



Pathfinder Honour: Trainer's Notes

Mountain Biking 1



Instructions to Trainers / Instructors of this Honour

Thankyou for being involved with this Honour. These notes have been developed to assist in teaching / instructing this honour. We recognise that there is much more information available and we are grateful that you should share your expertise.

Please remember that Honours are designed to develop our Pathfinders in many ways; their interests, their knowledge and their relationship with their Saviour and Creator. Your enthusiasm and creativity will have a huge impact on those doing the honour.

To complete an Honour, the following (where applicable) must be completed satisfactorily:

- Physical and Practical Requirements.
- Honour Workbook.
- Honour Assessment Sheet. (*On SPD Honour Website but Leader's level access is required*)

Additional Reference Material

Please see additional references on the back page of these notes

Acknowledgements

Please refer to citations within the text of these notes. Be aware that content of these references is beyond the control of the SPD. The company 'Bums on Bikes' has been especially helpful and professional. Also, David Hughes and Wayne Born have provided valuable insights and expertise.

Mountain Biking 1 Honour: Trainer's Notes

REQUIREMENT 1: Earn the Cycling 1 Honour and ensure you are still familiar with its contents.

See: <http://honours.adventistconnect.org/cycling-1>

REQUIREMENT 2: Using a mountain bike and a road bike as examples, show and describe five differences between mountain bikes and road bikes. Briefly explain why they are different.

There are many different kinds of bicycles. Mountain bikes and road bikes are two types that are popular.

As a general rule, mountain bikes are designed to meet the challenges of rough, off-road conditions. This means that they must be sturdily built and have features which allow for good control and traction. On the other hand, road bikes are designed for distance travelling on smooth surfaces at speed.

The following pictures are courtesy of the Brisbane cycling firm called 'Bums on Bikes'. See <http://www.bumsonbikes.com.au/bikes/>



Cannondale Mountain Bike Trail 29er 5



Cannondale CAAD8 6 Road Bike

Some differences are as follows:

- **Shape:** Road bikes, having been designed for speed, generally position the rider much closer to the top tube and the pedals. This hunched-over position is more efficient for getting power from your legs, but is also far more taxing on your back than a more upright mountain bike. This design difference is very apparent in the different types of handle bars used for each kind of bike.

Mountain bikes have wide handle bars that allow the rider greater control, as opposed to the bent handle bars of most road bikes which are lower and more aerodynamic.

- **Weight:** Where a heavy frame is a huge burden on speed, it is often a necessity for going down the mountain. Many mountain bikes are heavy out of necessity, with wider tyres and extensive suspension systems helping to make the ride down the mountain easier to manage. Good road bikes will be designed to eliminate as much excess weight as possible; utilizing materials such as titanium and carbon fibre to allow strength and flexibility in addition to reducing weight.
- **Suspension:** Road bikes that are built for speed usually have no suspension, though they are often built with materials that will absorb vibrations from unevenly paved roads. On the other hand, front shock absorbers, rear suspension, and even unique hybrids are available for mountain bikes. Some mountain bikes come with a lockable suspension. When going uphill, it can be turned off as some pedal power is absorbed by the suspension and wasted. It is turned on when the rider desires extra cushioning.

Mountain Biking 1 Honour: Trainer's Notes

- **Tyres:** The key with mountain bike tyres is traction. They're wider and covered with lots of nubby rubber to increase surface area and friction. These qualities help the mountain bike rider retain control of the bike as they go down hills. Road bike tyres, on the other hand, are generally very thin and very smooth. They rely on the surface of the rubber and the skill of the rider to maintain friction between the bike and the road.

Again, pictures are courtesy of 'Bums on Bikes' <http://www.bumsonbikes.com.au/bikes/>



Mountain Bike Tyre MAXXIS Ikon 26 x 2.20



Road Bike Tyre Continental GP4000 700 x 23

- **Gearing** - Most mountain bikes have three chainrings (44/36/22) paired with a 7, 8, or 9 speed cassette. Most road bikes have two chainrings (53/39), larger than a mountain bike, paired with a smaller 9 or 10 speed cassette. The larger gear ratios on a road bike allow greater speed on smooth surfaces.
- **Shifters / Brake Levers** - Mountain bikes have a horizontal brake lever paired with a trigger shifter (Rapidfire) or a twist shifter (GripShift). Road bikes have either an integrated vertical lever, meaning that the brake lever is also used for shifting by pushing the lever to the side, or a vertical gear lever paired with downtube shifters, paddle levers on the sides of the downtube used for shifting.

