

Redefining Airline Turnarounds with Agentic AI Insights

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An abstract graphic at the bottom of the page featuring flowing, liquid-like shapes in shades of white and light blue, with a prominent rainbow-like reflection across the center.



Executive Summary

This whitepaper is written for airline operations leaders: heads of ground operations, station managers, and the executives who carry accountability for on-time performance, network reliability, and cost control. It addresses one of the most persistent and expensive problems in commercial aviation: the turnaround.

Every airline departure depends on a precisely sequenced set of concurrent ground operations. When that sequence breaks—a late catering truck, a weather hold, an equipment shortage—the consequences rarely stay local. A five-minute delay at one gate can cascade into hours of network disruption, stranding connecting passengers, triggering crew extensions, and generating recovery costs that compound across the day. Most airlines have visibility into these events after they happen. Few have the capability to intervene before they spread.

The root cause is structural. Ground operations data is scattered across systems that do not share information in real time. Dashboards show past data instead of current conditions. Compliance issues occur outside the decision-making process instead of being part of it. Traditional AI has tried to close these gaps, but it relies on historical data, identifying patterns instead of prompting actions within the quick timelines that turnarounds require. These gaps explain why experienced operations teams spend more time handling problems than preventing them.

This whitepaper examines how agentic AI addresses these gaps directly, by monitoring live turnaround conditions, detecting risks before they compound, and surfacing specific, actionable recommendations while keeping human operators in control at every decision point. It covers four operational pillars that define a proactive turnaround management model, the data and integration foundations required to make it work, and a phased adoption roadmap designed for airlines at varying levels of operational maturity.

Airline operations leaders will come away with a clear picture of where the technology stands today, what responsible implementation requires, and what measurable improvement looks like at each stage of adoption.

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Introduction

Imagine an aircraft arriving at the gate, and everything falls perfectly into place. Passengers disembark smoothly, cleaning crews rush in, fuel trucks arrive on time, baggage handlers coordinate with cargo loads, and the next crew boards without any issues. This is the ideal turnaround—a well-timed ballet lasting 30 to 90 minutes, depending on the flight. However, in reality, a single problem such as a late catering truck or a weather delay creates a ripple effect on connections, crews, and revenue. Aviation veterans have seen how a five-minute delay at one gate causes hours of network disruption, costing thousands of dollars for each flight.

Turnarounds are the heart of airline efficiency. They involve multiple connected tasks: deplaning, cleaning, catering, fueling, inspections, crew changes, boarding, and pushback. Each task depends on resources such as ground equipment, staff, and infrastructure, all of which can be affected by factors like storms or gate availability. Experts who have managed airline operations for years know that turnarounds are a competitive advantage. Airlines that excel in turnarounds maintain tight schedules and lower costs, while fostering passenger loyalty.

When Minutes Mean Millions

Herb Kelleher, co-founder and former CEO of Southwest Airlines, once said, *"You can't have a mid-life crisis in the airline industry because every day is a crisis."*¹

Delays cost the U.S. airline industry approximately \$33 billion annually, with disruptions continuing to increase due to weather events, staffing shortages, and supply chain fragility. Limited airport slots, aging fleets, and labor constraints compound the pressure. Even slight delays can wipe out quarterly profits. Rising fuel prices, tarmac holds, and data errors are a standing concern at the executive level. Aviation consultants have observed airlines losing substantial revenue due to avoidable delays, often caused by disjointed systems and a lack of visibility into ground operations.

Delays ultimately impact performance across dimensions. The effects span cost, where extra fuel, overtime, and compensation claims spike; revenue, where missed connections imply lost bookings and ancillaries; and customer experience, where late arrivals breed frustration and erode loyalty scores.^{2, 3, 4, 5, 6}

The Cascade Effect in Practice

Consider this example scenario: a 12-minute catering delay occurs at a hub. It pushes boarding back, misses the slot, and adds 15 more minutes. The aircraft's next leg starts late, stranding connecting passengers who need to rebook. Costs mount with recovery fuel, crew extensions, and vouchers. Operationally, staff reshuffle gates and rosters manually, eroding trust in plans.⁵

Most airlines experience some version of this daily. Few have the real-time visibility to stop it. Aviation experts have observed this firsthand; for example, a KPI dashboard showing a significant drop in on-time performance (OTP) owing to cascading delays, pulling net promoter scores (NPS) down and increasing costs exponentially quarter over quarter. Without clear data identifying root causes, such as weather or equipment failure, targeted intervention remains difficult.

