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GNSS Interference Monitoring for Airline Operations: OCC

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Executive Summary

GNSS interference monitoring for airline operations is best treated as an evidence-management task for the **operations control centre (OCC)**. A useful ground dashboard shows what each source observed, where, during which period, and with what limitations. It should distinguish **official notices**, **occurrence reports**, **derived aircraft observations**, and **operator-internal evidence**. The corrected **Safety Information Bulletin (SIB) 2022-02R4** from the **European Union Aviation Safety Agency (EASA)** is information only, with nonmandatory recommendations; the **US Federal Aviation Administration (FAA)** resource guide is also advisory rather than regulatory. Neither document makes an external map an approved operational decision system. (ad.easa.europa.eu) (www.faa.gov)

As of **6 October 2026**, the EASA regional tables display **7-day and 30-day windows dated 30 September 2026**, and the agency describes weekly updates. These are flight information region (FIR) indicators, with statistical conditions and occurrence cross-checking, rather than a diagnosis for every aircraft crossing an identified region. (www.easa.europa.eu) (www.easa.europa.eu) The original Revision 4 publication was **3 July 2026**; its correction is dated **22 July 2026**. (www.easa.europa.eu) (ad.easa.europa.eu) Source-version control therefore matters as much as map colour. The FAA's page date, **8 December 2025**, differs from its linked guide's **Version 1.1**, recorded **12 March 2026**. (www.faa.gov) (www.faa.gov)

The available maps measure different things. **GPSJAM** aggregates accuracy reports over **24 hours** and does not establish the cause of low accuracy. (gpsjam.org) (gpsjam.org) **EUROCONTROL AUGUR** shows previous-day automatic dependent surveillance-broadcast (ADS-B) observations within its indicated network coverage. (augur.eurocontrol.int) **GPSwise** advertises fleet, aircraft and FIR alerts, but its public documentation gate leaves detailed integration specifications unverified in this review. (gpswise.aero) (gpswise.aero) A page's refresh interval or a provider's published processing cadence should appear as that specific statement, not as a measured end-to-end latency or completeness guarantee.

The recommended design is a jurisdiction-labelled **source and confidence map**, with separate labels for authority, observation freshness, coverage, corroboration and reviewer status. Retain the original notice or report, explicitly label unavailable observations, and make escalation ownership visible. Access rights need their own review: OpenSky requires written permission for commercial use, while NAV CANADA distinguishes public access from licensed data products. (opensky-network.org) (www.navcanada.ca) Such a dashboard can support ground awareness and safety-data review. Its scope should remain explicit, with approved procedures, official briefing channels and accountable operator review retained as the decision framework.

Introduction and Background

Global navigation satellite system (GNSS) is the category of satellite-navigation systems; **Global Positioning System (GPS)** is one system within that category. (www.faa.gov) Jamming and spoofing belong to the wider problem of radio-frequency interference, but an external observation often cannot identify the physical cause. GPSJAM, for example, describes its evidence as aircraft reports of navigation-system accuracy and expressly limits causal interpretation. (gpsjam.org) (gpsjam.org) Airbus describes GNSS inputs to navigation, surveillance and communication functions, illustrating why the effects extend beyond a map position. (safetyfirst.airbus.com) The intended readers include airline OCCs, US Part 135 charter teams, European air operator certificate (AOC) holders, Canadian operators and business-aviation safety and information technology (IT) owners selecting ground-display sources.

The practitioner question is therefore narrower than whether a map can show an apparent hotspot. It is whether an OCC or safety-data owner can explain a displayed item well enough to use it as contextual evidence. A notice of planned activity, an aggregate accuracy anomaly, and a crew's recorded experience may refer to overlapping geography without describing the same event. The FAA's public GPS status page separates reported anomalies from scheduled testing, illustrating why these categories should remain visible. (www.fly.faa.gov)

This report examines public source documentation available on **6 October 2026**. It covers European, United States, Canadian and selected national sources, rather than claiming worldwide completeness. It separates documented capabilities from recommended dashboard design and distinguishes public access from integration entitlement. Where the review did not establish an application programming interface (API), licence, geographic cell size or latency commitment, that remains an explicit unknown.

