



Risk Management Modeling and Information Sharing Beyond Maintenance

Introduction to bowties and model thinking

Bowtie as a framework to measure performance and share information

Marko Krnjić | CGE Risk Management Solutions

Started in
2004

We make
barrier based
risk management
software.

Market
leader
In 12 industries

80-90
Events
each year



CGE

Risk Management Solutions

Making risk understandable

2000+
clients
in 83 countries


20-30%
annual growth in the last 6
years

200+
partners
around the world

What are we managing?



Challenges

 Sharing data and information

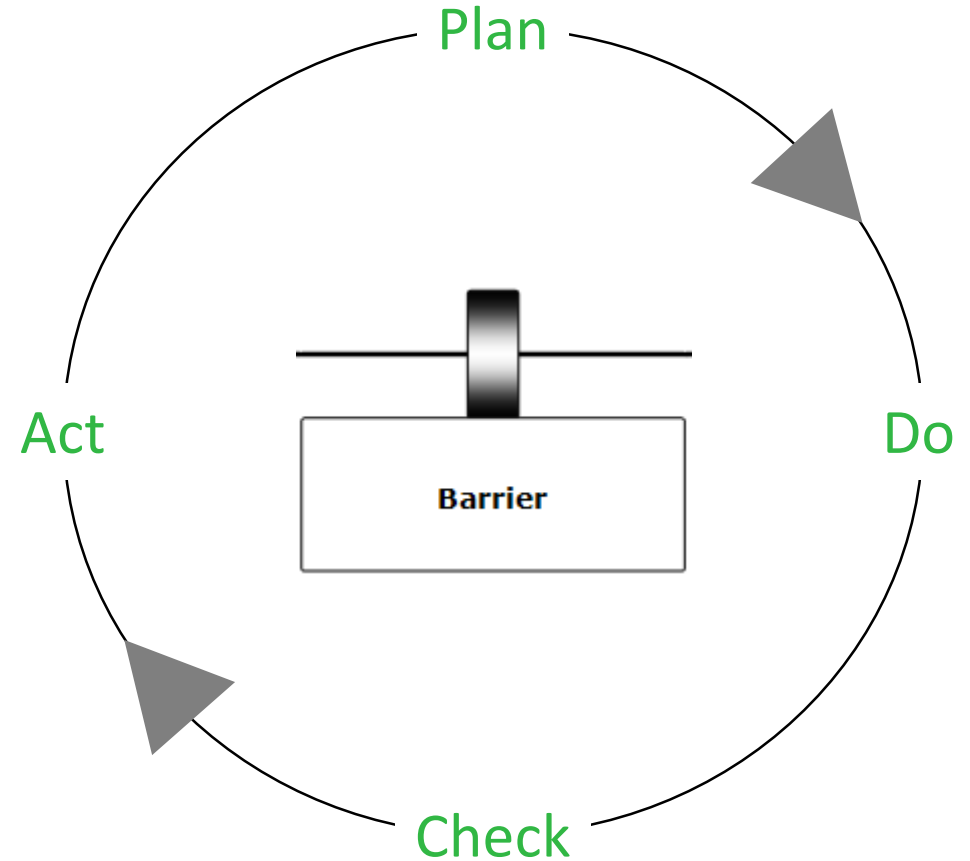
 Speaking a common and understandable language

 Analyze differences and make well-founded decisions

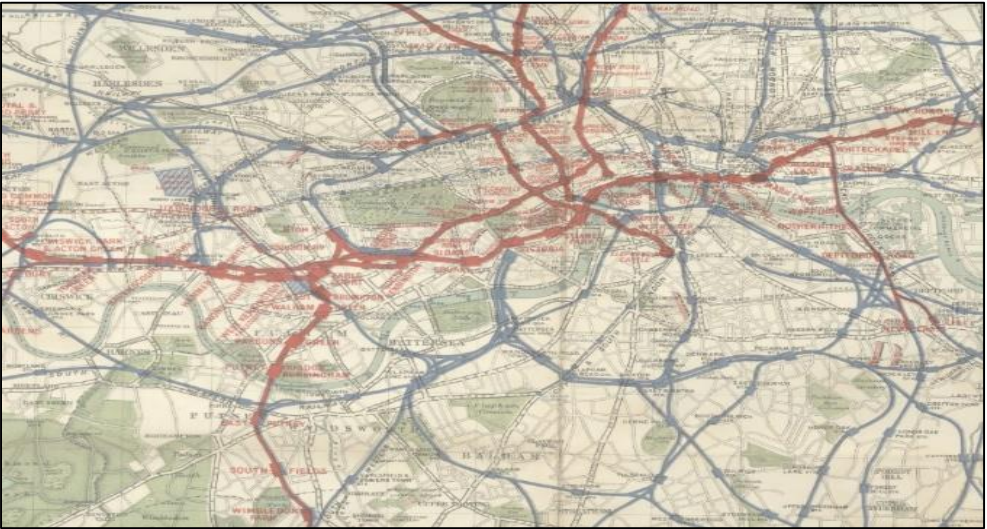
 Maintain all information streams and keep data updated

Are you in control?

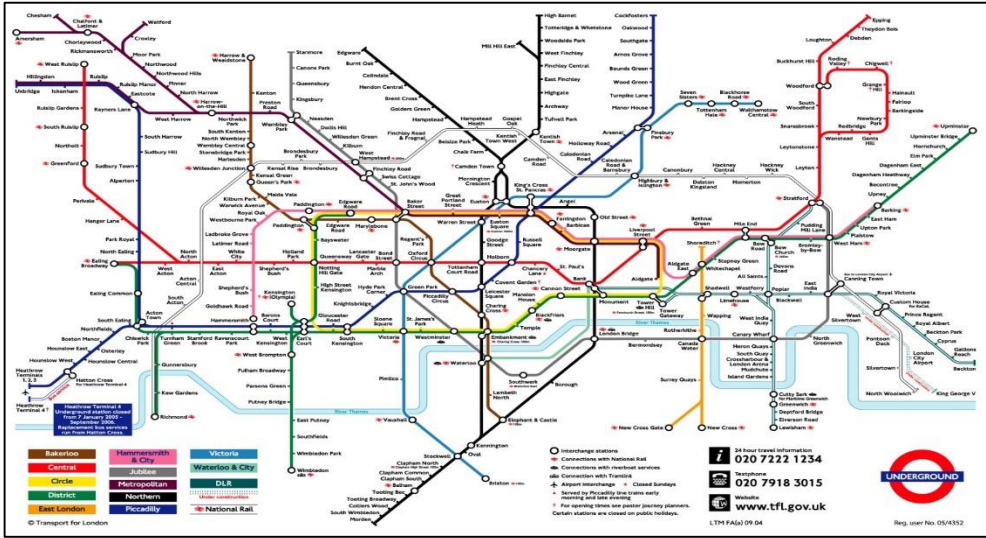
- Do you understand what can go wrong?
- Do you know what your systems are to prevent this from happening?
- Do you have information to assure they are working effectively?



