

## VACS without traffic flow implications – Collision warning and avoidance systems

System	Description	Sources of info
<b>Active Passive Integration Approach (APIA)</b>	Assists the driver if a collision is imminent by reducing the car's braking distance, thereby minimising the risk of a collision; specifically, a Lane Departure Warning (LDW) system makes sure that the vehicle does not leave the lane, and a Closing Velocity (CV) sensor brakes as soon as the vehicle in front is too close, thus preventing or lessening the seriousness of rear-end collisions	Alkim et al, 2007; <a href="http://www.continental-corporation.com/www/pressportal_com_en/Se arch.html?q=APIA&amp;view=asSearch&amp;filterDoc types=type_1">http://www.continental-corporation.com/www/pressportal_com_en/Se arch.html?q=APIA&amp;view=asSearch&amp;filterDoc types=type_1</a> [accessed 31.01.2014]
<b>Advanced Braking System (AdvBS)</b>	Combine features of conventional ABS, linked brakes and traction control	<a href="http://www.local-transport-projects.co.uk/files/BP5%20004%20Advanced%20Braking%20Systems%20(v1).pdf">http://www.local-transport-projects.co.uk/files/BP5%20004%20Advanced%20Braking%20Systems%20(v1).pdf</a> [accessed 11.03.2013]
<b>Anti-lock Braking System (ABS)</b>	Prevents skidding, reduces stopping distance and allows steering the vehicle around obstacles it would otherwise hit	Burton et al, 2004; Grover et al, 2008
<b>Brake Assist (BA)</b>	Depending on the situation, the system gives the driver an early warning of a potential rear-end collision, determines how much braking power is required to prevent a collision, and automatically initiates an emergency stop if the driver fails to react appropriately	Alkim et al, 2007; <a href="http://www.continental-corporation.com/www/pressportal_com_en/Se arch.html?q=Brake+assist&amp;view=asSearch&amp;filterDoctypes=type_1">http://www.continental-corporation.com/www/pressportal_com_en/Se arch.html?q=Brake+assist&amp;view=asSearch&amp;filterDoctypes=type_1</a> [accessed 31.01.2014]
<b>Brake-by-Wire system (BbW)</b>	System that shortens the braking distance based upon Electro Mechanical Brake (EMB) actuation, instead of the currently employed pneumatic actuation; the EMB system is using the principle of self-enforcement for generating brake force, thus leading also to very low energy consumption and more silent braking	Hoeger et al, 2011
<b>Braking Distance Warning System (BDWS)</b>	Generates hazard lights flashes when emergency brake is engaged to warn next car to slow down in speed. Reminds next car to keep proper distance when in use of emergency brake	<a href="http://www.taiwantrade.com.tw/argus/products-detail/en_US/555549">http://www.taiwantrade.com.tw/argus/products-detail/en_US/555549</a> [accessed 15.03.2013]
<b>Collision Avoidance - Braking and Steering (CA-BS)</b>	Extension of the Automatic Emergency Braking System that also steers as a means to avoid accidents	iMobility Forum, 2013
<b>Collision Avoidance System (CAS)</b>	Detects an imminent crash and, depending on the particular system's capabilities, may warn the driver, pre-charge the brakes, inflate seats for extra support, move the passenger seat, position head rests to avoid whip lash, tension seat belts and automatically apply partial or full braking to minimise impact	Ehmanns and Spannheimer, 2004; Bishop, 2005; Alkim et al, 2007; Van Driel, 2007; Grover et al, 2008; Benmimoun et al, 2012; Kessler et al, 2012; iMobility Forum, 2013; <a href="http://www.eurofot-ip.eu/en/intelligent_vehicle_systems/acc/">http://www.eurofot-ip.eu/en/intelligent_vehicle_systems/acc/</a> [accessed 11.03.2013]; <a href="http://ec.europa.eu/transport/road_safety/specialist/knowledge/esave/esafety_measures_unknown_safety_effects/collision_avoidance_systems.htm">http://ec.europa.eu/transport/road_safety/specialist/knowledge/esave/esafety_measures_unknown_safety_effects/collision_avoidance_systems.htm</a> [accessed 15.03.2013]
<b>Cooperative Collision Warning (CCW)</b>	Delivers forward collision warning, right-side blind spot or lane change warning, and intersection collision warning capabilities	Sengupta et al, 2007; Popescu-Zeletin et al, 2010
<b>Emergency Electronic Brake Lights (EEBL)</b>	In case of hard braking, sends a warning to the following vehicles	Popescu-Zeletin et al, 2010
<b>Following Distance Warning (FDW)</b>	Monitors the distance and time headway to a preceding vehicle and provides continuous feedback to the driver without intervening on its own	Bishop, 2005; Regan et al, 2006
<b>Pre-crash Safety System (PSS)</b>	Using information from sensors, detects the risk of a collision with the vehicle in front; if the collision is unavoidable, pre-charges the brakes and retracts the seatbelts to help reduce injuries	Ehmanns and Spannheimer, 2004; Bishop, 2005; Van Driel, 2007; Popescu-Zeletin et al, 2010
<b>Reverse Collision Warning (RCW)</b>	Visual and audible system, which warns drivers about the likelihood of collision with an object behind the vehicle by means of sensors in the rear bumper	Regan et al, 2006; <a href="http://ec.europa.eu/transport/road_safety/specialist/knowledge/esave/esafety_measures_unknown_safety_effects/collision_avoidance_systems.htm">http://ec.europa.eu/transport/road_safety/specialist/knowledge/esave/esafety_measures_unknown_safety_effects/collision_avoidance_systems.htm</a> [accessed 15.03.2013]