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Publishable Executive Summary

This derivable provides the definition, requirements and simulations of the accident type scenarios that had been developed from the results obtained in task 5.1. The main objective is to define the scenarios and provide the requirements to be able to carry out the simulations in order to assess road users' safety. The results obtained in this part of the project will be the baseline to carry out further in-depth analysis that will be carried out in the task 5.3 activities with LS-DYNA and Pre-Scan.

The results from the GIDAS analysis showed that the accident types could be used to prepare frequent and relevant crash scenarios of 16t+ trucks. The main crash opponents for the trucks in accidents were cars followed by commercial vehicles, bicycles, pedestrian and powered two-wheelers.

In total, 12 relevant accident scenarios were generated for crashes with pedestrians, cars, commercial vehicles and cyclists. As exceptions the rear-end crashes with a car that crashed into the back of a truck were discarded due to the fact that it was not relevant for the AEROFLEX project scope. On the other hand rear-end crashes with a truck with more than 16T crashing into the back of a car were included. Concerning the accidents with powered two-wheelers, only a few crashes had occurred with trucks with more than 16T and they were difficult to unify in an accident type group. Therefore the group of crashes with PTW's was excluded from the further investigation. A list of accident types with pedestrians, cars, commercial vehicles and cyclists as crash opponents was drawn up and pictograms were included to illustrate the defined scenarios.

Once the generic scenarios were defined with the data gathered from GIDAS, the 12 PC-Crash accident scenario reconstructions were carried out using comprehensive information of the accident circumstances for each scenario. The obtained results in PC-Crash are a guideline of the vehicles, pedestrian and cyclists' behaviour as found in an accident. The main results that are shown are the different body part accelerations such as head, thorax and hip that pedestrian and cyclist had in those scenarios. Severe accelerations could represent severe injuries or even fatalities. The aim was to show when the events take place and in which order the pulses occur to understand the events in the timeline. To do so, the acceleration peaks on the diagrams were synchronised with the videos from the simulations. In order to obtain more accurate values and level of injury a detailed simulation has to be carried out with LS-DYNA.

In order to evaluate the correct performance of the new systems implemented in the further activities, some KPIs were defined. In this derivable four KPIs are presented: One for the reduction of serious and fatal injuries and another one for pedestrian safety including head impact, run over and pelvis protection.

A conclusion from the PC-Crash scenario simulation in the pedestrian scenarios, when a pedestrian enters the road from the left side or right side is that the most severe accelerations are at the head and hip when impacts against the frontal part of the truck occur. In the scenarios where the pedestrian is walking along the sidewalk and has an impact with a truck turning, the body parts that are affected are the head when it impacts against the road surface and the hip when it impacts against the frontal part of the truck and against the ground.

As for the cyclist scenarios, when a cyclist travelling in lateral direction of the roadway of the truck approaches an intersection and the truck overtakes the cyclist to turn and collides with the cyclist, the severe accelerations are when the head impacts against the road surface. In the scenario where the cyclist is crossing an intersection and collides against a truck, the severe accelerations are in the hip and head when they impact against the frontal part of the truck. The last cyclist scenario is when the cyclist is cycling on the lateral of the road and the truck speeds up to overtake the cyclist but the cyclist impacts against the side of the truck, the severe accelerations are when the hip and thorax impact against the lateral part of the truck and in the head when it impacts against the road surface.

The main result from +16T trucks against commercial vehicles (including light trucks and buses) and truck against a car are the simulations of the vehicles' behaviour during the accident. Some results such as accelerations, energy and impact angles can be obtained for further vehicle structural analysis in these scenarios. Occupant safety injuries in these scenarios were not evaluated as they are out of the scope and only vulnerable road user simulations will be carried out at this point.