Permanently coping with railway suicide and trespass for a safer, more secure and more competitive rail transport: Lessons from the RESTRAIL project

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Fundamental Values Department – Security Division

The Danish Transport and Construction Agency's Safety Conference – Copenhagen, 28 October 2015
Overview

- Introduction
- The problem
- RESTRAIL project
- Main output
- Examples
- The way forward
International Union of Railways (UIC)

> Founded in 1922 in Paris
> More than 230 members worldwide
> Promotes the development of rail transport at global level

> Platform for:
  - Cooperation
  - Research projects
  - Dissemination
  - Training
  - Standards & recommendations

> www.uic.org
Inside UIC

> Fundamental values department
Security at UIC

> Global Security Platform and Steering Committee
Overview

Introduction  The problem  RESTRAIL project  Main output  Examples  The way forward
Background

Train-person collisions (intentional / unintentional)

- Suicides = 70% of all fatalities
- Trespassing accidents = 18%

TOTAL = 88% of all fatalities within the railway system
Accidents to persons

> Trespassing accidents = 61% of all accidents to persons

**Figure 10: Number of fatalities per victim category (EU-28: 2006–2012)**

Source: European Railway Agency (ERA, 2014)
Consequences: psychological trauma

> **Train drivers** (Briem et al., 2007; Farmer et al., 1992; Limosin et al., 2006)

70% need a sick leave of 4.4 days (Cothereau et al., 2004).

> **Railway staff, rescue employees and eye witnesses** (Baumert et al., 2005; Mishara, 2007; Rådbo et al., 2005)
Consequences: quality of service (2)

- Average shut-down time: 120-240 minutes

Average direct costs incurred by IMs: € 50,000 – 100,000
Average direct costs incurred by RUs: € 25,000 – 75,000
Consequences: passenger perception (3)

> The image of rail transport, attractiveness, feeling of security

> Both for suburban / commuter and high-speed contexts
What is trespass?

> Unauthorised (illegal) presence on the railway property (tracks, stations, trains...) & no injury intent

  • Crossing the tracks in illegal places (Silla & Luoma, 2009)
  • Walking across or along the tracks (Lobb et al., 2001)
  • Loitering close to the tracks (Savage, 2007)
  • Lying or sitting on tracks to rest or to socialize (Pelletier, 1997)

> Error of perception, knowledge, judgement (Lobb et al., 2001, Ward & Wilde, 1995) OR deliberate rule violation (Freeman & Rakotonirainy, 2015)?

> Not all trespassing behaviours result in casualties
LC users when they violate the rules?

> Trespass between a LC and a nearby station platform
Why? Convenience

> Shortcut (time saving, most attractive route) (e.g. Lobb et al., 2001; Robinson, 2003; RSSB, 2011; Silla & Luoma, 2009)
Why? Unconsidered risks

> Children and teenagers (playing, socialising, hanging around)
Why? Underestimated risks

- Daring and adventurism, thrill-seeking (Nixon et al. 1985; Lerer & Matzopoulos, 1996) (e.g. “train surfing”, “chicken”)

- Sensation seeking (Freeman & Rakotonirainy, 2015)
Why? Underestimated risks

> Homeless people looking for shelter

© Reuters
Why? Leisure

> Recreational purposes (e.g. tourists taking a walk)
Why? Taking photos and shooting movies

> Amateur and professional photographers and filmmakers

(e.g. Camera assistant killed during *Midnight Rider* crash; fitness trainers killed on tracks while filming workout video)
Why? Escape from controlled areas

> Migrants
Why? Negative will (1)

> Fraud, fare-dodging

> Metal theft
Why? Negative will (2)

> Vandalism, graffiti (Offler et al., 2009; Thompson et al., 2012)
Overview

Introduction  The problem  RESTRAIL project  Main output  Examples  The way forward
REduction of Suicides and Trespassing on the RAILways: A collaborative project

www.restrail.eu
Consortium

17 partners from 12 countries

Coordinator: UIC
6 UIC members (IMs, RUs)
4 research centres
3 universities
3 industries, SME
Objectives

To help reduce

Suicides & trespassing accidents (prevention)

Post-incident consequences (mitigation)

To provide

An analysis and identification of cost effective measures

Recommendations and guidance
Methodology

> Collection and analysis of data related to railway suicides and trespassing accidents (WP1)

