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SESSION OUTLINE

Safe Skies, Clear Logic

The AXTENI Approach to Trustworthy AI

5 Sections

01 The AI Landscape in Aviation

Market context, adoption trends, and the Gartner Hype Cycle shift

CONTEXT

02 The Three Critical Challenges

The Trust Gap, Knowledge Silos, and Regulatory Lag

PROBLEM

03 The AXTENI Framework

Architecture, pillars, and integration logic

FRAMEWORK

04 Evidence and Application

SESAR, ATM, SHAP, and 737-MAX lessons

EVIDENCE

05 Key Messages and Future Research

Actionable takeaways and the path forward

FORWARD

Meet the Research Team

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Projected AI Market by 2034

33%

of transport firms have adopted AI

Yet fewer than 1% have implemented responsible AI governance practices

GenAI in the Trough of Disillusionment

Per the Gartner Hype Cycle, GenAI has moved past peak enthusiasm. Airlines and manufacturers are scaling back as sustainable reliability is questioned.

Shift to the Plateau of Productivity

The industry is redirecting focus toward advanced analytics, lifecycle management, and operational integration where XAI becomes essential.

Skepticism Is Intensifying

As enthusiasm fades, the bar for trust and reliability rises. Operators, pilots, and maintenance crews demand transparency before acceptance.

CHALLENGE 01

The Trust Gap

Surveys reveal persistent skepticism among pilots and maintenance crews. The opaque, black-box nature of AI conflicts directly with aviation's deeply embedded safety-first culture. High skepticism means low adoption and that is a safety risk in itself.

CHALLENGE 02

Knowledge Silos

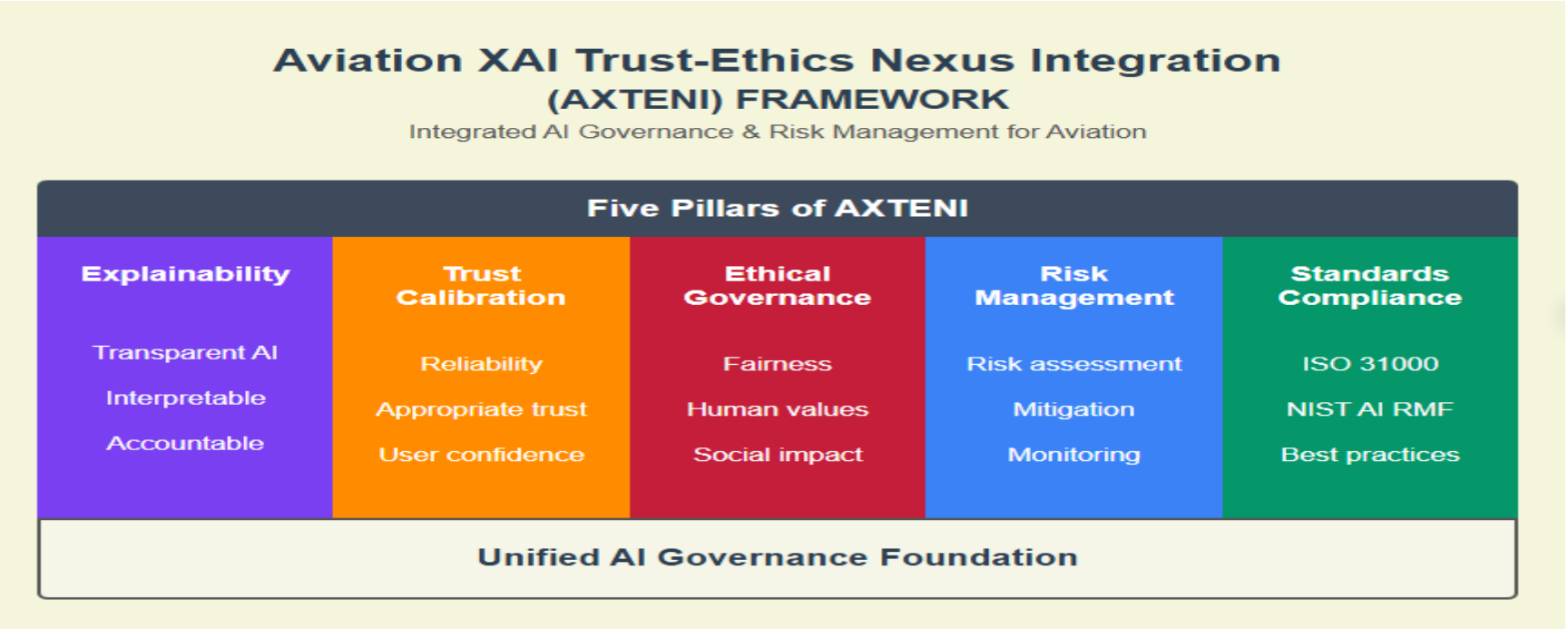
AI research is fragmented across technical, ethical, and social disciplines. There is no cohesive, unified safety standard. Researchers in each domain work in isolation, leaving aviation leaders without actionable, integrated guidance.

