

brake in normal driving and that it was therefore not surprising that they mostly used the rear brake when a crash was imminent.

These research reports provided valuable information in an area where reliable data are scarce. However, it is not clear from the reports or any other available literature whether the reliance of riders on the rear brake in emergencies has anything to do with the placement of the rear brake control. More specifically, the reports did not add to our understanding whether lack of standardization of the controls caused rider error in emergencies, or if overall unfamiliarity with the motorcycle was the more important factor in crashes.

The agency is addressing other motorcycle safety issues by issuing a *Motorcycle Safety Program* (January 2003), which calls for new program actions to supplement existing initiatives to reduce the number of motorcycle fatalities and injuries. Motorcycle fatalities have increased from 2,116 in 1997 to 3,181 in 2001, an increase of over 50 percent. *The Motorcycle Safety Program* may be viewed at <http://www.nhtsa.dot.gov/people/injury/pedbimot/motorcycle>.

C. Brake Control Location Study Funded by Aprilia

Because the available studies did not show a connection between rear brake control location and crashes, before we granted Aprilia's petition for temporary exemption for the Leonardo 150, we asked Aprilia to comment on our concern that a left hand rear brake control on a vehicle that is more powerful than a motor-driven cycle may confuse riders, resulting in crashes. As earlier stated, the purpose of FMVSS No. 123 is to "minimize accidents caused by operator error in responding to the motoring environment, by standardizing certain motorcycle controls and displays." Our concern was that differing rear brake control locations may contribute to unfamiliarity with a motorcycle's controls and thus degrade a rider's overall braking reaction beyond what would exist on a motorcycle with a conventionally configured (right foot operable) control.

Aprilia responded by hiring Carter Engineering of Franklin, Tennessee, to conduct a study comparing braking reaction times of riders on an Aprilia scooter without a foot brake and a conventional scooter with a foot brake. The report on that effort, "Motor Scooter Braking Control Study" (Report No. CE-99-APR-05, May 1999), may be reviewed at the Department of Transportation's Docket at [http://](http://dms.dot.gov)

dms.dot.gov, Docket No. NHTSA-98-4357.

In the Carter Engineering study, test subjects (adults test-riding the scooters) compared rear braking on a Leonardo 150 with a Yamaha XC-125 Riva with a conventional foot-operated rear brake. The two test scooters were arranged side-by-side facing a traffic signal light positioned several yards away at approximately eye level. Test subjects with varying degrees of motorcycle riding experience were selected randomly from among dealership employees and customers. Each subject simulated "riding" both models, which were stationary on their center stands during the testing. The test subjects responded to the traffic signal by activating the brakes whenever a red light was observed. The subjects' braking reaction times were measured electronically.

The study concluded that the subjects' braking response times on the Leonardo were shorter on average than those measured on the Yamaha scooter with conventional right-foot mounted brake controls. Aprilia commented that "[o]verall, the test subjects' reaction times on the Leonardo were approximately 20 percent quicker than their reaction times on the conventional motorcycle." Aprilia stated its belief that "a less complex braking arrangement like that of the Leonardo will improve rider reaction in an emergency situation."

We note that the test subjects, selected at a franchised dealer of Honda, Yamaha, Suzuki and Kawasaki motorcycles, were either employees or customers of the dealership. As such, all test subjects presumably have experience in riding motorcycles or scooters, and are probably not novice riders. We have no indication of how much the test subjects knew about the study, or whether they were informed of what would be the desired braking results, from Aprilia's and Carter Engineering's viewpoint.

Nevertheless, Aprilia did provide some evidence, in the form of the Carter Engineering report, showing that American riders do not appear to hesitate in using a left handlebar-mounted rear brake control and that riders may actually gain some benefit in their braking response time. Based in part on the Carter Engineering study, we granted the Aprilia petition, interpreting the Carter Engineering report as an indication that the Leonardo 150 rider's braking response was not likely to be degraded by the different placement of the brake controls, thus addressing our main safety concern and meeting the

statutory requirement for grant of an exemption.

D. Search of NHTSA's Consumer Complaint Database

As an additional measure to determine whether there is a safety-related problem with placement of the motorcycle rear brake control, we conducted a search of the NHTSA database of consumer complaints, recalls, and service bulletins to look for problems arising from motorcycle brake controls. We found only one complaint since 1995 directly relating to brake controls. In that complaint, the owner of a model year 1997 touring motorcycle complained that the right foot brake was in a "somewhat awkward position," requiring the rider to rotate his ankle too far downward to achieve effective brake activation. Although FMVSS No. 123 specifies for the rear brake control, downward motion for the operator's right foot, the range of motion to actuate motorcycle foot brakes is not an aspect of performance regulated in FMVSS No. 123.

IV. The Regulatory Alternatives for Rear Brake Control Location

With the motorcycle crash causation studies and Carter Engineering tests as background, we propose two regulatory alternatives for the rear brake control location. After considering the comments on this proposal, we will adopt one of the alternatives in the final rule. The first alternative would require the rear brake control to be located on the left handlebar for any motorcycle that lacks a clutch, regardless of the motorcycle's configuration. The second alternative would require the left handlebar location only for clutchless motorcycles that are "scooters," a newly defined subset of motorcycles. Under either alternative, all other motorcycles would meet present FMVSS No. 123 rear brake location requirements that the rear brake is operated by a right foot control.

A. First Alternative

We propose the following as the first alternative: FMVSS No. 123 would specify two brake control configurations. The factor determining which of the two configurations the motorcycle manufacturer must use would be determined by whether the motorcycle is equipped with a clutch lever. Motorcycles with a clutch lever would be required to have the rear brake control on the right side operated by the rider's right foot. Motorcycles without a clutch lever would be required to have the rear brake control on the left handlebar and would have the option of