**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 Heavy Vehicle Forward Collision Warning (FCW) and Automatic Emergency Braking (AEB) Systems for Heavy Trucks | **5. Report Date**27 September 2018 |
| **6. Performing Organization Code** |
| **7. Author**Ricardo Inc. | **8. Performing Organization Report No.** |
| **9. Performing Organization Name and Address**Detroit Technical CenterVan Buren Twp., MI48111 USA | **10. Work Unit No. (TRAIS)** |
| **11. Contract or Grant No.**DTNH2216D00037Task Order: DTNH2217F00147 |
| **12. Sponsoring Agency Name and Address**National Highway Traffic Safety AdministrationEvaluation Division; National Center for Statistics and Analysis1200 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**The US Department of Transportation (US DOT), National Highway Traffic Safety Administration (NHTSA), is developing a regulatory framework that encourages the safe development, testing and deployment of advanced driver assist systems (ADAS) and automated vehicle technology for both passenger and commercial vehicles1. Key features of these technologies relative to heavy vehicles include forward collision warning (FCW) and automatic emergency braking (AEB) systems that help prevent rear-end crashes or reduce their severity by applying the brakes for the driver2. On 16 October 2015, the National Highway Traffic Safety Administration (NHTSA) issued a grant of petition for rulemaking relative to forward collision avoidance and mitigation technology on heavy vehicles, including FCW and AEB systems. This grant of petition allows NHTSA to determine whether to issue a rule in accordance with statutory criteria.3 Subsequent research has included evaluation of heavy-vehicle crash warning interfaces (DOT HS 812 191), automatic emergency braking test track evaluations (DOT HS 812 166), and truck tractor braking performance improvement (DOT HS 809 753 and DOT HS 809 700).4 Field tests of heavy-vehicle crash avoidance systems were completed during 2016 and produced the conclusion that the overall systems work as intended.5 In 2015, the National Transportation Safety Board (NTSB) recommended that manufacturers install forward collision avoidance systems as standard features on all newly manufactured passenger and commercial motor vehicles.6 The purpose of the current study is to determine the product piece, total system cost, incremental consumer price, and weight of FCW/AEB systems on medium duty and heavy duty trucks to provide insight into the safety and efficiency benefits of using the systems for crash avoidance.Currently available collision avoidance system (CAS) technologies employ a number of sensors and warnings intended to inform the driver, assist in maintaining safe distances, and intervene if the driver does not respond to a potential conflict. These features include AEB, FCW alerts, lane departure warnings (LDWs), adaptive cruise control (ACC), impact alerts (IAs), following distance alerts (FDAs) and stationary object alerts (SOA) which indicate urgency of the potential conflict. Appropriate and timely activations could reduce distraction, modify driver behaviour, identify conflicts before they unfold, and enable improved vehicle control7. During the current study, cost and weight estimates were developed for FCW/AEB systems as employed on heavy duty trucks with gross vehicle weight ratings (GVWR) exceeding 10,000 lbs.8 This included four commercially available baseline systems (Bendix® Wingman® Fusion™, Meritor WABCO OnGuardACTIVE®, Detroit Assurance®, and Delphi AdvanceTrac®) as implemented on five vehicles (Ford F-Series Super Duty®, Freightliner M2, International LT™, Volvo VNL, and Freightliner Cascadia®). These systems first entered the market in 2013. Components unique to the FCW/AEB systems include a forward-facing camera, heads up/dedicated display, front radar sensor, connectors, wire harnesses, and associated processors.9Criteria used for selecting the subject vehicles and FCW/AEB components included 1) at least two of the systems were to include crash imminent braking (CIB) and at least one system without CIB, 2) at least one vehicle in GVWR Class 4-6, 3) at least one vehicle in GVWR Class 7, 4) at least two systems equipped with dynamic brake support (DBS), 5) at least two vehicles with hydraulic brake systems, and 6) at least two vehicles with air brake systems. The study of the FCW/AEB systems included A) identification of parts unique to the FCW/AEB functions, and B) teardown and evaluation of FCW/AEB components to determine manufacturing methods and costs and component weights. |
| **17. Key Words**AEB, FCW, CIB, Heavy Trucks, crash avoidance systems,  | **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**125 | **22. Price** |

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