

avDmf

Monitoring of aircraft noise and of noise-abatement procedures, **flight by flight and in real time.**

Summary of the technical report · Athens International Airport (LGAV)
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7

rules checked

3.5 m

flight positions

minutes

from event to finding

Two clarifications that apply to everything that follows

- **We draw a strict line between measurement and sanction.** The system measures, records and documents. It imposes no sanction, does not interfere with the operation of the aircraft, transmits no signal to the crew and removes no competence or discretion whatsoever from the commander or from the supervising Authority.
- It produces data. **Their assessment, the weighing of safety exemptions and any imposition of sanctions belong exclusively to the competent Authority.**
- **Whatever is described as existing, works.** This is not a feasibility study: the system is in production on the real movements of the airport, and the figures quoted come from the production database.

PART 1

The system as it stands

What is working today, in a production environment.

What is working today

Four limbs, all in production.

1

Collection

Own ADS-B receivers, merged streams, redundant coverage. Automatic archiving of METAR/TAF per airport.

2

Evaluation

Per flight and continuous — no nightly or monthly batch processing. Seven rules whose parameters live in a database table.

3

Documentation

A complete dossier per finding, exported to a text document: map, charts, sampled track, METAR, exemptions.

4

Notification

Push / SMS / e-mail to a defined list of recipients, within minutes of the event.

1.1 Data collection

Primary data, traceable down to the individual receiver.

- Monitoring is carried out with **own ADS-B receivers** (up to three), with the streams merged and with redundant coverage.
- Every track position is stored together with **the identity of the receiver that captured it**, with a timestamp and with the fields for position, altitude, speed, track, vertical rate, callsign and aircraft identifier — in a geospatial database.
- The data are **not drawn from commercial or free online aggregation services** and undergo no intermediate processing by a third party. This is critical to their evidential value.
- In parallel, **METAR/TAF are received and archived automatically per airport**, so that every event is accompanied by the meteorological conditions prevailing at the time.

1.2 Real-time evaluation

There is no nightly or monthly batch processing. Evaluation is per flight and continuous.

Moment	Action
During the flight	Every 20 airborne positions the full set of rules is evaluated; anything detected is recorded immediately and triggers a notification.
On closure of the flight	Final evaluation over the complete track (at 6,000 ft or after 15 minutes without signal).
On restart of the application	Flights left open are closed and evaluated, so that no movement is lost.

*The process can be repeated without a duplicate entry being recorded for the same flight: each new evaluation replaces the previous ones. In practice the finding exists and has been notified **within minutes of the event, not the following month.***

1.3 The rules checked and their regulatory basis

The parameters of each rule are held in a database table and are changed from the administration interface, with no change to the code.

Code	What is checked	Regulatory basis	Thresholds
nadb_thrust_reduction	Early reduction of take-off thrust	AIP GREECE LGAV AD 2.21.3(a)	below 1,800 ft MSL
nadb_acceleration	Early acceleration above the initial climb speed (V2+10)	AIP GREECE LGAV AD 2.21.3(a)	below 3,300 ft MSL · +10 kt
sid_horizontal	Horizontal track deviation from the published SID	AIP GREECE LGAV AD 2.21.3(b)	below 1,800 ft
tango_takeoff_point	Roll started outside the first 300 m of the runway	TANGO procedure / SID 4 RWY 03R	300 m · 30 kt
tango_speed_change	Initial speed changed by more than 10 kt	TANGO procedure	up to 3,300 ft
tango_course_change	Course changed before 4,300 ft	TANGO procedure · AD 2.21.3(b)	20° · up to 4,300 ft
speed_limit_low	Exceeding 250 kt below 10,000 ft	General speed limit	250 kt + 10 kt tolerance

The NADP-A procedure is checked **in all three of its limbs** — no thrust reduction before 1,800 ft, no acceleration before 3,300 ft and adherence to the published SID — and not only as regards the initial climb speed.

1.4 Metrological care

The design is asymmetrically conservative: we would rather no finding were issued than issue one that cannot be substantiated.

Barometric correction (QNH)

ADS-B altitudes are pressure altitudes. Without correction the error against true MSL reaches ± 500 ft. The system reduces altitudes to MSL automatically, using the QNH of the nearest METAR, before every comparison, and states the correction in the finding.

Runway elevations & two samples

Measurement zones are defined above the elevation of the specific runway. Every change detection requires **two consecutive samples**, so that momentary measurement noise is excluded.

Coverage interlocks

A check runs only where the ground track is continuous and the aircraft has been measured essentially stationary before the roll. Where coverage is fragmentary, **the rule is skipped** rather than producing an unsupported finding.

