



Tow Ropes and Towing

Revision History

Version	Date	Notes
1.0		First Version
2.0	Nov 2011	Add daisy chain towing
2.1	Feb 2013	Minor tidying and add some pictures



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3. INTRODUCTION

Returning cartie to the start line after each run is a critical part of any event, both in terms of the most efficient use of time and the overall safety of the event. Good equipment, well briefed tow drivers and cooperative competitors can go a long way to making sure your event runs smoothly.

This document details the tow rope design used by the Scottish Cartie Association and the procedures for towing.

4. TOW ROPES

The SCA uses two types of tow rope systems, depending on circumstances and availability. These are either a “daisy chain” system where each team provides their own section of rope to connect them to the cartie behind, or a multi-point tow rope system, where many carties are attached to a single tow rope provided by the event organiser.

Each system has its own strengths and weaknesses;

Multi-point

For

- Standards – all towing equipment maintained by organiser, so can be kept to a known standard

Against

- Time and expense – repair, maintenance and replacement work and costs have to be carried by the organiser
- Event Logistics – rope needs to be unhitched from all carties and stowed before tow vehicle can return to start line
- Un-occupied tow points on the rope can be easily damaged

Daisy chain

For

- Time and expense – repair, maintenance and replacement work is the responsibility of the teams themselves
- Rope passes under each team’s own cartie, so if they damage it due to low ground clearance it is at their own expense
- Logistics – tow rope is always where it needs to be – with the cartie itself – and can streamline the event workflow
- Length – always exactly the right length for of rope for the tow train with no unused tow points
- Flexibility – ease of lengthening or shortening tow trains.

- Separation – each team can make the rope long enough to give the required separation between their cartie and the next

Against

- Variable quality of towing ropes unless supply / specification is tightly controlled

1. Daisy Chain Tow Ropes

For daisy chain towing, the individual teams all provide their own tow rope and fittings. The organisers need to supply only the lead rope to attach the first cartie in the chain to the hitch on the tow vehicle.

Each team shall provide at least one tow rope sufficient to allow between 2.5m and 3.0m separation between the rear of their vehicle and the tow point of the following vehicle. This tow rope shall be either;

1. A 14mm polypropylene rope eye spliced at both ends

or

2. A BSEN1492 compliant duplex lifting sling rated to at least 1 ton

In addition, each team shall provide;

- At least one 1 ton rated D or bow shackle
- At least two M10 clip hooks

Teams may also provide bungee “shock absorbers” at their discretion.

2. Multi-Point Tow Ropes

The SCA standard multi-point tow rope is made of 14mm polypropylene rope with eye splices at each end and individual eye spliced tow points along the rope. Each tow point is fitted with a bungee shock absorber and an M10 snap hook to attach to the tow point on each cartie.

They are provided on a spool which allows for rapid deployment and easy transport and storage.

Specification for a “4 cartie” rope;

- 20m x 14mm polypropylene rope, eye spliced at both ends, with three towing eyes spliced onto the rope at 3m, 8.5m and 14m from the front end.
- M10 snap hooks at each tow point, optionally attached to the eye splices by 3 x 700mm x 6mm bungee shock absorbers.
- Max cartie length – 2.5m
- Min cartie separation – 3.0m

