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Human-systems integration for preventing vehicle interaction fatalities

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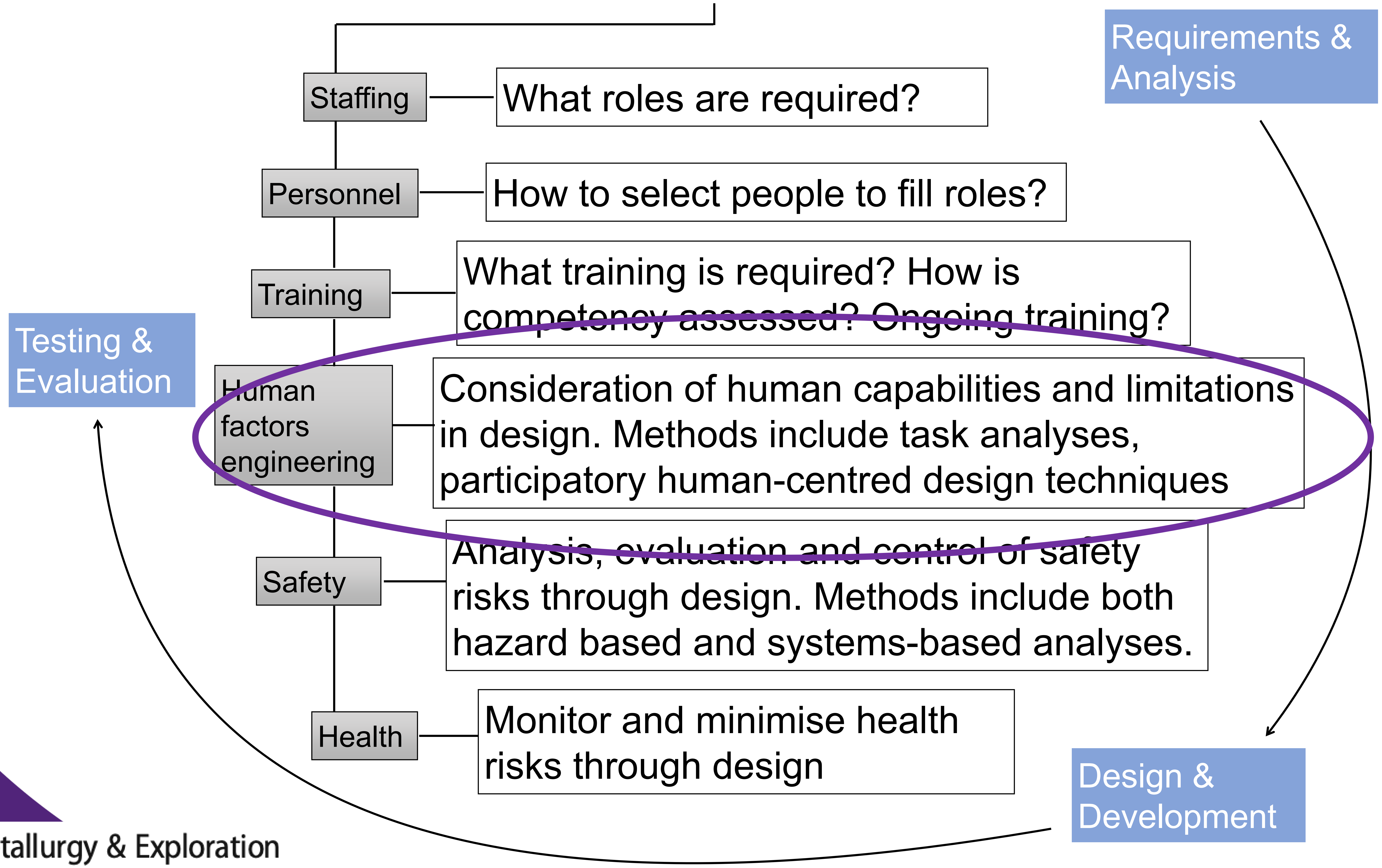
Human-Systems Integration for Mining

