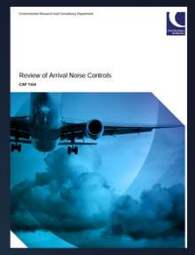

Ideagen


# Gear down detection

Objective data to influence airlines to reduce approach noise

# Authoritative guidance



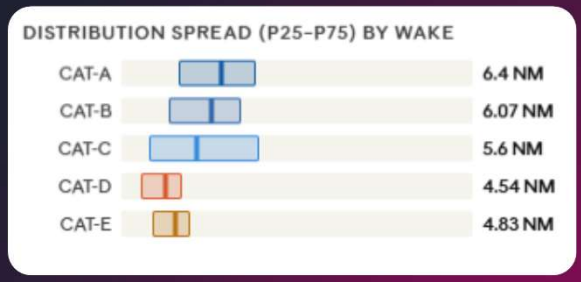

## UK CAA Doc: CAP 1554

*Operational Factors affecting noise on final approach*

- Proposes a number of measures to reduce noise under the approach path

## Low power / Low drag

- Flaps deployed +0.5 to 1.5 dB < 5 NM
- Gear deployed +3 to +5 dB 5-10 NM




## Data to influence airline behaviour

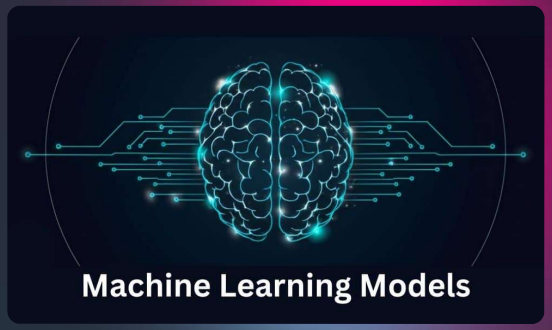
- By working with airlines to deploy gear later, noise impact may be reduced for communities under the arrival path

# How it works

## Camera Capture

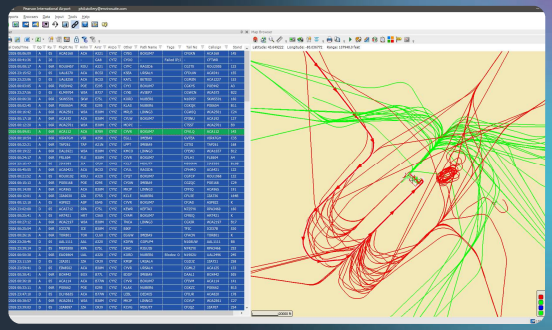
High sensitivity, high magnification camera installed with clear line of sight down the ILS captures high-resolution images of aircraft on final approach every 4 seconds at a range of 3-16 nm

## AI Detection




A computer vision pipeline detects each aircraft and classifies whether landing gear is deployed or retracted with 98.5% classification accuracy.

