Welcome in the Road Safety Room

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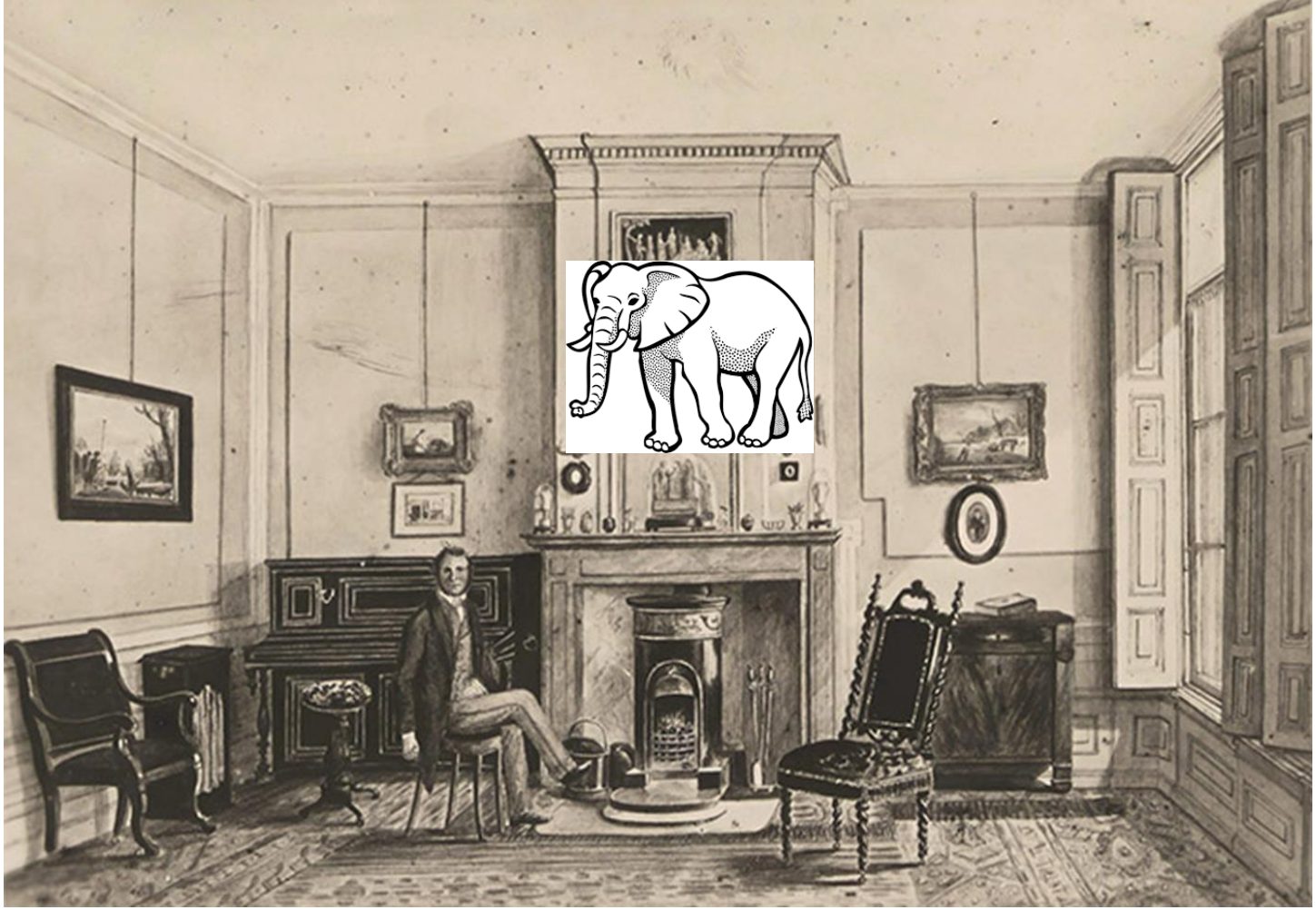
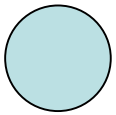


