



Edinburgh
Trams



INTEGRATED **HUMAN** FACTORS



The Evolution of the BaselineNC™ Workplace Fatigue Monitoring Wearable Project at Edinburgh Trams



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Why are Edinburgh Trams undertaking this workplace fatigue monitoring wearable project?

The Rail Accident Investigation Branch (RAIB) *“Overturning of a tram at Sandilands junction, Croydon: 9 November 2016”* rail accident report provided recommendations on improving the management of tram driver fatigue risk after the report found that:

“Seven people were killed, nineteen were seriously injured, and 43 had minor physical injuries (including the tram driver). Only one person was physically unhurt. A substantial number of people involved with the accident suffered shock and/or emotional trauma.”

This tragedy underscored the need for a proactive fatigue management system that could identify and mitigate risks before they lead to accidents.

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Beginning as the Driver Innovation Safety Challenge (DISC), through to FOCUS+ and now BaselineNC the project has seen the collaboration of academia and industry to develop a world leading workplace fatigue monitoring system that can help save lives, reduce risk and deliver efficiencies in public transport but also across industry sectors.


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Edinburgh Trams have supported the development of BaselineNC, that monitors and analyses drivers' and mobile workers' fatigue and well-being levels. Pioneering a pre-emptive — identifying symptoms early that could indicate future loss of focus, inattentiveness and performance — and not reactive approach to accident prevention.

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This has led to significant milestones such as:

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- **Through collaboration with City of Edinburgh Council, Edinburgh Napier University, Integrated Human Factors (IHF), Scotland CAN DO, Transport for Edinburgh and UKTram, Edinburgh Trams piloted a wearable fatigue management solution.**
 - **Initial trials in Edinburgh provided useful biometric data to enhance the BaselineNC algorithms through machine learning, leading to 36 devices being distributed amongst volunteers from networks in Blackpool, Edinburgh, Manchester and Sheffield, as well as at UKTram.**
 - **Leading to a wider EIT Urban Mobility project involving between 50-70 workers in Edinburgh and at DKV Debreceni Közlekedési Zrt. in Debrecen, Hungary, providing valuable data on how the system functions across different modes of public transport.**

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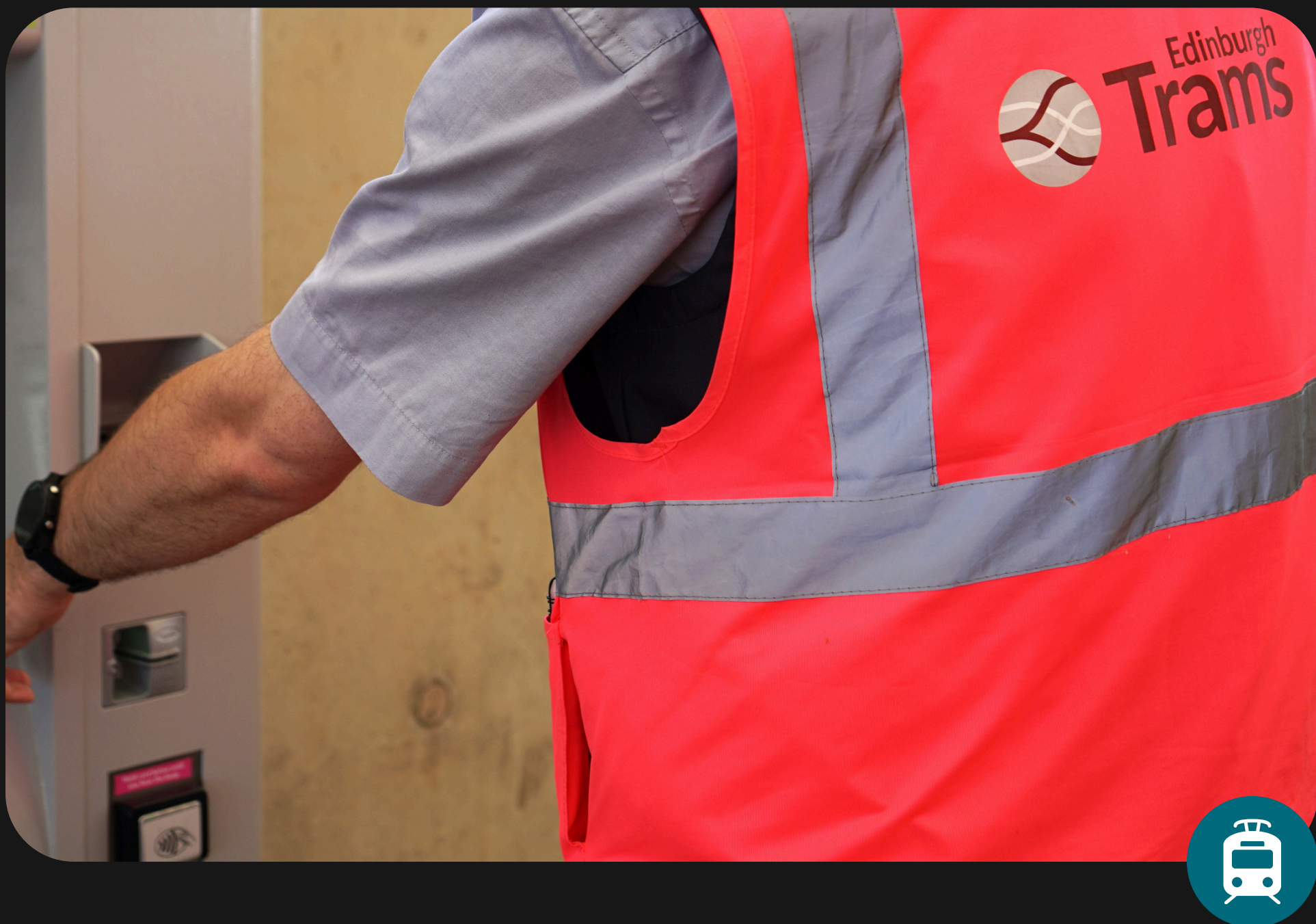
The initial trials at Edinburgh Trams provided operational evidence — from a combination of comprehensive IHF and independent assessment results — that BaselineNC delivers effective situational awareness monitoring of fatigue onset with 98% biometric data accuracy.

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One of the assessment results showed the pre-emptive detection of the onset of worker fatigue by BaselineNC **HOURS before two visually observed microsleeps.** There were also several other microsleep episodes within this time frame and BaselineNC was able to highlight the wearer's steady decline to a state of dangerous fatigue.

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With the wearable assessed and trialled for suitability, the system is now being tested for operational scenarios. With one of the objectives to humanise the implementation against key metrics such as user adoption and acceptance. For example, the establishment of procedures and processes when the onset of worker fatigue is detected.