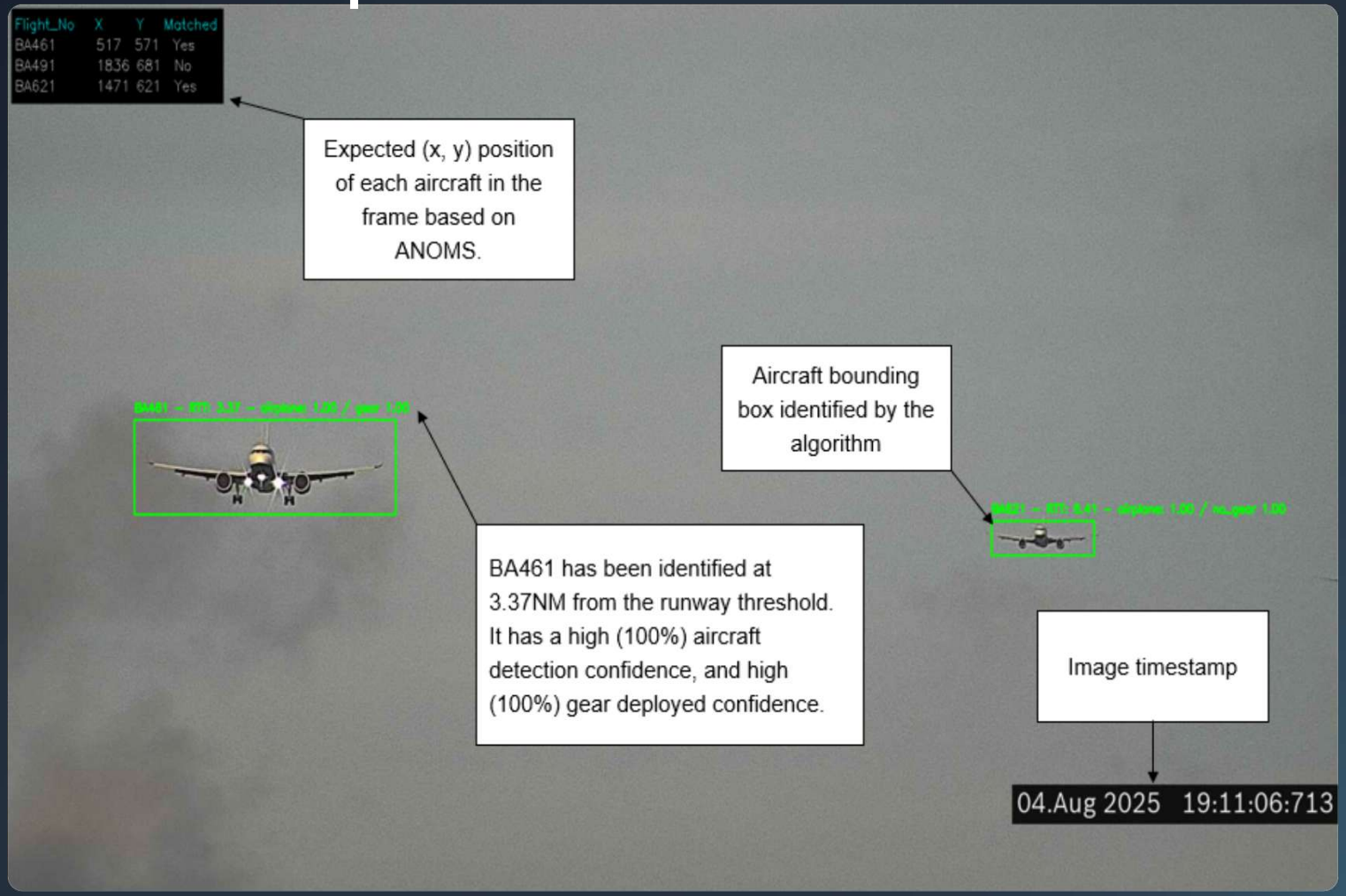
## NOMS Correlation



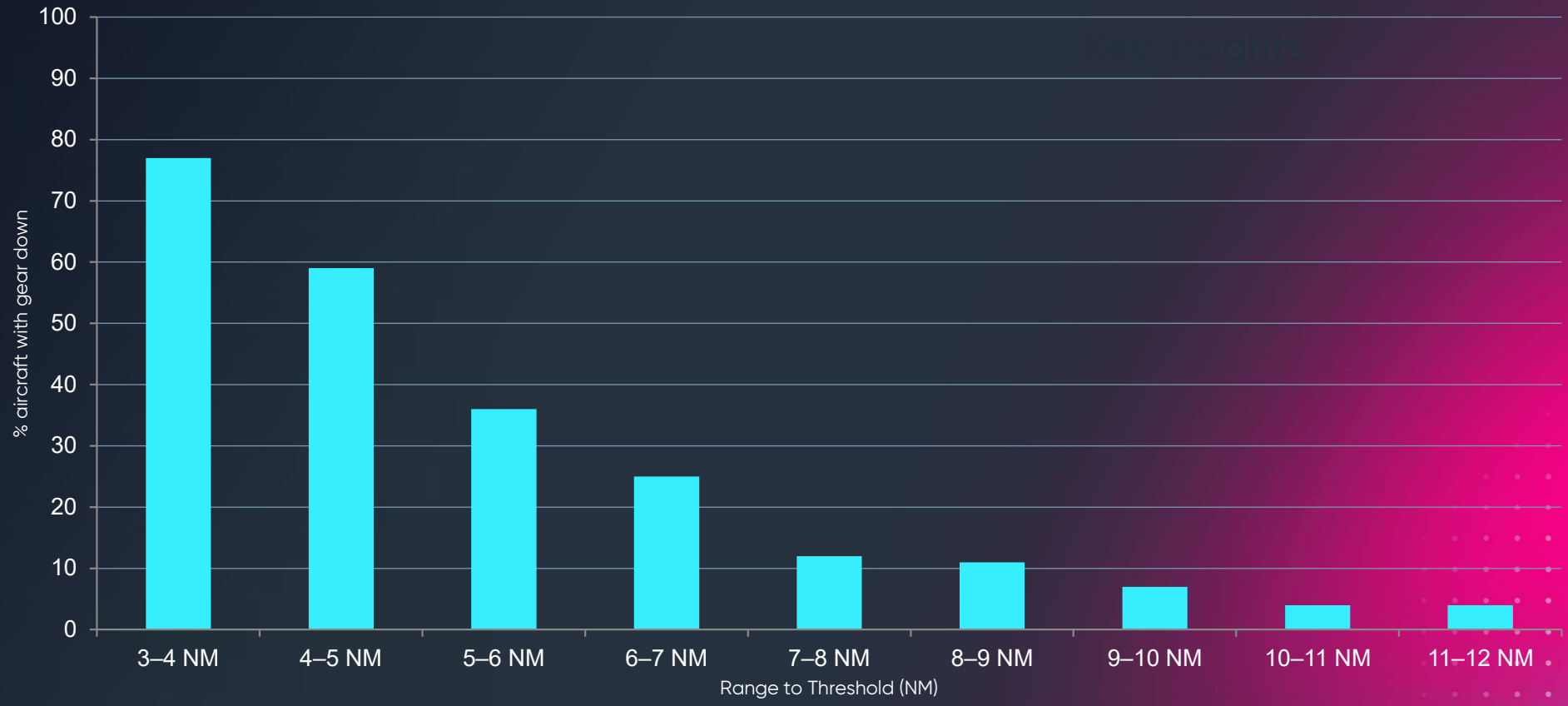
Each detection is correlated with surveillance and flight plan data. The Range to Threshold (RTT) in nautical miles as the gear is deployed is stored with each operation.

Operates with ANOMS and Ideagen Noise

# Detection example



# When do aircraft deploy their gear?




** Distribution across 2,300 operations*

# Gear down performance example dashboard

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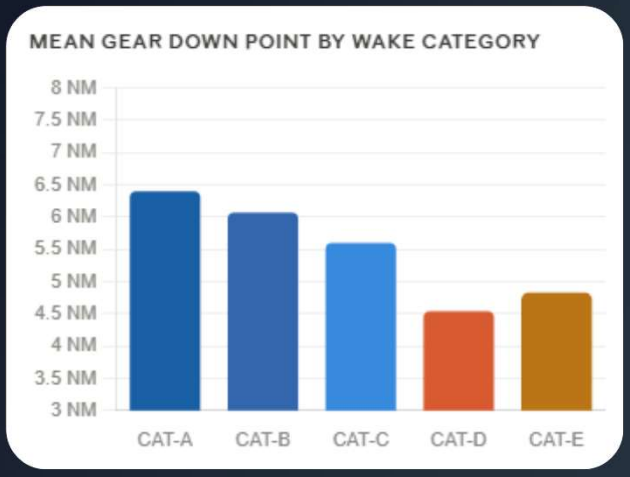


