / PRO 8000

Pulling power	3620 kg
Amp draw at full load	280 amps / 350 amps
Gears	3 stage planetary
Rope	29metres/8mm diameter aircraft wire rope
Motor	1,8hp 12-volt DC / 1,9hp 12-volt DC
Gear ratio	210:1
Weight	34 kg/ 38 kg
Drum diameter/length	63mm/228mm
Dimensions (LxDxH)	525x152x162 mm / 550x156x204 mm
Switchgear	separate housing / integral

RAMSEY REP 9000 / PRO 9000

Pulling power	4070 kg
Amp draw at full load	400 amps
Gears	3 stage planetary
Rope	29metres/8mm diameter aircraft wire rope
Motor	1,9hp 12-volt DC electric
Gear ratio	138:1
Weight	42 kg / 43 kg
Drum diameter/length	63mm/228mm
Dimensions (LxDxH)	592x156x162 mm / 592x156x204 mm
Switchgear	separate housing / integral

RAMSEY RE 10 000 / REP 12 000

Pulling power	4530 kg / 5440 kg
Amp draw at full load	390 amps
Gears	worm
Rope	30metres / 9mm diameter aircraft wire rope
Motor	2,5hp 12-volt DC electric
Gear ratio	470:1
Weight	59 kg / 61 kg
Drum diameter/length	89mm / 212mm
Dimensions (LxDxH)	565x273x260 mm
Switchgear	separate housing

WARN M12000

Pulling power (kg)	5400
Amp draw at full load	400 amps
Gears	3 stage planetary
Rope	38metres/9,5mm diameter aircraft wire rope
Motor	2,5hp 12-volt DC electric
Gear ratio	261:1
Weight (kg)	62
Drum diameter/length	90mm/210mm
Dimensions (LxDxH) mm	620x220x280
Switchgear	separate housing

WARN M10000

Pulling power (kg)	4500
Amp draw at full load	475 amps
Gears	3 stage planetary
Rope	38metres/9,5mm diameter aircraft wire rope
Motor	2,5hp 12-volt DC electric
Gear ratio	199:1
Weight (kg)	57
Drum diameter/length	90mm/210mm
Dimensions (LxDxH) mm	620x220x250
Switchgear	separate housing

WARN XD9000 / WARN XD9000i

Pulling power (kg)	4100
Amp draw at full load	400 amps
Gears	3 stage planetary
Rope	30metres / 38 metres 8mm diameter aircraft wire rope
Motor	2,5hp 12-volt DC electric
Gear ratio	156:1
Weight (kg)	39
Drum diameter/length	64mm/230mm
Dimensions (LxDxH) mm	550x160x230
Switchgear	separate housing / integral

WARN XD8000i / X8000i

Pulling power (kg)	3600
Amp draw at full load	423 amps
Gears	3 stage planetary
Rope	30metres/8mm diameter aircraft wire rope
Motor	2,1hp 12-volt DC electric
Gear ratio	216:1
Weight (kg)	34 kg
Drum diameter/length	64mm/230mm
Dimensions (LxDxH) mm	550x160x230
Switchgear	integral / separate housing

WARN M5000

Pulling power (kg)	2200
Amp draw at full load	280 amps
Gears	3 stage planetary
Rope	24metres/8mm diameter aircraft wire rope
Motor	1,7hp 12-volt DC electric
Gear ratio	216:1
Weight	25 kg
Drum diameter/length	64mm/230mm
Dimensions (LxDxH) mm	550x160x230
Switchgear	separate housing

WARN M8274 HI PROFILE

Pulling power (kg)	3600
Amp draw at full load	435 amps
Gears	spur gear
Rope	46metres/8mm diameter aircraft wire rope
Motor	2,1hp 12-volt DC electric
Gear ratio	314:1
Weight	50 kg
Drum diameter/length	90mm/220mm
Dimensions (LxDxH) mm	420x220x390
Switchgear	separate housing

Hand winches

Relatively light and inexpensive and very versatile, hand operated winches are effective for situations where winching odd directions is required as the winch can be made to pull in any direction required. They can also double as a hoist. Hand winches need physical strength to operate and the pulling power can be sufficient for quite difficult pulling jobs. Some hand winches, such as the Turfor, are a favourite with hardened off-roaders as they are light and although not inexpensive are cheaper than drum winches. The steel cable on Turfor type winches needs to be stowed somewhere on the vehicle but because steel cable does not flex as easily as rope, it must not be kinked or crushed. This can be a problem if stowing it inside a vehicle and cable clamps mounted on a bush-bar or roof-rack are a better alternative. Turfors work by two sets of jaws biting the cable and pulling it through the winch. The cable must be well cared for as damage can cause the cable to slip. Should the cable need replacing, the diameter required by the winch is critical for it to work properly. The snatch block, described below, increases the pulling power of the hand winch.

RECOVERY ACCESSORIES

Equipment:

- Spade
- High-lift jack & jacking plate
- Five-metre chain
- Q20 or similar
- Gloves
- Length of ski rope (safety line)
- Two large bow shackles for attaching straps.
- Two large D-shackles for attaching chains & straps to vehicles.
- Two small D-shackles for linking chain.
- Tree protector/ winching strap to attach to an anchor.
- Tuggum-strap for snatch recoveries.
- Snatch-block to increase winch pulling power or change direction of a pull.
- Sand ladders/PSP to assist self recovery.
- Winch (vehicle-mounted or portable, electric, hydraulic or manual).

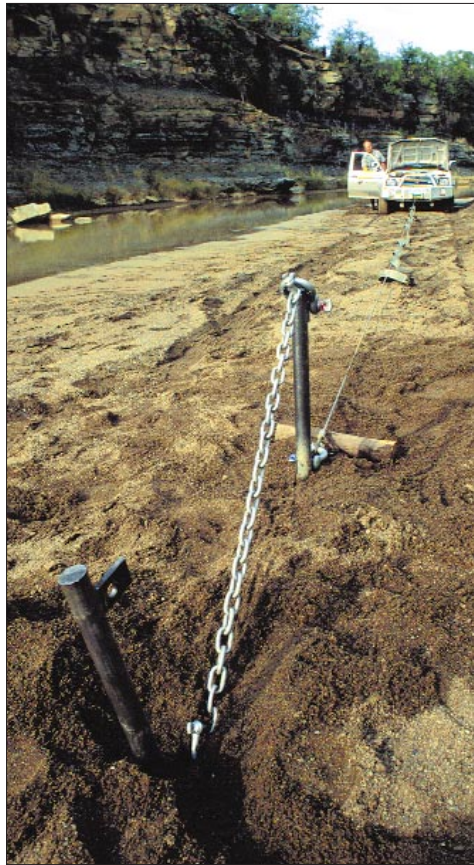


D-shackles and bow-shackles

When a link needs to be made between elements in the recovery operation, in most cases a shackle is the most suitable and reliable way to do it. Using the incorrect type of shackle can result in damage to the strap or a failure under stress. When selecting shackles for your recovery tackle don't be tempted to go the cheap route. There are some Chinese shackles which are a direct copy of some excellent English products but are not as strong.

Working load markings

Quality shackles are marked with indelible information such as the safe working load, the maker's name and sometimes 45° marks. If there are no markings on the shackle it is probably inferior and cannot be trusted. The safe working load is the important bit of information. Decent sized bow-shackles are 4 ³/₄ tons. This means that the shackle's breaking load is 5,4 times that much. In the case of a 4 ³/₄ ton shackle the breaking load is 25,65 tons.