Reality



Representation on map

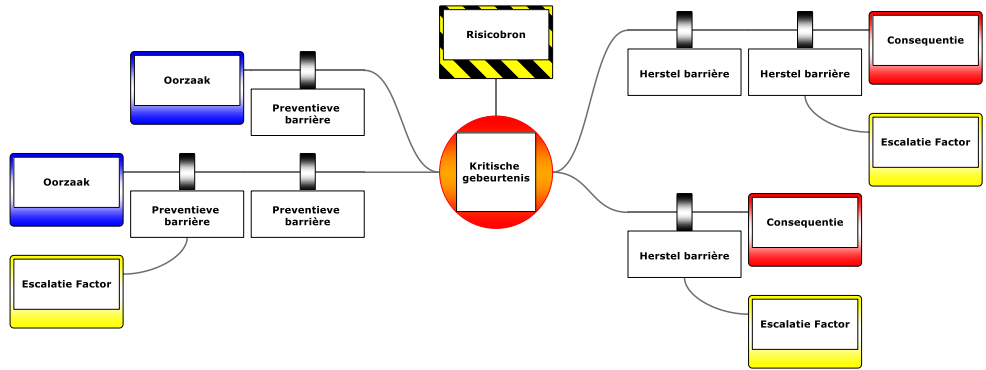


Risk Register

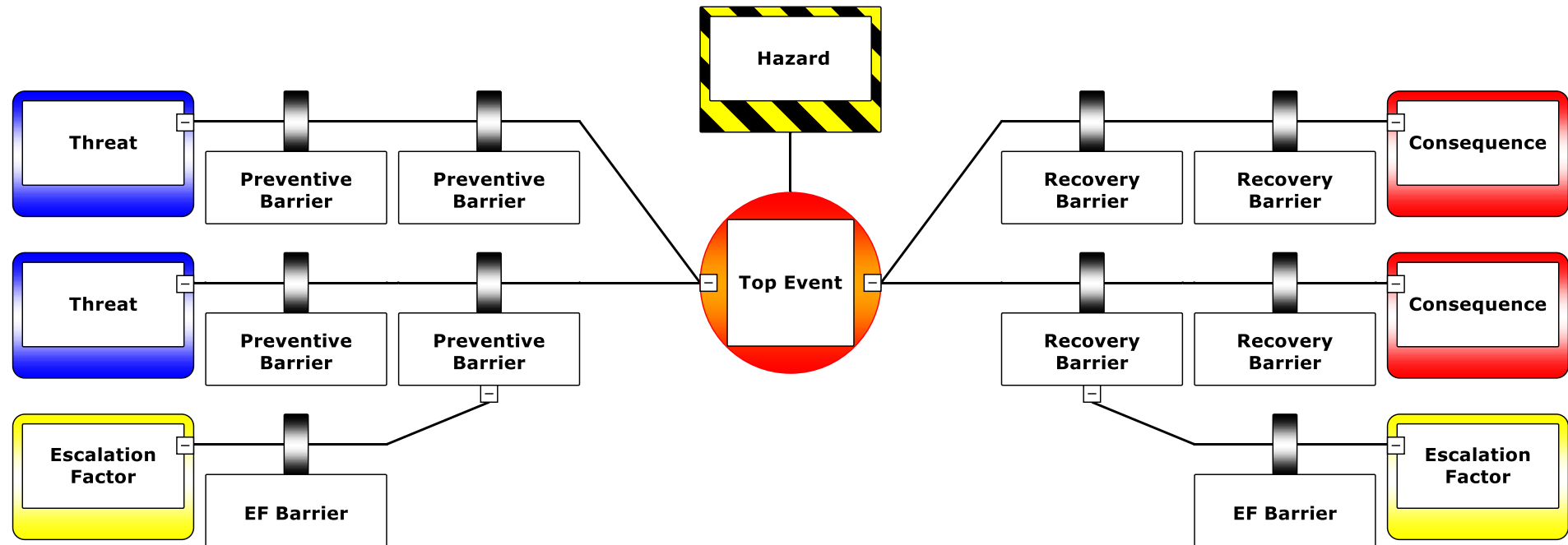
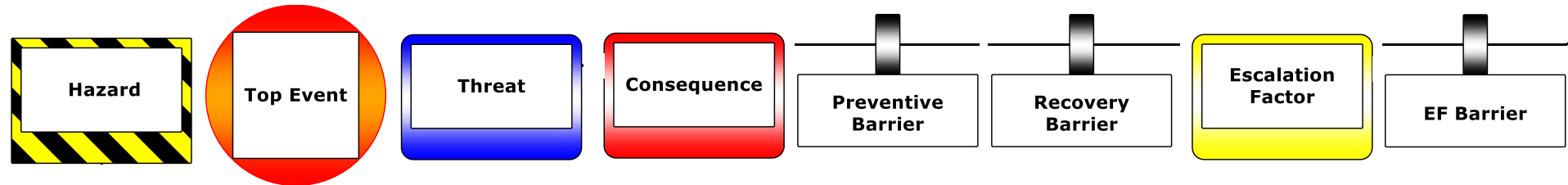
LOCATION	ITEM	EFFECTS OF HAZARD IDENTIFIED	RISK ASSESS	RISK CONTROL
All Offices	General office work, Operation of office equipment (computers, photocopiers)	Manual Handling & Ergonomics Electrical Safety	Very Low/Low	Staff Induction and Training Refer to University Guidelines for Manual Handling and Ergonomics Refer to Equipment Operation Manuals and other relevant SOP's
All Laboratories	General laboratory work, preparation of chemical reagents, experiments involving chemicals	Manual Handling & Ergonomics Chemical exposure Electrical Safety	Medium	Staff Induction and Training Refer to University Policy on Guidelines for Laboratory Conduct Refer to University Chemical Management Policy Guidelines Refer to Chemical MSDS and follow recommendations Maintain Chemical Register Refer to Equipment Operation Manuals and other relevant SOP's
Specialist Laboratories	As above, but includes Quarantine and PC labs, Radioisotope Labs, Analytical Facilities, Wine Science Laboratories	As above, but may include: Quarantine and PC Containment, Radiation Exposure, Working on Specialist Equipment or in Confined Spaces	Medium	As above, but may include: Refer to relevant Quarantine and PC Policies and Legislation Refer to relevant Radiation Policies and Legislation



