A Study of Rollover Crashworthiness of Bus Structure According to ECE R66

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ABSTRACT

ABSTRACT This paper adopted finite element software LS-DYNA and proposed a simulation procedure considering the Economic Commission for Europe Regulation — ECE R66 to study full bus frame roll-over and pendulum test. Frist of all, the simple bay section frame is adopted to verify the simulation procedure, and then 6 meter bay section rollover test, simple bay section and 1.8 meter bay section pendulum test, and last full bus frame roll-over test are studied in details, including residual space, energy condition and effective plastic strains. Research results for the simulation of crash of full bus and bay section may provide a useful reference for designers. Future studies may be extended to consider full bus body structure optimization and models can be used to evaluate occupant compartment intrusion and to assess occupant protection countermeasures in various impact scenarios. Key Words : bus, body section, roll over, pendulum, LS-DYNA

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REFERENCES

參考文獻〔1〕行政院交通部， http://www.motc.gov.tw/〔2〕內政部警政署， http://www.npa.gov.tw/〔3〕經濟部技術處(2003)，92年度科技專案計畫大客車車體設計技術研討會〔4〕王偉中，(1993)“大客車車體結構之安全性研究”，財團法人車輛研究測試中心〔5〕范志銘，(1998)“車輛傾斜穩定度檢測規範及標準比較研究”，經濟部八十八年度科技研究發展專案計畫技術報告〔6〕范志銘，(1999)“國內傾斜穩定度法規檢測制度建立研究”，經濟部八十八年度科技研究發展專案計畫技術報告〔7〕辜宏恩，(2003)“大型汽車傾斜穩定度研究”大葉大學機械工程學系碩士班技術報告〔8〕Roger M. Zimmerman, (1979)“Tests and Materials for School Bus Retrofit Applications”, Stapp Car Crush Conference〔9〕J.C. Brown,(1990)“The design and type approval of coach structures for roll-over using the CRASH-D program”Int. J. Vehicle Deign, vol. 11, nos 4/5〔10〕Taeg Kim,(1993)“study on the stiffness improvement of bus structure” Society of Automotive Engineers 931995〔11〕E. Larrode, A. Miravete, F. J. Fernandez, (1995)“A New Concept of a Bus Structure Made of Composite Materials by Using Continuous Transversal Frames”, Composite Structure, Vol.32 345-356〔12〕閔永軍，許林雲，(1997)“客車車身的降噪結構設計”，客車技術與研究(中國大陸)〔13〕徐康聰，黃天澤，(1997)“客車折彎件的電腦分析”，客車技術與研究(中國大陸)〔14〕羅升，(1997)“中型客車三段式車架設計”，客車技術與研究(中國大陸)〔15〕馬建，(1997)“大客車車架縱梁強度程式化計算模型探”，客車技術與研究(中國大陸)〔16〕劉兆賢，(1997)“CK6980型客車底盤車架的設計”，客車技術與研究(中國大陸)〔17〕Matyas Matolcsy, (1998)“Development Possibilities in Relation to ECE Regulation 66 (Bus Rollover Protection)”, The 16th International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number:98-S4-O-04〔18〕Sandor Vincze, (1998)“European Test Methods for Superstructures of Buses and Coaches Related to ECE R66(The Applied Hungarian Calculation Method)”, The 16th International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number:98-S4-P-18〔19〕James C. Anderson, (2000)“Rollover Crashworthiness of a New Coach Structure”,Society of Automotive Engineers 2001-01-3520〔20〕Dr Matolcsy, Matyas , (2002)“Protection of Bus Drivers in Frontal Collisions” The 18th International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number:359〔21〕Giovanni Belingardi, Davide Gastaldin, Paolo Martella, Lorenzo Peroni, (2002)“Multibody Analysis of M3 Bus Rollover :

Structure Behaviour and Passenger Injury Risk ” The 18th International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number:288〔22〕Hiroyuki,Yoshihiro, Fujio, Shungo, (2001)“Research on Bus Passenger Safety in Frontal Impacts”, The 17th International Technical Conference on the Enhanced Safety of Vehicles (ESV) , Paper Number:287〔23〕Jeffrey C.Elias, Lisa K. Sullivan, Linda B. McCray, (2001)“Lanrge School Bus Safety Restraint Evaluation”, The 17th International Technical Conference on the Enhanced Safety of Vehicles (ESV) , Paper Number:345〔24〕Linda McCray, Aida Barsan-Anelli, (2001)“Simulations of Large School Bus Safety Restraint-NHTSA”, The 17th International Technical Conference on the Enhanced Safety of Vehicles (ESV) , Paper Number:313〔25〕www.nhtsa.gov〔26〕www.cic.cranfield.ac.uk〔27〕劉俊宏, (2002)“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〔28〕林智群,(2003)“車輛碰撞之動態反應”, 大葉大學車輛工程研究所碩士班畢業論文〔29〕LS-DYNA THEORETICAL MANUAL, V960 ,1998