A recovery rig with multiple stakes. The more bits of chain, different sizes shackles and lengths of strap you have, the easier it is to construct a complex rig.

Important rules when using shackles:

- *When using a shackle for recovery operations, tighten the bolt and then loosen it by a quarter of a turn. This prevents damage to the thread and makes releasing the bolt easier.*



Bow-shackles



D-shackles

Clip-shackles are dangerous and must not be used for vehicle recovery.



My recovery kit and its components:

Bow-shackles. All my shackles are marked with the maximum working load.

Wooden pole for joining straps. This is a piece of curtain rod.

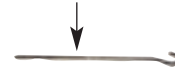
Tuggum strap. I have a Warn, an ARB and a Spanset which I alternate. I always carry two snatch straps at any one time



Three metre chain with suitable D-shackles

Loose-fitting leather gloves

Winch cable guide. Used for protecting fingers while guiding cable onto a winch drum



Polyester tree strap - 2,5 metres

The bag has clear plastic pockets for easy sorting and cleaning

- *When using a shackle for a long-distance tow, hand-tighten the shackle bolt firmly.*
- *Good quality shackles rarely fail - they simply distort so that they are difficult to undo. It is normally the chain or tuggum that fails first.*
- *Shackles designed to snap closed are unsuitable for vehicle recovery as they are not strong enough and can fail even in light duty operations.*
- *NEVER use two shackles to join two tuggum straps together. If one strap should break the attached shackles become a deadly missile. Joining two tuggums together is illustrated later in this chapter.*

D-shackles are used in the following ways:

- *Joining sections of chain or attaching a chain to a vehicle.*
- *Attaching a snatch block to a vehicle.*
- *Attaching a chain to anchor/tree strap bow-shackle.*

Bow-shackles are used whenever straps need to be connected. The extra width of a bow-shackle prevents the strap from being crushed during maximum stress.

Bow-shackles are used in the following ways:

- *Attaching tuggum straps to chains and anchor straps.*
- *Attaching snatch-blocks to tree straps.*
- *Attaching tuggum-straps to vehicles.*
- *Always place the strap over the bow section and the chain or snatch block over the bolt.*

Towing rings and eyes

Off-road vehicles should have towing eyes at both front and rear for use during vehicle recovery operations. Do not attach towing lines to a bush bar or to any part of the vehicle body or steering mechanism. If there are no towing eyes, attach lines to suspension components such as spring shackles, but beware of sharp edges damaging the rope or cable.

Snatch blocks

A snatch block is a hook or eye attached to a large pulley wheel through which the winch cable runs. A snatch block effectively gears down the pulling power - it doubles the pulling force at half the speed and is used in conditions where the winch power is insufficient for the task.



The following uses and advantages are associated with using snatch blocks:

- *Doubles pulling power.*
- *Winching from difficult angles.*
- *Overheating of electric winches reduced.*
- *Current draw is reduced and are therefore kinder to batteries.*

Rings and eyes

All off-road vehicles should be fitted with numerous easily accessible towing eyes for vehicle recovery and winching. Factory fitted towing eyes are suitable for light and medium duty towing operations. They are not designed for use with tuggum straps. Therefore when a tuggum strap is used, both towing eyes must be used. This is illustrated in a later chapter on vehicle recovery. The correct alternative is to fit heavy-duty towing attachments.

Familiarise yourself with the location of your vehicle's towing eyes before venturing off-road. When a vehicle is stuck in deep mud, it can be difficult to reach towing eyes that are located far beneath the vehicle or low to the ground.

Spades/Shovels

A spade is not a spade when it comes to off-roading. Apart from it being the most important recovery tool, the spade must be designed right - garden spades work, but not nearly as well as those designed for the job.

Ideally, an off-road spade should have a cupped blade, more like a shovel, for removing mud or wet sand, for which a flat blade is very inefficient. A long handle will permit reaching well under the vehicle should it be caught on the axles or chassis but if it is too long it can be awkward. Collapsible camp shovels have handles far too short for digging out a vehicle. A pointed blade is better than square as it is more suited to digging sand from under a tyre and provides easier penetration. It should also be painted a bright colour because spades are often



The 4xForum off-road shovel - purpose designed for the job of digging out a vehicle. Available from Safari Centre stores.

left lying in the bush after a recovery operation and only found missing the next time someone gets stuck.

When selecting a spade consider the following:

- *Feel the weight. It must not be unnecessarily heavy.*
- *The length should be sufficient to dig under a vehicle.*
- *Fold-away type camp shovels are far too short and make removing material from under a vehicle almost impossible.*
- *The blade should be a shovel-shaped. A flat blade is far less effective. The blade must not be too big - this adds weight and makes clearing under a vehicle more difficult.*
- *Fancy materials such as stainless steel are pointless - a spade is a spade, not a work of art. And, they get lost.*
- *Find a way of attaching your spade in a convenient place. Front-Runner make a nice roof-rack mount. Place the shovel on the side near the front of the rack so that the curve of the blade bends around the front corner. In this way it will not be caught by bushes that pass close to the vehicle.*

Gloves

Gloves are a major asset to the off-roader and when a recovery operation begins, put on a pair of loose-fitting leather gloves. They help prevent possible injury when handling winch cable, can prevent serious injury when working at the winch and when sand ladders and jacks get hot under the desert sun they are a big help. They are also very useful in preventing blisters when digging and oily hands when jacking.



Loose-fitting leather gloves are essential equipment for all off-roaders.

Anchor straps/Tree protection

When using a tree as an anchor, cable or chain will cut into the bark and this could kill the tree. To protect it use an anchor strap. They are best made from polyester and must have no stretch. Purpose-made anchor straps are available from 4x4 equipment outlets. This can be said to be an essential piece of equipment and is used in a multitude of ways in all kinds of recovery situations.



Anchor straps are usually 3 or more metres long and are used in some way in most winching operations.

Chains

Carry a length of chain in your recovery kit. Chains are an excellent addition to the complete recovery kit and a length of two metres is sufficient for most jobs. They are particularly useful for attaching straps onto vehicles not well equipped for off-road recovery. An ideal chain is one with an 8000kg breaking strain, electroplated with grab hooks attached to both ends. The chain can be folded back



One of a hundred and one uses for a length of chain.

on itself, and the grab hook hooked to any link, thereby shortening the chain to the desired length. Spanset make them. Makro sell them.

Use and care of chains:

- *Do not shock-load a chain as this weakens the links. Normally a weak link goes undetected until it fails.*
- *Keep away from sharp edges when under load.*
- *Do not let a chain kink.*
- *A knot in a chain weakens it dramatically.*
- *To prevent rust, clean the chain in soapy water, allow to dry in the sun and then apply a light coat of Q-20 or similar before storing in a canvas bag.*
- *Galvanised chain should be selected in preference to untreated mild steel.*



A simple safety line is created by winding a snatch strap over the cable. Should the cable break the extra weight and drag will bring it down quickly and safely.

Safety lines

A safety line must be considered whenever a recovery operation is set up. The purpose of a safety cord is to prevent a missile being created by anything in the recovery tackle breaking. Laying a blanket or towel, or rolling a strap around the cable is quick and easy.