The publishing brand is adjacent to this source category. **LANDING.AERO** describes custom flight-operations software and integration of existing data sources; it would be a possible **custom ground-system integrator**, rather than an originating GNSS-interference authority. (www.landing.aero) Any integration proposal should be evaluated against the operator's evidence requirements, access agreements and review workflow. The article does not assess aircraft certification, provide flight-deck handling instructions, or prescribe automated operational actions. Its deliverable is a source-selection and provenance framework that an operator's operations, safety and IT owners can review together.

Key Changes

Current documents need independent version checks

The corrected EASA registry entry identifies **22 July 2026** as its issue date and says the republication corrects editorial errors and improves consistency. The agency's announcement dates the original Revision 4 to **3 July 2026**. (ad.easa.europa.eu) (www.easa.europa.eu) A dashboard should therefore retain the document identifier, original publication date and correction date in separate fields. Treating a correction as a new observation would create misleading freshness.

The same principle applies in the United States. The FAA GNSS landing page is dated **8 December 2025**, while its linked resource guide records **Version 1.1 on 12 March 2026**. (www.faa.gov) (www.faa.gov) The page also says that links are rechecked quarterly, which is a maintenance statement about the resource directory rather than a GNSS observation cadence. (www.faa.gov) A review process should inspect the linked document's version, not infer it from the surrounding page's timestamp.

Regional indicators and event evidence now need distinct labels

EASA's affected-FIR method uses **Navigation Integrity Category (NIC) 7** as a boundary for position-report quality, requires adequate sampling conditions, and cross-checks reported occurrences. (www.easa.europa.eu) These ingredients justify describing an item as an **officially published regional indicator**. They do not turn the FIR boundary into an interference contour or establish that every flight inside it was affected.

AUGUR similarly distinguishes previous-day interference observations from prediction functions. Its help describes observations derived from **automatic dependent surveillance-broadcast (ADS-B)** NIC data and limits availability to indicated coverage. (augur.eurocontrol.int) (augur.eurocontrol.int) A ground product should preserve the distinction between observed interference context and navigation-service prediction, even when the layers appear in the same application.

Data-sharing initiatives do not establish unrestricted public feeds

EASA describes a shared Data4Safety workspace under joint activities planned for **2026**, intended to consolidate interference data and harmonise detection algorithms. (www.easa.europa.eu) Its broader **Data4Safety (D4S)** programme is a voluntary partnership drawing on several aviation datasets. (www.easa.europa.eu) These are relevant developments in source coordination, but they do not establish a public, licensed endpoint that an operator can immediately ingest.

The proposed change for OCC teams is procedural: assign a source owner who checks what is actually available before IT builds a connector. A published collaboration, a web map and a documented production feed should have different onboarding states. That distinction keeps promising future access from appearing as an existing capability.

Source and Confidence Matrix

Table 1 summarises the source inventory. Its ground-display roles are recommendations for a non-authoritative awareness dashboard, not grants of permission or approved operational uses. “Not verified” means the fetched public material did not establish the detail.

Source and custodian	Authority and jurisdiction	Geography and observation window	Collection and update	Uncertainty	Access and rights	Proposed ground role
EASA affected-FIR table	Official regional context; European aviation regulator	Named FIRs; 7-day and 30-day tables dated 30 September 2026. (www.easa.europa.eu)	ADS-B quality analysis with occurrence cross-checking; weekly publication. (www.easa.europa.eu)	Regional aggregation and sample sufficiency limit flight-specific interpretation.	Public webpage; no dedicated public GNSS data API identified in this review.	Dated regional context layer.
FAA GPS status	Official US air-traffic status display	Published location, altitude and affected-airspace fields. (www.fly.faa.gov)	Reported anomalies and scheduled testing are separate; page refreshes every 5 minutes. (www.fly.faa.gov)	Refresh is not event age; fetched tables did not expose usable event rows.	Public web display; specific interference-feed contract not verified.	Link to source; retain notice/report distinction.
NAV CANADA Notice to Airmen (NOTAM) services	Canadian aeronautical-information custodian	Geographic and route searches; item-specific validity. (www.navcanada.ca)	Canadian notices use International Civil Aviation Organization (ICAO) format. (www.navcanada.ca)	Notice issuance and absence do not establish complete detection coverage.	Public browsing and commercial data licensing are different arrangements. (www.navcanada.ca)	Official notice references with identifier and validity.
AUGUR, EUROCONTROL	European official monitoring tool	Previous-day interference inside indicated ADS-B coverage. (augur.eurocontrol.int)	Observed NIC layer alongside other GNSS functions.	Coverage boundary matters; observations and predictions must stay separate.	Web access and API are documented; interference-specific contract details need confirmation. (www.eurocontrol.int)	Coverage-labelled historical context.
GPSJAM	Independent derived-data map; no regulatory jurisdiction	Hexagonal aggregation over 24 hours. (gpsjam.org)	Aircraft accuracy reports; daily update described by maintainer.	Low accuracy does not establish its cause.	Public map; commercial ingestion and reuse rights not verified.	Exploratory anomaly context with date and method.

