

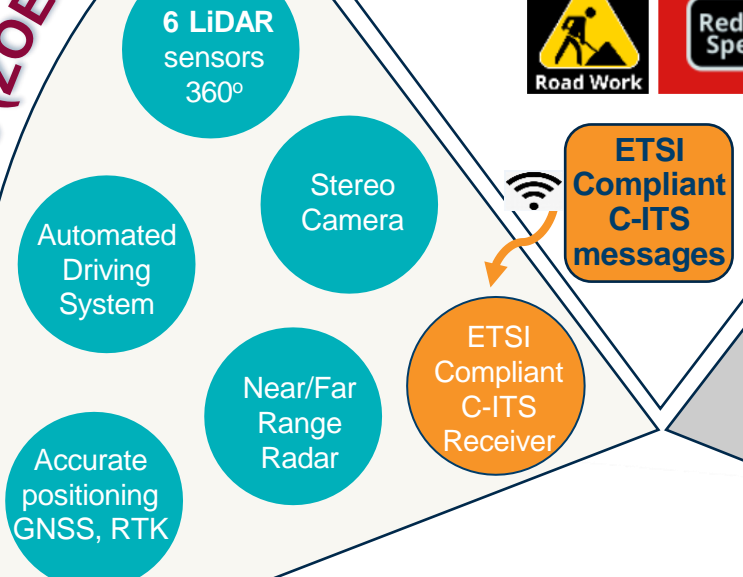
Cooperative and Highly Automated Driving (CHAD) safety study Work Package 2: C-ITS and AV integration, and benefit evaluation



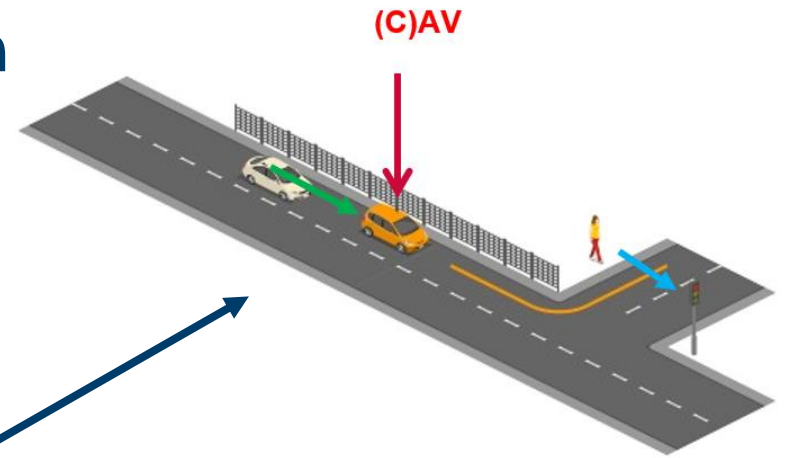
Study Objective:

Evaluate safety benefit of an Automated Vehicle (AV) with Cooperative Intelligent Transport System (C-ITS) messages (safety benefits of Cooperative and Automated Vehicles (CAV) over an AV)

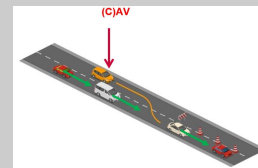
Research Vehicle (ZOE2)



C-ITS Infrastructure



Occluded pedestrian at traffic light intersection



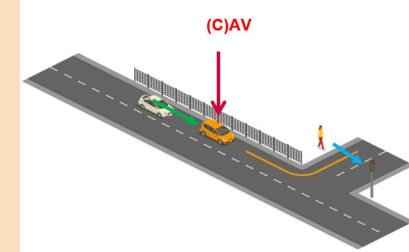
Roadworks with alternate route

Use Cases



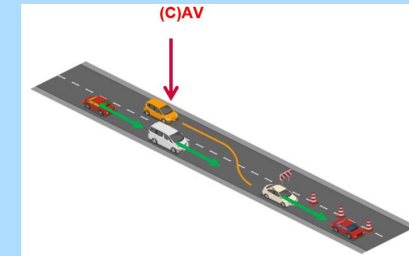
What we found? (Occluded pedestrian at the traffic light intersection use case)

- Both AV and CAV manage to stop before colliding with the VRU. C-ITS does not provide added benefit.
- In case of rear end crashes, crash likelihood improved by 20 per cent in CAVs; the crash severity also reduced. It is important to note these benefits may likely reduce or diminish as explained in ‘Study limitations’ below.
- The communication quality has no impact on reducing the likelihood of crashes and near crashes on intersection.
- Smooth velocity profile is achievable in CAVs, thus creating a more naturalistic driving behaviour. Harsh braking behaviour can be further reduced if the remaining green light phase is known within the SPaTEM (Signal Phase and Timing Extended Message).



What we found? (Roadworks use case)

- No change observed in the likelihood of crashes and near crashes on roadworks zone.
- The introduction of DENM (Decentralised Environmental Notification Message) drastically increases the success of lane change for CAV.
- The communication quality has no impact on reducing the likelihood of crashes and near crashes in the roadworks zone.
- The AV and CAV both equally complied with the speed limit in the roadworks zone.
- In the case of lane closure, CAV has "better" or "earlier" orderly change of lane before the location of lane closure.



Study limitations

- The IEEE Standards Association has recently introduced a new standard, IEEE 2846-2022, which outlines a minimum set of assumptions aimed at enhancing the safety-related models in Automated Vehicles. If these assumptions were incorporated during our study, benefits attributed to the CAV in comparison to the AV would likely reduce or diminish. Therefore, our findings should be considered as interim.



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