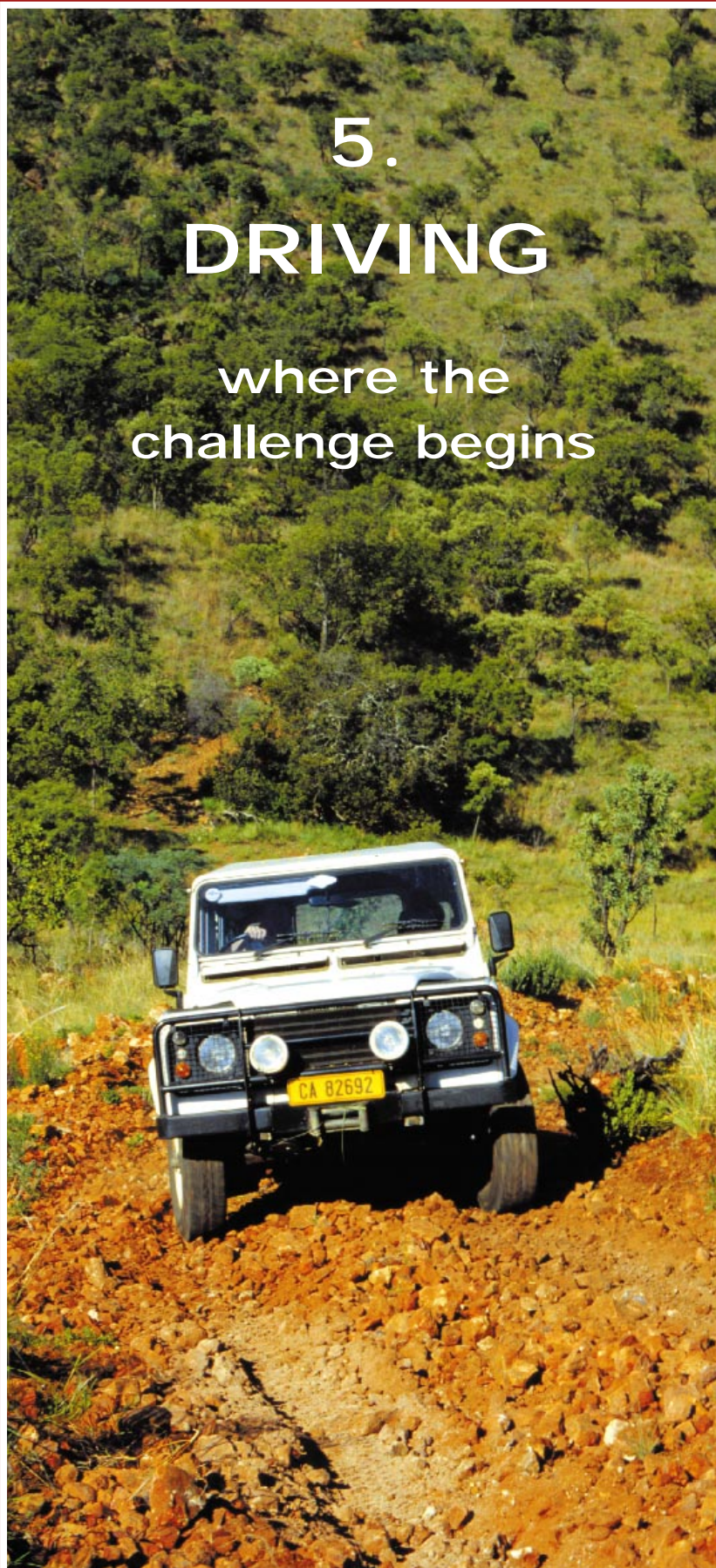


5.

DRIVING

where the
challenge begins



Driving off-road is very different from any other kind of driving. It can be very enjoyable and can also be very frustrating, especially to a beginner who may find himself suddenly stuck in conditions that appear at first sight to be easy going. Although there are basic rules to follow when driving off-road, the combination of road condition, tyre tread, type of shock absorbers, driving style and a dozen other factors can have a marked impact on a vehicle's performance. What follows are guidelines to successful off-road driving.

The first time I took a vehicle off-road I got stuck because I did not pay enough attention to where I was going. I was driving slowly over flat veld, when the nose of the vehicle suddenly dropped away and we came to a grinding halt. The front bumper was jammed hard against the opposite side of a metre-deep ditch which had been obscured by tall grass. One front wheel was clawing at thin air and only one of the rear wheels was touching ground. I walked a long way to get help, which came in the form of a cheery old man driving a 4-ton truck and a long chain. We drove over a rise and my stricken vehicle came into view. It looked like a duck feeding in shallow water with its tail feathers in the air.

Driving off-road can be learnt by anyone - it just takes practice. People criticise off-road vehicles when they get stuck - if the vehicle in front of you bogs down and you manage to get through, it does not necessarily mean that you have a better vehicle - it probably means that you are a better driver!



USING FOUR-WHEEL DRIVE TRANSMISSIONS

Drivers of 4x4 vehicles do not use four-wheel drive as often as they should. Drive to all four wheels should not only be used when in difficulty but to increase tyre adhesion, even if it appears to be adequate. I will give an example; while researching a book in 1994 I was loaned an Isuzu KB260 for a trip into the Maluti Mountains. When the road ahead was blocked by a swollen river I was forced to about turn and head back up along the route I had come. To make matters worse it started to rain and it was getting dark. I was

forced to drive faster than I would have liked. In this situation permanent four-wheel drive is the best but the Isuzu has part time four-wheel drive. In two-wheel drive, I had to work hard to stay on the road, for although the surface was firm, we were sliding around. When I engaged four-wheel drive the Isuzu drove as if on rails and we travelled in complete safety. I did not need four-wheel drive but it improved safety and increased my speed. How much extra fuel did I use? I calculated for the 60 kilometres we travelled that evening, at a conservative 5% increase in fuel consumption, I spent an extra 92c on fuel!

Driving all four wheels offers better all round safety, handling and improved tyre life on anything but a perfect road surface.

THE BASICS

When Must Four-Wheel Drive be Engaged?

The key is BE PREPARED. Select four-wheel drive BEFORE you encounter difficulties. If you consider that the terrain over which you are about to travel could not be easily traversed in a normal motor car, then engage four-wheel drive. Even if it is just a rough track and the going is easy, engaging four-wheel drive will reduce wear on the transmission by distributing the pounding to all four wheels instead of just two. If you have free-wheel hubs, lock them immediately you leave the road - you will be able to engage your front wheels from inside the cab at a moment's notice. Do not wait until you need four-wheel drive before engaging.

Thumbs

Keep your thumbs outside of the steering wheel rim. Steering kick-back when hitting an obstacle can jerk the steering wheel around with such force that it can badly bruise a thumb or finger.

Seat Belts

Seat belts should be worn although many find that the inertia types are uncomfortable as they tend to tug and pull, locking and unlocking as the vehicle shakes around. Wear seat belts during steep climbs or descents and side-slopes or wherever a roll-over could result. Do not wear seat belts in deep wading situations or any similar situation where there is a risk that a quick evacuation of the vehicle may be necessary.

Holding the Steering Wheel

In almost all off-road situations it is not necessary to fight the vehicle, forcing it to change direction. It is far preferable to let the steering wheel slip through your hands, gently coaxing the vehicle to go in the direction you wish.



