Cross Go Kart

Chalwad Pruthviraj Dilip¹, Tighile Kaustubh Krishna², Panchal Rushikesh Satish ³ GatadeShriprasad Anil⁴, Bhosale Shravani Sharad⁵, Prof .Bidve Mangesh Angadrao⁶ ^{1, 2, 3, 4, 5} Dept of Mechanical Engineering

⁶Guide HOD, Dept of Mechanical Engineering

^{1, 2, 3, 4, 5, 6} Vishweshwarayya Abhiyantriki Padvika Mahavidhyalaya, Almala, Maharashtra ,India.

Abstract- Cross go-karts, or off-road go-karts, or dune buggies, are small cars meant for off-road use, a combination of recreational motorsports and engineering technology. This essay discusses the basic principles behind their design, performance characteristics, applications, and related safety measures. The aim is to evaluate their usability, mechanical designs, and prospects for the future in both leisure and utilitarian use.

Keywords- Chassis, Go-Kart

I. INTRODUCTION

Cross karts, or off-road go-karts and buggies, are a specialized and thrilling category of motorsport. Light in weight and open-wheeled, cross karts are designed to take on diverse and demanding off-road conditions, with a mix of agility, speed, and ruggedness. Differing from their trackbiased go-kart relatives, cross karts have strong frames, longtravel suspension, and frequently more powerful engines to cover dirt tracks, gravel roads, and even tougher terrain. This research paper seeks to investigate the complex universe of cross karts, including their engineering and design concepts, safety factors, the terrain of racing and recreational purposes, and their evolution over time

II. HISTORICAL

Evolution Cross karts can trace their roots to the overall development of go-karting in the mid-20th century. With go-karting becoming more popular, enthusiasts began to adapt and modify karts for unpaved surfaces. As a result, vehicles were developed with more robust frames, suspension systems, and off-road tires. As time passed, manufacturers specialized in designing and producing karts for off-road use. The activity developed popularity throughout theworld with design and type of racing changing across regions. As more robust and dependable motors became available and advances in suspensions were introduced, the pace and sophistication of today's cross karts are increasing. More off-road interest in motorsport, combined with ease of cross cart availability, has driven these on-going rises in popularity and development

III. DESIGN AND ENGINEERING

Cross kart design and engineering focus on durability and offroad capabilities. The major features are:





3.1 Frame Construction:

Cross kart frames are most commonly constructed with high-strength steel tubing (e.g., mild steel or chromoly steel) to provide support for off-road driving stress, including impacts and torsion loads. The frame is intended for structural reliability and driver protection, with roll cages or protection bars used. The geometry of the frame, including wheelbase and track width, is designed in detail to provide the optimum stability and handling on uneven surfaces. Increased wheelbases are used to enhance stability at higher speeds, while reduced wheelbases are used for improved manoeuvrability through sharp sections. An increased track width also helps in improved stability. Computer-Aided Design (CAD) software is usually used to design different frame geometries and examine their impact on handling characteristics.

Table 1: Property of the material for the Fabrication of the chassis

Material name	Ultimate tensile strength	Young's Modulus	Density
AISI 1018	440	200	7870

Values (in mm)

Table 2: Table caption Parameters Front track width

Front track width	1252.72
Rear track width	1249.68
Wheelbase	2133.6
Overall length	2590.8
Overall height	1432.56
Overall width	914.4

3.2 Suspension Systems:

Perhaps the most significant differences between cross karts and conventional go-karts are the use of sophisticated suspension systems. The suspension systems of cross karts are designed to absorb shock and maintain the tires in contact with the ground over rough terrain. Independent suspension systems with A-arms, trailing arms, or swingarms combined with shock absorbers and springs are common suspension setups. The suspension travel is much greater than in track karts, and therefore the wheels can swivel over bumps. Suspension tuning (spring rate, damping) plays a significant part in achieving an optimum compromise between ride quality and handling performance. Anti-squat and antidive geometries are typically applied to minimize objectionable chassis motion during acceleration and braking and consequently enhance traction and control.

3.3 Engine

In this cross go kart we have used engine of a motorcycle TVS apachertr 160 Cross karts are usually powered by gasoline engines, typically four-stroke engines.

The engine is the heart of a cross kart, providing the power needed to tackle challenging off-road terrain. Unlike traditional cross go-karts designed for paved surfaces, cross karts typically utilize more robust and powerful engines. Motorcycle Engines These are very popular due to their highperformance characteristics, being lightweight and producing high RPMs and torque suitable for off-road racing and demanding conditions. The choice of engine for a cross kart depends on factors like the driver's age and experience, the intended use (recreational or racing), the specific racing class regulations, and budget. The trend in higher-performance cross karts leans towards adapted motorcycle engines due to their excellent power-to-weight ratio.

