Understanding the risk and benefits of providing TPWS permanent speed restrictions set speed information to train drivers

T1014 - July 2014

Background

Fitting the Train Protection and Warning System (TPWS) was mandated under the Railway Safety Regulations 1999, which stated that train protection had to be installed before 1 January 2004. However, after the Ladbroke Grove accident in 1999, the infrastructure owner (then Railtrack) committed to bringing forward the deadline for signal fitment by a year. Fitment was completed by the end of 2003.

During a three year period over 12,000 signals, 650 buffer stops, around 1000 permissible speed reductions (previously referred to as permanent speed restrictions (PSR)), as well as over 6,000 passenger, freight, and engineering trains were fitted with TPWS equipment. Some locomotives and vehicles were, however, exempt from fitment.

A key design criterion for TPWS was that it should be 'invisible' to the driver of a train driven correctly. The term 'correctly' was generally accepted as meaning a train that was being driven in accordance with the company's defensive/professional driving policy.

Because of the nature of TPWS, it was necessary to make assumptions regarding the braking capabilities of trains. The trigger speed and location of TPWS Over-speed Sensor System (OSS) loops were optimised for trains capable of achieving a full service brake application at 9%g and an emergency braking application at 12%g. They cannot provide differential speed control for slower trains other than a single step difference of 20%, which is used for freight trains.

A significant proportion of those passenger trains built since the late 1990s was capable of exceeding these percentages. This meant that trains capable of achieving greater than 12%g emergency braking rates (certain recent designs of high speed passenger trains) and higher speed freight services (normally inter-modal services permitted to operate at more than 60mph) have to be driven well within their normal braking capability if
Undesirable TPWS brake demands at the TPWS OSS loops are to be avoided.

Drivers began to realise that, by using the braking points of older trains that had braking characteristics that were not as good as the modern trains, they were reducing speed too early and risked delays. Gradually they began to find braking points closer to the target location and found that they were able to achieve the smooth, consistent braking curves required by their company’s driving policies and still get train speed down to the required speed.

Drivers believed, quite justifiably in most cases, that train speed and deceleration at the time of the TPWS brake demand was such that they would have been able to achieve the target speed. This left them feeling frustrated and in some cases to lose faith in the system.

Drivers have raised their concerns with their local ASLEF representatives at an Annual Assembly of Delegates and a resolution was passed regarding the provision/publication of trigger speeds. It was agreed that an approach should be made to the management at each train operating company (TOC) to request that TPWS trigger speed information be made available to drivers.

ASLEF asked one TOC about the possibility of providing this information but, as the TOC believed that drivers adopting professional driving policies should automatically bring train speed within trigger speeds, they did not provide the information.

Previous feedback from industry confirmed that this position was common to most train operating companies.

In an attempt to resolve the issue, approaches were made to RSSB to conduct research into whether it was appropriate to provide train drivers with details of the trigger speeds at TPWS OSS associated with PSRs and how such information is best communicated.

The TPWS Strategy Group debated this subject and confirmed the current position held by most train operators but supported the use of a research project to determine whether this position should be changed.

**Aims**

The research was originally sponsored by Operations Focus Group, supported by the TPWS Strategy Group. Its successor,
the Train Operations Risk Group (TORG), has reviewed the report.

The research project considered the following issues:

- The advantages and disadvantages of providing drivers with trigger speeds at TPWS OSS associated with PSRs. Issues to be considered included driver distraction, confusion between the locations of TPWS OSS loops associated with PSRs and signals, the effects on driving technique and the potential changes in mind-sets from having different target locations.
- Current driving policies and instructions in relation to approaching PSRs.
- Whether compliance with driving policies and instructions should reduce the likelihood of brake demands caused by exceeding the trigger speeds at TPWS OSS associated with PSRs.
- Train operating companies' policies for dealing with a brake demand caused by exceeding the trigger speeds at TPWS OSS associated with PSRs.
- The best mechanisms for providing drivers with TPWS OSS trigger speed information.
- The potential for including TPWS OSS trigger speeds within the Driver Advisory System.

Data sources

The majority of the data included within the report has been extracted from the Safety Management Information System (SMIS). Data in SMIS is recorded by railway undertakings (RU) and by the Network Rail safety reporting team using information recorded in the Route Control logs and reports from the response staff.

Further information has also been obtained from:

- Discussions with representatives from train and freight operating companies.
- Train and freight operating companies' internal policy and procedures documents.
- Examples of driver briefing notices.
- On-train data recorder information.
- Project steering group meetings.

A questionnaire used to survey drivers and driver managers was designed to capture their attitudes to, understanding of, and practical experience associated with TPWS OSS at PSRs and the
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benefits and disbenefits of providing trip speed information to drivers.

Supporting information from research project T1044

Research project T1044 A review of compliance with permanent, temporary and emergency speed restrictions (which is currently in progress) has carried out a review of the processes used to plan, introduce, publish and operate speed restrictions; and the identification of the potential for human error which can lead to speeding events. As part of the T1044 project, interviews were carried out with drivers and included questions regarding the provision of information about TPWS trigger speeds. This provided some useful information to support this project.

Findings

From the data which has been made available, and from the responses received to the questionnaires, it has been concluded that there are a number of different methodologies being employed by RUs across GB railways.

Some RUs, who have provided their drivers with TPWS OSS information, have employed general briefing methods. Some have targeted their briefs according to their perception of the best way to tailor the mitigation measures to the specific locations concerned and one TOC has trialled lineside signage as a solution. From the levels of data available, it is difficult to accurately indicate whether there is any direct correlation between any of these initiatives, and subsequent levels of TPWS brake demands at PSRs.

Those RUs that have provided their drivers with a comprehensive list of TPWS OSS trigger speeds may have seen a reduction in brake demand numbers, although it is inconclusive as to whether this has come about as a direct result.

Where targeted briefs have been employed, in particular to raise awareness of a location with repeated OSS-initiated brake demands, a noticeable decrease in incidents has been observed, although the overall numbers are relatively small.

The provision of lineside signs which show the TPWS trigger speeds, as pioneered between Fenchurch Street and Shoeburyness, seems to have had a positive effect on brake demand numbers. However, as the numbers of these brake demands was already fairly low prior to the signs being erected,
their efficacy may be questionable in terms of statistical significance.

Conclusions

In conclusion, there are a number of different tools available to the industry which individual RUs may choose to adopt to try to reduce the instances of trains being tripped on the approaches to TPWS locations requiring a reduction in permissible speed. One, or more, of these may be the most suitable way in which to address the issue; however, it remains for each individual RU to evaluate whether to apply one or more of these methods, depending on the location(s) concerned as well as the particular characteristics of their individual operations. Nevertheless, none of these appear to be a panacea to the problem.

Deliverables

This project has produced a research report that provides industry with a summary of the various methods currently adopted by passenger and freight operating companies to advise their drivers of TPWS trigger speeds. It also considers whether these methods are likely to be successful and the potential risks that may arise as a result of providing this information.

Next Steps

TORG recommends that RUs should review the report and evaluate whether to apply one or more of these methods to make information about TPWS trigger speeds available to their drivers. The decision may depend upon the location(s) concerned, as well as particular characteristics of their individual operation.

There are no immediate requirements to develop further tools as it remains for each individual RU to evaluate whether to apply one or more of the methods identified in the research report.

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