We have an elephant in the room



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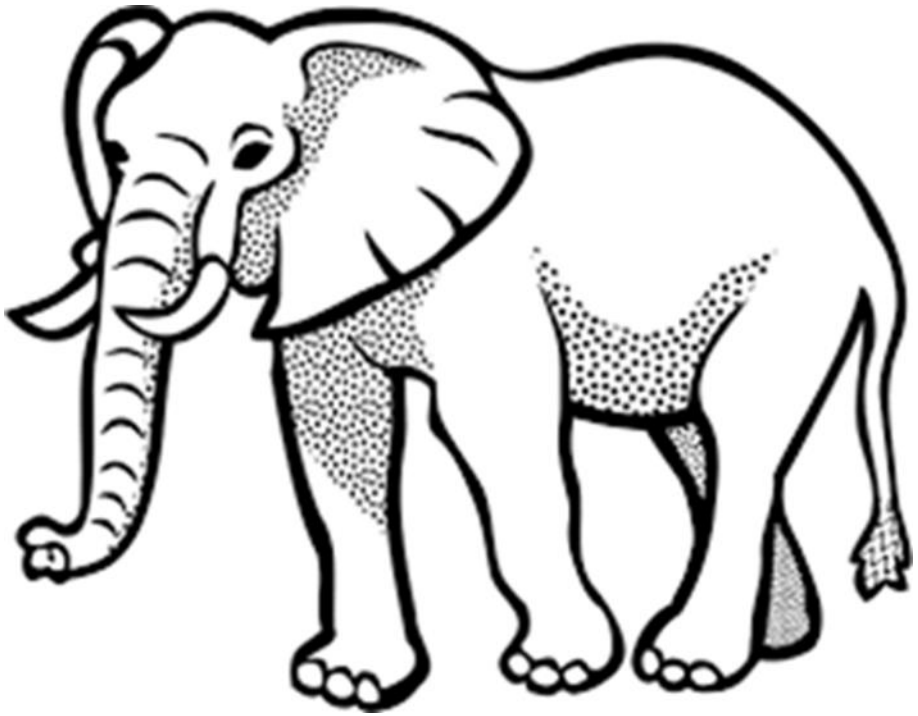
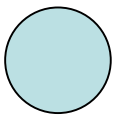
Name of the elephant?



CRASH CAUSATION



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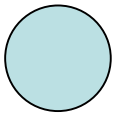
Crash causation: it is time to remove him from the road safety room

Opening Ceremony, 7th IRTAD Conference,
Lyon, 27 September 2022

Fred Wegman, Chairman IRTAD,
Prof. em. Delft University of Technology

Our elephant: Crash causation

- I observe a disagreement in the Road Safety Room on causes of crashes
- I call this an elephant in the room: an obvious major problem or issue that people avoid discussing or acknowledging, but having and expressing divergent views
- Moreover, we have regular visitors in our room: ministers, policymakers, the media, influencers, or people with pubtalk, in talkradio or talkshows



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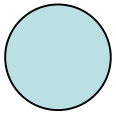
Recently I met with a very well-known, highly respected Dutch citizen

- I told him that I am working in the field of road safety
- He told me:

ROAD ACCIDENTS OCCUR BECAUSE OF BAD HUMAN BEHAVIOUR: EDUCATION IS NOT EFFECTIVE, ENFORCEMENT IS NOT FEASIBLE, SO WE HAVE TO WAIT FOR AUTOMATED VEHICLES. THEN THE CAR CAN MAKE THE DECISIONS AND THE HUMAN BEING CANNOT BREAK THE LAW ANYMORE, CANNOT MAKE MISTAKES OR ERRORS AND WE DON'T HAVE ACCIDENTS

- I told him: I am sorry, but I cannot agree fully with you as I have some different views



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High-speed train derailment in the north of Spain, 24 July 2013

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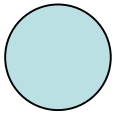
What happened?

