

EON Live – The Situation Room

The moments that matter, on demand.

A product white paper on the mission library of EON Live — the flight simulator for industrial plants: a curated, cited catalog of the industry's critical moments, automatically matched to your facility and run on live physics.

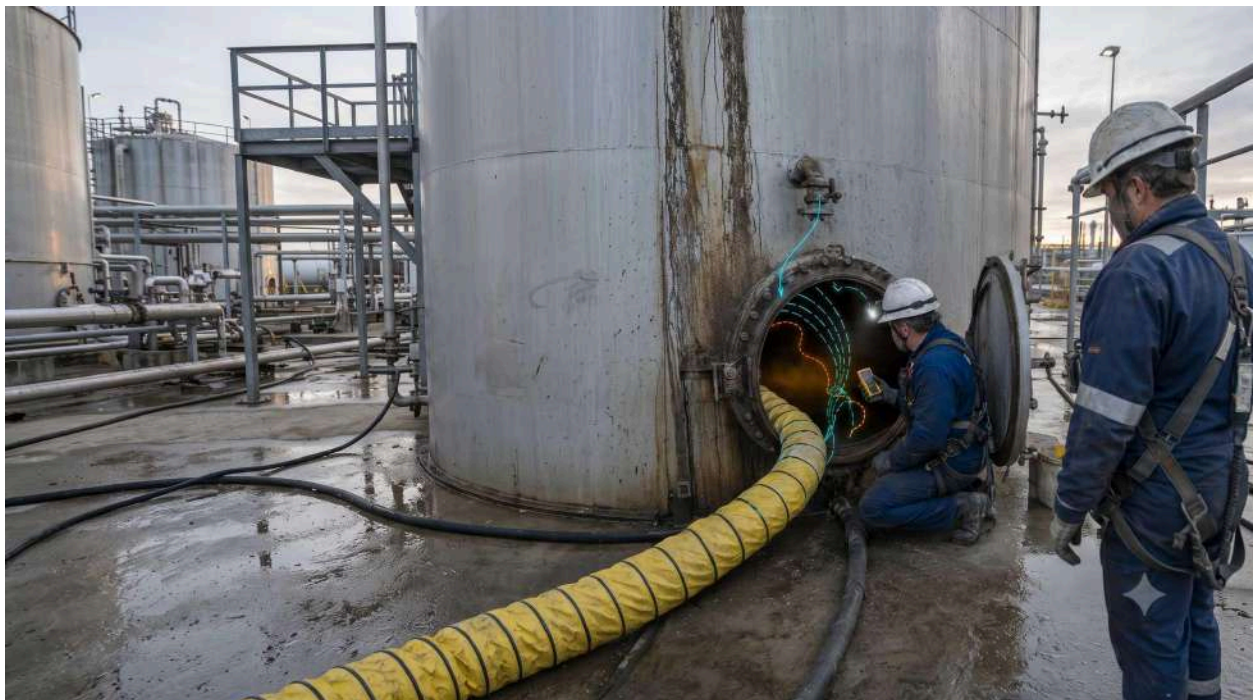


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Executive summary

The Situation Room is the mission library of EON Live — the flight simulator for industrial plants: 120 industrial situations across seven genres plus a flagship set, every one grounded in a real incident or a real standard — Piper Alpha (1988, 167 dead), BP Texas City (2005, 15 dead), Buncefield (2005), DuPont La Porte (2014), and the investigation record of the CSB, OSHA, API and IOGP. Each situation is a card: WHAT happens, WHY it matters, HOW to handle it, HOW OFTEN it occurs, what the CONSEQUENCES have been, and the cited statistics behind all of it. Sixty-six of the 120 carry real, cited frequency statistics; the rest are honestly marked “not quantified in public sources.”

The library is not courseware to be watched; it is a catalog to be run. EON Universal scans a customer’s facility model and automatically determines which titles fit that specific rig. One click dresses EON Live’s real-time physics twin with the situation’s starting state and injected faults, and the run unfolds unscripted — the consequences emerge from the physics, not from a branch someone authored. Physics doesn’t hallucinate. Difficulty is not new content but physics dials on the same card: Beginner turns guidance on; Expert adds cascading faults, a lying sensor, and tight time. One simulator, infinite variations.

The positioning is blunt: this is training on the moments that actually kill people and cost millions — the transients and isolation errors where incidents cluster and which conventional training almost never rehearses — with competence proved against a per-card rubric rather than asserted by a certificate.

