A Study of Go-kart Frame Structure Considering Torsional Stiffness and Collision Strength

游家華、梁卓中

E-mail: 9314783@mail.dyu.edu.tw

ABSTRACT

Go-kart (also called KARTING) has become a recognized and important part of the automobile racing hierarchy. It is one kind of Formula for designing racing car in the world. Designing every single component or system of the frame must have racing functions. The frame of Go-kart influences road dynamic behavior for competition. To satisfy the philosophy of simplicity, competition Go-kart regulations require the absence of suspension systems and differential gear. Thus elastic frame characteristics are highlighted by the absence of suspension elements and the global dynamic behavior is influenced by chassis shape and stiffness and by tires characteristics. Hence frame stiffness must be carefully evaluated in order to compensate the absence of differential gear by producing loads transfer during a turn. The accidental statistics compiled by 10 state regulatory agencies of America that the majority of reported. It could show that the number of accident reports of Go-kart hit stationary object that 24% of all accidents, the number of accident reports of Go-kart ride collided that 64% of all accidents, two rates that 88% of all accidents. Therefore the design of Go-kart frame is very important subject for collision safety. Therefore, this study investigated both handling and collision of Go-kart frame using LS-DYNA3D software. By added pole or change width of the frame to improve handling and collision's safety. And according to Solazzi frame as a referent prototype model. The design and setup of fourteen various Go-kart frame according to ratification by international authority (CIK/FIA). The discussion that the whole torsional stiffness of Go-kart frame, the front, the lift, the right bumper amount of shrinking, the maximum compression of frame during different direction, the maximum energy absorption of each bumper and frame during different direction, etc. These results may provide a useful reference for designing Go-kart frame.

Keywords : Go-kart frame, torsional stiffness, collision strength, LS-DYNA3D

Table of Contents

REFERENCES

1. 經濟部工業局新聞稿, "經濟部工業局推動新興產業之發展政策與方向", 2002年。 2. http://www.honeylakesports.com/kart%20structure.htm/ 3. Saferparks, "Sources of Data on U.S. Amusement Ride-Related Accidents and Injuries", Revision 2, 2002. 4. 竹南小型賽車場， http://www.rks.idv.tw/index01.asp/ 5. 中華賽車會, "如何振興台灣小型賽車運動社論", 2003年。 6. Lonny L. Thompson, Srikanth Raju and E. Harry Law, "Design of a Winston Cup Chassis for Torsional Stiffness", SAE Paper, No.983053, pp.2571~2583, 1998. 7. Lonny L. Thompson, Pipasu H. Soni, Srikanth Raju and E. Harry Law, "The Effects of Chassis Flexibility on Roll Stiffness of Winston Cup Race Car", SAE Paper, No.983051, pp.2558~2570, 1998. 8. Lonny L. Thompson, Jon K. Lampert and E. Harry Law, "Design of a Twist Fixture to Measure the Torsional Stiffness of a Winston Cup Chassis", SAE Paper, No.983054, 1998. 9. John W. Melvin, Kenneth J. Baron, William C. Little, Thomas W. Gideon, John Pierce, "Biomechanical Analysis of Indy Race Car Crashes", SAE Paper, No.983161, 1998. 10. Kerry T. Wilcoxon, "Occupant Restraint Design for Commercial Go-karts", SAE Paper, No.1999-01-1294, 1999. 11. Andrew Deakin, David Crolla, Juan Pablo Ramirez and Ray Hanley, "The Effect of Chassis Stiffness on Race Car Handing Balance", SAE Paper, No.2000-01-3554, 2000. 12. R. Baudille, M. E. Biancolini, C. Brutti, L. Reccia, "Analisi integrata multi-body FEM del comportamento dinamico di un kart", AIAS 2001, Alghero, settembre 2001. 13. E. Pezzuti, L. Reccia, A. Ubertini, A. Gaspari, "Analisi dell'interazione pilota-kart mediante techica multi-body", AIAS 2002, settembre 2002. 14. L. Solazzi, S. Matteazzi, "Analisi e sviluppi strutturali di un telaio per kart da competizione", AIAS 2002, settembre 2002. 15. M. E. Biancolini, R. Baudille , C. Brutti, L. Reccia, "Integrated multi-body/FEM analysis of vehicle dynamic behaviour", Fisita Congress, giugno 2002. 16. T. Amato, F. Frendo , M. Guiggiani, "Handling Behavior of Racing Karts", SAE Paper, No.2002-01-2179, 2002. 17. http://www.torvergata-karting.it/article/articleview/11/1/2/ 18. Filho, R. R. P , Rezende, J. C. C , Borges, J. A. F , "Automotive Frame Optimization" , SAE Paper, No.2003-01-3702, 2003. 19. 梁卓中, 鄧作樑, 游家華, "單人座小型賽車Go-kart行駛彎道之車架分析" , 第20屆機械工程研 討會, 第C冊固力與設計上集, No.1701~1708, 2003. 20. CIK/FIA Technical Regulations, 2003. 21. CIK/FIA Homologation Regulations, 2003. 22. Thomas Gillespie , "Fundamentals of Vehicle Dynamics", SAE Paper , pp.210-214,1993. 23. LS-DYNA THEORETICAL MANUAL， V960 ,1998. 24. 劉俊宏, "車架結構之碰撞強度分析", 大葉大學機械工程學系碩士班畢業論文, 2002. 25. 林智群, "車輛碰撞之動態反應分析", 大葉大學機械工程學系碩士班畢業論文, 2003. 26. 林忠旗, "高速撞擊下AISI 4340合金鋼之變形行為分析與模擬", 成功大學機械工程學系碩士畢業 論文, 1995.