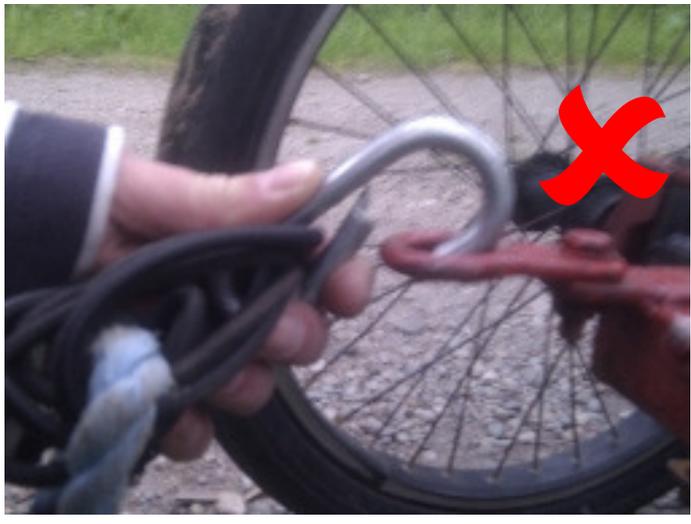


Figure 1 - 1 Ton Shackle



Figure 2 - M10 Clip Hook

<p>Standard “4 point” tow rope on spool ready to be deployed, showing snap hook fitted through eye splice on free end ready to be attached to the tow vehicle. Tow rope is then laid out by holding the side handles and walking away from the vehicle.</p> <p>Note – there is no bungee on the front end of the tow rope.</p>	
<p>Eye spliced tow point, with snap hook clipped back on to tow rope for transit. Snap hooks should be clipped back onto the tow rope when not in use to;</p> <ul style="list-style-type: none">➤ Reduce damage when towing➤ Stop them flailing around and injuring people when being deployed from their spool	
<p>Tow point with snap hook ready to be attached to a cartie.</p> <p>Note the 3 bungees attaching the snap hook to the eye loop.</p> <p>The bungees may wear and even break during use. They should be inspected before each tow and replaced as necessary.</p>	
<p>The last tow point – a simple eye splice at the end of the tow rope.</p> <p>Note – snap hook attached using 3 bungees.</p> <p>An 8 cartie rope can be made by joining two 4 cartie ropes with another 3m eye spliced rope. This should be done by passing a shackle or snap hook through the end eye splices, which leaves the end snap hook of the lead rope still available for a towing a cartie. NEVER put the</p>	

<p>link shackle through the bungee.</p>	
<p>Three spare bungees. 700mm x 6mm bungee cord, tied with a simple knot.</p>	
<p>“Gate down” – the wrong way to attach a snap hook.</p>	
<p>“Gate up” – the right way to attach a snap hook.</p>	

5. CARTIE TOW POINTS

- Cartie tow points need to be large enough to accept the M10 snap hooks
- Cartie tow points need to be accessible and clearly visible so the snap hooks can be attached and checked easily
- Cartie tow points should be as close to the centre line of the vehicle as possible
- Towing rings should be mounted horizontally and well clear of the ground to prevent the snap hook touching the ground
- A second ring should be fitted at the rear of the cartie to accept an M10 snap hook to retain the rope and keep it from fouling on the wheels when cornering
- The path that the tow rope takes from the front to the rear of the cartie should be well clear of the road surface to avoid abrasion and damage to the rope

Different race organisers may specify different towing equipment. For ease of compatibility, it is suggested that carties have a permanently attached rigid towing eye and separate screw links or similar of different sizes to suit.

6. TOW VEHICLES

All manner of different vehicles are used for towing. Provided they have sufficient power to pull the train of carties there should be no real problem.

An ideal tow vehicle;

- Has automatic transmission
- Has good visibility to the rear
- Has a tow hitch
- Can tow at least 2000Kg with ease

The most common tow vehicle is an ordinary family saloon. Typically these will be able to tow 1200Kg to 1500Kg. A cartie with driver weights approximately 200Kg, so a family saloon will struggle to tow more than about 6 carties at a time, and perhaps even fewer on steep courses. Larger 4x4 vehicles can tow more, although 8 carties per tow rope is the most advised to avoid overstressing the tow rope itself and also to keep the train to a manageable length. If the course has particularly tight bends, the maximum length of the tow rope will be less than this in order to allow the corners to be negotiated safely.

One of the main problems with towing is “snatch”, when the tow vehicle decelerates and the carties over-run the rope. When the slack comes back out again, this can put large shock loading on the cartie and the tow rope. This commonly happens when changing gear, so **gear changes should be avoided if at all possible**. Ideally, the tow vehicle should stay in the same gear for the entire tow. **If it is absolutely necessary to change gear, then make the gear change as quickly as possible**. A short sharp gear change is much preferable to a slow and smooth one, as the resulting deceleration and acceleration often causes very bad snatch which is not apparent to the tow driver.

Automatic transmissions are ideal for towing as the gear changes are very smooth.

The tow driver needs to be able to monitor the train behind so that action can be taken if there are any issues. Therefore the tow vehicle needs good rearward visibility. Ideally, there should be a co-driver in the tow vehicle whose responsibility is to monitor the carties and warn the driver of any issues.



7. HOOK UP / UNHOOK PROCEDURES

1. Daisy Chain Tow Rope

At the bottom of the course;

1. Park the tow vehicle in the hitch up area facing in the right direction to tow the carties back up hill.
2. Take the lead section of the tow rope and attach it to the back of the tow vehicle.
3. As each cartie arrives, attach the rear of the tow rope to the cartie's front towing eye using a snap hook *provided by the cartie driver*. The snap hook should be attached *gate upwards* (see right).
4. If there are more carties to be attached, retrieve the cartie's own tow rope from the cartie and attach it to the rear loop of the tow rope using a 1 ton shackle provided by the cartie driver. Do NOT attach to either the towing eye or the snap shackle. Pass the tow rope under the cartie, through the rear tow rope guide and extend out the rear of the cartie ready for the next cartie.

