

Mobile cranes, what goes wrong?

An analysis of dominant accident scenarios

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Outline

- Introduction
- Research questions
- Methodology
- Results
 - Literature
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 - Dutch accident data
- Conclusion
- Discussion

Mobile cranes



Perception

- Cranes are dangerous, most of the time accidents with mobile cranes are caused by toppling of the cranes

Research questions

- Which accident scenarios occur during mobile crane activities?
- Which scenarios are dominant?

Methodology

- Literature search
- Expert meetings
 - 10 experts
 - Different disciplines
- Analysis of Dutch accident data
 - GISAI

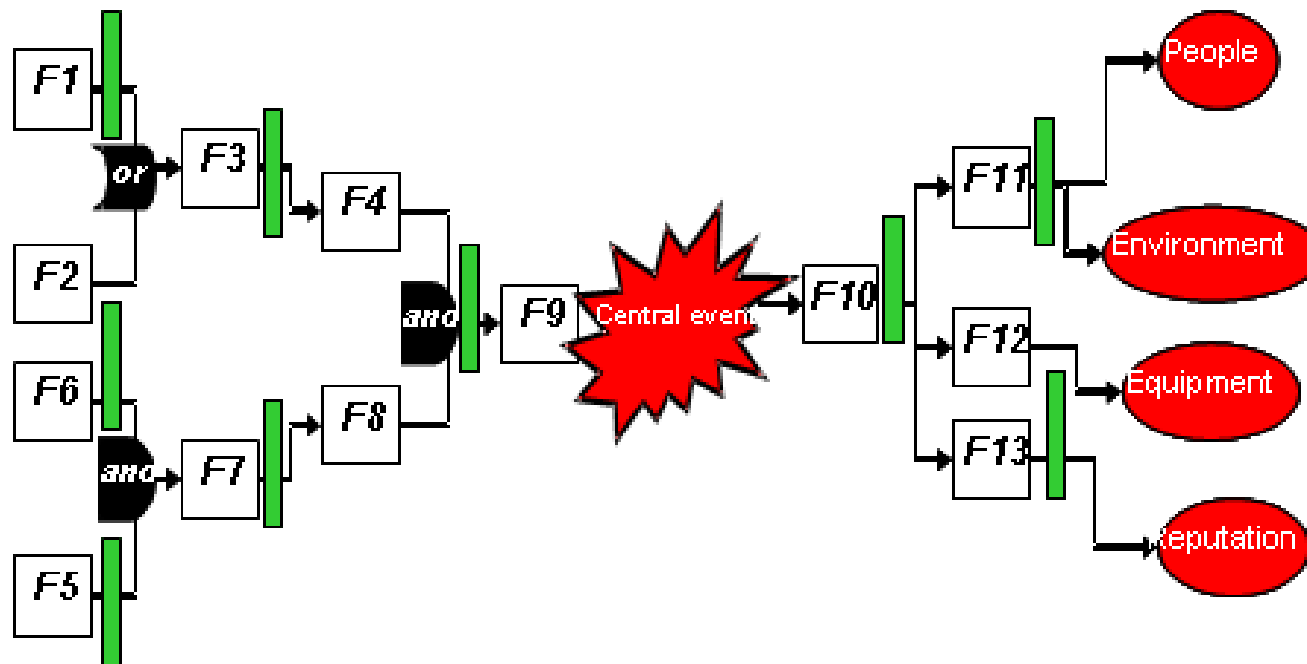
Methodology, GISAI

- Information system of the Dutch labour inspection
- Telephone report of the accident
- Report of the labour inspector
 - Eyewitness statements
 - Observations
 - Findings
- Coded information about accidents and victims

Methodology, model

Bow tie model

Fault tree, scenario's and primary barriers Event tree, scenario and effect reducing barriers



Results, literature (Studies)

Häkkinen ea, 1978, 1993	Butler, 1978	Suruda ea., 1997; Sheperd ea., 2000
1. Load instability	1. Mechanical problem	1. Overhead wiring
2. Rigging the load	2. Crane instability	2. Load instability
3. Hoisting persons	3. Jib instability	3. Jib instability
4. Assembling and dismantlement	4. Structural problems	4. Hoisting persons
5. Crane instability		5. Crane instability
6. Accessibility		6. Assembling and dismantlement
7. Jib instability		7. Accessibility
		8. Person in crane reach

Results, expert meetings

Ranking: Activity,

Central event

crane instability,

1 Positioning, outriggers

2 Assembling

3 Misleading signals

4 overloading

5 Wrong plans, equipment

6 Crane failure

Load instability

7 Exceeding limits

8 Overloading

9 Movement with hanging load

10 Simultaneously hoisting

11 Swinging load

Jib instability

12 Overloading

13 Load hits boom

14 Breaking cables

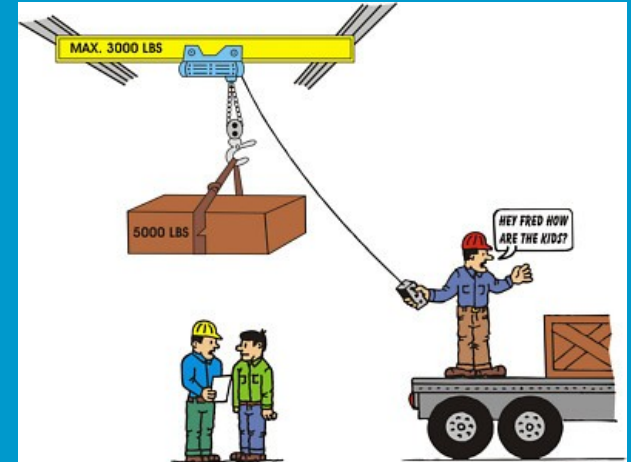
Sweep area not respected

15 Excavator, remote control



Results, Dutch data

- Load instability 72%
n=126
- Contact contra-weight or jib 12%
n=20
- Crane instability 8%
n=13
- Hoisting gear instability 5%
n=9
- Jib instability 3%
n=6



Conclusion

- Accident information in literature is limited
 - Lacking attention to management influence
 - Specific attention for rigging danger is missing
 - Differences between studies
- Counterweight is a danger, but not in literature or experts
- Scenarios literature, experts and Dutch data are almost the same: Instability of crane, load, jib
- Same scenarios, but differences in ranking the scenarios

Discussion

- Experts missed scenario's
 - No rigging crew in expert group
 - Perception
- GISAI only reported accidents
- No victim means no report
- GISAI missed clear equipment coding