REQUIREMENT 3: Give the definition for the terms 'rigid', 'hard tail' and 'full suspension' and briefly explain the advantages and disadvantages of each.

Source: http://en.wikipedia.org/wiki/Mountain_bike

Mountain bikes can be classified into three categories based on suspension:

- **Rigid:** A frame with no suspension. Because of its simplicity, a rigid mountain bike is the less costly than a hard tail or full suspension bike. It is lighter and has fewer parts to malfunction. Ride comfort and handling are poorer than the other two suspension types. The original mountain bikes were all rigid frames.
- **Hard tail:** A frame with a front suspension fork and no rear suspension. The front suspension absorbs shocks imposed on the front wheel. This improves handling and makes riding on rough terrain easier on a rider's arms, but it incurs cost and weight penalties when compared with a rigid frame
- **Full suspension (ie Dual Suspension):** A front suspension fork and rear suspension with a rear shock and linkage that allow the rear wheel to move on pivots. When compared with the other two suspension systems, they are more comfortable (even on rough terrain), can handle greater abuse when riding tough trails, and can be adjusted to fit a number of different types of terrain. As expected full suspension systems are more complex (and therefore more expensive) and have weight penalties compared to the other two systems.

Mountain Biking 1 Honour: Trainer's Notes

REQUIREMENT 4: List at least three materials that mountain bike frames are made from and give an advantage and a disadvantage of each material.

Materials for mountain bikes are summarised as follows:

- **Steel alloys.** Low carbon steel tubing is usually used in entry-level mountain bikes. Although steel is heavy compared to the following materials, it has useful shock absorbent properties and excellent strength-to-weight ratio. It is also simple to repair.
- **Aluminium alloys.** The range of aluminium alloys is vast, courtesy of the aircraft industry. Aluminium alloys are lightweight and have high resistance to corrosion.
- **Titanium:** Titanium is a light metal, yet it has a high strength to weight ratio. It has excellent corrosion resistance and is very durable. On the down side, it is very expensive to manufacture.
- **Composite materials.** Well known materials include carbon fibre and Kevlar. Properties are 'up there' with the best of the previously mentioned materials. Because a mould is used in the manufacturing process, there is enormous flexibility regarding shape, size and design features. Disadvantages include a very high manufacturing cost and the inability to make repairs

REQUIREMENT 5: Explain differences between single track, double track, and fire roads.

Based on: http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Recreation/Mountain_Biking

The essential feature of single track is that it is narrow and, as the name suggests, consists of just one track. It may smooth and flowing, but it may also exhibit technical rocky sections and may be criss-crossed with tree roots.

Double tracks and fire roads may also have 'technical' sections but are wide enough for four-wheeled off-road vehicles.

REQUIREMENT 6: Know and practice courtesy rules that should be followed when doing off-road riding.

As a recreational activity, mountain biking should be fun, but that doesn't mean you're free to do whatever you want. When riding on national parks and public trails, you are more likely to encounter hikers, joggers and horseback riders using the same trails. Since you are travelling at a faster speed than others, it is important to take precautions, observe proper conduct and show consideration for others. Simply put, show your respect and consideration to others and the environment.

Below is the list of proper conduct and etiquette that you must observe while in the area:

- **Go easy with hikers.** When you have to pass them, slow down and make sure they know that you are there. Do not pass at top speed, otherwise you will startle them. You may even receive negative reaction if you do not slow down. Once you have seen people in front of you, reduce speed substantially as you get near and make some noise so that they will know that you are coming. A greeting or a bell is good but sometimes, foot scrape, gear shift or any subtle noise is enough. Never assume that they have seen you until they look up.

Do not forget to thank them for giving you their right of way. Pass with care especially if there are young children and pet animals. The key is to show respect and be polite.

Mountain Biking 1 Honour: Trainer's Notes

- **Give way** - If you see other bikers or hikers coming your way, the best thing you can do is to slow down until you reach full stop and let them pass, especially if the track is narrow or if they are coming from above. Add a smile on your face and a polite nod.
- **Never scare horses and other animals** - Horses are often scared of bikes. If you see equestrians coming your way, make sure that you dismount at least 15 meters from the horse. Most horse owners will appreciate this gesture and will thank you. Also you will never know if you are dealing with horseback rider or an inexperienced horse so initiate courtesy.

