

**SNATCH BLOCKS**  
 One of the most overlooked accessories in the winch user's bag of goodies is the "snatch" block. This specialized pulley reel, through the laws of physics, can almost double a winch's pulling power when used one way, and change the angle of pull when used another way. The only drawback of a snatch block is that it reduces the winch's line speed when used to increase the pulling power of the winch.



The proper method of using a snatch block to double the winch's pulling ability—or to halve the work load—requires attaching to the object being winched and running the hook-end of the winch cable back to the winching vehicle. This provides a 2.00:1 mechanical advantage. The farther away the hook is attached to an anchor point other than the winching vehicle, the more the mechanical advantage decreases. If the snatch block is anchored, there is no mechanical advantage at all until the hook is attached to the vehicle with the winch—then it instantly provides 2.00:1 leverage factor to pull the winching vehicle.

Snatch blocks swivel open, allowing the winch cable to be draped over the pulley. Then the block is closed and attached to a non-winching vehicle using either a short length of choker chain or a heavy-duty nylon strap. You use a nylon strap, be sure it is not looped over any metal with sharp edges that can sever the strap when the load is applied.

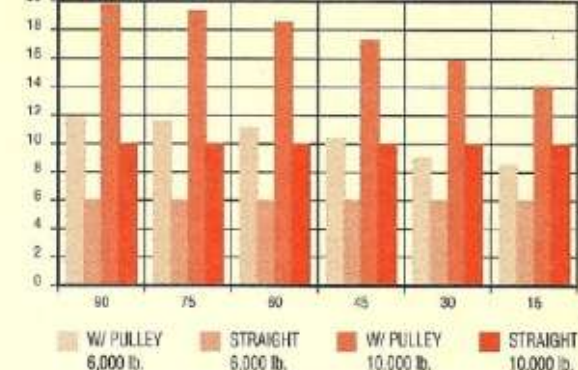
Meanwhile, the hook-end of the winch cable is run back to the vehicle with the winch and attached to its frame or a tow block. Drape a floor mat or heavy tarp over the cables to prevent them from whipping back should something break under the increased strain. Slowly take up the slack until it is just taut. Inspect the hookup. If all is well, inch away, keeping an eye on the winch motor to make sure it isn't overheat. If you see wisps of smoke from the motor, stop winching immediately and let the winch motor cool down for at

least 15 minutes. In a worst-stuck case, you may need even more pulling power. Use two snatch blocks for a 3.00:1 mechanical advantage. The second snatch block attaches to the vehicle with the winch and the hook-end of the cable; then it goes back to the vehicle that's being winched or to the anchor. Remember, each "leg" of the setup uses more cable. That means the winching vehicle may have to move closer, or another length of cable has to be employed.

The angle of the second part of the cable determines the amount of mechanical advantage provided by the snatch block (see accompanying diagram). Little mechanical advantage is gained until the second leg of cable exceeds 90 degrees going back toward the winch. As the angle increases, so does the mechanical advantage. Consequently, snatch blocks are very effective in redirecting the pulling angle.

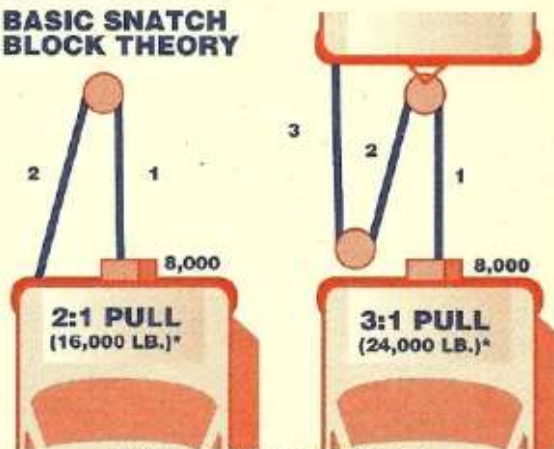
However, the most common use of a snatch block in redirecting cable pull is in moving objects in some other direction than directly to the winching vehicle. For example, say you need to move a tree out of the road. Attach the snatch block to another anchor point in line with where you want to move the felled tree. Run the winch cable through the snatch block and on to the downed tree. Now, when you apply power to the winch, the tree is pulled toward the snatch block and not toward the winching vehicle. This method also works very effectively on vehicles as well as trail obstructions—especially if the vehicle being winched can't be safely pulled directly toward the recovery vehicle.