Speed correction & scope

The 250 kt limit refers to indicated airspeed whereas ADS-B transmits ground speed; a correction is applied. The horizontal track check is restricted to jet aircraft until separate corridors are defined per category.

1.5 Exemptions — the system does not check what need not be checked

Exemption is decided at three levels and recorded explicitly.

1

By aircraft type

Propeller aircraft with MTOW up to 5,700 kg (explicitly under AIP AD 2.21.3a), helicopters, purely military types (Chicago Convention, Article 3), firefighting types.

2

By aircraft

Ordinary civil types belonging to a state body — military, coastguard, police, air ambulance, government — automatically identified from the owner or operator.

3

By flight

From the callsign: the relevant exemptions attach to **the mission, not to the aircraft** — the same helicopter may fly a commercial flight today and a medical transfer tomorrow.

The applicability or exemption decision is stored as a snapshot in each flight's record, so that the entry documents the regime in force at the time of the event — even if the legislation changes later.

1.6 The evidence dossier

For every violation finding a complete dossier is produced automatically, exported to a text document.

- **Flight details** — date and time, flight id, callsign, aircraft type, registration, runway, airport.
- **A description of the violation** with the measured value and a reference to the rule breached.
- **The track rendered on a map** together with the approved SID.
- **Charts** of altitude against distance, of speed and of deviations.
- **A 50-point sampled track** — altitudes, distances from the threshold, times, speeds, geometry.
- **The METAR for the hour of the event.**
- **An explicit statement of applicability or exemption** from the procedure.

1.7 Current figures from the production database

Reference date: 04/08/2026.

3,506,770

recorded flight positions

19,853

flights

9,186

flights with violation findings

3,203

aircraft on the registry

132 / 213

aircraft types / operators

4–6 min

full re-check of one month of traffic

*In the preliminary phase, 4,200,000 track records were processed for a single month, of which 1,900,000 concerned movements to and from the airport up to 10,000 ft. A full month of traffic loads in about 15 minutes — **a complete re-check is a matter of minutes, which allows any third party to verify the results.***

PART 2

The planned extensions

An acoustic subsystem, and detection of reverse thrust on landing.

2.1 Acoustic subsystem

Measurement of instantaneous level per event — not an area average.

What is installed

Permanent **Class 1** sound monitoring stations (IEC 61672-1), with an IEC 60942 acoustic calibrator and traceable calibration, following **ISO 20906** (unattended monitoring of aircraft sound). LAFmax (Fast, 125 ms) and a 1/3-octave spectral signature are recorded, GPS time-synchronised.

The transport already runs as a pilot

Test instruments are connected to avDmf over MQTT with TLS, with automatic rejection of duplicate messages and recovery after a network outage. For instruments that send files at fixed intervals, a gateway reads the continuous serial output (one line every 0.5 s) and forwards it live — a notification within 1–2 seconds — while downloading the original files as evidence, with CRC and SHA-256.

What it adds

For each individual movement a time series of instantaneous level is produced, correlated with a specific flight through the ADS-B track. That is, an answer not to the question “how loud is the area on average” but to the question “**which aircraft, at what time, under which procedure and at what level**”.

The same architecture serves, without change, the permanent Class 1 stations of the production phase.

2.2 Detection of reverse thrust on landing

A six-stage algorithm.

1

Touchdown trigger

Touchdown from ADS-B: timestamp and runway.

2

Analysis window

The first ~15–20 seconds of the rollout — where reverse thrust is applied.

3

Onset detection

A sharp rise in LAFmax combined with a broadband spectral signature. The distinction is not a fine one: reverse above idle raises engine speed substantially and produces a clearly distinguishable component.

4

Spatial check (TDOA)

With three stations it is confirmed that the source is moving along the runway axis at landing speed — ground vehicles, other aircraft and other sources are rejected.

5

Classification

idle / above-idle, with a threshold calibrated per aircraft type.

6

Evidence dossier

Flight details, level time series, spectrum, TDOA result, confidence level, METAR, cross-check of the same registration on other landings, calibration certificates.

Two design choices we regard as non-negotiable: **(a)** zero false positives as the priority — a high confidence threshold, double confirmation and **a human in the loop before any issuance**; **(b)** calibration against ground truth from the flight data of a co-operating operator during a pilot phase.

PART 3

Usefulness in verifying the measures

What it actually makes possible, beyond recording.