Moreover, do not make any abrupt movements that will scare the pet animals of other people on the trail. Be respectful with the owners and they will surely appreciate you. Keep your distance from any animals you have seen on the wild whether it is dangerous or not. Do not disturb them because they may attack. Remember that animals are more scared than you, but they will not hesitate to fight back if you pose any threat to them.

- **Leave no traces** - Do not throw anything on the trail. Bring a small bag to place all your trash. Candy and food wrappers, plastic cups, empty glue tubes and bike parts are non-biodegradable. Stay on the trail. If you cannot ride the trail, dismount, carry your bike and walk through it. Do not create new paths to avoid bike tracks that may be followed by other bikers.
- **Ask Permission** - If you are going to ride on private property, make sure that you ask permission from the owner.

REQUIREMENT 7: Discuss some spiritual applications of mountain biking and write a brief paragraph (max 50 words) relating to your personal experience of mountain biking.

If one pauses to reflect for a few moments, heaps of spiritual applications come to mind. To aid the thinking process, consider the following for a spiritual application:

- A rigid mountain bike versus a full suspension bike.
- A flat tyre or any broken bike part.
- The role of safety equipment.
- The results of 'showing off'.
- Climbing a steep trail.
- Avoiding obstacles on the track.
- Courtesy and caring for others.
- Assisting new mountain bike riders develop skills.
- Errors of judgement (or bad choices) you have made when mountain biking.

REQUIREMENT 8:

a. Name three (3) injuries which can occur when mountain biking.

Over recent years, there has been a significant amount of data collected on injuries associated with mountain biking.

The scope of this honour is limited to mountain biking as a recreation, not as a competitive sport where downhill speeds may approach 100kmph and there is significant jostling and manoeuvring to move through treacherous terrain to gain the quickest time. Although the risks are much lower for recreational mountain biking, similar injuries can occur if proper precautions are not adhered to. Do not become complacent.

Mountain Biking 1 Honour: Trainer's Notes

These notes are based on two authoritative sources:

- i. *Mountain Biking Injuries* by Tod Sweeney, MD, Sports & Family Medicine of Colorado http://www.leadvillraceseries.com/news_article/show/155118?referrer_id=528399-news
- ii. *Mountain Biking Injuries: a Review* by Michael R. Carmont, British Medical Bulletin, Volume 85, Issue 1 Pp. 101-112. <http://bmb.oxfordjournals.org/content/85/1/101.full>

Injuries may be classified into two groups¹ – overuse and traumatic:

Overuse injuries:

Overuse injuries are more prevalent in competitive mountain biking. They are related to interactions between the cyclist's body, the bicycle, and the terrain on which they ride. They often involve the knee, lower extremity, spine, upper extremity and saddle region.

Training errors frequently contribute to overuse injuries and these include inadequate physical conditioning, suddenly increasing mileage, hill climbing or riding intensity. Improper bike adjustments to optimise the body size & shape can lead to overuse injury.

Injured cyclists may require temporary modifications of their riding habits until symptoms decrease. Rather than taking a complete break from cycling, the injured cyclist can often benefit from relative rest, i.e. temporarily decreasing mileage and hill climbing and emphasizing low-resistance easy pedalling. As symptoms subside, the cyclist can gradually increase the amount and level of riding.

Traumatic injuries

Traumatic injuries include abrasions, bruising, fractures, dislocated joints and concussion. These are usually the result of being tossed off a bike. Abrasions to the shins can be caused by riding through prickly vegetation without protection.

Thankfully, most traumatic injuries are minor.

Fractures, dislocations and concussions are less common, but are more serious and in extreme cases are life-threatening. The majority of these injuries occur to the extremities of the body and generally involve the fingers, wrists and head (including the face and teeth). Shoulders are also vulnerable to injuries such as clavicle fractures and dislocations.

The majority of traumatic injuries take place on downhill rides. Injuries tend to be more severe (ie. injuries to the head and neck and even spinal injuries) when a rider is thrown forward over the handlebars than when he or she falls off the side of the bike.

b. List six (6) ways to minimise injuries when mountain biking.

All of the following ways of minimising injuries are really only common sense.

