Experiences and Challenges
in using STAMP
for Accident Analysis

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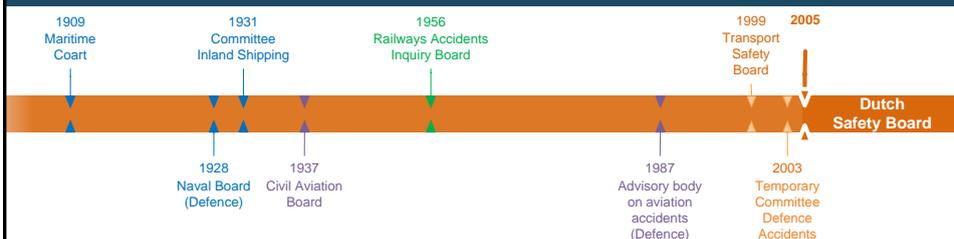Department of Research & Development
Dutch Safety Board

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

DSB: Goal & tasks

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SAFETY BOARD

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

THE DUTCH
SAFETY BOARD

1909 Maritime Coart	1931 Committee Inland Shipping	1956 Railways Accidents Inquiry Board		1999 Transport Safety Board	**2005**

Dutch Safety Board

1928 Naval Board (Defence)	1937 Civil Aviation Board		1987 Advisory body on aviation accidents (Defence)	2003 Temporary Committee Defence Accidents

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

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SAFETY BOARD

DSB: Stance on achieving safety

Everyone should reduce risks as much as practicable (ALARP), by practicing safety management
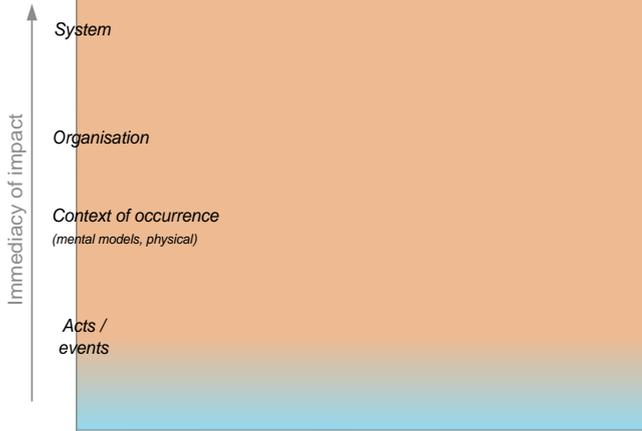
Safety management consists of:
1. Identify & evaluate risks
2. Identify & implement appropriate measures
3. Monitor & evaluate effects
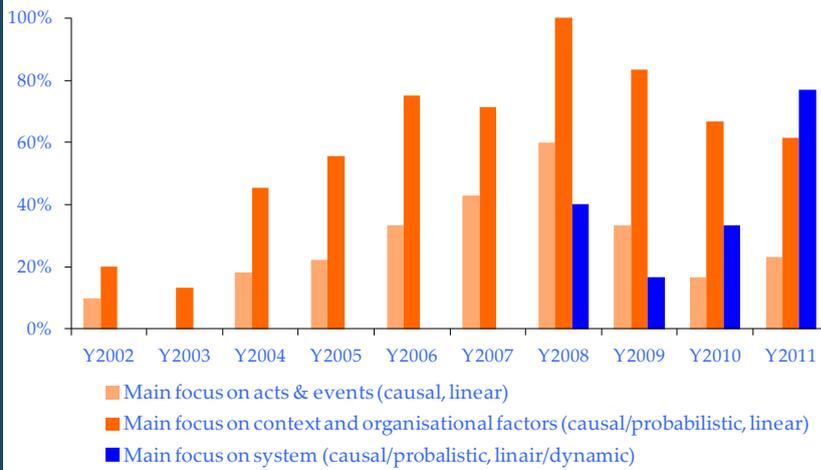4. Continuously update and improve

Management commitment is essential!

Components or system?

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SAFETY BOARD
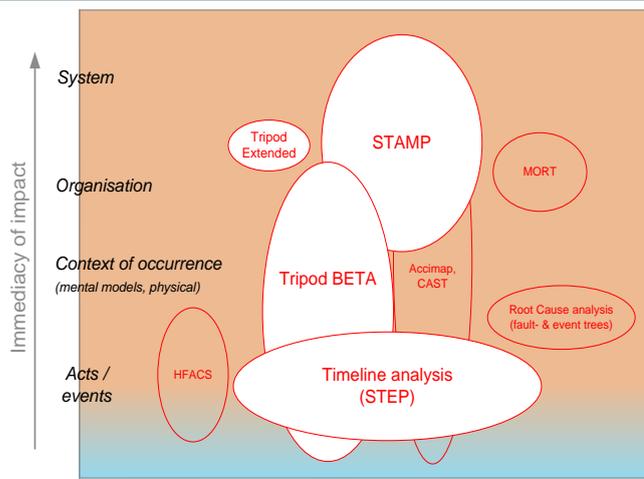
DSB: Methods used

