

## The Effectiveness of Synthesizing A-Pillar Structures in Passenger Cars

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**Abstract :** The Toyota Camry is one of the best-selling cars in America. It is economical, reliable, and most importantly, safe. These attributes allowed the Camry to be the trustworthy choice when choosing dependable vehicle. However, a new finding brought question to the Camry's safety. Since 1997, the Camry received a "good" rating on its moderate overlap front crash test through the Insurance Institute of Highway Safety. In 2012, the Insurance Institute of Highway Safety introduced a frontal small overlap crash test into the overall evaluation of vehicle occupant safety test. The 2012 Camry received a "poor" rating on this new test, while the 2015 Camry redeemed itself with a "good" rating once again. This study aims to find a possible solution that Toyota implemented to reduce the severity of a frontal small overlap crash in the Camry during a mid-cycle update. The purpose of this study is to analyze and evaluate the performance of various A-pillar shapes as energy absorbing structures in improving passenger safety in a frontal crash. First, A-pillar structures of the 2012 and 2015 Camry were modeled using CAD software, namely SolidWorks. Then, a crash test simulation using ANSYS software, was applied to the A-pillars to analyze the behavior of the structures in similar conditions. Finally, the results were compared to safety values of cabin intrusion to determine the crashworthy behaviors of both A-pillar structures by measuring total deformation. This study highlights that it is possible that Toyota improved the shape of the A-pillar in the 2015 Camry in order to receive a "good" rating from the IIHS safety evaluation once again. These findings can possibly be used to increase safety performance in future vehicles to decrease passenger injury or fatality.

**Keywords :** A-pillar, Crashworthiness, Design Synthesis, Finite Element Analysis

**Conference Title :** ICMEDA 2020 : International Conference on Mechanical Engineering Design and Analysis

**Conference Location :** New York, United States

**Conference Dates :** April 23-24, 2020