CHALLENGE 03

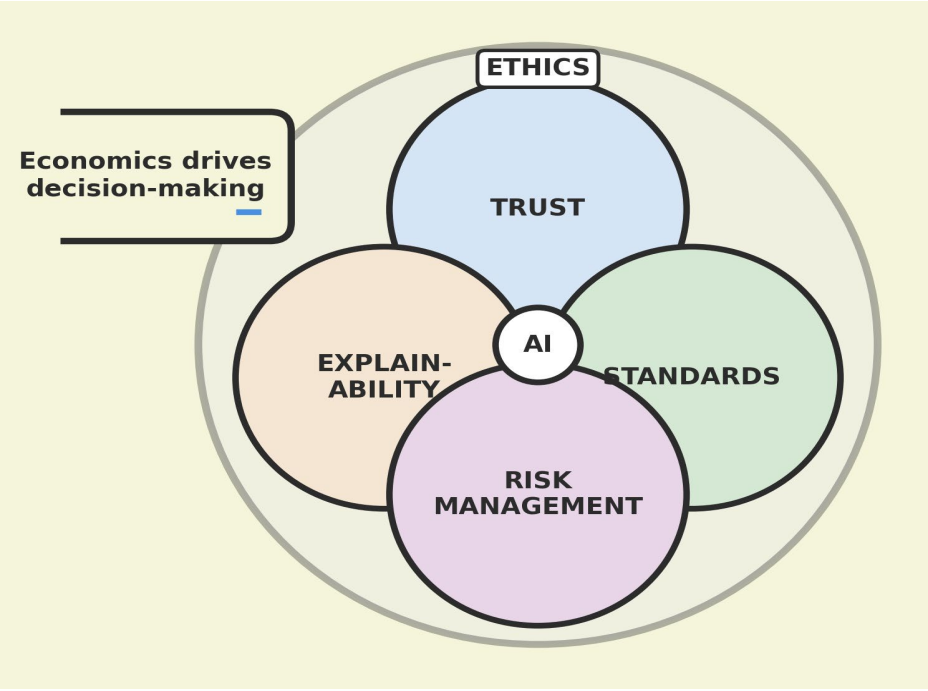
Regulatory Lag

AI deployment is outpacing the development of robust safety protocols. This gap creates significant liability and risk management exposure for operators, manufacturers, and regulators particularly in high-consequence environments.

03 | Introducing the AXTENI Framework



03 | Ethics — The Anchor of the AXTENI Model



Ethics as the Governing Principle of AI Decision-Making in Aviation

Ethics as the Outer Boundary

Ethics governs the entire system. All four inner domains, Trust, Explainability, Standards, and Risk Management, operate within the ethical boundary, ensuring no dimension can override responsible conduct.

Economics Drives Decision-Making

The callout acknowledges that economic pressures are a real driver of AI adoption decisions. AXTENI frames ethics as the counterbalance , ensuring that cost and efficiency never become justifications for compromising safety or fairness.

AI at the Nexus

The AI node at the center of the four overlapping circles represents the integration point. Every governance dimension converges on the AI system itself, making each deployment decision ethically informed and technically accountable.

From Black Box to Transparent Partner

XAI does not replace complex models. It bridges the gap between algorithmic output and human understanding through post-hoc explanation techniques applied after the model is trained.

SHAP Example — Component Failure Prediction

Scenario: An AI system outputs a HIGH-RISK prediction for a turbine component.
SHAP Reveals: The recent spike in operating temperature was the dominant driver (68% contribution).
Secondary factors: Vibration anomaly (21%) and flight cycle count (11%).

POST-HOC

Applied after model training — no need to rebuild the system

FEATURE

Importance scores show which inputs drove the prediction

DIALOGUE

Turns opaque outputs into operator-readable explanations

NIST Risk Management Framework + ISO 31000

A flexible governance blueprint ensuring AI systems perform as intended under aviation-specific stressors

NIST AI RMF

MAP | MEASURE | MANAGE | GOVERN

Provides a structured, repeatable process for identifying, assessing, and managing AI risk throughout the system lifecycle. Aviation stressors such as vibration, temperature, and cognitive load are mapped as system inputs.

ISO 31000

Risk Identification and Treatment

Offers a universal risk management vocabulary and process architecture. When combined with NIST, it ensures governance decisions are both technically sound and organizationally coherent.

