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The Honorable Ricardo Martinez, M.D.
Administrator
National Highway Traffic Safety Administration
United States Department of Transportation
400 Seventh Street, S.W.
Washington, D. C. 20590

Petition to Open Rulemaking On

Federal Motor Vehicle Safety Standard No. 214

Side Impact Protection

July 2, 1998

750 First Street, NE Suite 901 Washington, DC 20002 Tel: 202/408-1711 Fax: 202/408-1699
World Wide Web: http://www.saferoads.org

SUMMARY

This petition asks the National Highway Traffic Safety Administration (NHTSA) to conduct rulemaking for the purpose of amending Federal Motor Vehicle Safety Standard (FMVSS) No. 214, Side Impact Protection, to increase the safety of occupants of passenger vehicles struck in lateral collisions.

Side impacts are one of the leading sources of motor vehicle deaths and injuries, and those injuries are especially severe. The current dynamic side impact standard, first adopted in 1988, was based on an agency prediction of continuing passenger vehicle decreases in size and weight. However, increases in the size, weight, market share, and fleet percentage of light trucks, vans, and sport utility vehicles (LTVs) over the last decade have magnified the threat of injury and death to the occupants of passenger cars and small LTVs. In turn, this increasing disparity of size and weight between LTVs and passenger cars has weakened the benefits that could be expected from the 1988 final rule.

The present requirements of the standard cannot accomplish a major reduction in the frequency and severity of occupant injuries resulting from lateral collisions. The dynamic test of Standard No. 214 includes compliance thresholds for thorax and pelvis acceleration that are undemanding and still permit the possibility of serious injury. Similarly, the vehicle surrogate used to impact passenger vehicles is especially inadequate for assessing the capabilities particularly of smaller LTVs to prevent serious injury when they are struck in lateral collisions by larger vehicles.

The petition evaluates several ways in which NHTSA could strengthen the standard. These include revisions of the passing scores for injury as well as of the design-of the Moveable Deformable Barrier (MDB) used to conduct side impact testing, especially by increasing- its weight, height, and stiffness to simulate better the increased overall aggressivity of a LTV as the striking vehicle in lateral collisions with passenger cars and with other LTVs.

NHTSA is also asked to consider, in lieu of the 1973 quasi-static cylinder test, the substitution of a dynamic lateral pole impact as a test of the structural integrity of the sides of passenger vehicles to resist intrusion and avoid failure of hinges and latches. Such a dynamic test not only better represents a "real-world" vehicle collision response, but could also secure manufacturer cost economies in compliance testing by coordinating with prospective requirements for dynamic tests using lateral pole impacts for compliance with Standard No. 201.

These actions do not have to be undertaken initially as mandatory changes to the existing standard whose current requirements can be met with only static countermeasures, including certain structural changes to the sides of passenger vehicles and the addition of strategically located padding. In order to foster greater reliance upon improved designs of side impact dynamic protection technologies, such as thorax air bags, NHTSA could approach the task of revising and improving Standard No. 214 by establishing compliance parameters that would be required only if manufacturers chose to use these dynamic side impact protection designs.

If NHTSA chose this rulemaking approach, a-proposed rule would be similar to the

recent preliminary rulemaking proposal issued by the agency for amending Standard No. 201 to increase the protection of the heads of vehicle occupants in side impacts. That agency initiative would permit, but not require, manufacturers to use dynamic head impact protection systems by meeting more demanding test requirements.

NHTSA strongly asserted its resolve in its 1995 final rule on Standard No. 2 14 to re-examine the standard for ways to improve side impact protection. Along with the agency's recently stated concern over the inordinate growth of LTVs and the threat to public safety they represent, this petition is a timely request for rulemaking action substantially to increase the level of occupant safety in lateral collisions. We believe that a dramatic increase in occupant protection when lateral impacts occur could be gained if both upper and lower interior side impact regulations promoted simultaneous deployment of dynamic countermeasures that prevent serious injury both to the thorax and to the head and neck.

This is a petition to open rulemaking for the purpose of reducing the risk of serious and fatal injuries to passenger vehicle occupants in side or lateral impacts by revising and improving the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 214. The current regulation governing lower vehicle interior side impact compliance standards consists of both a quasi-static and a dynamic test for cars and for light trucks, vans, sport utility vehicles, other multi-purpose vehicles (MPVs) and buses less than 10,000 pounds gross vehicle weight rating (GVWR).

I. The Current Requirements of Federal Motor Vehicle Safety Standard No. 214.

The current standard consists of two separate compliance testing requirements. The quasi-static compliance test, comprising intermediate and peak crush force limits, involves the application of a 12-inch diameter vertical cylinder/semi-cylinder pushed against the mid-point of a-passenger vehicle door or occupant area (coupes) to test localized intrusion by a narrow, tall, rigid fixed object hazard (for example, a tree, luminaire, or telephone pole). The quasi-static test for passenger cars took effect on January 1, 1973, and was extended to trucks, buses, and MPVs with an effective date of September 1, 1993. 56 FR 27427 et sec.

NHTSA added new, separate dynamic compliance requirements for lower interior side impact protection in passenger cars on October 30, 1990. 55 FR 45722 et seq. Sections S3(f) and S5 of these requirements were extended to MPVs, trucks, and buses with a GVWR of 6,000 pounds of less, with certain exclusions, effective September 1, 1998.

These new compliance requirements were specifically designed to measure the occupant effects of vehicle-to-vehicle lateral Collisions. The standard specifies a dynamic side impact test based on the use of a 66-inch wide MDB of 3,015 pounds to strike the sides

of passenger vehicles, trucks, and buses at 33.5 miles per hour (mph). The face of the MDB of Standard No. 214 has a bottom edge 11 inches from the ground and an impacting bumper whose lower edge is 13 inches from the ground. The MDB is mounted on a trolley with 27 degree crabbed wheels' and strikes the sides of passenger vehicles at a point 37 inches forward of the struck vehicle's wheelbase mid-point, except for vehicles with wheelbases greater than 114 inches in length. In this case, the side impact reference line is 20 inches rearward of the centerline of the vehicle's front axle. Similar impact point specifications govern the testing of MPVs, trucks, and buses.

