Preparing Today’s Airport Security for Future Threats – A Comprehensive Scenario-Based Approach

Mara Cole
Bauhaus Luftfahrt
Agenda

- Problem
- Context: Airport Security
- Enhanced Scenario Process
- Analysis of Data
- Conclusion
Problem

- Airports: gateways for criminal attacks on aircraft
- Primarily reactive security measures
- Very high system complexity
- Vast amount of interrelated elements
- Anticipatory approach to
  - Gain insights into possible future threats
  - Overcome reactive implementation

→ Methods of future research such as scenario planning?!
Scenario Planning – Standard Process

Five Basic Steps (de Jouvenel*)

1. Defining the problem and choosing the horizon: Environment scanning
2. Constructing the system and identifying key variables
3. Gathering data and drafting hypotheses: Cross-impact analysis
4. Exploring possible futures
5. Outlining strategic choices

→ This approach leads to a few plausible future scenarios with a rather global focus.

→ Only a relatively small amount of elements can be considered.

The Context: Airport Security

- Complex system with a large variety of
  - Processes
  - Technologies
  - Involved actors

- High level of detail necessary to understand relations

- Security system faces large variety of threat aspects (→ many critical uncertainties)

- Requirements for airport security scenario process:
  - Very high level of detail
  - As many standardised scenarios as possible
Approaching the System

Standard Scenario Process

1. Environmental Scanning
2. Selection of Elements
3. Cross-Impact Analysis
4. Exploring Possible Futures
5. Strategic Choice
Approaching the System

Standard Scenario Process

1. Environmental Scanning
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- Identification of the airport security system elements
- Identification of system borders
- Structuring of terms

Result
- 15 domains, 210 system elements
- Up to six hierarchy levels
Alteration of Standard Process

- **Standard:** Cross-impact analysis
- **Problem:** High system complexity (~44,100 connections)
- **Adapt process to requirements of the airport security system**

![Diagram of Standard Scenario Process and Enhanced Scenario Process](image-url)
Reduction of Connections
Reduction of Connections
Reduction of Connections

[Diagram showing a matrix and flowchart related to reduction of connections.]
Cross-Impact Analysis I

Standard Scenario Process

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Enhanced Scenario Process

Element Level
Domain Level

Reduction of Connections
Scenario Builder
Analysis of Data Set

→ Change level of abstraction from domain level back to element level
Cross-Impact Analysis II

- Only element relations belonging to interrelated domains are considered
- Still ~12,300 connections to be specified
- Danger of subjectivity
- Challenge:
  - Precise descriptions of elements
  - Generation of a common understanding of elements and the quality of their interrelations
How to Make Use of the Data

- Standard: Consider development of variables to deduce possible futures
- Problem: Elements do not develop (due to high level of abstraction)
  - Interaction lets the system as a whole evolve
- Scenario generation has to be pursued in another way

### Standard Scenario Process
1. Environmental Scanning
2. Selection of Elements
3. Cross-Impact Analysis
4. Exploring Possible Futures
5. Strategic Choice

### Enhanced Scenario Process
- Reduction of Connections
How to Make Use of the Data

- Standard: Consider development of variables to deduce possible futures
- Problem: Elements do not develop (due to high level of abstraction)
  → Interaction lets the system as a whole evolve
- Scenario generation has to be pursued in another way
Scenario Builder

- Aim: Generate a variety of consistent scenarios, trace relation between respective scenario and potential counter-measures

- High system complexity → MS Excel-based tool facilitates intuitive access to complete scenario space

- Successive compilation of scenarios

- Only elements structurally consistent with the already chosen scenario part are offered

- Automatic listing of connected security measures
Analysis of Data Set

- Automatic scenario generation allows systematic analysis of complete scenario space
- Database of 220,000 scenarios based on constrained combinatory choice
Analysis of Data Set (Cluster)

- Clustering of threat scenarios
- Analysis of structurally weak points in the security system
Conclusion

Standard Scenario Process

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2. Selection of Elements
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Enhanced Scenario Process

Element Level
Domain Level

1. Reduction of Connections
2. Scenario Builder
3. Analysis of Data Set
Conclusion

- Anticipatory approach to airport security

- Scenario approach merging elements from a standard scenario process, system analysis and matrix-based complexity management

- Approach includes advantages of scenario planning without compromising the specific requirements of airport security

- Advantages:
  - Allows dealing with high level of detail and complexity
  - Makes the broad space of all structurally consistent scenarios accessible to analysis

- Analysis of the generated data set helps
  - Indicating vulnerabilities of the security system and
  - Developing ideas how to improve the security measures
Thank you very much for your attention!