



## TruckOn Overhead Collision Prevention

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# TruckOn — Overhead Collision Prevention



When an over-height truck collides with a tunnel, overpass or enclosed bridge, everything comes to a grinding halt. This is dangerous for the driver and other road users; costly for the RTA and the truck owner; and a major disruption for all road users as they wait for the accident to be cleared. *TruckOn* is a forward-looking 'proof-of-concept' project to demonstrate how emerging wireless vehicle communication technologies could prevent accidents of this type.

## Why bother?

Collisions between over-height vehicles and infrastructure costs the RTA millions per year in repairs. There are approximately three collisions with infrastructure per month. Such accidents occur despite the deployment of sophisticated warning systems such as road side electronic 'variable message' signs or stop signs projected onto a 'water curtain' directly across the path of the vehicle. Drivers may think the message is for another road user, or may think they should be able to squeeze through. Some drivers do not know the height of their truck — particularly if the load determines the height.



**Warnings are regularly ignored: this over-height truck has driven through a stop sign projected onto a water curtain at the entrance to the Sydney Harbour Tunnel.**

### Features

- Remote detection of an over-height truck;
- Use of the emerging 'DSRC' standard for wireless vehicle communications between vehicle and infrastructure;
- Delivery of warnings and advisories (auditory & visual) directly into the cabin of the offending vehicle;
- Identification and tracking of the offending vehicle;
- Notification to the traffic authority (simulated);
- Intervention with the vehicle speed control to progressively slow the vehicle and prevent a collision (simulated).

## How does it work?

When an over-height vehicle breaks a height detection beam our road side control system uses wireless vehicle communications (DSRC) to transmit to all vehicles in the vicinity the GPS location and exact time when the beam was broken. It also sends a 'map' of the road ahead that includes: distance to the overhead infrastructure and location of a diversion (if available). Systems on board each vehicle process this information to determine if they were guilty of tripping the detector. The guilty vehicle's on-board system then begins transmitting its identity, speed and other tracking information to the road side controller. Meanwhile, its on-board system also



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delivers warnings and advisories to the vehicle driver. These are tailored to the location on the road (e.g. distance to the infrastructure) and to the driver's response.

If a driver ignores advice to take a diversion or pull over, then, as the distance to the infrastructure decreases, a speed control system progressively slows the vehicle until it halts short of the danger. The speed control is reset automatically by the driver taking a diversion or on remote command from a Transport Management Centre.

The Transport Management Centre is kept informed of vehicles that don't comply with instructions or that need assistance to safely clear the area.

## Future Proofing

The on-board software is envisaged to work on a single common platform that can deliver a wide variety of safety and other useful applications that require Wireless Vehicle Communications via DSRC (and/or 3G) and GPS capabilities. Standardisation that supports this approach is already underway in the USA and Europe and demonstrations (of non over-height applications) have been conducted.

For example, in an Australian truck, the one platform could support, TruckOn, the Intelligent Access Program (IAP), RTA 'Intelligent Speed Adaptation' (ISA) systems, Navigation (GPS), Electronic Driver Diaries, Fleet Management, Port Access Scheduling, plus Rail Crossing Safety and other collision prevention applications.



**The height of this truck depends on how the crane is stowed!**

## Partners

Embedded Systems Australia industry cluster ([www.embeddedsystemsaustralia.com.au](http://www.embeddedsystemsaustralia.com.au)) with NICTA's support, made this project possible by arranging a grant from Industry & Investment NSW, workshops, and project discussions with the RTA. The project is delivered by ESA members NICTA, Braetec, Cohda Wireless, CPE Systems and ResTech.





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## Sponsors and Supporters

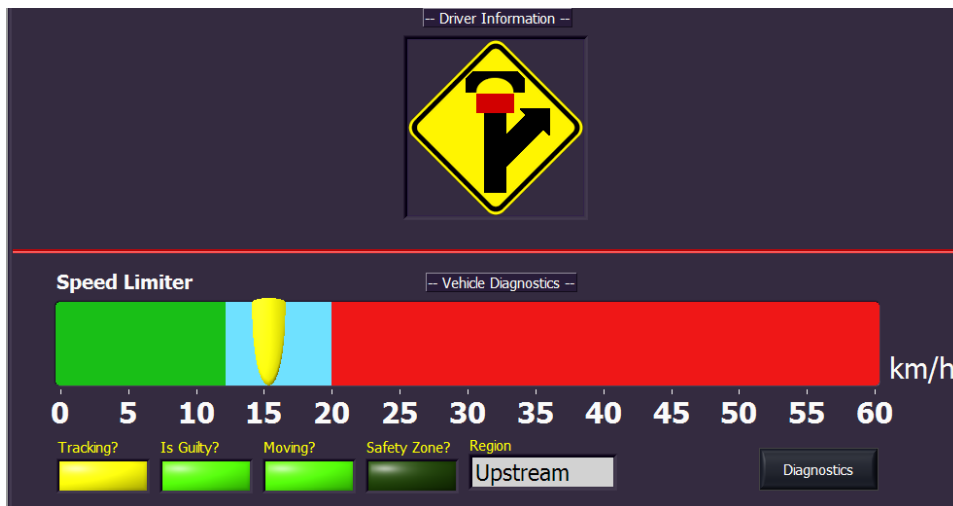
This project has been supported by a \$100,000 grant from Industry and Investment NSW matched by cash and in-kind resources of the RTA. Microsoft has assisted with sponsorship, and The Warren Centre provided assistance during the project's inception.