Except for passenger cars with wheelbases greater than 130 inches in length or with rear seating areas that cannot accommodate the specified test dummies, anthropomorphic test dummies are placed in both the front and rear outboard seating positions on the struck side of the test vehicle.[2] The injury measurements of side impact forces on the test dummies comprise acceleration scoring for the ribs and spine combined as the Thoracic Trauma Index (TTI(d))[3] and for the pelvis. TTI(d) shall not exceed 85g for four-door test vehicles and 90g

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'The design requirements for the MDB are separately contained in 23 CFR Part 587 and MDB dimensions in Figure 2 of Standard No. 214. They together provide specifications to control impact performance and include the barrier backing plate, barrier block, barrier face material, bumper block, and bumper face.

[2]The specifications for the 50th percentile male side impact anthropomorphic dummies for testing under Standard no. 214 are separately contained in 23 CFR Part 572, Subpart F.

[3]This injury criterion represents the average of peak acceleration values measured on the lower spine and the greater of the acceleration values of the upper and lower ribs of the Side Impact Dummy (SID).

for two-door vehicles, and pelvis acceleration shall not exceed 130g.

II. The Deficiencies of Standard No. 214.

a. The Acceleration Limits of the Current Standard.

This brief recitation of test specifications, however, does not adequately convey the complex history of the choices made by NHTSA in establishing especially the dynamic test requirements of Standard No. 214. Petitioner believes that an objective evaluation of the basis for the agency's rulemaking decisions will show that, in particular, the size, weight, and general aggressivity of the MDB adopted in 1988 for cars and extended to light trucks, vans, and sport utility vehicles (LTVs) in 1995, is not a demanding test which produces the level of benefits that should be obtained from this standard, especially for passenger cars and small LTVs, such as compact sport utility vehicles and compact pickups. Neither the occupants of passenger cars nor of small LTVs are being provided the level of the protection the-standard should ensure when, in particular, their vehicles are struck by higher, heavier, more aggressive LTVs .

Similarly, the acceleration-based scores selected in 1988 and, again, extended to the dynamic side impact testing of LTVs in 1995, do not produce the most desirable countermeasures from manufacturers which would provide better occupant protection from

death and injury in side impacts. [4] Even the technology that could achieve a major increase in the level of protection for the side impacts addressed by Standard No. 214 -- side impact, or thorax, air bags -- are not being used sufficiently by current manufacturers to provide dramatically improved levels of protection over the static countermeasures underwritten by the current standard.

In large part, this failure to optimize side air bags and to install them throughout the passenger vehicle fleet has persisted because the passing test scores for measuring injury under the present standard are too weak. [5] NHTSA's own 1994 Preliminary Economic Assessment (1994 PEA) accompanying its Notice of Proposed Rulemaking determined that a

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[4] This was pointed out recently in the joint petition for rulemaking filed by the IIHS, the Association of International Automobile Manufacturers, and the American Automobile Manufacturers Association. The petition favorably quotes 1991 Canadian research showing that the unreliability of TTI scores has retarded manufacturer development and use of side impact air bags. Petition for Rulemaking to the National Highway Traffic Safety Administration, December 22, 1997, p. 5.

[5] 'Petitioner welcomes the recent announcement by Ford (see New York Times, National/Metro, World Wide Web Edition, April 8, 1998) that all of its cars, including the Windstar van, will increasingly be equipped with side impact air bags in forthcoming model years. However, it should be noted that the use of dynamic technologies for lower interior side impact protection complies with a standard that can be met with only static countermeasures. There is no available information that demonstrates the extent to which side impact air bags in Ford passenger vehicles might exceed the minimum passing scores of the current standard. Also, none of Ford's pickup or sport utility vehicle models will be provided with side impact air bags. Small pickups, in particular, are vulnerable to high rates of occupant death and injury from lateral impacts by larger LTVs. This was demonstrated by NHTSA's own side impact tests with the Ford Ranger, as well as with the Mitsubishi Mighty Max, in 1993-1994.

TTI(d) score of 85g generates a **50 percent probability of an Abbreviated Injury Score (AIS) 3 or greater injury.**

Petitioner regards this as too tolerant a standard. This view of the weak acceleration passing score levels of the current standard has been stated repeatedly for the record by major members of the highway and vehicle safety community, including the IIHS, Public Citizen, Advocates, and the Center for Auto Safety, in comments filed with the series of dockets on proposed amendments to Standard No. 214 since 1988. For example, in its comments to the 1994 NHTSA proposal to establish dynamic testing compliance requirements for LTV side impacts, the IIHS pointed out that it '-'does not accept the premise that lower acceleration criteria are not achievable in passenger cars" and, in any case, it would be appropriate for the agency to establish lower TTI(d) and pelvic acceleration limits for LTVs. 59 FR 30756, 30759.[6]

An impartial assessment of the rationale for the agency's choice of passing score thresholds for TTI(d) and pelvic acceleration clearly shows that the regulatory target at the time of both the proposed and final rules establishing the initial passenger car dynamic

[6]This view was a re-assertion of IIHS's comments to the 1990 proposed rule on a dynamic side impact compliance standard for passenger cars. IIHS contended that test data show that existing production cars can meet pelvic acceleration limits of less than 90g. Accordingly, IIHS urged NHTSA to set the pelvic passing threshold near this figure within the agency's proposed range of 90g to 130g. Similarly, IIHS strongly recommended the substantial additional safety benefits of lowering the passing TTI(d) score only five g, from 85g to 80g. 55 FR 45745.

standard was not radical gains in occupant safety protection, but rather an attempt to raise the overall car fleet to a relatively higher, more uniform level of side impact safety. As a consequence, the agency chose compliance levels that would grandfather a high percentage of the existing passenger vehicle fleet's capability already to meet a relatively indulgent set of acceleration limits. A survey of NHTSA's estimates in the 1990 NPRM on the probable, pre-existing fleet percentage of compliance with the final rule acceleration scores confirms this. 55 FR 45741-45742. Although, for example, two-door cars needed significant changes as a group to meet an TTI(d) of 85g, most four-door cars already complied.