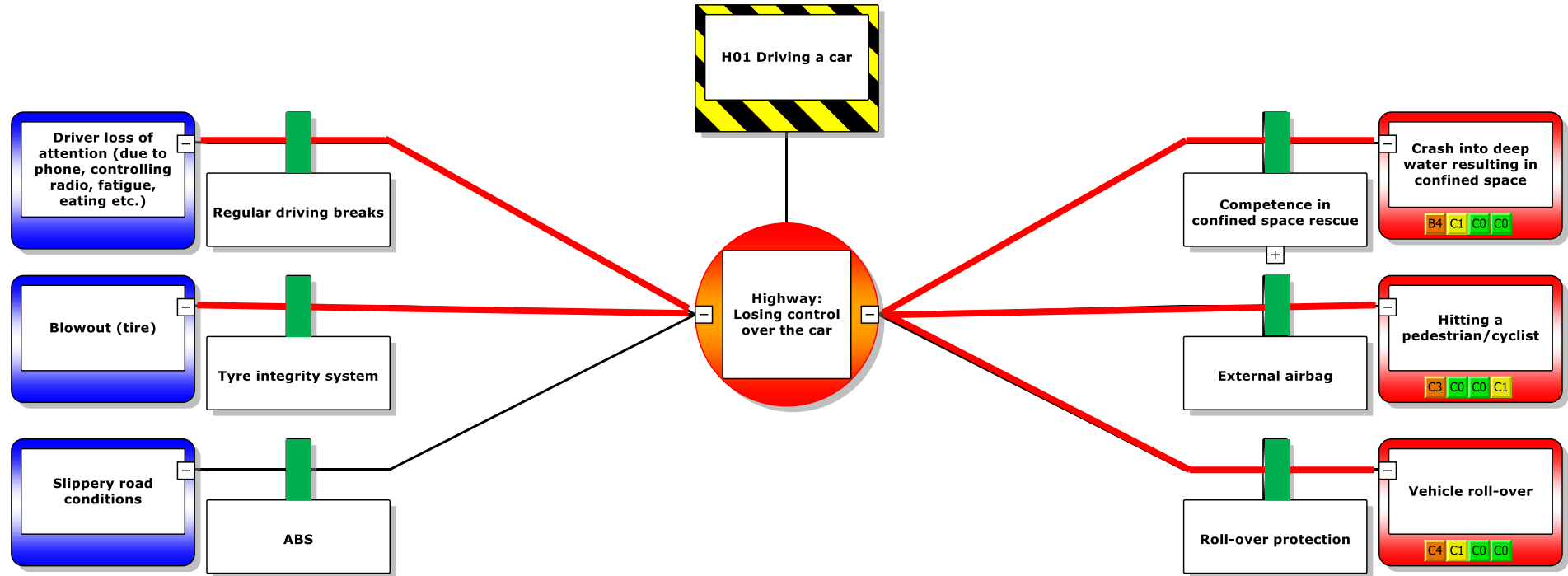
Bowtie Risk Analysis



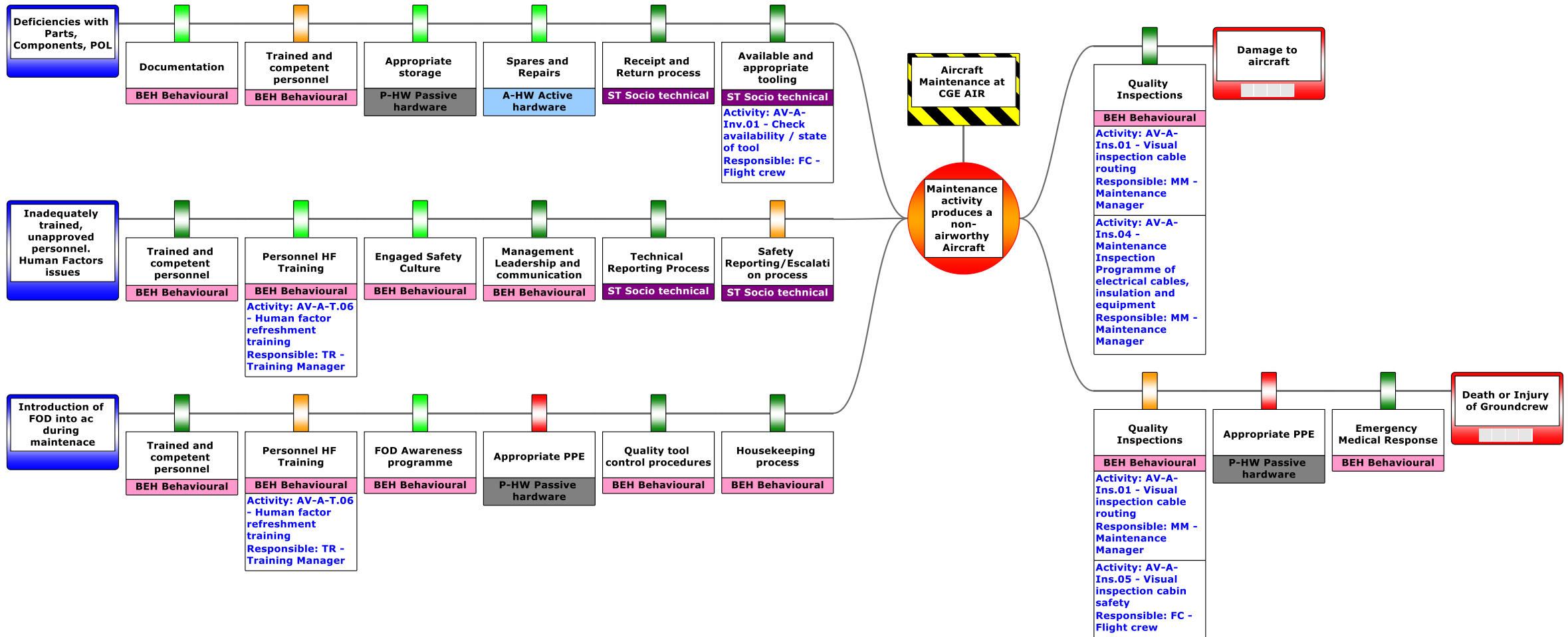
Bowtie in 8 steps



Scenario based story telling



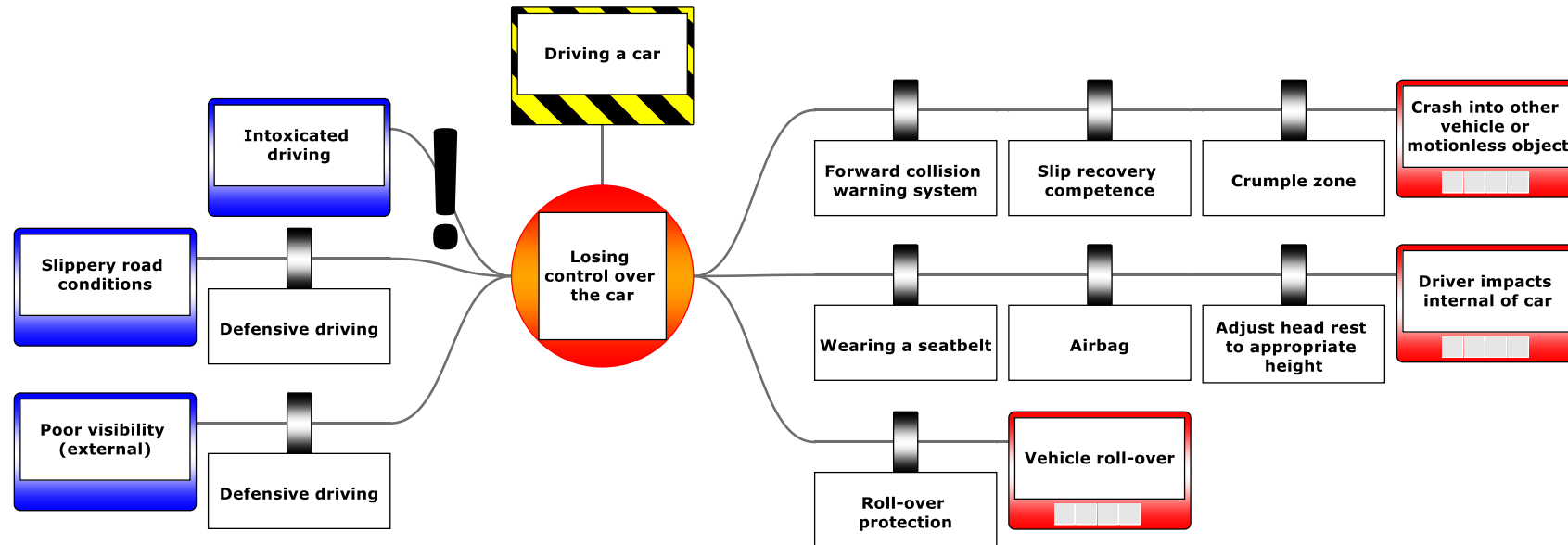
Use as framework and provide structure



Easier to see relations and weak spots

	A	B	C	D	E
1	Risk	Threats	Consequences	Barriers	Risk level
2	Driving a car / Losing control over the car	Intoxicated driving Slippery road conditions Poor visibility (external)	Crash into other car or motionless object Driver impacts Internal of car Vehicle roll-over	Airbag Crumple zone Defensive driving procedure Forward Collision Warning System Head rest adjustment to appropriate height Roll-over protection Seatbelt Slip recovery competence	Med

