

TAKE A TRIKE

Do you ride or drive a trike?
Enter the curious world of the Can-Am Ryker



Bombardier Recreational Products (BRP) has a long history of making innovative vehicles for land and water.

For 2019, the company has come up with something completely new. The Can-Am Ryker is a novel trike with a surprisingly long gestation period, as Vincent Varaldi, project manager, Can-Am Vehicle Engineering explains: "The BRP Design and Innovation group started imagining the Can-Am Ryker back in 2008. It was a dream for something simple, minimal and with style that would be fun to ride and extremely accessible. There was a lot to learn to make the Ryker happen – it would not have been possible to manufacture such a machine back in 2008."

It started life in 2D form on a computer, moving to 3D next. During the development phase various software packages were used, with Rhino for surfaces, Catia for 3D design, and again with NCode for the finite element analysis. Star-CCM+ was used for the CFD, with Simpack and Matlab for vehicle dynamics. For NVH GT Power, Siemens Sim Center with Siemens Test Lab was used, and, as Varaldi adds with a smile, "Also a standard software used around the world by engineers: Excel."

The prototype stage proved crucial, with 14 new patents being generated along the way. Phase one – the mule



A mechanical final drive was chosen over a belt due to the distance from the engine

Willing and stable

Even though the centre of gravity is naturally very low, BRP wanted to make it as stable as possible. To this end a stability system is combined within the ABS unit to form the ESP. Varaldi explains, "It grabs data from the vehicle, such as wheel speed, yaw rate, lateral and longitudinal acceleration, steering position, brake demand, etc. With that data, it analyses the present and predicts the coming state of it. If the future is considered as not suitable, the vehicle stability system (VSS) will

intervene by using individual brakes, increasing or releasing pressure or altering engine torque."

The tyres are new and unique. Supplied by Kenda and developed for the Can-Am Ryker, there are two different sets. One is for general purpose use on tarmac, the other for the Rally Edition, is designed for a mix of paved and unpaved roads. Work on tyres started early on, with attention paid to weight distribution, vehicle size, cornering balance and engine power.



Varaldi confirms, "We wanted a balanced vehicle, so we studied braking, cornering, different grip levels and hydroplaning, comfort and wear."



phase – consisted of validating the layout and shape, with the orientation of everything on board considered. Phase two featured loops to validate concept details, function and then the reliability. The extra time and expense of so many physical prototypes was justified, as Varaldi explains, “At each stage, we discovered and reinforced or solved issues. As an example, we optimised some elements such as increasing the stiffness of the front axle to improve the fun and the dynamic behaviour by adding a cross member. Another example is adding some padding to help the tool-free adjustable foot rest continue to slide well over time.”

One conversation the engineers had early on concerned material

choices. “We were guided mostly by three objectives, two of them coming from the key pillars of the projects,” continues Varaldi. “It must be affordable, which impacts final cost, and fun, which translates into the right stiffness and weight for the handling. The third objective comes from our eco-responsibility, which meant choosing the right materials, limiting the pollutants and optimising the recyclability.”

The design is split into two modules. The lower one, which takes care of the major loads is made from steel tubes and stampings. The upper one is made from a composite of plastic and long fibres manufactured with a compression process. This second

structure is multifunctional, like many parts on the machine, as it is part of the external body and takes some dynamic load with the steering, as does the seat base, while holding the fuel tank, storage compartment and lights.

“This approach was very much part of the design philosophy,” notes Varaldi. “We worked with a few key elements to guide our design in the right direction. More specifically: first, no parts should have only one function and all parts should do as much as possible. Second, development of the platform using a modular approach with group functions for efficiency. And finally, limit ourselves to the needs and suppress the nice-to-have.”

Power packed

The Can-Am Ryker weighs around 300kg. The two engine options are a 600cc two cylinder unit producing 50HP or a 900cc three cylinder unit producing 82HP. Both are electronically controlled and the latter features an ECO mode and a Sport mode. Both options

come equipped with a 4.5in digital display housing a speedometer, tachometer, odometer, trip counter, gear position indicator, distance to empty alert, engine warning lights, fuel gauge and clock.

The tank capacity is 20 litres, and the fuel is Premium unleaded.



DRIVETRAIN

To power the thing along BRP selected a longitudinal inline BRP Rotax engine, with two or three cylinder options. These are assembled in Austria and Queretaro, Mexico.

“We chose this engine arrangement because as well as good performance it works well from an ergonomic perspective, it’s smaller between the driver’s legs. It is also optimised for the inertia distribution for better handling,” observes Varaldi.