At the top of the course;

1. Detach the lead tow rope from the first cartie. Return the clip hook and shackle to the cartie driver.
2. Stow the lead tow rope section in the tow vehicle and return to the bottom of the course. The teams are responsible for unhitching and stowing their own towing equipment.

2. Multi Point Tow Rope

At the bottom of the course;

1. Park the tow vehicle in the hitch up area facing in the right direction to tow the carties back up hill.
2. Take a tow rope spool and attach the free end of the tow rope to the tow hitch on the towing vehicle.
3. Walk away from the vehicle, allowing the tow rope to unspool behind it.
4. As carties enter the tow area, direct them to the tow point on the rope where you want them. Attach the snap hook to the cartie's front towing eye *gate upwards* (see right).



5. Pass the tow rope to the rear of the cartie and attach the top rope through the rear tow rope guide. Note that this is NOT load bearing – it is only to keep the rope centralised so it does not foul on the cartie wheels when going around corners.
6. Remember to distribute the carties evenly along the rope, filling it up from the rear most tow point. Always have the last tow point occupied. Do not leave spare tow rope to drag behind the last cartie. **NEVER** coil spare tow rope in the last cartie.
7. If any tow points are unused, clip the hooks onto the tow rope to stop them dragging along the ground and being damaged or lost.

At the top of the course;

1. Unhook each cartie from the tow rope and clip the snap hook back on to the rope to stop it flailing about when unspooling the rope.
2. Put the rope back on to the spool. Start at the rear end of the tow rope so that the free end left after you have put the rope on the spool is the front of the tow rope.
3. Put the spooled up tow rope back into the tow vehicle and return to the bottom of the course.

8. TOWING PROCEDURES

The most important thing to do when towing carties is to **maintain a slow and constant speed**. Unnecessary deceleration must be avoided, as this causes the tow rope to go slack. Once the tow rope goes slack there is a risk of it becoming fouled in the wheels of the carties, and it also drags along the road and will very quickly become worn. Furthermore, when the slack is taken out again this can result in large shock loading on the tow rope and the carties. This is extremely unpleasant for the cartie drivers and risks damage or loss of control, with potentially disastrous consequences.

The temptation to speed up to try and “save time” should be avoided. Faster tows invariably cause more problems than they solve. The maximum speed of a tow should be the speed at which the course can be negotiated without the need to change speed. In any case it should **never exceed 15mph**, and for some courses the maximum tow speed will be considerably slower than this.

If possible, the tow should be carried out with minimal changing of gear. If possible, tow vehicles with automatic transmission should be used. If a manual gear change is absolutely necessary, it should be done as quickly as possible. Slow and gentle gear changes may seem better, but they can cause the tow rope to go very slack and consequently produce a large snatch when the tow vehicle accelerates again and the slack is taken up.

The tow driver must pay close attention to the tow train and watch for problems. Ideally, there should be a co-driver in the tow vehicle who is responsible for monitoring the carties and warning the driver of any issues.

When attaching carties to the tow rope it is important to;

- Inspect the tow rope when laying it out behind the tow vehicle. Replace any worn or missing clip hooks and bungees. Badly frayed ropes must not be used. They should be replaced or repaired

- Distribute carties evenly among the available tow ropes. If you have a tow rope with only one cartie on it, take carties from the other ropes to balance out the distribution
- Fill the tow rope from the back to the front, filling alternate tow points and then going back to fill in the empty ones
- NEVER leave spare to rope trail behind the last cartie
- NEVER leave spare rope in the last cartie
- ALWAYS have a cartie on the last tow point
- Ensure each cartie is properly clipped on to the rope with the **gate upwards**
- If the cartie has a rear rope guide fitted, attach it to the tow rope
- Move all carties as far back as possible to remove any slack from the line before setting off

Tow drivers must;

- Ensure all cartie drivers are wearing full protective equipment (helmets etc.) and ready to be towed before setting off
- Set off very gradually and hold a constant speed for the entire tow
- Avoid decelerating and unnecessary gear changes. Ideally stay in 1st gear
- If gear changes are unavoidable, make them as quickly as possible.
- If deceleration is necessary, do so as gradually as possible
- Keep speed below 15mph at all times
- Have hazard lights and headlights switched on
- Keep a close eye on the cartie train and watch for any problems