Source and custodian	Authority and jurisdiction	Geography and observation window	Collection and update	Uncertainty	Access and rights	Proposed ground role
Flightradar24 map	Provider-derived map	Documented six-hour or 24-hour resolution. (www.flightradar24.com)	NIC-based calculations with flight and terrestrial receiver sufficiency.	Published methodology is dated July 2024. (www.flightradar24.com) Access/coverage need current review.	Map visibility does not establish a commercial embedding licence.	Supplemental comparison layer.
GPSwise / SkAI	Commercial provider-derived product	Worldwide ADS-B mapping described by provider. (www.skai-data-services.com)	Provider describes maps, alerts, analytics and API access. (gpswise.aero)	Precise cell resolution, coverage guarantees and contractual latency not verified.	API documentation is password-gated. (gpswise.aero)	Candidate licensed feed, subject to technical and rights review.
Traficom statistical monitoring	Finnish national authority	Finland; statistics updated 2 October 2026. (tieto.traficom.fi)	Reports supplemented by frequency and ADS-B monitoring.	Reporting criteria changed; totals are not direct prevalence measurements. (tieto.traficom.fi)	Public statistical page; integration entitlement not established.	National background and methodology context.
Operator-internal reports	Operator custody; applicable local reporting framework	Recorded flight segment, equipment context and report period	Company intake, reconciliation and reviewer workflow	Reporting delay, incomplete detail and duplicated evidence require review.	Operator access controls and retention policy	Flight-linked evidence queue, without automatic cause attribution.

The matrix's principal value is separation. Official provenance increases confidence about who published an item; it does not increase geographic precision beyond the source's method. Conversely, a detailed aircraft observation may be geographically useful while retaining uncertainty about cause. The dashboard should show both properties rather than rank every row on a single scale.

EUROCONTROL also documents **SHERLOCK**, including its **GNSS Radio Frequency Interference Detector (GRID)**. Access is intended for stakeholders with validated need and requires authentication, role-based permissions and acceptance of data-use policies. (www.eurocontrol.int) It belongs on the enquiry list for eligible operators, but should not be represented as an unrestricted public feed.

Implementation Considerations and Process Changes

Preserve a record before drawing a marker

The recommended unit of ingestion is an **evidence record**, not merely a coloured map cell. Each record should retain its source classification, original wording or licensed payload, relevant timestamps, geographic scope and current review state. This is a proposed data model, informed by the sources' differing methods. The FAA anomaly form, for example, requests start/end locations and warns that affected aircraft-system time should not determine the reported start date. (www.faa.gov) (www.faa.gov)

Table 2 sets out fields that allow a reviewer to explain a dashboard item without mistaking display convenience for source precision.

Field group	Recommended stored evidence	Display or review purpose
Provenance	Custodian, source URL, document version, original item identifier, retrieval result	Identify the publisher and permit return to the source.
Jurisdiction	Issuing authority, notice jurisdiction, applicable reporting channel	Avoid extending a national reporting arrangement to another state.
Time	Observation start/end, publication time, retrieval time, display time, timezone quality	Separate historical coverage from processing freshness.
Geography	Source FIR, cell, point or polygon; altitude bounds if supplied; original resolution	Prevent conversion of a coarse region into an implied precise contour.
Method	Notice, occurrence report, NIC aggregate, provider detection, internal report	Make heterogeneous evidence distinguishable.
Coverage	Source coverage statement, sample availability, missing geography, missing time bins	Distinguish unavailable observations from negative observations.
Corroboration	Independent supporting records, upstream dependencies, contradictions	Avoid counting repeated derivatives as independent confirmation.
Rights and review	Licence reference, allowed audience, retention limits, reviewer, unresolved questions	Keep access entitlement and accountable interpretation visible.