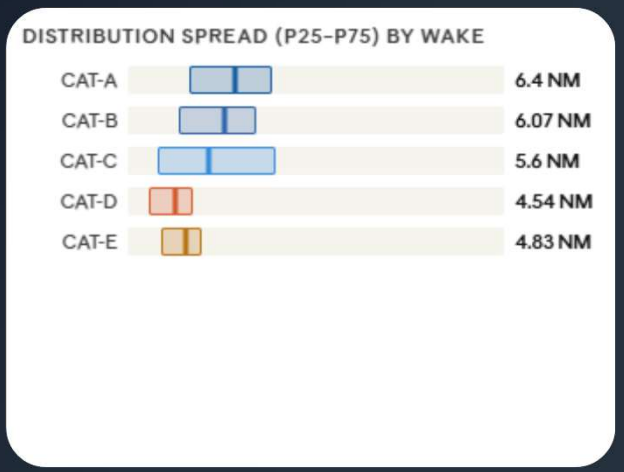


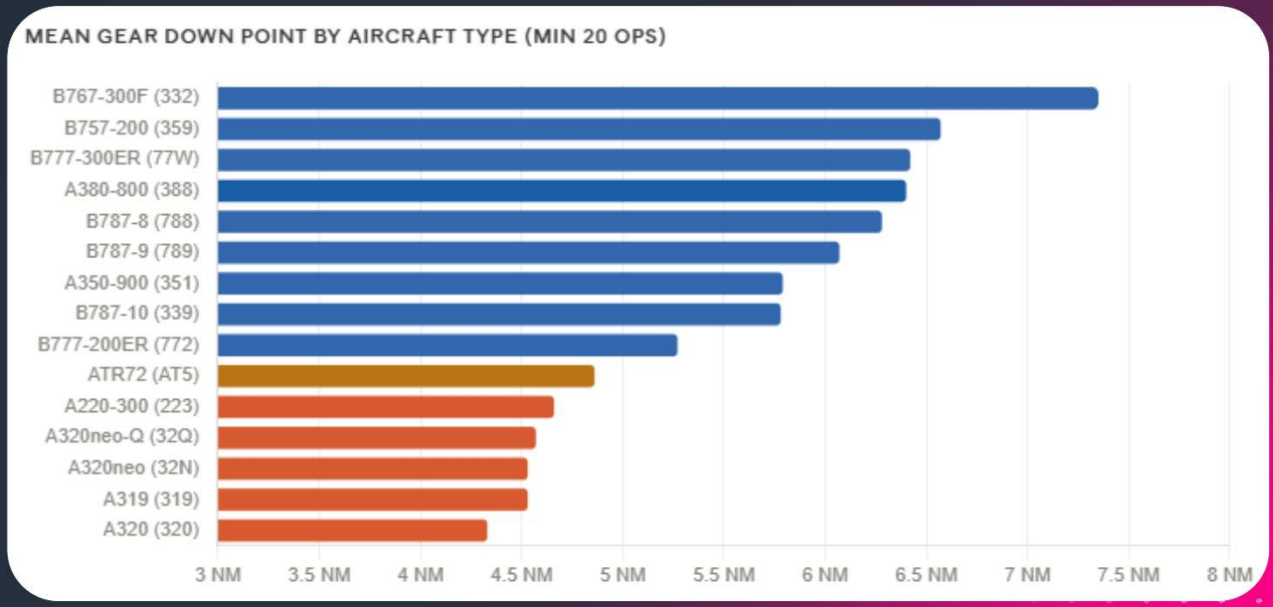


Cat A/B heavy jets deploy gear ~1.5 NM earlier than Cat D medium jets (6.1 NM vs 4.5 NM avg). Larger aircraft use gear drag for speed reduction at greater range. The B767-300F and B757-200 are highest mean of any type – worth investigating whether this is procedural.

# Outlier operations *worth a conversation?*

Shows 43 operations deployed gear beyond 9.1 NM (All are Cat B heavy jets.

TOP 20 OUTLIER OPERATIONS — GEAR DEPLOYED EARLIEST (≥9.1 NM THRESHOLD)

| FLIGHT | AIRCRAFT | AIRLINE | WAKE | GEAR DOWN | VS AVERAGE |
|---|---|---|---|---|---|
| [redacted] | 788 | [redacted] | CAT-B | 14.5 NM extreme | +9.0 NM |
| [redacted] | 77W | [redacted] | CAT-B | 13.66 NM extreme | +8.2 NM |
| [redacted] | 788 | [redacted] | CAT-B | 13.01 NM extreme | +7.5 NM |
| [redacted] | 77W | [redacted] | CAT-B | 12.97 NM extreme | +7.5 NM |
| [redacted] | 332 | [redacted] | CAT-B | 12.27 NM extreme | +6.8 NM |
| [redacted] | 788 | [redacted] | CAT-B | 12.05 NM extreme | +6.6 NM |
| [redacted] | 77W | [redacted] | CAT-B | 11.95 NM high | +6.5 NM |
| [redacted] | 77W | [redacted] | CAT-B | 11.86 NM high | +6.4 NM |
| [redacted] | 781 | [redacted] | CAT-B | 11.37 NM high | +5.9 NM |
| [redacted] | 351 | [redacted] | CAT-B | 10.96 NM high | +5.5 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.79 NM high | +5.3 NM |
| [redacted] | 388 | [redacted] | CAT-B | 10.71 NM high | +5.3 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.62 NM high | +5.2 NM |
| [redacted] | 359 | [redacted] | CAT-B | 10.53 NM high | +5.1 NM |
| [redacted] | 332 | [redacted] | CAT-B | 10.33 NM | +4.9 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.28 NM | +4.8 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.22 NM | +4.8 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.16 NM | +4.7 NM |
| [redacted] | 789 | [redacted] | CAT-B | 10.13 NM | +4.7 NM |
| [redacted] | 77W | [redacted] | CAT-B | 10.06 NM | +4.6 NM |