DSB: Methods used

■ Main focus on acts & events (causal, linear)
■ Main focus on context and organisational factors (causal/probabilistic, linear)
■ Main focus on system (causal/probalistic, linair/dynamic)

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DSB: Methods used

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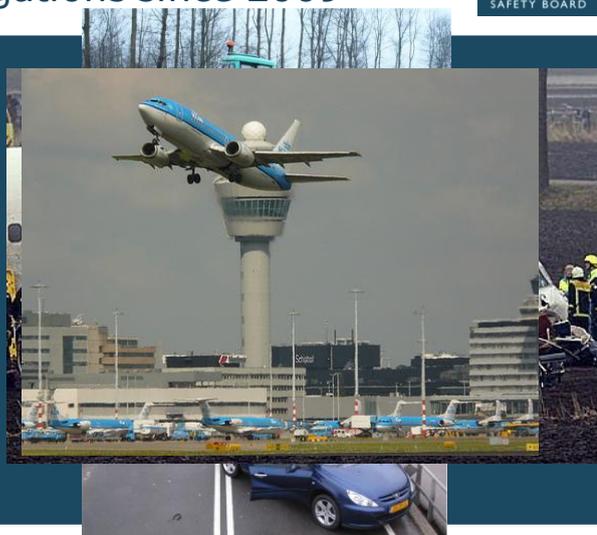
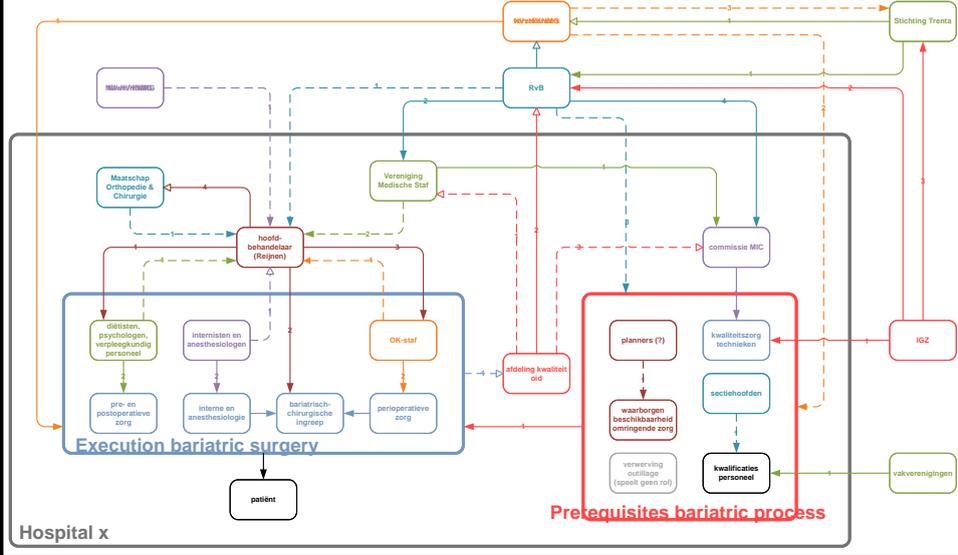## Experience: Nancy november 2009

Experience: Used in investigations since 2009

Accidents
- On roads
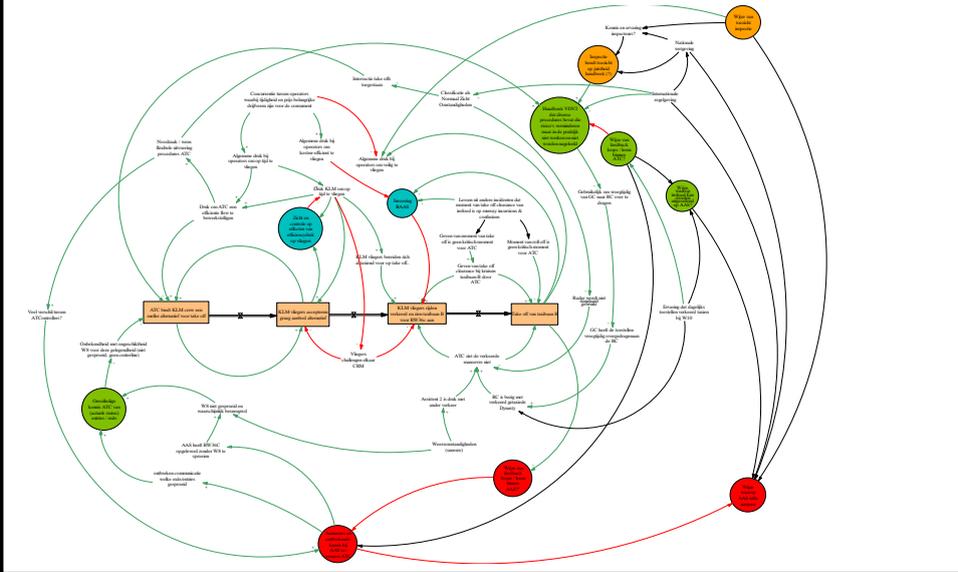- On rails
- On sea
- In aviation
- In industry
- In healthcare
- During crisismanagement
- Other