The fields are intentionally orthogonal. A record can have high confidence in source identity but uncertain time; another can have a precise observation interval but unknown spatial coverage. Collapsing those dimensions into an unexplained confidence percentage would hide the issue the OCC most needs to inspect.

Use explicit confidence labels

The following proposed labels avoid implying a calibrated probability where none has been established:

- **Authority:** official notice, official contextual publication, provider-derived observation, or operator report.
- **Freshness:** current within the source's stated window, historical, delayed, or timestamp unknown.
- **Coverage:** documented within footprint, sparse sampling, outside footprint, or footprint unavailable.
- **Evidence status:** single source, corroborated, contradictory, awaiting review, or withdrawn.

- **Cause status:** source-attributed jamming, source-attributed spoofing, nonspecific accuracy anomaly, or unresolved.
- **Review ownership:** named responsible team, last review time, and next review trigger.

These are editorial and system-design recommendations, not confidence categories asserted by a regulator. They should be defined in an operator-owned data dictionary before use.

Keep automation bounded to evidence handling

Automation can fetch permitted records, check schemas, calculate elapsed time, detect changed documents and create a review task. A source failure should produce a visible unavailable state with the last successful retrieval time. A parser should not silently reuse an old observation as current data. Source-link maintenance is also a separate responsibility; the FAA explicitly acknowledges that linked documents may change between checks. (www.faa.gov)

If an operator introduces automated summarisation, retain the original evidence and require review of any generated statement that changes source scope, certainty or timing. The source record should remain inspectable independently of the summary. A useful acceptance exercise is to ask a reviewer to reconstruct the item's provenance and age from the interface alone.

Reports, Notices and Contradictory Evidence

A report is an observation, not a complete population

The **FAA GPS anomaly form** is a reporting channel, with fields for effects, timing and location. (www.faa.gov) NAVCEN currently directs aviation anomaly submissions, domestic and international, to that FAA channel. (www.navcen.uscg.gov) GPS.gov separately describes outside-US aviation support through NAVCEN. (www.gps.gov) These statements address different support and submission contexts; they do not replace the reporting arrangements of the state or operator concerned.

For Canada, **Transport Canada CASA 2024-10** asks operators experiencing interference to report to **air traffic services (ATS)** as soon as possible. (tc.canada.ca) The UK Civil Aviation Authority (CAA)'s **SN-2025/006** describes normal company safety reporting and references the UK's applicable occurrence-reporting framework. (www.caa.co.uk) An OCC dashboard should therefore retain both the operator's internal record and the status of any required external report, with the jurisdiction named. The reporting team should validate current requirements against its approved process.

NAVCEN's **GUIDE** heatmap offers a useful caution: the agency explicitly says that the display does not delineate real-world impacted areas. (www.navcen.uscg.gov) Its default period is the last **30 days**. (www.navcen.uscg.gov) A visually persuasive heatmap can still be a display of submissions rather than a measured exposure boundary.

A notice describes published information and validity

Canadian **Notice to Airmen (NOTAM)** procedures allow the responsible control-centre manager to issue a loss-of-GNSS notice following multiple pilot reports, with the report threshold at managerial discretion. (www.navcanada.ca) That provides a concrete reason not to equate notice presence with a standardized detection threshold. The reviewed NAV CANADA operational-guides page identifies **14 May 2026** as the current Canadian NOTAM Operating Procedures (CNOP) effective date. (www.navcanada.ca)

For dashboard purposes, preserve a notice's identifier, issuing authority, original text, validity period and cancellation or replacement status. Keep planned interference activity separate from observed effects. A matching notice may provide context for a report, but matching geography alone is not causal verification.

Contradictions should remain visible

Suggested review rules are:

- **Retain scope:** compare FIR evidence with FIR evidence before drawing flight-specific conclusions.
- **Align time:** overlapping publication dates do not ensure overlapping observation windows.
- **Check method:** NIC quality, pilot narrative and spectrum measurements answer different questions.
- **Trace dependencies:** two maps sharing upstream observations may provide limited independent corroboration.
- **Record disagreement:** show both source records and the reason a reviewer has not reconciled them.
- **Avoid absence claims:** missing cells, empty rendered tables and missing notices require distinct labels.

EASA's combination of derived indicators with occurrence cross-checking illustrates the importance of preserving multiple evidence types. (www.easa.europa.eu) The proposed dashboard should support that review pattern while retaining the limitations of each source.

