MAD-Ai

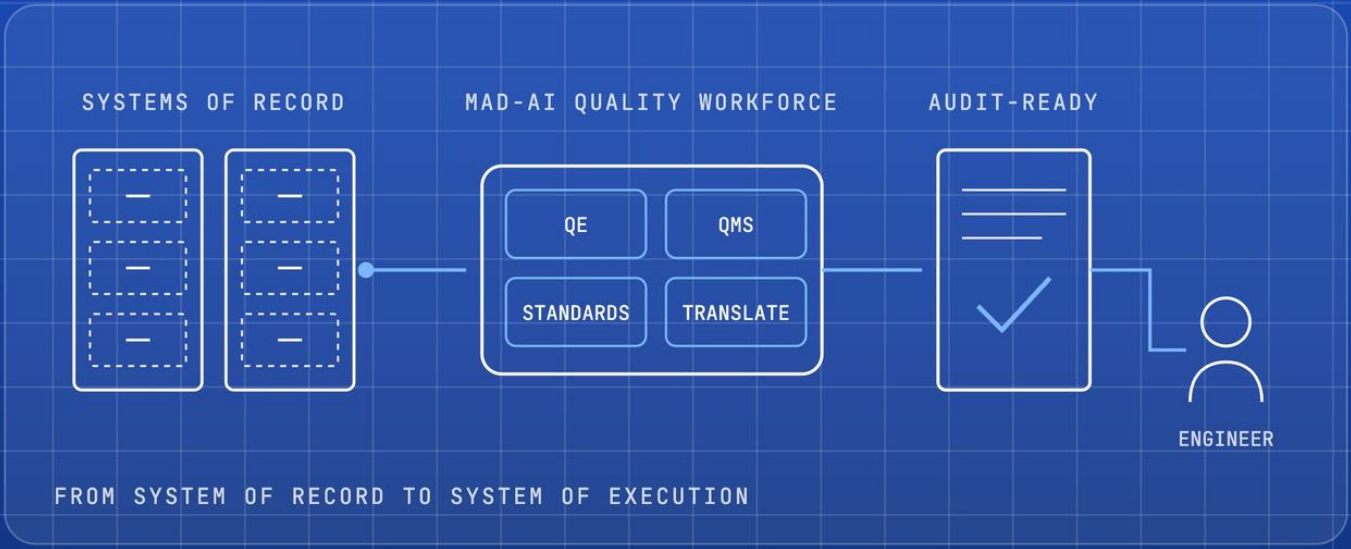
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WHITE PAPER · 2026

WHITE PAPER · AEROSPACE & DEFENSE

MAD-Ai in Aerospace & Defense.

A purpose-built AI workforce for aerospace and defense quality operations, closing the execution gap in AS9100, AS13100 and defense programs.



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STANDARDS
AS9100 · AS13100 · MIL-STD-1629A

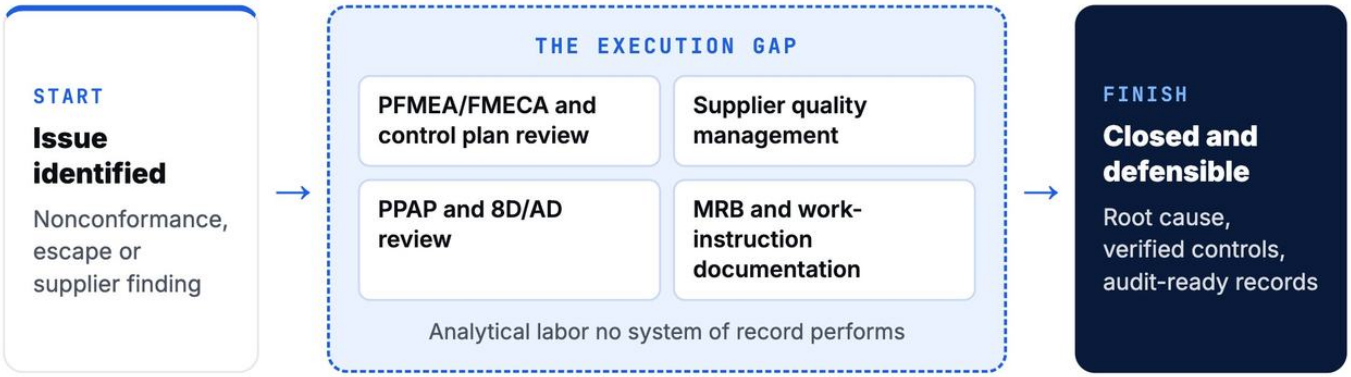
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EXECUTIVE SUMMARY

Storage is not completion. Execution is the gap that matters.