Similarly, cost containment for manufacturers, including the need to set a standard at a cost level that would not trigger strong, protracted manufacturer opposition, was a second major consideration in the acceleration scores that were adopted. The importance of this consideration for the agency in its need to limit manufacturer opposition is clearly shown in the benefits assessment for the 1990 proposed rule. Although the agency showed that benefit improvements generally kept pace with cost increases for countermeasure actions by manufacturers, NHTSA set compliance limits that imposed only moderate engineering and manufacturing costs. However, the agency also showed that it would have favored, for example, a lower TTI(d) score of 80g rather than the 85g of the final rule because of the large gains in fatality prevention. 55 FR 45746. In sum, the acceleration passing scores of the current standard are compromises which leave a large portion of the American motoring public without strong safety protection, especially the dramatic gains in protection that could

be afforded through the routine use of side impact air bags.

b. The Moveable Deformable Barrier (MDB).

In its Notice of Proposed Rulemaking of January 27, 1988, NHTSA asserted that it had selected the weight of the MDB "to be representative of future vehicles expected to be involved as the striking vehicles in side impact crashes in the United States. " 53 FR 2240, 2241. The agency claimed that it had derived the weight of the MDB from the median curb weight of impacting vehicles involved in serious to fatal injury side impacts. This figure was based on an average weight for passenger vehicles derived from the average 1986 curb weight of cars, 2,820 pounds, and 1986 curb weight of light trucks, 3,500 pounds. Id.

At-this point in its argument supporting its proposal for the dimensions and weight of the MDB, NHTSA asserted that vehicle fleet weight **will decline in the 1990s** and that the MDB is a realistic choice representing a combination of a 2,700 pound vehicle with 300 pounds of occupants and cargo. Nevertheless, even at this stage of its rulemaking considerations, the agency already was interested in creating a hybrid MDB that would also incorporate some of the features of LTVs because of its anticipation that larger, heavier LTVs would more often become the striking vehicle in side impacts with smaller passenger vehicles :

> The agency believes that the MDB front face stiffness should be higher than typical passenger car front structures and more like light trucks because trucks (as striking vehicles) are currently responsible for nearly as many serious injuries and fatalities as are passenger cars.

Id.

In its final rule of October 30, 1990, NHTSA, however, did not incorporate any design features for the MDB that would simulate the mass, front end height (including bumpers), or overall aggressivity of LTVs.[7] Despite strong support from consumer safety organizations for a higher, heavier MDB to test side impact safety at higher speeds,[8] the agency instead chose to adopt a MDB that essentially replicated the size, including overall front end and bumper heights, and mass of a mid-sized passenger car.

But these major design concessions did not mollify vehicle manufacturers: even though NHTSA had relinquished the attempt to introduce design features into the MDB that would more closely simulate the character of a LTV as the striking vehicle, "[a]uto manufacturers unanimously opposed adoption of the proposed side impact requirements, challenging numerous aspects of the proposed performance requirements and test procedure." 55 FR 45722, 45724.

NHTSA's awareness of and determination to address the growing problem of passenger car side impacts by LTVs, however, did not end with the establishment of the dynamic side impact standard for passenger cars. In fact, the agency's research on the topic progressed and allusions by NHTSA to the need to accommodate the special severity of

[7]The MDB adopted, however, is somewhat stiffer than the average passenger car.

[8]Both the Center for Auto Safety and Public Citizen argued in their comments for a MDB that more closely simulated the mass and aggressivity of a LTV. See 55 FR 45771.

LTVs as the striking vehicle when colliding with cars increased in its rulemaking actions.

For example, in its August 19, 1988, Advance Notice of Proposed Rulemaking (ANPRM) on LTV side impact safety involving the extension of the quasi-static cylinder test to LTVs, the agency used the occasion again to voice its concern that its standards should recognize the increased threat presented by LTV impacts. NHTSA noted that "[in] multiple vehicle crashes resulting in serious injuries and fatalities to passenger car occupants, trucks are about equally as likely as cars to be the striking vehicle." 53 FR 3 17 16. Consequently, it seems reasonable that "[d]ifferences in physical characteristics and use between LTV's and passenger cars would likely warrant differences in possible test procedures and/or performance requirement&]" including the use of an MDB that is more like a light truck' than a car. Id.

NHTSA continued to pursue this logic in its ensuing rulemaking on a dynamic side impact standard for LTVs. Although the considerations of this docket focused on the design of a MDB to simulate an LTV as the striking vehicle, the agency made it clear at numerous points that its concern over the unrepresentativeness of a car-based barrier side impact with LTVs extended to its lingering discomfort over the use of only a car-based MDB for side impact testing of cars.

NHTSA relied on the analogy of mismatched size and weight between LTVs and cars to advance its preliminary proposal in this docket for a substantially heavier, higher MDB so that smaller, lighter LTVs would benefit from improved side impact protection when struck

by heavier, taller, stiffer LTVs. Following testing with a series of MDBs ranging up to 4,000 pounds with the bottom' of the MDB face raised from the 11 inch height of the car-based MDB to 18.5 inches from the ground,' the agency proposed an increase in both the height and weight of an MDB for side impact testing of LTVs. 59 FR 30756 et seq. (June 15, 1994).

The agency proposed a higher, heavier MDB despite concerted opposition from most vehicle manufacturers -- universally by domestic marques -- for setting any dynamic side impact standards for LTVs. However, NHTSA was strongly encouraged to set a LTV side impact standard by the IIHS and Advocates in their comments submitted to the 1992 ANPRM docket. Both safety organizations urged the agency to provide equivalent protection for LTV occupants when their vehicles suffered side impacts by other LTVs. Id. at 30759. IIHS argued convincingly that extension of dynamic test requirements to LTVs was necessary given the steady growth of this class of passenger vehicles and it disagreed strongly with the position that there was no need to require that LTVs provide a minimum level of protection even if many LTVs already could meet the standard.[10] As a result, IIHS supported the use of a barrier for testing LTVs that was heavier than 3,000 pounds in order to be more

[9]These tests are described in detail in the Preliminary Regulatory Impact Analysis (PRIA) of April 1992.

