

The Aerospace MRO Situation Room

Training a green workforce on the maintenance errors that brought aircraft down
— safely, and unforgettably



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Executive summary

Aviation maintenance is losing its judgment to retirement faster than it can rebuild it, in a domain where being wrong is an airworthiness event, not an inconvenience. Regulators require recurrent human-factors training against maintenance error; the training that exists is forgettable. **The MRO Situation Room** replaces the forgettable slide deck with a cinematic, rigorously-sourced catalog of the real accidents that maintenance errors caused — and wires each one into EON's composable Aviation Living Library so a story becomes a component, a 3D twin becomes a live, playable procedure. This paper sets out the problem, the design, and the evidence behind a pilot library of 31 fully-cited cases.

1. The problem: a competence crisis with a delayed fuse

Three forces meet on the hangar floor.

The workforce is turning over. Airbus and Boeing long-range forecasts put global demand at more than 600,000 new aircraft-maintenance technicians over the next two decades, the majority replacing a retiring generation. The traditional certification path takes five to six years. You cannot close a demographic gap with a training model that slow.

The judgment walks out the door. Every experienced engineer who retires takes decades of tacit "why" with them. Their green replacements arrive into a domain where a single undocumented deviation can bring an aircraft down years later.

The error is time-displaced. This is the defining, treacherous property of maintenance error: the mistake and its consequence are separated in time. A shift manager fits the wrong windscreen bolts by eye at 3 a.m.; the windscreen departs 27 hours later at 17,300 feet. A repair crew mis-splices a bulkhead; it fails seven years and 12,318 flights later, killing 520 people. Because the technician never witnesses the consequence, the feedback loop that builds judgment is broken. The only way to close it is to let them learn from someone else's accident.

Regulators know this: EASA Part-145.A.30(e) and the FAA mandate recurrent human-factors training. Maintenance error is a contributing factor in roughly one in eight major accidents and a leading cause of in-flight engine shutdowns. The obligation is universal; the delivery is weak. That gap is the market.

2. The design: three principles that make it stick

2.1 Grounded in the official report

Every case in the Situation Room is sourced to its official investigation — NTSB, AAIB, JTSC, BEA, and equivalents. Every statistic carries its citation and a confidence flag; where a

number is not quantified in public sources, the card says so rather than inventing one. Carriers are named exactly as their reports name them. In the pilot corpus, **93 cited statistics are verified against the primary report text — zero are unsourced.** This honesty is not decoration; it is the product's credibility, and it is enforced by the compiler that builds the catalog: a card that carries an uncited number, an impossible date, or a broken source link cannot ship.

2.2 The two-date signature

Each card carries two dates — **error committed** and **the accident** — and the interval between them, computed and displayed: "27 HOURS," "7 YEARS," "SAME SHIFT." This is the single design decision that turns a database into a teaching instrument. It makes the delayed fuse visible, it dramatizes the stakes, and it delivers the core lesson without a word of lecture: you will not see the result of your error, so you must respect the procedure now.

2.3 The library spine

Where a component is at fault, the card links into EON's **Aviation Living Library** — 50 equipment classes across 12 system families, ~350 subcomponents, organized on ATA iSpec 2200, aviation's own maintenance-manual numbering standard. This is what no catalog can match: the Alaska 261 jackscrew case opens onto the Horizontal Stabilizer Trim Actuator class sheet, whose cutaway shows the very ballscrew, backup nut, and no-back brake the accident turned on. A story becomes a component becomes a twin. Cases that are structural rather than component-based (a fuselage lap joint, an aft bulkhead, a windscreen frame) carry a structure reference instead; procedural cases (tools left behind, a skipped duplicate inspection) carry the human-factor tags.

