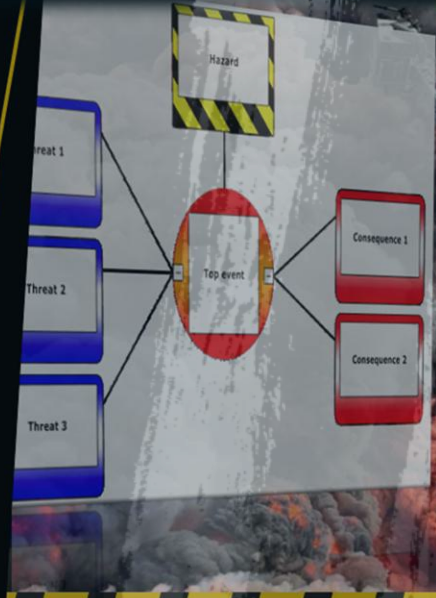


IF EVERYTHING
IS CRITICAL...
"NOTHING IS"



THE
MODEL
ISN'T THE
WORK

WHAT'S
MISSING?



- Changing conditions
- Conflicting goals
- People adapt
- Time pressure



PART 3

HUMAN FACTORS
HUMAN PERFORMANCE

THE
**WEAKEST
BARRIER**
ISN'T HUMAN

PEOPLE
ADAPT

SAFE AS

SafetyInsights.org

Link: https://youtube.com/@safe_as_pod

COMPLEX
PROCEDURES

UNCLEAR
INFO



FATIGUE

CONFLICTING
GOALS

DISTRACTION

Link: https://youtube.com/@safe_as_pod

CONTROLLED
≠ WORKING



Part 1: Distinguishing Controls from Clutter

**IF EVERYTHING
IS CRITICAL...
"NOTHING IS"**



CORE FINDINGS

- Controls/barriers are split between classical views (active/passive hardware directly blocking hazardous energy) and radical views (including rules, audits, procedures, and management systems).
- Distinguish between 'Barrier Function' (what must be achieved), 'Barrier System' (the overall arrangement delivering it), and 'Barrier Element' (an individual component).
- A control must be hazard-specific (defining actor, object, and goal), independent, effective on its own, and auditable. Support activities maintain barrier/control health but are not barriers themselves.
- Reclassifying support and verification routines as erosion controls reduces register noise and focuses assurance on critical controls (e.g., Rio Tinto reduced lists and verifications by 40%).
- Prioritise Direct Controls that eliminate/isolate high-energy transfer, are verifiable, and remain effective despite unintentional human error.

Part 2: Operationalising Controls & Field Verifications



Link: https://youtube.com/@safe_as_pod

CORE FINDINGS & PRACTITIONER TAKEAWAYS

- Identifying bow tie controls are intentions, but ‘protection’ requires 6 stages: Identified → Specified → Implemented → Verified → Monitored → Improved.
- Controls require explicit performance standards defining testable specifications and erosion factors (corrosion, wear, desensitisation, workload) that degrade functionality.
- Supposedly ‘independent’ controls can share hidden couplings (common power, shared maintenance, single supervisor). Double-checks create social redundancy where checkers blindly rely on ‘doers’ – **the fallacy of social redundancy**.
- Assurance degrades over time into ceremonial and ritualistic form-filling while original design assumptions drift from operating reality. Assurance must monitor whether foundational assumptions hold.
- Field studies show low combined control reliability in high-risk work (e.g., 23% in construction). Consider tracking High Energy Control Assessments (HECA) and Pre-Job Brief quality over injury rates.



Part 3: Designing for Human Performance & Learning from Daily Work

CORE FINDINGS & PRACTITIONER TAKEAWAYS

- Human error isn't a 'root cause', threat, or investigation conclusion; it's the starting point for examining work context and why barrier design failed.
- Active human-technical barriers rely on **Detecting** cues, **Deciding** appropriately, and **Acting** in time (Detect-Decide-Act). Operators act on internal mental models, which become outdated by delayed feedback.
- Expectations must specify actor, task, cues, required response time, competence, and observable outcomes under worst realistic operating conditions.
- Eliminate environmental error traps (mismatched gauges, poor access etc.) rather than blaming worker attitudes or using judgmental labels like 'complacency'.
- Workarounds solve immediate constraints but can silence improvement signals; focus risk management on Critical Steps (irreversible harm if wrong) and Risk-Important Actions.

PART 3

HUMAN FACTORS
HUMAN PERFORMANCE

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Part 4: Model Limitations, Goal Conflicts & System Capacities

CORE FINDINGS & PRACTITIONER TAKEAWAYS

- Bow tie models, like any model, simplify dynamic sociotechnical work into static linear pathways - missing real-time operational variability and feedback loops.

E.g., **THE MODEL ISN'T THE WORK**

- Controls actively alter work systems: changing workload, communication, or introducing new vulnerabilities (alarm overload, visual blockages).
- Human flexibility isn't just an error source, rather human adjustments provide essential resilient capacities to manage unmodelled operational variability.
- Robust risk management requires balancing Prevention (the plan), Execution (real-time judgment), and Recovery (failing safely without worker harm).
- Falling minor injury rates can coexist with rising major accident potential. Frontline adaptations mask systemic flaws until latent failure combinations align – the **TRAGEDY OF ADAPTABILITY**

