

DELIVERABLE REPORT

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DISSEMINATION LEVEL: **RESTRICTED (RE)**

TITLE: **UPDATE OF THE THEORETICAL VALIDATION OF THE DRIVING CONTROLS STRATEGY AND SAFETY/STABILITY ASSESSMENT BY SIMULATION AND BENCHMARKING AND RESULT OF TASK 4.4.4.**

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VERSION: **FINAL**

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PROJECT ACRONYM: **TRANSFORMERS**

PROJECT TITLE: **CONFIGURABLE AND ADAPTABLE TRUCKS AND TRAILERS FOR OPTIMAL TRANSPORT EFFICIENCY**

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COORDINATION: **VOLVO (SE)**

PROJECT MANAGEMENT: **UNIRESEARCH (NL)**

Executive summary

This report is an update of the deliverable D4.3: "Theoretical validation of the driving controls strategy and safety/stability assessment by simulation and benchmarking" [1]. D4.3 discussed the difference in dynamic behaviour of a tractor-semitrailer between a conventional semi-trailer combination and one in which one of the trailer axles is driven: the hybrid on demand (HoD)-trailer. The report D4.3 focused on the theoretical background of the HoD-trailer concept.

This report serves two purposes:

1. Verification of the simulation model (developed in D4.3) using experimental results
2. Validation of the conclusions of D4.3 with respect to possible stability issues of the TRANSFORMERS vehicle, compared to conventional tractor + semi-trailer vehicles

A subset of the manoeuvres that have been proposed in deliverable D6.5 [2] is tested in under sub-task4.4.4:

- single lane-change,
- ISO double lane-change ("chicane"),
- turning manoeuvre,
- emergency braking.

Due to technical and modelling issues, the emergency braking experimental results could not be compared with the numerical model results. The other tests have been performed successfully and showed that:

1. The numerical model of the tractor + semi-trailer combinations fits well, both for the conventional combination and the TRANSFORMERS vehicle.
2. The conclusions of D4.3 are valid for the Transformer vehicle:
 - a. The dynamical behaviour of the hybrid on demand (HoD) combination is close to the behaviour of the conventional tractor + semi-trailer combination.
 - b. No additional stability control measures are needed in addition to the common measures such as traction control, anti-lock braking control and drive-train logic (i.e. strategy to use the HoD-trailer).
 - c. If, for any reason, the tractor's or semi-trailer's stability controller must be activated, the HoD-semi-trailer system should be switched off. In these cases, the energy regeneration should also be disabled.

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