Winches work best when the winch cable is coming onto the drum on a straight pull. When the cable is off to one side of the fairlead, it tends to pile up on that side, decreasing the pulling capacity and causing potential damage to the cable. Using the snatch block can help alleviate that problem.



Example of using a single snatch block with cable spooling from drum payer of a 10,000-pound-capacity winch to improve pulling capacity on the object to be moved. Note: This does not take into account a 5- to 10-percent loss in pulling capacity due to friction at the snatch block pulley.

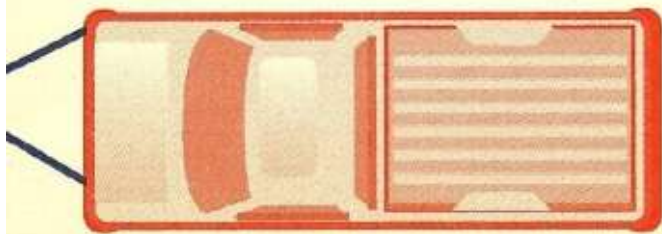
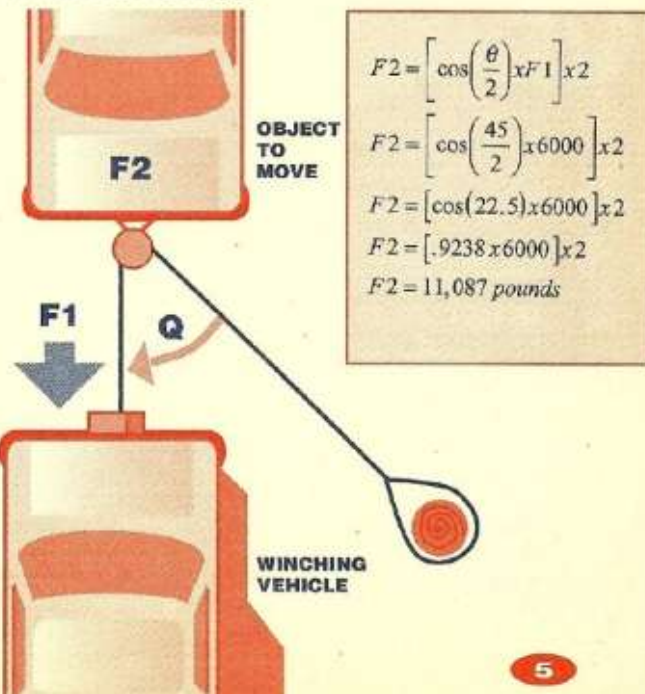
### BASIC SNATCH BLOCK THEORY



\*MINUS ABOUT 10% FOR FRICTION

**Calculating pulling power:** According to Scott Thiel, a mechanical engineer at Warn Industries, the force exerted on the object F2 by a snatch block can be measured by first determining the included angle. Divide by two. Take the cosine of that number and multiply it by the force exerted on the winch. Double the result to get the approximate force exerted on F2.

For example, a vehicle starts winching at 6,000 pounds of pull, at a 45-degree angle to the object. The initial pulling force on object F2 is approximately 11,087 pounds. (Remember, the included angle becomes greater as the object is winched toward the vehicle, so the force decreases accordingly.)