- i. Follow a physical fitness program tailored for mountain biking and recognise your physical limitations when on the track.
- ii. Eat healthful food and ensure you are always hydrated.
- iii. Ensure the mountain bike is in good condition before you ride it.
- iv. Make sure the bike is adjusted to suit your body before you ride the track.
- v. Before proceeding, understand the terrain by planning ahead.
- vi. Ensure your bike handling skills are sufficient to complete the course safely – in other words start with simple things and improve. Learn from others who have skills.
- vii. Monitor speed. Most mountain bike accidents happen when going downhill.
- viii. Pay attention to the task at hand. Don't forget that show-offs fall off.
- ix. Wear approved safety equipment

Mountain Biking 1 Honour: Trainer's Notes

- c. List three (3) items of safety equipment that should be worn when mountain biking and explain their role in minimising injury.
- i. Helmet use is clearly effective in decreasing head injuries and should remain a key preventive measure. Make sure it is an approved helmet (AS/NZS2063 for Australia and New Zealand) and that it is fitted correctly.
 - ii. Chest, shoulder, and extremity padding (ie gloves), is also used to decrease superficial injuries
 - iii. Long trousers, gaiters or shin guards protect the shins and legs when riding through undergrowth. Caution; ensure loose clothing does not get caught in bike parts.
 - iv. Wear appropriate footwear, especially that which closed in – ie no thongs.

REQUIREMENT 9: Describe and demonstrate how to:

- a. Check to confirm that a mountain bike is in good condition before riding it.
- b. Check the condition of a mountain bike after riding it so it is ready-to-ride next time

Please refer to the Cycling 1 Honour Trainer's notes: <http://honours.adventistconnect.org/cycling-1>

Useful site: http://www.dailymotion.com/video/xh1ev5_how-to-inspect-your-mountain-bike-before-riding-video_sport

REQUIREMENT 10: Demonstrate competency in the following skills:

The following notes are meant as a guide. **Competent instructors who can explain and demonstrate by example are strongly recommended.**

- a. How to assess a situation and develop a safe and effective 'plan-of-attack' before riding each part of the track.

When determining a 'plan-of-attack', take into account personal safety and potential damage to mountain bikes, the track and the local environment. Make consideration for others an important part.

First up, develop a plan-of-attack for the whole trip by taking a big-picture approach to get a feel for the track in its entirety. This allows a decision to be made in relation to making-a-start or cancelling (or modifying) the trip if the risks of bad things happening are too great.

Some points to consider are

- Steepness of the track for both ascending and descending.
- Type of track surfaces (loose surface, rocky, slippery etc).
- Obstacles on the track or which may have to be ridden around.
- Condition of the track (rain damaged, overgrown by vegetation etc).
- Physical energy requirements. Does it match the level-of-fitness of participants?
- Technical difficulty. How this relates to riding ability and skills?
- Weather conditions; current and possible changes to the weather
- Availability of support (viz medical, communication, bike repairs etc).

After this, break the trip down into manageable parts; finally to that part of the track that is about to be traversed. This is often at the top or bottom of a hill or steep rise. Points listed above apply here also.

Mountain Biking 1 Honour: Trainer's Notes

b. How to position your body on the bike or shift your weight.

As mentioned previously, it is strongly recommended that competent instructors explain and demonstrate how to position one's body on a mountain bike to the best advantage.

Positioning one's body on a mountain bike and shifting weight to address the challenges of mountain biking are basic skills that are used in all aspects of the sport. Learn them.

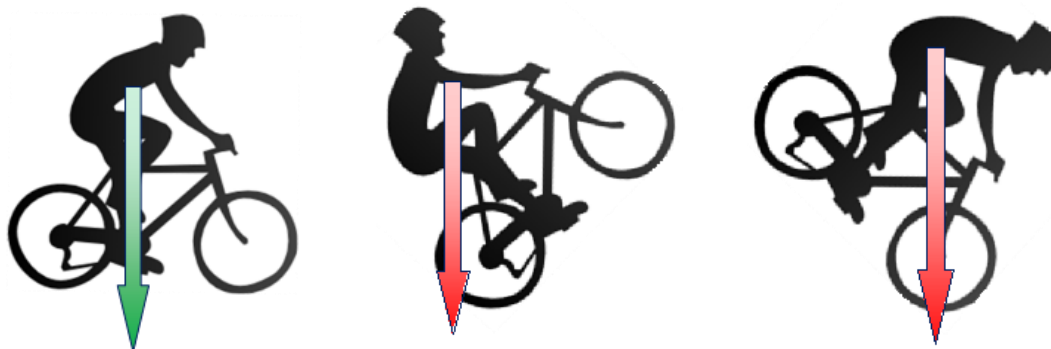
Mountain bike riders often use the term 'positioning'. The most basic position is to have both pedals opposite each other in the horizontal position. The rider holds firmly onto the handlebars, places weight on each pedal and raises his/her backside just clear of the seat. This helps absorb bumps and the rider is ready to shift position to compensate for the change in slope and any other challenge.