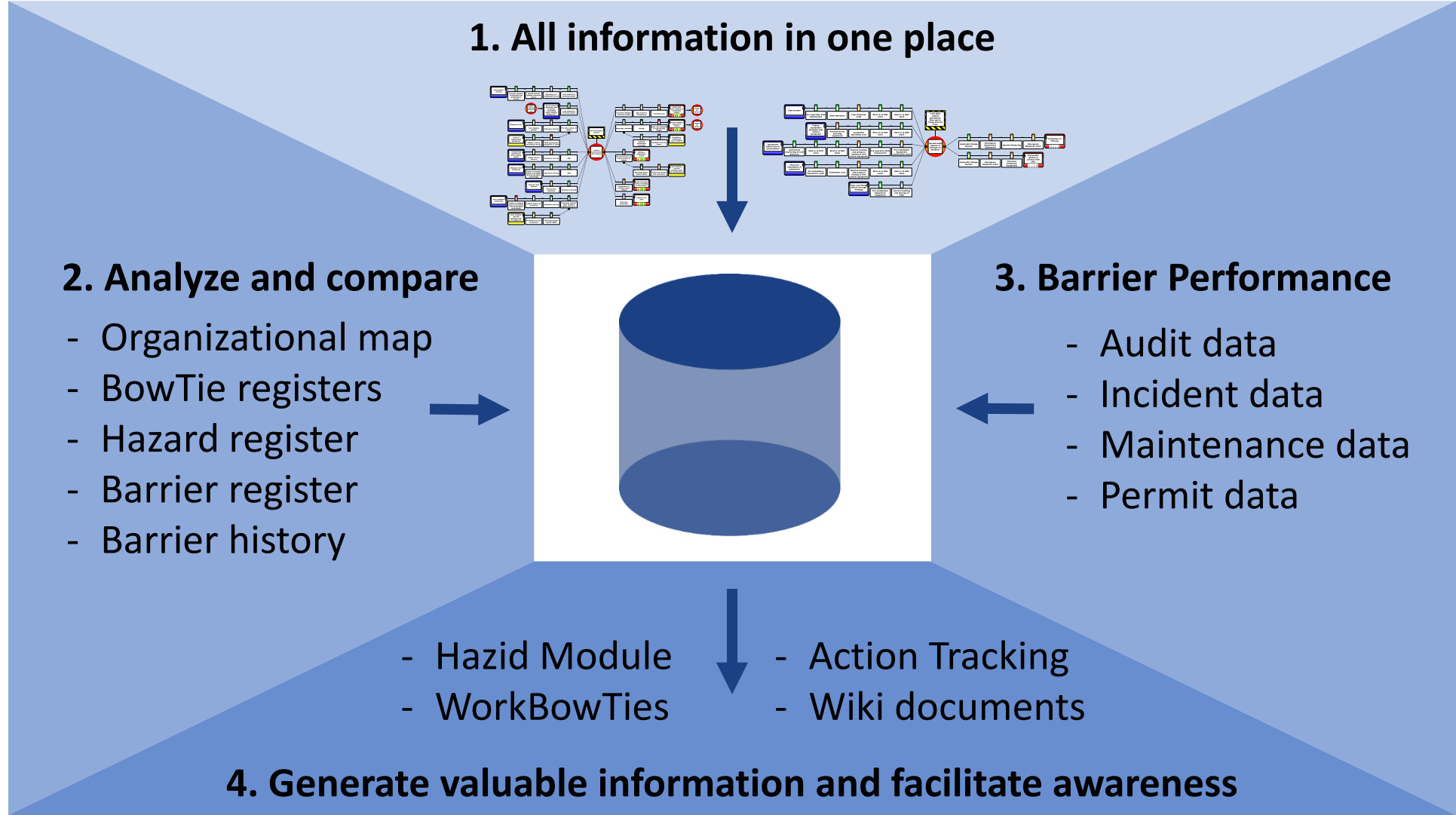
VS



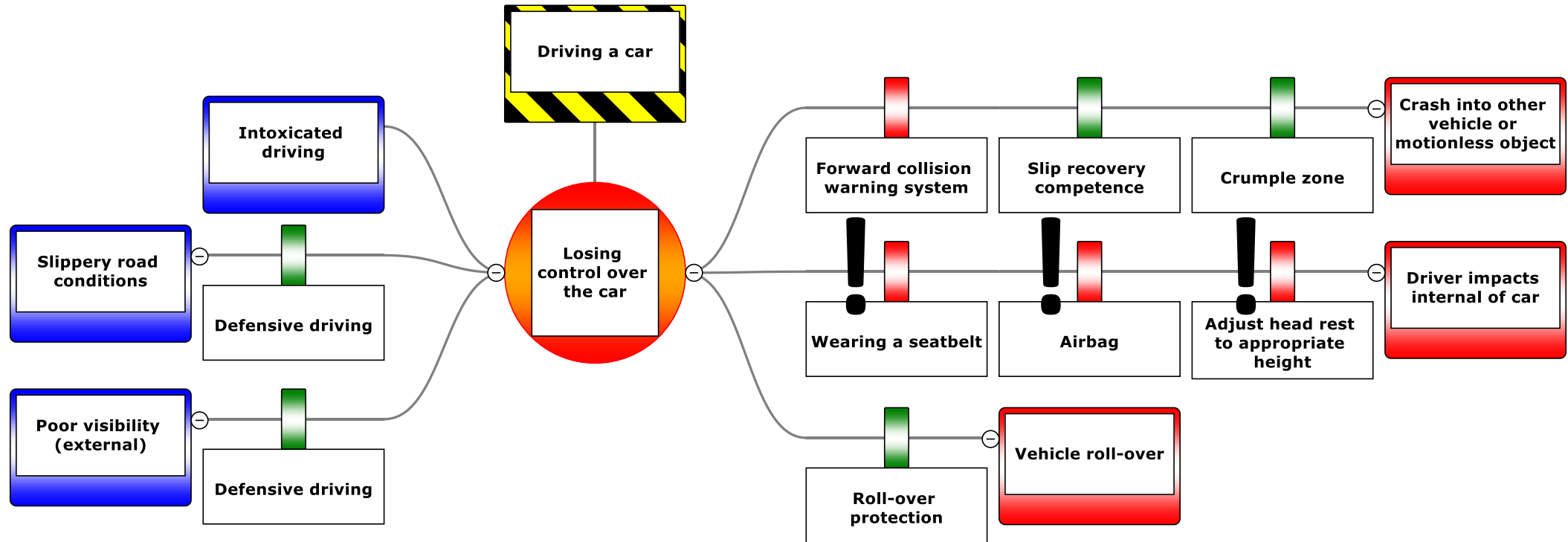
The next step

- Identify weak links and blind spots ✓
- Improve initial decision making ✓
- Take away borders – Communicate in the same language
- Get the right information to the right person
- Receive relevant information