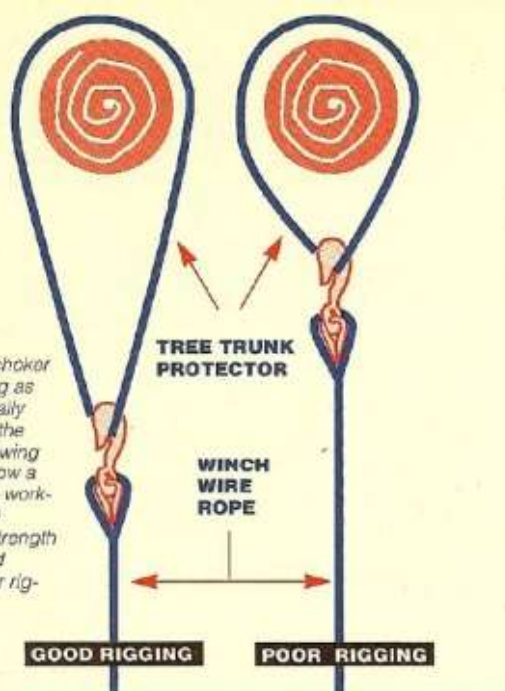




## CHOKERS

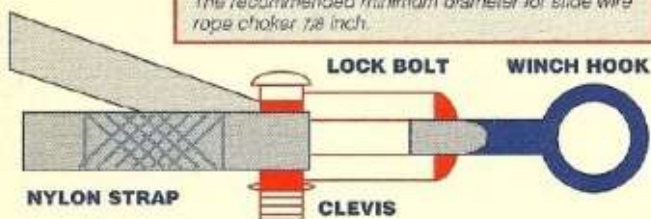
### ANCHOR

**Chokers:** The choker should be as long as possible, especially when anchoring the vehicle. The following data illustrates how a chain with a safe working load of 8,000 pounds has its strength severely reduced through improper rigging.



Angle (deg.)	Safe working load (lb.)
5 or less	8,000
60	6,800
90	5,600
120	4,000

Chokers with a slide hook must be used with care; angles in excess of 120 degrees are likely to occur. The recommended minimum diameter for slide wire rope choker is 1/2 inch.



A standard setup for winching with a tow strap includes a clevis. When using a tow strap, be careful that the strap is not placed around sharp edges; a frayed strap loses much of its pulling power, and may break.



All cable includes a removable forged clevis hook, galvanized heavy-duty wire rope thimble, and a swaged carbon steel sleeve for the utmost in strength and safety.

## STRAPS AND CHAINS

Sometimes a situation arises where there is no convenient place to attach the cable hook. Either there are no tow hooks on the vehicle, or they can't be reached. First instincts lead most infrequent winch users to run the winch cable around the handiest item that looks like it can take the strain of a full pull. Wrong. Looping the winch cable around an axle tube or bumper and then attaching the hook back over the cable to make a sliding loop is a great way to ruin a winch cable. The pressure of the hook digging into the cable will cause a permanent kink at that spot—and if the cable is wrapped over a sharp edge, there's a great possibility some cable strands will be cut.

Instead, haul out a clevis and a nylon "tree-saver" strap or a short piece of heavy-duty chain. The winch manufacturers' accessory kits contain these items, along with a pair of leather gloves to protect hands from sharp edges and frayed cable strands. Tree-saver straps can be wrapped around an anchor tree without fear of cutting into the bark. If that happens, the tree will be permanently scarred or possibly killed. Remember, all

Tread Lightly! principles should apply to winching, too.

Nylon cuts, so avoid placing the strap over any sharp edge e.g., around spring shackles or sharp-edged bumpers or frame sections. If these are the only places to make the hookup, or for the chain. If the nylon winch strap is used, loop it over the attaching point, then slip the loop at each end of the strap over the open clevis. Screw the clevis bolt tightly to lock the strap end in place. A nylon strap attached to the winch cable hook to the opposite end of the clevis.



This setup ensures neither of the nylon strap loops will accidentally come loose, or suffer any damage from the hook itself.

Use the same procedure when incorporating the choker chain that comes with most accessory kits. If you don't have a winch accessory kit, make sure the chain links are large enough to allow the clevis's lock bolt to slip through. If they aren't, the chain may be too light to handle the winching task and could snap under load.

## WARNING! DO NOT ATTACH HERE

Caution must be exercised when attaching a winch cable to a vehicle. The force exerted by a winch can cause serious damage to steering, drivetrain, and suspension components. Avoid putting winch cables or attaching straps and chains around steering linkages, shocks, shock mounting brackets, driveshafts, A-arms, or any other component that is not part of the chassis. Axle housings

should also be viewed cautiously. Toyota and Jeep axle housings are prone to "crush" damage because of their thin wall construction. Using welded-on tow hooks and light-duty factory bumpers as attaching locations is also dangerous: welds can tear and bumpers bend. The strongest and safest places to attach a winch cable strap, or chain is directly to the frame, or to tow hooks bolted to the frame.