The Competitive Imperative

In a competitive market, operational efficiency determines which businesses succeed. For years, airlines have depended on what we generally refer to as traditional AI, which includes rule-based systems and machine learning (ML) models that analyze historical data, identify patterns, and create dashboards to assist with decision-making. The issue is in the design. Traditional AI detects and reports, but it doesn't take action. By the time an alert appears, the chance to intervene has often already passed. Five structural gaps add to this problem over time.

Gap 1: Visibility-to-Action Gap

Dashboards reflect history, but not the situation unfolding at the gate right now. Critical intervention windows close before the next refresh.

Gap 2: Orchestration Gap

Legacy systems (AODB, DCS, crew management, and baggage handling) run on different cycles and rarely speak to each other in real time. Coordination defaults to manual bridging.

Gap 3: Compliance Gap

Recommendations that ignore crew rest rules, regulatory constraints, or labor agreements are operationally risky and untenable. Compliance cannot be an afterthought; it must be embedded in decisions.

Gap 4: Disruption Propagation Gap

Most systems assess delay impact at the flight level, rather than the network level. A fifteen-minute slip on a trunk route during peak hours carries a different downstream cost than the same delay on a quieter rotation, and without that context, teams are always fighting the last fire.

Gap 5: Ground Resource Visibility Gap

Ground Support Equipment (GSE), including fuel trucks, tow tractors, and boarding bridges, is often tracked manually or in disconnected systems.

It is vital to address these gaps. Improved data flow leads to fewer disruptions, quicker turnarounds, and a competitive advantage over rivals who still rely on manual processes.

The New Operational Paradigm: Agentic AI

Airlines depend on precision. While traditional AI (rule-based systems and ML models trained on historical data) can track trends and generate reports, it remains fundamentally reactive. As complexity increases with more flights, tighter schedules, and expanding variables, operations require systems that respond in real time. Agentic AI can monitor live conditions, identify issues, and suggest solutions while ensuring human oversight for safety and context.

These systems are designed as operational partners. Agentic approaches can significantly reduce reactive decisions, dynamically managing the “what ifs,” while balancing efficiency and compliance needs. For turnarounds, this presents a chance to move from constant crisis management to proactive coordination.

Where Agentic AI Can Create Impact

Agentic AI provides new opportunities to improve responsiveness, coordination, and adaptability in turnaround operations.

Real-Time Action

Agentic AI reads live data and intervenes at the moment a risk is detected, surfacing options before a delay compounds

For example, detection of an eight-minute fuel delay prompts suggestions, such as rescheduling boarding or swapping trucks

Dynamic Detection

Agents weigh context, accounting for whether a delay occurs at peak hub or off-peak, and model impacts on connections, gates, and crew times

Embedded Compliance

Suggestions factor in labor laws and safety requirements, with auto-logs for audits

Actionable Guidance

Agentic AI delivers actionable recommendations (crew reassignments, gate optimizations, and catering hold solutions such as expedited cleaning or buffer adjustments), enabling teams to review options in seconds and execute them decisively

Continuous Learning

Feedback refines future responses, building intelligence over time

Orchestration

Integration with AODB, DCS, and key airline systems for milestone validation at every stage

The Four Pillars of Agentic Turnaround Management

Agentic systems for turnaround management are organized into four pillars to drive proactive operations.