Access, Licensing and Vendor Review

Public availability is separate from system entitlement

OpenSky's current terms require written permission for commercial use and also address operational representational state transfer (REST) API licensing. (opensky-network.org) (opensky-network.org) ADS-B Exchange distinguishes its community API as personal and noncommercial, while its data-use policy makes sharing and derivative uses conditional on explicit authorization. (adsbexchange.com) (support.adsbexchange.com) The current linked JETNET terms require permitted data, workflows and functionality to be specified in the relevant order form. (www.jetnet.com) These documented conditions are procurement inputs, not judgements about the providers.

NAV CANADA's website terms address integration of its site or underlying database into software, while its data-sales page describes commercially licensed annual subscriptions. (www.navcanada.ca) (www.navcanada.ca) A browser workflow can therefore be practical for a manually reviewed source inventory without establishing permission to build an automated production connector.

EASA's general copyright notice allows reproduction with acknowledgement subject to stated exceptions. (www.easa.europa.eu) Its generic RSS page describes feeds by content type; no dedicated machine-readable GNSS FIR feed was identified in the fetched material. (www.easa.europa.eu) The correct procurement statement is “public feed not verified in this review,” followed by a custodian enquiry, rather than a categorical claim that no feed exists.

Ask for the operational details the public page omits

GPSwise documents alert configuration for fleets, aircraft identifiers and FIRs, while its API documentation is gated. (gpswise.aero) (gpswise.aero) AUGUR documents an API, but the publicly fetched material did not establish a contractual interference-specific endpoint and service level. (www.eurocontrol.int) Generic FAA **System Wide Information Management (SWIM)** connectivity is also documented; that alone does not identify a GNSS-interference dataset. (www.faa.gov)

Before selecting a feed or manual process, ask:

- **Dataset:** which observations, fields and event definitions are included?
- **Coverage:** which receiver footprints, altitudes, FIRs and sampling exclusions apply?
- **Time:** what is the observation window, publication cadence and backfill behaviour?
- **Delivery:** is access a webpage, export, supported API, message stream or authenticated workspace?
- **Uncertainty:** are sample counts, detection rules and confidence definitions supplied?
- **Rights:** may data be stored, transformed, displayed to OCC staff and shared with contractors?
- **Dependencies:** which upstream networks or third-party datasets are involved?
- **Continuity:** how are feed failures, schema changes, corrections and withdrawn records communicated?
- **Support:** who resolves disputed records and licensing or coverage questions?
- **Evidence:** can the operator retain the original item and an audit trail of revisions?

An evaluation should include a representative sample under the intended licence, with documented acceptance criteria. Product labels such as “live” and “worldwide” should remain attributed capabilities until actual coverage and delivery are assessed for the operator's intended geography.

Data Analysis and Evidence

Compare clocks before comparing maps

Time labels should use **Coordinated Universal Time (UTC)** and identify any source time that cannot be normalized reliably.

Table 3 collects verified dates and cadence statements. None is presented as a universal interference-detection benchmark.

Source	Verified date or interval	Meaning and limitation
EASA SIB	Original 3 July 2026; correction 22 July 2026. (www.easa.europa.eu) (ad.easa.europa.eu)	Document-version dates, not event observations.

Source	Verified date or interval	Meaning and limitation
EASA FIR overview	7-day and 30-day windows, dated 30 September 2026. (www.easa.europa.eu)	Aggregate regional observation windows; published weekly.
FAA guide and page	Page 8 December 2025; guide Version 1.1, 12 March 2026. (www.faa.gov) (www.faa.gov)	Distinct page-maintenance and document-version metadata.
FAA GPS status	Page refresh every 5 minutes. (www.fly.faa.gov)	Display refresh, not a guarantee that all observations are five minutes old.
GPSJAM	24-hour aggregation; daily update after midnight UTC. (gpsjam.org)	Historical aggregate, rather than instantaneous exposure.
AUGUR interference	Previous-day ADS-B observations. (augur.eurocontrol.int)	Coverage-limited historical layer.
GPSwise release	Provider announcement describes jamming-data updates every 10 minutes. (gpswise.aero)	Dated provider claim, not independently measured end-to-end latency.
NAV CANADA CNOP	Current issue effective 14 May 2026. (www.navcanada.ca)	Procedure publication, separate from each NOTAM's validity.