Aerospace and defense quality organizations have spent a decade investing in systems of record: QMS platforms, PLM, supplier portals and ERP modules that trace every nonconformance and change back to a drawing revision. They store and trace with rare rigor. What they do not do is complete the work.

Between the moment an issue is found and the moment it closes, with a defensible root cause, verified controls and documentation that will survive a customer or DCMA review, sits a volume of analytical labor no system of record performs. Quality leaders are drowning in MRB, nonconformance workflows and portal admin, with less time for floor-level problem solving. That execution gap concentrates in a few high-volume, high-risk workflows: PFMEA/FMECA and control plan review, supplier quality management, PPAP and 8D/AD review, and MRB and work-instruction documentation.



MAD-Ai's Manufacturing Quality Super-Intelligence System (MQSIS) is a purpose-built, agentic AI platform that deploys a specialized AI workforce on top of existing systems, available 24/7. It works within AS9100 and AS13100 environments, extends to MIL-STD-1629A defense programs, and is built for sensitive and military data.

10–15×
average speed improvement across 100+ quality workflows

100+
pre-built workflows from APQP through corrective action closure

$3–7
returned for every $1 spent, driven by consistency as much as speed

Figures from MAD-Ai testing trials and customer deployments. Results vary.

THIS WHITE PAPER COVERS

What you will find inside.

01 The execution gap pushing A&D quality organizations toward AI, and why generic chatbots fall short.

02 How MAD-Ai works: a specialized AI workforce that executes structured quality workflows, not a chatbot.

03 Key use cases: MRB burden reduction, PFMEA/FMECA and control plan crosswalk, supplier quality at scale, PPAP and 8D/AD automation, and video to work instruction.

04 Proof points and ROI across the Quality Suite.

05 Security and compliance for sensitive and military data.

06 A practical path to adoption for aerospace and defense manufacturers.

SECTION 1 · THE PROBLEM

1.1 Storage is not completion.

A QMS can hold a nonconformance record with full traceability to the lot, the drawing revision and every prior occurrence. It cannot write the root cause narrative, check whether the PFMEA and control plan agree on the controls in place, or judge whether an 8D's containment will hold up under customer review. That still depends on a person, usually one of a few experienced engineers, turning stored data into a finished, defensible output.

In aerospace and defense that translation work is heavier than most industries. Programs carry configuration control requirements that automotive does not, and AS9100-driven audits expect the output to demonstrate control, not just describe an event.

SECTION 1 · THE PROBLEM

1.2 Rising complexity, static headcount.

A&D suppliers face several pressures at once:

- **Product complexity:** tight tolerances and complex geometries demand more rigorous planning and control.
- **Regulatory overhead:** AS9100, AS13100 and MIL-STD-1629A add documentation, traceability and structured problem solving.
- **Customer variation:** each OEM or Tier 1 has its own PPAP, 8D, portal and scoring nuances.
- **Talent constraints:** senior quality engineers are scarce, yet much of their time goes to MRB, portal admin and form-filling.

FIELD OBSERVATION

At a Tier 1 manufacturer operating across North America and Europe, quality teams were running with significantly fewer people and departures going un-backfilled, before the full automation layer was in place.

→ **The execution gap does not shrink when headcount does. It widens.**

1.3 When "AI" becomes a risk, not a solution.

Incidents of confidential or military data exposed through general-purpose AI platforms have made A&D companies cautious. The concerns are real: proprietary prints and military drawings leaking into public models, customer-specific processes training a model others can use, and gaps against SOC 2, GDPR, cyber and export-control requirements. Quality leaders are often told to go slow or avoid AI entirely, unless it is demonstrably built for secure, compliant use.