## EMERGENCY CABLE REPAIR

Winch cables do break, so extreme caution should be used at all times when winching. If the winch cable separates, the only proper way of emergency repair is to use cable clips—small clamps designed specifically for use on winch cable. Place at least three (four is ideal) of these clamps spaced three to four inches apart with the "U"-bolt of each clamp over the "dead" or short end of the cable. Never place the clamps with the "U"-bolt over the "live" or long-end of winch cable. Properly clamped cable has a maximum efficiency of 80 percent and should only be used only in an emergency situation; otherwise, replace it with new cable as soon as possible.



A swaged cable terminal; provides 100-percent efficiency.



Correct positioning of cable clips, with all U-bolts around "dead" or short end of the cable; provides a maximum 60-percent efficiency.



Incorrect positioning of middle cable clip. U-bolts should never be placed around "live" or long end of the cable.



# FOUR WHEELER

## TOW JAM

### Tips on "springing back" into action

The escalating popularity of the noble art of getting stuck brought several devices aimed at getting unstuck to the market. One of the most effective, both in terms of cost and efficiency, was the nylon strap.

In a way, the strap simply functions like a rubber band. Absorbing the tremendous stresses that occur when a ton or two of four-wheel drive is tugging on another couple of stuck tons, the strap stores this energy by stretching some 20 percent. The strap then releases the stored energy to pull with more force than the pulling vehicle is actually producing at the moment. Thus, a basic law of physics is at work—for the four wheeler.

Although a strap is a good choice for unsticking a four-wheeler, it's not guaranteed not to come loose. The "coming loose" part can wreak havoc on life and limb.

Generally, either the strap comes loose from itself (i.e., it breaks) or something comes loose from one of the vehicles. Unlike the chain, the strap may have 20,000 to 30,000 pounds of energy stored up when something lets go. A hook at the end of the strap might weigh only a pound, but when catapulted by tens of thousands of pounds of force, it becomes a projectile capable of major destruction.

Rule number one for safe operation is to minimize risks when strapping vehicles together. That excludes using loose hooks, cables, or chains to secure the strap to a vehicle—in other words, anything that might accompany the strap for the rebound should something break. This also rules out broken bumpers and hitch balls.

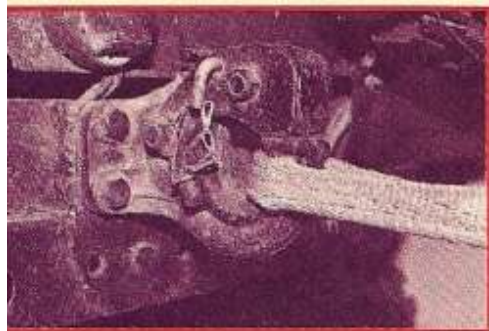
Although a strap is far more for-

giving than a chain, the correct ways to attach it to a vehicle are still very few. Best might be a properly installed pintle hook, which is both stout and keeps the loop securely in place. Frame-mounted tow hooks that are of sufficient strength and installed with quality fasteners would take a close second. The next alternative, looping around the frame, is a distant third. More often than not, the frame has sharp edges that can cut into the webbing, and the smallest cut drastically reduces the strength of the strap, increasing possibilities of damage to body and soul. It is imperative to keep the strap away from sharp edges and heat. An exhaust pipe can ruin the nylon, too.

While the modern-day four wheeler usually isn't blessed with many suitable places to attach a strap (or chain, for that matter), at least he's offered a wide variety of straps. The strap's width and capacity should be determined by the circumstances it'll be used under rather than the vehicle size. For example, a mini-truck buried in the windshield wipers in sticky mud might require a greater-capacity strap than a 1-ton truck stuck in sand. Going overboard in the capacity department might mean losing the strap's tensile advantage over a nonstretching device because the 20 or so percent of recoil can't be fully utilized. Conversely, not enough capacity and the strap might break the first time out.

