

Carver One: The History

CARVER ONE

Early 90's Inspired by the ever-increasing congestion and pollution problems of modern traffic, Anton van den Brink, founder and director of the Eurotool Group of companies, launches an initiative to investigate the feasibility of realising a so called slender comfort vehicle, i.e. a vehicle half the width and half the weight of a conventional car. Indeed, studies demonstrate that more than 90% of all cars are only occupied by one or two people.

An enthusiastic group of engineers teams up with Anton van den Brink and found Eco-Car BV.

Eco-Car develops a single passenger enclosed 'motorcycle' with controllable support wheels to balance the vehicle at slow speeds and to allow it to stop. This first prototype, however, requires considerable driving skills.

1993 In December 1993, the prototype is demonstrated at the exhibition 'The Compact Car, History with a Future'. Market analysis indicates a large potential for narrow vehicles that could transport one or two people and that would not require special driving skills.

Eco-Car concludes that its prototype is an interesting concept but not a commercially or technically viable solution. Whilst for decades several serious attempts have been made by established companies to develop a man wide vehicle that automatically tilts in corners², patent investigations indicate that a truly user-friendly technology has not yet been developed.

Based on a thorough review of known designs and technologies, the engineers are convinced that the lack of practical man wide vehicles is largely due to the lack of a reliable technology that would automatically ensure the balance of the vehicle in corners, provide comfort and safety at varying speeds and road conditions while requiring no special driving skills.

1994 Chris Van den Brink and Harry Kroonen, aeronautical engineers at Brink Dynamics, one of the Eurotool companies, develop the Dynamic Vehicle Control (DVC™) concept which automatically translates the 'car type steering' input into an optimal 'motorcycle type banking' of the chassis. The concept is built into a first mechanical test model.

1995 International patents without limitations are granted on the DVC™ system.

1995-96 The first vehicle concept using the DVC™ system is realised. This narrow tilting three-wheeler is the validation of the concept, and, not unimportantly, offers tremendous driving pleasure as a bonus. Several versions of the prototype are developed, fine-tuning the hydraulic tilting mechanism and the steering system.

1997 The three-wheeled prototype is extensively tested by the Dutch police.

In May, the prototype is approved for road use by the Dutch National Road Authority.

In June, Brink Dynamics is awarded the prestigious Dutch Innovation Centre award (ID NL) 'Best invention of 1997'.

CNN World Report features the Brink Dynamics prototype and the future potential of narrow vehicles.

1998-99 The driving dynamics of the prototype are further optimised to improve vehicle safety and control, and to enhance the driving experience. In collaboration with Johan Vissers, one of the engineers who had been involved in the early versions of the prototype, the vehicle is further developed and restyled into the Carver.

1999 In September the Carver design concept is featured at the 1999 IAA Motor Show in Frankfurt, Germany.

2000-02 The Carver design concept is further developed and validated.

2002 The Carver is granted EU type certification. Vandenbrink BV, sister company of Brink Dynamics, is established to manufacture and market the Carver.

2003 24 exclusive Carvers are built by hand, 20 of which are sold worldwide (UK, Spain, Netherlands, UAE, ...)
The Carver features in various renowned magazines and television programmes, amongst them BBC Top Gear.

2004-05 Further road testing and validation results in a perfected version, the Carver One.

2005-now Carver Europe GmbH, with head office in Zürich (CH), is founded to coordinate the worldwide production, sales and service of the Carver One. The engineering facilities remain located in Dordrecht (NL).
From 1 February 2006, Carver Europe head offices - now Carver Europe BV - are relocated to Dordrecht, near Rotterdam (NL).

For the production, Carver teams up with Prodrive, one of the world's leading motor sport and vehicle technology providers. Together they set up an entirely new production process. During the preparations for the new process, every single of the 1200 components of the Carver One is under scrutiny. The total number of components is reduced to improve production efficiency and maintainability. About half of the original components are fully re-engineered resulting in a more reliable vehicle clients will be able to enjoy to the fullest for many years to come.

The global sales and service network is being rolled out and preparations for the production of the first batch of a limited edition of 500 hand-crafted vehicles are underway.

The Carver One features in several international television programmes, including Discovery Channel and Beyond Tomorrow and is exhibited at various international motor shows.



² Banking is the only natural way to take corners. Bringing the centre of gravity towards the centre of the curve ensures stability. For a vehicle to be user-friendly, the banking should be done automatically rather than being set by the driver.

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Frequently Asked Questions: 1 of 2

CARVER ONE

Why is the Carver called Carver?

Dutch by design it owes its name to the English verb 'to carve', meaning 'to cut into a desired shape, to decorate by cutting and shaping carefully, to cut or engrave figures as an art, ...' This is exactly what happens when you drive a Carver: you 'carve' corners..

So what is it exactly, a car or a motorcycle?