# Trends – see the difference your efforts make

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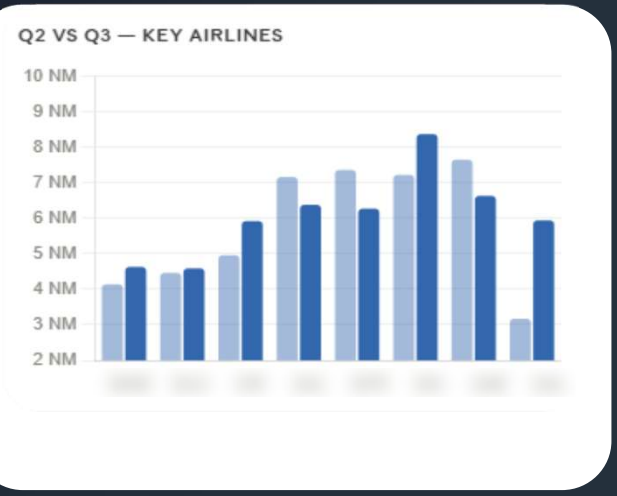
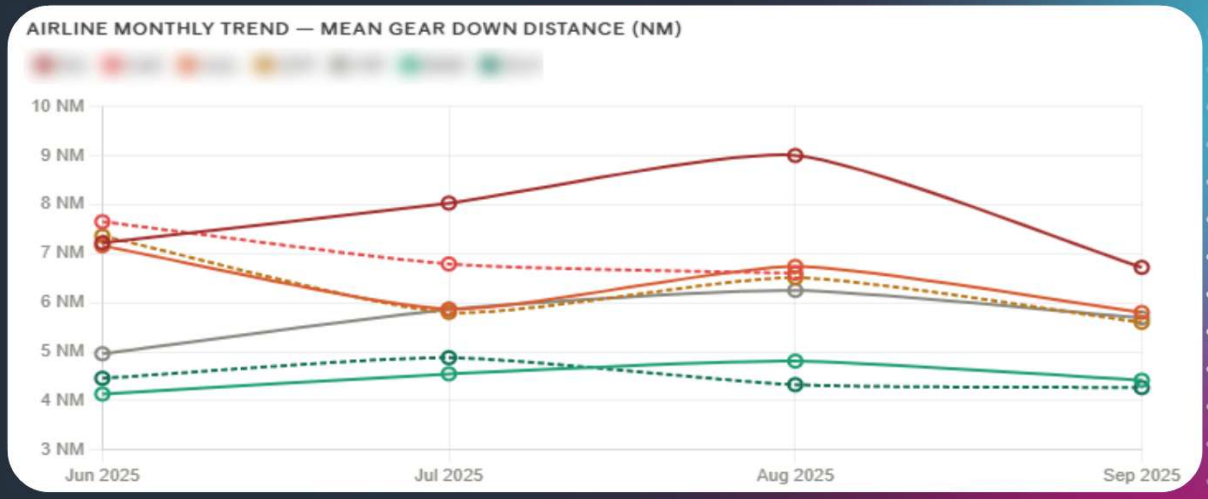
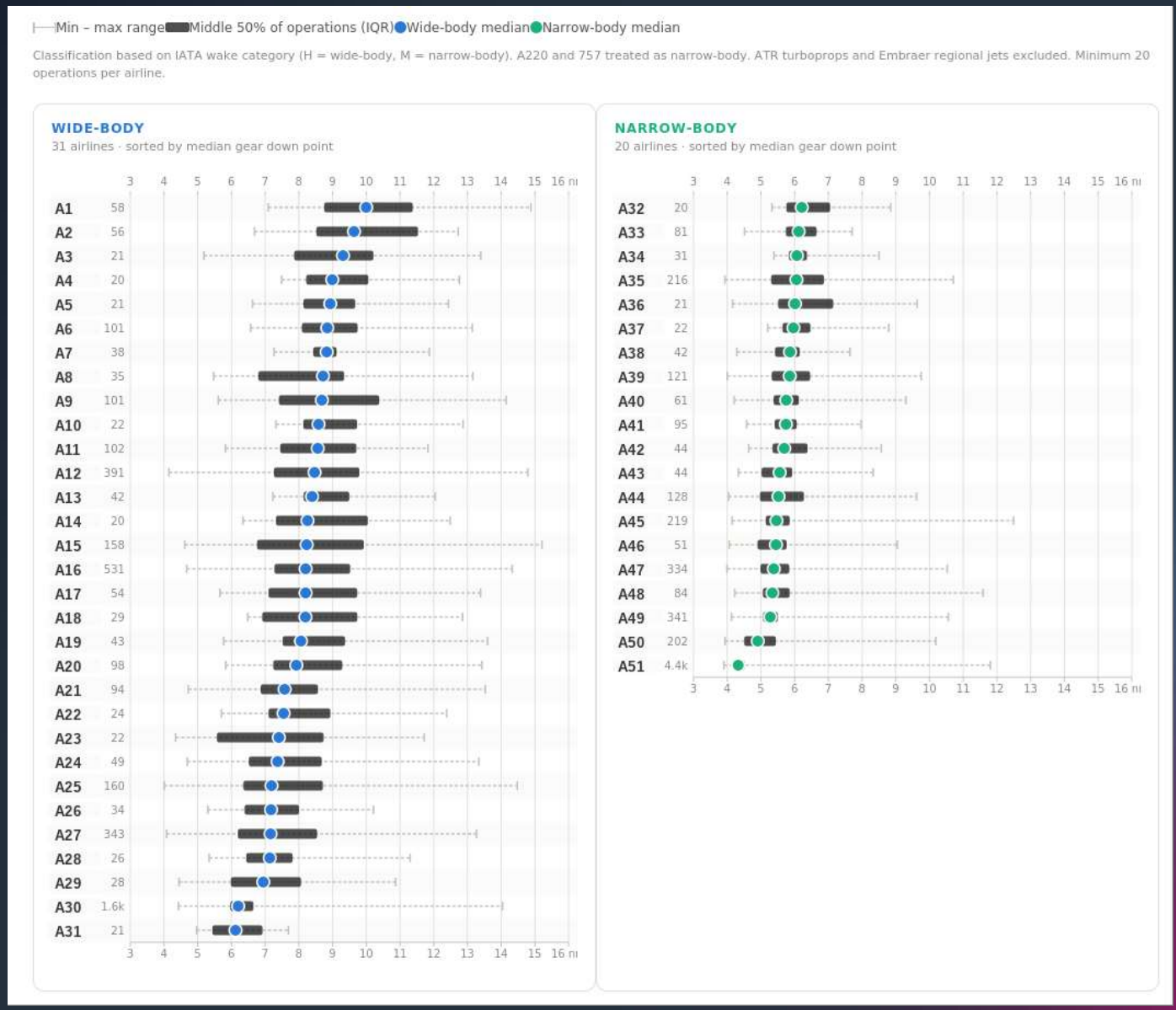
| Q2 2025 (late Jun) | Q3 2025 (Jul–Sep) |
|---|---|
| 5.31 NM | 5.48 NM |
| 88 ops · median 4.67 | 830 ops · median 5.10 |
| | ▲ +0.17 NM vs Q2 |

| Best month | Highest month |
|---|---|
| Jun 2025 | Aug 2025 |
| 5.31 NM mean | 5.60 NM mean |