Tyre chains

Chains linked to form a ladder and wound around each tyre are particularly useful when driving in snow or very thick mud. The diamond style of chains are the best. Drive onto the chains attaching the inside chain first. Drive the vehicle five car lengths and then re-tension them if necessary. It is a good idea to practice fitting tyre chains before departing because fitting them in ice and snow conditions is messy and awkward without practice. You will need a pair of gloves to fit chains. Do not fit chains to the front tyres alone - driving like this can be very dangerous because the inferior traction on the rear wheels tends to make the vehicle spin at the slightest provocation.

Tow bars

Tow bars are designed and fitted for towing trailers and must not be used for vehicle recovery. Original vehicle manufacturer tow bars are generally stronger than those fitted by tow bar fitment centres, but as a tow bar should never be used for anything but light-weight towing and recovery operations a tow bar must not be considered as a primary recovery attachment.

TUGGUM/SNATCH/KINETIC STRAPS

Tuggum straps are elasticised towing straps used to extract a vehicle by another vehicle. Because of the stretchability of tuggum straps the tow vehicle can move under power and 'jerk' the vehicle from its bogged predicament. Off-roaders use tuggums as the first option when debogging a vehicle. This is the lazy way out because:

1. Tuggums are dangerous. One mismatched component of weak mount can be disastrous. Tuggum straps have killed people.

2. Tuggum straps have a limited life and are expensive. Depending on the load, about twenty pulls and a strap becomes 'stretched out'. Using it for tuggum operations after this is extremely dangerous. The stress is absorbed by the stretch. No stretch=major stress.

Selecting a tuggum strap:

- *Don't go a cheap route.*
- *Protective sleeves on the end loops are a good idea especially if they slip, or better, if they can be removed easily for cleaning and replacement.*
- *Breaking strain rating is important but know the weight of your vehicle. When fully loaded, a vehicle may weigh 3000kgs. A breaking load factor of four should be estimated. Therefore: $3000 \times 4 = 12000$ kgs minimum breaking strain is required.*
- *A stretch of 20% is sufficient. Most good straps have a rating of 20-30%.*
- *Tuggums should be more than six metres long. The longer the strap the higher percentage the stretch and longer the working life. Eight or nine metres is ideal.*
- *Buy all the attachment accessories you need to avoid having to jury-rig equipment not designed for the job. When breakages occur it is more often attachments. Buy the best quality gear.*

Tuggum straps are unpredictable:

- *The actual stretch is determined by many factors: moisture content of the air, previous pulls and their loads, the time the strap has had to rest, how well was the strap cleaned.*



Top: SpanSet heavy-duty strap - an excellent performer.

Next down: ARB is one of the better straps is rated at 25% stretch.

Next down: Warn heavy-duty strap is rated at 20% stretch.

Bottom: Locally produced cargo-carrying strap sold as a tuggum. At best they have about 10% stretch and are unsafe for tuggum operations.



Bogged on a beach with an incoming tide, work fast as a tide rises deceptively fast. Have a wide range of equipment; for example two sizes of shackles for chains and straps. A poor selection or badly cared for equipment can cost a vehicle in situations such as this.



- *An average strap doing one hard pull stretching to its full capacity needs between 6 and 24 hours to recover (contract to its original length) Time needed depends on previous work load. A newer strap recovers faster.*
- *When a strap stops recovering fully - to within 90% of its original length it is 'tugged out'. Using it as a tuggum and relying on its stretch, which at this point may be as low as 5%, is dangerous. The strap is now good as a pull strap. It can also be used as a winch strap but the small amount of stretch left in it may not be ideal.*

More facts about tuggum straps:

- *Genuine tuggum straps (those made for the job) are polyamide, not polyester.*
- *Cargo carry straps (broad green straps) sometimes sold as kinetic straps are often not suitable and when used shock-load the vehicle and attachments.*
- *The more moisture, the longer the stretch but the breaking strain is decreased.*
- *Sand and grit in the webbing accelerates the wear and decreases the breaking strain.*
- *Tuggums with a built-in indicator filament (a strip of coloured material is woven along the length of the strap. When it breaks the tuggum is 'stretched out") have been outlawed in most countries. The system is unreliable and must not be trusted.*
- *Tuggum straps cannot be told apart from non-stretch straps unless they are labelled. Using the wrong strap could be disastrous. Novices beware. Only experts in polyamide technology would be able to tell the difference by just looking.*



JACKS

High-Lift

The high-lift jack is the most useful off-road tool available. It is an indispensable and highly versatile device but can only be used if a strong vehicle jacking platform is available. Working four-wheel drive vehicles should have adequate bumpers for this, but unfortunately most modern 4X4s do not. Rear tow bars make good jacking points but on the front end of most vehicles there is nowhere to use the jack. The cure is simple: have your off-road equipment outlet fit them for you. Armed with a spade and a high-lift jack, in most cases, you are better equipped for the unexpected than a vehicle equipped with a spade and a winch.

There are a number of manufacturers of high-lift jacks, but the original American-made Hi-Lift has proved itself time and time again to be the best. In most cases high-lift jacks are carried on the outside of the vehicle and dust clings to the oily lifting mechanism, which causes it to jam. Q-20 or a similar spray lubricant must be used to free the mechanism before it is used. But take care: this can cause the formation of a mixture of dust and oil - a grinding paste which quickly wears the components. The only way to prevent this is for the jack to wear a jack-nappy when in transit. Alternatively wrap the mechanism in cling film and secure it with tape or a rubber band and lightly oil the shaft immediately before use.



A jack-nappy protects the moving parts from dust. When dust clings to the grease, the grease turns into grinding paste, damaging the jack when it is used.

Air/Balloon jacks

These are large polyurethane bags placed under the vehicle and inflated by exhaust gas to lift the vehicle so that objects which aid traction can be placed under the wheels. Balloon or air jacks have some disadvantages off-road and are not as versatile as the high-lift. They are nevertheless quick and easy to use and do not require much physical strength to operate. advantages and disadvantages are listed on the chart on the previous page.



Balloon jacks come in various sizes and colours. The strength of the top and base are important as thorns, sticks, bolts and hot exhausts can cut through and render the jack useless.

COMPARISONS: HI-LIFT JACK VERSUS BALLOON JACK	
BALLOON JACK	HI-LIFT JACK
Can be used with almost every vehicle	Can only be used with vehicles fitted with suitable bumpers or add-on jacking points
Does not require jacking plate	Jacking plate required on soft ground
Very easy to use effectively	Requires familiarisation in order to use effectively
Safer. A vehicle cannot easily fall off a balloon jack unless it is punctured in which case it pops like a balloon and the vehicle falls heavily.	Can be dangerous in many ways: Unstable, jacking arm can spring up and injur.
Not suitable for repair work under vehicle	Not suitable for repair work under vehicle
Can be used for 'jack and pack' technique	Can be used for 'jack and pack' technique
Cannot be used for 'jack and push' technique	Ideal for 'jack and push' technique
Not versatile	Extremely versatile can be used for winching, lifting, pushing, clamping and many other less obvious purposes
Subject to puncture by stones, thorns and hot exhaust. Rendered useless if there is even a small hole in the exhaust system. Can roll over during lift and get punctured	Reliable if kept well lubricated
Dust does not affect operation	Dust jams mechanism. Lubrication solves this problem
Reliant on the engine to operate	Independent power source (biceps and back muscles)
Small punctures can be repaired	Spare parts readily available. Simple to repair and maintain

Bottle jacks

These are available in a very wide range of lifting capacities from one to 15 tons and over. Bottle jacks tend to be rather tall so before you set off on your safari, simulate a puncture by releasing the air out of one of the rear and one of the front wheels and make sure that the jack fits under the axle now that the tyre is flat. Bottle jacks must be upright to work and periodically need topping up with hydraulic fluid. To jack up a fully loaded 4x4 you will need one with at least a five-ton capacity.