Pillar 1: Turnaround Monitoring

- Real-time pulse on milestones, passenger flow, fueling, and baggage
- Dashboards flag risks fifteen to twenty minutes ahead using sensors and forecasts
- Humans verify alignment with the ramp reality
- Ground teams shift from reactive firefighting to proactive risk management, identifying and reducing potential delays before they happen

Pillar 2: Exception and Compliance Management

- Diagnoses disruptions, models impacts, and ranks fixes under constraints
- Logs for audits ensure control
- Disruptions are managed locally rather than spreading throughout the network
- Compliance documentation is automatic, eliminating the need for post-event reconstruction

Pillar 3: Performance and Regulatory Reporting

- Turns data into insights: OTP, costs, and trends
- Automated reports, benchmarks vs. IATA standards
- Leadership gains predictive visibility into operational health through automated compliance reporting

Pillar 4: GSE and Resource Status

- Tracks assets via GPS, predicts shortages, and optimizes resources
- Equipment shortages are anticipated rather than discovered during turnarounds

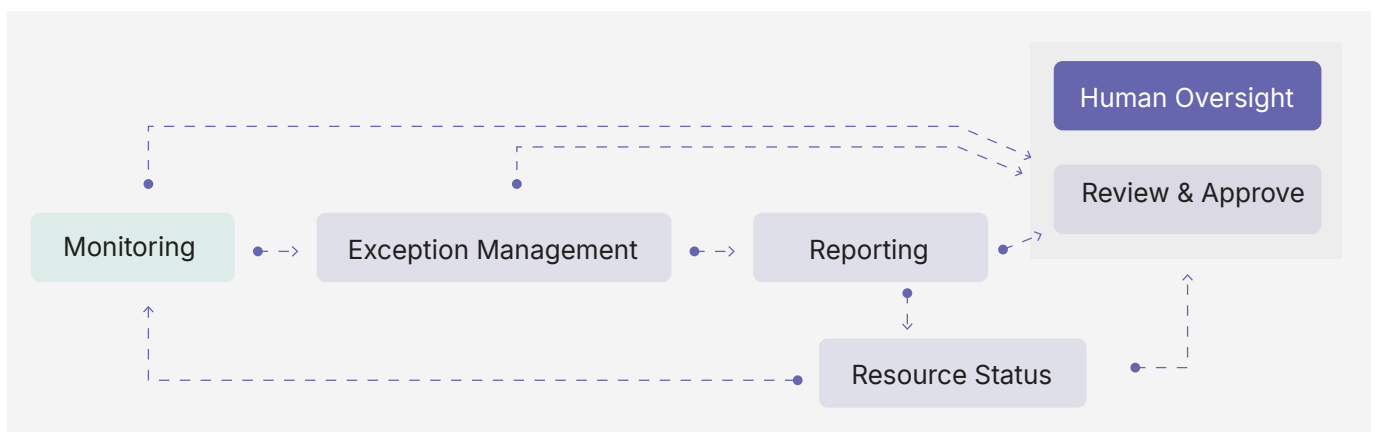


FIGURE 1: FOUR PILLARS OF AGENTIC AI-DRIVEN TURNAROUND MANAGEMENT

The flow above shows how agentic modules can work together or separately based on the airline setup. Monitoring agents track the live turnaround milestones. Exception management addresses disruptions with actionable recommendations. Reporting combines performance data, and resource status maintains equipment visibility. Each component can operate independently while coordinating, through shared data streams. Airlines can implement measures that suit their operational maturity and scale. This keeps human oversight central, while agents manage the step-by-step orchestration.

Industry-Wide Benefits

Agentic AI strengthens the entire aviation ecosystem. By integrating IATA standards, it addresses fragmented data and inconsistent metrics, enabling true interoperability of the data.

- **Continuous Coordination:** Automated data exchange among airlines, ground handlers, and airports creates unified visibility. This change transforms fragmented operations into an efficient, functioning network.
- **True Benchmarking:** Standardized milestones support meaningful peer comparisons. This fosters competitive excellence, as leaders establish new performance benchmarks.
- **Enhanced Compliance:** Built-in audit trails show active risk management in the system. They provide regulators with consistent documentation while strengthening their accountability.
- **Passenger Trust:** Schedule reliability and proactive communication build confidence. This positions airlines as trusted partners in predictable journeys.

