

and therefore asked us to limit the period during which the injury criteria must be met and data are collected for the low risk deployment tests to 10 ms after dummy interaction with the air bag ceases. This approach had been presented earlier by the Alliance in an October 2001 petition for rulemaking. Volkswagen and BMW suggested an alternative means of limiting the collection of compliance data would be to review the test video and data traces to separate air bag-induced injury readings from secondary impacts. They stated that such a method would most effectively ensure that all air bag-related injuries were captured without penalizing manufacturers for secondary impacts. BMW noted that NHTSA has established a precedent for using film analysis to determine compliance in FMVSS No. 201, Occupant protection in interior impact. TRW offered a similar alternative, under which film and data channel analyses would be used to limit the collection of compliance data. It also advocated a 300 ms time-frame for all rear-facing child seat testing. Autoliv advocated a much more basic approach under which NHTSA could make a case-by-case determination that the secondary impact was unrelated to the air bag.

This is a complex issue. As we noted in the preamble to both our May 2000 and the December 2001 final rules, we do not believe that all dummy contact with the vehicle interior would necessarily be the result of dummy interaction with an overly aggressive air bag. This is because a dummy subjected to the deployment of any air bag in a low risk deployment test will continue to move rearward until it strikes some object, and because the low risk deployment test does not take into account the forward momentum of the dummy that would typically be present in a real world crash in which the frontal impact air bags deploy. For these reasons, we are reluctant to retain the existing compliance data collection period, particularly because it may effectively preclude manufacturers from complying with the rule through the use of low risk deployment technologies. Nevertheless, we remain concerned that an air bag propelling the dummy backward with excessive force could result in secondary impacts relatively early in the crash event. These new low risk air bag technologies remain relatively untested by NHTSA, and we are somewhat dependent on the manufacturers' experience in the testing and development of their own systems.

Accordingly, we have decided to limit the data collection for compliance purposes to 100 ms after initial

deployment of the air bag for systems that are certified to either S21.4 (3-year-old) or S23.4 (6-year-old), as requested by the Alliance and supported by other petitioners. All injury measurements recorded during that time that exceed the allowable values, regardless of the source of injury, will be considered noncompliances. We continue to believe that setting a specific time period is the simplest, most appropriate, and most objective way to determine which data to collect for compliance purposes. The basis for our decision is set forth below. However, as discussed in the December 2001 final rule, we will actually record the dummy injury measurements for a longer time period dependent upon the data collection system. If there is any indication that peak injury measurements recorded after 100 ms are the result of an air bag's aggressiveness, we may choose to initiate rulemaking to increase the period of time that data will be considered for compliance purposes.

The primary thrust of the Alliance's petition is that, in a real world crash, a child would have sufficient forward momentum relative to the vehicle, and thus experience a lower change in velocity due to the air bag interaction, to prevent serious injuries resulting from secondary impacts with the interior of the vehicle. Thus, the high injury readings associated with secondary impacts in the static low risk deployment tests (primarily high neck injury readings) are artifacts of those tests and do not represent a real world condition. The Alliance presented one set of sled test results, comparing one low risk deployment test (6-year-old dummy in position 1) to a 26 km/h (16 mph) dynamic sled test to support its position.

We agree that the rebound velocity of a dummy in the static low risk deployment test does not replicate the rebound velocity of an out-of-position occupant in a real world crash in which the occupant moves forward as a result of vehicle braking and crash dynamics. The forward momentum of the occupant in such a crash will reduce the velocity with which the occupant is thrown back into the seat. The amount of this forward momentum (and the resulting reduction in rearward momentum) is impact velocity-dependent. In low speed crashes, the forward momentum will be less than in higher speed crashes. Since air bags may be designed to deploy at impact speeds considerably less than the 26 km/h (16 mph) used in the Alliance sled test, we are uncertain that forward momentum alone will be sufficient to prevent rebound injuries that are the result of the air bag's propelling an individual rearward.

Likewise, our experience with the SCI data indicates that secondary impacts are not limited to seat backs, but could be into the B-pillar, the door, or even the header. However, the SCI cases are inconclusive as to whether or not the secondary impacts result in more serious injury than those produced by the air bag.

The Alliance also suggested that the agency's reliance on SCI data to justify our concern that secondary impacts could be the result of air bag interaction depended on old air bag designs that could not meet the low risk deployment requirements. The Alliance's point is well taken. We note that no vehicles in the SCI database were designed to meet the advanced air bag requirements. Indeed, to the best of our knowledge, there is only one SCI case of a "lower powered" (*i.e.*, model year 1998 or later) air bag-equipped vehicle that resulted in a critical injury (AIS 5) and was also reported to have seat back contact. That case involved a 1999 Ford Contour. We do not believe the passenger air bag in that vehicle would be sufficiently benign to meet the low risk deployment requirements. We also have some concerns about our ability to attribute the serious injuries to seat back contact, as the subject case involved a crash in which the delta-V has been determined to be around 48 km/h (30 mph).

The Alliance also indicated that the typical low risk deployment systems that are likely to be used in future vehicles would consist of an initial, benign deployment with a secondary "expensing stage" that would occur at least 100 ms after the initial deployment. It maintained that this "expensing stage" would occur so late in the crash event that it could not be the source of air bag interaction or rebound injury. It also provided data using an inflator designed to expense 40% of the air bag's propellant initially and 60% secondarily (40/60 air bag design). In that instance, the secondary deployment occurred 200 ms after the initial deployment and did not result in any excessive injury response measurements at the end of the crash event. As noted in the December 2001 final rule, our concern is with 40/60 air bag designs for which the second deployment has the propensity to cause injury. We do not find persuasive the Alliance's contention that the second stage of deployment will always be benign, but believe that injury measurement assessment for 100 ms will ensure that a second stage deployment does not occur during significant occupant engagement with the air bag.