

# Enhanced information design for high speed train displays: determining goal set operation under a supervisory automated braking system

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## **Abstract**

As a task traditionally reliant on external sources of information, integration of European railway initiatives will change traditional British train driving by migrating a new signalling standard for exclusive use inside the cab. On-board computer systems and driver-interfaces will instruct throttle changes for speed and braking points under a supervisory automated braking system. However, it is unclear what effects such a fundamental transformation in human-machine expertise and automatising of goal setting activity is likely to have on driver control. The present study used a blues-skies approach and process control analogy to investigate performance under automatic (closed loop) and driver goal set (open loop) operations in ATREIDES (Adaptive Train-Research Enhanced Information Display and Environment Simulator). Eighteen postgraduate participants, all with engineering backgrounds, were trained before performing a short train journey under tracking, predictive or basic driver display modes. The results showed that performance under automatic goal setting was more optimal, required fewer safety interventions, and considered subjectively easier than driver goal set modes. However, modes were equally demanding on objective measures, suggesting supervisory automation and overt tracking did not reduce cognitive effort. The findings are discussed in relation to characteristics of control activity with implications of future changes to the UK train driving task.

## **Introduction**

### *Motivational background*

The proposed integration of the European Railway Traffic Managing System\* (ERTMS) in the UK will make fundamental changes to the train driver's task. Though the reasons for change are motivated by European initiatives (e.g., international standardisations, interoperability regulations) and appear to weigh heavily on one side of the performance-safety divide (e.g., maximised capacity,

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\* Information accessible at <http://www.ertms.com/>