> Assessment of measures to reduce railway suicides (WP2) and trespassing accidents (WP3)

> Mitigation of consequences by improving procedures and decision making (WP4)

> Pilot field tests and evaluation (WP5)
11 Field tests in 8 countries

Map of RESTRAIL field tests

- **Trespass prevention**
- **Suicide prevention**
- **Consequence mitigation**

- Video enforcement & sound warning at 2 trespassing hotspots in open track + Education in 5 schools situated close to railway lines
- Mid platform fencing in 3 pilot test areas around London
- Societal collaboration to prevent railway suicide
- Forward facing CCTV
- Gatekeeper Programme
- Combination of fences, anti-trespass panels, video camera and communication campaign
- Education outside schools (railway museum) + Warning signs and posters at a trespassing hotpot in a station
- Computer Based Training module for responding bodies

Danish Transport and Construction Agency's Safety Conference - 28 October 2015
Final outcome: the toolbox

Paper version (260 pages)

Practical guide (44 pages)

Website www.restrail.eu/toolbox
Overview
The RESTRAIL Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTRAIL research project and it aims to be a helpful, intuitive and user-friendly tool. It summarises practical information collected and produced during the project (synthesis, guidelines, best practice, lessons learned and empirical evidence for effectiveness). The content also (...)
Background

Railway suicides and trespassing accidents represent 88% of all fatalities occurring within the railway system, resulting in more fatalities than train derailments and collisions together (ERA, 2014). They lead to human and economic consequences with considerable impact on the whole society. Beyond the human loss, suicide and...
1 – About

The RESTRAIL Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTRAIL research project and it aims to be a helpful, intuitive and user-friendly tool. It summarises practical information collected and produced during the project (such as, lessons learned and empirical evidence for effectiveness). The content also (...)

Read more

2 – Specific guidance

70 measures cross-classified on 4 criteria

3 – Specific guidance

4 – Other features
The RESTRAIL Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTRAIL research project and it aims to be a helpful, intuitive and user-friendly tool. It summarises practical information collected and produced during the project (synthesis, guidelines, best practice, lessons learned and empirical evidence for effectiveness). The content also (…)

Read more
General guidance

Structures the problem analysis supporting the selection of the optimal intervention(s) and providing action plans
1. Describing and understanding the problem

- Problem identification (what, where)?
- Further details (how, why?)
- Partners & stakeholders
- Resources

2. Analysis of target situation

- Target location
- Problem behaviour
- Existing measures
- Objectives of new measures

3. Selection of measures

- Which measures could fit the problem?
- Focus on families of measures
- Consult Specific guidance

4. Implementation plan

- Select specific measures
- Expected effects
- Involved organisations
- Estimated costs
- Funding
- Schedule
- Evaluation planning

5. Implementation

- Follow implementation plan
- Execution
- Maintenance

6. Evaluation

- Follow evaluation plan
- Effects
- Costs and problems
- Whole process
- Implications
- Publication of results

General guidance
<table>
<thead>
<tr>
<th>Actions</th>
<th>Questions to be answered</th>
<th>Issues to be considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of the problem</td>
<td>What is the nature of the problem?</td>
<td>• suicides</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• attempted suicides</td>
</tr>
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<td></td>
<td></td>
<td>• trespassing accidents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• trespassing behaviour</td>
</tr>
<tr>
<td></td>
<td>Which are the motives of trespassing?</td>
<td>• trespassing with suicide intent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• shortcut, time saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• graffiti / vandalism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• theft</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• leisure, walking around / loitering</td>
</tr>
<tr>
<td></td>
<td>In which part(s) of the railway system does the problem occur?</td>
<td>• station (which platform, which part of the platform, etc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• marshalling yard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• railway line (open line)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• level crossing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• tunnel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• some other location</td>
</tr>
<tr>
<td></td>
<td>Where is the problem location?</td>
<td>• preliminary identification of the location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• location marked in a map</td>
</tr>
</tbody>
</table>
Selection of measures

**TRESPASSING WITH SUICIDE INTENT**
- Measures for suicide prevention
  - Measures influencing perceived attractiveness and availability of rail traffic as a mean
  - Decision to commit suicide
- Decision to use railway as a mean
  - Measures supporting the correct behaviour
  - Measures influencing access to tracks