Upright Screw-thread jacks and scissor jacks

These are sometimes supplied with a vehicle as standard jacking equipment. Those that resemble bottle jacks are worthwhile although a little tedious to operate. Some designs are intended to work on one specific vehicle only. The screw threads must be kept clean and well oiled to prevent jamming by dirt and dust. Unlike a hydraulic jack they function at any angle, which is useful when using the jack to straighten bent bodywork.

Scissor jacks are generally unsuitable for off-road use, as they jam easily as dirt clog the threads and are unreliable and break in heavy duty use.

Jacking plates

When using a jack, other than a balloon jack, on soft ground something to prevent it from sinking while the vehicle is being raised has to be used. A steel or thick wooden plate approximately one foot square, preferably with lugs attached to its surface to prevent the jack from slipping sideways, is ideal. A heavy wooden laminated bread board with large wood screws to act as lugs is easy to make and works well. An even cheaper jacking plate can be made from two square 16mm pine boards. Laminate them together with a waterproof wood glue, making sure that the grains run perpendicular to each other. As a last resort the spare wheel makes a very effective, if cumbersome, jacking plate.

When using a regular bottle jack a wood block about 45mm thick can be very useful as a jacking plate, and also for when the bottle jack is used in awkward predicaments, for example when the maximum stretch of the jack is not sufficient. It is also very useful when the bottle jack is used to aid vehicle recovery. This happens when the jack is made to lift an individual wheel so that a more tractable item can be slid underneath or digging can take place.

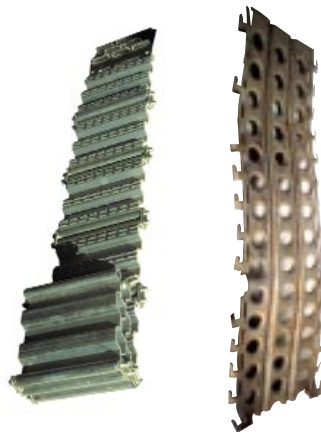
TRACTION AIDS

Traction aid encompasses purpose made articles that are placed under the wheels to aid traction. They are made from plastic, rubber, steel or alloy. Some work, others don't.

SAND LADDERS/PSP/TANK TRACKS

Sand ladders, perforated steel plate (sometimes made from aluminium) and tank tracks are all used as traction aids for vehicle recovery. They are used to pack under wheels in slippery or loose ground to aid traction. These are lengths of galvanised steel or aluminium ladder or perforated plating, generally one to two metres long, that have been used by civilians and the military for years. Their design has changed little and they are bulky, heavy and awkward to use. They are effective in mud and sand. There are some modern and cheaper equivalents made from steel and alloy that look like ladders. These are similar in effectiveness but often easier to stow and lighter.

Flexible sand ladders, called Trac-mats are more effective than traditional rigid types in most situations. Each section of the track is pressed with sharp projections that increases grip and they work in clay mud as well as in sand. Being flexible they tend to mould into the ground. Because of this less digging is required to



Flexible alloy trac-mats.

Perforated steel plate.



lay them and they do not kick up and damage the vehicle as sometimes happens with rigid types. They are also compact, easy to stow - in fact, in most respects more versatile than rigid ladders. Use gloves when handling sand ladders

to prevent pinched fingers (flexible types) and burns (hot climates). Both perforated steel plate and flexible ladders offer excellent grip either wet or dry and are equally effective in sand and mud.

RUBBER MATS

Lengths of rubber mat normally used as industrial flooring are being sold as debogging aids with various names. They are cheaper than metal, fairly effective in sand but utterly useless in mud. Rubber does not grip on rubber when wet.

PLASTIC CLIP-TOGETHER

Half-metre lengths of moulded plastic ladder clip together to make a traction aid as long as you like are a good idea and work fairly well. Grip in wet is okay but good in the dry. When it gets very muddy the plastic edges designed to grip the tyre are too small and quickly disappear under a coating of mud. At this stage tyres spin with little grip. They are also made too narrow. In wet conditions they must be anchored to be effective.

STEEL LADDERS

Many off-road workshops fabricate simple steel ladders as traction aids. They are cheaper than PSP or Trac mats but most seem to suffer in the same way - when they get muddy tyres lose their grip.

COMPARISONS: RIGID PLATE (PSP) VERSUS FLEXIBLE SAND LADDERS (TANK TRACKS)	
RIGID LADDERS	FLEXIBLE 'TANK TRACKS'
Bulky to transport.	Folds up and easy to transport
Must be periodically flipped over so that a bend does not set in.	Do not distort easily.
On uneven ground plates tends to kick up and hit the vehicle	Excellent for uneven ground as the flexible tracks conform to the shape of the ground
Versatile in that they can be used as a short bridge when strapped together	Cannot be used as a bridge
PSP plates are shorter than tank tracks	Added length aids recovery

RECOVERY TECHNIQUES

GOLDEN RULES OF VEHICLE RECOVERY:

- *Stop spinning your wheels the moment it appears you are stuck. Trying too hard only makes things more difficult. Each unnecessary rotation of the wheels only digs you in deeper.*
- *Establish if any part of the vehicle's weight is resting on anything other than the wheels. If so jack up the vehicle and correct this first.*
- *Take a close look at all four wheels and establish which one is halting progress. Work on this wheel first.*
- *Take a second look at each wheel. Any other wheels that do not have a clear path ahead of them must be worked on next.*
- *Do not be tempted to try to drive out after a half-hearted attempt to de-bog a vehicle. Failure means that all the work done the first time will have to be redone.*
- *Should your initial attempts fail, stop, have something cool to drink and try to analyse why the vehicle cannot be freed. Logic and common sense are your allies - use them.*
- *Use all the resources at your disposal. These include all areas behind or in front of the wheels that are firm (push the vehicle in that direction), a slight slope (gravity can be a major ally).*
- *Look out for things that will hinder progress. These include a slight slope (gravity can also be an enemy), front and rear wheels dropping into a ditch simultaneously (arrange things so that wheels drop alternately).*
- *Your equipment can be used in more ways than meets the eye. Adapt them to your needs.*

The use of tow bars for vehicle recovery

NEVER use a tow ball with a winch or snatch strap. Imagine the tow ball snapping during a snatch operation or during heavy winching! I heard a story of a Range Rover winching out a badly bogged vehicle. The driver correctly insisted that his passenger leave the vehicle and stand well back. The winch cable was simply hooked over the tow ball of the stuck vehicle. At maximum stress the tow ball snapped and the cable with the round ball attached tore through the Range Rover, cutting through the roof and splitting the front passenger seat in two. The Range Rover was declared a write-off. Because of other precautions taken nobody was hurt. Tow balls are mild steel - not the correct material for high-stress pulling. The only time a tow ball can be used for vehicle recovery is if



If you have a 4x4, remove the standard tow hitch and fit one designed for the job. The type above can be used for towing AND recovery.