Inspections

In difficult off-road situations, climbing out to inspect the ground over which you are about to drive can prevent bogging down or vehicle damage. This is especially important when negotiating rocky terrain where transmission damage can result if rocks strike the gearbox or axles.

Avoid Misuse of the Clutch

Engaging the clutch at the wrong moment either to change gear or to prevent a stall can create problems off-road. The beginner should avoid the clutch whenever the vehicle is traversing an obstacle - avoid changing gears and rather let the vehicle stall on a slope than risk a backward slide out of control. Next to hooliganism, misuse of the clutch causes more accidents off-road than anything else.

WHEN DO I ENGAGE FOUR-WHEEL DRIVE OR LOCK A DIFFERENTIAL?

Part-time 4-wheel drive vehicles

Engage 4-wheel drive in conditions where you feel that a 2-wheel drive vehicle with similar ground clearance may battle to get through.

Permanent 4-wheel drive vehicles

Lock the centre diff if there is any danger that any of the vehicle's four wheels may lose traction and spin.

'Super-Select' 4-wheel drive (Mitsubishi Shogun/Pajero)

Engage 4-wheel drive centre diff unlocked in ALL conditions other than smooth dry tarmac. Lock the centre diff if there is any danger that any of the vehicle's four wheels may lose traction and spin.

Axle differential locks

Lock axle differentials (always lock rear axle before front) in soft conditions, in all undulating terrain or if there is a possibility of lifting a wheel. In flat soft sand axle diff locks can hinder progress due to the understeer they cause. This understeer results in the turn of the front wheels being exaggerated, exerting additional braking action, halting progress.

The transfer gearbox

Part of what makes an off-road vehicle special is the transfer gearbox, a second gearbox in which an additional set of gear ratios is supplied for off-road driving. Some transfer gearboxes are integral with the main gearbox, and others are separate units, lubricated by a separate oil reservoir. The transfer gearbox reduces the overall gearing, thus giving a new set of ratios that are changeable by the gears in the main gearbox. A 5-speed gearbox with a transfer box will give the vehicle a total of ten forward gears, and two reverse gears.

Incorrect use of the transfer gearbox can cause severe damage to it and other transmission components. Never use excessive throttle openings when in low-ratio first or second. Excessive torque loads can destroy differentials and twist off half shafts.



In the case of selectable four-wheel drive vehicles, additional lever/s attached to the transfer gearbox will select four-wheel drive. Therefore, the gears selectable with the transfer box will be:

- *Two-wheel drive - high-ratio (normal road driving).*
- *Four-wheel drive - high-ratio (easy off-road driving and for momentum-critical driving).*
- *Four-wheel drive - low-ratio (difficult, slow off-road driving).*

In the case of a permanent four-wheel drive vehicle, additional lever/s attached to the transfer gearbox will select:

- *Four-wheel drive - high-ratio (normal road driving).*
- *Four-wheel drive - high-ratio + centre differential lock (easy off-road driving and for momentum-critical driving).*
- *Four-wheel drive - low-ratio + centre differential lock (difficult off-road driving).*

Even for moderate off-road driving it is advisable to lock the centre diff whenever the low-ratios are selected. This will protect the differentials from damage due to excessive torque transmitted when in low-range.

The transfer gear lever may have a central position marked "N". This is neutral and in this position no power is delivered to either propshaft. Neutral is used when the vehicle is being used to drive auxiliary engine driven equipment via power take-offs. It is also the position which should be selected if the vehicle is being towed for long distances.

FREE-WHEEL FRONT HUBS

The sole purpose of free-wheel hubs is to save fuel on the open road. The amount of fuel they save is not measurable under 50 kilometres. Often drivers of part time four-wheel drive vehicles use more fuel than their permanent four-wheel drive counterparts because when the going gets a bit difficult they are often too lazy to stop, get out and lock the hubs and instead battle through in two-wheel drive, spinning their wheels and using more fuel.

I am highly amused at the off-road driver who continually jumps out of his vehicle to engage the front hubs, only to disengage them again when the going gets easier. I once saw a driver, after he had stopped in knee deep mud, jump out of his vehicle, stand fumbling



in the mud to engage the hubs, climb back inside and then, to my amazement, on driving out, he jumped out and went to disengage them. The terrain was rough and there was quite a bit of mud around. He was under the misconception that driving with the hubs locked was damaging his vehicle or that he was using extra fuel.

TYRE PRESSURES

Part of the preparation for driving off-road is the deflation/inflation of the vehicle's tyres in order to enlarge the tyre footprint and thus increase floatation or penetration. This is a subject under much debate, as many think that as soon as off-road driving begins, one should automatically let one's tyres down. There are many things to consider.

When to let down tyres:

This subject is under constant debate and there are no absolutes. My own feelings are as follows:

- *If the tyres need to penetrate to obtain traction, such as rocks, hard and steep slopes, shallow snow, steep hard sandy inclines and shallow slippery mud the tyres should be inflated to normal operating pressures.*
- *If conditions require protection, such as sharp rocks and in conditions where the tyre sidewalls are threatened, then pressures up to 20% higher than normal operating pressures should be used.*
- *If conditions require floatation, where the tyres need to float over the surface and not break through, such as soft sand and thick, bottomless mud, tyres should be deflated.*
- *An experienced driver will quickly recognise when conditions require lower tyre pressures and will be able to estimate what pressures are required.*



When tyre pressures are reduced the footprint becomes longer rather than wider. Increasing the contact area with the ground reduces the pressure of each tyre on the ground thereby reducing penetration.

- *As a guide for beginners, start at 1,5-bar. If going is still difficult, drop to 1-bar. From this point drop pressures to as low as 0,6-bar for tubeless and 0.4-bar for tubed. This is about as low as you can go without taking the risk that the tyre will slip on the rim (tubeless) and deflate. With a tubed tyre you can go as low as 0,25-bar in emergencies.*
- *Speeds must be kept down to prevent tyre damage, especially if you are using tubed tyres.*
- *Incorrect procedures regarding the deflating of tyres, often done the moment that conditions look tricky, frequently leads to drivers finding the going even more difficult because they deflated their tyres when the conditions required normal tyre pressures. I have on several occasions seen drivers deflate tyres in conditions where a mountain road, layered with treacherous, slippery mud, required the tyres to bite through to the firm surface beneath the mud. As a result they found themselves unable to control their vehicles because their broad tyre footprint was sliding over the surface. This is particularly dangerous during a descent when steering control can become very difficult.*

Tyre pressures and the effect on tubed and tubeless tyres:

- *A vehicle with tubed tyres can be driven more aggressively because the tube serves to hold the tyre on the rim and if the bead is broken, there will be no air loss. For this reason pressures can be dropped lower than with tubed tyres.*
- *Excessive speed with reduced pressures with tubeless tyres will quickly wreck the tube and a blowout will result.*
- *Tubed tyres are more robust for driving at lower pressures because without a tube, internal friction is reduced.*
- *Tubed tyre emergency pressure: 0.5bar.*
- *Tubeless tyre emergency pressure: 0.7 bar.*

Slow speed and control is the essence of steep descents. Should engine braking be insufficient to slow the vehicle enough, brakes can be used if cadence braking is used. Never engage the clutch when on a steep slope, even if the vehicle threatens to stall.