SECTION 1 · THE PROBLEM

1.4 From system of record to system of execution.

Today, execution depends on each engineer's availability, program knowledge and writing ability, so quality and turnaround vary by who is assigned rather than what the situation needs. Closing the gap means turning system-of-record inputs directly into structured, audit-ready outputs, so work keeps moving instead of queuing behind whoever is free.

HOW WORK MOVES WITH AN AI WORKFORCE



→ **The engineer still reviews, still decides and still owns the final call. What changes is how much manual assembly sits between the data and that decision.**

SECTION 2 · THE PLATFORM

2.1 An AI workforce built for complex quality operations.

Most AI demos still look like better search or chat. MAD-Ai's specialized AI workforce instead executes structured quality workflows, applying defined standards and preparing outputs for review, while engineers keep technical decisions, approvals and final disposition. Its specialized capabilities:

01

Quality Engineer

Understands manufacturing processes, risks and root cause logic.

02

QMS Specialist

Interprets your QMS, work instructions and procedures.

03

Standards Interpreter

Aligns work with AS9100, AS13100 and customer expectations, including AS13100-style PFMEA/DFMEA or MIL-STD-1629A FMECA.

04

Translation Agent

Translates work instructions and documents while keeping structure and formatting.

SECTION 2 · THE PLATFORM

Rigor in the workflow, not in the prompt.

This AI workforce sits above your existing QMS, ERP, MES, PLM and customer portals and works alongside your engineers. Nothing gets ripped out. It works from the data and documents you already create.

THE DIFFERENCE

A general AI chatbot is a user-amplification system: only as rigorous as the person prompting it. MAD-Ai runs controlled AI workflow execution, with structured inputs, required evidence fields and embedded rules for each format.

2.2 Purpose-built for manufacturing quality.

MAD-Ai is configured on real industry logic and deep operating experience. More than 100 quality workflows are engineered into the platform, including:

- PFMEA/FMECA analysis and control plan crosswalk
- PPAP package evaluation and grading
- 8D/AD analysis for completeness and rigor
- Nonconformance and MRB support
- Work instruction generation and standardization
- Supplier quality and scorecard automation

KEY TAKEAWAY

It doesn't just summarize documents. It executes structured workflows, applies standards, generates findings and produces reports quality teams can use right away.

SECTION 2 · THE PLATFORM

2.3 The digital thread in practice.

At a high level, MAD-Ai works as an intelligent digital thread that automates the intake, analysis and routing of manufacturing anomalies.

01 INTAKE

Structural defect ingestion

Shop-floor nonconformance data, operator notes and inspection findings enter the platform as soon as they are logged.

02 CONTEXT

Concurrent data-lake querying

Relevant historical corrective actions (8Ds), PLM drawing revisions and program requirements are pulled in parallel.

03 TRIAGE

Language parsing and semantic triage

Unstructured floor notes are parsed to isolate the affected feature, damage severity and process step, then routed toward standard rework, scrap or formal MRB escalation.

04 GOVERNANCE

Engineering governance and escalation checks

The anomaly is checked against technical specifications, AS13100 and MIL-STD benchmarks and internal QMS boundaries. Any conflict escalates straight to a senior engineer.

05 OUTPUT

Automated report generation

The full analysis is compiled into a structured engineering review report with direct traceability and data citations.

SECTION 3 · USE CASES

Key use cases for A&D quality teams.

01

MRB BURDEN REDUCTION

Freeing quality engineers for floor-level problem solving

MAD-Ai ingests MRB documentation, fills and structures the fields, flags gaps and drafts the narratives for engineer review. QEs move from data gatherers to reviewers and decision-makers.

02

PFMEA / FMECA CROSSWALK

Control plan alignment for AS13100 and defense programs

Whether a program uses AS13100 PFMEA/DFMEA (per AESQ RM13004) or MIL-STD-1629A FMECA with criticality ranking, MAD-Ai normalizes the data, flags inconsistent rankings and runs the crosswalk to the control plan with prioritized fixes.

03

SUPPLIER QUALITY AT SCALE

One standard across the whole supplier portfolio

Supplier 8Ds and CAR/SCAR responses are graded against one rubric, with support for the follow-up conversation, so every Tier 2 and Tier 3 supplier gets the same review, not just the known problem ones.