The following diagrams illustrate the basic science behind changing position. A rider on a mountain bike is riding on a flat surface, then up a steep hill, then down the hill. The rider's body has not been re-positioned to compensate for changed gravitational forces.

On the flat surface, gravity is 'acting' just in front of the rear wheel in the approximate position of the green arrow. This is great for traction on the rear wheel and stability as there is weight on both wheels.

When going uphill, gravity is 'acting' behind the rear wheel (red arrow). There is little weight on the front wheel for steering and there is a big risk that the bike and rider will topple over backwards. A solution is to position the weight of the rider forward.

When going downhill, gravity is 'acting' at the front wheel (red arrow). As a result there is little weight on the rear wheel for traction and there is a big risk that the bike and rider will topple over the handle bars. This danger increases if the brakes are applied. A solution is to position the weight of the rider towards the rear.



There are a numerous internet sites which demonstrate the principles. Here's some:

- How to Position Your Body for Trail Riding: <http://www.youtube.com/watch?v=bGaOAUcu-DQ>
- Techniques-Move your Body: <http://www.bikeradar.com/fitness/article/technique-move-your-body-19011/>
- A "Before You Ride" Basic Beginner Mountain Bike Skill Workshop: http://mountainbike.about.com/od/learningtoride/ss/Basic_Skills_5.htm

Mountain Biking 1 Honour: Trainer's Notes

c. How to ascend steep slopes.

The following is courtesy of the cycling firm – Bums on Bikes. The heading is 'Gears, pedals, tips for getting to the top' <http://www.bumsonbikes.com.au/bikes/hill-climbing-pg-39.html>

Gears, pedals, tips for getting to the top

Gears and pedals

Change into a gear low enough to pedal at a cadence (revolutions per minute) of about 80 before and during your ascent. Think of your pedals as going round and round. Spin the pedals rather than stand and grind.

Sit back on the saddle (ie sit on the saddle towards the back of the saddle)

On longer climbs you'll use 10 to 12 per cent less energy if you stay seated. And your heart rate will be about 8 per cent lower. Keep your body still, relax your hands and don't bunch your body. Look at the road just in front rather than the whole hill. And your shoulders should be back and 'open'.

Standing

If you must stand, shift up a gear or two then power into both down and up strokes. Don't lean too far forward: you're just right if the nose of your saddle is brushing the back of your thighs.

Breathing

If you're breathing irregularly, take a deep breath and hold it for a few pedal strokes. Then take a breath every time one foot reaches the bottom of a stroke. Then try 1.5, and finally every two strokes. You'll actually deliver more oxygen to your system with a controlled rate rather than irregular panting or gasping.

Eating and drinking

Eat before you're hungry and drink (lots) before you're thirsty. Keep your water bottle refilled and always have spare food available.

Some internet sites are:

- Mountain Bike Technique - Climbing Part 1 <http://www.youtube.com/watch?v=hYPx0PSrGMI>
- Mountain Bike Technique - Climbing Part 2 <http://www.youtube.com/watch?v=8ZYwPY6h0ic>
- Climb better on a mountain bike in 90 seconds <http://www.youtube.com/watch?v=WkS8nzvqfPA>

d. How to descend steep slopes.

The following is courtesy of the cycling firm – Bums on Bikes. It is under the heading of 'Hill Descending' <http://www.bumsonbikes.com.au/bikes/hill-descending-pg-40.html>

Hill Descending

Getting back down can be just as tricky. A few quick tips will make going down hills the breeze it's supposed to be.

Get back

Depending on the grade of the hill, get farther and farther back behind your seat. Don't be afraid to have the seat in your gut and your backside right above the rear tire.