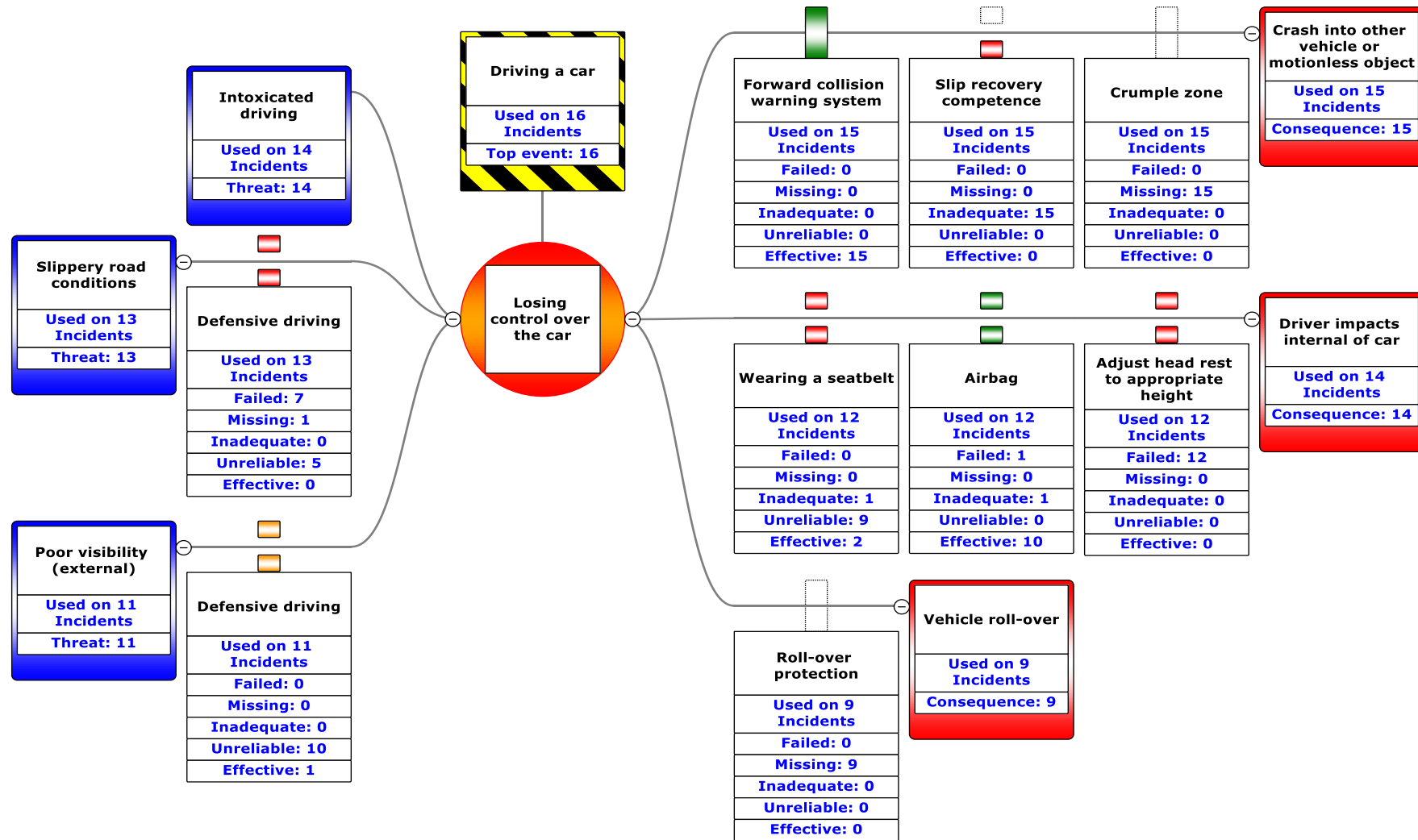




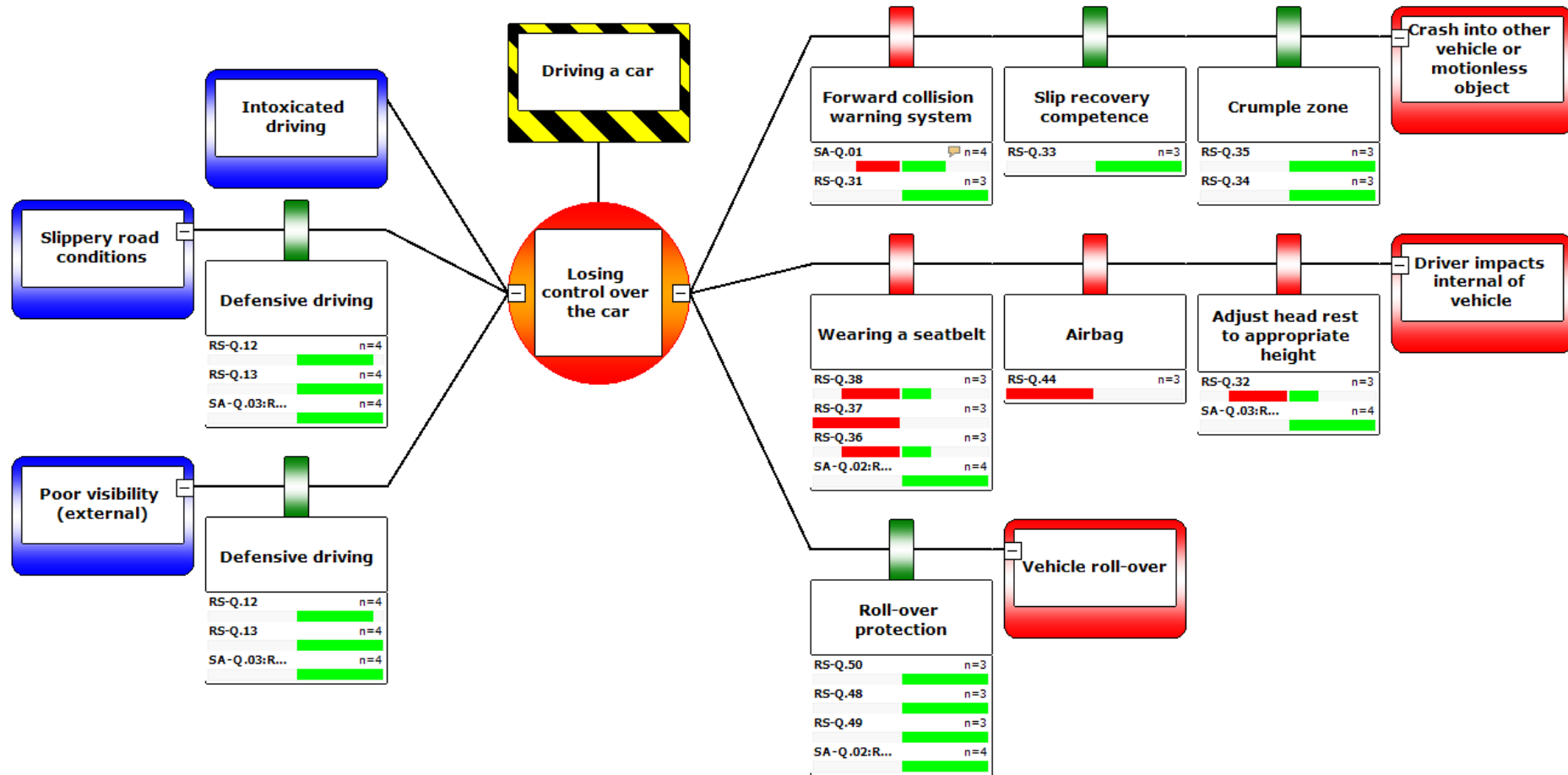
Update or alter decision based on new information



Learn from incidents



Learn proactively



Aeroporto di Verona
Aerolíneas Argentinas
Afriqiyah Airways
Air New Zealand
Air France
Airways New Zealand
Air Service Gabon
AirTanker Services Limited
Alba Servizi Aerotrasporti SpA
Alidaunia srl
American Airlines
Amsterdam Schiphol Airport
ArkeFly
Ascent Flight Training
Avinor
Belfast City Airport
Bergamo airport
Bizjet Aircraft and Helicopters Management
Boeing Defense UK
Bristow Helicopter
Britair France
British Airways
Canadian Base Operators
Caverton Helicopters
Changi Airport Group
Civil Aviation Authority UK
Civil Aviation Authority Singapore
CASA - Civil Aviation Safety Authority
CHC Helicopter
Christchurch International Airport
Corendon Dutch Airlines
COCESNA
Delta Air Lines
DGAC
Emirates Airline

