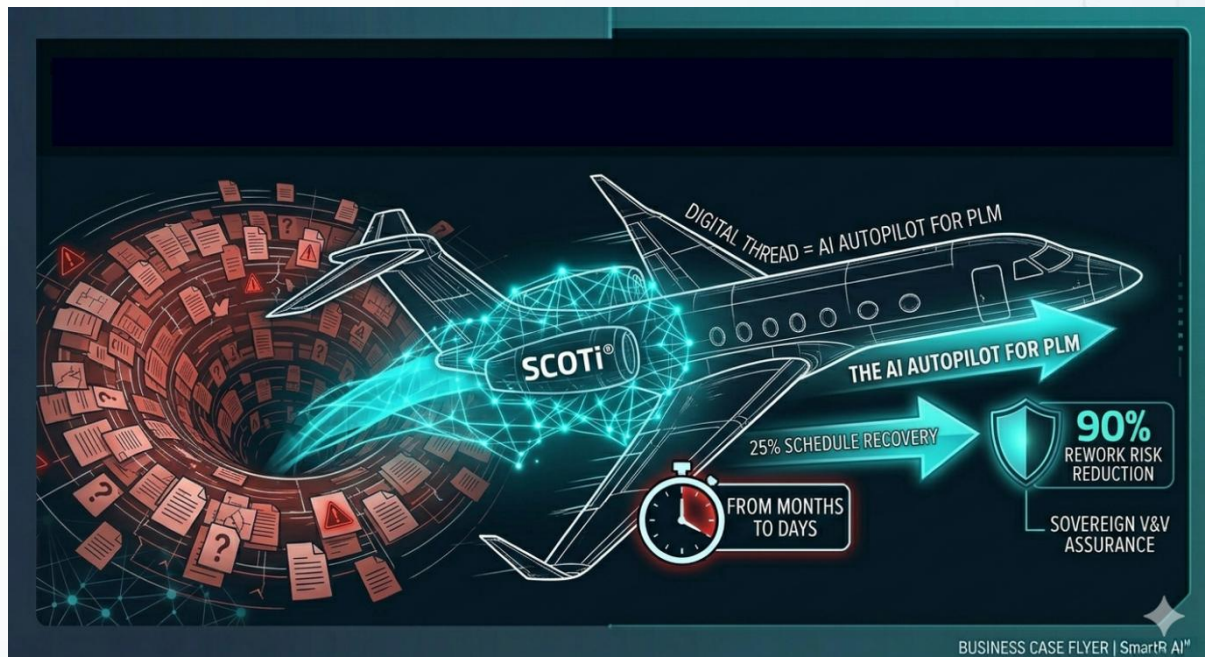


Business Use Case



The AI Autopilot for PLM

How SCOTi Master Builder with V&V Slashes Development Time by 25% and Cuts Rework Risk by 90%

Executive Summary: The \$100B Complexity Gap

Aerospace and Defense (A&D) engineering is paralyzed by its own legacy. Companies spend 30-40% of engineering time managing requirements, validation, and verification—not innovating. This “complexity gap” costs the industry over \$100B annually in delays, rework, and missed opportunities. The root cause isn’t a lack of expertise, but “Organizational Amnesia”—decades of tribal knowledge trapped in siloed systems, retiring experts, and disconnected workflows.

Traditional Product Lifecycle Management (PLM) tools organize the chaos but cannot solve it. Teams push through suboptimal requirements because reworking 1,000+ specifications takes months. This leads to a devastating chain reaction: poor requirements obscure the Means of Compliance, validation becomes a struggle, and problems discovered late in the process trigger catastrophic cost overruns. Industry data shows 40-50% of requirements change after Critical Design Review—the most expensive possible time to make changes.

SCOTi® Master Builder, augmented by its integrated Verification & Validation (V&V) package, eliminates this paradigm. It acts as an AI Autopilot for PLM, transforming requirement management from a manual, error-prone burden into an automated, strategic advantage. By enabling “right-to-left” design, automating traceability, and generating



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compliant V&V artifacts, SCOTi has demonstrated the ability to reduce development timelines by 25% and cut rework risk by 90%. At one client, it compressed a 6-month requirements process into 3 days.

This use case details how SCOTi Master Builder with V&V closes the loop from initial concept to certified compliance, turning your organization's deepest institutional knowledge into its most powerful competitive weapon.

The Critical Pain Points: Why Current Systems Fail

1.1 The “Okay-Enough” Requirement Trap

Human nature prioritizes completion over perfection. Under deadline pressure, teams finalize “okay-enough” requirements. These ambiguously phrased, incomplete, or untestable specifications become toxic assets, making downstream verification and validation (V&V) exponentially harder and more expensive.

1.2 The Architectural Straitjacket

Poorly architected requirements force engineering teams into a design straitjacket, misaligned with optimal implementation paths. Changing the 3-tier requirement hierarchy (System, HLR, LLR) at this stage is prohibitively expensive, leading to implementation delays and compromised product architectures.

