**ABSTRACT**

Train derailments or collisions have the potential to result in catastrophic loss of life and/or destruction of property. Ever higher demands for train density (i.e. trains per hour for a given section of track) as well as the catastrophic results when accidents do occur have given rise to the development of railway signalling systems as mitigation measures (Rolt, 2009; Theeg & Vlasenko (2009b).

Signals Passed At Danger (SPADs) refers to when a train driver passes a stop signal without authority and is one of the typical causes of such accidents resulting in significant damages reported within Transnet Freight Rail (TFR) in recent years. Studies have shown human train driver error and violation of signals to be a significant cause of SPAD events.

This study investigated the application of train driver automation as a mitigation measure against SPADs within the South African railway environment in general and TFR in particular. The study was qualitative in nature, following a model development methodology and used in-depth, semi-structured interviews with railway signalling engineers for data collection. The primary goal was defined to be the development of a train driver function automation method that could be considered the most appropriate within the TFR operational environment.

The study determined the most appropriate method to be that of having a human driver with technical supervision. In this arrangement, the human driver could remain in his conventional role of driving the train but with a technical supervision system superimposed that automatically intervenes if a train driver exceeds his movement authority (e.g. Automatic Train Protection or ATP). This approach mitigates many of the costs imposed by human failure associated with SPAD events, yet retains the value of human flexibility which is especially useful under abnormal circumstances.