As indicated, straps come in different lengths and widths, yet with the same rated capacity. A longer strap means more rubber-band action than a shorter version of the same capacity, but while more stretch can help you get unstuck better, it also stores more potentially lethal energy. In other words, be extra careful when using the more "powerful" straps, and triple-check the attachments.

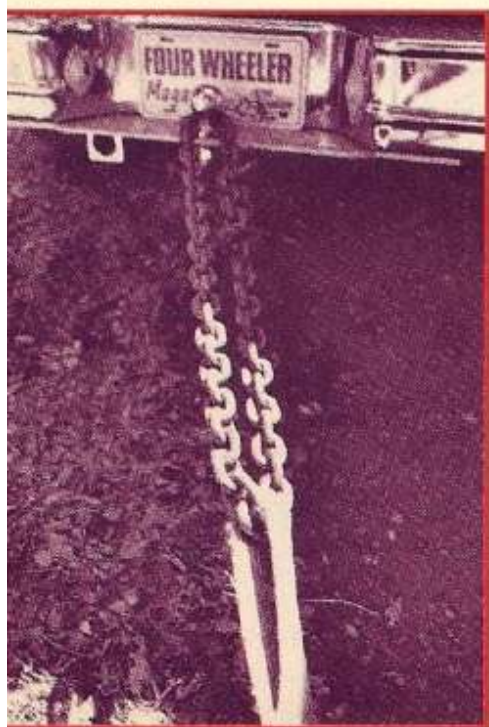
—Jimmy Nylund



To minimize the risk of physical and material damage, a strap should be secured to the vehicle in the best possible manner. A pintle hook is an excellent choice because it is connected directly to the frame and distributes stresses evenly while holding the strap in place.



Looping a strap around a bumper, such as the setup pictured here, may lead to three things: a bent bumper, a strap snapped by the bumper's sharp edges, or both. Much better would be to attach the strap to a frame-mounted tow hook (if so equipped) or, in a pinch, to the frame itself.



It's an altogether unwise idea: the thought of a flying hitch off accompanying a broken chain or strap should be enough to discourage wheelers from even contemplating this one.



This after-the-fact photo reveals that a strap that breaks loose can pack a serious wallop. A ruined bumper and valance resulted from a direct hit by a water-soaked strap.