SPECIFIC OFF-ROAD DRIVING SITUATIONS

STEEP SLOPES

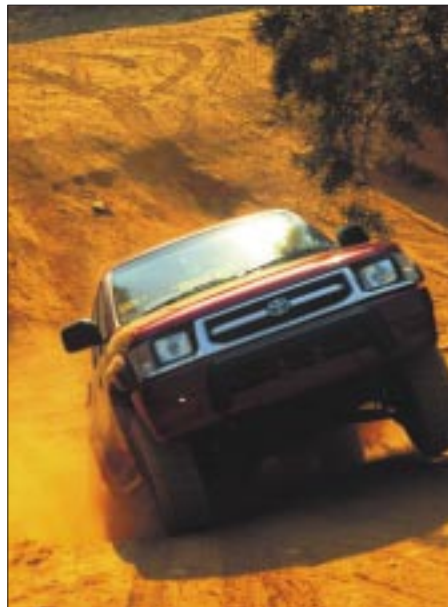
When descending or ascending steep slopes follow the fall line. Avoid tackling slopes at an angle as a slide and roll-over could result.

Descending a steep slope

The trick is to use the compression of the engine to slow the vehicle down. In doing so all four wheels are braked simultaneously. This eliminates, on all but the most severe slopes, the risk of the wheels locking and a slide resulting. The golden safety rule for driving, either up or down steep slopes, is under no circumstances engage the clutch.

The procedure on firm ground is as follows:

- *Remember the golden rule: if you depress the clutch at the wrong moment you may lose control. No matter what happens, the clutch is not required if the vehicle is moving.*
- *Engage four-wheel drive, ensure that free-wheel hubs are engaged and lock any differentials that you can lock.*
- *Select the lowest gear available; low-range first.*
- *Release the hand-brake and begin the descent.*
- *As the vehicle begins its descent take your feet off the pedals and place them firmly on the floor. If you're a beginner you may want to tuck your left leg under the seat to prevent the inadvertent use of the clutch.*
- *The engine will provide all the braking you need. You will have full control because there is no chance of locking the wheels due to action on the brakes.*
- *If the vehicle loses traction and starts to slide, steer towards the direction of the slide (downhill) and apply a gentle, careful acceleration.*
- *If engine braking is insufficient, gentle application of the brakes can be made. Do this when the vehicle is moving in a straight line. (so brake before a corner and take the corner under compression only)*
- *Apply brakes in short sharp jabs to avoid locking the wheels (cadence braking). Be aware that the use of brakes can induce a slide, so take care not to cause a wheel to lock.*



Climbing steep slopes requires a combination of momentum and traction. Too much speed reduces traction, too little speed reduces momentum.

- *If you are using the brakes they must be released the moment a wheel begins to slide or the vehicle's direction changes due to a slide.*
- *NEVER change gear during a steep descent. If the clutch is depressed the vehicle will speed down the slope out of control.*
- *If your engine stalls during the descent because your vehicle has hit an obstacle, start it with the starter motor while in gear and keep your foot well away from the clutch. Apply a little accelerator to get you going.*

Descending on slippery ground - all of the above and:

- *Use of the brakes is highly dangerous and can induce a slide from which you may not recover. Low range second is the gear of choice for very slippery descents and descending sand dunes.*

Ascending a steep slope

When confronted with a steep slope the driver must decide: do I need momentum or control? A higher gear and speed will provide momentum but if the slope is bumpy a higher speed will cause the wheels to lift, resulting in loss of traction. In this case a lower speed may be preferable. Climbing steep dunes requires a different approach where speed is the essence. (see dune driving)

The procedure is as follows:

- *Engage four-wheel drive, lock any differentials that you can lock and make sure your free-wheel hubs are engaged.*
- *Select a gear that will offer enough torque to get you up, but not too low as to promote wheel spin. Second or third gear low-ratio usually works well.*
- *As the vehicle begins its ascent give a little extra power. The more slippery the surface, the more momentum you will need to get over the top. If the surface is uneven, a lower speed will prevent the wheels from bouncing and leaving the ground, thereby losing traction.*
- *If the vehicle loses traction and wheels start to spin, decelerate very slightly and accelerate again once the wheels grip again.*
- *Decelerate as you crest the slope to avoid hitting an unseen obstacle or go careering over the edge in the wrong gear.*
- *If your attempt failed due to lack of power, select a gear one lower than the gear you first tried. If your attempt failed due to loss of traction, you have two choices - select a higher gear than before and/or, attack the slope with a little more speed.*
- *A gear change during the ascent may be needed if not enough momentum can be achieved at the lower section of the slope. A very rapid change down can be attempted but must be done at the place on the slope of minimum traction. eg. corrugations.*



Engine stall on a steep slope

If your engine stalls during a steep ascent the vehicle is in a potentially dangerous situation. The golden rule applies more in this situation than in any other: allow the vehicle to stall and do not try to prevent the stall by depressing the clutch. It is this single act that counts for more off-road accidents than any other.

Remember - DO NOT DEPRESS THE CLUTCH.

If your vehicle stalls on a steep slope:

- *Apply the hand-brake firmly simultaneously holding the vehicle with the foot brake.*
- *Depress the clutch, slowly and cautiously. If safe, engage reverse gear and release the clutch.*
- *If you are unable to engage reverse because the vehicle cannot be held by the brakes alone, have someone pack rocks behind the wheels to secure the vehicle. Once this has been done engage reverse and release the clutch.*
- *Release the hand-brake - slowly.*
- *Start the engine, (only kick the starter otherwise the starter motor will propel the vehicle down the slope) while engaged in reverse and your foot off the clutch, while simultaneously gently releasing the foot brake. The engine will fire and the vehicle will descend safely under engine compression braking to the bottom. From this point the procedure is described in 'descending slopes' but this time it is done in reverse.*

Side slopes

When a steep slippery mountain track tilts the vehicle the rear wheels often break away causing a slide. On clay-type mud this can happen without any provocation and is severely exaggerated when one is moving down a slope. This situation is corrected as follows:

- *Steer towards the direction of the slide.*
- *Decelerate gently.*
- *Do not use brakes as this will increase the slide.*
- *Once the vehicle is straightened up, cadence braking can be used to slow the vehicle.*

Side slopes on sand are particularly dangerous because of the danger of roll-over as the lower wheels penetrate the sand increasing the angle. When approaching a slope in thick sand take it at speed under full power, making sure that momentum is maintained.

MUD DRIVING

A good rule is to walk across the obstacle before you attempt to drive through it. With mud this is rarely done, and this is why 4WD vehicles can easily suffer structural damage while driving in mud. Rocks and logs often lie hidden under the mud and hard mud is often driven through with excessive speed. Mud driving can be tricky, especially for those who have fitted sand tyres onto their vehicles where the shallow treads quickly clog and sit on the surface without any grip.



Select the appropriate gear before hitting the mud. It is a balance of accelerating when traction is good and decelerating when wheel spin occurs, while also keeping speed constant.

