Experiences and Challenges in using STAMP for Accident Analysis

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Content

1. Dutch Safety Board
2. Experiences with STAMP
3. Case: generic STAMP Airport Ground Traffic
4. Lessons learned & Challenges
DSB: Goal & tasks

1. To learn from accidents, in order to prevent future accidents
2. Investigate (series of) accidents
   - Course of events (reconstruction)
   - ‘underlying factors’ (blame-free, explanatory, technical, human, environmental, organisational, systemic)
3. Make recommendations
4. Communicate findings

DSB: History

1909 Maritime Court
1931 Committee Inland Shipping
1937 Civil Aviation Board
1956 Railways Accidents Inquiry Board
1987 Advisory body on aviation accidents (Defence)
1987 Temporary Committee Defence Accidents
1999 Transport Safety Board
2003
2005
2005 Dutch Safety Board
DSB: Characteristics

- All kinds of accidents, excluding law enforcement and war operations
- Obligatory investigations in some branches
- Autonomous agency
- Far-reaching authority
- Protection of witnesses
- Board + Bureau (75 staff)
- Budget € 12 million

DSB: Stance on achieving safety

Everyone should reduce risks as much as practicable (ALARP), by practicing safety management

Safety management consists of:
1. Identify & evaluate risks
2. Identify & implement appropriate measures
3. Monitor & evaluate effects
4. Continuously update and improve

Management commitment is essential!

Components or system?
DSB: Methods used

- **Immediacy of impact**
  - System
  - Organisation
  - Context of occurrence (mental models, physical)
  - Acts / events

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- Main focus on acts & events (causal, linear)
- Main focus on context and organisational factors (causal/probabilistic, linear)
- Main focus on system (causal/probabilistic, linear/dynamic)
DSB: Methods used

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Experience: Nancy November 2009

Experience: Used in investigations since 2009

Accidents
- On roads
- On rails
- On sea
- In aviation
- In industry
- In healthcare
- During crisis management
- Other
Experience: How did we use it?

- In many different ways!
- System Hazard = accident/incident or unsafe state(s)
- Draw initial System Control Structure
- Discuss (relevant) components
- Identify roles & responsibilities
- Identify constraints (Control & Feedback)
- Question interactions
- Question reasons for inadequate control, feedback, interactions

What did it bring?

- For the investigation process:
  - Provided structure to include system
  - Made range of choices explicit
  - Helped moving away from direct causes & focus on one actor
  - Graphical support

- For the results, allocation of:
  - Actors responsibilities towards others/system performance
  - Inadequate interactions between actors & processes
  - Blind spots in the system
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Case: Drawing the system
Case: high level control structure

**Loss**
Collisions resulting in loss of life, damage or severe disturbance of daily operation

**System hazard**
Violating a minimum of separation between vehicles and between vehicles and objects

**System safety constraints**
- Take off / landing executed only when runway is empty
- Crossing runways only when runway is not used for take off / landing
- Maintenance and construction of infrastructure only when infrastructure is blocked

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Case: more detailed control structure

**GROUND MOVEMENTS**
- Airport operations vehicles
- Aircraft
- Construction crews & miscellaneous
- Aircraft-related vehicles

**TRAFFIC CONTROL**
- Runway control
- Ground control
- Apron control

**INFRASTRUCTURE AVAILABILITY**
- Service roads
- Runways
- Taxiways
- Platforms

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Case: 3 incidents

- Runway incursion (1998)
- Airplane departed from taxiway (2010)
- Bird strike (2010)

Can a generic STAMP be applied and is it useful for analysis?

Example: 3 incidents in generic STAMP
Example: first conclusions

Can it be applied? Yes!

Usefull?
• Saves time: system already documented!
• Immediate focus on system: constraints & flawed control
• Identification of recurrent weaknesses possible (multiple incidents)

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Lessons learned

- STAMP has added value, but doesn’t replace other methods
- Structured use is recommended
- Investigating the system requires a different paradigm
- Investigators still tend to focus on reconstruction
- Start early modeling the control structure, generic STAMP can help
- Support understanding of the control structure
  - Color coding
  - Maximized number of components and interactions
  - Use of multiple diagrams
- Focus on parts & interactions; seeing the whole is for a few
- Understanding of the system only comes by doing it yourself

Challenges

- To persuade investigators to apply system thinking/STAMP
- To decide what components to include
- To allow sufficient time to investigate & analyse the system
- To see the whole and break the whole into pieces - for understandability
- To apply and use ‘dynamic modeling’ for recommendations
- To communicate findings
Nevertheless:
It reminds us every time of our natural tendency to break down the system into pieces, forgetting about the whole...

Contact us?
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