[10]As noted earlier in Section I. a of this petition, IIHS also argued for lower TTI(d) and pelvic passing scores, as it had in its docket comments to NHTSA's 1988 docket proposing a dynamic side impact standard for cars.

representative of the larger passenger vehicles in the fleet. 1994 PEA, p. 11-8; 59 FR 30759.

NHTSA responded in the 1994 NPRM with the same position it had taken in its 1992 PRIA, that simply extending the existing requirements of the standard to LTVs would not produce sufficient benefits and that the vast majority of LTVs already comply with current No. 214.[11] See 59 FR 30756, 30761. NHTSA also emphasized in its PEA accompanying this proposal that "[w]hile accident data show that LTVs are generally safer than passenger cars in side impact crashes, they also show 'that serious and fatal thoracic injuries to LTV occupants in side impacts constitutes a serious safety problem that warrants attention."[12] 1994 PEA, p. 11-10.

Accordingly, the agency offered a range of weights from 3,000 to 3,800 pounds for an MDB to test LTV side impact safety.[13] Because LTV occupants also sit higher in their vehicles than car occupants, NHTSA also proposed a range of MDB height from 33 to 45

"See the PRIA to accompany NHTSA Docket No. 88-06, Notice 18, pp. 17, 29. In fact, NHTSA in its 1994 PEA, op. cit., stated that simply extending the existing FMVSS No 214 passenger car requirements to LTVs would "not meaningfully address the LTV side impact problem. . ." P. II-16.

[12]NHTSA's analysis of 1992 Fatal Accident Reporting System (FARS) data showed that small pickups were especially vulnerable to side impact crash fatalities, with a loss rate of more than 30 deaths per million registered vehicles (MRV), a figure 50 percent greater than the MRV fatality rate for all LTVs. 1994 PEA, Table 11-2.

[13]A peculiarity of the rulemaking, however, was that benefits assessments were performed only for two specific weights in this range, 3,000 and 3,600 pounds.

inches or, as an alternative, matching barrier height to specific LTV occupant seating reference or H-point. Id. at 30762.

It is important to stress here, however, that this rulemaking indicated that the agency had begun to have serious misgivings over the direction it had taken since 1988 in establishing dynamic side impact standards. In the PEA for its 1994 proposal to set dynamic side impact safety standards for LTVs, NHTSA identified the vehicle manufacturing and sales trend that had begun to confound the accuracy of its prior regulatory decisions.

> The 3,000 lb. MDB required for the passenger car dynamic side impact protection rule reflected the fact that the agency believed that the curb weight of the light duty vehicle fleet would be decreasing in the 90's. However, the sales-weighted average EPA test weight of the passenger car and LTV fleet has been steadily increasing in recent years (about 44.5 lbs. per year between MY 89 and MY 93). * * * [I]n MY 93 the average combined EPA test weight for passenger car's [sic] and LTV's was 3,601 lbs. " * * * [T]he percentage of LTV's in the light duty vehicle fleet has been steadily increasing, nearly doubling from 20.1 percent in MY 82 to 35.7 percent in MY 93. Since LTV's are gaining weight on the average, and their proportion of the light duty fleet is increasing, the average weight of the light duty vehicle fleet is increasing.

1994 PEA, p. IV-17. NHTSA also showed in this economic evaluation of benefits that average curb weights had reached 3,301 pounds for the struck vehicles and 3,336 pounds for the striking vehicles in side impacts. When 300 pounds is added for cargo/occupants, as the agency did in modelling the original MDB for Standard No. 2 14, NHTSA held that a minimum of a 3,600 pound MDB is entirely reasonable for testing LTV side impact safety. Moreover, the average weight of the striking vehicle for the National Accident Sampling System AIS3+ torso injuries was 3,800 to 4,000 pounds. 1994 PEA, p. IV-18.

This is why, in its testing program for LTV side impact rulemaking, the agency concentrated on the vehicles most at risk within the LTV fleet: small pickups, small utility vehicles, and small minivans. Id. at III-l. In its testing program of small LTVs, using MDBs only at the standard's weight of 3,000 pounds, but indexed to H-point and therefore raised so that the bumper of the MDB loaded the doors of the vehicles above the sills, NHTSA found that a number of small LTVs, including pickups, SUVs, and minivans, failed either the TTI(d) or pelvic measures, or both. For example, the 1989 Suzuki Sidekick with a test weight of 2,845 pounds, failed TTI(d) with a score of 95.4 and failed pelvic acceleration with a score of 150.5g. The Ford Ranger, at the time the best selling small pickup, passed TTI(d), but failed pelvic acceleration with a score of 162.7g. The Ranger weighed 3,86 1 pounds for the test.

In its fourth series of tests, the agency raised the weight of the MDB to 3,600 pounds, but refrained from subjecting the small pickup (1993 Mitsubishi Mighty Max) and small SUV (1991 Geo Tracker) test subjects to even higher MDB weights because of NHTSA's "concern that a heavier MDB would present too severe a dynamic test condition for the lower curb weight LTV's." 1994 PEA, p. III-7. Despite this concern, the raised MDB even at 3,600 lbs. caused the Tracker to fail both TTI(d) and pelvic acceleration, and the Mighty Max to fail TTI(d).

Despite these persuasive results on the need for a Standard No. 214 procedure that was appropriate to LTVs, the agency's proposal did not prevail. Of the 19 comments

received by the agency for a stronger side impact standard for testing LTV safety, only one safety organization, Advocates, supported the agency's willingness to increase the size, weight, and stiffness of a MDB for improving LTV side impact safety. As with all previous rulemaking proposals for establishing side impact standards,

> [V]ehicle manufacturers were unanimously opposed to the NPRM, and wanted the rulemaking either terminated or limited to a straight extension of the passenger car side impact protection requirements. The American Automobile Manufacturers Association (AAMA), representing GM, Ford, and Chrysler, strongly believed the rulemaking should be terminated. Toyota, Isuzu, and Mazda also believed the rulemaking should be terminated. In the alternative, these commenters, together with Volkswagen and Nissan, said 'that if NHTSA decided to proceed with a final rule, it should adopt no more than the passenger car test procedures and injury criteria.