A few rules can be applied when driving in mud:

- *Engage 4WD well before you need it and lock differentials. If you have both front and rear axle diff locks, leave the front disengaged unless the conditions are particularly bad - locking both axles causes steering difficulty. Make sure your free-wheel hubs are engaged.*
- *Select the appropriate gear before tackling the most difficult terrain. For thick, deep mud in a large engined vehicle, third gear low-ratio or first gear high-ratio is suggested. With smaller engined vehicles, select second gear low-range. The lower the gear, the more chance of wheel spin. The higher the gear the more chance of having to change down a gear, which could mean a loss of momentum.*
- *If wheel spin occurs, decelerate immediately, but delicately. If you take your foot off the accelerator completely your vehicle will slow down too quickly, and when you accelerate again the wheels are likely to spin. It is a balance of accelerating when traction is good and decelerating when wheel spin occurs while also keeping your speed constant.*



Slippery mud can be great fun but can also be very dangerous. Use low gears and keep speeds as low as possible. When a slide begins, release the accelerator and turn against the slide while avoiding the brakes.

- *Avoid doing anything suddenly. Keep your actions smooth and your steering wheel dead ahead if possible.*
- *If you find that the wheel spin continues and you are slowing down, it means that you are about to get stuck. If you avoid accelerating and continue to decelerate slowly while your wheels are spinning, and you still get stuck, rest assured that although you may have stopped, you will not be deeply bogged down. You would have avoided making unnecessary work for yourself by spinning your wheels and digging yourself in deeper.*

Another method to aid traction is to swing the steering wheel from side to side when the vehicle is moving. This works well if the wheels are spinning in ruts and the consistency of the mud is firm. The additional traction is given by the tyre sidewalls as they move from side to side.

When driving in thick mud with broad tyres designed for floatation in sand, spinning will not cause them to dig in as quickly as would narrow mud tyres. Instead, the treads clog with mud and the tyre loses all traction and spins on the top of the mud without driving the vehicle. In this case the best course of action is to drive through the mud at speed, keeping the wheels spinning. In the process the mud clogging the treads is flung out. There is a danger in this situation of damaging the vehicle by going too fast and hitting unseen obstacles hidden under the mud.

Allowing the wheels on one side of the vehicle to drop into a ditch at the side of a track is one of the most frequent ways in which vehicles bog down in muddy conditions. These ditches often occur on both sides of the track and are caused by water run-off that has eroded deep channels that catch the unwary. Unless your vehicle is fitted with differential locks on the axles, the wheels buried in the ditch will spin and the wheels on the outside will remain stationary. So, if you are travelling on a track that slopes away at its edges, drive slowly and carefully stay in the middle.

Steep mountain slopes in slippery mud

In Southern Africa many of the mountainous regions are blessed with high rainfall. This means that at certain times of the year the unsurfaced roads become difficult and dangerous to negotiate. In the late '80s, when I was acting as service crew for a privateer rally driver in the highlands of the Eastern Transvaal, over 400mm of rain fell in four days. Many of the special rally stages were closed and competitors and service crews were battling with the mud.



On a wet winter's day in the Maluti Mountains. The truck had swung wide to avoid a donkey and the slope had dragged in wheels into a roadside ditch. I attempted a rescue with the Isuzu.

I made the most of the conditions and enjoyed the rally more than ever - I was in my element.

On driving down one particularly steep hill - after having to stop and engage low range first in an attempt to keep my Range Rover from landing up in the deep drainage troughs running alongside the road - I came upon two stricken vehicles. Both had lost control and were lying with their left wheels in the troughs. As I arrived the party of a dozen men who had been battling all night to extricate the vehicles, yelled at me for coming down the hill, saying. 'Now we've got you to rescue too - there's no way out of here but up the hill because the river's flooded and blocked the road'. I apologised, engaged reverse and quickly drove back up the hill. None of these men had been in this situation before and it was obvious that they were out of their depth. I walked back down the hill, slipping and sliding as I went. They were now ready to listen and after an hour we had both vehicles free. To my astonishment, as the second vehicle was freed, the driver jumped in and raced down the hill, completely out of control, in two-wheel drive and in the wrong gear. He landed up in the same ditch a little further down. I drove down to him, told him what I thought of his driving technique and, to prove a point did a 3-point turn in the middle of the road and drove back up the hill.

Four-wheel drive vehicles are equipped with transmissions designed for all conditions - use the vehicle and its features to their full advantage.



Descending slopes in shallow, slippery mud:

- *Use low gear ratios and go slow. Do not be in a hurry. Lock up four-wheel drive even if you do not think you need it. Conditions change very quickly and if you are engaged in four-wheel drive you stand a better chance of handling them.*
- *Steering control is lost when the vehicle's motion exceeds the rotation speed of the wheels. This will occur if you use brakes in the conventional way - so if you need to stop, apply brakes in short sharp jabs.*

Rocking

This is a method using small wheel rotations (1/4 to 1/2 a wheel turn) to build up momentum when a vehicle is caught between two obstacles.

Select low-range second or third gear. Increase the engine revs and release the clutch. The moment before wheel spin occurs, depress the clutch. Your vehicle will roll backwards off the obstacle. As the rear wheels hit the obstacle behind you, the vehicle will bounce forward. Make use of this forward momentum and release the clutch again. Each time the vehicle is rocked back and forwards in this way speed and momentum will increase. At the moment when you feel that enough speed has been built up, release the clutch and accelerate gently.

Rocking works particularly well on rocky terrain and sometimes in mud, and will also work in reverse. If attempted in sand however, it usually digs the vehicle in deeper.

SAND DRIVING

More vehicles are seriously damaged when driving on sand than on any other type of terrain. This is due to a careless approach to dune driving where vehicles are inadvertently launched over the vertical lee side of a dune or drivers attempt U-turns on the slopes of a dune. While the angle does not appear to be beyond what the vehicle can handle, as the wheels bury themselves in the sand the angle becomes steeper and the vehicle rolls over.

Flat firm beaches are not playgrounds for 4x4s. Driving and turning sharply to kick up the sand often leads to disaster when the inside wheels hit a



very soft patch and the vehicle rolls. On the thousands of kilometres of sand track criss-crossing the subcontinent, patches of soft slippery sand wait to catch the unwary.

Even if you have broad purpose-built sand tyres you will need to deflate them to broaden the contact area with the ground in soft sand. Everything will depend upon the floatation of the sand and often this can be determined only by driving on it. During the heat of the day, especially after long periods without rain, the air gaps between the sand particles will be larger and the sand will have less floatation. During the cooler hours, the sand will be more dense and will support more weight. After rain and in the early morning, moisture will compact the sand and make the going easier.

A few rules can be applied when driving in sand:

- *Engage 4WD well before you need it and lock up your transmission. Make sure your free-wheel hubs are engaged.*
- *Select the appropriate gear before tackling the difficult parts. You will need the highest possible gear that will give you enough torque to get through - try high-range first or if the sand is very thick, low-range third. A gear change in thick sand will halt your vehicle as quickly as if you had applied brakes. The lower the gear, the more chance of wheel spin. The higher the gear the greater the chance of having to change gear which could mean the loss of momentum.*
- *Follow other vehicle tracks. This reduces the scars on the landscape which in some desert areas remain visible for decades.*

- *If you need to stop, find a firmer patch and do not touch the brakes - simply slow down and let the vehicle come to a halt. Applying brakes will cause a weight shift and a little wall of sand to build up in front of the front wheels - this will make starting off difficult.*
- *Before starting off, or if you find starting off difficult, reverse a short distance (one metre is often enough) along your own tracks and pull away. This allows momentum to be gained before you reach the wall of sand that was created when your vehicle stopped.*
- *If you get stuck, try reversing along the same tracks you approached on. The opposite twisting action of the axles in reverse will help give traction. Attempting to leave the tracks may get you stuck. On your second attempt, go through with a little more speed.*

Sand dunes

Driving on sand dunes is a particularly delicate conservation issue and should never be undertaken in a thoughtless manner. If driving up and over a dune, check over the top for people, other vehicles and the sharpness of the descent on the other side.