04

PPAP AND 8D/AD AUTOMATION

Faster, more consistent submission review

Real-world formats go in (Word, PDF, Excel, images, portal exports). MAD-Ai grades all 18 PPAP elements with a pass/fail summary and checks 8D/AD containment and root cause before submission.

05

VIDEO TO WORK INSTRUCTION

Capturing operator know-how on mobile devices

A simple video of an operation becomes step-by-step visual work instructions with annotated frames, editable text and PDF export, so onboarding is faster and updates are easier.

KEY TAKEAWAY

Every use case ends the same way: the engineer reviews, decides and signs off. MAD-Ai removes the assembly work in between.

SECTION 4 · PROOF POINTS

Results across the Quality Suite.

Across more than 100 pre-built workflows, results vary by category but follow a consistent pattern:

METRIC	WHAT IT COVERS
10–15×	Average efficiency gain across the Quality Suite's 100+ workflows
15×	Problem-solving and root cause workflows: 8D creation and grading, 5-Why
32×	Risk analysis and failure review: PFMEA/FMECA, control plan crosswalk, reverse PFMEA
29×	Supplier quality management: CAR/SCAR review, scorecard analysis, follow-up
$3–7	Return for every $1 spent, driven by consistency as much as raw speed

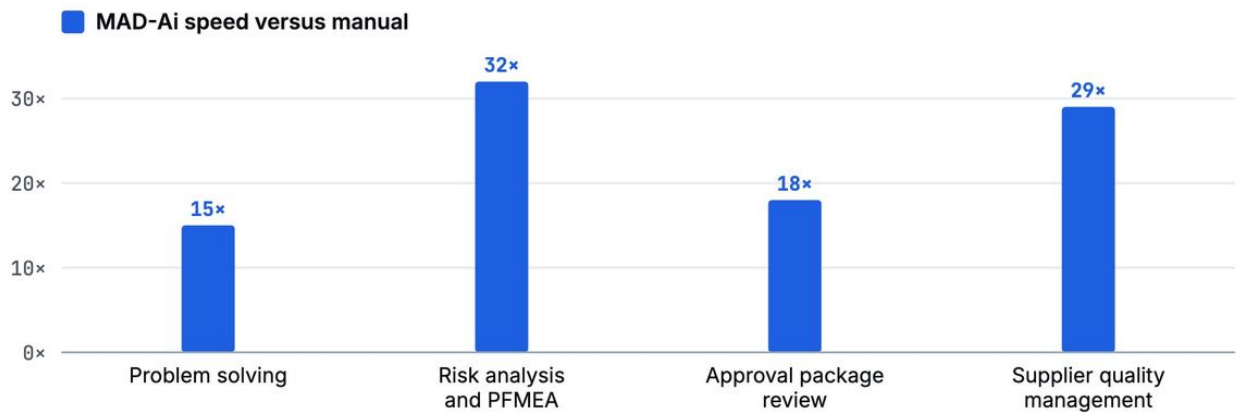


Figure 1. Speed by workflow category. Metrics reflect the compressed time for automated data aggregation, normalization and risk cross-referencing before final human review and disposition. Baselines come from manual engineering hours on equivalent workflows.

SECTION 5 · SECURITY & COMPLIANCE

Security and compliance for sensitive and military data.

For aerospace and defense, no AI conversation is complete without a rigorous look at security. MAD-Ai runs on AWS-hosted infrastructure with zero-trust architecture and enterprise data isolation, and has worked through security reviews with aerospace and defense suppliers. Your drawings, PFMEAs, FMECAs and production data stay yours.

5.1 Core security posture.

SOC 2 TYPE II

Audited controls

Security, availability and confidentiality controls are audited and operating effectively over time.

GDPR

Data protection

Supports data protection expectations for organizations with European operations or customers.

NO PUBLIC TRAINING

Your data stays yours

Customer data is never used to train public or shared models.

DATA MINIMIZATION

Kept only as needed

Sensitive data is not stored beyond what configured workflows and retention policies require. Customers can request deletion per policy.

5.2 Fit for military and export-controlled environments.

Any AI solution for A&D must keep export-controlled, proprietary and military data out of public model endpoints, document its infrastructure, data flows and retention, and stand up to review by CISOs, IT security and, where applicable, government stakeholders. For defense, ITAR and export-controlled work, MAD-Ai offers dedicated deployment architectures aligned with NIST SP 800-171 and CMMC 2.0 (Level 2+), including isolated single-tenant enclaves in AWS GovCloud where contracts require it. Detailed security documentation is available to your IT and security teams during evaluation.

