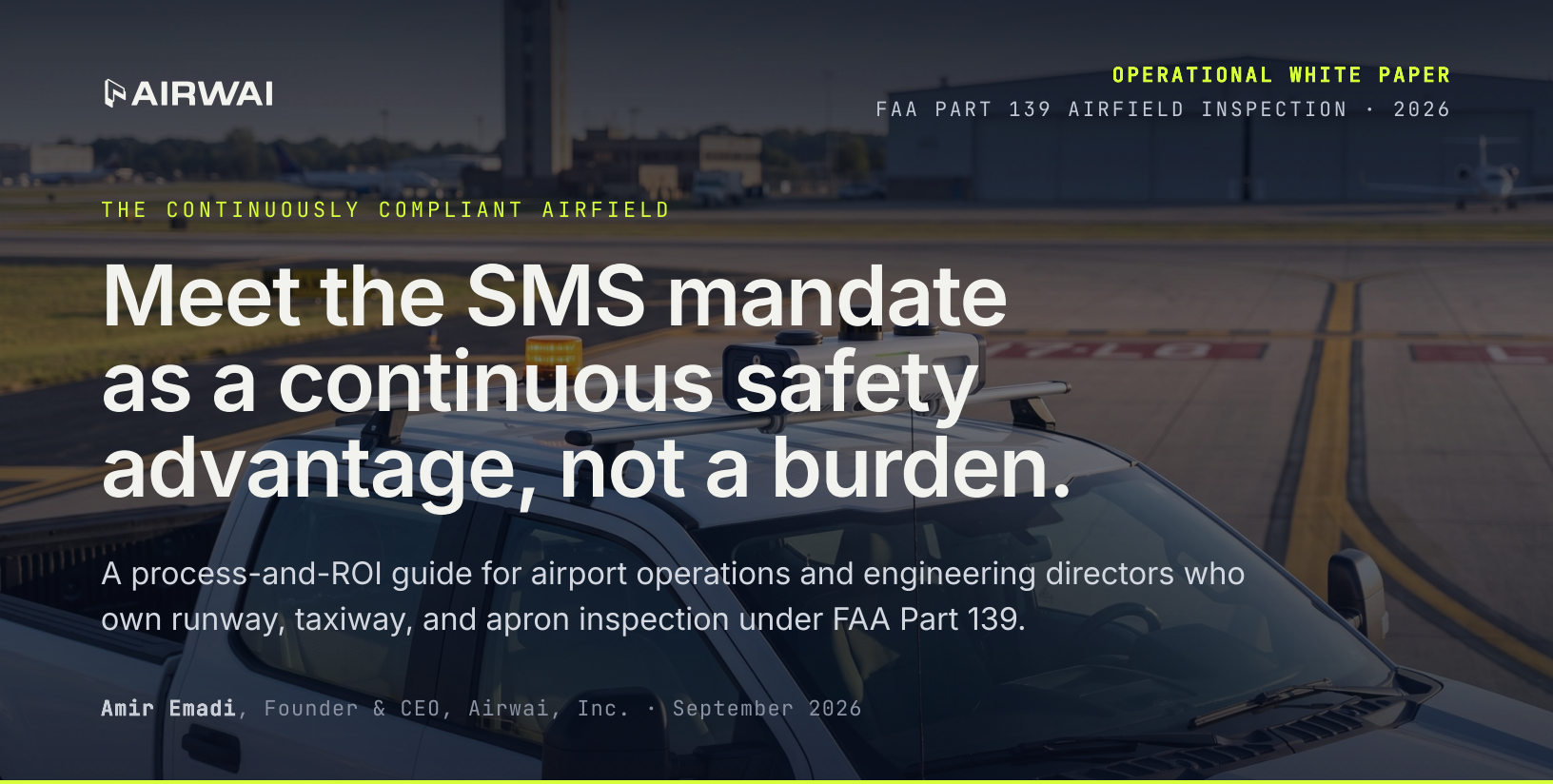

THE CONTINUOUSLY COMPLIANT AIRFIELD

Meet the SMS mandate as a continuous safety advantage, not a burden.

