From 2014 onwards, active safety will play an ever more important role in EuroNCAP testing, with the first stage being the introduction of AEB tests into the NCAP assessment. AEB systems detect a slowing or stationary vehicle (or pedestrian) ahead and apply the brakes to avoid or mitigate an accident. Assessing the effectiveness of these systems is not a trivial job and the test protocol requires accurate control of the speed and lateral position of both the test vehicle and the target, as well as the distance between them. ABD robots are the ideal tool to provide accurate vehicle control for AEB testing.

Anthony Best Dynamics has worked with the EuroNCAP test partners who are using ABD robots to develop the official test protocol for testing AEB systems. EuroNCAP classifies these systems as “City”, “Inter-urban” and “Pedestrian” and the first two types will be rewarded in EuroNCAP tests from 2014 (with Pedestrian tests to follow in 2016). The official EuroNCAP procedure also describes how Forward Collision Warning (FCW) system tests are to be performed.

In the AEB test procedure (for City and Inter-urban systems), the vehicle under test follows a soft target towed by another vehicle, with a range of closing velocities. The procedure specifies that the two vehicles must meet a series of conditions at the point the test starts:

- **Speed of vehicle under test** (test speed, +1kph / -0kph)
- **Speed of soft target** (test speed ±1kph)
- **Lateral deviation from straight-line path, both vehicles** (0 ±0.1m)
- **Relative distance between test vehicle and soft target** (0 ±0.5m)
- **Yaw velocity, both vehicles** (0 ±1.0°/s)
- **Steering wheel velocity** (0 ±15.0°/s)

Once the test conditions are met, the towing vehicle brakes at a constant deceleration (reducing the distance from the test vehicle to the soft target). The test vehicle’s AEB system should detect this and apply the brakes.

While it may be theoretically possible (with sufficient attempts) to meet all of the starting conditions with manual driving, in order to perform this procedure efficiently, robots should be used. ABD steering and pedal robots can be programmed to accurately follow a test path at a precise speed to satisfy the initial conditions, and can brake to give accurate, controlled deceleration. They can also be programmed to maintain a relative distance/speed to another vehicle or moving target and can use a wide range of triggers to start a test.
Capabilities and equipment required:

### AEB City

#### VUT – vehicle under test

- **GPS-Motion pack, giving:**
  - Position measurement to 0.03m
  - Velocity measurement to 0.1kph
  - Yaw rate measurement to 0.1°/s
  - Longitudinal acceleration measurement to 0.1m/s

- **OxTS RT3000, GeneSys ADMA, IMAR iTRACE, Racelogic VBOX3i**

#### Towed soft target (EVT – EuroNCAP vehicle target)

- No direct measurement of position, velocities or accelerations. Test requires towing vehicle to follow a straight line to within 0.1m and hence it is assumed that the EVT will follow directly behind it.

#### Towing vehicle

- **GPS-Motion pack, giving:**
  - Position measurement to 0.03m
  - Velocity measurement to 0.1kph
  - Yaw rate measurement to 0.1°/s
  - Longitudinal acceleration measurement to 0.1m/s

- **OxTS RT3000, GeneSys ADMA, IMAR iTRACE, Racelogic VBOX3i**

### AEB Inter-urban

#### VUT – vehicle under test

- **Relative position/velocity measurement system, giving:**
  - Distance and relative velocity between VUT and EVT.
  - ABD Synchro, OxTS RT-Range, Racelogic ADAS

#### Towed soft target (EVT – EuroNCAP vehicle target)

- **Relative position/velocity measurement system, giving:**
  - Distance and relative velocity between EVT and VUT.
  - ABD Synchro, OxTS RT-Range, Racelogic ADAS

#### Towing vehicle

- **Relative position/velocity measurement system, giving:**
  - Distance and relative velocity between VUT and EVT.
  - ABD Synchro, OxTS RT-Range, Racelogic ADAS

#### Steering robot with path-following: (1)

- To drive vehicle along straight line behind EVT, while maintaining steering wheel velocity of <15°/s.
- To perform tyre conditioning sinusoidal manoeuvres.
- Any ABD steering robot, SR15 is ideal

#### Throttle and brake robots:

- Maintains constant speed. (2)
- **FCW test:** applies brakes as defined in test protocol, triggered by audible FCW warning signal or CAN-bus.
- ABD CBAR is ideal

#### Notes:

- (1) ABD can supply a basic straight-line path-following software module designed to satisfy these requirements.
- (2) As an alternative, the relative position/velocity can be controlled by pedal robots in the VUT (with the towing vehicle maintaining a constant speed).

### AEB Pedestrian

AEB Pedestrian testing is scheduled to be included in the EuroNCAP rating from 2016. The protocol has not yet been finalised, but a moving pedestrian target will be needed, similar to the one shown here (from Dynamic Research Inc.). ABD is currently developing a system which will integrate with its driving robots to allow fully synchronized operation.

### All of the top 25 most successful vehicle manufacturers in the world use ABD technology to develop their vehicles

*OICA World Motor Vehicle Production survey 2012

For more detailed information on ABD products contact:

**Email:** info@abd.uk.com
**Tel:** +44 (0)1225 860200

www.abd.uk.com

ABD has representatives throughout the world.

For details please refer to our website.