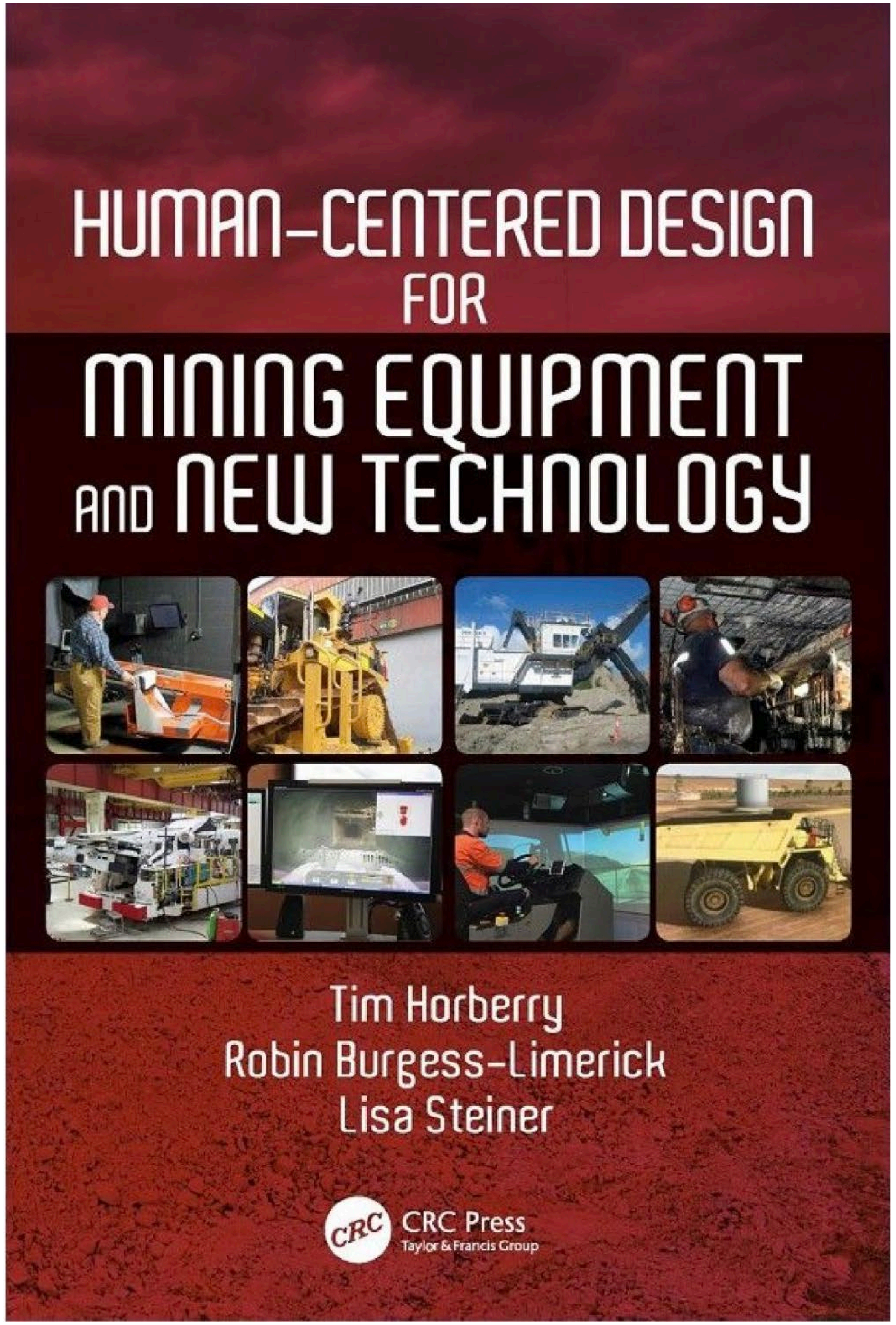


Mining, Metallurgy & Exploration
https://doi.org/10.1007/s42461-020-00248-z

INTERNATIONAL STANDARD **ISO 9241-210:2019**

Ergonomics of human-system interaction —

Part 210:
Human-centred design for interactive systems



Human-centred design principles

- The design is based upon an explicit understanding of users, tasks, and environments
- Users are involved throughout design and development
- The design is driven and refined by user-centred evaluation
- The process is iterative
- The design addresses the whole user experience
- The design team includes multidisciplinary skills and perspectives

Human-centred design activities

1. Understanding and specifying the context of use

2. Specifying the user requirements

3. Producing design solutions

4. Evaluating the design

How do fatal surface mine truck collisions occur?