1.3 The Fear of the Drawing Board

With thousands of interdependent requirements, the cost of a fundamental redesign is untenable. Teams are forced to “push through” with flawed foundations, increasing both development and lifecycle support costs.

1.4 The Late-Stage Compliance Catastrophe

Discovering a missed regulatory standard or a critical flawed requirement during final integration or certification is a program manager's worst nightmare, often requiring a multi-million-dollar, schedule-breaking rework.

The Bottom Line: The current process doesn't manage risk; it defers and amplifies it. The later a problem is found, the more it costs.

$$\text{Cost of Fix} \propto e^{(\text{Stage of Discovery})}$$

The SCOTi Solution: Master Builder with Integrated V&V

SCOTi Master Builder is not a document generator; it is an AI-powered engineering co-pilot that automates and enhances the entire requirements lifecycle, with integrated V&V ensuring every requirement is born compliant and testable.

Core Innovation: The “Right-to-Left” Methodology

Instead of building bottom-up, teams start with the **end goal** (e.g., “a missile system with a 99.99% reliability rate in specific environmental conditions”). SCOTi helps stakeholders work backward:

1. **Define Success:** Articulate operational objectives and key performance parameters.



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2. **Derive System Requirements:** SCOTi uses its enterprise knowledge base to propose a comprehensive, compliant set of System-Level Requirements supporting the goal.
3. **Intelligent Flowdown:** AI automatically decomposes System Requirements into logically consistent High-Level (HLR) and Low-Level (LLR) Requirements.
4. **Instant Iteration:** If implementation challenges arise, “what-if” scenarios can be run in **minutes, not months**. The entire requirement set can be regenerated and re-analyzed, enabling optimal design lock-in early.

2.1 Phase 1: AI-Driven Requirements Synthesis & Perfection

- **Knowledge Integrator:** Ingests all historical project data (requirements, test cases, lessons learned) from siloed systems (DOORS, Jama, Aras, SAP) to build a living enterprise knowledge base.
- **Intelligent Authoring & Critique:** Proposes requirement baselines and actively critiques drafts against industry best practices (e.g., INCOSE), flagging ambiguity, gaps, and weak phrasing while suggesting improvements.
- **Real-Time Coverage & Traceability:** Continuously validates that all parent requirements are fully addressed by children, auto-generating traceability matrices and highlighting gaps for immediate correction.

2.2 Phase 2: Automated Verification & Validation Planning

This is where SCOTi transforms requirement management into assurance.

- **Means of Compliance (MoC) Engine:** For each requirement, SCOTi recommends the appropriate MoC (Analysis, Inspection, Demonstration, Test) based on historical data and regulatory context.
- **Draft Validation & Test Plans:** Automatically generates structured validation plans and draft test procedures directly linked to the requirement hierarchy.
- **Safety Assessment Drafting:** Leverages knowledge to draft initial System Safety Assessments (SSA) and Functional Hazard Assessments (FHA), flagging areas for expert review.

2.3 Phase 3: Lifecycle Execution & Evidence Hunting

- **Project Intelligence Dashboard:** Monitors implementation progress against requirements by linking to development tools (Git, JIRA), providing real-time visibility into which LLRs are coded, tested, or delayed.
- **Automated Evidence Correlation:** As test results and compliance documents (CoCs, reports) are generated, SCOTi's **Discrepancy AI** hunts and matches them to the corresponding requirements and MoCs.
- **Gap & Shortfall Identification:** Proactively identifies validation gaps, incomplete tests, or failed compliance, recommending precise corrective action plans.
- **Certificate of Compliance Generation:** Compiles all evidence to auto-generate draft certification packages, dramatically accelerating final sign-off.



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The Power Use Case: From RFQ to Certified Bid in 1/2 a Day

Scenario: An aerospace prime contractor receives a complex, 500-page Request for Proposal (RFP) for a new UAV system. The bid response is due in 30 days.

Traditional 4-Week Process (High-Risk)

- Week 1-2:** A tiger team of senior engineers manually parses the RFP, highlighting requirements.
- Week 2-3:** They brainstorm a high-level architecture and begin manually drafting a compliance matrix and System Requirements in Word/Excel.
- Week 3-4:** Panic sets in. Gaps are discovered. The flowdown to HLRs is rushed. The verification approach is vague. The bid is submitted with inherent risks, unknown unknowns, and potential multi-million dollar estimating errors.

