

Traffic Safety Facts

Research Note



April 2007

DOT HS 810 752

Summary of Novelty Helmet Performance Testing

The National Highway Traffic Safety Administration (NHTSA) tested seven popular “novelty” helmets to determine how they compare to properly certified helmets. The novelty helmets all performed significantly worse, based on their lack of ability to absorb impact energy during a motorcycle crash. Novelty helmets, in general, had very little, if any, impact-absorbing capability. Computer simulations of head impact attenuation tests show a 100-percent probability of brain injuries and/or skull fracture for the person involved in a crash while wearing a novelty helmet.

Background

Motorcycle fatalities have increased for eight straight years. In 2005, 4,553 motorcycle riders died, which represents a 13-percent increase over 2004, during which 4,028 motorcycle riders died.¹ The 2006 NOPUS survey, a probability-based observational survey of motorcycle helmet use in the United States, found that 14 percent of motorcycle riders use helmets that do not comply with Federal Motor Vehicle Safety Standard (FMVSS) No. 218, *Motorcycle Helmets*. These helmets were identified by their lack of coverage or thickness.²

Despite the scientific evidence showing that helmets that meet or exceed the minimum requirements of FMVSS No. 218 reduce deaths and injuries to motorcycle riders, many Americans choose to wear uncertified helmets, often called “novelty” helmets. The objective of this report is to provide comparative data to consumers to quantify the lack of head injury protection offered by uncertified novelty helmets as compared to helmets which have been properly certified to meet the minimum performance requirements of FMVSS No. 218.

Certified Motorcycle Helmets versus Uncertified Novelty Helmets

When purchasing a helmet for on-road use, a consumer has two options. The first is a *certified motorcycle helmet* that is certified by the manufacturer to conform to all aspects of FMVSS No. 218. In accordance with FMVSS No. 218, the symbol “DOT” has been

applied to it, constituting the manufacturer’s certification that the helmet conforms to all aspects of the standard. A person may not apply the symbol to the helmet if, in exercising reasonable care, the person has reason to know the certification is false or misleading. Each year, NHTSA conducts a testing and inspection program on randomly selected sets of helmets to identify those that do not meet the requirements of the standard, and which may be determined to be noncompliant.

The second option available to consumers is an *uncertified novelty helmet*. The term *novelty helmet*, as used in this article, is a term that describes a helmet that is similar in form to a motorcycle helmet designed for on-road use, but is not certified by a manufacturer to meet the minimum safety performance requirements of FMVSS No. 218. In general, these helmets have little or no impact-attenuating lining inside their shells, they are not made to withstand the penetration requirements of FMVSS No. 218, and their retention systems do not ensure that the helmets stay fastened on motorcycle riders’ heads in the event of a crash. A novelty helmet is easily identified by a consumer because the manufacturer has not labeled it with the symbol “DOT” on the rear of the helmet. In addition, most suppliers refer to these helmets as novelty helmets or distinguish them in some other way from certified helmets.

Evaluation Methodology

NHTSA’s Office of Vehicle Safety Compliance (OVSC) purchased seven different novelty helmets from the market place and tested them at an independent laboratory using the equipment and performance parameters used to test certified motorcycle helmets. These helmets were made by different manufacturers and were generally representative of novelty helmets of various sizes, styles, and costs.

Results

When compared to certified motorcycle helmets, novelty helmets perform significantly worse in terms of their ability to absorb impact energy during a motorcycle crash. A certified helmet is permitted to transfer no more than a 400g acceleration to a headform in an FMVSS No. 218 test which measures energy attenuation of the helmet during specific impacts. Novelty helmets were shown to transfer significantly higher accelerations (636g to 992g) to the headform during these testing impacts since they have very little or no energy-attenuating liner. Thus, in a motorcycle crash, the energy

¹ www-nrd.nhtsa.dot.gov/pubs/810639.pdf; DOT HS 810 639, Motor Vehicle Traffic Crash Fatality Count & Estimates of People injured for 2005 (August 2006)

² DOT HS 810 678, Traffic Safety Facts - Research Note: Motorcycle Helmet Use in 2006 - Overall results by Donna Glassbrenner, Ph.D., and Jianqiang Ye. National Highway Traffic Safety Administration, Washington, DC. 2006.