For those who care: it is both or neither... You steer it just like a car and it reacts just like a motorcycle: when cornering, it banks. It combines the exciting agility of a motorcycle with the comfort and safety of a car: the best of both worlds.

Why does it tilt?

Bringing the centre of gravity towards the centre of the curve ensures stability. The tilting is essential. For a vehicle to be user-friendly, the banking should be done automatically rather than being set by the driver. This is exactly what the Dynamic Vehicle Control (DVC™) system does and this is why the Carver One is such a comfortable and safe vehicle with an excitingly sporty behaviour.

Do I need to learn how to drive a Carver One or can I just drive away?

There are no exceptional skills required. Just allow yourself time to get used to the tilting. For some this takes just minutes. Once you get the hang of it, the banking in corners comes natural.

How does it feel to drive a Carver One?

Formula 1 pilot Jenson Button's smile when he put the Carver One to the test pretty much says it all, and if not, his final verdict does: "... absolute madness... fantastic!"

Jeremy Clarkson from BBC's Top Gear admitted "... never had so much fun in a car, really and truly. And I don't think I'd ever get tired of it!" and "The most fun you can have."

Is the Carver One a commuter vehicle or is it just another fun car?

How about dubbing it a "fun commuter"? Conceived as a more rational commuter vehicle, it proved to be just tremendous fun to drive, and this aspect has been paramount to its success.

How does the Carver One handle adverse driving conditions?

While the Carver One was not specially designed to handle the most severe winter conditions, it could be used by the more experienced driver on snowy roads provided you use winter tyres or spikes. On slippery roads, situations of under-steering are solved in much the same way as with a standard front wheel drive car. Situations of slight over-steering (i.e. the backend of the Carver One breaking up to 30 degrees relative to the position of the front wheel) are relatively easy to control, just like they are with a standard rear wheel drive car. In situations of heavy over-steering the driver just should not overreact. Releasing the throttle and the steering wheel (i.e. do not force it) would allow the Carver One to seek its natural balance.

Which exterior colours are available?

The basic palette is white, yellow and blue. As an option, we further have 8 metallic colours and 4 special colours available. The Carver One can come in any other manufacturer colour or custom colour of choice (option).

How many persons can travel in a Carver One?

The Carver One is a two-seater. Driver and passenger are seated in a tandem seat arrangement.

Can the Carver One tow a trailer?

The Carver One did not receive type approval for towing a trailer.

Is there room for any luggage?

There is some storage space on the parcel shelf and we have a custom-made luggage bag (+/- 20 L) which can be fitted underneath the spoiler. And if you get to travel by yourself, the passenger seat is also available for your luggage.

How many models are available?

We currently have one model available: the Carver One. Its standard equipment includes the following: removable hardtop roof in body colour, double 5-spoke alloy wheels, 3-spoke sports leather covered steering wheel, black sports interior, electric windows, design aluminium dashboard and gear lever knob, 4 instruments (engine temperature, fuel gauge, speedometer & odometer and rev counter, dashboard 'carving' LED indicators with acoustic signal, built-in class III remote control alarm system incl. remote control power door lock, heating / ventilation / windshield defroster, front and rear seatbelts, black carpet with Carver logo, ash tray/cup holder, 12 V socket and tyre repair kit, metallic exterior paint, leather interior upholstery, OPTIONAL : rear spoiler, roll-up soft top, shadow or high power wheel packs, matte black rear frame, radio/CD/MP3. If you want any other options, just ask. We will be happy to discuss and evaluate any special requirements you may have.

Does the Carver One have air conditioning?

The current Carver One comes with heating, but no air conditioning. We will be providing air conditioning in the future and we expect to be able to offer it in the course of 2007.

Does the Carver One have heating?

Indeed, the Carver One is standard equipped with heating and ventilation and windshield defroster. It does not have seat heating.

What about drink holders?

The Carver One is equipped as standard with an ashtray that can be used as a drink holder.

Can the Carver One be adapted to meet special needs?

The Carver One having regular car controls, in principle, some of the adaptations available for an ordinary car could be applied to the Carver One by a qualified installer. At some point we will be launching an automatic/cvt version which may help accommodate some disabled drivers. Every disability is different, so if you have any questions regarding special adaptations, just contact us. We will be happy to verify what can be done.

Is there a right hand drive version available?

The Carver One is neither right nor left hand drive. However, the controls are laid out as though sitting in a left hand drive vehicle, just as in a Formula 1 race-car. The single door is on the left hand side.

When will the automatic version be available?

We currently expect to be able to offer an automatic version in the course of 2009.

Have you considered alternative energy like hydrogen, fuel cells, electricity?

For the time being there are no concrete plans to develop an electric or hybrid version. However, we keep close track of all technical developments. After all, ecological concerns sparked the development of the Carver One's predecessors.

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Frequently Asked Questions: 2 of 2

CARVER ONE

How does the automatic tilting system work?