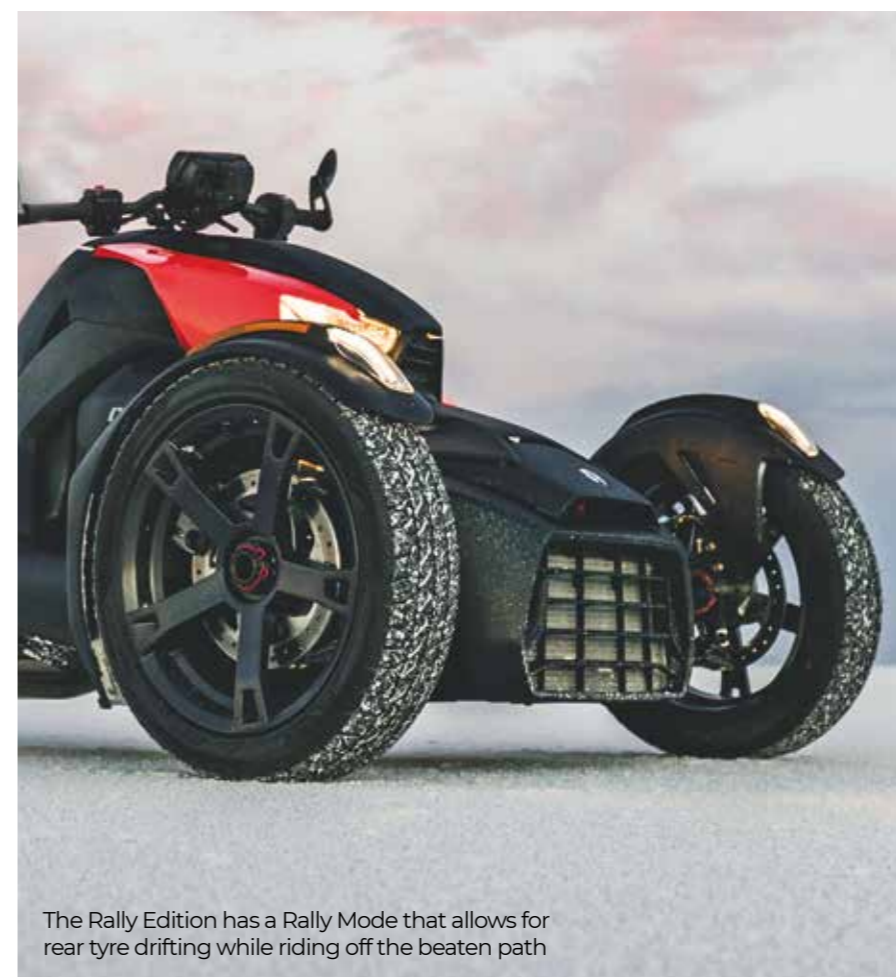
The gearbox is a modified version of a BRP CVT, based on the companies’ many years of experience with this type of drive. A driveshaft was chosen to transmit torque to the rear. This technology was chosen because it is robust and durable, lowering the cost of ownership. And it gives a smoother ride. “The driveshaft is also able to accommodate the distance versus a chain because the rear wheel is too far away from the power pack,” notes Varaldi. “And to nail this choice, it is better packaging than a belt, which allowed us to drop the seat height for



A lever on the left selects reverse

a more fun ride, giving the go-kart sensation we were seeking, with better handling and a lower centre of gravity.”

Although this is clearly a performance machine, economy was also considered in



The Rally Edition has a Rally Mode that allows for rear tyre drifting while riding off the beaten path

tandem, with the optimisation of the engine and transmission parameters and all the CFD done at the start of the project to achieve better aerodynamic performance. An optional windscreen improves economy.

Talking of options, there are plenty of them. In fact, there are 75,000 possible configurations with the options available at purchase. Even the sales process is novel, with an augmented reality app to help potential buyers choose. Varaldi explains, “A ‘ride like no other’ needs a shopping experience like no other, and that’s what the Ride Builder app is. We’re at the forefront of bringing AR to the industry. People can design and build their dream machine, and then see it right in front of them in their driveway or even their living room.”

Production is taking place in Juarez, Mexico, where there is a mix of manual and robot assembly. The assembly lines are automated with AGVs and buggies on a track. Varaldi concludes, “This represents a US\$350 million business at BRP, and we expect that number to triple in the next five years.” •