E.N.I. Servizi Aerei SpA
ERA Helicopters
FAA
Finnair
Finnish Commuter Airlines
Finnish Transport Safety Agency
Flair Air
Flight Safety Foundation
Freebird Airlines
Genova Airport
Hainan Air Group
Heathrow airport
Helibarra Taxi Aéreo
Helicópteros Marinos S.A.
Hong Kong Civil Aviation Department
HOP Brit Air
Italfly
Irish Aviation Authority
Japan Airlines
Jayrow Helicopters
Jazeera Airways
JetStar
Kelowna Flightcraft
KLM Royal Dutch Airlines
KLM UK
Leonardo Helicopters
Liverpool Airport
London City Airport
Luchtverkeersleiding Nederland
Malaysian Airlines
Manchester Airport
MHS Aviation
Milano airport
Military Aviation Authority UK
National Helicopter Services Trinidad & Tobago

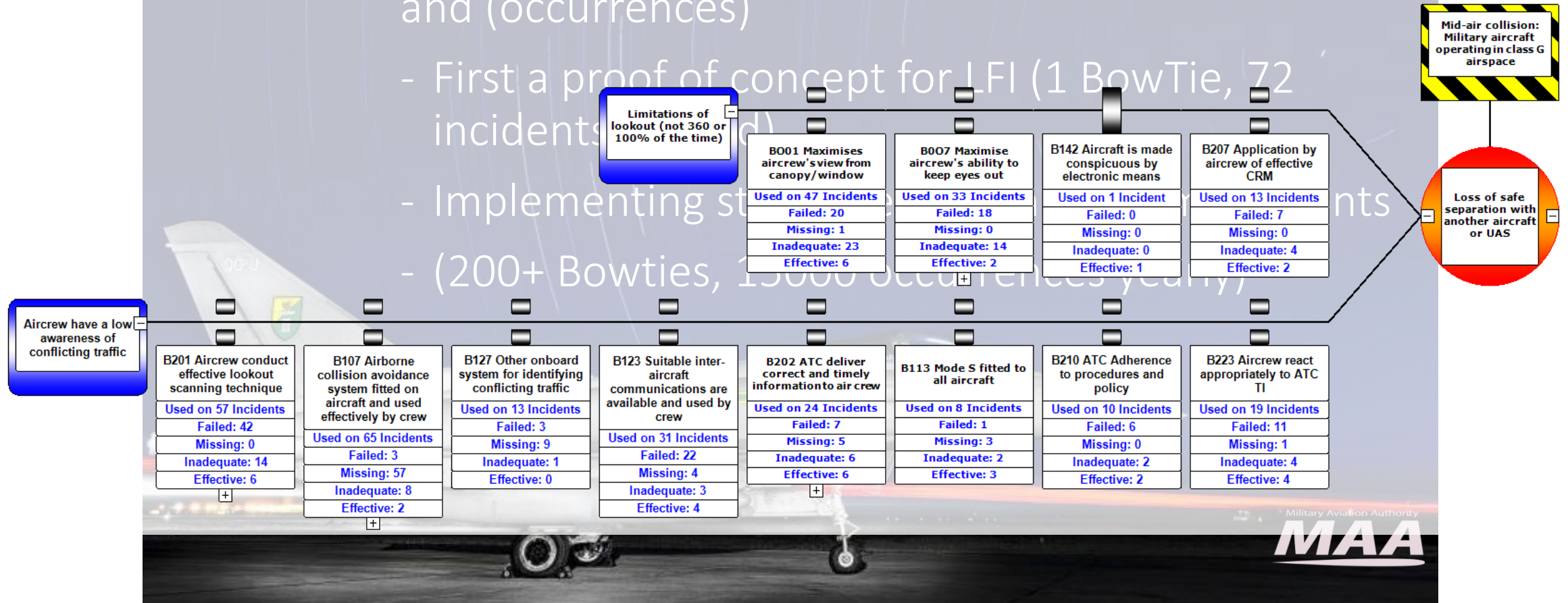
Nayak Aircraft Services
Noordzee Helikopters Vlaanderen
Norwegian Air
Norwegian Air Shuttle ASA
Norwich Airport
Oman Air
Pegasus Airlines
Pellissier Helicopter
Perth airport
Petrobras Aviation
Praxair
Qantas
Royal Australian Air Force Australia
Royal Air Force UK
Royal Netherlands Aeronautical Association
Ryanair
SFS Aviation
Shell Aircraft International
Singapore Air Transport Training College
Sirio SpA
Skyline Helicopters
SkyWest Airlines
SmartLynx Airlines
Taxi Aéreo - Lider Aviação
TFC
Torino Airport
Toscana Airport
Turin Airport
Turkish Airlines
UK Air Accident Investigation Board
Urzad Lotnictwa Cywilnego - CAA Poland
Vancouver Island Helicopters
Venice Airport
Verona airport
World Food Programme



Military Aviation Authority UK

A 6 year journey towards learning from incidents and (occurrences)

- First a proof of concept for LFI (1 BowTie, 72 incidents)
- Implementing standardised BowTies
- (200+ Bowties, 15000 occurrences yearly)