34 surface mine truck collision fatalities since 1990

11 - truck driving over a light vehicle parked near a truck

6 - truck driving over a light vehicle waiting at intersection

7 - truck colliding with moving light vehicle at intersection

i.e. **70% involve loss of situation awareness**

Loss of situation awareness – restricted visibility

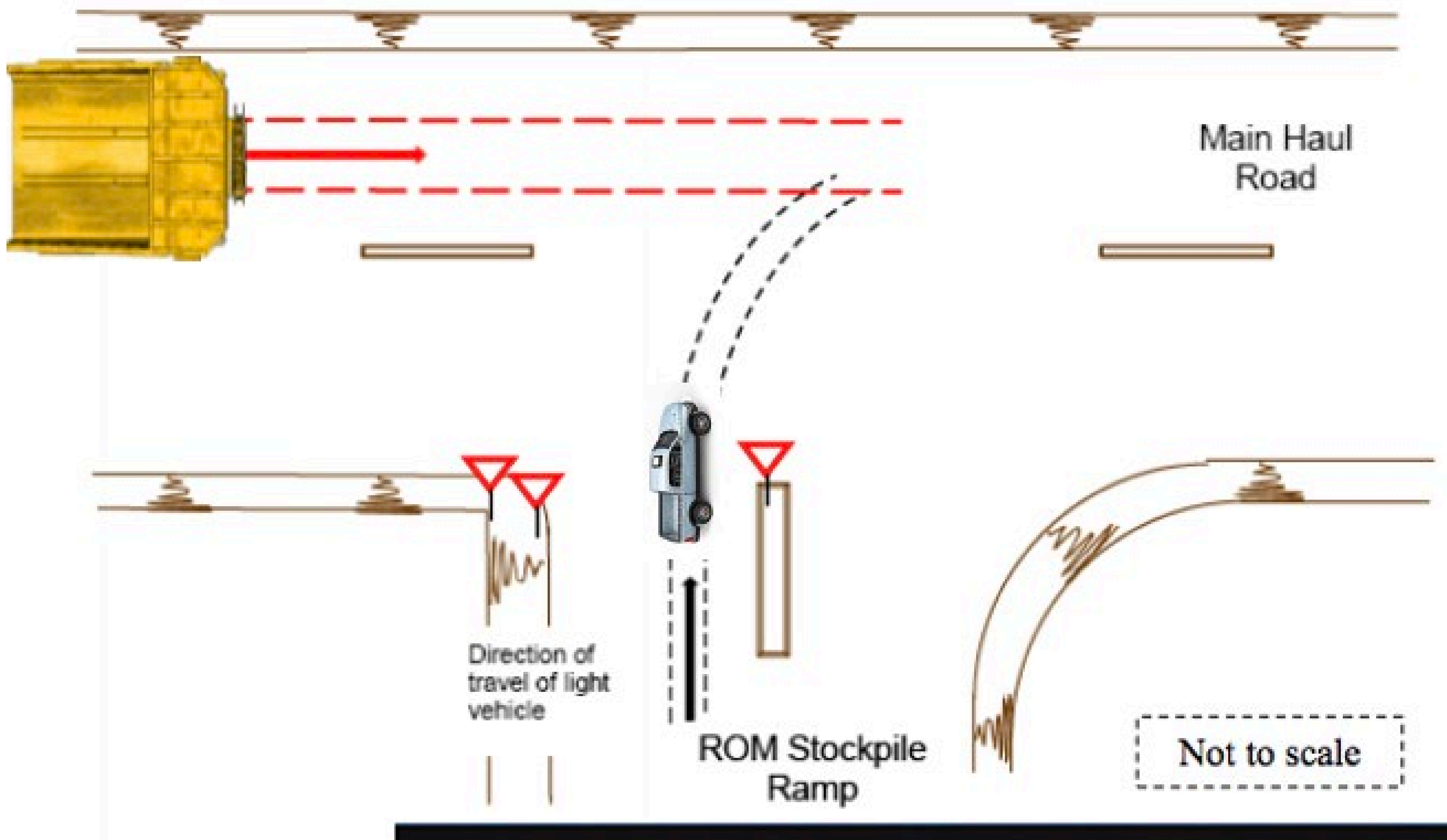
Supplement
direct
perception

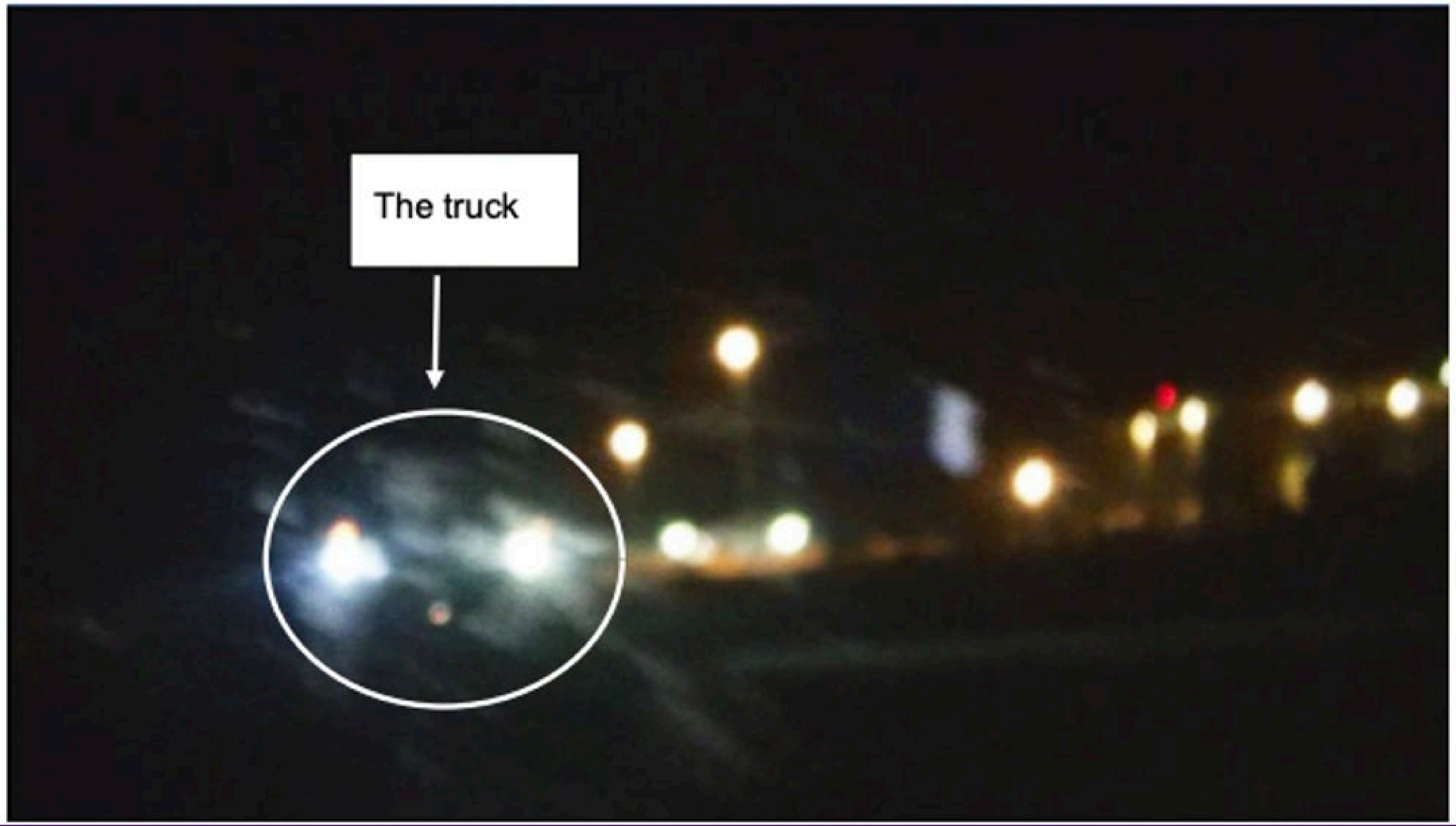
Loss of situation awareness - selective attention

Direct attention to critical information

Loss of situation awareness – “looked but did not see”

Ravensworth
2013





Prompt engagement of conscious attention

Effectiveness relies on novelty

Site observations of collision awareness systems

- Frequent nuisance alarms
- Additional systems (eg dispatch, speed over-ride, bucket-up alarms) provide superfluous auditory information
- Radio conversations compete for attention
- Inconsistent arrangement of cab interfaces
- No prioritisation of alarms

Recommendations

- Remove superfluous auditory alerts
- Improve radio discipline
- Modify advisory collision avoidance system logic to eliminate nuisance alarms
- An attention-getting auditory alarm followed by speech instruction when an alarm is required
- Seat vibration for driver distraction / fatigue alert
- Suppress radio in the event of a alarm
- Standardise cab interface layout