The best and worst vehicles, and novice and expert drivers get stuck - there is no shame in it. In fact experienced drivers get stuck more often because they are more adventurous - it is the only way to get experienced.

one vehicle is pulling out another from a static start. (Non-inertia pulls. Recovery is dependent upon the traction of pulling vehicle only)

Using a spade

Using a spade to dig out a vehicle may appear common sense, but there is more to it when in the field. Bear in mind that in 90% of all recovery operations some digging or clearing of the path in front of the vehicle should be undertaken. In many cases a little digging is all that is needed.

On the beach

Assuming that the tyres have been deflated to the required pressure, bogging on the beach can easily be overcome with a little digging, as long as the driver hasn't got the vehicle in so deep that the axle is buried and the vehicle has grounded. Once the vehicle has stopped, dig out a good measure of sand from all four wheels and attempt to reverse out. If this fails and a tuggum or winch is to be used, always clear a path with your spade.

Over-extended axles

Over-extending the vehicle's wheel articulation, creating a situation where a wheel has no weight on it, is a common way of getting bogged. The most common practice is to place material under the spinning wheels. This is far less effective than digging under the wheel in the opposite corner which has the most weight on it. By doing so you are reducing the required axle articulation. In effect you are placing the vehicle's own weight on the wheels that are airborne and spinning.

Hung-up

When a vehicle attempts to traverse uneven terrain and exceeds its break-over angle and the chassis between the front and rear axles touches the ground the vehicle has 'grounded' or is 'hung up'. This is very much an unforgivable situation because the cautious driver should have had someone marshalling the obstacle from the outside who could warn of impending disaster. The recovery procedure is to dig away the ground from under the vehicle or to raise the vehicle with a high-lift jack and place material under the wheels. Do not climb under a vehicle supported only by a high-lift jack.



Although there are rules and guidelines for vehicle recovery, no two recovery operations are the same. Ingenuity, common sense and a wide range of equipment are needed for most recovery situations. However, safety must be first priority. Don't create campfire stories by being injured or killed by shortsightedness or carelessness.

Direct pull

One vehicle pulling another using a non-stretch rope or chain will require good traction to be able to exert a meaningful pull. A four-wheel drive will easily spin its wheels on firm gravel or sand even if pulling a vehicle that is only lightly bogged. When attempting a direct pull, always look for an advantage, like a slope or a surface where the wheels will get a better grip. Be careful that the recovery vehicle does not bog down while attempting the recovery.

THE USE OF WINCHES

Winches are potentially hazardous. Study these key points:

- *Place a single individual in charge of the winch. This person will be the ONLY one to use the switch - and the ONLY one handling the recovery of the winch cable once the winching operation is complete. This is done to prevent anyone losing fingers - a common injury when the cable handler lets someone else handle the switch.*
- *Before winching have everyone stand well clear. The slingshot effect caused by a cable break under load can cause serious, even fatal, injury.*
- *Wear gloves when handling winch cable and use a cable guide when feeding in loose cable.*
- *The winch cable should be cared for and wound neatly on the drum under tension.*
- *Always have five turns of cable wound around the drum before winching. Less than five turns could mean the cable clamp on the drum coming undone.*
- *Never stand in the 'V' of a winching layout under tension.*
- *Never step over a strap or cable after it has been attached in a recovery layout, even when it appears to be lying harmlessly on the ground.*
- *Never hook a winch cable around an object and then back on itself. This is a common cause of cable breakages among the inexperienced. Anchor straps are used to prevent this.*

ANCHORS

Natural anchors

Natural anchors are anything that you find suitable to attach a cable to - trees, rocks and signposts (signposts on gravel roads are unreliable and pull out of the ground very easily) If you are going to use a tree as an anchor, protect the tree by using a tree-strap to prevent the steel cable from cutting into the bark as this can kill a healthy tree. Attach the strap as close to the ground as possible.

The strength of an anchor depends on how badly the vehicle is bogged and how much preparation is made before winching begins. Assess the strength of the anchor first - if it appears weak, then pre-preparation to the vehicle will need to be extensive. If the anchor is fool-proof, little or no preparation may be needed, and if winching fails nothing is lost and some digging and clearing can be done.

Have someone monitor the condition of an anchor during recovery. If it appears to be loosened by the winching, then halt the process before it is weakened further because even a weak anchor is better than no anchor at all. To put less stress on the anchor more clearing around the wheels and jacking must be done before further winching.

Man-made anchors

If there is no anchor to which a winch cable can be attached, a man-made anchor can be created. No made-made anchor of any reliability can be made without a lot of effort. Consider the alternatives - what is the effort and time likely to amount to, to create an anchor, dig a bit and then use the winch; or, dig a lot and maybe use a jack and then drive out. In very difficult situations all of these will be required.

Anchor construction tools:

- *Heavy hammer*
- *Iron standard/s or purpose designed stakes*
- *Danforth boat anchor/Pull-Pal anchor*
- *Chain, shackles and anchor strap*

If the vehicle is bogged down where there are no good anchor points, an anchor can be created.

Here's how:

- *Drive steel stakes into the ground at 45° and about one metre apart and then attach the cable to the stakes as close to the ground as possible. Create 'Vs' between the top and bottom of each stake. See photograph on page 194.*
- *Danforth-type boat anchors also work well if the ground is soft. This is because the harder the pull, the deeper they drive into the mud - in theory. The angle of pull must be as close to the ground as possible. Pull-Pal from Orvas (011 646 9708) is an effective anchor in soft ground. Both the Danforth and Pull-Pal are bulky and overly heavy for expedition use.*
- *A long length of chain run along the ground secured with ten or more long tent pegs. The more difficult the winching operation, the more tent pegs will be required. This man-made anchor takes little effort and if the vehicle is not deeply bogged it is a quick and effective way of creating a light-duty anchor.*
- *As a last resort a spare wheel can be buried either horizontally or vertically which is the more conventional but less effective way. The winch cable is passed through the middle of the wheel and attached to a steel bar (use a power bar or a heavy wheel spanner). After burying the spare wheel, dig out from under the vehicle making sure that no soil is supporting the vehicle's weight. This is a last resort because burying the wheel is hard work and despite perserverance it is often a waste of time.*



Remember: the harder the effort put into an anchor, the better its effectiveness. Before using your man-made

anchor - which under most conditions will be suitable only for a light-weight pull - dig out channels in front of all four wheels to allow easier forward movement. Do not be in too much of a hurry when preparing the anchor or digging out soil from under the vehicle. If you try to winch before you are absolutely ready, you may fail - and have to go through the entire process again. Once you are ready to begin winching, aid the process by having everyone not directly involved with the winching pushing the vehicle. Engage low range second and apply as little throttle as possible. Do not permit the wheels to spin.



Winching in deep cloying mud

Mud can sometimes be the most difficult stuff. When it is particularly thick it creates a vacuum under a vehicle and no matter how much winching and heaving, the vehicle just won't move. When this occurs the vehicle's progress is halted as much by the lack of traction as by the vacuum. Here a combination of high-lift jack and winch is required.