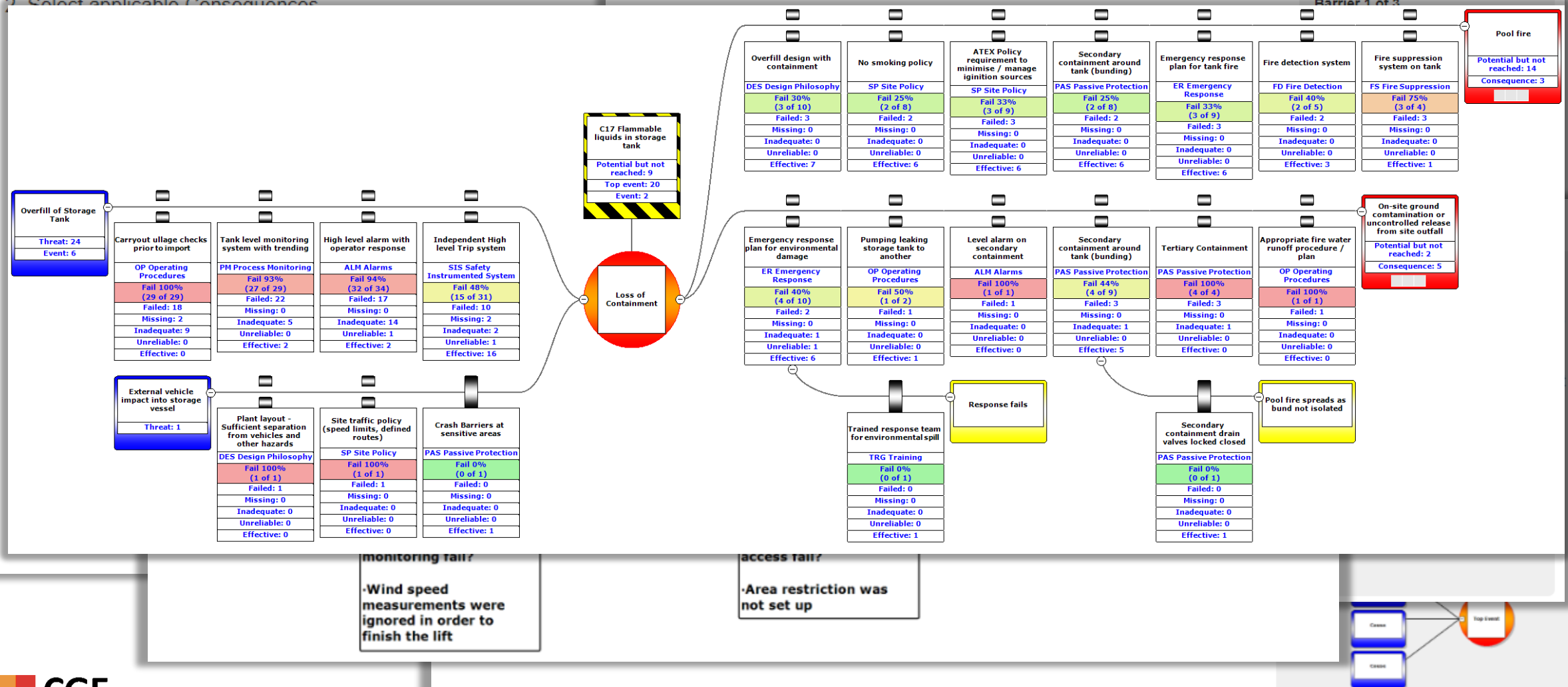
Structured analysis of occurrences in BowTieServer

- Single reporting system ASIMS
- Circa 15,000 reports per year
- Data is imported into BowTieServer using **SIR**
- Occurences are analysed and linked to 200+ BowTies

Scenario-based Incident Registration

4. Performance details of safety measures






Monitor and adhere to weather criteria and stop lift if limits are exceeded - Barrier 1 of 3



- ⇒ BowTie Groups
- 1. Loss of Control
 - 1.1 Operation of Large CAT Fixed wing aircraft (human performance) / Aircraft unintentionally deviates from normal in-flight parameters
 - 1.2 Operation of Large CAT Fixed wing aircraft in adverse environmental conditions / Aircraft unintentionally deviates from normal in-flight parameters
 - 1.3 Operation of Large CAT Fixed wing aircraft experiencing technical failures / Aircraft unintentionally deviates from normal in-flight parameters
 - 2. Runway Excursion
 - 2.1 Large CAT Fixed wing aircraft - Landing Operations / Inability to make a stop within the expected landing distance requirement
 - 2.2 Large CAT Fixed wing aircraft - Take-off and Landing Operations / Loss of directional control on the runway
 - 2.3 Large CAT Fixed wing aircraft - Take-off/ Departure Operations / Aircraft does not accelerate or take-off as expected
 - 3. CFIT
 - 3.1 Large CAT fixed wing aircraft - Arrival or departure (general) / Terrain separation deteriorating below normal requirements
 - 3.2 Large CAT Fixed wing aircraft - Non-precision approach (especially in IMC or at night) / Terrain separation deteriorating below normal requirements
 - 3.3 Large CAT fixed wing aircraft - Precision approach in IMC or at night / Terrain separation deteriorating below normal requirements
 - 4. Runway Incursion
 - 4.1 Large CAT fixed wing aircraft operating on the ground in or close proximity to the protected area of an active runway / Incorrect presence of aircraft on runway
 - 4.2 Vehicles and/or personnel in or close to the protected area of an active runway for large CAT fixed wing aircraft / Incorrect presence of aircraft on runway
 - 4.3 Large CAT Fixed wing aircraft - Take-off and Landing Operations / Incorrect presence of aircraft on runway
 - 5. Airborne Conflict
 - 5.1 Large CAT fixed wing aircraft operations whilst airborne UK Class A airspace / CAT aircraft in close proximity with another aircraft
 - 5.2 Large CAT fixed wing aircraft operations whilst airborne UK Class G airspace / CAT aircraft in close proximity with another aircraft
 - 5.3 Large CAT Fixed wing aircraft in the circuit area of a procedural (non radar) equipped aerodrome / CAT aircraft in close proximity with another aircraft
 - 6. Ground Handling
 - 6.1 Loading operations for large CAT fixed wing aircraft at UK Aerodromes / Aircraft significantly outside the operational mass and balance
 - 6.2 Ground operations for large CAT fixed wing aircraft at UK Aerodromes / Significant ground damage undetected prior to aircraft commencement of flight
 - 6.3 Cold weather conditions conducive to large CAT fixed wing aircraft contamination (on the ground) / Aircraft commences take-off with contamination
 - 7. Fire
 - 7.1 Aircraft electrical systems on large CAT fixed wing aircraft / Hidden area fire becomes established
 - 7.2 Combustible materials in the cargo compartment on large CAT fixed wing aircraft / Cargo compartment fire
 - 7.3 Fuel and combustible aircraft components for large CAT fixed wing aircraft - external to the pressurised areas / Fire occurs externally
 - 8. Umbrella
 - 8.1 Human Factors / Activities not performed, or not performed to a safe standard
 - 8.2 Technical Factors / In-service technical equipment does not meet safe standard
 - 8.3 Environmental Factors / Degraded safety margin

<https://www.caa.co.uk/Safety-Initiatives-and-Resources/Working-with-industry/Bowtie/>

Conclusion

-  Start small – Try to speak the same language through (a part of) the organization by adapting certain models like bowtie.
-  Create buy in – Fit processes and structures from the organization into the model.
-  Quantify and enrich – Collect additional data sources and combine them all together.
-  Reach the right person – Use the available tools to reach the right person in the organization and work efficiently by providing and gathering valuable information.
-  Continuously improve – Use information of today to be safer tomorrow. Find weak spots and fix them!

Questions?



Please feel free to visit our stand to elaborate and see the tools in action.