- High-speed train derailed in a sharp curve: 80 passengers were killed, 144 were injured
- The train was travelling at twice the permitted speed limit of 80 km/h
- The driver was reported to have been on the phone talking to a colleague just prior to the crash
- An official investigative report determined that this crash was *completely preventable*
- Official findings: driver was **'exclusively'** responsible



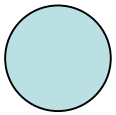
The cause(s)?

- The facts primes us to believe the driver was to blame:

train driver inattention ⇒ excess speed in curve
excess speed limit ⇒ derailment and crash

- If you dig a little bit deeper, another picture emerges:

'Upstream' risk landscape: no driver alerts, no last line of defence (e.g. European Train Control System ETCS had consciously been switched off)



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Safe System thinking: have a look at the 'upstream' risk landscape

- A crash like the high-speed derailment could be prevented by 1) installing multiple layers of prevention, by 2) redundant safety systems and by 3) a pro-active safety culture

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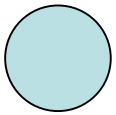
First of all: can we agree on the following?

- We – road safety professionals - are interested in crash causation because we would like to take actions to prevent crashes or reduce their severity
- That is something different than assessing legal or insurance issues

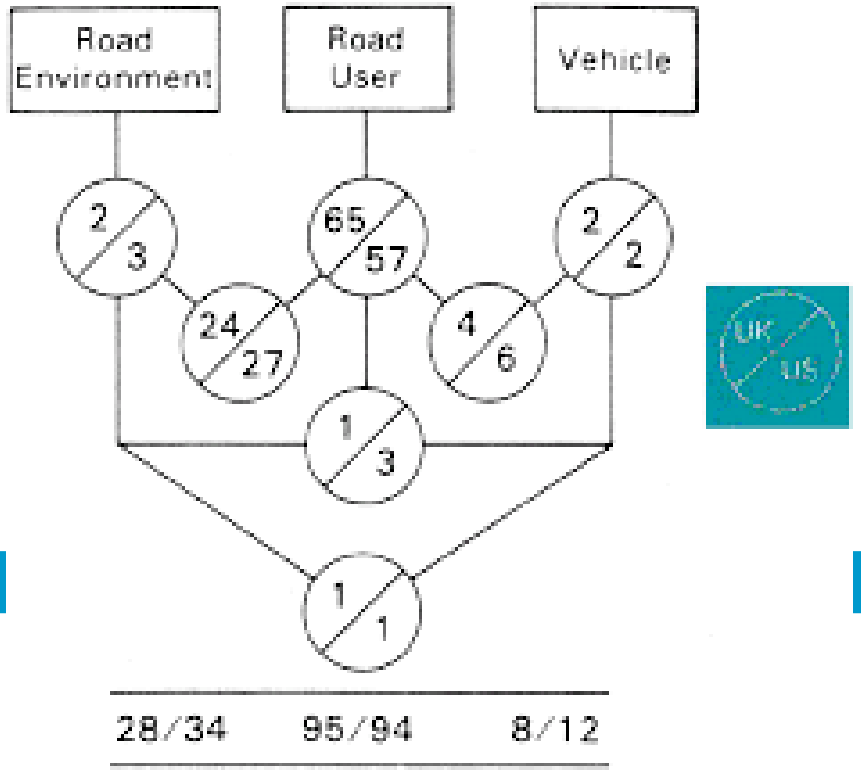
Several methods for investigating causes of crashes are available

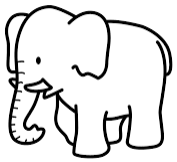
- Individual crashes
  - In-depth; crash reconstruction; clinical crash causation
  - Observations in traffic: 'naturalistic driving'
- Analysing a specific set of crashes (road type, transport mode, age group, collision type, etc.)
  - Studies using police reports, in-depth studies
  - Laboratory test, computer simulation, driving simulator