Table 1. FY06 Novelty Helmet Test Data Summary

		Supplier, Model*, Size						
		Frenchy's Helmets, Inc.	The Helmet Source	Hot Leathers	Helmets R Us	Iron Braid	Helmets Etc.	Barney's Leather
FMVSS No. 218 Requirement		Dante II	German	Hawk Style Novelty	Smokey Novelty	ACC Polo Novelty	Novelty Super Eagle	100EZ/EZ Rider
		Large	Large	Medium	Medium	Medium/Large	Small	Small
S5.1 Impact attenuation	Peak accelerations shall not exceed 400g	Fail	Fail	Fail	Fail	Fail	Fail	Fail
		989 g	989 g	984 g	988 g	636 g	981 g	992 g
S5.2 Penetration	The striker shall not contact the surface of the test headform	Fail	Fail	Fail	Fail	Fail	Fail	Fail
S5.3 Helmet retention system	Shall attain the 136.1 kg (300 lbs) load without separation and without moving more than 2.5 cm (1")	Fail	Pass	Fail	Fail	Fail	Fail	Fail
		Separated at 101.2 kg (223 lbs) load	Met requirement	Separated at 56.7 kg (125 lbs) load	Separated at 59.9 kg (132 lbs) load	Excessive elongation at ~22.7 kg (50 lbs) load	Excessive elongation at full load	Excessive elongation at full load

*Helmets may be sold under different names at other dealers.

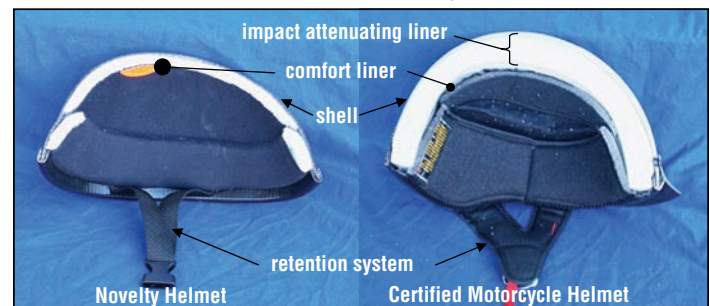
that would have been absorbed by the energy-attenuating liner found in a certified helmet would be transferred to a motorcycle rider's head. NHTSA used the acceleration pulse data obtained during the tests to assess the probability for injury for an individual wearing one of these types of novelty helmets. The data was entered into the Simulated Injury Monitor (SIMon) software that uses a finite-element model of adult skull and brain characteristics to understand and interpret head trauma. The system calculated head injury criterion, commonly called HIC, skull fracture correlate, and various types of brain injuries. All analyses gave a 100-percent probability of brain injuries and skull fracture, indicating that the person wearing the helmet will sustain fatal head injuries.

Every novelty helmet tested easily allowed the striker, the test device which transfers a penetration blow to a helmet during a compliance test, to penetrate the helmet's shell and contact the headform, which is not permitted by FMVSS No. 218. Novelty helmets lack the design characteristics to prevent excessive penetrations.

Also, novelty helmets are not generally designed to ensure that the helmets' strap retention systems can withstand typical crash loads. Novelty helmets failed the retention requirements of FMVSS No. 218 because the retention systems either separated or elongated more than one inch during the test. A retention system that can withstand forces applied to it during a motorcycle crash is essential to ensure that the helmet will remain on the motorcycle rider's head during the crash, providing critical protection.

Representative novelty helmets and certified motorcycle helmets are shown in Figure 1.

Figure 1. Cross sections of a representative novelty helmet on the left and a representative certified motorcycle helmet on the right.



Conclusions

The novelty helmets tested performed significantly worse than any helmet that complies with FMVSS No. 218. In general, noncompliant novelty helmets will not protect motorcycle riders during motorcycle crashes from either impact or penetration threats, and will not likely be retained on motorcycle riders' heads during crashes.

Novelty helmets present motorcycle riders with a higher risk for skull fracture and brain injury when compared to certified helmets. A motorcycle rider who wears a novelty helmet during a motorcycle crash in which the rider falls to the ground and the rider's head contacts a rigid body such as a paved road will likely sustain fatal head injuries. Motorcycle riders who wear novelty helmets and believe that "something is better than nothing" have a false sense of security regarding the protection afforded them by helmets not designed or manufactured to comply with FMVSS No. 218.



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For More Information

The OVSC compliance testing database is available at www.nhtsa.gov/cars/problems/comply/Index.cfm. To search for motorcycle helmet compliance test results, search by "Equipment" (rather than "Vehicle") and "FMVSS No. 218"; the search may be limited further by searching for a compliance test year or by make and model of a helmet. In addition to a summary of the test results, for motorcycle helmet tests, there is a link to the actual test report. Reports for the 2007 testing year will be available in May 2007.