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Analysis and Identification of Trends in Electric Vehicle Crash Data

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Abstract : Battery-electric vehicles (BEVs) are growing in sales and popularity in the United States as an alternative to traditional internal combustion engine vehicles (ICEVs). BEVs are generally heavier than corresponding models of ICEVs, with large battery packs located beneath the vehicle floorpan, a “skateboard” chassis, and have front and rear crush space available in the trunk and “frunk” or front trunk. The geometrical and frame differences between the vehicles may lead to incompatibilities with gasoline vehicles during vehicle-to-vehicle crashes as well as run-off-road crashes with roadside barriers, which were designed to handle lighter ICEVs with higher centers-of-mass and with dedicated structural chasses. Crash data were collected from 10 states spanning a five-year period between 2017 and 2021. Vehicle Identification Number (VIN) codes were processed with the National Highway Traffic Safety Administration (NHTSA) VIN decoder to extract BEV models from ICEV models. Crashes were filtered to isolate only vehicles produced between 2010 and 2021, and the crash circumstances (weather, time of day, maximum injury) were compared between BEVs and ICEVs. In Washington, 436,613 crashes were identified, which satisfied the selection criteria, and 3,371 of these crashes (0.77%) involved a BEV. The number of crashes which noted a fire were comparable between BEVs and ICEVs of similar model years (0.3% and 0.33%, respectively), and no differences were discernable for the time of day, weather conditions, road geometry, or other prevailing factors (e.g., run-off-road). However, crashes involving BEVs rose rapidly; 31% of all BEV crashes occurred in just 2021. Results indicate that BEVs are performing comparably to ICEVs, and events surrounding BEV crashes are statistically indistinguishable from ICEV crashes.

Keywords : battery-electric vehicles, transportation safety, infrastructure crashworthiness, run-off-road crashes, ev crash data analysis
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