A process-and-ROI guide for airport operations and engineering directors who own runway, taxiway, and apron inspection under FAA Part 139.

Amir Emadi, Founder & CEO, Airwai, Inc. · September 2026

BOTTOM LINE

An airfield inspected once or twice a year cannot feed a Safety Management System that expects a continuous, documented, forward-looking record. A vehicle your crews already drive can, and the same pass builds the inspection history your certification runs on.

EXECUTIVE SUMMARY

The FAA's Safety Management System (SMS) rule asks certificated airports for something a periodic walk-around was never built to give: a continuous, documented, forward-looking picture of airfield condition. The fix is not more inspectors. It is changing the medium, so the vehicles already moving across your movement areas capture condition on every pass and file it, as a located and dated record, into the mapping system you already run.

- SMS (the FAA's Safety Management System rule, 14 CFR Part 139, Subpart E) now reaches roughly **277 certificated airports** and shifts safety from periodic inspection toward continuous, documented, and predictive workflows. (Source: FAA; Esri, 2026.)
- Manual inspection is a sample in space and a snapshot in time: at one deployment it produced only **20–40 observations per shift**, inconsistent by inspector, weather, and light, with early-stage defects left undetected across paper logs and spreadsheets. (Source: Esri published case study.)

- **Where most airports sit today is Stage 0–1 of a five-stage maturity ladder** (clipboard to autonomous program); the reachable target is a continuously determined condition record that flows straight into your Esri (ArcGIS) system of record.
- **At San Bernardino International Airport, the same crews and vehicles now capture more than two million data points per pass and, in Esri's published comparison, detected three to seven times more surface anomalies per mile than the manual method**, with documentation kept continuous rather than annual.

THE COST OF THE STATUS QUO

A periodic inspection cannot feed a system the FAA now expects to run continuously.

Airside inspection, safety, and compliance were monitored by trained staff casing the movement areas, logging what stood out, and filing reports. SMS raises the bar: it is a standing, documented management system that expects hazards caught as they appear and safety performance measured over time. The obligation lives in each airport's Airport Certification Manual (ACM), the document that names the inspection method and data source the FAA has accepted. The question is no longer whether you inspect. It is whether the data you collect can feed the record the FAA now expects.

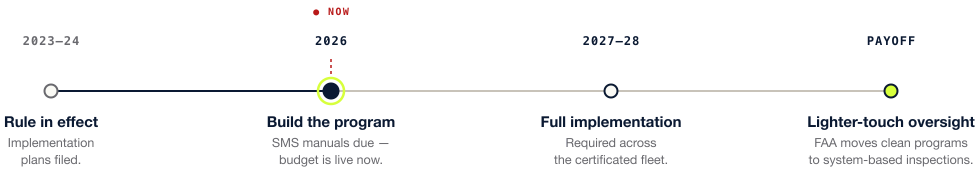

Exhibit 1. SMS turns airfield safety into a standing, dated obligation, not an annual event. Source: FAA 14 CFR Part 139, Subpart E.

EXHIBIT 2

The constraint was never the inspectors. It was the medium.

A person walking or driving a movement area can record only what they can see and write down, roughly a few dozen observations a shift, graded differently by different eyes on different days. Deterioration, though, is continuous and compounding: a crack found early is a maintenance line item; the same crack found late is a closure. A record built from periodic samples cannot show the trend, and a trend you cannot compute is a trend you cannot manage.

Method note: manual observation rate (20–40 per shift) reported in Esri's published San Bernardino case study.