3.3.1Engine Calculation

For the cross Go-Kart we had following Engine with following Engine Specification

Table 2

Table 5		
Model	TVS Apache RTR 160	
Engine type	Vertical Single Cylinder	
	Four stroke	
Displacement	159.7 CC	
Cylinders(qty)	1	
Cylinder Bore	Cast Iron	
Type of fuel	Gasoline	
Net torque	13.85 Nm @ 7000 rpm	
Maximum speed	100 km/hr in 16.7 sec	

3.4 Drivetrain

The engines produce the power and torque needed to drive off road. The drivetrain comprises a manual clutch, a chain drive train, and a solid rear axle. In contrast to some onroad machines, cross karts tend not to feature a differential, so both rear wheels turn at the same speed. This can be beneficial inloose conditions to keep momentum up but demands gentle steering input through corners



3.5 Steering

Cross go-karts use rack-and-pinion steering systems for precision control. Steering geometry is carefully designed to provide manoeuvrability without compromising stability.

Table 4: Steering	System	Calculation
-------------------	--------	-------------

Steering type	Ackerman	
Steering column	Rigidly mounted	
Steering wheel diameter	365.76 mm	
Turning radius	1295.4 mm	
Steering ratio	1:2	

3.6 Braking

Braking systems usually consist of hydraulic disc brakes on all wheels, offering strong stopping power and heat resistance. Breaking Calculation

For the breaking we had caliper and master cylinder

calliper

- □ Double piston calliper
- □ Brand-Endurance
- □ Double piston calliper
- □ Weight-950 grams
- □ Single outlet master cylinder with reservoir

Master cylinder

- \Box Single outlet master cylinder
- $\hfill\square$ Brand-Endurance with baja pulsar reservoir
- □ Weight: 350 grams



3.7 Roll Cage/Protective Structure:

A robust roll cage or protective framework that envelops the

driver must be present to provide protection in the event of a

rollover. These frameworks are designed to meet some safety s pecifications dictated by racing commissions.

Safety Harness: Four- or five-point safety harnesses hold the driver firmly in place in the seat so that he or she will not be thrown out or shuffled around significantly upon impact.

Protective Headgear and Equipment: Drivers need to wear certified helmets, protective eye or face shields, gloves, and appropriate protective clothing, such as racing suits or long-sleeved heavy shirts and trousers.

Vehicle Inspection: There needs to be a proper check on the entire vehicle, that is, its frame, suspension, brakes, and tyres in order to ensure safe operation.

Track/CourseDesign: Inorder to host an appropriate racingevent,thedesignoftrack/courseis an importantaspect regarding safety. Features that are needed areto provide widerun-offareas, correct signage, and removal of harmful obstacles.

Rules and Regulations: Racing organizations implement and enforce rules and regulations concerning safety to manage vehicle construction, driver gear, and ontrack conduct.Racing and Recreational Use Cross karts are employed both for competitive racing and recreational purposes.

IV. CONCLUSION

Cross karts are a high-energy and exciting part of motorsports that provide an interesting off-road driving experience. They are designed and engineered with the emphasis on ruggedness and suspension, which allows them to conquer difficult terrain. Safety is still a top priority, with tight regulations and safety features in both racing and leisure use. The universe of cross karts includes formal race competitions and off-road excursions for fun, attracting a diverse group of followers. From their initial modifications of the classic gokarts to the high-tech vehicles of today, cross karts have found a unique niche in the landscape of motor sports and continue to grow with improving technology and engineering.

REFERENCES

- [1] Indian Karting Championship Rule Book.2018
- [2] Kiral Lal, O.S. Abhishek, (2016). Design, analysis and fabrication of Go-Kart, Int. J. Sci. Eng. Res., VGovardhana Reddy, Md. Hameed.(2016) Design report of a go kart vehicle, Int. J. Eng. Appl. Sci. Technol., Vol. 1, Issue.

- [3] Prof. Ambeprasad Kushwaha & Prof. Avinash Chavan Tapeshwar A. Das, Shubham S. Kenjale, Jay A. Patel, Pradeep R....volume 7, Issue.
- [4] Nitish Kumar Saini, Manmeet Singh Panwar, Akhilesh Maurya, PraveenAjay Singh. Design and Vibration Analysis of Go-kart ChassisInternational Journal of Applied EngineeringResearch, ISSN 0973-4562. 2019;14(9):53-60. (Special Issue) ©Research India Publications. http://www.ripublication.com