Implementing Agentic Intelligence: Key Imperatives

Ascendion's Engineering^{AI} methodology is built on a core belief: technology and operations must evolve hand-in-hand, or both will falter. This means integrating AI agents, human intelligence, and robust platforms into a single enterprise operating system:

The Platform (AAVA™) acts as the automation core, embedding AI agents across the full turnaround cycle, rather than isolated tasks.

The Process layer retools daily workflows, allowing automation to tackle repetitive jobs while humans oversee high-stakes decisions.

The People layer equips teams to collaborate with AI agents, shifting the focus from routine execution to strategy, expert calls, and insights.

Agentic AI delivers results when change hits the operational level. Five key imperatives determine whether that holds in practice.

Priority 1: Data Infrastructure

Agentic AI demands real-time data from operations systems, ground tracking, weather, and crew platforms, all fused into a governed layer. Industry studies confirm that poor data quality undermines outputs. The data architecture must link live events through APIs, enforce business rules, and use ML for upstream issue detection. The AAVA Data Trust Studio operationalizes this governed layer in practice, combining quality, AI, and ML metrics for streamlined validation.^{7,8}

Priority 2: API-Based Integration Standards

Two-way APIs enable agents to ingest schedules and gates while triggering the notifications. Open integration standards must connect DCS, Tech Ops, and Crew Management without overhauls, with future inter-agent protocols enabling cross-functional collaboration. AAVA's REST connectors implement these standards in practice, integrating across systems without requiring full overhauls.

Priority 3: Human-in-the-Loop Design

Human-in-the-loop design is essential for flight safety and operational compliance. It establishes review protocols, structured feedback systems, and override capabilities at each turnaround milestone. Airline operations remain a deep human discipline. Agentic AI works best when it reflects that reality, codifying essential design inputs (including edge cases) as features, built with the staff who know them best. With built-in checkpoints and role-based workflows, turnaround coordinators, dispatchers, and ramp supervisors shift from reactive decision-makers to active orchestrators of intelligent systems. Ascendion's Engineering^{AI} methodology is built around this model, ensuring human judgment remains central at every stage of the turnaround cycle.

Priority 4: Strategic Change Management

Position technology as augmentation: agents monitor the ramp while operations experts focus on disruption recovery. Start with a modular approach, focusing on high-friction areas like GSE pre-positioning or gate allocation, and then broaden your focus. With AAVA's phased roadmap, turnaround coordinators and ramp supervisors become agent-native roles, but human judgment still makes the final decision.

Priority 5: Outcome-Based Learning Architecture

Integrate analysis mechanisms for recommendations, KPIs, and feedback. Engineering^{AI} extends learning loops beyond models to workflows, scaling across crew, maintenance, cargo, and fuel operations by reusing proven components.

The Path Forward: Maturity Curve and Adoption Roadmap

Airlines exploring agentic AI can adopt a phased approach, progressing from basic configurations to more advanced ones. Throughout this process, AAVA serves as the foundation, enabling teams to begin with small, simpler turnarounds and gradually incorporate additional agents and routines as confidence builds.

However, progress hinges on establishing solid fundamentals, including robust data strategies, transparent audit trails, and well-defined methods for human-agent collaboration. This gradual rollout approach effectively manages risk while allowing teams to build confidence through practical experience, thereby guiding the pace of subsequent enhancements.

The roadmap below shows the possible phases and illustrates what could be built over time.