By using the advanced Dynamic Vehicle Control (DVC™) system, a mechanical-hydraulic system that distributes the driver's input or steering torque between the front wheel steering angle and the cockpit tilt angle. This distribution is automatically adjusted to varying speeds and road conditions to ensure an optimal balance at all times. At lower speeds < 10 km/h (6 mph), when standing still or in reverse, the steering torque is directed to the front wheel angle and the passenger compartment remains upright. At higher speeds the steering torque is mainly directed to the tilt angle of the cockpit and rear wheel steering. All the driver has to do is steer in the desired direction.

If you want to know more: visit the download section of the Carver Engineering1 website (www.carver-engineering.com).

What is the fuel consumption?

Despite its sporty power to weight ratio the Carver One has modest fuel consumption. Estimated average is 5.8L/100 km.

How does having your tri-wheel configuration with one wheel up front improve the car's handling? Doesn't friction increase more on the front train when in curves?

For non-tilting vehicles a minimum wheel track width is required to balance the overturning roll torque while cornering. Because the Carver One banks (leans inward) when cornering, there is no 'overturning torque' on the wheels and the resultant forces always pass through the centre-line of the vehicle. This is exactly what happens when a motorcycle takes a corner.

For a normal (non-tilting) trike for example, the usual layout is with the two wheels up front because the most extreme loading occurs when the driver brakes in the corners. In such situations it is important to have the largest roll stiffness up front. This 'rule', however, does not apply to the Carver One.

For a car, the cornering behaviour is largely determined by the weight shift to the wheels at the outside of the curve. For a car to corner better, one would need to put the centre of mass as low as possible (to reduce the weight shift) and also have a stiffer suspension so the outer wheels could better handle the additional loading.

Because the Carver One is always balanced while cornering, there is no such load shift to the outside of the curve and therefore it is not a limiting factor that there is only one wheel at the front.

Why not use a motorcycle engine?

The Carver One being handled like a car, we need the entire drive-train of a car. It would be difficult to connect a motorcycle engine to the drive-train of a car. Also, the complete drive-train (engine + gearbox + differential) of a car is very compact, much more compact than a specially designed drive-train with a motorcycle engine would be.

Is there enough room for tall people?

We have catered for quite tall people. Our current record is 2.05 m (6 ft. 8 in.) A lot depends on the ratio leg length/upper body length. It is easier to accommodate longer legs as we can shift the driver's seat back, impacting, however, the space available for the passenger.

Are there any restrictions with regards to the weight of driver/passenger?

Total weight of driver and passenger should not exceed 200 kg (440 lb.).

What if the hydraulics fail?

The Dynamic Vehicle Control (DVC™) system is essentially a hydraulic-mechanical system. Hydraulic failure is detected by a custom designed valve which ensures the cockpit of the Carver One returns to its upright position. This feature is powered by the oil pressure in the hydraulic accumulator. This safety feature also

ensures the Carver One stays upright when it is parked. When the DVC™ system fails, the steering becomes extremely heavy as the tilting mechanism is inactive. The driver immediately notices a change in the vehicle's response / behaviour allowing him/her to take appropriate measures.

When the Carver One is parked, can it topple / be pushed over?

The hydraulic-mechanical system is locked when the Carver One is parked. It cannot topple over and it cannot be pushed over. To allow maintenance (access to the engine) the Carver One can be put in maintenance position, i.e. tilted 45 degrees, by operating the hydraulic valve.

How is the brake balance? What about ABS?

The Carver One has a two-way braking system, i.e. with a separate hydraulic system for the front wheel and a separate system for the rear wheels. In the factory the brake balance is tuned to obtain the perfect balance between front-wheel and rear-wheel braking. There is no ABS available.

How does the Carver One perform in crash tests? What are its safety features?

The Dutch Organisation for Applied Scientific Research (TNO) executed several crash simulations. However, there are no special crash tests developed for three-wheel vehicles and car crash tests cannot be copied exactly. It is therefore difficult to obtain comparable data. The Carver One is much safer than a motorbike and as safe as a small car.

The steel cage construction offers safety protection, as do the seat belts. The safety measurements are comparable to those of a racing car where safety is also provided by a rigid casing and seat belts.

The chassis was designed and its rigidity determined with the aid of crash test simulations and CAD/FEM analysis.



Has the Carver One been road approved?

The Carver One has obtained a full EU type road approval certificate. It can be used in all European countries and countries accepting the EU type approval. Various initiatives to obtain certification outside Europe have been launched.

What type of licence plate will I receive with the Carver One?

For tax reasons, the Carver One is classified as a motorcycle (or trike) in most countries.

What driver's licence do I need to drive a Carver One?

A full motorcycle licence is required in New Zealand.

Do I need to wear a helmet in the Carver One?

Neither the driver nor the passenger needs to wear a helmet or protective clothing. The enclosed cabin, safety chassis and seat belts provide ample protection.

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