AXTENI Synergy

✓ Covers technical and organizational dimensions simultaneously

✓ Scales from single aircraft systems to fleet-wide deployment

✓ Provides audit-ready documentation for regulators

✓ Aligns with existing aviation safety management systems (SMS)

✓ Bridges the gap between engineering teams and leadership

Empowering Operators as Active Partners — Not Passive Observers

Human-Autonomy Teaming (HAT)

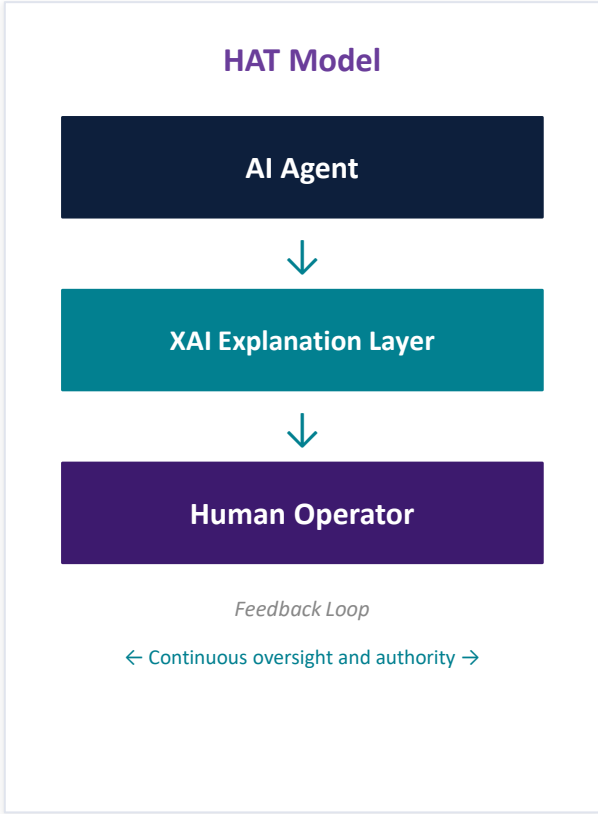
AXTENI reframes AI not as a replacement for human judgment but as a teaming partner. Operators retain meaningful authority over decisions, with AI surfacing information to inform rather than supplant their expertise.

The Intervention Imperative

A critical feature of AXTENI is ensuring that operators can always intervene. Systems must be designed so that the human can override, question, or escalate any AI-generated recommendation without friction or penalty.

Cultural Integration

Aviation has a deeply embedded safety culture built over decades. AXTENI is designed to work with that culture, not against it, translating algorithmic outputs into the language of operational safety professionals.



REAL-WORLD APPLICATION

SESAR and Air Traffic Management

XAI has been successfully integrated into remote airfield digital air traffic control within the Single European Sky ATM Research (SESAR) initiative. Transparency and reliability are paramount for human operator acceptance in this context.

MULTI-AGENT FRAMEWORK

Trusted Intelligent Systems (TIS)

TIS employs a multi-agent framework balancing operational objectives with trustworthy XAI behaviors. The system is grounded in Markov Decision Process theory, providing a theoretically robust platform for real-time decision support.

SAFETY IMPERATIVE

Lessons from the 737-MAX

The 737-MAX tragedies demonstrate that transparency alone is insufficient. A framework must actively manage the tension between algorithmic complexity and human intuition. Governance failures cost lives. AXTENI addresses this directly.

KM1

Strategic Need

GenAI has hit a hype trough, raising skepticism. AXTENI restores trust by integrating ethics and XAI, providing a reliable blueprint for sustainable AI adoption in aviation.

KM2

Practical Application

XAI is already proving vital in ATM and SESAR. AXTENI supports human-autonomy teams by ensuring the transparency and reliability required for high-stakes flight safety.

KM3

Future Governance

AXTENI synthesizes ISO and NIST standards into a flexible governance model. Future research must focus on empirically validating this framework within the aviation context.

Research Call to Action: Empirical validation studies, multi-site ATM deployments, and cross-disciplinary collaboration are the essential next steps.

Conclusion

Securing the Safe Skies of Tomorrow

We stand at a pivotal threshold. The aviation industry has embraced AI for its efficiency but trust, transparency, and governance have not kept pace. The AXTENI Framework bridges that divide. By unifying Explainability, Technical Reliability, and Human Oversight into a single integrated model grounded in NIST and ISO standards, AXTENI offers a practical, empirically grounded path from skepticism to sustainable adoption. The safe skies of tomorrow depend on the governance decisions we make today.

Explainability

XAI and SHAP

Reliability

NIST and ISO

Oversight

Human Authority

The measure of intelligence is the ability to change.

Albert Einstein

AXTENI represents that measured, purposeful change from opacity to transparency, from risk to governance.

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Thank You.

We welcome your questions, insights, and perspectives.

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