

principal theme of the comments was a sharp division of opinion about whether the dynamic rollover test should be a closed loop maneuver test like the ISO 3388 double lane change that emphasizes the handling properties of vehicles or whether it should be an open loop maneuver like a J-Turn or Fishhook that are limit maneuvers in which vulnerable vehicles would actually tip up. Ford recommended a different type of closed loop lane change maneuver in which a path-following robot or a mathematical correction method would be used to evaluate all vehicles on the same set of paths at the same lateral acceleration. It used a measurement of partial wheel unloading without tip-up at 0.7g lateral acceleration as a performance criterion in contrast to the other closed loop maneuver tests that used maximum speed through the maneuver as the performance criterion. Another unique comment was a recommendation from Suzuki to use a sled test developed by Exponent Inc. to simulate tripped rollovers.

The subsequent test program (using four SUVs in various load conditions and with and without electronic stability control enabled on two of the SUVs) showed that open-loop maneuver tests using an automated steering controller could be performed with better repeatability of results than the other maneuver tests. The J-Turn maneuver and the Fishhook maneuver (with steering reversal at maximum vehicle roll angle) were found to be the most objective tests of the susceptibility of vehicles to maneuver-induced on-road rollover. Except for the Ford test, the closed loop tests were found not to measure rollover resistance. Instead, the tests of maximum speed through a double lane change responded to vehicle agility. None of the test vehicles tipped up during runs in which they maintained the prescribed path even when loaded with roof ballast to experimentally reduce their rollover resistance. The speed scores of the test vehicles in the closed loop maneuvers were found to be unrelated to their resistance to tip-up in the open-loop maneuvers that actually caused tip-up. The test vehicle that was clearly the poorest performer in the maneuvers that caused tip-ups achieved the best score (highest speed) in the ISO 3388 and CU short course double lane change, and one vehicle improved its score in the ISO 3388 test when roof ballast was added to reduce its rollover resistance.

Due to the non-limit test conditions and the averaging necessary for stable wheel force measurements, the wheel unloading measured in the Ford test

appeared to be more quasi-static (as in driving in a circle at a steady speed or placing the vehicle on a centrifuge) than dynamic. Sled tests were not evaluated because we believed that SSF already provided a good indicator of resistance to tripped rollover.

B. National Academy of Sciences Study

During the time NHTSA was evaluating dynamic maneuver tests in response to the TREAD Act, the National Academy of Sciences (NAS) was conducting a study of the four SSF-based rollover resistance ratings and was directed to make recommendations regarding driving maneuver tests. We expected the NAS recommendations to have a strong influence on TREAD-mandated changes to NCAP rollover resistance ratings.

When NHTSA proposed the present SSF rollover resistance ratings in June 2000 (65 FR 34998), vehicle manufacturers generally opposed it because they believed that SSF as a measure of rollover resistance is too simple since it does not include the effects of suspension deflections, tire traction and electronic stability control (ESC). In addition, the vehicle manufacturers argued that the influence of vehicle factors on rollover risk is too slight to warrant consumer information ratings for rollover resistance. In the conference report of the FY2001 DOT Appropriations Act, Congress permitted NHTSA to move forward with its rollover rating program, but directed the agency to fund a National Academy of Sciences (NAS) study on vehicle rollover ratings. The study topics were "whether the static stability factor is a scientifically valid measurement that presents practical, useful information to the public including a comparison of the static stability factor test versus a test with rollover metrics based on dynamic driving conditions that may induce rollover events." The National Academy's report was completed and made available at the end of February 2002.

The NAS study found that SSF is a scientifically valid measure of rollover resistance for which the underlying physics and real-world crash data are consistent with the conclusion that an increase in SSF reduces the likelihood of rollover. It also found that dynamic tests should complement static measures, such as SSF, rather than replace them in consumer information on rollover resistance. The dynamic tests the NAS recommended would be driving maneuvers used to assess "transient vehicle behavior leading to rollover."

The NAS study also made recommendations concerning the statistical analysis of rollover risk and the representation of ratings. It recommended that we use logistic regression rather than linear regression for analysis of the relationship between rollover risk and SSF, and it recommended that we consider a higher-resolution representation of the relationship between rollover risk and SSF than is provided by the current five-star rating system.

We published a Notice of Proposed Rulemaking on October 7, 2002 (67 FR 62528) that proposed alternative ways of using the dynamic maneuver test results in consumer information on the rollover resistance of new vehicles. We chose the J-Turn and Fishhook maneuver (with roll rate feedback) as the dynamic maneuver tests because they were the type of limit maneuver tests that could directly lead to rollover as recommended by the NAS. We also proposed to use a logistic regression analysis to determine the relationship between vehicle properties and rollover risk, as recommended by the NAS. The resulting rollover resistance ratings were proposed to be part of NHTSA's New Car Assessment Program (NCAP). Also, we proposed two methods for presenting rollover resistance ratings for consumer information.

IV. Notice of Proposed Rulemaking

The TREAD Act calls for a rulemaking to determine how best to disseminate rollover test results to the public, and our Notice of Proposed Rulemaking (NPRM) of October 7, 2002 (67 FR 62528) proposed two alternatives for using the dynamic test results in consumer information on the rollover resistance of new vehicles. In this case the term "rulemaking" refers more to the process than to the product. This document does not amend the Code of Federal Regulations, but establishes NHTSA's policy on consumer information regarding the rollover resistance program. As mentioned above, this program places no requirements on vehicle manufacturers, only some on NHTSA.

While the TREAD Act calls for a rulemaking to determine how best to disseminate the rollover test results, the development of the dynamic rollover test is simply the responsibility of the Secretary. Based on NHTSA's recent research to evaluate rollover test maneuvers, the National Academy of Sciences' study of rollover ratings, comments to the July 3, 2000 notice, extensive consultations with experts from the vehicle industry, consumer groups and academia, and NHTSA's