It is a truly collaborative project with all partners contributing significant in-kind support.



## Examples

The following scenarios indicate what the driver sees and hears.



In cabin screen. Above the red line are visuals intended for the driver. Below the red line are the speed limiter simulator and diagnostics, which would normally be hidden from the driver.

### Scenario 1 — Ignore all warnings!

The driver ignores the advisory to take the Diversion (Exit) and proceeds towards the overhead infrastructure.

#### Visual

There are two different visual symbols when the vehicle is moving: one for 'upstream' of the Diversion and a second for 'downstream' — when a Diversion option does not exist. When the vehicle is halted, the symbol is replaced with advisory text.

#### Audio

There are four different audio messages. When travelling slowly, each message is repeated regularly, when travelling fast, a message may be skipped in favour of the most relevant message.



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## Status

- **Upstream Warning** — The driver is warned and advised to take the Diversion/Exit. (At high speeds the vehicle is slowed by the speed limiter a small amount to reinforce the warning).
  - **Downstream Warning** — It is now too late to take the Diversion. The driver is now advised to pull over.
  - **Downstream Safety** — The driver has ignored warnings and the danger has increased. The system now progressively slows the vehicle to avoid a collision ahead.  
Note: The beginning of the 'Safety Intervention' zone is determined by the vehicle type — to give it sufficient room for gradual deceleration to a halt. In this zone the vehicle's maximum speed is reduced as the distance to the hazard reduces. If the driver still attempts to proceed, the vehicle slows to a halt a preset distance from the infrastructure.
  - **Halted** — The vehicle has been slowed to a halt, or the driver has pulled over. Details are provided to the driver on next actions.
  - **Manual Reset (not shown)** — After an RTA road crew has arrived to clear the truck the 'Transport Management Centre' issues a Reset command to restore speed control and turn off tracking.
- Audio: "Speed control restored. For enquiries phone the RTA on 131 700."