The table shows why a single “last updated” label is insufficient. A recent download may contain a prior-day observation; a current document may describe a process rather than the current environment. Reviewers need the clock relevant to the question they are asking.

Interpret prevalence figures within their collection methods

IATA reported a **220% increase in GPS signal-loss events between 2021 and 2024**, attributing the figure to its Global Aviation Data Management **Flight Data eXchange (FDX)** dataset. (www.iata.org) FDX is an aggregated, de-identified database contributed to by participating airlines. (www.iata.org) The public release does not supply annual flight denominators for the growth statement. Consequently, it should not be restated as a percentage of all flights, a worldwide spoofing rate or a route-specific probability.

OPSGROUP published its GPS Spoofing WorkGroup report on **6 September 2024** and reports **almost 2,000 completed flight-crew surveys**, separately from its **950 project participants**. (ops.group) These are different populations. The fetched publication page did not establish a representative sampling frame, so survey participation should be treated as evidence of the report's collection method, not a prevalence denominator. Its historical report is a research reference, rather than a current OCC telemetry feed.

Scientific work also illustrates why confidence needs method-specific interpretation. A **2026 arXiv preprint** notes that ADS-B quality indicators may remain high during abnormal reported-position behaviour and that heterogeneous receiver timestamping can produce apparent speed spikes. (arxiv.org) (arxiv.org) Those observations support asking for timing controls and multi-aircraft consistency checks; the preprint is not a validation of a commercial product.

The preferred data analysis for an individual operator is therefore a quality analysis of the selected sources. Track missing timestamps, unsupported geography, licence status, record duplication and reviewer disagreement. These measures assess whether the dashboard is explainable. They do not estimate the

probability that the next flight will encounter interference.

Suggested pilot-evaluation measures include:

- **Window completeness:** records with explicit observation start and end.
- **Geographic completeness:** records retaining the source's original footprint and resolution.
- **Provenance completeness:** records with a reachable original item and version.
- **Coverage visibility:** periods clearly marked as unavailable or outside footprint.
- **Reviewability:** unresolved discrepancies retained with accountable ownership.
- **Rights completeness:** datasets with documented permission for the intended display and retention.

Publish these definitions before collecting results. Any later performance claim should identify the measured population, timeframe and method, rather than relying on a provider's refresh statement.

Stale or Contradictory Sources (Hypothetical Example)

This example is **illustrative**. Its timestamps and records are invented to demonstrate provenance arithmetic; they are not a measured latency benchmark, an actual interference event or an operator case study.

Suppose an aggregate observation window ends at **18:00 UTC on 30 September 2026**. Its publisher releases the item at **06:00 UTC on 1 October**. A permitted connector retrieves it at **08:00**, and the dashboard displays it at **08:15**. The observation-end age is therefore **14 hours 15 minutes**, while the ingestion age is only **15 minutes**. The elapsed-time breakdown is **12 hours** to publication, **2 hours** to retrieval and **15 minutes** to display. The calculation uses the same UTC timeline throughout.

Showing only “updated 15 minutes ago” would describe ingestion and leave the observation's age hidden. The proposed label would instead say “observation ended 14 hours 15 minutes ago; retrieved 15 minutes ago,” with the source window and retrieval status available on inspection. These are distinct facts about the hypothetical record, even though both labels use elapsed time.

Now suppose a newer operator report describes an accuracy anomaly inside the same FIR, while a public map has no coloured cell at that location. The records cannot be reconciled from colour alone. The map may have a different window or inadequate observation coverage; GPSJAM explicitly describes missing receiver or aircraft input as possible reasons for uncoloured areas. (gpsjam.org)

The review queue would retain both records and check:

- **Overlap:** whether the observation periods and altitude bounds actually coincide.
- **Footprint:** whether the source collected relevant data in that location.
- **Method:** whether the map's accuracy indicator matches the report's stated evidence.
- **Independence:** whether another apparent corroborating map uses the same upstream input.
- **Outcome:** the reviewer's explanation, remaining uncertainty and next review trigger.

The example's lesson is about evidence presentation. The dashboard should make the disagreement intelligible and support operator review, without generating a flight instruction or treating a missing map cell as reassurance.