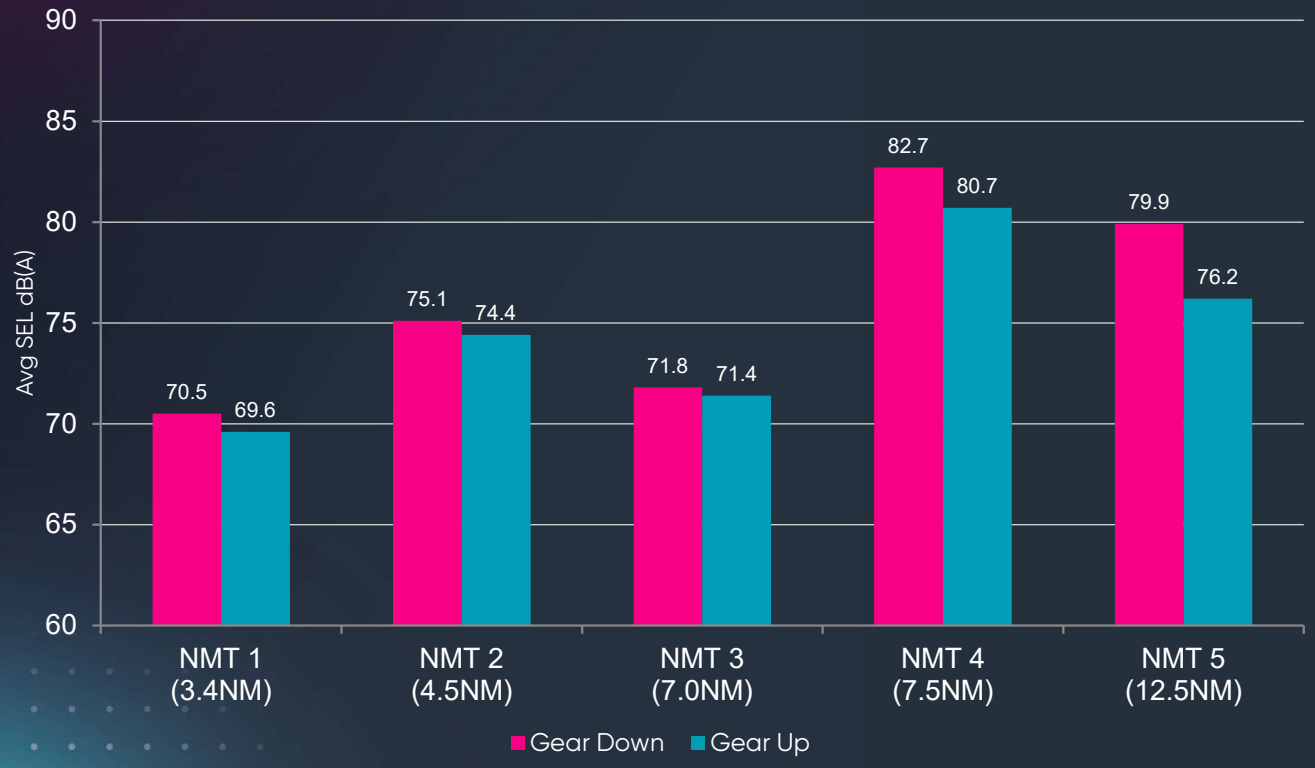



# Trends


Min – max range
Middle 50% of operations (IQR)
Wide-body median
Narrow-body median
Classification based on IATA wake category (H = wide-body, M = narrow-body). A220 and 757 treated as narrow-body. ATR turboprops and Embraer regional jets excluded. Minimum 20 operations per airline.
WIDE-BODY
31 airlines · sorted by median gear down point
A1 58
A2 56
A3 21
A4 20
A5 21
A6 101
A7 38
A8 35
A9 101
A10 22
A11 102
A12 391
A13 42
A14 20
A15 158
A16 531
A17 54
A18 29
A19 43
A20 98
A21 94
A22 24
A23 22
A24 49
A25 160
A26 34
A27 343
A28 26
A29 28
A30 1.6k
A31 21
3 4 5 6 7 8 9 10 11 12 13 14 15 16 nı
NARROW-BODY
20 airlines · sorted by median gear down point
A32 20
A33 81
A34 31
A35 216
A36 21
A37 22
A38 42
A39 121
A40 61
A41 95
A42 44
A43 44
A44 128
A45 219
A46 51
A47 334
A48 84
A49 341
A50 202
A51 4.4k
3 4 5 6 7 8 9 10 11 12 13 14 15 16 nı

# Noise Impact – if airlines delay gear, measurable noise reductions are achievable

Boeing 777-300ER (77W) – 249 operations




## 2 dB(A)

lower SEL noise at NMT 4 (directly under flight path) when gear is deployed later

### What this means

Heavier aircraft (RECAT-EU B / 77W) deploy gear on average 1.4 NM earlier than narrowbody aircraft (RECAT-EU D / A320).

If airlines can be encouraged to delay gear deployment even by 1–2 NM, measurable noise reductions are achievable for communities under the approach path.


Ideagen
Reverse thrust detection
Evidence-based noise monitoring for full-power reverse-thrust operations

# Ideagen Aviation Environment

## Reverse Thrust Detection

*Evidence-based noise monitoring for full-power reverse-thrust operations*

### WHAT WE'RE DOING

Locate an NMT at each runway and use statistical analysis to determine aircraft type specific **thresholds** for the top 10 types.

Suspected full power reverse thrust operations are automatically flagged for confirmation

### WHY WE'RE DOING IT

Reverse thrust has been **discouraged at many airports for years** because of the noise nuisance it causes nearby communities. Until now, there **hasn't been a systematic way to determine when it's actually been used** — airports need a defensible, evidence-based way to enforce restrictions and hold airlines accountable.

### HOW IT WORKS

**Setup — initial study (one-off)**

Determine best measurement location. Install portable NMT installed, Collect 1-2 weeks of noise data and analyse to find detection thresholds set for the top 10 aircraft types.

**Ongoing detection cycle**

**1. Monitor**

NMT installed near each runway captures noise events during landing.

**2. Analyse**

Each event is checked against the aircraft-specific detection threshold and flagged as suspected RT.

**3. Review**

A user listens to the audio and confirms or overrides the flag.

**4. Report**

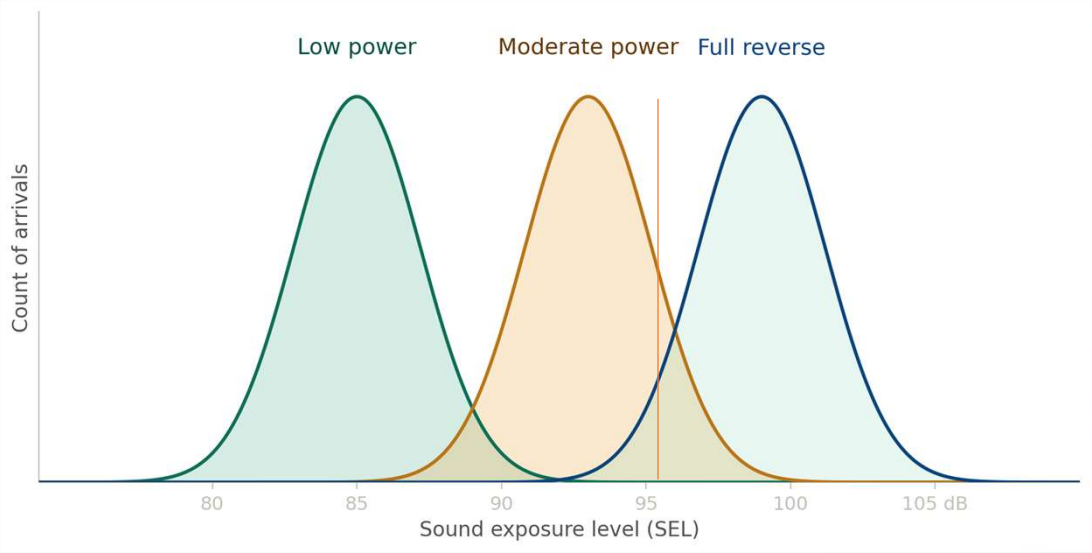
Confirmed RT operations feed reports for any period, or monthly counts by airline.

# Ideagen Aviation Environment

## Reverse Thrust Detection

*Evidence-based noise monitoring for full-power reverse-thrust operations*

**Detection accuracy**




Thresholds are designed to capture 95% of full reverse thrust operations and minimize the false positives from moderate reverse thrust.

Audio monitoring confirms full power usage

# Ideagen Aviation Environment

## Reverse Thrust Detection

*Evidence-based noise monitoring for full-power reverse-thrust operations*

**Monitoring location**



# Operational Intelligence

- Benchmark aircraft performance
- Locate inefficiencies to direct mitigation
- Improve efficiency to reduce fuel burn and carbon emissions
- Improving punctuality and utilisation

# Ideagen Aviation Operations

**HORIZON 1 · NOW**

## Descriptive & diagnostic

- Real time Situation Awareness
- 13 tracked segments per flight across the airfield & airspace
- Performance metrics covering punctuality, delay, efficiency and airfield usage
- Comprehensive visualisation & post-incident replay

**HORIZON 2 · ROADMAP**

## Enhanced

**HORIZON 3 · FUTURE**

## Predictive capability

## Horizon 1 focus — what it delivers today, and to whom

| Stakeholder | | What horizon 1 delivers |
|---|---|---|
| APOC / Duty Manager | Maintain situational awareness | Live performance dashboards. Runway occupancy, dwell times, taxi times, OTP, departure queue length, arrivals separation. Live anomaly detection. |
| Head of Airfield Ops | Owns day to day airfield efficiency | Trends in key performance metrics by airline, runway and operation type. Review of past performance. |
| Airfield Disruption manager | Identify operational inefficiencies | Key performance metrics, trends and identified outliers. Airfield replay investigation |
| COO / CEO | Accountable for On-time performance | Trends and throughput data. |
| Planning & infrastructure | Evidence for capital investment decisions | Airfield usage heatmaps. Stationary point hotspots. Runway and taxiway utilisation by time of day and season. Aircraft mix and routing patterns. Infrastructure closure impact analysis. |
| Head of maintenance | Pavement and asset optimisation | Usage-based targeting. Surface loading by area, aircraft type and frequency. High-dwell location mapping. Runway occupancy time trends. Aircraft weight and movement frequency by zone. |