SCOTi Master Builder Process (Confident & Data-Driven)

- Hour 1: Data Hoover** ingests the RFP PDF. **SchemaSense** connects to internal PLM/ERP.
- Hour 2-3: Master Builder** analyzes the RFP against the enterprise knowledge base (past UAV projects, standards libraries). It generates a **complete draft set of System Requirements**, a detailed compliance matrix, and identifies:
 - “**Known-Knowns**”: Requirements perfectly aligned with past projects.
 - “**Known-Unknowns**”: New, high-risk requirements needing R&D.
 - “**Unknown-Unknowns**”: Critical standards or implications the customer may have omitted, with recommendations.
- Hour 4:** AI flows down requirements, drafts initial V&V plans and MoCs, and creates a preliminary risk register.
- Hour 4-8 (Interactive):** The engineering team reviews, refines, and iterates. SCOTi incorporates feedback in real-time, ensuring consistency.

Outcome: In **less than half a day**, the team has a comprehensive, traceable, and testable technical baseline. The bid is **more accurate, less risky, and demonstrates profound competence** to the customer, potentially including value-added insights on their own RFP.

Quantifiable Benefits & ROI

Metric	Before SCOTi	With SCOTi Master Builder & V&V	Impact
Requirements Development Time	6+ Months	3 Days (Documented Case)	~98% Reduction
Post-CDR Requirement Changes	Industry Avg: 40-50%	Target: <10%	~80% Reduction in Late Churn
Overall Project Timeline	Baseline	Accelerated by 25%	Earlier Market Entry / Revenue
Risk of Major Rework	High (Program-Defining)	Reduced by 90%	Predictable Cost & Schedule



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Metric	Before SCOTi	With SCOTi Master Builder & V&V	Impact
Bid Preparation Time	4-6 Weeks	<1 Week	>80% Faster Response
Engineering Efficiency	30-40% on Admin	Focus on Innovation & Problem-Solving	Higher Value Work

Financial Impact: The savings compound across the lifecycle—from more accurate bidding (win more, profit more), through efficient development (lower labor cost), to reduced warranty and support costs (higher quality product).

Strategic Advantages: More Than a Tool, A Capability

- **Assistive Intelligence, Not Displacement:** SCOTi augments engineers, automating the tedious while elevating their role to critical thinking, review, and innovation.
- **Zero-Rip Integration:** Works on top of IBM Aras, SAP, PTC, Jama, DOORS, etc. No data migration, no workflow disruption.
- **Compliance by Design:** NIST, ITAR, GDPR, HIPAA-ready. Built for the most secure A&D environments (air-gapped or private cloud).
- **Eradicates Organizational Amnesia:** Turns retiring tribal knowledge into a perpetual, scalable corporate asset.
- **Creates a Strategic MoAT:** The organization that learns and adapts fastest from its own historical data gains an insurmountable advantage.

Conclusion: The End of the “Okay-Enough” Era

The aerospace industry’s complexity crisis is a data and knowledge problem. SCOTi Master Builder with V&V is the enterprise-scale solution. It transforms requirements from a static, burdensome document into a dynamic, intelligent, and assured digital thread that runs from the earliest customer conversation to final certification.

By enabling flawless “right-to-left” design, providing instantaneous iterative power, and automating the grind of V&V, SCOTi doesn’t just save time—it de-risks the entire product lifecycle. It empowers organizations to finally leverage their deepest wells of experience to build better, faster, and more reliable products.

Stop managing requirements. Start assuring outcomes.

SCOTi® Master Builder: The Human Face of Innovation in the Age of AI.
Bridging the Complexity Gap for Aerospace & Defense.

Business Use Case

About smartR AI

We believe that data and AI play a key part in a sustainable world. smartR AI™ is a multi-award-winning, Edinburgh-based technology firm delivering the first "Master Builder" Agentic AI platform for the \$100B+ Aerospace & Defense (A&D) engineering market. As active members of Scottish Engineering and UK Space, we provide secure "Assistive Intelligence" that bridges the "Complexity Gap" in large-scale programs. We believe successful technology starts with people, not code; we don't just deploy algorithms, we solve real-world engineering bottlenecks by working from ideation through implementation.

Our flagship platform, SCOTi®, acts as an AI Autopilot for PLM, solving the industry's critical problem of "Organizational Amnesia"—the loss of 40+ years of institutional knowledge caused by siloed legacy data and a retiring expert workforce. By digitizing expert knowledge and automating requirements traceability 4,800x faster than manual review, we eliminate the need for teams to "start from scratch," transforming error-prone processes into a scalable competitive advantage. SCOTi® integrates seamlessly with industry-standard tools ensuring non-disruptive deployment into the world's most complex engineering workflows.

Our Mission: We eliminate project failure through the fusion of human critical thinking and machine-scale experience, empowering organizations to extract value from their data in an ethical, responsible, and sustainable manner.

Our Vision: The Human Face of Innovation In an era of AI complexity, we are the human-centric bridge between cutting-edge technology and real-world business impact. Our vision is to provide risk-free, controllable, and financially viable solutions for the challengers and innovators who are shaping the future of our world.

- Empowering businesses with AI-Powered Efficiency, Accuracy, and Trust.
- Revolutionizing product lifecycle management through human-critical thinking.
- Leading the competition with specialized, ethically-deployed Assistive Intelligence.



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