shield-type booster seats was not caused by the dummy's impact against the shield alone, but by the force of the seat back and the aft row passenger as they pressed the dummy into the shield. Therefore, although CAMI used a test dummy weighing less than the range of children recommended by the manufacturer for its booster seat, the FAA believes that the dynamics would be the same for a child within the weight limits specified by the manufacturer.

The FAA believes that shield-type booster seats, which may contribute to higher abdominal loading, might put children in a potentially worse situation than the alternatives permitted in the FAA regulations. In the study, the FAA researchers at CAMI compared the abdominal load impacts on the CAMIX anthropomorphic test dummy when it was placed in a shield-type booster seat and when it was placed in a lap belt in a typical airplane passenger seat. When an adult-size test dummy aft of the CAMIX dummy and with a breakover seat back, the abdominal load was 37.6 pounds per square inch (psi) when the dummy was restrained by the lap belt compared to 59.5 psi for the dummy when it was in a shield-type booster seat.

The CAMI researchers also found that the abdominal loads on the CAMIX test dummy with a locked seat back were higher in the shield-type booster seat (in the 19.8 to 20.8 psi range) than in a typical airplane lap belt with a locked seat back (9.5 psi).

The FAA recognizes that the booster seats are designed for children in the 30 to 60 pound weight range. Although the CAMIX dummy is 27.2 pounds, it was the only test dummy available that was equipped to measure abdominal loads. However, the FAA believes that abdominal loads for children who are in the 30 to 60 pound weight range and who are in shield-type booster seats would similarly exceed the abdominal loads that those children would experience in lap belts in representative aircraft seats in a worst case survivable aircraft crash.

The FAA is proposing to ban shieldtype booster seats in aircraft during takeoff, landing, and movement on the surface because of the concern about the increase in abdominal pressure. The FAA believes that there is a relationship between abdominal loading and injury. The agency notes, however, that no accepted injury criteria have been developed that would permit the FAA to predict precisely the severity or type of abdominal injury. In view of the absence of criteria for assessing the relationship between differences in measured levels of abdominal loading and the resulting risk of injury, the FAA invites comments, including statistical data, on the value of abdominal loading, by itself, as a predictor of injury.

The FAA recognizes that differences in abdominal loading are but one measure of the overall safety performance of child restraint devices. Among the others are the degree of extension of the spine and the head injury protection criteria (HIC) developed by NHTSA to measure head injury risk in motor vehicle crashes. Accordingly, the agency invites comments on the overall safety performance of shield-type booster seats compared to that of other available means of protection.

A separate seat or berth must be available in order to use a shield-type booster seat. If the FAA adopts this proposal to ban the use of shield-type booster seats, children over age 2 will have to use the passenger seat lap belt or some other type of approved child restraint system. The accompanying adult or the airline may provide the alternative approved child restraint system, but neither is required to do so. The FAA believes that children 2 years old or older will be safer in their own passenger seat restrained by a lap belt or in allowable child restraint systems than they would have been in the shield-type booster seats.

Under existing regulations, children under age 2 are not required to use a child restraint system or lap belt. Those children are permitted to be held on an adult's lap. By proposing to ban the use of shield-type booster seats, the FAA does not mean to encourage the practice of adults holding children under age 2 on their laps. Again, the FAA believes that a child who weighs enough to use a booster seat would be safer in a passenger seat lap belt or other approved type of child restraint system.

The FAA invites comments on the issue of whether the proposed ban would induce more parents to place more children on their laps during flight. The FAA also invites comments on the relative safety of placing children in shield-type booster seats versus putting children on laps. Although the FAA does not encourage the practice of holding a child under age 2 in an adult's lap, in 1992 the FAA decided not to mandate that children under age 2 use some type of restraint system (57 FR 42662). The FAA concluded that if children under age 2 were required to be in approved restraint systems and if the affected operators used such a requirement to charge for the transportation of children under age 2, more fatalities and injuries would occur.

The FAA determined that if adults were charged for the transportation of infants, some adults would decide to drive in automobiles to their destinations rather than fly. Noting that the accident rate on the roads is higher than the accident rate in commercial air transportation, the FAA concluded that more deaths and injuries would occur for children in automobile accidents than would be avoided in aviation crashes if the FAA mandated the use of child restraint systems for children under age 2 on aircraft. The FAA invites comments on its previous decision not to mandate child restraint systems. Recently, Congress instructed the FAA to restudy the net safety impact that would result if the agency were to mandate restraint devices for infants. That study will be submitted to Congress shortly and will be added to this rulemaking docket.

Vest- and Harness-Type Child Restraint Systems

Because of the location of the safety belt anchors for an airplane seat, harness-type child restraints tested at CAMI did not provide adequate restraint to prevent a serious impact with a seat back in front of the child occupant and a rebound impact with the occupant's own seat.

The FAA is aware that there may be an issue as to whether a parent who has been told that these devices are banned will choose not to buy a ticket for a separate seat for a child under 2, and, instead, hold the child in the lap. A parent who has purchased a ticket for the use of the vest- and harness-type device also has the option of using the passenger seat lap belt or using an approved child restraint device. The FAA believes that a parent who has purchased a ticket for a child, upon being told that the child could not use a vest- and harness-type device, would elect to use the passenger seat lap belt or an approved child restraint device. Others may believe that the parent may choose to hold the child on his or her lap. However, as noted above, the FAA believes that a child would be safer in a passenger seat lap belt or other approved type of child restraint system. The FAA also believes that a parent of a child under 2, who is already predisposed to buy a ticket for a separate airplane seat for use with a vest- and harness-type device and who has received education on the effectiveness of the allowable alternatives in advance of purchasing tickets, would purchase a ticket for a separate seat in order to use an approved and recommended child restraint device. The FAA specifically invites comments on this issue. Based