# H1-Real time airfield Situational awareness

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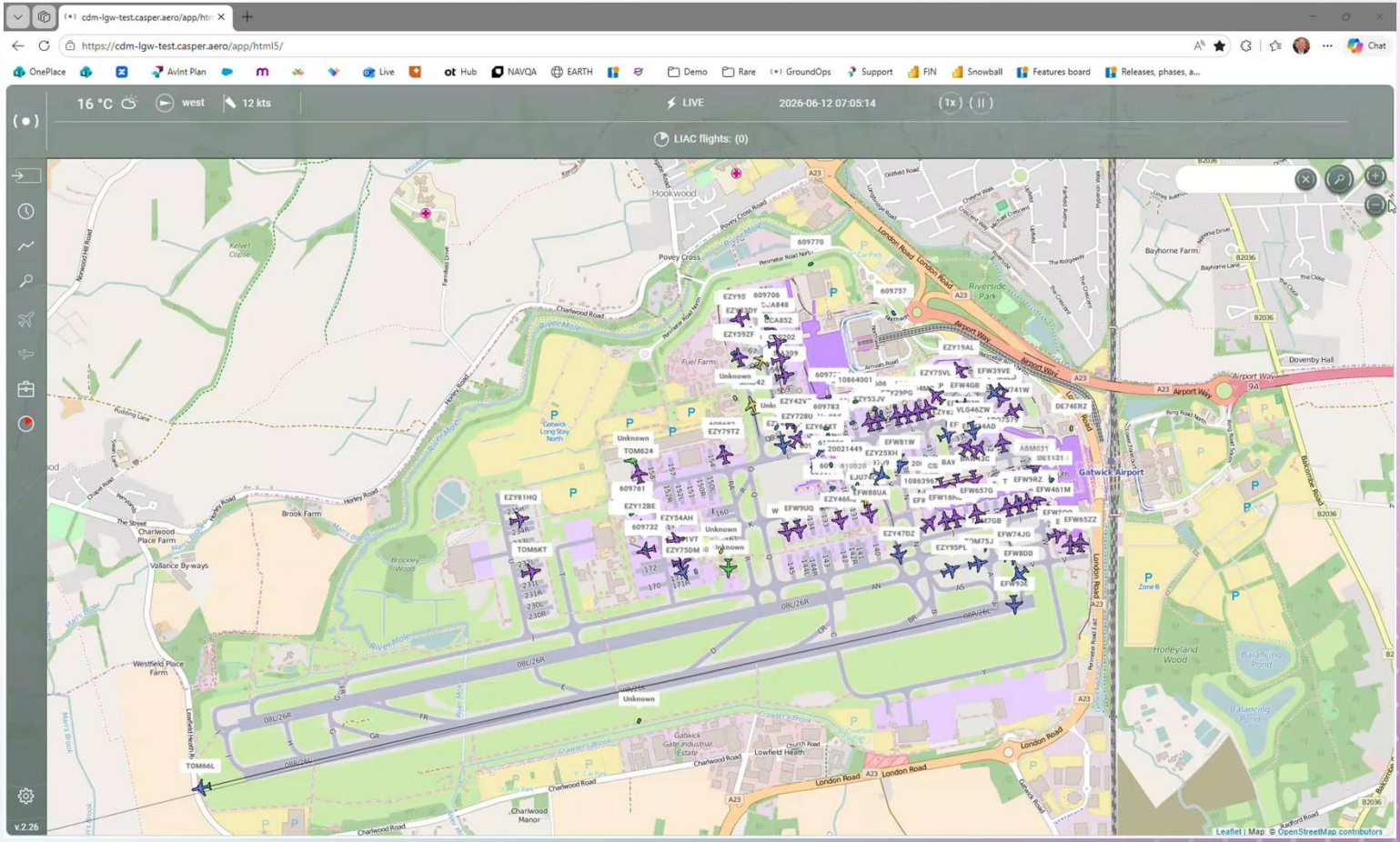
Live 1-second radar track of every aircraft movement on the airfield — the APOC's primary working view throughout the shift

- The APOC monitors this throughout the shift and acts immediately when an anomaly surfaces.
- Includes aircraft and ground vehicles
- Real time of replay for incident review
- Similar view used by ground crews to understand what's happening around the airfield
- Operates on tablets and mobile devices

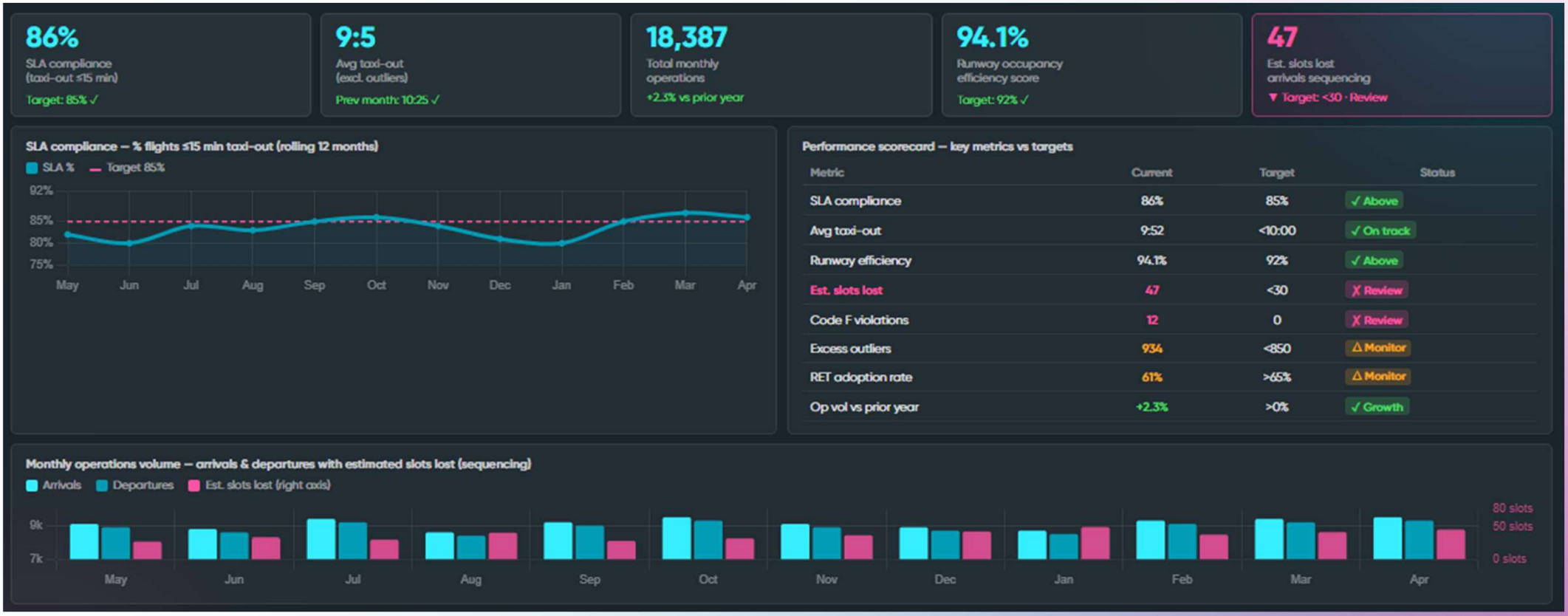


# H1-Duty manager

Review of airfield performance

# H1-Exec KPI Summary

How are we doing against SLA in terms of OTP, Taxi time, Runway Efficiency and other KPIs



