Innovative data methods for passenger safety during the Covid-19 outbreak

July 31, 2020

The rail industry has been working hard to attract passengers back to rail. RSSB has been undertaking work in the area of crowd simulation to quantify the risk of infection from Covid-19 per average passenger journey. In the article below, we share the preliminary results of RSSB's findings and detail what it hopes to do with the results and research in the near future.

During the Covid-19 outbreak, the rail industry has seen passenger numbers fall to as low as 4%. Looking ahead, RSSB recognises that passenger confidence in returning to rail as a mode of transport will be challenging. Passengers will need to be confident that they are safe from the risk of infection of Covid-19 whilst travelling.

The work outlined below describes, one strand of work RSSB is delivering to ensure passengers are able to travel safely and confidently again from summer. It is intended for train operating companies and the wider industry to use the data provided to make informed decisions that prioritise passenger experience.

As part of RSSB's commitment to ensuring a better, safer railway—particularly during the recent Covid-19 outbreak—RSSB has recently joined an alliance of partners called Emergent Alliance. The Emergent

Alliance is formed by organisations from all industries who have pledged to share data and expertise to collaboratively build the economic resilience and innovation of GB industries for a better tomorrow and support recovery from the Covid-19 outbreak.

The challenge of tempting passengers to return to rail

The Covid-19 outbreak has presented many challenges that the rail industry has not experienced before. As such, RSSB shared this challenge with the Emergent Alliance with the aim to:

- help policy makers understand the relationships between rail's contribution to economic growth (its reactivation) and the risks of infection by encouraging more passengers to use train services during the outbreak.
- understand how to maximise the direct and indirect economic benefits of passenger returning to rail whilst limiting further the risk of infections from Covid-19.

Challenge: *What is the risk of infection from Covid-19 whilst travelling?*

RSSB's approach: Focus on infection risk per passenger journey

RSSB's current focus is on the relationship (labelled 'a' in the diagram) between passengers travelling and the possibility to spread Covid-19. This is seen as the key to the overall problem, it is the most complex area to address and the most pressing in and of itself.

RSSB's approach to this challenge is in three parts:

1. **Understand chances of infection through 'personal contact'**

We are using a model which collates information about Covid-19—such as level of infections in the UK from ONS survey data, proportion of pre or asymptomatic cases from academic literature to give a probability of infection through each 'personal contact'.

2. **Understand the number of 'personal contacts' experienced in a journey**

RSSB is working with crowd simulation experts, Crowd Dynamicshttps://www.crowddynamics.com/ to understand:

1. the number of times two passengers are within a given distance of each other and for how long
2. the movements through stations, onto trains and whilst on trains during train movements.

RSSB has completed a demonstrator model using an Azuma Class 800 carriage layout, common in LNER

trains and are now starting to model multiple scenarios for different train classes, services, passenger demand levels and so on.

3. **Combine the information and simulation work with mitigation measures to give an infection risk per passenger journey value**

Point 1 and 2 together provide an infection rate per journey, assuming that there is no mitigation from eg masks, HVAC or surface cleaning processes. The final step will incorporate estimates of the effectiveness of these processes in reducing the risk of infection.

Work on quantifying these mitigations and the impact of different social distancing measures used in estimating infection risk per passenger contact has been shared with LNER.

The results from RSSB's analysis has been used by LNER to support their risk assessment for long distance seating reservations or seating plans, maximising LNER's service capacity whilst still ensuring the safety of passengers and used in review discussions with the ORR.

https://play.buto.tv/wprPV

The initial results

Initial values have been produced for a simple train journey scenario involving a Class 800 carriage. The journey modelled involved loading 44 passengers onto a carriage, travelling for 30 minutes, alighting 22 passengers, boarding another 22 and then travelling another 30 minutes before alighting all passengers.

From this scenario we estimate that the risk of infection per passenger journey is **around 1 in 11,000* journeys** using the 0.05% population infection rate for England (from ONS).

RSSB's ongoing work

RSSB is now working at pace to develop more complex models using different train types, more complex journeys and various loading scenarios. This will help target the infection per journey to particular operators, regions or even train services.

It is also engaged in an ongoing process to refine and confirm the various values and models being used, based on the latest, emerging, medical and scientific publications.

The method, assumptions and values used are being presented to the Department for Transport Chief Scientific Advisor's office on 31st July for verification. This should ultimately provide regional estimates of passenger infection risk by service type and passenger demand or loading.

In the longer term, RSSB is also seeking to include movements around different layouts of stations by passengers. This will garner a better understanding of the entire time that a passenger is on the GB rail

network.

This simulation work delivered for LNER is just one of many projects RSSB is undertaking to deliver and share with the wider GB rail industry. RSSB recently hosted a stakeholder webinar entitled *Beyond Covid-19: Adapting to the new normal in rail* on 23 July, at which Rail Minister Rt. Hon Chris Heaton-Harris provided the keynote introduction. Presentations were given on the different areas and work RSSB is leading and contributing to. This work, amongst other bodies of work, currently being delivered will support the industry to continue to mitigate the effects of Covid-19, support decision-making and ultimately encourage passengers that GB rail continues to be safe.

Welcoming the simulation work, Iain Ferguson, LNER Head of Safety and Sustainability said: "I'm really pleased we could work with RSSB to deliver this work and share results with other TOCs. The work we did shows that onboard, customers and staff can be assured that they are as safe as can be in any other indoor environment.

"Together we were able to be assured that LNER is taking the right measures to control risk, by taking advantage of the data made available to us through the crowd simulation work."

For more information about on this work please contact us via our Customer Self-Service Portal.

Further information:

*These values are all in development and do not include any mitigations from mask use or HVAC at the present time.

These values are in development and do not include any mitigations from the use of masks or HVAC at the present time.

This figure represents an initial estimate and is still subject to a detailed epidemiological expert review and refinement and there may be significant changes in the future.

Click here for more details.

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