Momentum is the single most important aspect when dune driving and everything a driver does must be geared to maintaining it - no matter how the conditions vary.

When a vehicle is on hard ground between dunes the correct speed and gear ratio for the climb must be established. In most dune conditions high (normal) ratio first, second and even third gears are appropriate. Avoid changing gear mid-slope as in most cases it will degrade the vehicle's momentum enough to stop it completely.

Gear selection in dune driving is, like all off-road driving, crucial. If you are using high-range first successfully, but occasionally need a lower gear to start off, use third, fourth and fifth low-range.



The secret of safe dune driving is establishing momentum at the base of the slope and then correctly timing the deceleration at the summit.



Never crest a dune without knowing what is on the other side. The lee slopes of dunes can be vertical. Always inspect your intended route.

All rules have their exceptions. In 1996 a group of friends in a Hilux and my family in a Land Cruiser went exploring the NamibRand Nature Reserve in Namibia, where we found some exhilarating dune driving. On one particularly long steep climb the Hilux in front balked at the steep dune and came to a halt. After about eight attempts the driver had run out of options and the dune remained unconquered. Approximately two thirds of the way up there was a length of corrugations where the track became a little steeper. The corrugations were created by drivers hitting the accelerator at the base of the gradient increase. Acceleration here simply meant spinning wheels, loss of momentum and the resultant corrugations. I then asked if I could give it a go. On the early part of the slope I realised that flat out in second gear high-range was not going to give me enough momentum to overcome the difficult patch and I was unable to back up further to give me extra speed. So, when I reached the corrugations, at the moment when my wheels would start to spin, I changed into first gear and powered my way up the final 30 metres to the top. My friend, now in the



Left: On this attempt to climb the dune I was not successful and decided not to try again. The severe jolt as I hit the base of the dune persuaded me not to put my vehicle through that torture again.



Steering feedback is very vague in sand. Hold the wheel gently and make sure your front wheels are not 'ploughing' as demonstrated here.

Land Cruiser, with much more power and momentum at his disposal, did the entire climb in second. In situations like this a gear change may be required and vehicles with more power require less effort to drive.

Rules of dune driving:

- *Deflate tyres before dune driving.*
- *Keep power constant on the slope.*
- *Maintain the momentum of your vehicle.*
- *You must aim to stop at the crest in order to inspect the descent and to engage the correct gear for the descent. The aim is to get your vehicle to stop at the top, even if it means touching the sand under its belly. Ideally its nose should be over the edge and the vehicle lying horizontal or pointing slightly downhill. If it is pointing uphill you may need to go back down and try again.*
- *You will need to decelerate as you near the top and judge it perfectly to get it right. If you stop and are still pointing uphill you will have to reverse back down and try again. Do this once you have checked the gradient and know what you are up against. Once your vehicle is successfully perched at the top, the next step is to dig away the crest that is touching the chassis between the wheels. Survey the drop and engage the low-range first for the descent. Keep your feet off the pedals and begin the descent. If the vehicle starts to slide sideways, steer towards the slide and apply gentle accelerator.*

Side slopes on sand

Never attempt to go sideways when ascending or descending a dune, because if you do the lower wheels will dig in and your vehicle will roll. Loaded roof racks are ill-advised when dune driving, and a conscious effort should be made to keep the vehicle's centre of gravity as low as possible when loading your vehicle. That will make dune driving safer. If the track ahead runs for a short distance along the side of a dune where the vehicle may slide, power is the only thing that will prevent the rear wheels from breaking away and the vehicle stopping at a precarious angle. Keep the power on and keep moving. If the back breaks away turn into the slope (downhill) and keep the power on. Getting stuck on a side slope is often a dangerous situation and the first priority

should be to secure the front of the vehicle to prevent it from sliding any further and increasing the angle and the risk of rolling the vehicle.

Sand tracks

When driving on thick sand tracks engage four-wheel drive even if you do not require it. Tyre wear will be reduced and vehicle control will be easier. Fuel consumption will also be improved because, even if you don't realise it, in two-wheel drive wheel spin will occur over the bumpy patches and speed is lost. The proof of this is the effect that a two-wheel drive has on this type of road. The spinning rear wheels cause large waves of sand to be built up and, after a time, driving on these roads is like riding a roller coaster.

When driving along deep sand tracks there is a natural tendency to fight with the steering wheel. This is due to the wheels sliding over the sand with very little feel being transmitted back to the driver as to which way the front wheels are pointing. Deep tracks can be driven without a hand being placed on the steering wheel at all. But don't be fooled by this, as I once was and play a game of chance along the narrow sand tracks in the Kalahari - many 4x4s have come to grief as the front wheels spin out and the vehicle suddenly rolls over. On this type of track the vehicle moves as if it were on rails and the inexperienced driver will tend to fight the steering wheel and most of the time the front wheels will not be pointing in the direction of travel - the front wheels will plough through the sand, absorbing power and consuming excess fuel. Very little steering effort is needed to guide a vehicle in these conditions. Let the vehicle steer itself while holding the wheel firmly enough to catch it if it suddenly swings, gently coaxing the vehicle in the direction you wish to go.

When driving along tracks through thick bush it is important to keep the windows rolled up to eye height. This is done to prevent branches along the edges of bush tracks from whipping into the passing vehicle and causing injury to the occupants' eyes.

Sand tracks that have very high walls are difficult to get out of. To get out of the trough, decelerate lightly, swing the wheel over quite hard and then IMMEDIATELY SWING IT BACK to just off the dead ahead position. If the steering wheel is left in the hard over position, a slide and a roll-over could result. If it works, the vehicle's



*Sand tracks
in the
Kalahari.
Engage 4WD
or lock the
centre diff
even if you
don't think
you need it.*

front wheels will ride over the ridge and the rear wheels will follow. If it does not, centre the steering and try again. If you find it impossible to leave the track, as can sometimes happen, stop the vehicle and try it in reverse. If you are forced to leave the track due to an oncoming vehicle, stop and turn on your headlights. Try the reverse procedure pulling off to the left hand side of the track.

On two occasions I have come across a 4WD vehicle lying in the middle of a sand track on its side. On both occasions the driver had tried to get out of the track. He had swung the wheel hard over and when nothing happened he turned it even more. All of a sudden the front wheels had hit something solid and the vehicle left the track so sharply that it rolled over. This is a common occurrence. Don't let it happen to you.

So remember:

- *Engage 4WD even if you don't need it.*
- *Hold the steering wheel gently.*
- *Slow down well in advance when you see oncoming traffic.*

BEACH DRIVING

Beach and sand driving have obvious similarities, but other important points should be considered when driving on the beach. Make sure you carry a can of Q-20, or a similar water repellent as well as a tyre gauge and pump with you. Drop tyre pressures before venturing onto the beach.

If the engine stalls or splutters because of water contaminating the electrical system, a dry rag and a spray of Q-20 in the distributor and on the HT lead connections is an instant cure. If you stall and are unable to restart, select 4WD low-range first gear and turn over the starter. Progress will be slow but if your battery has a good charge, you should be able to get out of reach of the waves. If the tide is threatening steer away from the water but remember that turning the steering to full lock will put a lot of resistance against the wheels and the starter motor may stall or the wheels may spin. If your tyres have a heavy tread, deflate them to as low as ten percent of normal road pressures.