Implications and Future Directions

The useful near-term architecture is a source registry plus an evidence store and review workflow. It need not begin with automated ingestion of every public map. Start with sources whose authority, access and interpretation can be explained; add connectors only when the intended use and rights have been verified.

ICAO's short-term GNSS radio-frequency interference roadmap emphasizes awareness, continuity and contingency arrangements. (www.icao.int) It is a framework for coordination, rather than a live geographic interference feed. A source catalogue should therefore distinguish policy and procedure resources from observation datasets, even when both are relevant to monitoring.

For integration work, the operator should define requirements before commissioning a dashboard. LANDING.AERO's first-party description includes integration of disparate sources and custom operations dashboards, making it a possible supplier for that ground-system work. (www.landing.aero) The same evaluation should apply to any custom integrator: source permission, explicit data models, failure visibility, change handling and review ownership. This is separate from acquiring an approved operational product or service when that is the actual requirement.

A **2021 peer-reviewed study** used real OpenSky data with simulated attacks, so its experimental detection results should not be presented as live-airline dashboard performance. (pmc.ncbi.nlm.nih.gov) This is a reason to request deployment-specific evidence when assessing future monitoring claims.

A practical ownership model is:

- **Operations owner:** defines the contextual questions and permitted dashboard role.
- **Safety-data owner:** defines report classification, reconciliation and escalation workflow.
- **IT owner:** manages connectors, timestamp handling, access controls and failed retrievals.
- **Data custodian contact:** confirms rights, schemas, source changes and coverage statements.
- **Accountable reviewer:** resolves contradictory records and documents remaining uncertainty.

Future source-sharing improvements may make coordination easier. They should still be evaluated through published schemas, coverage statements, access arrangements and measured delivery evidence. A new alert service becomes useful when an operator can explain what triggers it and what it does not observe. The fundamental requirement remains a traceable link between each dashboard statement and the evidence that supports it.

Frequently Asked Questions (FAQs)

Can a FIR indicator establish that a specific flight was affected?

A regional indicator should remain labelled at the source's granularity. Review relevant flight-linked records before drawing flight-specific conclusions; preserve uncertainty rather than extending a regional classification to every crossing.

Is a GNSS interference map also a spoofing detector?

That depends on the method. GPSJAM does not establish the cause of reported low accuracy. (gpsjam.org) Providers that describe spoofing detection should supply definitions, validation evidence and uncertainty details before their categories are adopted in an operator's dashboard.

Does a public map imply an available API or reuse licence?

Public visibility establishes browsing access, not the intended integration entitlement. OpenSky's commercial-use permission requirements and NAV CANADA's licensed data arrangements illustrate why rights need separate verification. (opensky-network.org) (www.navcanada.ca)

Who should own a stale-data or conflicting-source escalation?

The recommended design assigns a named operations or safety-data review owner, supported by IT for retrieval failures. Show the last successful retrieval, source observation window, unresolved contradiction and next review trigger. The owner and thresholds should be defined in the operator's process before launch.

Conclusion

GNSS interference monitoring for airline operations should produce an explainable picture of evidence. That picture needs a jurisdiction-labelled source inventory, preserved observation windows, explicit coverage limitations and a review workflow for contradictory records. A map is useful when its meaning can be reconstructed from the underlying source; visual detail alone is insufficient.

The report's source matrix separates official regional context, official notices, reported occurrences, derived ADS-B observations and operator-internal evidence. These categories can complement one another, provided the dashboard retains their differences. Document corrections, historical aggregation and processing cadence should remain separate metadata rather than being merged into a single freshness label.

Source selection also requires practical access decisions. A public page, a documented API and a licensed production feed are different delivery arrangements. The operator should establish permitted audiences, transformations, retention and redistribution before commissioning connectors. It should retain visibility of source failures and missing coverage throughout normal use.

The resulting ground dashboard can support OCC awareness and safety-data review with a modest, explicit claim: it shows what selected sources reported or inferred, within stated limits. Confidence should describe provenance, freshness, coverage and corroboration rather than imply a certified aircraft position or an unsupported forecast. Named ownership, source links and retained evidence make that boundary inspectable and give operations, safety and IT staff a common basis for review.

Source links

Links cited in this article, in order of first appearance. Full addresses are provided for readers using extracted text.

1. https://ad.easa.europa.eu/blob/EASA_SIB_2022_02R4_C1.pdf/SIB_2022-02R4_1

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