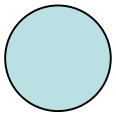


Summarizing results of two in-depth studies (US and UK) from the 1970s

- US Tri-level study of accidents (Treat et al., 1979)
- UK TRL study (Sabey and Staughton, 1975)
- "94-95% of crashes: the road user"
-







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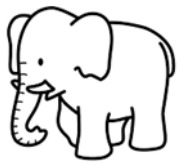
From a recent French study

- This study confirms the prevalence of human factors as accident causal factors. At least one human factor is present in 92% of accidents
- For factors in terms of infrastructure, vehicle and traffic conditions, this rate stands at 30%, 20% and 18% respectively
- The results confirm the high accidental exposure associated with certain factors, particularly excessive or inappropriate speed, driving under the influence of alcohol or drugs, non-compliance with priority rules (deliberate or otherwise) and inattention



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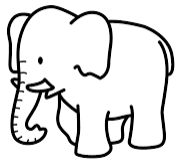
From a recent US-report: 'road safety problem is a behavioural problem'



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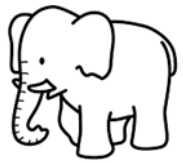
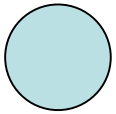
What we learned from crash causation studies

- Analysis of crash causation does not allow to clearly determine the influence of one specific cause. A road crash has been a result of many interacting factors
- Most of crash cause classification systems have been focused on *the errors and actions of the participant that immediately led to the crash, and because of that prevention actions focus on human behaviour*
- When focussing on human behaviour one is close to blaming the human, and on nothing else





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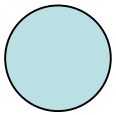
A serious road crash (rural intersection) in Canada April 2018

- 16 young boys from a hockey team died in a crash between a truck and a bus

Three actions taken after the crash

- Truck driver (who failed to observe a stop sign): brought to justice, was convicted and sentenced
- Intersection: report of a consultant identified deficiencies and potential safety issues at the 'Armley Corner' intersection (only)
- New truck drivers: better training

- This rather narrow approach reflects an inappriorate assessment of crash causes and misses opportunities for improvements



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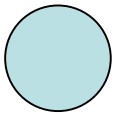
Crash causes as starting point of prevention and for legal proceedings

- The purpose of legal proceedings is not crash prevention and the purpose of prevention is not the determination of guilt, innocence or liability*
- This difference of purpose renders the legal definition of cause unsuitable for crash prevention

- * See: Crash causation and prevention, Ezra Hauer in AAP 143(2020)



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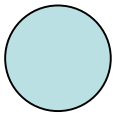
Police and Insurances assessments of crash causation for crash prevention?

- Using police reports to assess crash causation is "extremely naive, biased, and non-productive"
- Police assessment is after culpability and not causation
- Police assessment is looking for violations; and that is their task!
- Police assessment helps insurance companies in assessing culpability and liability
- So, don't use these assessments when you are interested in crash and/or injury prevention



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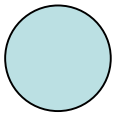
Crash causes definition for prevention

- This is why, Ezra Hauer asserts, that the 65%-95% (user as a cause) is a consequence of an unsuitable cause definition, not a finding
- We need another definition of crash causation, in which we:
  - Acknowledge that most crashes have multiple causes
  - Accept that actions and circumstances not present at the crash time and site can also be considered as causes
  - Understand that compliance with norms does not remove a circumstance or action from being a cause



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A new definition of crash causes (when crash prevention is the aim)

- In crash prevention the cause of crashes (of some kind) is a circumstance or action, which, had it be different, the frequency of such crashes and/or their severity would be different

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Crash prevention actions are

- Crash prevention actions change causes aiming to reduce the frequency of future crashes and/or to improve their severity distribution
- So: crash cause and crash prevention actions are naturally linked

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An example from the maritime sector