**TRESPASSING WITH NO INTENT OF CASUALTY**
- Measures influencing attitude and/or activity leading to trespass and the associated perceived attractiveness of rail properties
  - Measures influencing knowledge of regulations and awareness of risks
  - Decision to trespass
  - Measures supporting the correct behaviour
  - Measures influencing access to tracks

**Being in the track area**
- Measures influencing the person’s behaviour when being in the track area
- Measures influencing consequences of collision

**Train-pedestrian collision**
- Early warning measures enabling the railway system or outsider person to react accordingly
- Measures influencing consequences of collision

**Unintentional trespassing**
- Measures influencing the occurrence of errors, potential confusion or events leading to unintentional trespassing
Chain of events

Improve practice & processes (transverse)

Influence decision

Deter access

Influence behaviour in track area

Reduce consequences

Danish Transport and Construction Agency's Safety Conference - 28 October 2015
<table>
<thead>
<tr>
<th>Type</th>
<th>Target problem</th>
<th>Effect mechanism</th>
<th>Study results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational &amp; procedural</td>
<td>Suicide</td>
<td>Influence behaviour</td>
<td>Yes (general)</td>
</tr>
<tr>
<td>Physical &amp; technological</td>
<td>Trespassing</td>
<td>Reduce consequences</td>
<td>Yes (rail)</td>
</tr>
<tr>
<td>Public awareness &amp; education</td>
<td>Suicide &amp; Trespassing</td>
<td></td>
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<tr>
<td>Mitigation</td>
<td>Trespassing &amp; Mitigation</td>
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3 – Specific guidance

70 measures cross-classified on 4 criteria.
The RESTRAIL Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTRAIL research project and it aims to be a helpful, intuitive and user-friendly tool. It summarises practical information collected and produced during the project (synthesis, guidelines, best practice, lessons learned and empirical evidence for effectiveness). The content also (...)

Read more
The RESTART Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTART research project and aims to be a helpful, intuitive and user-friendly tool. It summarises practical information collected and produced during the project (synthesis, guidelines, best practice, lessons learned and empirical evidence for effectiveness). The content also (…)

Read more
8. Fences at stations
   8.1 Intermediate fencing between tracks
   8.2 Mid platform fencing
   8.3 Fencing platform ends
   8.4 Sliding doors at platforms
   8.5 Anti-trespass grids
   8.6 Symbolic deterrent fencing

9. Fences outside stations
   9.1 Fencing at hotspots
   9.2 Nets at bridges
   9.3 Fencing off objects close to the tracks
   9.4 Measures to soil clothes

10. Landscaping
    10.1 Removal of vegetation to increase visibility

11. Detection and surveillance systems
    11.1 Intelligent CCTV combined with sound warnings
    11.2 Detection systems combined with sound warnings

12. Lighting devices to influence behaviour
    12.1 Dispelling light source
    12.2 Lighting linked to a movement sensor
    12.3 Tracking spotlight linked to a movement sensor

13. Light to increase visibility at hotspots
    13.1 Increased visibility by lighting at specific identified hotspots

14. Safety and emergency devices at stations
    14.1 Emergency information at stations to ensure rapid intervention
    14.2 Information encouraging help seeking for people with suicide intent

15. Hear and voice messages
    15.1 VARIS messages
    15.2 Other messages

16. CCTV
    16.1 Monitoring CCTV
    16.2 Recording CCTV

UP TO ENGINEERING OR TECHNOLOGY SUCH AS DETECTION SYSTEMS, LIGHTING DEVICES, ETC.
These are measures related to engineering or technology such as fencing, landscaping, detection systems, lighting devices, etc.

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<td>15. Incident management and information platform</td>
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<td>15.1 Geo-data relating to the incident location and access points</td>
</tr>
<tr>
<td>15.2 Incident information, including third party involvement</td>
</tr>
<tr>
<td>15.3 Essential response actions</td>
</tr>
<tr>
<td>16. Forward facing CCTV</td>
</tr>
<tr>
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Specific guidance: content structure

Tracking spotlight linked to a movement sensor

- **Description**
  What does this measure refer to and what is its objective?