Maturity Roadmap

Maturity Level	Key Characteristics	Potential Focus Areas	Potential Business Benefits
Level 1: Foundation	<ul style="list-style-type: none"> Platform live, connected to core systems (AODB, DCS, weather, and GSE) Early alerts reviewed and approved by the staff 	<ul style="list-style-type: none"> Establish transparency and audit trails Define a small set of baseline KPIs Train teams to read and discern the system suggestions 	<ul style="list-style-type: none"> Better day-to-day visibility Easier regulator conversations due to human sign-off A working proof point for what follows
Level 2: Assisted Decisions	<ul style="list-style-type: none"> All operational perspectives are active Common exceptions are pre-checked recommendations Limited assisted actions are performed in a controlled mode 	<ul style="list-style-type: none"> Cut response time by watching the issues in parallel Record decisions and outcomes so that the system can learn 	<ul style="list-style-type: none"> More consistent calls in pressure scenarios Growing trust among frontline teams Early gains in schedule stability
Level 3: Autonomous Routines	<ul style="list-style-type: none"> Routine tasks are performed independently within a defined scope Passenger, cargo, and maintenance activities are coordinated in real time The outcomes are fed back into the system 	<ul style="list-style-type: none"> Move staff toward planning and oversight of the program Keep every action traceable and reviewable 	<ul style="list-style-type: none"> There is a clear operating advantage at scale Fewer local fixes, more network-level wins Teams spend less time firefighting
Level 4: Forward Planning	<ul style="list-style-type: none"> Delays are anticipated earlier and avoided more often Multiple agents coordinate across airports and rotations The network behavior is continuously tuned 	<ul style="list-style-type: none"> Keep people focused on rare and unfamiliar cases Use patterns from past operations to refine the rules and limits 	<ul style="list-style-type: none"> Durable edges across the network Strong position in the industry benchmarks Operations shift from reactive control to planned execution



The Future: Building an Agent-Powered Ecosystem

Once turnaround agents demonstrate operational value, the AAVA foundation naturally expands to crew scheduling, maintenance coordination, cargo handling, irregular operations, and fuel optimization. These agents function as a unified system, sharing knowledge across domains through common foundations that enable collaboration.

This synchronized approach is enabled by four coordination pillars.

<p>Pillar 1: Shared Data Foundation</p> <p>All agents access consistent, real-time operational data.</p>	<p>Pillar 2: Common Decision Context</p> <p>Agents understand each other's decisions and constraints.</p>
<p>Pillar 3: Joint Execution</p> <p>Agents plan and act together, aligning turnaround steps with crew and maintenance actions.</p>	<p>Pillar 4: Full Action Traceability</p> <p>Cross-agent decisions are fully logged and auditable.</p>