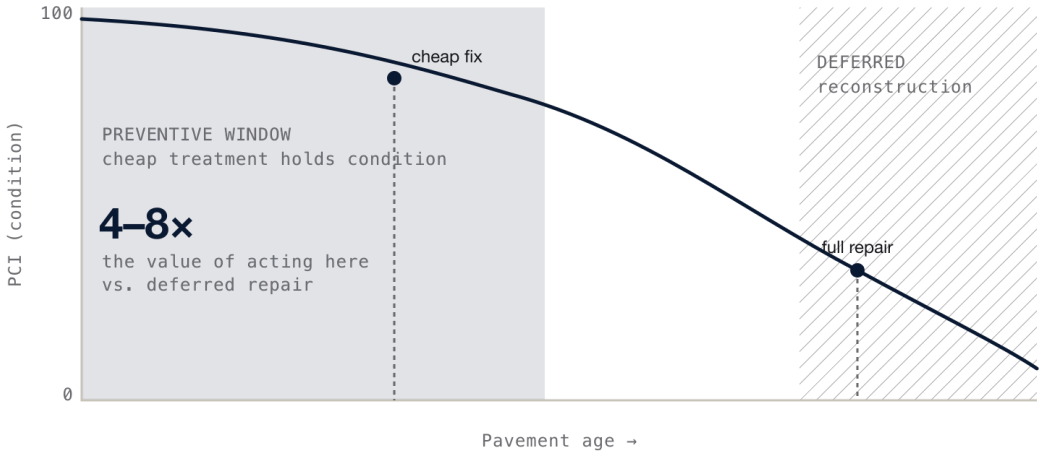

Exhibit 3. Pavement decays slowly, then quickly. The low-cost preventive window is short, and periodic surveys routinely miss it. Illustration of the industry deterioration curve; not a measurement of any specific pavement.

STATUS-QUO COST · **PER INSPECTION PASS**

TODAY (MANUAL)

20–40

observations per shift, inconsistent by inspector, weather, and light.

Source: Esri published SBD case study.

ACHIEVABLE (SENSOR PASS)

2M+

machine-ready data points per pass, consistent every shift and season.

Source: Esri published SBD case study.

HOW IT WORKS

Capture on the pass, decide on the vehicle, deliver into

the map you already run.

Airwai builds the software that turns a moving vehicle into a continuous airfield inspection. Our engine, LAIRA (Layered Autonomous Inference and Reasoning Agent), reads sensor data as the vehicle drives, computes the condition determination on the vehicle during the pass, and delivers the outcome into your own Esri (ArcGIS) tenant, where it becomes a condition report, a routed work order, or a safety notice. You receive outcomes through the map and the API, never raw model labels or scores; the determination logic stays with us, the record stays with you.

