



Transportation  
Safety Board  
of Canada

Bureau de la sécurité  
des transports  
du Canada



# Expanding the Use of On-Board Voice and Video Recorders

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22 April 2016

Canada

# Outline

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# Background

- No requirement for on-board voice and video recorders on locomotives.
- Limited installations have been on a voluntary basis by railways.



# R99T0017 – Trenton Junction

- Train passed a signal that was indicating Stop.
- Train travelled over a switch in the reverse position, and then came to a full stop.
- No derailment, no injuries.



# R99T0017 – Trenton Junction

- What happened that day?
- The signals worked as intended –  
So how were they missed.



## R99T0017 – Trenton Junction

“Had the locomotive event recorder (LER) in the controlling locomotive cab been equipped with voice recording capability, it may have been possible to determine more definitely the effectiveness of the crew’s communications as they approached the occurrence location.”



## Recommendation R03-02

The Department of Transport, in conjunction with the railway industry, establish comprehensive national standards for locomotive data recorders that include a requirement for an on-board cab voice recording interfaced with on-board communications systems.



# R12T0038 - Burlington





# Railway Signals



# The signals worked as intended – So how were they missed?





Work Crew

**HORN  
BELL**



## Findings as to Risk

- The lack of locomotive in-cab voice and video recorders and forward facing video recorders deprives accident investigators of valuable sources of information that can enhance safety.



## Recommendation R13-02

The Department of Transport require that all controlling locomotives in main line operation be equipped with in-cab video cameras.



# Watchlist 2014

## On-board Voice and Video Recorders

- With no requirement for on-board voice and video recorders on locomotives, key information to advance railway safety may not always be available.
- Ensure that communications and interactions in locomotive cabs are recorded.
- The TSB is committed to working with the regulator and the railway industry to explore ways of making progress on this issue.



# CTAISB Act

- CTAISB Act restricts the use of on-board recordings to TSB investigations.
  - Subsection 28(2) states that every on-board recording is privileged ...
  - Subsection 28(7) states that an on-board recording may not be used ... in disciplinary proceedings, proceedings relating to the capacity or competence of an officer or employee ..., or in legal or other proceedings.



# Use of On-Board Recordings

## TSB Investigations:

- LVVR is essential for fully understanding the sequence of events and for examining crew actions and interactions.

## Expanded Use?:

- TSB, TC and other stakeholders see value in expanding the use of on-board recorders for legitimate safety purposes within the context of SMS programs.





# TSB / TC Joint LVVR Safety Study

- Assess the technology and operational aspects of LVVR.
- Demonstrate the safety benefits of this technology.
- Identify best practices.
- Identify implementation issues.



# LVVR Safety Study – Project Tasks

Project Tasks	Sub-Tasks
A. Technology Assessment	<ul style="list-style-type: none"><li>• Experience from the US.</li><li>• Experience from the other modes.</li><li>• Current Canadian experience.</li><li>• Common / Best Practices - Technology.</li></ul>
B. Legislative & Regulatory Assessment	<ul style="list-style-type: none"><li>• Applicable Acts and Regulations.</li><li>• Privacy Concerns.</li><li>• Other Legal Issues.</li><li>• Implications for other modes.</li></ul>
C. Operational / Human Factors Assessment	<ul style="list-style-type: none"><li>• Checklist for assessing On-Board Recordings.</li><li>• Triage and Detailed assessments.</li><li>• Common / Best Practices – Operational.</li><li>• Potential to evaluate Human Factors.</li></ul>
D. Safety Benefits Assessment	<ul style="list-style-type: none"><li>• Benefits for TSB Investigations.</li><li>• Benefits for proactive safety management.</li></ul>



# Current Technology / Experience

Current Experience	Preliminary Observations
Experience from the U.S.	<ul style="list-style-type: none"><li>• Freight Railroads</li><li>• Passenger / Commuter Railroads</li><li>• Federal Railroad Administration</li><li>• NTSB</li></ul>
Experience from the other modes	<ul style="list-style-type: none"><li>• Aviation - CVRs</li><li>• Marine - VDRs</li></ul>
Canadian Experience	<ul style="list-style-type: none"><li>• Locomotive Event Recorders</li><li>• Forward – facing video</li> <li>• On-Board Voice &amp; Video Recorders</li><li>• On-Board Voice Recorders</li><li>• On-Board Video Recorders</li></ul>







# Assessment Methodology

Elements to Consider	<ul style="list-style-type: none"><li>• Operational – Normal Situation</li><li>• Human Performance</li><li>• Operational – Non-Normal Situation</li></ul>
Checklist for assessing On-Board Recordings	<ul style="list-style-type: none"><li>• Voice &amp; Video Recordings</li><li>• Voice Recordings</li><li>• Video Recordings</li></ul>
Scenarios of Interest	<ul style="list-style-type: none"><li>• Time of day</li><li>• High vs. low periods of work</li><li>• Start vs. end of shift</li><li>• Additional Crew Members</li></ul>



# Checklist for Assessing On-Board Recordings

A. Crew Information	<ul style="list-style-type: none"><li>• Number of people in cab</li><li>• Role of each crew member</li><li>• Crew interaction</li><li>• Crew Resource Management</li></ul>
B. Capturing elements of human performance	<ul style="list-style-type: none"><li>• Stress</li><li>• Level of alertness</li><li>• Workload</li><li>• Situation awareness</li><li>• Distraction / Inattention</li></ul>
C. Locomotive controls	<ul style="list-style-type: none"><li>• Coverage area</li><li>• Numerical readouts / position</li><li>• Inputs from crew members</li><li>• Responding to alarms</li></ul>
D. Non-normal situations	<ul style="list-style-type: none"><li>• External detectors / alarms</li><li>• Emergency / Non-standard radio communications</li></ul>



# Preliminary Observations

Operational
Voice & Video Recordings
Voice Recordings
Video Recordings





# Concluding Comments

## A. Complete the LVVR Safety Study:

- Data collection completed.
- Analysis to be completed in April 2016.
- Final report to be prepared in May 2016.

## B. Next Steps:

- Circulate final report to stakeholders in all modes.
- TSB/TC discussions on “go-forward” plan.



# Canada