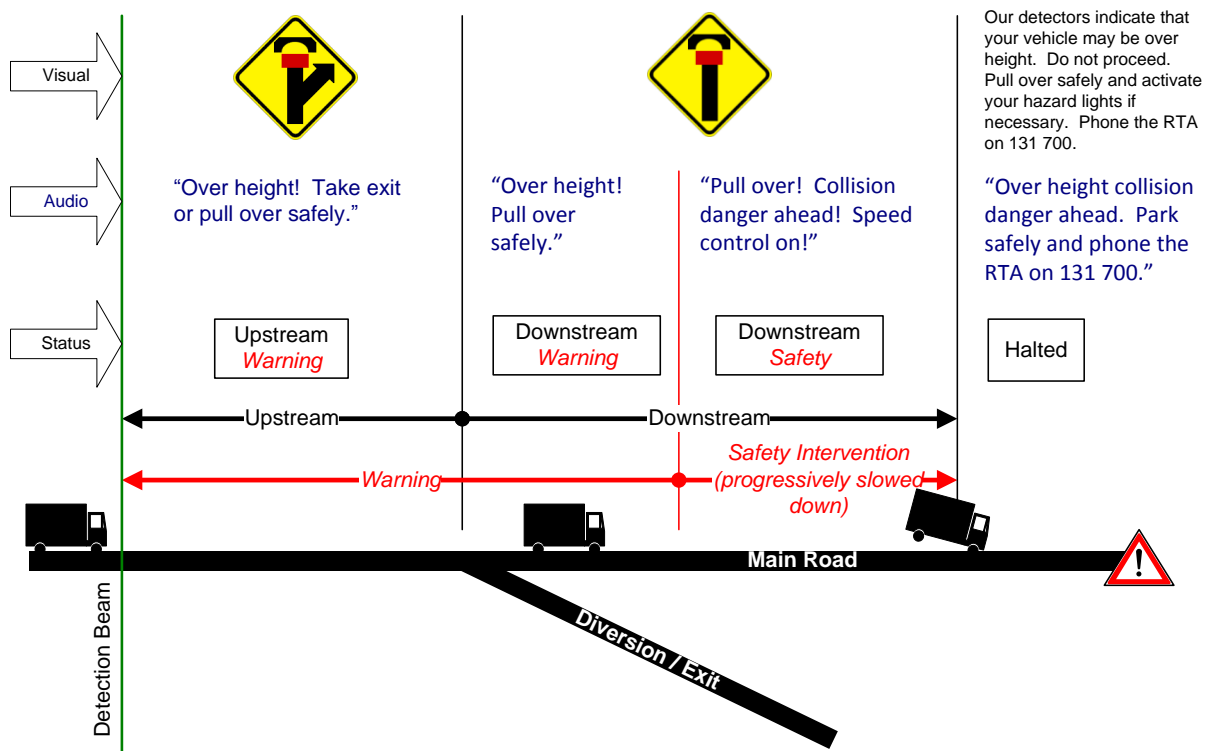


Figure 1: Over-height vehicle ignores warnings.

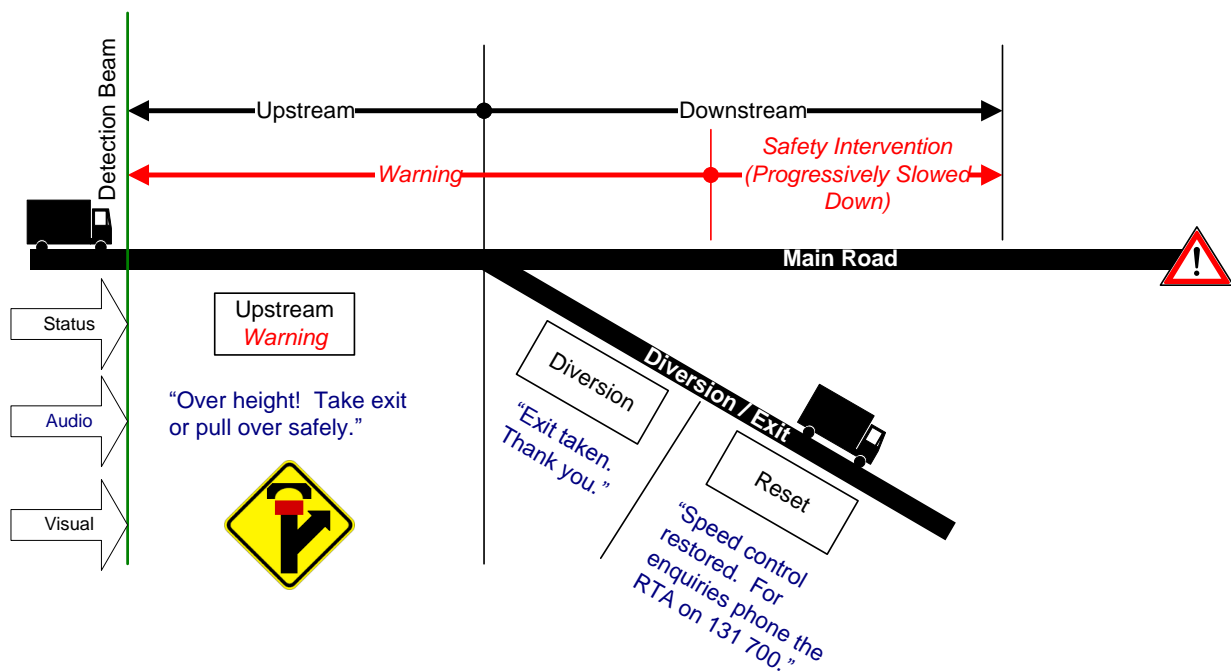


## Scenario 2 — The driver takes the Diversion/Exit

The driver acts on the advice to take the Diversion (Exit).

### Status

- **Upstream Warning** — The driver is warned and advised to take the Diversion/Exit. (At high speeds the vehicle is slowed by the speed limiter a small amount to reinforce the warning).
- **Diversion** — The system detects that the driver has taken the Diversion.
- **Reset** — The driver has proceeded along the Diversion out of the area. The system automatically resets; speed control is restored and tracking is turned off.



## Enquiries

For more information visit the project web site [www.embeddedsystemsaustralia.com.au/truckon](http://www.embeddedsystemsaustralia.com.au/truckon) or contact:

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