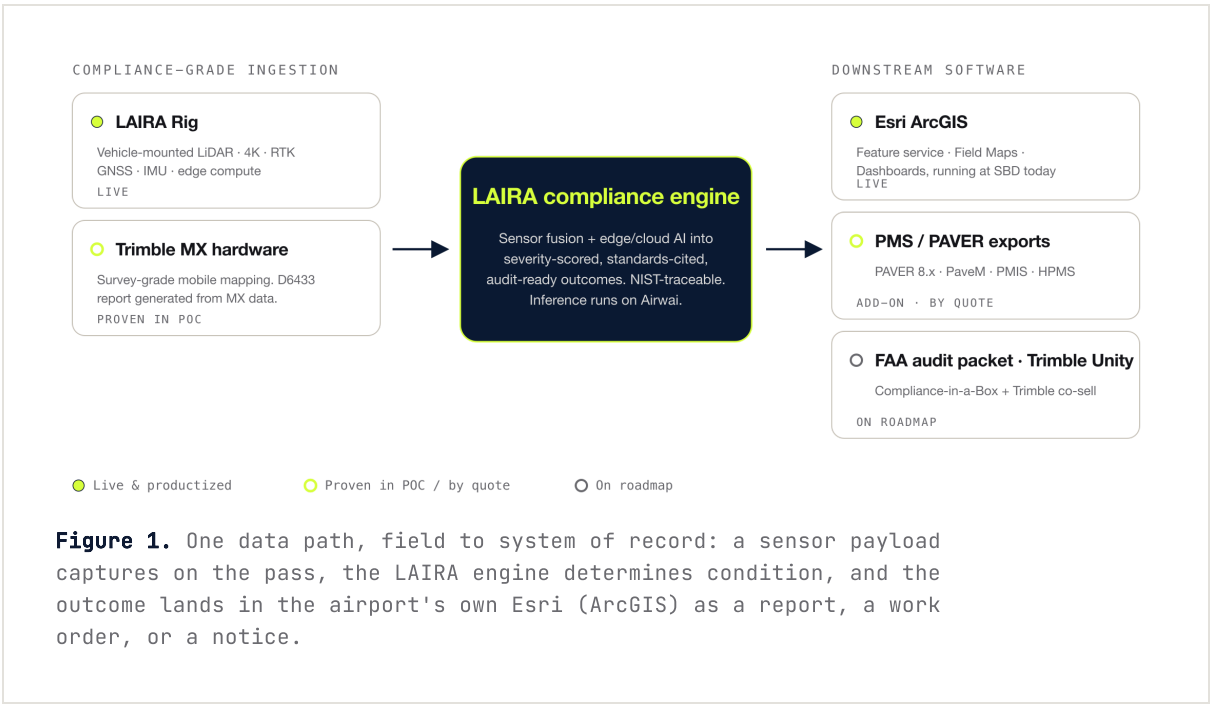

Figure 1. One data path, field to system of record: a sensor payload captures on the pass, the LAIRA engine determines condition, and the outcome lands in the airport's own Esri (ArcGIS) as a report, a work order, or a notice.

The sensing is commercial off-the-shelf and rides equipment you already operate. In the field to date, the payload has combined LiDAR (a laser scanner that measures surface geometry), an electro-optical survey camera, survey-grade satellite positioning, and an inertial navigation unit, with the artificial-intelligence inference running on the vehicle itself. It operates persistently without closing a runway, taxiway, or apron, adds no burden to the operator driving, and carries no dependency on airport IT: the sensing and the determination run on the platform, and every reported number resolves to an auditable per-sample-unit worksheet.

Figure 2. The LAIRA Rig, the survey-grade sensor unit for the compliance tier.

Figure 3. A LAIRA-equipped vehicle capturing on a live airfield.

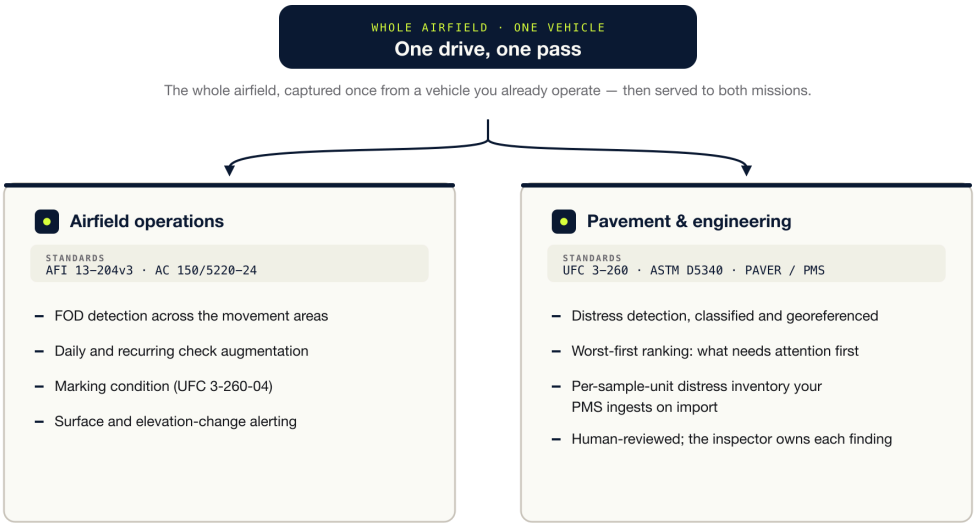

Figure 4. One pass, two missions: the same drive serves daily operations (foreign object debris, marking and lighting, safety-area checks) and the engineering record (pavement condition and trend).

THE MATURITY MODEL

Five stages from clipboard to a self-updating airfield record.

Plan the program by stage, not by tool. The ladder measures one thing: how much of your condition record updates itself and flows into your system of record without re-keying. Find the last stage that is fully true of your operation today; the next stage is your target.