# H1-Planning and infrastructure

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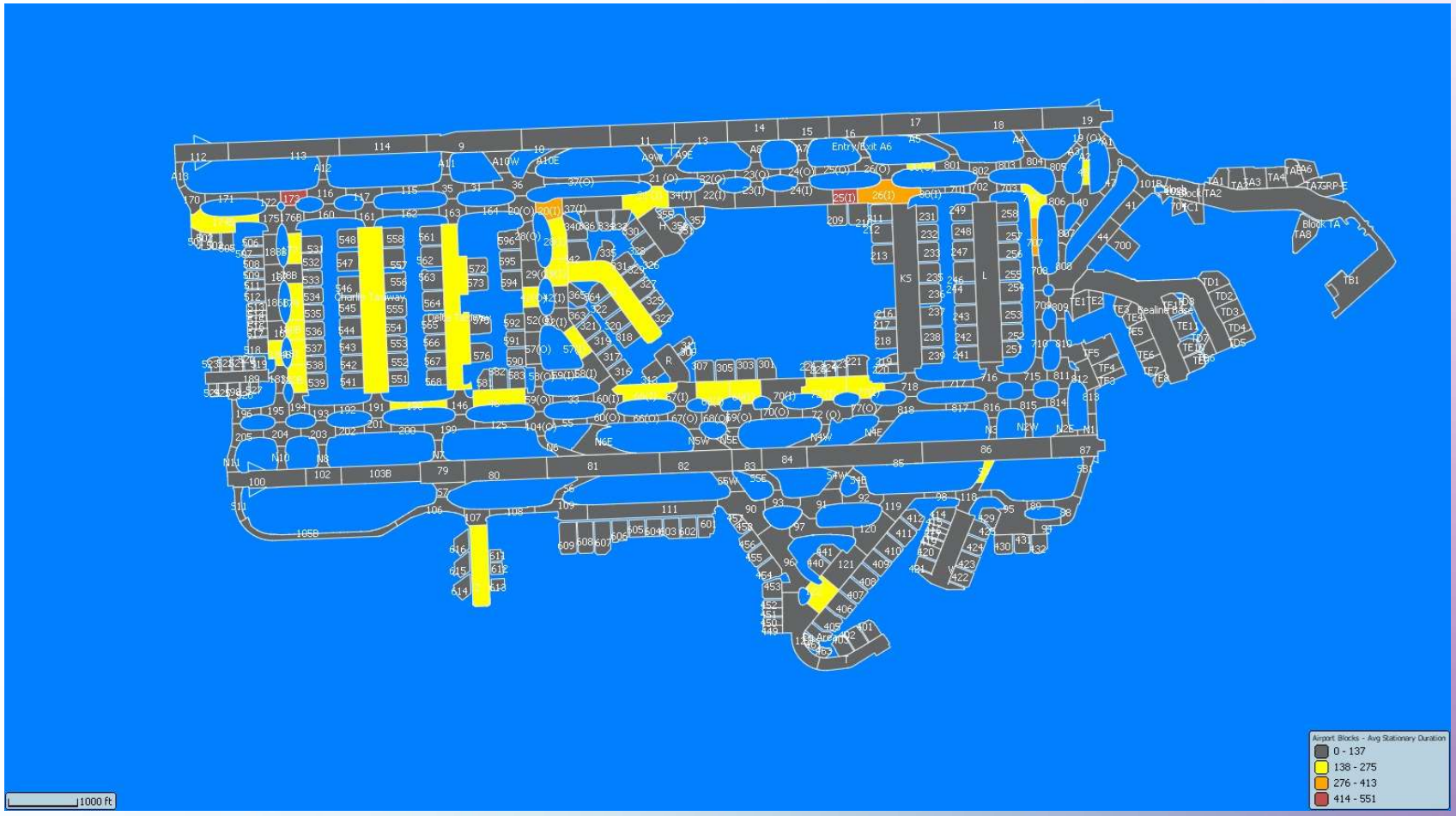
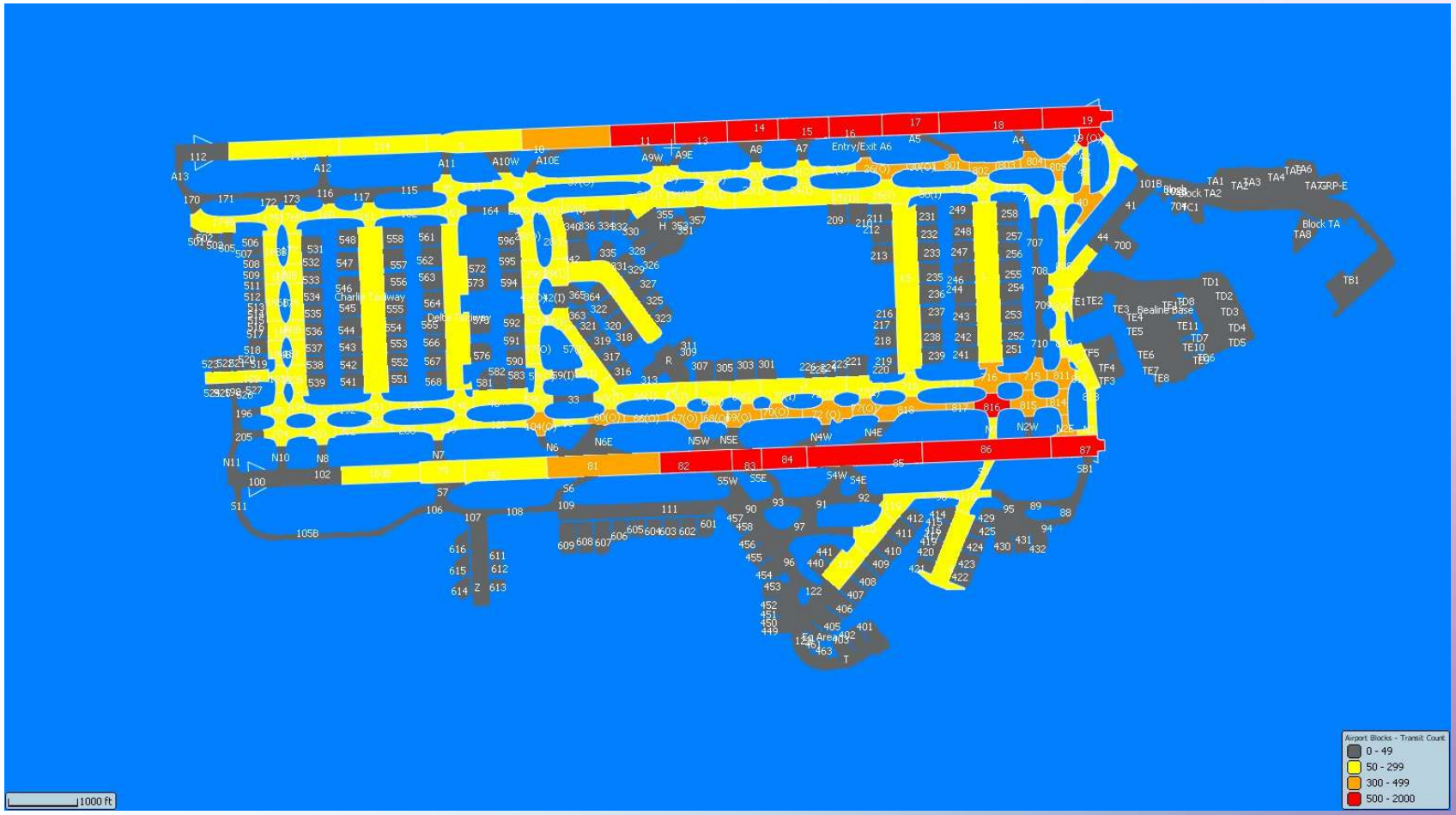
Stationary heatmap – where are the bottlenecks?