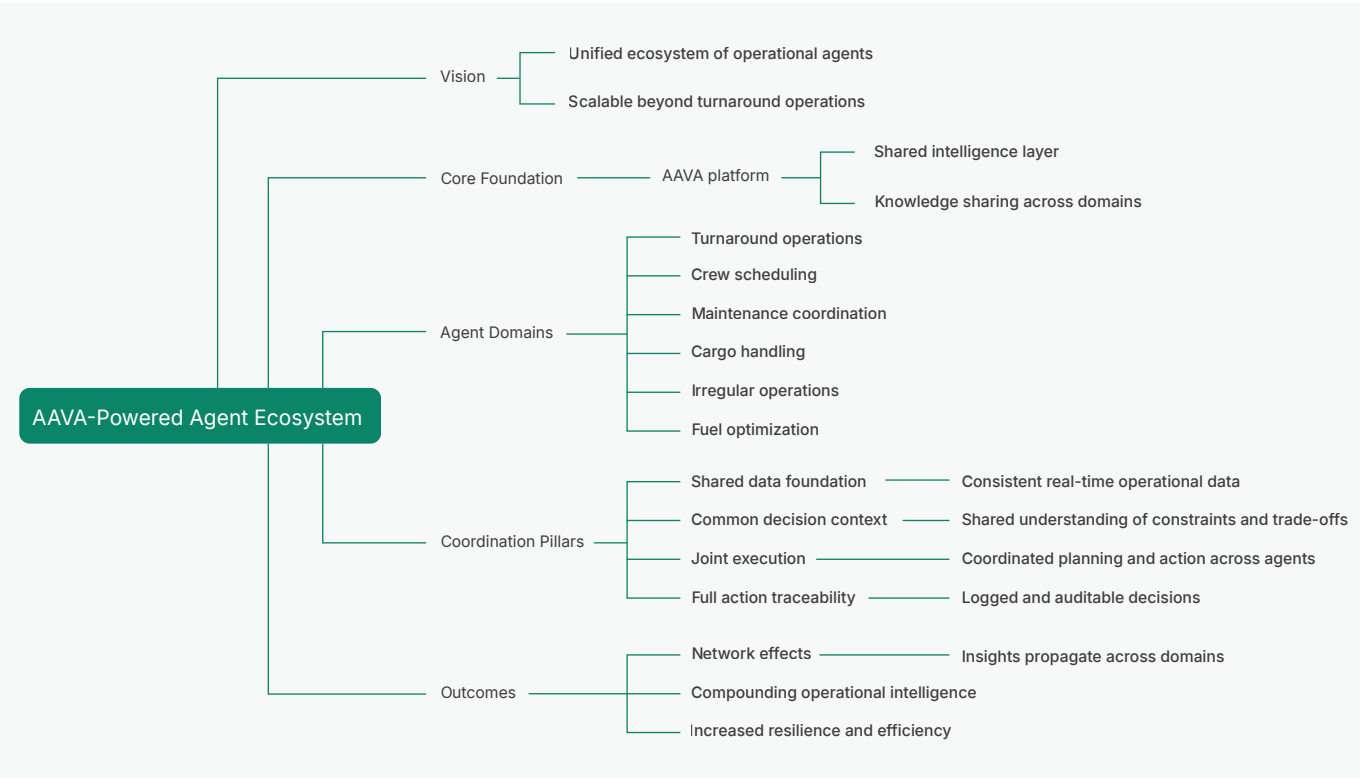


FIGURE 2: FUTURE STATE: ECOSYSTEM OF AGENTS

Together, these pillars create network effects, where insights from one area strengthen others, building compounding operational intelligence over time.



Each area has its own challenges, such as unpredictable disruptions, fragmented legacy systems, and strict regulatory requirements that must be addressed. However, the underlying blueprint remains the same.

- **Continuous Monitoring:** Every agent tracks live operational conditions at all times
- **Early Issue Detection:** Agents spot cross-system patterns before problems spread
- **Clear Recommendations:** Each agent explains the reasoning behind its suggested actions
- **Human Control by Design:** Every agent's action is clearly defined by boundaries
- **Learning from Outcomes:** One shared learning engine updates agents based on real operations

Taking the First Step

For airlines ready to explore agentic AI, the path forward begins with grounded and deliberate action.