60 FR 38749, 38753 (July 28, 1995).[14]

NHTSA was openly disappointed with its final regulatory decision. The agency had stressed even in the preamble to its final rule that the adoption of only a car-based set of side impact test requirements imposed additional burdens on manufacturers without producing any benefits while ignoring a serious and growing problem with deaths and injuries of LTV occupants when their vehicles were struck in their sides.

> The number of fatalities in LTV side impacts increased faster than the overall fatality rate. In 1984, LTV side impacts resulted in 1,197 fatalities; in 199 1, there *were* approximately 1,676 fatalities in side crashes. NHTSA estimates that, by the mid 1990's, side impacts will result in 1,763 fatalities for LTV occupants sitting in the front or second seat, annually.

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[14]This view of simply extending the exist&g car-based standard to the testing of LTVs was also supported by the IIHS, although it had supported a more demanding test with a heavier barrier only two years earlier. Id.

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> Looking solely at multi-vehicle side impacts between LTVs and other light vehicles, approximately 78 percent of the LTV fatal 'torso' injuries are caused by other light and heavy trucks, and only 22 percent by passenger cars . . .

Id. at 38751.

Despite the fact that a more demanding standard would produce substantial benefits in protection especially for occupants in small LTVs that are close to the weights of passenger cars, NHTSA nevertheless adopted the alternative forwarded by manufacturers and supported by IIHS simply to extend the existing car-based side impact requirements to LTVs. The rationale offered by the agency was that this action would ensure no retreat from current levels of LTV side impact safety and "would prevent any future LTVs being introduced into the market that are inferior in side crash safety performance to passenger cars. " Id. at 387555. The agency went on to state that "a modified test procedure for LTVs is not being adopted at this time because of concerns that NHTSA has about the proposal in light of the public comments. " Id. at 38754. Moreover, because NHTSA anticipated that LTVs exceeding 6,000 pounds GVWR would easily pass the existing car-based side impact test requirements that were being extended to LTVs, [15] the agency would not require Standard

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"This was clearly demonstrated several years ago by Canadian tests which used both bullet vehicles and the competing European and U.S. Moveable Deformable Barriers (MDB) for conducting side impact tests. 'One test involved the use of a Ford Taurus as a bullet vehicle -- the kind of car which the U.S. MDB of Standard No. 214 is generally modelled on -- to laterally impact the Chevrolet Lumina APV. Although the Lumina had a total mass that was substantially less than the Chevrolet Caprice, which also was tested as a laterally struck vehicle, there' were dramatically lower peak dummy response values in the Lumina crash.

No. 2 14 compliance certification by manufacturers. [16]

III. Argument.

Petitioner believes that the current FMVSS No. 214 fails to adequately protect the occupants of passenger cars and small LTVs in side impact crashes. A review of the current status of the growth in the size, -weight, and proportional fleet representation of LTVs, projected market trends for LTVs and cars, and the scores for No. 214 compliance and New Car Assessment Program (NCAP) testing, indicate that both the size, weight, and aggressivity of the current MDB, as well as the level of compliance passing scores, fail to secure the safety benefits that a strong rule would accomplish. Many of the considerations demonstrating that No. 2 14 is in need of revision and strengthening are, in fact, drawn directly from recent research, test findings, and benefits assessments issued by NHTSA itself.

The Canadian researchers attributed this result not to the greater mass of the Lumina, but rather to "the more favorable vertical alignment of the stiffer structural components . . . as a result of the more elevated positions of the floor pan and seat assembly." Dainius Dalmotas, et al., "Prospects for improving Side Impact Protection Based On Canadian Field Accident Data and Crash Testing," SAE Paper No. 910321, SP-851, p. 43.

[16] NHTSA's previous tests of LTVs with MDBs ranging between 3,000 and 4,000 pounds, reviewed in its 1994 PEA, on. cit., showed that LTVs greater than 6,000 pounds GVWR could be expected to pass the car-based side impact standard by considerable margins, as much as 35g below the TTI(d) 85g passing score of No. 214. 60 FR 38756.

This means that LTVs with curb weights of as little as 4,000 pounds -- typical mid-sized SUVs, for example -- are excused from compliance testing. Id.

For example, NHTSA recently release a series of analyses showing that the threat of injuries and deaths to passenger car and small LTV occupants from large LTVs is growing disproportionately as a result of the rapid growth of LTVs as the passenger vehicles of choice. The main report was issued by the agency in January 1997, entitled, *Relationships Between Vehicle Size and Fatality Risk in Model Year 19854993 Passenger Cars and Light Trucks* (NHTSA 1997 Study).[17] The basic findings of the report include the following:

- Between 1985 and 1993, car weights remained essentially the same, but the average weight of LTVs rose 340 pounds and the passenger vehicle fleet representation of LTVs rose by 50 **percent.** P. v.
- As a result, by 1993, the last year of the agency's analysis, **the average light truck weighed almost 1,000 pounds more than the average car.** Id.
- "At this time, essentially two fleets of vehicles are sharing the roads: a fleet of relatively light, vulnerable passenger cars, stable in numbers and in average weight; and a fleet of relatively heavy aggressive light trucks, growing in numbers and in average weight. " P. 143.
- This increasing disparity of LTV with car weights has increased the threat of fatalities to car occupants and further widening of the disparity will elevate that threat even more. P. 62.
- The mass, momentum, and structural strength, such as the longitudinal stiffness, of LTVs

[17]This study was peer-reviewed by the National Academy of Sciences prior to its release.

make them aggressive vehicles which are hazardous to occupants of lighter vehicles colliding with them. Pp. 1, 4.

- Most of the deaths in LTV-car collisions are of the car occupants, and the chances of death and injury to those car occupants rapidly accelerate when the striking LTV weighs more than 4,000 pounds. P. 109, fig. 5-11.
- Conversely, there is a direct and constant linear relationship between car weight and fatality risk indexed to the average weight of the current fleet of LTVs: as weight decreases for the passenger car below 4,000 pounds, there is a direct increase in crash risk from collisions with LTVs so that the chances of a car occupant fatality in a car weighing 2,000 pounds is more than 20 **times** the fatality risk of a car occupant in a car weighing 4,000 pounds.[18] P. 162, fig. 6-6.
- Reducing the average weight of LTVs by only 100 pounds would have a positive effect on car occupant safety in LTV-car crashes with no change in LTV occupant safety in these multiple-vehicle crashes. Pp. viii, 141.