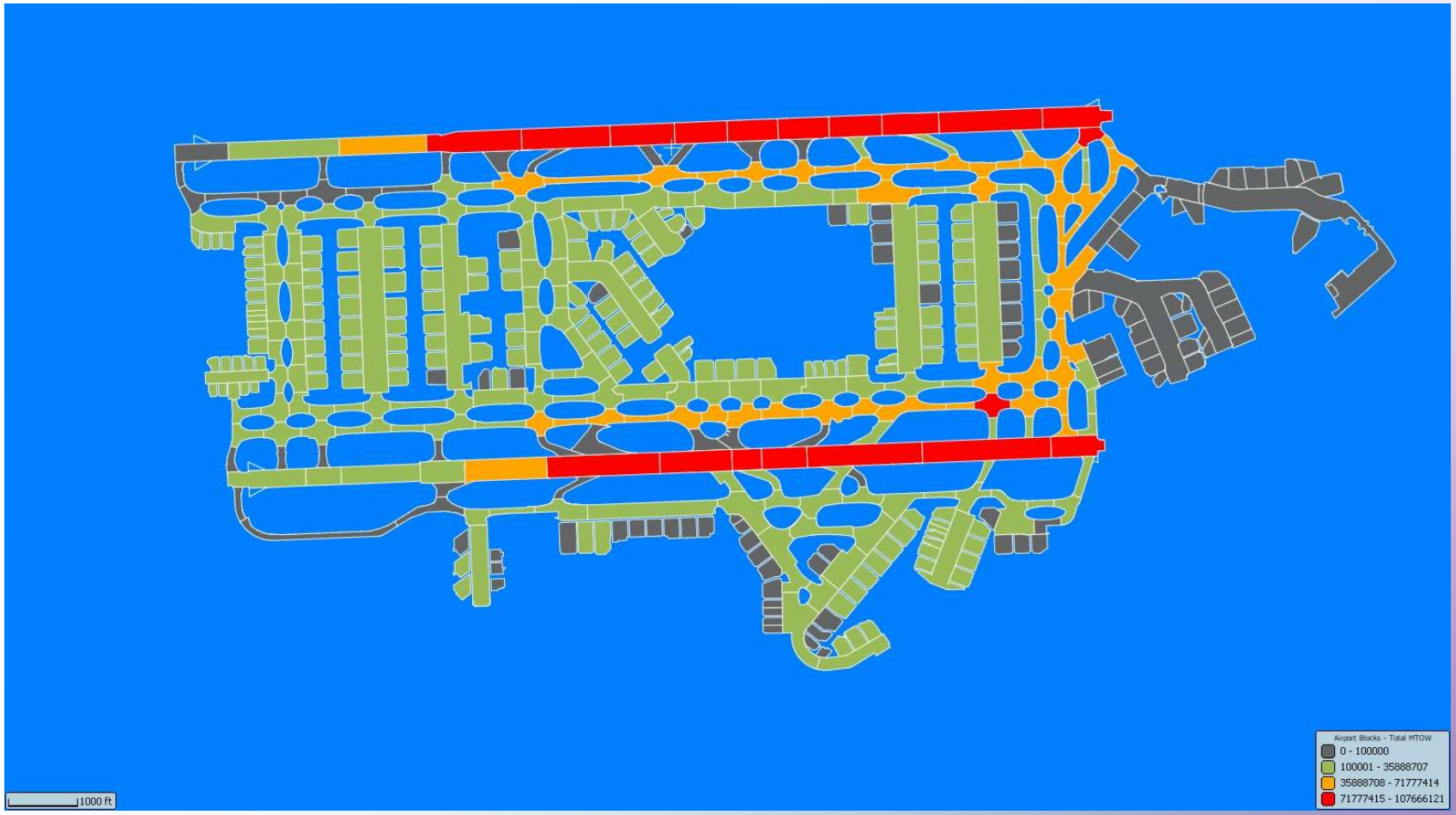
# H1-Planning and infrastructure

Transit count – how many aircraft are using which parts of the airfield?



# H1-Planning and infrastructure

Block loading–which surfaces have taken the most punishment and when do they need inspection?



# Ideagen Aviation Operations

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Assessing efficiency to benchmark performance, locate inefficiencies to direct mitigation, reducing fuel burn and carbon emissions, improving punctuality and utilisation

**HORIZON 1 · NOW**

## Descriptive & diagnostic

- Real time Situation Awareness
- 13 tracked segments per flight across the airfield & airspace
- Performance metrics covering punctuality, delay, efficiency and airfield usage
- Comprehensive visualisation & post-incident replay

**HORIZON 2 · ROADMAP**

## Enhanced

- Ground vehicle tracking and safety metrics
- Transparent per-flight GHG model, auditable at operation level
- Open API and data warehouse feeding airport data lakes

**HORIZON 3 · FUTURE**

## Predictive capability

- H 1&2 tell you what happened and why.
- H 3 tells you what is going to happen — and what to do about it before it does.
- AI agents: anomaly detection, diagnosis, natural-language query
- Predictive feeds: flight plans, weather, CDM, maintenance, stand allocation


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Aviation’s future belongs to those who can see further, act faster, and build lasting trust.
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