STAGE 0	STAGE 1	STAGE 2	STAGE 3	STAGE 4 · TARGET
Manual Clipboard or windshield survey; findings live in one inspector's notes. **You are here if** results are paper or spreadsheet, re-keyed by hand.	**Digitized** Findings captured on a device, but scored and interpreted by a person. **You are here if** you log digitally but analysis is manual.	**Automated capture** Sensor capture at scale; detection assisted, review still human. **You are here if** a sensor collects, but you QA every result.	**Determined** Condition determined automatically to a defined standard; exceptions escalate. **You are here if** the system reports outcomes and you spot-check.	**Autonomous program** Continuous, self-updating condition record flowing straight into the system of record. **You are here if** the record updates itself and drives the work plan.

Self-locate: read each “you are here if” left to right and mark the last one fully true today. Most airports sit at Stage 0 or 1. The return comes from advancing one stage at a time, not from leaping to Stage 4.

THE PATH · THREE TIERS

Three ways to buy, each advancing you one rung up the ladder.

You do not have to start at the top. The program is priced so you can begin with automation on the records you already keep, add screening-grade condition when you want a continuous read, and move to survey-grade capture when the record has to carry the weight of FAA acceptance. Each tier maps to a stage on the ladder above.

Esri integrator

Free

AUTOMATION

- Keeps your own, already-accepted human inspection records current in the ArcGIS you already run.
- Routes findings straight to work orders and delivers a daily morning airfield briefing.
- Consolidates airfield-operations software you pay for today into the system of record you own.
- No sensor capture; the AI stays out of the compliance record.

Advances you to **Stage 1–2** · automation only, never a compliance claim.

Screening

$35K /yr · $3K/mo

SCREENING-GRADE

- Turns on the determination engine: workflow automation with a human in the loop.
- Screening-grade condition from a GoPro or phone capture on vehicles you already drive.
- Recurring passes, condition history, portfolio view, and export or API to your systems.
- A continuous read of the whole airfield between formal surveys.

Advances you to **Stage 3** · screening-grade, not FAA-accepted.

Compliance · Survey

$150K /yr · multi-year lower

SURVEY-GRADE

- The LAIRA Rig (LiDAR): survey-grade capture plus the determination engine.
- A durable inspection archive keyed to your sample units.
- The path to FAA acceptance: a validation package and support amending your ACM.
- The only tier that carries survey-grade, FAA-accepted condition data.

Advances you to **Stage 4** · the survey path to FAA-accepted data.

A note on the words. We say “FAA-accepted,” not “certified” or “compliant.” Airfield condition data becomes acceptable for your Part 139 reporting only when your FAA Airport District Office accepts an amendment to your ACM naming the method. The Compliance tier is the tier built to reach that bar; the Free and Screening tiers live on the automation side of the line by design.

THE IMPLEMENTATION PATH

A staged plan you can start this

quarter and expand as it proves out.

01 Locate your stage and name the system of record.

CONTEXT	You cannot plan an advance until you know where you sit and where the record must land.
PREREQUISITES	Your current inspection method and cadence; whether you already run Esri (ArcGIS); the process owner.
ACTIONS	Mark your stage on the ladder; confirm your ArcGIS tenant; name the one metric that proves today's cost (missed defects, re-keying hours, survey interval).
BEST PRACTICE & PITFALLS	Pick the metric before the tool. The quiet mistake is buying capture before deciding where the record lives and who owns it.

02 Turn on the Esri integrator and route the work.

CONTEXT	Start with automation on the records you already keep, at no cost and no capture.
PREREQUISITES	Your existing Survey123 / Field Maps records and an ArcGIS Online account.
ACTIONS	Connect your inspection records; enable work-order routing and the daily morning briefing; retire the standalone airfield-ops subscription it replaces.
BEST PRACTICE & PITFALLS	Deploy the airfield inspection schema once; from then on every pass is unchanged. Do not let the automation touch the compliance record; that line is deliberate.