3. Usefulness in verifying noise-abatement measures

- **3.1 Verification of compliance, movement by movement.** For every departure it is documented whether all limbs of NADP-A, of TANGO and of the published SID were observed; for every landing, whether reverse above the permitted setting was used. This is neither sampling nor statistical estimation — it is a census.
- **3.2 Identification of the noise source.** The combination of acoustic measurement and ADS-B track answers the question that no system designed for average indices can answer: which specific movement caused the specific nuisance. That is the precondition for any targeted measure and for any credible answer to a resident's complaint.
- **3.3 Assessment of how effective the measures are.** Because the complete primary data are retained, before-and-after comparison is possible for any measure applied: the change in compliance rate by operator, aircraft type, runway and hour of the day, against the measured level in the settlements.
- **3.4 Night operations.** The same checks are applied with separate thresholds and separate reporting for the night period, where the nuisance weighs disproportionately more.
- **3.5 The usefulness runs both ways.** The same data also protect the party being checked: the archiving of meteorological conditions, the recording of NOTAM and the computation of exemptions allow it to be objectively documented that a deviation was due to operational reasons or to an air traffic control instruction.

PART 4

Effectiveness

A position on the technical claims. The legal assessment belongs to counsel and to the Court.

4.1 “A full NADP-A monitoring mechanism already exists”

It is not disputed that a monitoring mechanism has been developed and that sanctions have been imposed. The following technical observations are submitted.

(A) TIMING

The check is retrospective and monthly, not in real time. The greater the distance from the event, the harder it is to retrieve the accompanying material and the weaker the deterrent effect. In avDmf the finding exists and is notified **within minutes**.

(B) COVERAGE

Checks on 19,061 flights over twelve months are reported — on average 1,400–1,500 flights a month. That number should be set against the total number of departures, so that the real coverage rate emerges. avDmf checks **every movement** the receivers capture, without sampling.

(C) SUBJECT MATTER

The violations identified concerned “exceeding the initial climb speed” — one of the limbs of NADP-A. It does not appear that the thrust-reduction altitude, adherence to the published SID or the TANGO procedure are systematically checked.

(D) NATURE OF THE SOURCES

The tools listed include open flight-tracking applications. These are aggregated data from a third-party provider, with a processing chain unknown to the user. For the purposes of an administrative sanction or of use in court, the difference from a primary capture by an own receiver is material.

4.1 (e) The divergence in the results

The two figures are not directly comparable — but the divergence is of an order that cannot be explained by that alone.

584 / 19,061

violations against flights checked, per the Authority's figures (3%)

9,186 / 19,853

flights with findings against the total, in the avDmf production database

- avDmf checks **seven rules**, whereas the available material indicates that mainly one is checked.
- A single flight may breach **more than one rule**.
- The avDmf entries are **findings**, which have not been through the examination of justifying safety reasons.

*We state that we place **the whole of our primary data at the disposal of the Authority**, precisely so that this divergence can be investigated jointly.*

4.2 “There is no competence to monitor instantaneous level”

THE CLAIM

No national maximum limit for instantaneous emission has been established, and the competence to establish one rests with the Ministry of Environment and Energy.

THE TECHNICAL POSITION

The premise is accurate; the conclusion does not follow. **Measuring and archiving the instantaneous level do not presuppose the existence of a limit — it is the other way round:** no limit can be set, or even discussed, without prior systematic measurement.

INTERNATIONAL PRACTICE

The report itself cites instantaneous noise limits at airports abroad, on which fines are imposed. Those limits are, by definition, **measured** — an internationally operating practice of per-event measurement therefore exists.

THE MATERIAL GAP

The argument about limits rests on **type noise certificates** (ICAO Annex 16) — values obtained from tests under standardised conditions. Certification attests what an aircraft **may** emit; it does not attest what the specific movement emits over the specific dwelling.

4.3 “Monitoring reverse thrust is technically impossible”

(A) THE EXISTING SYSTEM CANNOT ISOLATE THE COMPONENT

Correct — and to be expected. Such systems were designed for total exposure using weighted long-term indices, with stations under the flight paths and outside the perimeter. **That an instrument designed for another purpose does not serve this one does not prove technical impossibility — it proves that a different measurement arrangement is required.**

(B) A SINGLE NOISE VALUE DOES NOT PROVE THE USE OF REVERSE

Correct as to the premise, mistaken as to the conclusion. Nobody proposes a judgement based on one value. **Three independent axes must agree simultaneously:** temporal (a narrow window after touchdown, known from ADS-B), spectral (the broadband signature of a spooled-up engine) and spatial (the source moves along the runway axis).

(C) NO COMPARABLE MECHANISM EXISTS AT ANY INTERNATIONAL AIRPORT

The observation may be accurate, but it is not a technical argument of impossibility. **The absence of precedent establishes that the undertaking is novel — not that it is unachievable.** The question put to the manufacturer was whether an off-the-shelf module exists; a negative answer to that is not the same as technical impossibility.