This is the way to go about it:

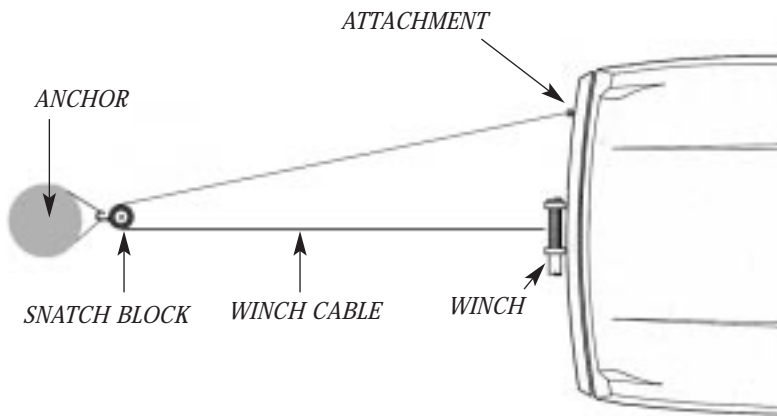
Place the jack about a metre in front of the bogged vehicle and lift up the jacking step to shoulder height. Run the winch cable over the jacking step to the anchor. Tilt the jack away from the vehicle and take up the tension. Now, with someone supporting the jack, begin winching in. As the cable is retrieved the jack is pulled upright, simultaneously pulling the vehicle forward and up, releasing the vacuum. Repeat this as many times as required.

The use of hub capstan winches

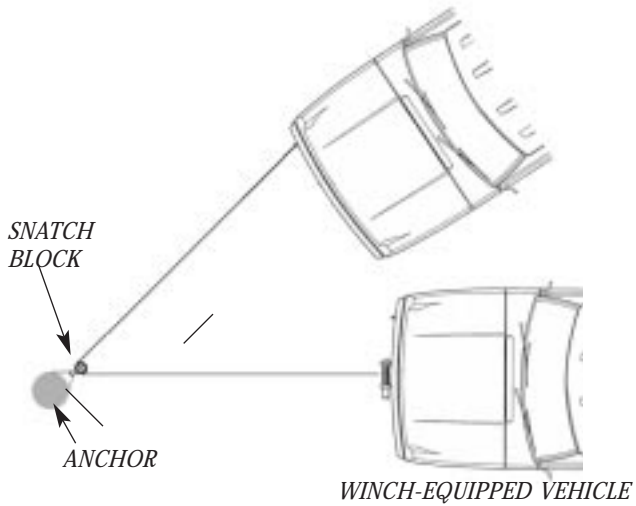
These simple devices allow the spinning wheels of a bogged vehicle to act as a winch. Hub capstans are attached directly to the wheel rim and a rope or cable is guided through a groove in the steel and secured with a knot or buckle. The rope should then be wound around the capstan at least five times, crossing over itself. The direction of wind and the gear selected (forward or reverse) will determine the direction of pull. Hub capstans on both wheels on the same axle must be used simultaneously as the axle differential will not allow winching on a single hub. Because rear half-shafts and differentials are generally stronger than those in front, it is recommended that the rear wheels are used for pulling. The vehicle must be engaged in four-wheel drive, hubs must be engaged and for those operating permanent four-wheel drive vehicles, the centre differential must be locked. Using hub capstans can damage the vehicle if the cables are allowed to get too short when the wheels are pulled together by the narrowing angles between the two lines.

Unfortunately no local manufacturers make hub capstans and the only vehicle I have ever seen them fitted to is a Land Rover.

USING A SNATCH BLOCK



CHANGING THE DIRECTION OF PULL



The winch cable is passed through the snatch block and is then returned and attached to a towing eye

THE USE OF THE SNATCH BLOCK

The snatch block is a heavy-duty single-line pulley. It is used to increase the pulling force of the winch or change the direction of pull.

Self-Recovery

During self recovery the snatch block is attached to the anchor. Run the cable from the bogged vehicle through the pulley and back to the vehicle where the cable is then attached. This is where dual towing eyes are very useful. Normal winching at half retrieval speed and double the pulling force is then performed.

Two-vehicle recovery

During two-vehicle recovery where the free vehicle's winch is used, attach the snatch block to the bogged vehicle. Run the cable from the winching vehicle through the snatch block and back to the vehicle where the cable is then attached to a towing eye. If your winch is rated at or under 6000 lbs pulling power, then it is very likely that a snatch block will one day be necessary.

If you have a winch fitted you will be in a good position to help another vehicle that has bogged down. This is where a winch is really useful.

To prepare for winching, follow this procedure:

- *If the area is slippery, anchor the winch-equipped vehicle by chaining it to a tree or by digging holes into which the front wheels will be driven. Alternatively, place wheel chocks in front of the front wheels.*
- *The line of the winch cable should follow the route that the bogged vehicle will move along when it is pulled out. If the winch is pulling from an angle, the winch cable will gather on the one side of the drum.*
- *Dig channels in front of the wheels of the bogged vehicle and remove any obstacles in its path.*
- *Once the stricken vehicle is attached to the winch cable and the cable is pulled taut, everyone should stand well clear.*
- *By opening the bonnet during the winching operation, the windscreen will be protected from damage should the cable break.*
- *The winching vehicle should have its engine running to keep the battery charged and the operator's foot should be on the brake.*
- *The driver of the bogged vehicle should engage low-range second and gently release the clutch as the winch takes up tension, rotating the wheels very slowly to assist the winch. Avoid spinning the wheels.*
- *When the vehicle is free, drive clear of the obstacle. Avoid driving over the winch cable.*
- *Where an anchor point is not in front of the bogged vehicle, or in the case of lack of space in front of a bogged vehicle in which to allow the winch equipped vehicle access, the snatch block is invaluable. Here the snatch block is used to change the direction of pull.*

Using a snatch block to pull a vehicle over an obstacle

If you wish to drive through very deep mud or climb a slippery slope and you suspect that your vehicle will not be able to do it without some assistance from the vehicle accompanying you, the use of a snatch block to change the direction of pull may be the solution. Attach the snatch block to an anchor on the other side of the obstacle. Run the winch cable from one vehicle, through the snatch block and back again to the second vehicle. As the second vehicle reverses on terra-firma it will pull the first up and over the obstacle. Now with one vehicle through, it can use the cable and pull the second vehicle directly towards it over the obstacle. No matter how easy the pull, always have a competent person at the wheel of the vehicle being pulled as in the event of equipment failure the driver must know how to stop the vehicle safely.

USE OF TUGGUM STRAPS

Tuggums or tuggum straps are dangerous but effective. Recently a woman passenger was killed when an attachment broke under load and the snatchum ripped through the towing vehicle. She was sitting in the passenger seat and the top half of the vehicle was cut in half. My own approach to snatch straps is that they must only be used for vehicles that are lightly bogged. This advice goes unheeded however, and it is only a matter of time before another victim falls to reckless use of snatch straps. Therefore, the rules below will not necessarily ensure safety but will go a long way toward it.

IMPORTANT RULES FOR USING SNATCH STRAPS:

- *Do not use the snatch strap if the vehicle is badly bogged i.e. with its weight resting on its chassis. Use a jack and spade to put the weight back onto the wheels first.*
- *The pulling vehicle must be similar in size and weight to the vehicle being pulled.*
- *The pulling vehicle must run in a straight line. Do not attempt to pull at an angle of more than 10°.*
- *Use bow-shackles to attach the snatch strap to the vehicles.*
- *Do not compromise on the security of attachment points. Use both tow eyes if the vehicle is fitted with them.*

Using a snatch strap is straightforward: Attach the snatch strap to the front or back of the bogged vehicle. Do not select back or front without first considering which is the most effortless direction of travel.

