Compatibility of child restraint systems (CRS) with commercial aircraft seats

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The Federal Aviation Administration (FAA) encourages the use of aircraft-approved child restraint systems (CRS, or child safety seats) on aircraft. However, the installation of a CRS on an aircraft seat can be challenging due to physical space restrictions. Many caregivers cite these challenges as a deterrent to using a CRS on aircraft, and choose a less safe option such as holding their infant on their lap or buckling their small child into the adult lap belt on the adjacent seat. This study aims to quantify compatibility concerns between CRS and aircraft seats and belts to ultimately facilitate higher rates of CRS use on aircraft.

The physical dimensions of aircraft seats (n=9) were obtained through collaboration with the SAE Aircraft Seat Committee. Data were collected for economy and premium seats in regional jet, narrow body, and wide body aircraft. The corresponding dimensions of various CRS models (n=56) were collected through direct measurement. Compatibility between CRS and aircraft seats was predicted in terms of seat width, seat cushion angles, and seat cushion length. Aircraft seat dimensions were also compared to automotive vehicle seat dimensions (n=111) collected during previous studies.

The width of several aircraft seats could not accommodate the width of many CRS, especially larger types of CRS in regional jet or narrow body aircraft (see Figure 1). Aircraft seat cushion angles are typically more horizontal than those in vehicles. This suggests that children in rear-facing (RF) CRS could be positioned in a more reclined position than the CRS manufacturer intends. The seat back angle with respect to seat cushion angle matched those measured from forward-facing (FF) CRS reasonably well, suggesting that most FF CRS should fit within the aircraft seat cushion angles provided. Seat cushion length (depth) in aircraft are shorter than the length needed to accommodate some CRS. This may cause the CRS base to overhang the front edge of the aircraft seat, especially for RF CRS which have long base footprint dimensions. Additional analyses are ongoing, including seat pitch and seat belt characteristics.

The results of this study provide benchmark data for manufacturers and elucidate potential difficulties for manufacturers, regulators, safety advocates, and caregivers to consider.

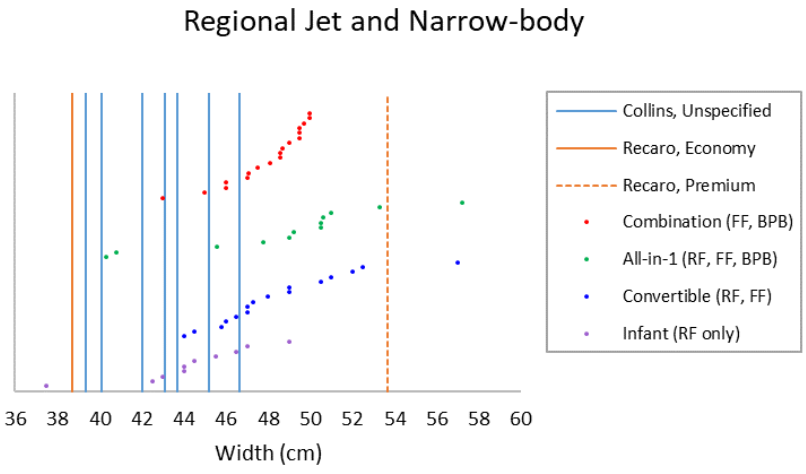

Figure 1: The width of each aircraft seat was measured between arm rests and plotted with the blue and orange lines. The corresponding widths of four different categories of CRS are shown by the dots (combination, all-in-1, convertible, and infant).