We fully accept that a novel system must be assessed rigorously. That is precisely why we propose a pilot phase with calibration against flight data and human approval before any issuance.

4.4 “There is a risk to flight safety”

We agree without reservation that flight safety prevails over any environmental objective.

THE SYSTEM IS PASSIVE AND EXTERNAL

It is not on board the aircraft, does not communicate with the crew, produces no indication in the cockpit and changes nothing about the means available to the commander. As far as the operation of the flight is concerned, it is **equivalent to a sound level meter in a back garden**.

THE “DISINCENTIVE” CONCERNS SANCTIONS, NOT MEASUREMENT

If the concern is that the commander will hesitate, the proper answer is a clear definition of the safety exemptions and express protection of their judgement — not the absence of measurement. **Ignorance is not a safety measure.**

EXISTING PRACTICE

Operators already record every parameter of a landing in detail through flight data monitoring, without this being regarded as a disincentive — on the contrary, it is a cornerstone of modern safety management.

4.5 Conclusion on effectiveness

- **There is no technical impossibility.** What is absent is the appropriate measurement arrangement — which has not been installed precisely because it was never asked for.
- The part of the mechanism that concerns **departures (NADP-A, TANGO, SID) is already working today**, in a production environment, on the real movements of the airport.
- Its results are **available for verification** by any third party, because the complete primary data are retained and a full re-check of a month is a matter of minutes.

PART 5

Co-operation & next steps

Critical steps of the implementation cannot be carried out unilaterally.

5. The bodies that must co-operate

Not out of institutional courtesy, but for specific technical reasons.

Body	Role	What is impossible without it
Airport operator	Airside access, approval of station siting in the touchdown zone, power and networking, installation safety clearance	Measurement of reverse thrust — the touchdown zone lies inside the perimeter.
Civil Aviation Authority	Regulatory framework, installation approval, assessment of findings, weighing of safety exemptions, imposition of sanctions	Turning a record into a result; and access to operators' flight data.
Civil Aviation Service	Air traffic control data, NOTAM, AIP, runway procedures	The definitive explanation of deviations — telling a violation apart from a radar vectoring instruction.
Ministry of Environment & Energy	Establishing a maximum limit for instantaneous level	A sanction for exceeding a noise level. Measurement can start immediately; a sanction presupposes an established limit.
Operators	Provision of flight data during a pilot phase, procedures per type	Calibration against ground truth — without it the threshold rests on statistics.
Municipalities & environmental organisations	Siting and hosting of stations outside the airport, residents' complaints as an independent cross-check	Measurement in the place where the nuisance actually occurs — which is the whole point.
Accredited laboratory & academic body	Periodic calibration of instruments with traceable certificates; validation of the methodology and algorithms	The evidential value of every measurement, and the system's resilience to challenge.

The proposal: a Joint Technical Committee

Civil Aviation Authority — Civil Aviation Service — airport operator — municipalities and environmental organisations — an independent academic body.

i

A single methodology

Agreement on one measurement methodology, accepted by all parties.

ii

A six-month pilot

With **all parties having common access to the same primary data.**

iii

Joint investigation of the divergence

Of the divergence in results described in paragraph 4.1(e).

Such a process would answer, **with measurements instead of assertions**, all the technical questions at issue — and faster than litigation will answer them.

Timetable — the critical point

The departures subsystem requires no implementation time, only a decision to use it.

- **Phase 1 — Procurement and delivery of equipment.** The only phase with a clear, predictable duration.
- **Phase 2 — Installation and commissioning of the stations,** following the required airside siting approvals.
- **Phase 3 — Configuration and calibration per aircraft type,** with pilot operation under human approval.
- **Phase 4 — Acceptance testing and final delivery.**

*The time-critical dependencies of the project as a whole **are not technical**: they are airside siting approval and access to flight data. Cost is the subject of a separate technical and commercial offer and is not included in this presentation.*

In closing

- The part of the mechanism concerning **the NADP-A procedure and the other departure procedures already works**, flight by flight and in real time, with a complete evidence dossier — and is verifiable by any third party.
- **Monitoring the instantaneous level** for each individual movement is technically unremarkable with Class 1 instruments and does not presuppose a legislated limit; **the limit presupposes the measurements, not the other way round.**
- **Detecting reverse thrust** is technically feasible with the appropriate measurement arrangement; it requires pilot calibration and human approval, and affects neither the operation of the aircraft nor the commander's discretion in any way.
- **None of the above delivers a result without co-operation.** The touchdown zone is airside; the flight data belong to the operators; the sanction belongs to the Authority; the place where the nuisance occurs belongs to the municipalities.

No side can solve the problem alone — and no court judgment is a substitute for a sound level meter.