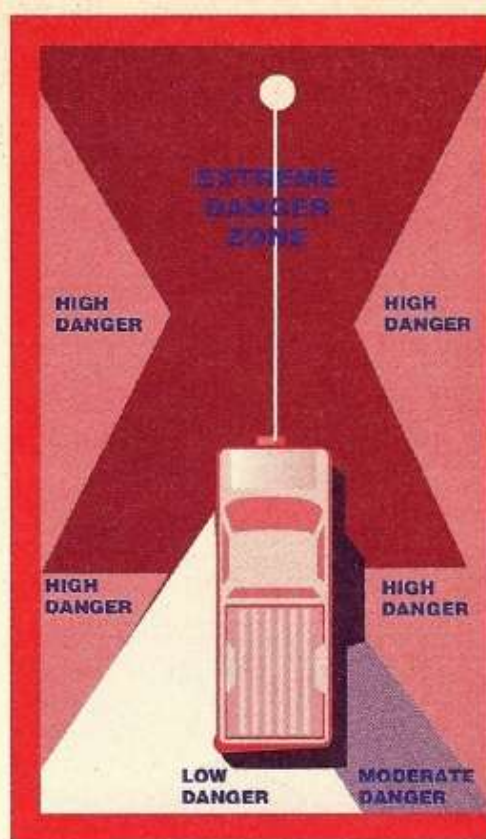


## BASIC RULES OF WINCHING ALWAYS:

- WEAR LEATHER GLOVES WHEN HANDLING WINCH CABLE;
- KEEP HANDS WELL AWAY FROM THE CABLE GOING INTO THE FAIRLEAD;
- DOUBLE-CHECK ALL ATTACHING DEVICES AND POINTS FOR SECURE FASTENING;
- KEEP SPECTATORS AT LEAST 50 FEET AWAY FROM THE WINCHING AREA;
- PLACE A HEAVY BLANKET, JACKET, TARP, OR FLOOR MATS OVER THE WINCH CABLE, ABOUT MIDWAY BETWEEN THE WINCH AND THE CABLE'S ATTACHMENT POINT;
- MAKE SURE ATTACHING POINTS ARE STRONG ENOUGH TO HANDLE THE STRAIN;
- WINCH IN INTERVALS SHORTER THAN 30 SECONDS TO KEEP THE MOTOR FROM OVERHEATING;
- CHECK THE CABLE FOR FRAYS, KINKS, OR OTHER DAMAGE BEFORE WINCHING;
- STAND BEHIND THE DOOR OR SIT IN THE VEHICLE WHEN OPERATING THE WINCH;
- PULL OUT THE CABLE BY HAND, WHENEVER POSSIBLE, TO SAVE THE WINCH MOTOR AND BATTERY POWER;
- INSPECT THE WINCH CABLE REGULARLY WHEN WINCHING.

## NEVER:

- STAND BESIDE A WINCH WHEN IT'S OPERATING, OR IN A DIRECT LINE WITH THE CABLE;
- STEP OVER A WINCH CABLE THAT IS UNDER LOAD;
- USE A TOW BALL AS AN ATTACHING POINT FOR THE WINCH CABLE;
- START WINCHING WITH FEWER THAN THREE WRAPS ON THE DRUM LAYER;
- CONTINUE WINCHING IF THE WINCH MOTOR STARTS TO SMOKE;
- USE FRAYED OR OTHERWISE DAMAGED NYLON STRAPS;
- HOOK THE WINCH CABLE BACK ONTO ITSELF;
- ATTACH THE WINCH CABLE, CHAIN, OR STRAPS TO STEERING COMPONENTS;
- ALLOW THE WINCH CABLE TO PILE UP ON ONE END OF THE DRUM WHILE WINCHING;
- STAND OR WALK BEHIND A VEHICLE BEING WINCHED UPHILL;
- USE A VEHICLE WINCH FOR HOISTING.



## WINCH MAINTENANCE

A winch is an electromechanical device that needs periodic maintenance. This is easily done. Make sure the electrical connections at both the battery and the winch motor are tight and free of corrosion. Check to make sure both cables are free of abrasions. Remove the cover of the control box and check the connections at the solenoids; then spray with WD-40. Spool out cable and then neatly rewind it under light load back onto the drum, inspecting for cable damage along the way. Replace the cable if it shows signs of fraying, kinking, or strand separation. Also check the hook.

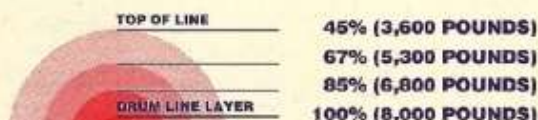
## AIRCRAFT STAINLESS STEEL CABLE RATINGS

Cable Dia. (in.)	BREAK POINT (LB.)	WINCHES TO (LB.):*
5/32	2,800	1,500
3/16	4,200	2,500
7/32	5,600	4,500
1/4	7,000	6,000
5/16	9,800	9,000
3/8	14,400	12,000

\*Allows for winch manufacturer's safety margin at rated stall point for winch

## BASIC RECOVERY ITEMS

1. 2-inch-wide, 30-foot-long nylon "snatch strap" (20,000-pound-or-greater) capacity
2. a pair of clevis hooks or "D"-shackles
3. short-handled shovel
4. 6-foot high-tensile chain with a hook on each end
5. snatch block of size that fits winch's cable
6. leather gloves
7. Hi-Lift or "shepherd's" jack
8. nylon "tree-trunk protector" strap
9. tow hooks bolted onto the frame of vehicle at front and rear
10. can of aerosol electrical contact cleaner



8,000 POUND  
CAPACITY WINCH

ELECTRIC WINCHES LOSE  
50-60% PULLING CAPACITY  
BETWEEN DRUM &  
OUTER LAYER

MOTOR



DRUM



8