There appears to be little hope, however, for uniform reductions in the size and

[18] IIHS found in its recent analysis of the relative fatal crash risk relationship between cars, including minivans, and pickups/SUVs that "[p]eople in small cars weighing less than 2,500 pounds struck in the side by pickups or utility vehicles have a relative death risk of 47-to-l . , ." IIHS News Release, February 10, 1998.

weight, and fleet representation, of LTVs.[19] With regard to the latter category, four of the five biggest vehicle platform sellers for passenger vehicles currently are truck platforms.[20] Moreover, Americans bought more SUVs, minivans, and pickups than cars in November of 1997, the first time that LTVs have surpassed cars in retail sales since the end of World War II. Given the considerably larger profit margins for LTVs, especially SUVs, manufacturers are continuing to intensively merchandise LTVs in the marketplace. Industry representatives confidently predict that within five years, LTVs will represent 55 percent of family vehicle sales.[21]

With regard to size, the biggest LTVs keep getting bigger. The 1998 Toyota Land Cruiser, for example, and its Lexus twin, have just been redesigned with 4.7 liter V-8 engines, supplanting the former inline six cylinder engine, and now each has a curb weight of 6,470 pounds.[22] Similarly, the current Chevrolet Suburban now weighs up to 6,700

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[19]However, a recent study by the IIHS, which reached the same basic conclusions about the current elevated threat that light trucks and SUVs present to smaller passenger vehicles, has called on vehicle manufacturers to reduce the weight, size, and structural incompatibilities between cars and light trucks by changing some of the basic design factors in pickups/SUVs that govern the highly unbalanced harm relationship between the two types of passenger vehicles in multi-vehicle crashes. See IIHS Status Report, Vol. 33, No. 1, February 14, 1998.

[20]*Automotive News*, October 24, 1997.

[21]New York Times, December 4, 1997.

[22]*Automotive News,* February 2, 1998.

pounds without occupants or cargo, and has gained 1,000 pounds since 1985.[23]

With specific regard to side impact protection, dynamic side impact protection systems for complying with Standard No, 214 have increasingly been installed in passenger cars. However, although these systems can ensure passing scores under the current requirements of the standard, their TTI(d) and pelvic acceleration scores are not dramatically different from the best scores of vehicles using only static systems of protection consisting of padding and some structural modifications.

Petitioner believes that the reason for these competitive scores of side impact air bag systems with static countermeasure scores is that the current standard's compliance scores are weak and relatively undemanding. As a result, the failure of the standard to demand a higher level of protection for occupants in side impacts has failed to motivate industry to produce side air bags which are dramatically superior lifesaving and severe injury-preventing designs, and to supply them as standard rather than optional equipment. [24]

For example, three passenger cars equipped with side impact air bags for complying

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[23]New York Times, November 30, 1997.

[24]However, it is uncertain in those instances where NCAP side impact scores for static countermeasures are competitive with those achieved with airbags, whether injury protection is in fact the same. A Canadian test program a few years ago showed that "all of the vehicle tests, even those which produced exceptionally low TTI values, exceeded biomechanical injury thresholds based on deflection and force." Dainius Dalmotas, et al., "Side Impact Protection Opportunities," Paper No. 96-S6-O-04, p. 901. These findings imply that even low NCAP scores based on current acceleration-only dummy response data may not necessarily ensure actual high injury protection.

with No. 214 were tested by NHTSA in its 1997 NCAP side impact testing program, the Cadillac Deville, the Nissan Maxima, and the Volvo 850 .[25] In general, the scores achieved were not significantly different from a number of cars equipped only with padding and some structural changes. [26]

However, many cars did quite poorly with only current static designs for compliance, including two 1998 cars in the 1998 NCAP testing program, the Chevrolet Cavalier and the Pontiac Grand Am, which each gained only a single star for driver protection in the five-star agency rating system. [27] Some other cars in the NCAP cohort also did. fairly poorly, such as the 1997 Honda Accord and the 1997 Mazda *626* .[28]

A considerable increase in the number of side impact air bags are now available on 1998 model cars. However, a significant proportion of these bags are being offered as optional rather than standard equipment, such as on the 1998 Toyota Camry. Moreover,

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[25]Cadillac Seville TTI(d)_D: 58, TTI(d)_P: 62; Pelvis-D: 97, Pelvis-P: 81. Nissan Maxima TTI(d)_D: 70, TTI(d)_P: 75; Pelvis-D: 95, Pelvis _P: 87. Volvo 850 TTI(d)_D: 62, TTI(d)_P: no score; Pelvis-D: 70, Pelvis-P: no score. NCAP side impact tests are conducted at 38.5 mph, five miles faster than required by Standard No. 2 14. Passing scores for compliance at 33.5 mph are TTI(d) at 85g (90g for two-door vehicles) and Pelvic acceleration at 130g.

[26]E.g., Ford Contour TTI(d)_D: 73, TTI(d)_P: 84; Pelvis-D: 82, Pelvis-P: 88.

[27]The actual scores for the Cavalier and the Grand Am were, respectively, Cavalier: TTI(d)_D: 123 and Pelvis-D: 116; Grand Am: TTI(d)_D: 109 and Pelvis-D: 102. *Automotive News,* April 14, 1997.

[28]Id.

these dynamic protection systems can be expected to provide a margin of safety which, in many instances, will not be substantially different from what can be achieved by static countermeasures.

Accordingly, petitioner believes that the time has come for NHTSA to consider rulemaking to revise and upgrade the scores and the test regime comprising FMVSS No. 214 in order to substantially increase the level of protection for occupants of cars and small LTVs in side impact crashes. Indeed, this action to improve the standard was first requested by the IIHS in its comments to the agency's 1994 proposal for establishing dynamic test requirements for LTV side impact safety compliance. IIHS urged NHTSA to "seriously review ways to upgrade this standard for all passenger vehicles." 60 FR 38760.