- Capsizing of a vessel in Zeebrugge (Belgium, 1987)
- Investigations blamed the boatswain and his supervisors
- Further research identified more 'contributory causes'
  - Vessel design
  - Harbour design
  - Cargo management
  - Passenger management
  - Traffic scheduling
  - Vessel operation

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Two approaches to the human fallibility

- Person approach vs. System approach

Person approach vs. System approach (James Reason, 1990)

- **Person**: errors of individuals because of forgetfullness, inattention, moral weakness, poor motivation, carelessness, recklessness, negligence, braking the law
- **System**: avert errors (or mitigate their effects) by defences, barriers, and safeguards

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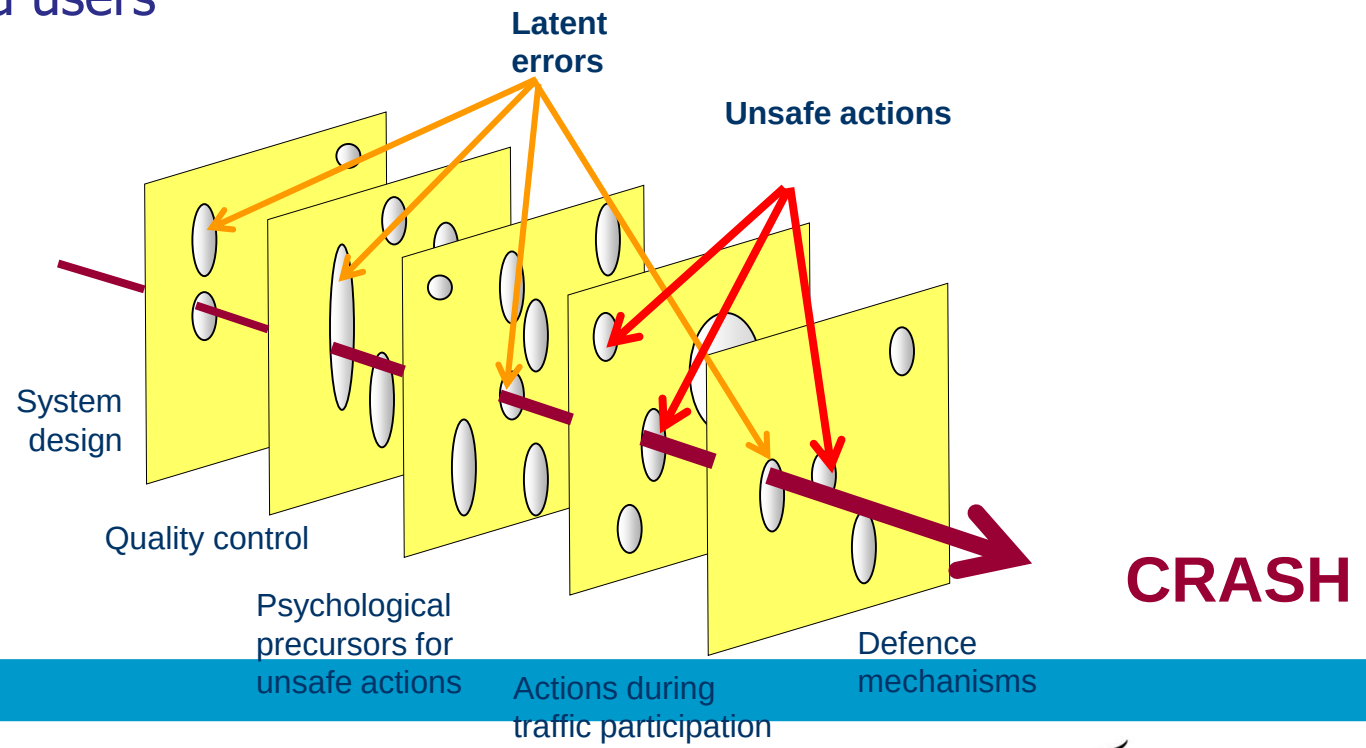
Safe System approach

