

## **Project Endeavour Blog 2**

### **Remote operator training – why now is the time to set standards for the future**

This blog post forms a part of a series of blog posts from the team at TRL working on Project Endeavour, where we are exploring the topics of safety, assurance, and remote operation of connected and automated vehicles.

More and more companies are trialling connected and automated vehicles (CAVs) on public roads, both in the UK and further afield. One thing that these trials tend to have in common is that they have a safety driver present within the vehicle who is overseeing operation, and ready to take control at any point. But what if this didn't need to be the case? What if the vehicle could be supervised and controlled remotely?

Remote operation is the next big step in the development of CAVs. Removing the safety driver from the vehicle provides many benefits in its own right, and acts as an important stepping-stone towards full autonomy.

As part of the Endeavour project, the team at TRL is developing a roadmap for the remote operation of CAVs. While focused on the UK, the broad themes and milestones are likely to be widely applicable. As with much of our research, the development of the roadmap began with a thorough review of existing literature. However, one area where the findings were sparse was the training of remote operators. This paucity of information is understandable and is likely due to the embryonic nature of the remote operation, the restricted jurisdictions in which remotely-operated vehicles are allowed to be deployed, and the limited number of companies testing or utilising remote operation in the public domain. It is also a highly competitive and commercially sensitive field.

The safety driver discipline itself is an emerging area; there is very limited formal guidance or legislation provided by national governments or supranational organisations such as the United Nations. In the UK, the Department for Transport's Code of Practice: Automated vehicle trialling (2019) provides some guidance on expectations around safety driver training, but largely places the onus on trialling organisations to define the experience and training required for their trials.

The British Standards Institution (BSI) are currently developing PAS 1884, sponsored by The Centre for Connected and Autonomous Vehicles (CCAV), which will provide detailed guidance to trialling organisations on the requirements and recommendations for safety driver selection and training. However, this specification will focus on the in-vehicle safety driver with only initial, high-level consideration given to remote operators undertaking visual line of sight operation.

It is reasonable to assume that several of the fundamental requirements for remote operator training are likely to mirror training requirements for in-vehicle safety drivers. We believe that a priority for remote operator training is to understand which areas will be common across the two roles, in order to draw upon the existing and evolving topics of in-vehicle safety driver training. For those areas that differ, careful consideration must be given regarding how best to devise training programmes to effectively prepare remote operators for their roles. Our research highlighted that remote operators are likely to face particular challenges, in areas such as obtaining adequate, continual situational awareness of the vehicle's environment, and in controlling the vehicle across networks with varying latency. Additionally, there are many different use cases that fall under the umbrella of "remote operation", and delivering each of these brings different technical, safety, social, and legislative challenges. It is important to understand how best to deliver training to meet this range of requirements.

It may also be possible to draw on other areas for training requirements in addition to that of current safety driver practices. Remote operation is more prevalent in off-highway environments such as mining; while these environments are generally less complex and pose fewer risks compared with public roads, the control mechanics and other operational requirements are similar, and may provide a useful starting point.

Remote operation has the scope to become one of the primary methods for the control of CAVs, not only during trials and testing, but during deployment. Given this, the present would be an opportune time for legislative, regulatory and guidance bodies at all levels to demonstrate initiative and leadership concerning the

requirements for remote operator-related training. Providing universally clear and accessible guidance on how it can, and should, be undertaken within existing and evolving legislation would be a good start. For example, bodies such as CCAV and BSI could leverage the momentum and knowledge gathered and exploited in the development of their current CAV Standards programme, to develop a remote operator training PAS. While further research is undoubtedly needed in relation to some aspects of remote operation (for example, situational awareness and latency) these can be explored in parallel with the development of a PAS. In doing so this would, with appropriate input, define and steer the direction of remote operator training requirements, reducing the risk of diverging approaches and consequently potential impacts on safety, timescales and costs, developing under competing test programmes.