- **Recommendations**
  Best practice and lessons learned

- **Warning points**
  Expected difficulties and issues you should pay attention to

- **Observations**
  Other points that you should not forget

- **Study results**
  Data or other evidence supporting the measure's effectiveness

**Gallery**

**Attached documents**
12.3 Tracking spotlight linked to a movement sensor

Description
What does this measure refer to and what is its objective?

This measure refers to technology to influence people at risk by motion sensitive lighting combined with movement tracking spotlights. This measure is used as a sudden lighting system with tracking of the person. Useful for situations in which technology can be used to provide a warning to people who move into an area that they should not enter, or behave in a way that places them at risk, with the intention of influencing the person to modify their behaviour and move to a place of safety.

Recommendations
Best practice and lessons learned

Warning points
Expected difficulties and issues you should pay attention to

Observations
Other points that you should not forget

Study results
Data or other evidence supporting the measure’s effectiveness
12.3 Tracking spotlight linked to a movement sensor

**Description**
What does this measure refer to and what is its objective?

**Recommendations**
Best practice and lessons learned

- Check the laws on human integrity in your country before making the plans.
- Check if you have a higher number of suicides during night time.
- The sensor needs to be able to react only to persons who are in its range.
- The effect will increase when combined with a follow-up measure as surveillance or sound warnings.
- Make sure there are no obstacles within the range of the tracking light behind which persons can hide.

**Warning points**
Expected difficulties and issues you should pay attention to

**Observations**
Other points that you should not forget

**Study results**
Data or other evidence supporting the measure's effectiveness
12.3 Tracking spotlight linked to a movement sensor

**Description**
What does this measure refer to and what is its objective?

**Recommendations**
Best practice and lessons learned

**Warning points**
Expected difficulties and issues you should pay attention to

- Blinding of train drivers by lights and interference with signal aspects should be prevented.
- Be aware that light pollution can cause acceptance risks with neighbours and nature conservation organisations. Communicate before installing. Maybe not to be used in rural nature areas because of light pollution. For further details on how to reduce light pollution you may check: [http://www.sustainablefairfax.org/content/view/321/27/](http://www.sustainablefairfax.org/content/view/321/27/)
- Impact of the spotlights for the people living in the direct environment could be an issue. For dispelling light sources there can be problems with national laws on human integrity.
- Effective only during night time.

**Observations**
Other points that you should not forget

**Study results**
Data or other evidence supporting the measure’s effectiveness
References (APA citation style)


- In Japan, introduction of blue LED lighting reduces suicides between 20% and 30% (Shida et al., 2012).

- The installation of blue light in train stations reduces suicides at night, would have a much stronger impact (Shida et al., 2014).

- Visible light of short wavelength (blue, green) has been shown to act as a blue-light hazard. This blue light has been shown to affect the retina or accumulate in the eye, constituting the retina or accumulating in the eye, indicating a blue light hazard within the eye. The relevance of this finding is not very clear. In general, the probability of developing blue light related acute pathologic conditions is low (Shida et al., 2014).

- Other literature suggests that once installed, the lighting is more than a barrier or a blue light threat, but a potential therapeutic tool.

- Anti-suicide lighting is used in The Netherlands at train stations and hotspots. ProRail started to evaluate its effects, which were promising. The evaluation showed that there was a decrease of 30%, 80% at some stations. Although the limited data it is not yet possible to make a firm conclusion. Further evaluations will be made after a longer observation period.
12.3 Tracking spotlight linked to a movement sensor

**Description**
What does this measure refer to and what is its objective?

**Recommendations**
Best practice and lessons learned

**Warning points**
Expected difficulties and issues you should pay attention to

**Observations**
Other points that you should not forget

**Study results**
Data or other evidence supporting the measure’s effectiveness

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**Type of measure:** Physical and technological
**Target problem:** Suicide
**Effect mechanism:** Influence behaviour in track area
**Evaluation studies:** Yes

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Gallery

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last update: 2014-09-22
Other examples
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Latest updates:
- 2014-09-16 PREVENTION ACTION PLAN
- 2014-09-16 CONSEQUENCES MITIGATION ACTION PLAN
- 2014-09-16 Overview

Events:
- 2011-11-09 RESTRAIL – Kick-off Meeting
- 2012-06-14 RESTRAIL: Info Day
- 2013-06-13 RESTRAIL Mid-Term Conference
- 2014-04-28 RESTRAIL Final conference
4 – Other features

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Read more
Advanced search

Selected keywords: Organisational and procedural, Trespass

Search results

Family

Risk assessment
This family of measures includes a number of different ways in which an organisation or the railway industry identifies risks in normal or special circumstances. This is an underpinning measure which supports decision-making and targeting of other measures. It is considered an organisational (...)