- System approach: prevention of latent errors (system gaps) based on the Swiss Cheese Model (Reason, 1997)
  - Intervene as early in chain as possible
  - Make unsafe actions less dependent from choices of individual road users



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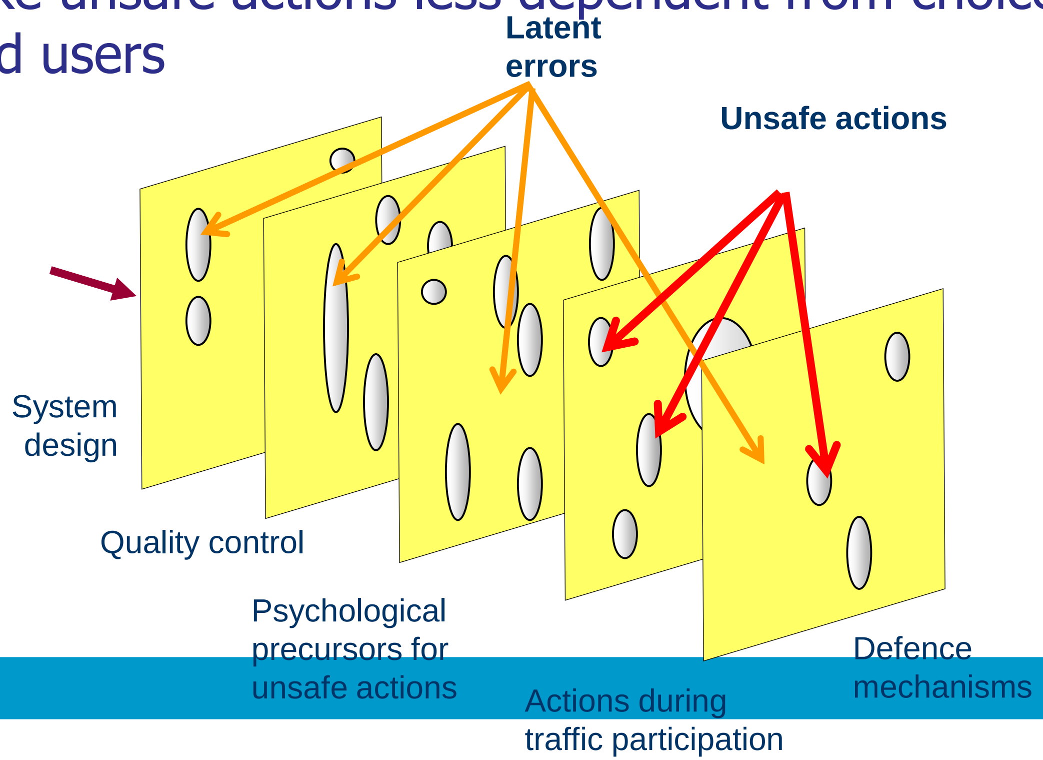
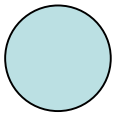


Any recommendation for IRTAD?

- Please, don't include information on crash causation coming from police records in the IRTAD-database
- Consider to include crash causation information from other sources using an appropriate definition of crash causes from a prevention perspective
- Communicate about the results of that work: the IRTAD-voice matters and this also will be considered as a support of implementation of Safe System



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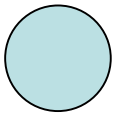
To conclude

- A good understanding of causes of crashes is a starting point for designing effective prevention actions
- Preventing crashes and reducing injuries in crashes is something different than assessing guilt or innocence
- Be cautious on believing simple crash causes (generally, not one cause, not '95% human failure')
- When thinking about crash causation think in terms of contributory factors or risk factors from a Safe System perspective (*use all slices of Swiss Cheese*)
- Always see human behaviour in its context



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THANK YOU VERY MUCH FOR YOUR ATTENTION

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