NHTSA stated that it was clear from IIHS's comments that IIHS believed that the rulemaking choice of simply extending current car-based side impact compliance requirements to LTVs "signaled that NHTSA is satisfied with the passenger car requirements of Standard 214, and that the research needed to upgrade the standard does not have a sufficient priority within the agency." Id.

NHTSA asserted a vigorous rejoinder to this charge. The agency

> note[d] that possible future upgrades of side impact protection for both passenger cars and LTVs will be an integral part of the agency's research and development project relating to side impact protection. * * * The agency will be considering what performance requirement upgrades should be made to all these vehicles, based on problem analysis and appropriate physical vehicle parameters.

Id. at 38755 (emphasis supplied).

for both TTI(d) (71g) and pelvis acceleration (-57g) and, because of the use of ITS, for calculated HIC. Given the extreme severity of the test due to the high impact speed and the tremendous concentration of crash forces with consequent deep intrusion produced by the use of a rigid, narrow cross-section vertical fixed object, inferred protection for an occupant from both severe thorax and head injuries would be outstanding.

Although recent attention to Standard No. 201 has been devoted by the agency and major safety organizations to the promise contained in dynamic upper interior head impact protection systems: petitioners believe that the current rulemaking and recent IIHS tests can support the possibility of NHTSA rulemaking to establish permitted, but not required, more demanding compliance levels for the use of dynamic thorax protection systems in meeting Standard No. 214. At the present time, given the relatively undemanding compliance demands of No. 214, manufacturers have not universally embraced thorax air bags as basic equipment in all of their passenger vehicles, and may also have failed to optimize them to withstand the kinds of especially severe impacts that could occur, for example, from crashes in which a much heavier, higher, stiffer LTV is the striking vehicle or when the lateral collision is with a nonfrangible, narrow cross-section vertical fixed object in the roadway environment.

Therefore, petitioner asks NHTSA to open rulemaking for the purpose of considering the potential for similar permitted, but not required, levels. of compliance with Standard No. 214 that would substantially increase overall protection to passenger car and LTV occupants

afforded by the use of dynamic rather than static lateral impact safety technologies. We believe that this direction for innovative safety policy improvements by NHTSA may even be hinted at in the agency's most recent rulemaking on upper interior side impact. In its discussion of the benefits of the proposed Hybrid III head and the SID body for use in a side impact pole test for Standard No. 201 compliance, NHTSA asserts that "[t]he Hybrid III head and neck currently provides the best means for evaluating head injury in this test while the use of the SID torso affords an opportunity to collect meaningful data relating to thoracic injuries." 62 FR 64546, 64547. Petitioner finds this remark by the agency to be filled with the promise of new ways for the agency to improve both side impact standards.

In considering the establishment of more rigorous standards for permitted, but not required, compliance with Standard No. 214 through the use of dynamic technologies, such as more sophisticated thorax air bags, NHTSA could evaluate anew the grounds for setting more demanding TTI(d) and pelvis acceleration scores. Similarly, the agency could review the *potential of using a heavier, higher, stiffer, and, hence, more aggressive MDB that is modelled on the characteristics of larger LTVs as the striking vehicle in side impacts. In addition, NHTSA could evaluate the benefits of changing the current dynamic test protocol of Standard No. 214 to permit a perpendicular side impact by a MDB without crabbed wheels. At the current test impact speed of 33.5 mph, this change would result in a more severe impact, as well as mitigate difficulties with test repeatability.

Given the desirability of simultaneously gaining more real-world verification of side

impact vehicle integrity in impacts with narrow cross-section, rigid fixed objects, such as poles, trees, and luminaires, as well as fostering manufacturer test cost economies, another possible topic of rulemaking could be agency consideration of the proposed dynamic lateral impact with a rigid pole as a more dependable test for intrusion, door latch and hinge strength, and ejection prevention under Standard No. 214 than the current, and perhaps outdated, requirement of a quasi-static cylinder test. Such a regulatory evaluation would allow agency consideration of establishing a limit on total intrusion which it decided not to do in its 1990 final rule.[31] 55 FR 45740.

Ford suggested in its comments to NHTSA Docket No. 88-06, Notice 06, which proposed extending the 1973 quasi-static cylinder test to LTVs, that the development of requirements to address side impacts with narrow cross-section fixed objects should include contact with the rocker and floor pan areas. 54 FR 52826, 52827 (December 22, 1989). Although this approach would essentially undermine the value of the current quasi-static test, it could have merit if the requirement were translated into a dynamic pole test such as the 1997 proposal permitting Standard No. 201 compliance in the use of dynamic upper interior head impact technologies.

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[31] Public Citizen and the Center for Auto Safety recommended in their comments to the 1988 proposed rule that NHTSA specify a maximum intrusion distance, such as 18 inches, as an addition to the quasi-static cylinder test of Standard No. 2 143. Such an intrusion limit would serve as a control on the production of injuries not measured by TTI(d) and pelvis acceleration limits. See 55 FR 45750. Substitution of a dynamic lateral pole impact for the quasi-static test would permit a realistic evaluation of intrusion limitation.

IIHS, in its comments to NHTSA's 1989 docket proposing extension of the quasi-static cylinder test to LTVs, questioned whether door beams in LTVs even have any significant effect in either vehicle-to-vehicle or vehicle-to-fixed object impact. 56 FR 27427 (June 14, 1991). Although these beams may be more important for passenger cars, a dynamic test, such as a pole test, for determination of the same safety benefits that are claimed for the quasi-static cylinder test, could lead to better hinge and latch design, better resistance to intrusion, and decreased rates of ejection. In other words, a realistic dynamic test for compliance that targets these benefits could lead to improved structural designs for lateral impact that would complement improved dynamic thorax and head protection in lateral impacts.

Petitioner believes that lateral impact vehicle strength and vehicle interior impact protection countermeasures for occupants are ultimately synergistic and require a policy stance by the agency that promotes a systems engineering response to side impact safety by manufacturers. This entails coordination of the innovative rulemaking on amending Standard No. 201 with the petitioned rulemaking for permitted approaches to Standard No. 214 that involve the use of dynamic, rather than static, technologies. A subtext of any agency action to evaluate new approaches to stronger safety benefits secured by Standard No. 214 would involve the consideration of a major renovation of the current compliance requirement of a cylinder test against vehicle doors.