As you descend, your centre of mass shifts forward causing the back wheel to become unweighted. When you brake, your effective centre of mass moves even further forward and the stopping process wants to rotate you and your bike over the front wheel. Clearly this is not a good scene. Compensate by keeping your body low and easing your backside off the back of the seat.

Mountain Biking 1 Honour: Trainer's Notes

Holding on

Keep a relaxed but firm grip on the handlebars. Keep a comfortable grip that tightens when you approach anything bumpy, rocky or technical.

During easy to moderate descents use only your index finger for braking. Switch to index and middle when you need more braking power.

Adjust your brakes so you can completely lock out without pulling them to the grips, yet keeping them close enough for you to grab comfortably.

Look ahead

Keep your eyes quickly scanning way in front for new obstacles and technical sections. Tighten your grip, but let the bike go where it wants to go while still maintaining balance.

Rider/bike ratio

It's most likely you'll weigh considerably more than your bike does. A typical rider to bike weight ratio is around 6:1. The obvious implication is that the position of your body on the bike has a major effect on how the whole arrangement performs. Weight transfer is the secret to controlled descent and stopping.

Stopping gracefully

The secret to stopping in a hurry is to focus on your front wheel. On the flat, it accounts for about 70% of your stopping power - even more when you're on the slope! When you hit the brakes, your effective centre of mass moves forward - the back wheel lifts and the front digs in. So there's more traction up front and more effective stopping using the front brake.

It's a good plan to shift your weight back at the same time to avoid pitching over the handlebars.

Corners

Ensure the bike is upright and pointing straight ahead while braking heavily; i.e. not cornering. Remember to squeeze the brakes progressively rather than 'slamming them on'.

You achieve maximum braking just before your wheels lock up (same principle as ABS on cars). Skidding is not an effective way to stop.

e. How to ride over obstacles such as rocks and roots.

This is best learnt by a practical demonstration by competent instructors, rather by using lots of words. Here are some internet sites:

- How to Ride Mountain Bike Over Obstacles:
http://www.ehow.com/video_2355470 Ride-mountain-bike-over-obstacles.html
- How to hop a log or rock on your mountain bike:
<http://www.singletracks.com/blog/mtb-training/how-to-hop-a-log-or-rock-on-your-mountain-bike/>

f. How to minimise the risk of damaging a mountain bike; particularly the rear derailleur, due to obstacles

This is best learnt by a practical demonstration by competent instructors.

Mountain Biking 1 Honour: Trainer's Notes

REQUIREMENT 11: Complete the following riding requirements: All rides must be done on an off-road trail which may be used for more than one ride or repeated to make a ride long enough to meet the following requirements

- a. Three 5km (3 mile) rides, one of which to be completed on single track;**
- b. Two 10km (6 mile) rides, one of which to be completed on predominantly single track**
- c. One 30km (20) mile ride**

Mountain Biking 1 Honour: Trainer's Notes

ADDITIONAL REFERENCES

General Information on Mountain Biking:

- <http://www.abc-of-mountainbiking.com/info/>
- http://en.wikipedia.org/wiki/Mountain_bike
- http://en.wikipedia.org/wiki/Mountain_biking
- Bums on Bikes home page: <http://www.bumsonbikes.com.au/bikes/>
- About Mountain Biking: http://mountainbike.about.com/od/learningtoride/ss/Basic_Skills_5.htm

Bicycle Suspension Systems:

- http://en.wikipedia.org/wiki/Bicycle_suspension#Rear_suspension
- <http://www.bikeradar.com/gear/article/buyers-guide-to-mountain-bike-suspension-part-1-28367/>

Adventist Outdoor Education <http://adventistoutdooreducation.com.au/mountain-biking/>

This website provides a summary of standard operating procedures and activity notification, emergency response and risk assessment forms for a number of outdoor activities.

It was developed by outdoor specialists, primarily for use in the SDA Education system in Australia.

It is a very useful reference, **but please check local legal and legislative requirements** before 'going into action'.

Mountain Biking documents on this website are:

- Mountain Biking Activity Notification, Emergency Response & Risk Assessment Form
- A Summary of the Standard Operating Procedures for Mountain Biking

Queensland Adventure Activity Standards - Mountain biking (Queensland Government)

- http://www.qorf.org.au/dbase_up/AAS_MTB_2.pdf