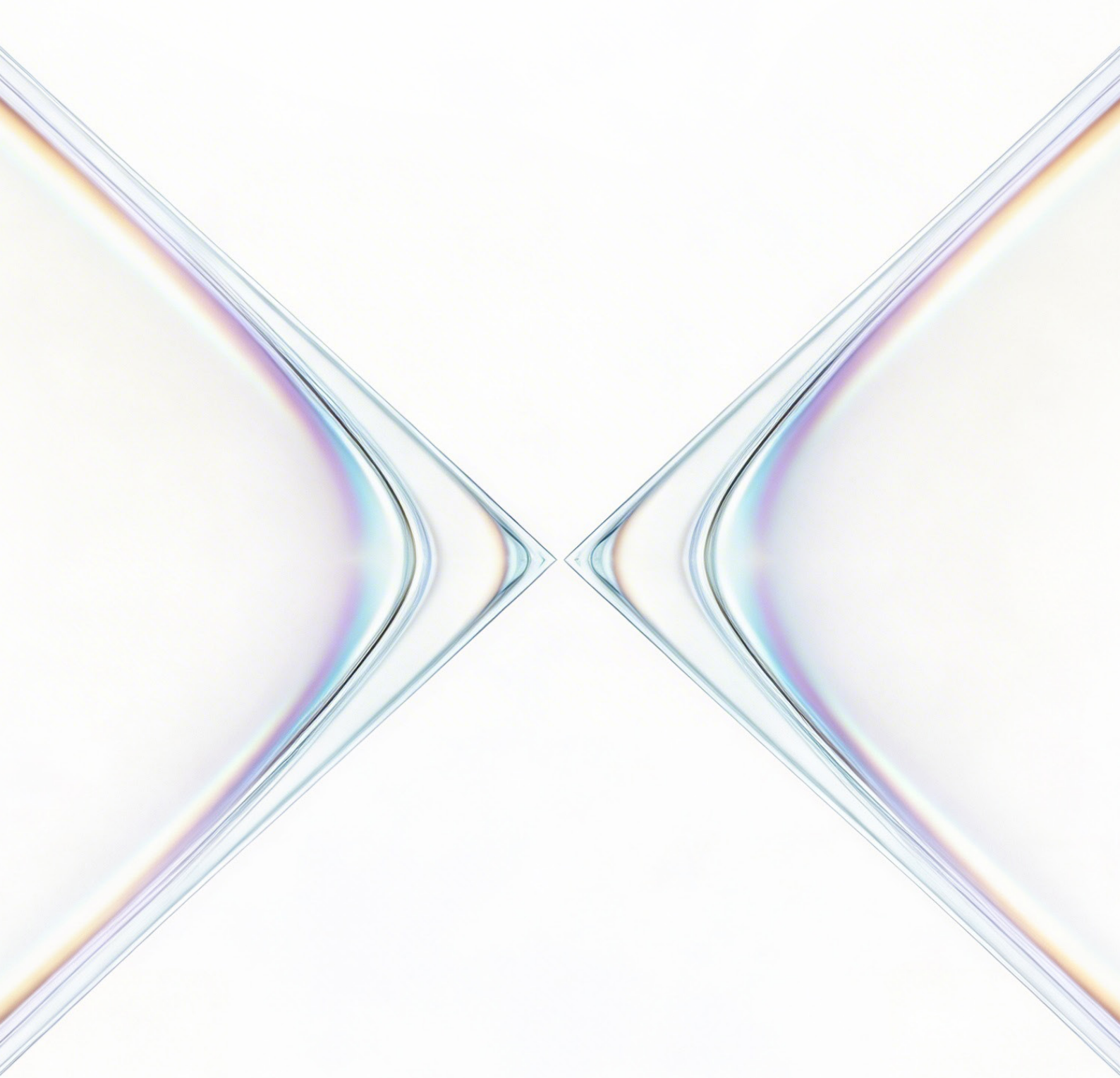
- **Audit Turnaround Data:** Profile sources for accuracy and identify gaps that lead to delays in the process.
- **Map the System Integration Points:** Find connections across the AODB, DCS, and ground operations platforms for real-time data flow.
- **Convene Operational Leads:** Discuss pain points with ramp supervisors, dispatchers, and station managers to prioritize a focused pilot area.
- **Launch a Controlled Pilot Program:** Deploy at a single hub gate with API integrations, keeping the scope limited and measurable.
- **Define Human-in-the-Loop Protocols:** Set clear thresholds for when recommendations require review or approval.
- **Invest in Team Training:** Hold workshops to improve comfort with agent interactions and decision-support workflows.
- **Carefully Track the Outcomes:** Measure on-time performance, costs, and resolution times compared to baseline metrics.
- **Refine Through Feedback:** Conduct weekly reviews to adjust agent behavior based on frontline insights.
- **Scale Gradually:** Move from assisted decisions to independent routines, as capabilities grow.

This approach ties innovation to practical operations, transforming potential into real change.

Conclusion

Turnarounds have always been where airline efficiency is won or lost. Human expertise remains central to every airline operation; agentic systems extend that expertise with precision, speed, and consistency at scale, converting operational losses into measurable gains and moving ground teams from reactive firefighting to proactive coordination.

Airlines that move in this direction gain improved schedule recovery, stronger operational control, and audit readiness.



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