03 Add screening passes for a continuous read.

CONTEXT	Between formal surveys, a screening pass gives you condition and trend across the whole airfield.
PREREQUISITES	A GoPro or phone mount on a vehicle already driving the movement areas; a recurring pass cadence.
ACTIONS	Run recurring passes; review flagged findings human-in-the-loop; build condition history and a portfolio view; export or push via API.
BEST PRACTICE & PITFALLS	Treat screening as screening: it prioritizes and warns, it is not FAA-accepted survey data. Say so internally so no one over-relies on it for reporting.

04 Advance to survey-grade capture and the FAA-acceptance path.

CONTEXT	When the record must carry the weight of Part 139 reporting, move to the LAIRA Rig.
PREREQUISITES	A scoped survey area; engagement with your FAA Airport District Office on an ACM amendment.
ACTIONS	Capture survey-grade with the Rig; build the inspection archive; assemble the validation package; support the ACM amendment naming the method.
BEST PRACTICE & PITFALLS	Acceptance is your FAA office's decision, not a vendor claim. A licensed professional engineer signs the compliance-grade determination; the software drafts, the engineer signs.

THE PROOF · SAN BERNARDINO INTERNATIONAL AIRPORT

A Part 139 airport ran the whole loop on its own vehicles, and the record changed.

San Bernardino International Airport (SBD) manages more than 1,300 acres of movement area. Working with Esri and Airwai, SBD put the LAIRA capture on vehicles already in service and published the outcomes into its own ArcGIS:

map layers of issue clusters, work orders in ArcGIS Field Maps, and a leadership dashboard. The findings cover pavement, foreign object debris, vegetation encroachment, and marking degradation, on a consistent objective baseline every shift.

Figure 5. LAIRA in the field at San Bernardino International Airport, capturing on the airport's own operations vehicles. SBD is a beta operating partner.

2M+

machine-ready data points captured per inspection pass.

Source: Esri published SBD case study.

3–7×

more surface anomalies per mile than manual inspection, in Esri's side-by-side comparison.

Source: Esri published SBD case study.

50%+

less field-validation time, in Esri's published estimate for the ArcGIS workflow.

Esri estimate (“could reduce”), not a measured Airwai result.

> **“By deploying AI-driven airfield intelligence within our GIS environment, we are demonstrating how airports can move from reactive operations to predictive, data-led management.”**
>
> Mike Burrows, CEO, San Bernardino International Airport

> **“Our team has a consistent, objective baseline across shifts and conditions, strengthening our compliance posture without adding burden to staff.”**
>
> Jonathan Galvan, Manager, San Bernardino International Airport

The deployment is documented in Esri's own transportation case study and in the ArcGIS Blog article “How GIS and AI Turn the SMS Mandate into Continuous Airfield Safety” (Esri, August 2026). The accumulated records build a persistent, map-based history that supports predictive maintenance and continuous Part 139 documentation, rather than an annual scramble.

THE PROOF · INDEPENDENT GROUND TRUTH

Tested the honest way, against a licensed engineer, on the same pavement, the same day.

Airport buyers rightly discount a vendor's own numbers. So the method was tested independently. At Wright-Patterson Air Force Base, a licensed civil engineer with the base civil engineer group hand-surveyed a set of pavement sample units, grading every distress by type and severity to the airfield standard (ASTM D5340). The same day, over the same areas, a LAIRA-equipped vehicle scanned and processed the pass. Neither side saw the other's work.

On the finding that matters most, the two agreed: both named the same unit as the worst pavement on the field, and both named the same dominant failure. Across the set, LAIRA's ranking of the units tracked the engineer's. The system's core job is to find real distress and rank the network, and on a blind, same-day test it agreed with an independent reference. The test was equally candid about limits, including where the system over-called a defect class, because an honest comparison is the point.

> **“We tested it the honest way: my team surveyed the pavement by hand, and the system scanned the same areas the same day, neither side seeing the other. Where it mattered most, the two agreed, including on the worst pavement on the field. An independent check like that is exactly what I want before we rely on any new tool.”**
>
> Maj Ryan Samolewski, 88th Operations Support Squadron, Wright-Patterson Air Force Base

EXHIBIT 4

The condition math is validated as arithmetic, and its boundary is declared.