An outgoing tide is the best time to drive on the beach due to the extra time to dig yourself out should you get into trouble. Do not underestimate the speed at which the tide comes in - you may lose your vehicle if you do! Drive as close as possible to the water's edge without getting splashed and you will be driving on the firmest surface. Beware of shiny wet patches and keep them between you and the surf - they indicate deep patches of sand saturated with water. Areas of pebbles or shells which even under the best lighting conditions are difficult to detect, are treacherous. They are invisible when the sun is low in the sky. Avoid driving on an unfamiliar beach at night.

Driver techniques for beach driving vary, and the method described for sand driving works on the beach. Additional speed can be used due to the absence of obstacles (as long as there are no people about). There are no paths or roads on the beach so if there are other vehicles about, give way to anyone who appears to be having difficulty, and watch out for children.

Low gear ratios will induce wheel spin unless the driver is very careful about how he applies his right foot. For example, hitting the accelerator once in the difficult patch will immediately spin the wheels - and if you bog down after wheel spin, your vehicle will be much deeper than if you had simply run out of traction.

Another method is to 'walk' your vehicle by using low-ratio first gear and crawl through, never allowing your wheels to spin. When using this method there is always the temptation to race the engine and go a bit faster. Don't be tempted - it's an invitation to disaster!

WADING

Off-road vehicles are often required to forge through deep water. Before doing so, check the vehicle manufacturer's specification data sheet on maximum wading depth, (or the vehicle handbook). This depth can only be exceeded if the following precautions are taken:

Water is ingested by the engine if the engine stalls and water is sucked up the exhaust pipe or if the water is too deep, the engine intake can suck water into the combustion chambers. SHOULD THIS HAPPEN DO NOT ATTEMPT TO RESTART THE ENGINE. IN MANY CASES IT IS THE RESTART THAT CAUSES THE SEVERE DAMAGE. Recovery from a drowned engine is covered in chapter 9.

In deep water the engine cooling fan splashes water around the engine bay, so either keep engine revs low, or remove the fan belt. Viscous-coupled cooling fans are ideal because when they hit water the friction slows the fan, reducing the splash. Some vehicles come equipped with bell housing drain holes which allow oil collecting in the bell housing to drain away. These holes should be sealed to prevent water coming into contact with the clutch.

Many years ago (when I was a lot less careful about such things) my vehicle was called upon to extract a yacht from deep water. I was unable to seal the bell housing because of a missing plug but I went ahead regardless and paid a high price. Water entered the



An unexpected hole in the river bed caught me out here. With no snorkel fitted the engine drowned but in this case there was no damage. The recovery of a drowned engine is in chapter 9.



bell housing and because the water was very cold, and the engine and gearbox were quite warm, the cooling effect caused water to be sucked into the engine through a leaking rear main bearing oil seal. The water, which was already mixed with fine sand, mixed with the engine oil and wrecked the main bearings. The engine had to be completely rebuilt.

Slow speed is essential and low-range second gear is recommended for most wading conditions. When entering the water do so slowly and avoid creating a splash that will wet electrical components. Drive at a speed that creates a clean bow wave. If you have ever seen a boat moving at speed and then slowing down, you will have noticed the bow wave catching up and pushing the boat from behind. This is exactly what happens to a vehicle in deep water. If you have created a bow wave and lose traction, the bow wave will push your vehicle forward as it catches up. This little push may be just what is needed to get you through a sticky patch, or up a river bank.

When crossing running water, test the depth and strength of flow before proceeding. If the flow is too powerful to walk against, rest assured that driving through it will be dangerous. Moving water will create more turbulence than still water, so consider this when calculating the depth. Move diagonally across the flow with the water pushing you. Crossing still water is safer but the possibility of deep sediment is more likely.

After wading, bell housing sealing plugs should be removed. Inspect the engine air filters if you think water may have entered

the carburettors. Water can contaminate gearbox and axle oils by entering through the breather valves. Because oil floats, it is easy to remove this water. Allow the vehicle to stand for a while and remove the drain plugs. The water will drain first and when you see oil, stop the draining process. If your engine oil has turned a milky grey colour, water has entered the engine sump. You will need to drain away the oil, flush the engine at least twice with oil or engine flush and then refill with new oil. Universal joints must be pumped with grease after being submerged.

Should an engine ingest water into the cylinders it normally stalls before any serious damaged is caused. This however is not the case with diesel engines - they are normally destroyed if this happens. There are few off-road experiences more rewarding than a difficult wading situation that is accomplished successfully.

UNEVEN TERRAIN AND OTHER SURFACES

Ridges

When crossing a ridge, stay at right angles to the ridge, passing both wheels on each axle over the obstacle at the same time. Crossing at an angle could result in lifting a wheel off the ground and the loss of traction on that axle.



Troughs

When negotiating a trough, cross at an angle so as to drop only one wheel at a time into the trough. This will always keep at least one wheel from either axle on firm ground. When moving along a series of troughs do so carefully and slowly, otherwise the differential may be grounded if a wheel drops to one side.



V-Shaped gullies

Driving along V-shaped gullies must be done with extreme caution. If one side of the vehicle slides down, and the wheels drop into the gully, there is a very good chance that the vehicle will get stuck. Getting out is also very difficult and digging may not work. One has to lift the lower wheels out of the gully, and to do this without momentum is very



When crossing troughs, allow a single wheel to drop at a time.

tricky. In this situation, differential locks on individual axles help a great deal.

When a V-shaped gully is entered, it should be done at an angle so as not to drop more than one wheel into the trough at a time. Exiting a gully should also be done at an angle so as not to allow both wheels on the same side of the vehicle to drop into the trough. Good axle articulation will assist a vehicle negotiating this type of terrain.

Ruts

Deep parallel ruts should be negotiated with one wheel in and one wheel out. If you allow both sides to drop into the rut the chassis may bottom out and progress could be halted. This would mean a great deal of digging to clear the underside of the vehicle to put the vehicle's weight back onto its wheels again.

Rough tracks

Although four-wheel drive may not be needed for traction, it is wise to engage it. This will reduce wear on transmission components and will afford the driver greater control. Avoid the constant use of brake and clutch and rather select a low-ratio gear that will keep the vehicle going at a steady speed. Look well ahead at the track surface and beware of sharp rocks that can tear tyre side-walls.

Boulders and river beds

Engage 4WD and lock the differentials, even though you may think you do not need it. Large vertical wheel movements will be required and if a wheel does lift off the ground, only if all four wheels are being driven will you keep moving. Select low-range second gear. Low-range first can be used if the terrain is particularly difficult - the pace will be slow but if part of the vehicle hits an obstacle there will be less damage. In this gear, wide throttle openings should be avoided. Beware of the vulnerable parts of your vehicle such as the axle differentials and gearbox casings, especially if they protrude below the chassis frame as in the case of many 4x4 bakkies. To avoid striking these, make sure that the wheels ride over the higher boulders, clearing the axle and chassis.



Slow speed and control in low gears is needed to prevent damage to the vehicle.

Salt pans

Driving over salt pans is a nerve wracking experience and to do it successfully will require experience and luck. Don't be fooled by the apparent firmness and dryness of the surface. Underneath lies thick, black, enveloping mud.