2.4 The taxonomy the industry already speaks

The catalog is organized on the shelves a maintenance organization thinks in — Powerplant & APU; Landing Gear, Wheels & Hydraulics; Flight Controls & Rigging; Fuel, Pneumatics & Ice; Electrical, Avionics & Air Data; Pressurization, Cabin & Oxygen; Structures & Fatigue; Tools, FOD & Sign-off — plus a Flagship row of the industry-defining disasters and a Satellite AIT extension. Cross-cutting every card are the twelve **Dirty Dozen** human-factor tags (Gordon Dupont / Transport Canada, 1993), the language regulators and trainers already use. Workers navigate by system; instructors filter by human factor; the same card serves both.

3. The method: a layer in the Work Intelligence flywheel

The Situation Room is not a point solution. It is one layer of the EON Work Intelligence stack, and its power comes from the others:

- **Genesis** shows known procedures, four ways.
- **EON Universal** builds the smart twin and *understands* the work — it reasons about faults and runs conditional procedures a scripted trainer cannot.

- **EON Live** makes pressure, flow, torque and heat behave as live state, so failures propagate realistically.
- **The Situation Room** carries the tacit "what to do when it goes wrong" that retiring experts hold — enacted against real geometry.
- **Field IQ** takes all of it onto the real aircraft: recognize the unit on sight, overlay the intelligence, guide the worker, and capture what actually happened.

Because EON models components rather than aircraft types — **composition, not enumeration** — one engine spans general aviation, commercial MRO, and satellite assembly. That is why the first playable mission is already designed: the landing-gear hydraulic **stored-energy** procedure, a conditional SOP that branches on "is stored pressure still present?" — a question only a system that understands the equipment can ask. The Situation Room card is its front door; the EON Live engine makes it playable.

4. Evidence: the pilot corpus

The pilot library is complete: **31 cases, every fact verified against the official report**. It spans the canon the industry learned from in blood — Japan Air Lines 123, American 191, Alaska 261, British Airways 5390, Aloha 243, Helios 522, ValuJet 592, Aeroperú 603, Continental Express 2574, Concorde 4590 — alongside the recurring-error patterns that keep happening (wrong parts, unlatched cowl, tools left in, gear pins not removed, duplicate inspections signed without a second look). The cited tolls of the pilot cases total more than 2,200 lives. Six cases are near-miss "saves," included deliberately: aviation's safety culture is built on the free lesson, and the saves teach as hard as the losses without a single gratuitous image.

Scope is disciplined by a single law: **maintenance, repair, and ground-servicing causes only**. No pilot-error accidents; no design or certification failures. The product assumes the aircraft was manufactured correctly and teaches the people who maintain it.

The corpus is designed to grow — 31 today, toward 60 and then to full parity — on the same criteria: a maintenance causal chain, an official report or a cited frequency basis, a shelf, and the honesty lint. Every artifact (posters, video reels, the review deck, the website data) is generated from one source of truth, so the catalog cannot drift out of sync with itself.

5. Positioning and honesty

The MRO Situation Room is a rigorous, cited human-factors resource. It is **not a certified training device**, and EON makes no regulatory training-credit claims pending a certification partnership. Generated imagery carries no airline livery, logos, or registrations,

and never depicts victims — the hardware and its aftermath carry the story. These are not constraints on the product; they are the reasons a serious aviation buyer can trust it.

6. The offer

For an airline's engineering and maintenance organization, an independent MRO, a Part-147/145 school, or a national aerospace center, the Situation Room is the un-boring version of a compliance line item they already pay for — and the visible front end of a composable intelligence platform that carries a worker's competence from the classroom to the flight line to orbit. It convinces a boardroom in one sitting and trains a cohort at scale, on content that is true, cited, and owned.

Learn from every accident — before it happens to you.

EON AI Ventures. Work Intelligence for the industries that cannot afford to be wrong. *All accident facts in this paper are drawn from public official investigation reports; industry workforce and error figures are attributed to Airbus, Boeing, Oliver Wyman, and regulator publications. The Dirty Dozen framework is attributed to Gordon Dupont / Transport Canada (1993).*