1 The problem: training rehearses the routine; incidents happen at the edges

Industrial incidents do not distribute themselves evenly across the operating year. They cluster violently in transient operations — start-ups, shutdowns, and abnormal states. CCPS-cited analysis puts process safety incidents at roughly five times more frequent during start-up than normal operation, and industry studies attribute about half of process safety events to the less than ten per cent of hours spent in transient operations. The pattern repeats in the anchor cases: Texas City was a start-up. Piper Alpha began with a standby pump returned to service against a defeated isolation. Buncefield was a tank filling operation with a failed gauge. DuPont La Porte was a routine draining task into an unventilated building.

Yet the moments where incidents cluster are precisely the moments conventional training cannot rehearse. No operator practices overfilling a live column. No maintenance crew rehearses cracking a flange on a line that is still pressurised. The industry’s answer has been the slide deck and the incident-report reading — description, not experience. Workers learn that Texas City happened; they do not learn what the misleading level indication looked like from the board, or whether they, specifically, would have caught it.

There is a second, quieter failure: generic scenario content. Off-the-shelf simulator scenarios model someone else's plant. Custom scenarios built site by site cost consulting money and do not transfer. Either way, competence is asserted — a completion certificate — rather than proved against the worker's own equipment.

2 The idea: a curated, cited library of the industry's critical moments

The Situation Room treats the industry's incident record as a catalog to be staged, not a shelf of reports to be filed. It is the twin of the platform's Component Library: where the Component Library answers "what parts exist and what do they know?", the Situation Room answers "what stories can this rig play?" The result is 120 titles across seven genres plus a flagship set:

Genre	Titles	Anchor pattern
Safety, Isolation & Stored Energy (LOTO)	15	The line that was "empty" wasn't
Start-up, Shutdown & Transients	15	Texas City, cold restarts, first fills
Overpressure, Relief & Flare	15	Blocked outlets, isolated PSVs
Rotating Equipment	15	Seal blowouts, the Piper Alpha pump
Process Upsets & Abnormal Operations	15	Gas blowby, flooding, runaways
Loss of Containment — Leaks, Fire & Dispersion	15	Jet fires, VCEs, H ₂ S, BLEVE
Utilities & Support Systems	15	Instrument air, cooling water, blackout
Flagship set	15	The industry's canonical killers
Total	120	

Workers browse the Mission Library: one shelf per genre, poster art per title, a severity badge, and a fit badge showing whether the title runs on the facility currently loaded. A title is a story — one poster, one card — and difficulty lives inside the title as levels, not as separate content.

3 Inside a situation card

Every title is a self-describing card with the same six-field spine, written in plain language a worker can read in two minutes:

- **WHAT** — what physically happens, as a story — “Someone shut the valves between the vessel and its safety valve. Then the heat came on.”
- **WHY** — the human stakes, anchored to the incident record and the standard it violates.
- **HOW** — the handling doctrine, as numbered field steps — isolate, bleed, verify at a gauge, drain, then break containment.
- **HOW OFTEN** — real frequency data where it exists — for example, the National Safety Council’s 48 hazardous-energy-control deaths in 2023, or CSB’s 80 nitrogen-asphyxiation deaths across 1992–2002.
- **CONSEQUENCES** — what the class of event has actually done — Williams Geismar 2013: a reboiler valved off from its relief device, heated, ruptured; 2 killed, 167 injured.
- **STATS** — every number carried with its source and a confidence flag: verified primary, secondary estimate, or unverified.

Behind the readable card sits the runnable object: a trigger pattern describing what a facility must contain for the title to fit, a starting state and per-level injected faults, a pass/fail rubric, and a fidelity note declaring what the live engine computes versus what it stages. The research behind all 120 cards is complete; authoring is transcription, not invention.

4 Matched to your facility, not to a demo plant

The Situation Room never asks a customer to pretend their rig is someone else’s. EON Universal scans the loaded facility model — its component instances and its pipe-graph connections — against each card’s trigger pattern in two passes: a component check (does the rig contain the required equipment types?) and a topology check (do the required relationships hold — for example, a block valve on the path between a vessel and its relief valve?).

The verdict is always explained. A non-fitting title stays visible in the gallery, greyed, with the matcher’s plain-language reason on tap: “needs a storage tank ✗”, “has a pump ✓ but no auto-start logic ✗”. Never a silent grey-out. The gallery header keeps score for the loaded facility — “23 of 120 situations fit this rig” — which doubles as a quiet inventory of what the facility model does not yet describe.

5 Difficulty is physics, not content

Every title plays at three levels — Beginner, Operator, Expert — and all three run the same card, the same trigger pattern, and the same rubric. What changes are the physics dials:

Dial	Beginner	Operator	Expert
Guidance / hints	On	Off	Off
Fault structure	Single, clean fault	Single fault, subtle onset	Cascade — fault triggers fault
Sensor honesty	All honest	Honest	At least one lying or dead sensor
Time and margins	Generous	Realistic	Tight

This design has two consequences. First, content authored once serves the whole competence ramp — there is no separate “advanced library” to build and maintain. Second, Expert difficulty is honest difficulty: the situation gets harder the way reality gets harder, through cascading faults, instruments that lie (the Texas City level transmitter reading plausible-low inside its calibrated span), and time pressure — not through trick questions. A dedicated Career Path shelf sequences titles into a guided ramp, unlocking harder levels and heavier genres as verdicts come in.