In 1974, Mark and Delia Owens ventured onto the Makgadikgadi Salt Pans in Botswana. I quote from their book 'Cry of the Kalahari':

"I bent over the steering wheel, scanning the white salt crust ahead for dark patches, a sign that the pan had not dried out completely. But there were none. It was like driving over a billiard table, and I began to relax. Then about 800 yards from the edge I saw some timbers and poles sticking at odd angles from a depression in the grey, cracked surface. We got out to investigate. What could have made such a hole? And where had the timbers come from? There were no tracks or any other clues. Puzzled, I looked into the deep, ragged pit, to the place where the ends of the posts converged and then disappeared into an abyss of mud. The throat suddenly tightened - someone had tried, unsuccessfully, to save his truck. I glanced quickly at ours.

"My God! The truck's sinking! Get in - hurry - we've got to get out of here!"

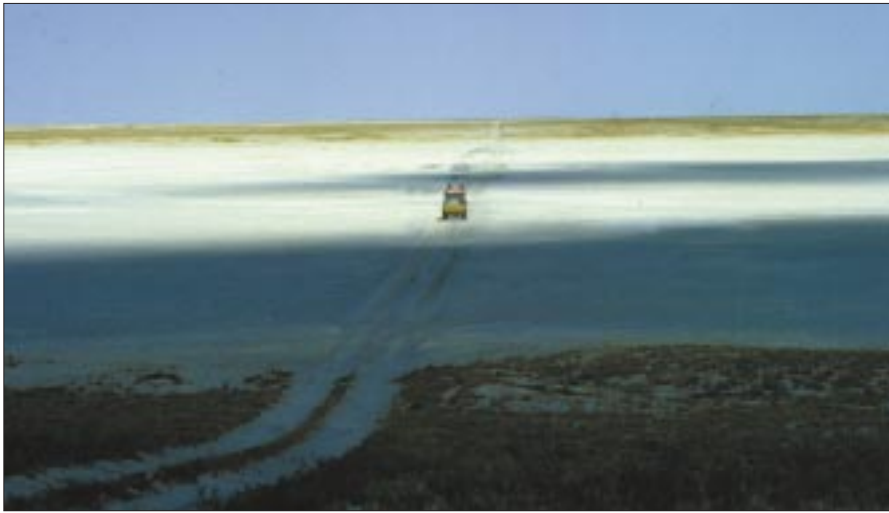
Its wheels were slowly settling through the salt crust into a pocket in the softer clay beneath. The surface was giving way; in seconds our truck would break through.

I tried to drive forward, but the engine stalled. The wheels had sunk too deep. Working frantically, I restarted the motor and jammed the gearshift into low-range four-wheel drive. Spinning and throwing clay, the Land Rover churned forward until it heaved itself up onto the firm surface again. I quickly shifted into high-range for better speed, swung around, and raced to the safety of the grass bank at the edge of the pan."

If, after reading that, you are still keen, then here is what to do. Before you venture across the pan, skirt around the edge to find



This One Ten rolled during a low-speed pancake on a salt pan. The weight-bearing properties of the crust are often indiscernable from the surface.



the shortest possible route across. If you have decided to go across test the surface by walking some distance in front of your vehicle. If your feet are breaking through the crust, then do not attempt to drive across, no matter how broad your tyres are. If your feet are stepping on firm ground, then dig a hole about 25cms deep. If the earth is hard and dry, then it may be safe to cross. Unfortunately, there may be areas in front of you that are still soft.

The lower your tyre pressures are the better your chances are of getting through - in theory. In practice it doesn't appear to make much difference. Engage four-wheel drive, lock differentials and hubs, select low-range third or fourth and proceed fairly slowly. If you rush and the surface breaks you will be a long way from the firmer ground behind you. Follow the direction of other vehicle tracks if they look fresh, and drive parallel to them while making your own tracks. By taking it slowly you can assess the firmness of the surface by how much power you are giving to the wheels. Look down at the wheels to gauge the depth of the tracks you are making.

If the surface breaks and you start sinking, either floor the accelerator or stop. Accelerating may get you through the soft patch, but if not you will be a long way from firm ground when you bog down. By stopping immediately you feel the vehicle sink it will be easier to dig out because of the close proximity of firm ground and suitable anchor points, such as another vehicle. Avoid sudden movements of the steering wheel. Turning will only make matters worse, because your wheels will act as a plough. If you choose to stop, attempt to reverse in your own tracks or try to steer out by making a gentle turn. If your vehicle resists leaving your tracks, straighten the steering wheel and let the vehicle steer itself. If you are making progress and the reverse is getting you out of trouble, all is well. If not, the mud may be so bad that even digging is sometimes pointless.

If you have another vehicle with you, which is highly recommended when driving on salt pans, do not waste any time - start the recovery operation without delay. Work fast - your vehicle may be sinking. Watch the recovery vehicle closely - and don't get that stuck too!

Bogging down on a salt pan is a miserable experience. The mud is the worst kind you are likely to find anywhere, and without the aid of another vehicle equipped with a winch it may be days before you get out. Above all, don't take driving over salt pans lightly - they are treacherous. In Botswana vehicles are consumed by the pans almost every year. Do not stop and look at the scenery, no matter how solid the surface appears.

Lastly, please consider both the environmental effect your vehicle tracks will have on the pans, and your fellow travellers that will pass after you have departed - in any event, it is far more pleasant and a great deal safer to walk than to drive.

Grasslands

Fit a grille guard to prevent grass seeds from clogging the radiator and causing overheating. Fire may be caused by dry grass wrapping itself around the propshaft or exhaust. The grass dries out and ignites, so frequent checks must be made and any grass collecting under the vehicle must be removed immediately. Tall grass also hides ditches, logs, ant hills and rocks, so caution is vital. Remember that your tracks will be clearly visible for some time after driving over grass, so in the interest of conservation use existing tracks if you can.



Grass hides logs that roll over and puncture tyres. Watch for hidden deep ditches. Even driving slowly cannot prevent bogging down or vehicle damage in tall grass.

Unsurfaced roads

Long stretches of unsurfaced roads present their own dangers.

Firstly, if you wish to overtake, check that your outside wheels do not hit the sand that piles up at the edge of the road; it will drag at the wheels on that side of the vehicle and can cause a spin. Secondly, if the road is convex, overtaking or even avoiding oncoming traffic can put your vehicle at a tilt, and this can cause a dangerous slide. If you see an oncoming truck throwing up clouds of dust, take the precaution of either slowing down to a crawl and getting well clear, or alternatively leaving the road and stopping altogether. There are very good reasons for this; for one thing, you will avoid loose stones being thrown up like bullets. For another, there could be another oncoming vehicle overtaking the truck through the dust. I was given this advice by an experienced traveller on the Caprivi road from Kongola to Katima Mulilo.

Many main roads through the Kalahari are made from a substance called as calcrete. Calcrete roads appear blinding white in the midday sun, and can be very dangerous. They are particularly prone to the effects of big trucks and storm water, and after a week of rain can be transformed from a smooth dusty flat that can be covered at 90 kph, to a virtually impassable quagmire. A driver needs to be very alert when driving on calcrete and driver changes should be regular. Driver concentration can be hard

to maintain on long stretches and surface changes are very difficult to see against the blinding white. On the 300 kilometre calcrete road from Nata to Maun in Botswana, there were a number of fatal accidents caused by vehicles travelling at high speed hitting deep ruts caused by the heavy rainfalls. Several vehicles rolled.

