

INNOVATIVE RUNNING GEAR SOLUTIONS FOR NEW DEPENDABLE, SUSTAINABLE, INTELLIGENT AND COMFORTABLE RAIL VEHICLES

D3.4 Impact assessment

Leader/Responsible of this Deliverable: Riccardo Licciardello, DICEA

The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The content of this document reflects only the author’s view – the Joint Undertaking is not responsible for any use that may be made of the information it contains. The users use the information at their sole risk and liability.

This project has received funding from Shift2Rail Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 777564.

Dissemination Level		
PU	Public	
CO	Confidential, restricted under conditions set out in Model Grant Agreement	X
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

Start date of project: 01/09/2017

Duration: 25 months

PUBLISHABLE SUMMARY

This report presents an assessment of the impact of the outputs of RUN2Rail WP3, including on potential impacts on the existing Regulatory and Standardisation (R&S) framework.

The benchmark for the impact assessment is inspired by Metro de Madrid's series 8000 3-piece 55.5 m trainset, in operation on line 10. Most of the necessary data were available for the project thanks to MDM who are a partner in the RUN2Rail consortium.

The main impacts addressed were those of the ROLL2RAIL Universal Cost Model UCM for the metro operator (costs of investment, energy, noise consequences, wheel maintenance, track maintenance, unavailability, hazards) and other economic impacts not directly affecting the operator or outside the rail sector, environmental impacts, social impacts, R&S impacts, with a particular focus on the latter.

The differences with respect to the benchmark scenario were explored for the above impacts over the 30-year time-frame of the study for the two following innovation scenarios:

- introduction on line 10 of new 3-piece 55.5 m trainsets following the RUN2Rail WP3 concept 'CONC_BG3', which has conventional layout (bogie vehicles) but innovative running gear comprising semi-active secondary suspension and active steering of the solid-axle wheelsets;
- introduction on line 10 of new 5-piece 60 m trainsets following the RUN2Rail WP3 concept 'CONC_SA3', which has mechanically simple lightweight single-axle running gear that is made possible thanks to fully active vertical and lateral single stage suspension with actively steered wheelsets (in the solid-axle version) or wheel pairs (in the Independently Rotating Wheel IRW version).

The results show for both innovation scenarios that the RUN2Rail concepts are capable of bringing significant benefits to the operator.

For both concepts the major contributors are wheel and track maintenance costs. Whilst the savings for wheel maintenance turn out to be similar for the two concepts (around 15 k€/year-trainset), the track maintenance savings are significantly higher for the single-axle concept (30-40 k€ versus 10-20 k€ per year per trainset). This is due to the impact of the lighter trainset weight on the most important cost driver, ballast renewal.

The single-axle concept is capable of offering other weight-related benefits that are not present for the bogie vehicle: energy savings and increased passenger revenue. Both these savings are comparable with wheel maintenance savings, 10-20 k€/year-trainset).

Operational unavailability costs due to the introduction of active suspensions and steering are shown to be manageable with an appropriate choice of redundancy levels.

The admissible increase in annual hazard costs per trainset was set as a target, in order to achieve hazard cost variations that are practically zero for both concepts.

All in all, and considered the limitations of the analysis, the results suggest that the innovative trainsets could lead to benefits that would justify a 5-10% higher investment with respect to the benchmark for CONC_BG3 and much in excess of 30% for CONC_SA3, which is favoured by its lighter weight and lower mechanical complexity with respect to the former.

The R&S framework defined by the TSI Loc&Pas, the Common Safety Method on Risk Assessment (CSM RA) and standards EN 14363 and the EN 5012x series seems quite suited to the RUN2Rail authorisation strategy proposal described in RUN2Rail Deliverable D3.3. The authorisation strategy may be seen as an explicit risk estimation performed using the EN 5012x series as a guideline with a link to the rule-based approach for running safety.

In SHIFT2RAIL, the follow-up of this work would be to include active suspensions and steering in Technical Demonstrator TD1.4 and perform their assessment according to the RUN2Rail authorisation strategy as described in D3.3, using the full data set based on the actual design of the demonstrator.

After SHIFT2RAIL and based on its results, the regulatory framework should then evolve with test methods gradually shifting towards virtual methods.

The authorisation strategy of the future will ultimately consist of a mix of virtual and on-track testing with the portion of virtual testing increasing over time, incorporating risk-based thinking right from the start.