Then follow this procedure:

- *Manoeuvre the recovery vehicle to the bogged vehicle and stop at a point no less than half the total length of the snatch strap.*



The most important part of a tuggum layout - good, strong attachment points. This one is a rare find - a standard recovery point strong enough for tuggum operations on the back of the new Nissan Patrol

- Attach the snatch strap to the bogged vehicle, making sure that there are no knots in the strap.
- Lay a blanket over the tuggum or attach a safety line (ski rope is ideal). In the case of the strap breaking the weight of the blanket will rapidly absorb the energy of the broken strap.
- With a go-ahead signal from the driver of the bogged vehicle, the recovery vehicle moves off at normal take-off speed in first gear.



Double tie a tuggum if possible. This reduces the likelihood of damage to the vehicle or breakage which can cause serious injury. Should a single towing eye, which is designed as a lashing point rather than a recovery point, be used for a snatch recovery it will probably break. If it does, someone is likely to get badly hurt. THE STRENGTH OF VEHICLE ATTACHMENTS FOR SNATCH OPERATIONS MUST NOT BE OVERESTIMATED. ALL SNATCH OPERATIONS ARE DANGEROUS.

Accelerate very gently and keep the speed constant. As the pull of the rope is felt, try to maintain a constant speed and continue to accelerate very gently - it is not engine power and torque that is doing the work, but the vehicle's momentum and energy being transferred through the elasticity of the strap.

- It has been proven that speeding off in the tow vehicle does not increase the pull. It does, however, over stress the tuggum.

Unfortunately, if the bogged vehicle is badly stuck, something will break. If it is an attachment it becomes dangerous to both bystanders and drivers.

Double tuggum-straps used together.

As we have discussed, having the towing vehicle move off with more speed does not increase the pulling force. Doubling the length of the strap together with a higher speed does, however, have the desired result. To do this a joint must be made linking the two straps. UNDER NO CIRCUMSTANCES join two straps together with shackles. Should one strap break the shackles become a deadly missile.

To make a safe join:

- Pass the loop of strap A through the loop of strap B.
- Take a short piece of rounded and smoothed wood and pass it through the loop of strap B and pull tight.
- Using a rectangular shaped or rough piece of wood will damage the snatch strap.



Safe use, care and maintenance of snatch straps

Never have a light vehicle try to 'snatch' a heavy vehicle that is deeply bogged. It may recoil and hit the bogged vehicle.

Case history: A Suzuki Jeep attempted to snatch a Land Rover Defender. The Suzuki took off at full speed from a distance of only about a metre from the Land Rover (which was the incorrect procedure anyway), The Suzuki came to the end of the stretchability of the strap and instead of the Land Rover moving forward the Suzuki recoiled and smashed into the Land Rover. Both vehicles, and the Suzuki driver, needed a lot of painful repair work.

Never have a heavy vehicle try to 'snatch' a light vehicle that is deeply bogged.

Case history: The SADF in northern Namibia some years ago used a military snatch strap, normally used to free armoured vehicles weighing up to 20 tons, on a deeply bogged Land Rover and an armoured troop-carrier was used as the tow vehicle. Instead of the snatch strap breaking, the Land Rover's chassis was torn from both axles, which remained firmly stuck in the mud.

Clean nylon straps with washing-up liquid after use. Dirt abrades fibres and speeds deterioration. Beware of detergents attacking the nylon. With extended use their stretchability deteriorates and they quickly become dangerous.

Measure the static length before use. Write it down. When the length of the strap has increased by 10% of its original length, it is no longer suitable for snatch operations. However, it still has many uses; long distance towing, extra long tree protector etc.

USE OF THE HIGH-LIFT JACK

There are few bogging down situations that cannot be overcome with a high-lift jack, a spade and a strong back. The high-lift jack is without doubt the most valuable piece of equipment that an off-roader can carry. The jack discussed here is the American standard brick red-coloured unit that has been around for many decades. Although there are competitors' jacks on the market, the 'old favourite' is virtually unbreakable and as long as it is kept well lubricated it is reliable. Unfortunately, more and more 'off-road' vehicles are being introduced with fancy curved plastic bumpers - impractical for bush work because of the absence of points where a high-lift jack can be used. There are cases where a vehicle has bogged down so comprehensively that jacking has been the only way out. Personally I would not venture to a place like the Makgadikgadi Pans in a vehicle not suited to jacking with a high-lift.

The jacking mechanism is used in the following way:

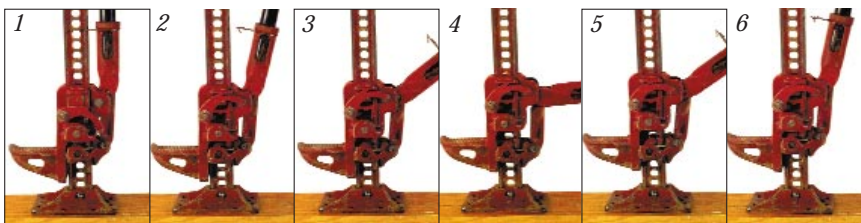
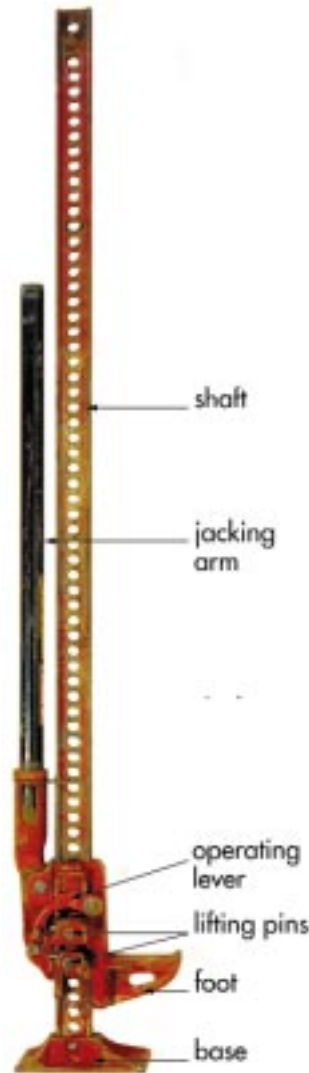
To lift a vehicle:

- *Stand the jack under the jacking point and push the operating lever (small L-shaped lever on top of the lifting mechanism) down.*
- *Raise the jacking arm to the upright position to hoist the entire mechanism up the shaft so that the jacking foot is positioned under the jacking point of the vehicle.*

- Adjust the jacking foot position exactly. Once this is done pull the arm down, thereby lifting and firmly locating the foot under the vehicle jacking point. Should the position need changing, lift the arm and readjust. Once satisfied with the foot's position, lower the arm once again all the way down until the lifting pin enters the perforations in the upright shaft or 'ladder'. It will click into place.
- Lift the arm to the upright position until a click is heard.
- Pull the operating lever into the upper position. It will click into place. The jacking foot will be held at that height. The vehicle is ready to be lifted.
- Hold the lifting arm with both hands. Gripping it firmly, pull it down once again until the pin locates and clicks into place. Lift the arm to the upright position and the second lifting pin locates itself. Continue until the vehicle's wheel/s are off the ground.

