



OAK **AirPicture** is an air-domain awareness module on OAK BMS. It fuses licensed **cooperative** tracks (ADS-B / satellite) with OAK's own **passive-RF** sensing and **explainable AI** classification into a single air picture — cooperative and **non-cooperative** — with source provenance, honest uncertainty and first-class **air-gapped** operation. So a defence analyst sees the whole picture, including targets consumer trackers can't show, understands what it means, and briefs it — even on a network that never touches the internet.

CAPABILITIES	
Capability	What it does
Fused air picture	Cooperative ADS-B / satellite tracks fused with non-cooperative passive-RF detections and BMS radar into single entities.
Dark-target dossier	Kinematics, source provenance and confidence, and the AI's classification hypothesis with its physics-based reasoning — for the emitter with no ADS-B correlate.
Explainable alerts	Geofence entry, ISR-orbit and tanker-track signatures, GPS-jamming-corridor indicators — raised to a triage queue, each with a "why".
Pattern-of-life	Historical routes, timing regularities, basing and deviations from norm by aircraft, registration or operator.
Playback & brief	Scrub a time window, replay an event, annotate the map, and export a sanitized snapshot pack for a commander's brief.
Air-gap mode	The same workflows on a disconnected enclave; per-source data freshness and latency are shown, so offline never means blind.

- DESIGN TENETS
- **Non-cooperative targets are first-class.** The emitter with no ADS-B correlate is the main case, not an edge case.
 - **Explainability everywhere.** Every AI verdict has an inspectable "because".
 - **Honest uncertainty.** Provenance, confidence and data age are visible on everything — a cross-fix shows its uncertainty ellipse, not a false-precision dot.
 - **Air-gap grace.** Offline is a first-class mode, never a degraded one.
 - **BMS-native.** AirPicture speaks the OAK BMS look and interaction language and inherits its sensors and COP.

DATA SOURCES & FUSION	
Source	Role
ADS-B (SBS-1)	Cooperative broadcast — dump1090 / readsb over TCP, or file replay.
Satellite ADS-B	Cooperative tracks with over-ocean coverage.
Passive-RF (PRF)	Non-cooperative, bearing-only; a two-station cross-fix places dark targets with a position-uncertainty ellipse.
Radar (BMS bus)	BMS-connected sensor tracks on the shared common operating picture.
Registry	ICAO / operator enrichment (arriving by periodic one-way transfer in air-gapped mode).
Correlation	ICAO and spatial association plus PRF cross-fix, producing a fused entity with visible provenance and uncertainty.

Unclassified · ITAR-free · representational. AirPicture v1 runs on notional, simulated data — no operational feeds and no classified handling. It is decision-support tooling for the analyst, not a weapons-cueing or fire-control system. All transports are receive-only. · © OAK DEFENSE LTD. · robbymiles@oakdefenseltd.com · www.oakdefenseltd.com/airpicture · 1-613-462-8803



EXPLAINABLE AI CLASSIFICATION

Non-cooperative entities are classified by the OAK AI EW Decision physics head from emitter features (band / PRF / SNR), kinematics, correlate status and fusion geometry. Each verdict is a **hypothesis with a signed, inspectable evidence chain**, for example:

- X-band nav-radar emitter → maritime-patrol-aircraft library match 0.87
- No transponder / flight-plan correlate within the uncertainty ellipse
- 242 kt at est. FL250 — inconsistent with a surface or small-UAS class

Confidence is **calibrated**; the classifier **ABSTAINS** on a thin margin and flags **out-of-distribution** inputs. Detaching a bearing (two stations to one) widens the uncertainty and lowers confidence — honest by construction, never a confident-looking guess.

DEPLOYMENT & AIR-GAP

Platform	Native module on OAK BMS (common operating picture).
Stack	PySide6 6.11 — Qt 6 / Qt Quick QML; pure Python + QML, no C++ toolchain.
Map	Offline Natural Earth 1:110m land, equirectangular projection; theme-aware (dark / light / red-light).
Transports	All receive-only (air-gap safe): SBS-1 TCP/file, satellite api/file, passive-RF UDP/TCP/file HAL, radar JSON track bus, registry.
Air-gap	Same workflows on a disconnected enclave; data arrives by periodic one-way transfer; freshness and latency shown per source.
Install	Per-user PyInstaller onedir installer — Start Menu / Desktop shortcuts, no administrator rights.

STATUS & POSITIONING

AirPicture v1 is representational, on simulated data — no operational feeds, no classified handling. It brings OAK's passive-RF and explainable-AI-classification threads onto the OAK BMS common operating picture, sold ITAR-free to Canadian and allied military and government customers.

Cooperative + non-cooperative

Passive-RF fusion

Explainable AI · evidence chain

Provenance & uncertainty

Air-gappable

On OAK BMS

ITAR-free · sovereign

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