Petitioner does not have a pre-determined view of what human surrogates should be

used in testing compliance with tougher standards for the use of Standard No. 214 dynamic protection technologies. Although the agency has recently forwarded the continuing use of SID,[32] including a new combination of SID with the HIII head for use in one of the compliance testing alternatives of the agency's tentative proposal for amending Standard No. 201 to promote the use of dynamic head protection systems,[33] there is ongoing debate over the relative merits of SID and the latest iteration of the EuroSID. Most of the debate has centered on a few major concerns, such as the influence of the SID lower arm on thorax trauma measurements, and the failure of the SID to measure velocity and chest deflection. Proponents of EuroSID have pointed out that it measures force and displacement, as well as acceleration. Also, advocates claim important information on viscous injury measures used for determining lower torso soft tissue injuries, such as to the abdomen.

NHTSA has conceded in past reviews of SID that the derived compliance standard of TTI(d) "represents an empirical formulation as opposed to an injury criterion primarily derived from biomechanical theory." 55 FR 45727. Further, "each TTI level predicts an injury probability distribution" and not a particular AIS level injury. Id. at 45726. On the other hand, NHTSA has defended SID against arguments that it inadequately addresses

[32] NHTSA Plan for Achieving Harmonization of the U.S. and European Side Impact Standards: Report to Congress, National Highway Traffic Safety Administration, U.S. Department of Transportation, April 1997.

[33] 62 FR 64546 et seq. (December 8, 1997).

abdominal injuries by pointing out that lateral abdominal compression measurement has not yet been perfected, circa 1990, as an injury criterion. Also, the agency argues that the lower rib and lower spine accelerometers of SID are reliable surrogate measures for inferred injuries to the liver, spleen, and kidneys. Id. at 45727. Moreover, although TTI(d) does not directly reflect rib deflection, it does correlate strongly with the number of rib fractures. Id. at 45728.

Petitioner does not have a position on the merits and disadvantages of competing dummy designs, or the issues of international harmonization, in this request to NHTSA to open rulemaking. We are instead interested in measurements from compliance tests that will permit accurate calculation of equivalent real-world trauma for human occupants subjected to the forces of lateral collisions by both other vehicles and fixed objects.

In that regard, we have no essential objection to the use of a dummy other than SID if it can be shown that it does not supply manufacturers with optimistic compliance test scoring advantages that are foreswom with the continuing use of SID. Any dummy that promotes continuing refinement of vehicle safety countermeasures to prevent more injuries and deaths to passenger vehicle occupants in violent side impacts should be the primary goal for the selection of a human test surrogate. [34] On balance, it appears that EuroSid has definite

[34] Allowing a test dummy alternative to the current No. 214 SID within a context of regulatory requirements for permitted, but not mandated, compliance when occupant lateral impact dynamic protection systems are chosen by manufacturers, could provide an opportunity for NHTSA to evaluate the potential for the functional equivalence of the U.S.

advantages in refined measurement of injury responses that could make it desirable for revisions to Standard No. 214 if NHTSA was confident that this dummy was appropriate for side impact testing with the substantially different vehicle fleet composition of the U.S.

IV. Conclusion.

Reports recently released both by NHTSA and the IIHS have dramatically set off in high relief the rapidly growing, unacceptable losses suffered by car occupants when their vehicles are impacted in their sides by heavier, stiffer, higher LTVs.[35] The enormous disproportionate losses from death and injury suffered especially by occupants in small cars when these light vehicles are struck by LTVs has accelerated both public and government

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with the ECE standard, but without disturbing the framework of the current mandatory features of the U.S. standard. One of the data areas that would bear on this issue would be the comparative virtues of SID vs. EuroSID with regard to the differences in occupant response between static and dynamic protection systems for lower interior side impacts. It has been argued that SID is relatively insensitive to a range of static side impact countermeasure material (about 10 to 40 psi) as against EuroSID. See B. Fildes and A. Vulcan, Workshop Report on Side Impact Regulations for Australia, Report CR149, Federal Office of Road Safety, 1995. Therefore, a comparison of the benefits between EuroSID and SID given a compliance regime triggered only by a manufacturer's desire to use dynamic protection technologies would permit an overall benefits comparison of the two dummies with regard to static vs. dynamic countermeasures.

[35]Hans Joksch, et al., *Vehicle Aggressivity: Fleet Characterization Using Traffic Collision Data,* NHTSA (DOT-VNTSC-NHTSA-98-l), February 1998 (also see Hampton C. Gabler and William T. Hollowell, "The Aggressivity of Light Trucks and Vans in Traffic Crashes," Society of Automotive Engineers, International Congress and Exposition, Paper No. 980908, Detroit, Michigan, February 23-26, 1998); IIHS *Status Report*, Vol. 33, No. 1, February 14, 1998. Neither of these investigations addresses the problem of occupant injury when smaller LTVs are struck laterally by larger LTVs.

attention to the need to mitigate these unacceptable losses in a major and timely manner.

Petitioner is convinced* that NHTSA must respond decisively to these current and prospective losses. Reform of the current Standard No. 214 is badly needed to ensure that a pivotally important area of the design changes in passenger vehicle fleet makeup -- the design and performance of vehicle side impact countermeasures -- will rapidly be addressed by manufacturers to offset the severe consequences of lateral impacts especially of cars and smaller LTVs. Although other fundamental changes in overall fleet design are both desirable and necessary in order to promote much greater crash compatibility, we believe that a more vigorous approach to the requirements of Standard No. 214 is long overdue.

For the reasons set forth in the body of this petition, petitioner respectfully requests NHTSA to open rulemaking to consider the amendment of FMVSS No. 214 to strengthen its compliance requirements so that superior, dynamic side impact protection technologies will be systematically implemented in both passenger cars and LTVs. The methods and goals that petitioner has suggested for agency evaluation also have the further purpose of securing better, closer coordination between the upper and-the lower interior side impact standards so that serious injury to both the thorax and the head and neck can be avoided through the widespread use of dynamic technologies for Standard No. 214 and Standard No. 201.

Respectfully submitted,

Judith Lee Stone
President