6 One click, live physics

Pressing Run does not open a new application; it dresses EON Live’s existing Operate console. The card’s starting state is applied to the twin, the chosen level’s faults are armed, and a mission banner pins the title and logline at the top. On Beginner, the components named in the trigger pattern glow; on Operator and Expert, the worker must find them.

From that moment the run is unscripted. EON Live integrates pressure, flow, temperature and valve state every frame across the real connectivity graph, so the consequences emerge from the physics rather than from an authored branch. Fill the column with the bottom valve closed and the level genuinely rises; miss the divergence and the carryover genuinely follows. Because the physics generates each run, the same title never plays exactly the same way twice — one simulator yields effectively infinite variations of the same critical moment.

At the end, the rubric is evaluated against the actual state trajectory: pass or fail, with the specific rubric lines met and missed. “Verifies relief path open before heat admitted” is either true of the run or it is not. This is the difference between a quiz score and provable competence — the record shows not that a worker attended, but how they stabilised the situation.

7 The honesty doctrine

A safety product that exaggerates is a contradiction in terms, so the Situation Room carries an explicit honesty doctrine with three planks.

- **Cited facts.** Every statistic on every card carries its source — CSB, OSHA, NSC, BLS, CCPS, API, IOGP — and a confidence flag: verified primary, secondary estimate, or unverified. An OSHA modelling estimate is labelled as an estimate, not presented as a measured count.
- **Flagged unknowns.** Sixty-six of the 120 titles carry real, cited frequency statistics. The remaining titles say so plainly: “not quantified in public sources.” No number is invented to fill a box. In a market accustomed to unsourced safety content, the gap itself is information — and admitting it is what makes the 66 believable.
- **Tier-1 physics versus pre-set consequences.** The live engine is Tier-1 lumped-parameter physics: pressures, temperatures, levels, concentrations and valve states, computed in real time. That covers the decision-critical part of every card. Consequences beyond that tier — blast overpressure, outdoor dispersion, brittle fracture, arc blast — are staged as pre-set consequence states, triggered when the lumped model crosses the threshold. Every card declares which is which, and a staged consequence is never presented as computed physics. The training value lives in the decisions before the threshold; the honesty lives in saying so.

8 The business case

The economics rests on three legs.

The cost of the moments. The situations in this library are the ones that kill people and cost millions to billions: Texas City killed 15 and injured more than 170; Piper Alpha killed 167 and remains the costliest offshore loss in history; Buncefield destroyed a terminal. Even the routine end of the library is expensive — hazardous-energy failures alone killed 48 U.S. workers in 2023 (NSC), and lock-out/tag-out remains a perennial OSHA Top-10 citation. Rehearsal is the only intervention that acts before the event.

One library that compounds. Because titles match on typed components and topology rather than on a memorised plant, the same 120 cards serve every facility a customer loads — and every facility the platform ever loads. The alternative — scenario content engineered site by site — costs consulting money per site and transfers nothing. Here the marginal cost of the 121st facility is zero authoring.

Provable competence. Rubric verdicts on real state trajectories give training, HSE and compliance functions something a completion certificate cannot: evidence of how each worker handled the specific failure modes their own facility can produce, at a stated

difficulty, on a stated date. That is a defensible answer to the question every operator faces after an incident — “how do you know your people were competent?”

The library also opens doors beyond the training centre: the same cards run as pre-job rehearsal in the field (the flagship set already spans train, field and operate modes), and the fit-count gives engineering a live measure of model completeness.

9 Roadmap

The build proceeds in the order the dependencies dictate. The research is complete: 120 titles across seven genre files plus the flagship report, cited and confidence-flagged. From there:

- 1. — Card authoring — transcribing each researched title into the structured card object (the authoring is transcription plus structuring; the research is done).
- 2. — Posters — batch-generated art per title, joined to cards by ID; no text baked into images, all labels live UI.
- 3. — Matcher — the trigger-pattern scan over the facility model, with plain-language verdicts.
- 4. — Gallery — the Mission Library browse, the scenario page with its facts box and difficulty selector, and Run wired to the Operate console.

Version 1 keeps difficulty as a pre-run choice and cards as hand-authored objects.

Deliberately deferred: dynamic auto-difficulty (the engine adjusting dials mid-run based on performance), a scenario-authoring UI, and multiplayer roles. The Career Path ramp ships in v1 as a simple linear unlock.