SECTION 6 · ADOPTION & CONCLUSION

An adoption path, and what it means for A&D quality.

THE ADOPTION PATH

01 STEP 01

Start with a targeted pilot

Pick visible pain with measurable value: a PFMEA/FMECA crosswalk on an AS13100-critical or defense program, PPAP grading for one family, or 8D/AD review on recurring nonconformances. Measure the work completed on a few real documents under NDA.

02 STEP 02

Engage IT and security early

Bring IT and security in from day one with a security brief (SOC 2 Type II, GDPR, architecture), a clear data flow and retention description, and how customer data is never used to train public models.

03 STEP 03

Scale across programs and sites

Expand from PFMEA/FMECA into PPAP, 8D and supplier quality, then across programs and sites with consistent workflows and scorecards. User and site licensing let you start small and grow with ROI.

Aerospace and defense manufacturers face a dual mandate: keep rigorous quality and compliance under AS9100, AS13100 and MIL-STD-1629A while moving faster with limited expert headcount. Traditional tooling and generic chatbots are not enough.

THE THESIS

Reliability under real workflow conditions is the procurement question for manufacturing AI. Execution, not insight, is the differentiator.

- Frees quality engineers from MRB and paperwork for floor-level problem solving.
- Raises the rigor and speed of PFMEA/FMECA, control plans, PPAP, 8D/AD and supplier follow-up.
- Works with existing systems, with no rip-and-replace, and meets security needs for sensitive and military data.

Standards cited: SAE AS9100 · AESQ AS13100 · AESQ RM13004 (FMEA and Control Plans Reference Manual) · U.S. DoD MIL-STD-1629A (canceled 1998; still referenced for military and space programs).

ABOUT THE AUTHOR

About the author and founder.



Rick Heilshorn

FOUNDER & CEO · MBA · MSENG · LSS MASTER BLACK BELT

Rick earned his Lean Six Sigma Master Black Belt at Honda, where he led quality initiatives across North America. After decades of manufacturing turnarounds and quality leadership, he built the methodology and domain expertise that became the foundation for MAD-Ai.

→ **His mission: bridge the gap between human expertise and the AI revolution. Not to replace skilled quality professionals, but to give them superpowers.**

This white paper reflects MAD-Ai's applied experience helping aerospace and defense suppliers close PFMEA, PPAP and 8D/AD gaps before they reach a customer portal or DCMA review.

CREDENTIALS

- **MBA and Master of Science, Engineering**
- **Lean Six Sigma Master Black Belt, earned at Honda**
- **Led quality initiatives across North America**
- **Specialist in manufacturing turnarounds**
- **Tier 1 automotive supplier leadership**
- **AIAG Quality Summit speaker**

ABOUT MAD-AI

MAD-Ai, LLC, based in Madison, Mississippi, delivers a purpose-built, agentic AI platform for manufacturing quality. Its Manufacturing Quality Super-Intelligence System (MQSIS) deploys a specialized AI workforce that executes structured workflows across 8D, PFMEA, PPAP, corrective action and supplier quality, helping teams work faster, reduce variation, retain institutional knowledge and scale without proportionally adding headcount. MAD-Ai supports automotive, aerospace, defense and advanced manufacturing organizations.

SEE WHAT MAD-AI CAN DO FOR YOUR QUALITY TEAM

Your best engineers shouldn't be buried in paperwork.

MAD-Ai's AI workforce fills fields, flags gaps and drafts AS9100-driven documentation for engineer review. Your engineers keep every approval and disposition, and get back to problem solving.

01 / DISCOVER

Talk to an Expert

Discuss your quality challenges, engineering workload, and opportunities to improve efficiency.

02 / DEMONSTRATE

See MAD-Ai in Action

See how MAD-Ai supports real manufacturing quality workflows, including 8D, PFMEA, and PPAP.

03 / VALIDATE

Start a Pilot

Evaluate MAD-Ai using your own quality workflows and measure the impact on engineering time.

LET'S TALK ABOUT YOUR QUALITY OPERATION

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