**Technical Report Documentation Page**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1. Report No.**  DOT HS XXX XXX | **2. Government Accession No.** | | **3. Recipient’s Catalog No.** | |
| **4. Title and Subtitle**  Cost and Weight Analysis of Automatic Emergency Braking Systems for Passenger Vehicles | | | **5. Report Date**  August 21, 2019 | |
| **6. Performing Organization Code** | |
| **7. Author**  Ricardo Inc. | | | **8. Performing Organization Report No.** | |
| **9. Performing Organization Name and Address**  **Detroit Technical Center**  **Van Buren Twp., MI**  **48111 USA** | | | **10. Work Unit No. (TRAIS)** | |
| **11. Contract or Grant No.**  DTNH2216D00037  Task Order: 693JJ918F000185 | |
| **12. Sponsoring Agency Name and Address**  National Highway Traffic Safety Administration  Evaluation Division; National Center for Statistics and Analysis  1200 New Jersey Avenue SE.  Washington, DC 20590 | | | **13. Type of Report and Period Covered**  NHTSA Technical Report | |
| **14. Sponsoring Agency Code**  NSA-310 | |
| **15. Supplementary Notes** | | | | |
| **16. Abstract**  Ricardo has analyzed the cost and weight of Automatic Emergency Braking (AEB) systems, exclusive of forward collision warning hardware, which use radar and/or camera sensors. AEB systems can avoid or mitigate forward collisions by either assisting the driver if enough braking force is not being applied (called Dynamic Braking Support, DBS) or automatically applying the brakes if a forward collision is imminent (Crash Imminent Braking, CIB.)  The Toyota Camry AEB system is part of Toyota Safety SenseTM P which has a Pre-Collision System (PCS) and uses a combination of radar and camera with sensor fusion. The incremental manufacturing costs and weights for the Toyota Camry camera system, including wiring, was $50.68 and the radar system was $69.68 for a total system cost of $120.36. The Toyota Camry system weighed 883g. The total manufacturing cost was split into $113.44 for variable and $6.92 for fixed costs. The end-user cost increase for the Camry AEB system was $156.18, or a 38% markup over the variable manufacturing cost basis.  The Subaru Outback, equipped with EyeSight®, uses a stereo camera system only for AEB. The system has a unique stereo camera module that is capable of detecting distance and speed of objects in front of the vehicle without the need for a radar sensor. The incremental cost of the Subaru camera module was $136.80 and other hardware, including incremental wiring, camera cover and mounting plate, and PCS braking switch, was $23.06 for a total system cost of $159.86. The weight of the Subaru Outback AEB system was 2478g but more than half of that total was for incremental wiring; the stereo camera module itself weighed 785g. The total manufacturing cost was split into $147.25 for variable and $9.65 for fixed costs. The end-user cost increase for the Outback AEB system was $207.21, or a 41% markup over the variable manufacturing cost basis.  Both the Toyota Camry and Subaru Outback AEB systems relied upon a processor that was shared with and present on the vehicle before the AEB systems were added and therefore was not included in the incremental analysis. | | | | |
| **17. Key Words**  Automatic Emergency Braking Systems Passenger Vehicles, AEB, PV, | | **18. Distribution Statement**  This report is free of charge from the NHTSA Web site at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov) | | |
| **19. Security Classif. (Of this report)**  Unclassified | **20. Security Classif. (Of this page)**  Unclassified | | **21. No. of Pages**  41 | **22. Price** |

**Form DOT F 1700.7** (8-72)