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Experience: Child abuse

Experience: football stadium

Experience: Bariatric surgery

Experience: Taxiway departure

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

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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
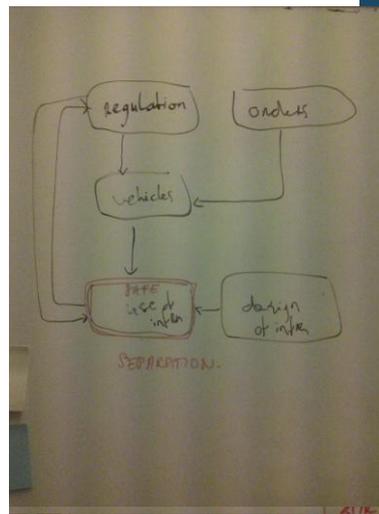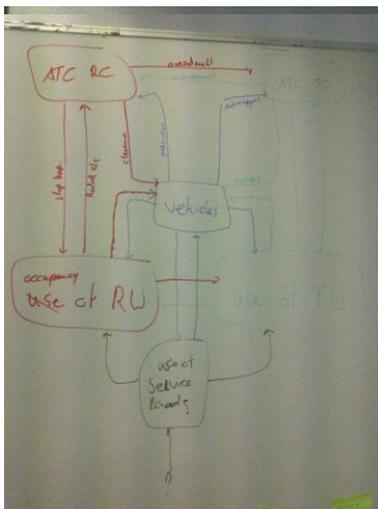 - Blind spots in the system

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Case: Drawing the system

Case: high level control structure

THE DUTCH SAFETY BOARD

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

....

movements

weather conditions

Case: more detailed control structure

THE DUTCH SAFETY BOARD

GROUND MOVEMENTS

airport operations vehicles

aircraft

construction crews & miscellaneous

aircraft-related vehicles

feedback on position acknowledgement etc

clearance routing instructions etc

TRAFFIC CONTROL

runway control

transfer   transfer

ground control

transfer

apron control

transfer

occupancy

visual ILS (?) etc (?)

taxiway & runway lights stop bars etc

GPS radar detection etc

service roads

runways

taxiways

platforms

INFRASTRUCTURE AVAILABILITY
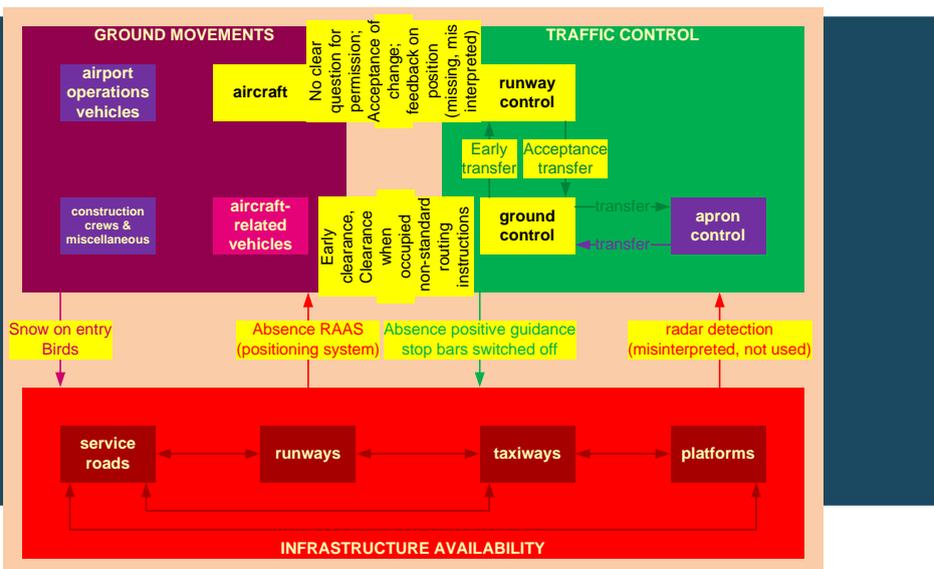
Case: 3 incidents

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

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

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SAFETY BOARD

Example: 3 incidents in generic STAMP

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GROUND MOVEMENTS

airport operations vehicles

aircraft

No clear question for permission; Acceptance of change; feedback on position (missing, mis interpreted)

runway control

TRAFFIC CONTROL

Early transfer | Acceptance transfer

construction crews & miscellaneous

aircraft-related vehicles

Early clearance, Clearance when occupied non-standard routing instructions

ground control

transfer → **apron control**

← transfer

Snow on entry Birds

Absence RAAS (positioning system)

Absence positive guidance stop bars switched off

radar detection (misinterpreted, not used)

service roads ↔ **runways** ↔ **taxiways** ↔ **platforms**

INFRASTRUCTURE AVAILABILITY

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

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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 ánd break the whole into pieces - for understandability
- To apply and use 'dynamic modeling' for recommendations
- To communicate findings

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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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