If you see a deep rut or trough in front of you and it's too late to stop, apply brakes as hard as you can without locking the wheels. Do this



Take it easy when driving on corrugations - they can cause the vehicle to slide even when moving in a straight line.

until the very last moment and then, the instant before the front wheels hit, release the brakes. As the foot brakes are released, the vehicle's centre of gravity moves towards the rear and weight is taken off the front wheels. Now the vehicle hits the trough with less than the normal weight on the front axle. Doing this could mean the difference between a broken axle and simply a heavy bump.

One more piece of advice: if you are travelling on a busy and dusty road, turn your headlights on - you will become visible through the dust.

Corrugations

Corrugations are to be found on all dirt roads that are used by heavy vehicles and are especially bad after rain. They can cause a great deal of damage if driven over too fast. Suspension components are stressed to extreme limits if the vehicle is heavily laden and torsion stresses on the chassis frame can cause cracks in the steel.

Corrugations can also cause loss of control, especially with vehicles that are softly sprung. Upon hitting the corrugations, vehicles like these tend to go into a slide, losing traction at the back end. Loading a vehicle does tend to dull this tendency, but an overload will have the opposite effect, in which case over-steer increases dramatically. The Land Rover Discovery and old Range Rover are particularly prone to this. By fitting gas shock-absorbers this tendency is reduced. It's a cause of more accidents on dirt roads than any other, save for alcohol.

Driving at night

If you intend travelling through Third World countries at night, my advice is avoid it at all costs! The dangers cannot be over stressed. Third World countries are generally unfenced, so cattle, goats, chickens and antelope are a constant danger. If you collide with a cow at 80 kph you will be in a lot of trouble! You may wreck your vehicle and if you are lucky enough to get out unhurt, the local tribesman will require compensation. Litigation against owners of animals straying onto public roads in Third World Africa is expensive and time consuming, and in most cases unsuccessful. Trucks without lights are an even bigger danger. They are normally filthy and any reflectors fitted will have a thick layer of dust on them so that when you do see them it may be too late to avoid a collision.

What is more, on dirt roads at night if there is a lot of dust, your visibility will be impaired by the light bouncing back off the dust, making your long range lights useless. I cannot stress this point strongly enough: it is extremely unwise to travel at night in the Third World.

Snow and ice

Even in Southern Africa snow and ice can present a challenge to the off-road driver. During Easter of 1984, I was caught by snow in the Lesotho Highlands, the only time I have ever had to deal with such a situation. We were descending the mountain at the time, so this made the going even more treacherous. I stayed locked in combat during the entire descent, changing between low-range



One of my first trips alone - One of the few breaks in a Lesotho snow storm, April 1984. Hours in low-range second consumed 45lit/100km!

second and third for over six hours. During this time we covered only 25 kilometres and fuel consumption measured 45 litres per 100 kilometres. My advice is to take extreme care, especially if the area is mountainous. Ice is often invisible and the road surface and tyre adhesion can be very difficult to anticipate. If the ice is thin and the tyres are not gripping, it can be melted by spinning a wheel. This can be tricky in hilly country as the spinning wheels cause the vehicle to slide around without much control. Broad tyres are dangerous in snow, floating over the surface. Narrow tyres with block treads and hard shoulders are best for snow conditions as they have a better chance of breaking through the snow to grip the surface beneath. Only in virgin powder snow are broad tyres preferable, and in these cases tyre pressures must be dropped to the absolute minimum - to 0.5 bar and speeds kept below 10 kph.

Snow chains are particularly valuable and if only a single set is available, place them on the rear wheels for tricky uphill climbs and on the front wheels when descending steep slopes. When tyre chains are fitted to only the front wheels there is the tendency for the back wheels to slide out, so extreme care should be taken.



Here's some additional advice about

Turn your headlights on in dusty conditions.

sub-zero conditions:

- *When a vehicle is parked for long periods, lift the windscreen wipers - they will stick to the windscreen otherwise. Do not leave the hand-brake on overnight, as some hand-brakes freeze. Rather park on level ground and chock the wheels.*
- *Weather conditions in high altitudes in winter can change very rapidly and it is imperative that when exploring such areas in winter, food and water rations for at least three days should be carried.*

Handling characteristics induced by four-wheel drive

4WD gives a vehicle peculiar handling characteristics - acceleration will promote understeer and deceleration will induce over-steer. If you find yourself in a situation where traction is poor and you need to steer with accuracy, steering with the accelerator pedal and/or hand-brake will be essential. The best way to test this is on a skid pan, a flat smooth surface on which water is sprayed. The more water on its surface, the less grip the tyres will have. This can be a hilarious experience so take some friends along. Apart from skilled use of the accelerator, rear wheel hand brakes must be used for steering the vehicle. Those vehicles equipped with transmission brakes that in effect lock all four wheels are not able to do this. Professional instruction would be very worthwhile.

Blow-outs

I have experienced four blow-outs while driving at speed in a loaded 4x4. Three occurred on the rear wheels and one on a front. 4x4s tend to have large wheels and tyres and so have a high centre of gravity. The result is that they tend to roll onto their roofs a little easier than normal road cars, especially if the vehicle is carrying a loaded roof rack. Catastrophic tyre and tube failures (blowouts) cause a vehicle to become difficult to control even if the failure occurs on a rear wheel. In such a situation the natural reaction is to stop as quickly as possible, but this is not always the most appropriate course of action. Hitting the brakes with any force in a blow-out situation tends to lead to loss of steering control followed by a slide. If the wheels strike a ridge or trough, even a shallow one, the vehicle can easily roll over. Avoid hitting the brakes. Simply take your feet off the pedals and gently change down one gear ratio. Take your time. Keep the vehicle on the road and away from the camber that will accelerate a slide. Causes of blow-outs range from under-inflation and overload to a twisted inner-tube. See chapter 4 for further insight into preventing blow-outs.



A convoy in the Cedarberg

Convoys

The rule for convoy driving is that you are responsible for the vehicle behind you. It is good manners for the vehicle behind to indicate that a turning ahead has been noted so that the vehicle ahead can proceed. Flashing lights is the common method. This also helps the following vehicle in that it does not need to travel close to the leader and therefore drive in its dust and when driving at night, can drive with its headlamps in high-beam.

Driving a 4x4 video -

a common sense approach to mastering off-road driving skills

Before writing and publishing full-time, I edited TV and cinema commercials for 17 years. Because of my background, I combined my film skills with my love for the subject of off-roading and wrote, directed and produced a video on driving.

It is a little over 50 minutes in length and covers all of the terrain, excluding snow, that you are likely to find in the wilderness. These include: sand tracks, beach, dune, salt pans, mud, wading, high-speed gravel, river beds and steep slopes. It also covers the use of gear ratios and differential locks.

As a teaching tool, video works very well in this arena. Seeing how a vehicle behaves when driven incorrectly and the difference when correct driving principles are applied is very effective. I am pleased to report that critics have praised it as one of the best of its kind in the world.

It is the first in a series of three, the second being '4x4 vehicle Recovery' (see chapter 6) and the third, 'Working in the Wilderness'. They are available through the Continental 4xForum, <http://www.4xforum.co.za> or by calling 27 21 785 5752.