Learning from best practice
This family of measures includes different ways in which a railway organisation or decision-maker can improve their knowledge and skills regarding suicide and trespassing prevention. This is an underpinning measure which supports decision-making and targeting of other measures. It can also (...)

Collaboration between organisations
This family of measures includes national partnerships as well as local ones (e.g. linked to a specific route or geographical area) to produce better joint working between a range of organisations and agencies. These measures underpin or support the implementation of many other measures. The (...)

Patrols and enforcement
This family of measures consists of visible surveillance performed by special security patrols to deter access to high risk areas, to enforce the law and to intervene when potential incidents are identified. It is considered a dissuasive family because it is aimed to detect and discourage (...)

+ ERA – European Railway Agency
  2014-03-10 CONSEQUENCES MITIGATION ACTION
  + Samaritans
  PLAN
  2014-09-16 Overview
  + Railway suicide prevention Canada
  2014-09-16 Overview
  2013-06-13 RESTRAIL Mid-Term Term Conference
  + 2014-04-28 RESTRAIL Final conference
Toolbox strengths

> Systematic development
> Practical & scientific orientation
> Complex but user-friendly content
> Paper- & web-based format
> Advanced search based on keywords
> Easy referencing & printing
> Interface adjusts to any tablet or smartphone
> Feedback submission system
Issues to improve

> Imbalanced content
  ▪ Little information or weak evidence (for some of the measures)

> Combination of measures
  ▪ No clear guidance

> Galleries & attachments
  ▪ More examples

> Design
  ▪ More ergonomic, new features

Recommendations.
Guidelines. Best practice.
Study results.

Explore over
70 interventions
200 publications

Search by keywords.

Print with one click.
Submit your feedback.
Overview

Introduction  The problem  RESTRAIL project  Main output  Examples  The way forward
Final conference
(18 September 2014, Paris, UIC HQ)

> 80 participants from EU, USA and Australia
> RESTRAIL – success story
> Overview of results & feedback
> Discussion about the further exploitation of the results
Next steps

> **International Union of Railways (UIC)**
  - Hosting, maintaining and updating the toolbox
  - Organisation of workshops
  - Dissemination

> **RESTRAIL partners will continue working together**
  - More elaborated and long-term field tests
  - Develop current measures & add new ones
  - Develop the toolbox to include LCs
Major events since the end of the project

> 2014/11 – European Level Crossing Forum (Rome, Italy)
> 2014/12 – Trafikverket workshop (Stockholm, Sweden)
> 2015/09 – Workshop during the 5th International Rail Human Factors Conference (London, UK)
> 2015/10 – Danish Transport and Construction Agency’s Safety conference (Copenhagen, Denmark)
> 2016/04 – Transport Research Arena Conference (Warsaw, Poland)
> 2016/05 – World Congress of Railway Research (Milan, Italy)
> …and counting
New ongoing field trials

> Anti-trespass panels
  - evaluated in France by SNCF in several locations (results expected in April 2017)
  - evaluated in Belgium by INFRABEL in several locations

> Anti-suicide blue lights
  - evaluated in Belgium by INFARBEL
  - evaluated in Great Britain by Network Rail

> Intelligent detection systems
  - video cameras + sound warning speakers evaluated in the Netherlands by ProRail
  - thermal cameras evaluated in Belgium by INFRABEL

> Platform screen doors (PSD)
  - several different types tested in the Stockholm metro system
RAILSEC proposal

> RAILSEC (“Knowledge and skills for railway security: Enhancing prevention of suicide and trespass”)

> Submission under review
Way forward

> Formal continuation within the EU

> ERA project 1.5 – Improving safety performance

> Since April 2015 – Research programme on use of behavioural techniques to reduce fatality rates in suicide/unauthorised person categories

> Periodic workshops on reporting and preventing suicides on railway premises
Further inquiries

Website
www.restrail.eu

Toolbox
www.restrail.eu/toolbox

Private workspace
https://ovidentia.uic.org
Thank you for your kind attention!

Contact: havarneanu@uic.org