Separate from the field test, the engine that computes airfield pavement condition draws its values from the FAA's own pavement-management system (PAVEAIR) and follows the published ASTM D5340 procedure. It reproduces every published value exactly and matches four independent worked examples from two engineering manuals, and it ships with a machine-readable acceptance suite of 1,887 checks at a one-in-a-million tolerance. That validates the computation. Producing an FAA-accepted condition result from field data is a separate bar, and we say so plainly.

Method note: engine arithmetic validated against FAA PAVEAIR (captured 31 July 2026) and four worked examples; field agreement is first-look and qualitative.

✓ **Straight talk:** nothing here is declared “validated” as a compliance-grade accuracy claim. Detection and ranking earned strong first-look agreement in a blind, same-day field test; the condition engine is validated as arithmetic. Every accuracy claim stays “not yet validated” until a completion run is scored, blind, and signed by a licensed professional engineer.

The same technology is being advanced through federal research and development in airfield pavement condition and foreign-object-debris detection. A completed research program does not, by itself, confer FAA acceptance; acceptance remains each airport's own regulatory step, described in the path above.

RUN THIS TO START

Your first-week runbook, before you talk to a vendor.

- ☐ **Locate** your current stage on the five-stage ladder.
- ☐ **Pull** the one metric that proves the status-quo cost: survey interval, re-keying hours, or missed-defect count.
- ☐ **Name** the process owner and confirm whether your condition record lives in Esri (ArcGIS).
- ☐ **Scope** one runway, taxiway, or apron segment for a bounded first pass.
- ☐ **Set** the success metric and a review date before anything is deployed.

WHERE TO START

Begin with automation you already qualify for; add capture when it earns the next rung.

STEP 0 · ZERO COMMITMENT

Stand up the Esri integrator

Connect your existing ArcGIS inspection records and see work-order routing and a morning briefing on your own data, free, with no capture.

STEP 1 · TIMEBOXED PILOT

A scoped screening or survey pass

One movement-area segment, a written success metric, and a review date, so the return is proven before you scale.

HOW TO PURCHASE

Registered, small-business, and available on the vehicles

you already buy through.

LEGAL ENTITY	Airwai, Inc. · Delaware C-corporation
HEADQUARTERS	13214 Crenshaw Blvd., Gardena, CA 90249
UEI	YAD4JA8BN6N6
CAGE	07Z17
EIN	99-3673785
NAICS	541330 Engineering Services (primary) · 488190 Air Transportation Support · 541511 Custom Computer Programming
BUSINESS SIZE	Small Business · SAM.gov registered & active

Contract vehicles & channels

- Cooperative purchasing: Sourcewell, OMNIA Partners, and NASPO ValuePoint (state and local, often exempt from separate competitive bid).
- Federal and SLED: GSA and, for defense airfields, Army and NASA software vehicles via our authorized distributor.
- Esri (ArcGIS) partner channel for airports already standardized on ArcGIS.
- Direct purchase and scoped pilots for sub-threshold engagements.

Ask us for the specific vehicle and quote for your jurisdiction; we route to the fastest compliant path for your procurement office.

STRAIGHT TALK ON THE CLAIMS IN THIS PAPER

Numbers from the San Bernardino deployment are drawn from Esri's published case study and blog; the "50%+ field-validation" figure is **Esri's estimate** ("could reduce"), not a measured Airwai result. The San Bernardino deployment is **live** (beta operating partner). The independent field test was **first-look and qualitative**; the condition engine is **validated as arithmetic** against the FAA's PAVEAIR values; **no accuracy claim is declared compliance-grade** until a completion run is scored blind and signed by a licensed professional engineer. Airwai delivers **outcomes** through your system of record and API, never raw labels or scores. Airfield pavement is assessed to **ASTM D5340** (not the roadway standard). We say **"FAA-accepted," not "certified,"** and FAA acceptance is your Airport District Office's decision on an ACM amendment. Automated safety notices are drafted and staged for a qualified human to file; the §139-qualified inspector signs every determination.

Airwai · Intelligence for critical infrastructure.

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