

Chapter 27

Security of Railway Infrastructures

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ABSTRACT

In recent years, some sadly famous terrorist attacks that occurred in different countries have put into evidence that railway transportation systems are not suitably protected, and not capable of tolerating and promptly reacting to them.

Moreover, it is clear that such mass transportation systems are particularly attractive for terrorists, due to the potentially far-reaching, often “spectacular” results of attacks. Examples of such kinds of events are the New York (2001), Madrid (2004), and London (2005) terrorist attacks. In addition, by focusing on ground transportation networks, and especially on railway systems, it is also easy to observe that they are particularly difficult to be secured since they are characterized by high accessibility and wide extension, as also noted by Fink (2003). In this sense, the needs of security and of mobility often conflict with each other. In effect, while an open and accessible system provides an efficient transportation of people and goods, this openness also allows malicious entities to exploit the transportation system as a target, weapon, or means to reach another target (Murray-Tuite, 2007). Then, on the contrary, it is clearly evident that security actions taken to limit malicious adversaries from reaching or capturing their targets may degrade the transportation system performances, so they have to be designed with particular attention. This is the reason why worldwide institutions are more and more sensitive to the growing need for security of the so-called Critical Infrastructures (CI), such as railway transportation systems, and are adopting a number of regulatory measures (US Congress, 2007; EU Commission, 2005, 2008, and 2010).

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For what concerns scientific research, the efforts are intended to define methodologies, build risk mitigation devices, and find out best practices that are technologically advanced, soon achievable, reliable, so as to increase the infrastructure protection without affecting the relevant transportation system performances. In this framework, *Quantitative Risk Analysis (QRA)* represents the main methodological approach for assessing security, which is indeed often characterized by a large set of variables dependent on human sensitivity, and requires calibration and adaptive tuning, thus resulting into unfriendly tools for the non-skilled users. Then, in this chapter, to tackle with the problem of clarifying the aims, the characteristics, and the limitations, a general architecture for a possible *QRA* tool for railway security assessment is presented, with particular attention to the relevant specifications (Di Febraro et al., 2010).

DEFINITIONS, MOTIVATIONS AND BIBLIOGRAPHY REVIEW ON RAILWAY SECURITY

In this section a basic glossary of the terms used in the chapter is provided, and the basic characteristics that make railway systems of significant interest for security are discussed. In the end, a bibliography review is presented.

Basic Glossary

In this section, a brief glossary of the most common terms used in the chapter is provided with the aim of facilitating the comprehension of the following sections. Then, consider the following basic definitions:

- **Threat:** The potential intent to cause harm or damage to properties or people;
- **Attack Likelihood:** An estimate of the real probability/frequency of a real attack
- **Terrorism:** A deliberate use of violence against people or properties with the aim of intimidating or coercing a government, the civilian population in furtherance of political or social objectives;
- **Sabotage:** A deliberate action aimed at weakening an enemy through subversion, obstruction, disruption, and/or destruction. Unlike terrorists, saboteurs do not consider fatalities the primary objective, although they do not exclude them;

- **Robbery/Theft:** The use of force or violence against properties or people with the aim of depriving the rightful owner of property;
- **Vandalism:** The use of force or violence against property with intent of malicious destruction or defacement of public or private property;
- **Adversary:** A general term indicating terrorists, saboteurs, thieves and vandals;
- **Attractiveness:** A measure of the likelihood of an attack to an asset;
- **Vulnerability:** A measure of the easiness of a security protection system to be overcome by adversaries.

The interested reader may refer to ASIS International (2003) and Garcia M. L. (2001) for a more complete glossary.

Railway Security Threats

In this section, the main threats for railway security are. In doing so, it is worth saying that three different kinds of threats are usually considered: terrorism/sabotage (gathered since they often use the same tactics, equipment, and so on, although with different aims), theft, and vandalism. The last two are the more frequent attacks so that, although they normally cause relatively low damages, often represent the main threats railway systems must face.

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