To lower a vehicle:

- Raise the jacking arm to the upright position.
- Push the operating lever down.
- Gripping the arm with both hands, lower the lever so as to release the lifting pin. At this point the vehicle's weight is in your hands. If you do not have a good grip and your weight is pressing down on the arm it can shoot up and cause injury. Have bystanders stand well clear.
- From this point jack the vehicle down by lifting and lowering the arm to its fullest extent.



WARNING

High-lift jacks can be dangerous.

The following simple safety advice must be heeded: when lifting or lowering a vehicle, hold the jacking arm firmly and with both hands. If released at the halfway point while under load it will shoot upwards with great force. It can smash teeth, cause concussion and the upward movement can release the lifting pin, causing the arm to drop by itself, starting an auto-jacking sequence which rapidly lowers the vehicle onto the ground. Once this auto-

jacking has started it is too dangerous to try and stop it running its full course. Holding the jacking arm firmly is especially important when lowering a vehicle.

When the jack is left unattended and under load, the jacking arm must ALWAYS be left in the upright position, clipped to the upright with the supplied wire clip. In any other position the jack poses a threat to anyone close to it.

High-lift jacks are unstable. Never climb under a vehicle that is supported only by a high-lift jack. If you need to dig under the vehicle, do what you can before you jack it up.

The following situations demonstrate how the high-lift jack can be used to extricate a vehicle:

Jack and push

Your vehicle is stuck on soft ground with the axles grounded on a ridge; or you have dropped into a gully and two or more wheels are off the ground and spinning. If the ground is soft, place the jack on its broad base and jack up the vehicle, high enough so that the one set of wheels is higher than the ridge on which the axle has been caught. Now push the vehicle sideways. The vehicle will pivot on the jack and land on the ground with the wheels on the ridge, thereby clearing the axle from the obstacle. In some situations you may need to do the same with the both axles. Vehicles with spare tyres attached to the tailgate may have to either remove them or swing them clear as the falling jack may catch on them and damage the vehicle bodywork. If they are removed from a separate wheel carrying frame, the frame can be closed and used to protect the rear of the vehicle from the jack during this operation.



Jack and pack

Quite often the ground under the jack is soft and slushy and in these cases the jack and push method is not effective - the vehicle topples off the jack, the wheels dig into the mud or sand and the vehicle settles back onto its chassis. In this situation the best course of action is to jack up the wheels that are the most deeply dug in. Once this has been done find something to place under them - sand ladders, trac-mats, carpets, rocks, branches or logs - in fact anything lying around (in wet mud, grass seems to make matters worse). Lie items in the direction of travel so that the wheels can gain some momentum as they ride over them. If all four wheels are deeply dug in, this must be done to all wheels.

Before attempting to drive out think about the gear ratio to use. Should you use a gear ratio that is too low, the result may be

wheelspin, and you may not only undo all your hard work but still have a bogged vehicle. Select the highest gear you think may work - try to remember the gear ratio that was getting you through difficulties beforehand, because once off the mats or logs you must be able to keep moving without a gear change. Selecting this gear ratio is critical and for each vehicle and for each situation it differs. The vehicle is then lowered and with everyone pushing, the clutch is let out gently with acceleration as smooth as possible. If the wheel spin occurs decelerate gently.



Jack & Pack - lift with the high-lift and then lay sand tracks under the front wheels.

High-lift winch

The high-lift jack can also be used as a hand winch. Heavy manila rope must be used (the stretch of nylon rope renders it ineffective)

Proceed as follows:

- *Remove the steel foot from the jack by sliding out the pin.*
- *Lay a length of rope from the bottom of the jack to the bogged vehicle. Do not attach it to the jack.*
- *Attach a cable or rope to the top of the jack and then onto the anchor.*
- *Position the lifting foot of the jack at its lowest position.*
- *Join a short length of chain to make a loop. Lay this loop across the rope at the bottom of the jack. Pass your hand through the loop and underneath the rope. Grip the chain and pull it through so that the chain loops around and grabs the rope.*
- *Using a D-shackle, attach the end of the chain you are holding to the hole in the base of the jacking foot.*

The jack is used as if lifting a vehicle. As the rope is pulled taut, the chain grips the rope. When the jack is at its highest point, slacken the rope and chain, slide the jack back down to its lowest position, slide the rope through the chain, and begin jacking again. Although it is a time consuming process, it is often successful when conventional winching techniques have failed.

Care of a high-lift jack

If carried on the tailgate of a vehicle, some method of preventing the mechanism being clogged by dust should be devised such as the jack-nappy, a washable nylon sleeve that covers the mechanism. The 'old favourite' is criticised by its competitors for jamming under load. It's a valid criticism and to prevent this the lifting mechanism must be clean and well lubricated. Have a can of Q-20 handy and at the first sign of slicking, give it a good spray. Despite this it remains, in my opinion, the best high-lifter on the market.

USE OF SAND LADDERS

An experienced driver would call for a sand ladder before too much digging is required. Four-wheel drive and hub locks should have been engaged long before sand ladders are needed.

If the vehicle has been allowed to dig itself in to the extent that the vehicle's weight is resting on the axles or chassis, a great deal of digging will be required. Do not dig a little and then attempt to drive out. This is a waste of time - if the attempt is unsuccessful the entire digging effort will have been wasted because the spinning wheels will replace the sand you have removed. Dig until you are sure that more digging would be a waste of time.

Dig channels in front of the wheels that appear to have the least traction and lie the ladders in front of them. If in doubt as to the wheels under which to lay the ladders, select the front wheels, since once the vehicle gets moving the rear wheels will also get the benefit of the extra traction (assuming you are driving out forward).

If in sand with the rear wheels sunken and the front wheels remaining clear, place the ladders under the rear wheels.

Dig out a channel in front of the other wheels so they do not have to roll over any ridges of sand that may have built up in front of them.

In very deep sand the sand ladders may get buried when the vehicle drives over them, so mark the position of the ladders with the spade.

Unfortunately for those doing the pushing, this may mean a bit of a walk, as it is important for the vehicle to be driven to firmer ground before it is stopped. The sand ladders will have to be dug up and carried. Attaching a rope to tow them out is not wise as the extra drag can cause the vehicle to bog down again.



Not only men and machines are attracted by mud.



Always consider a push - its quicker to organise than a winch or tuggum.

Off-Road Vehicle Recovery - Selecting equipment, using it correctly and a common sense approach to getting vehicles unstuck.

A sequel to the Driving a 4x4 video described on page 181 is the video, Off-Road Vehicle Recovery. Like in the driving video, I have attempted to explain off-road recovery in a simple but not simplistic way. The video explains all of the equipment needed, and wanted, and illustrates their use. Because all recovery situations are unlike any before, and after, it is a subject which creates much argument and comment. I have no doubt this video does it too. Because none of the recovery situations in the video were contrived, not everything works as planned - like the real world.

There we are, expecting everything to work as planned, and we end up trying four, five and six times to extricate a vehicle. The result is an understanding of how frustrating, rewarding and sometimes humorous off-road recovery can be. It will educate and entertain - this much I can guarantee.

It is 55 minutes long and is available at all major 4x4 outlets and good book stores, or by calling 021 785 5752.

