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R2-D2 FLEET OPERATIONS CONSOLE

— End-User Integrator Onboarding Guide —

Originator: iLab / TaskForce-X
Releasability: Releasable to coalition partners and authorized industry integrators participating in Task-Force-X.

RECORD OF CHANGES

Version	Date	Summary of Change	Authority
Edition A, Version 1	May 2026	Initial release.	iLab / TaskForce-X

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1 INTRODUCTION

1.1 Purpose

This document guides an **End-User Integrator** — an industry or partner team — in connecting one or more unmanned vehicles (UXVs) to the R2-D2 fleet, from initial network access through to live data in the Common Operating Picture (COP). It describes the network onboarding, the assigned endpoints, the data-format expectations, and the model by which integration scales across a fleet.

1.2 Scope

This document covers integrator-facing procedures: network access via NetBird, the assigned telemetry and video endpoints, the technical onboarding of data, validation and go-live, the engagement models, and the support available under national authority. It does not cover R2-D2 internal operation or administration.

1.3 Audience

The intended audience is the technical staff of an integrating organisation, and the national or coalition authority sponsoring that integration.

1.4 References

- a. STANAG 4817 / AEP-105 — Coalition CATL High-Information-Bandwidth (HIBW) message set, Draft 3 / Release Candidate 4 (version 0.3.0-rc4).
- b. STANAG 4609 — NATO Digital Motion Imagery Standard (KLV metadata).
- c. STANAG 5516 — Tactical Data Exchange (Link 16).
- d. R2D2-OV-001 — R2-D2 Fleet Operations Console, Descriptive Overview.

2 PREREQUISITES

The integrating organisation requires:

- a. A nominated point of contact to receive credentials.
- b. A host (ground station, gateway, or bridge) able to run the NetBird client and reach the management endpoint.
- c. Knowledge of the platform's telemetry output format and its video output (sensors, protocols, and stream layout).

3 NETWORK ACCESS (NETBIRD)

All integration traffic transits a private overlay network; no service is exposed to the public internet.

- a. **Token issue.** The originator issues a NetBird setup key (token) scoped to the integrating organisation and its access group.
- b. **Client install.** The integrator installs the NetBird client on the connecting host(s).
- c. **Enrolment.** The integrator connects to the management endpoint at `netbird.office.ilab.zone` and enrolls the peer using the token. The peer joins its assigned group automatically.
- d. **Least-privilege access.** Access is granted by group. An enrolled peer reaches only the network resources assigned to it — its telemetry endpoint and its restreamer endpoint — and no other resource.

4 ASSIGNED ENDPOINTS

Both endpoints are reached over the NetBird overlay (a private IP and port).

4.1 Telemetry Endpoint (Data)

An assigned Node-RED ingest endpoint (IP and port on the overlay) at which the platform delivers telemetry and data products other than video — position, status, tasking feedback, results, and world-model updates.

4.2 Restreamer Endpoint (Video)

An assigned restreamer endpoint for EO/IR and other video. The port and protocol are assigned according to the direction of the stream:

- a. **Integrator pushes.** The originator assigns the IP, port, and protocol — RTSP, SRT, or UDP, as suits the platform — and the integrator publishes to it.
- b. **Originator pulls.** The integrator provides the RTSP details — stream and sub-stream URLs and ports for each sensor (EO/IR, etc.) — and the originator pulls them.

The protocol and port assignment is matched to the platform's actual video output.

5 DATA AND TELEMETRY ONBOARDING

A joint technical session aligns the data between the integrator's team and the originator's.

5.1 Preferred Format

STANAG 4817 (AEP-105 / HIBW), sent natively, is preferred. A platform that already emits 4817 is placed directly onto the bus.

5.2 Accepted Formats

Where native 4817 is unavailable, the originator ingests a range of other formats — approximately 15, including OTH-GOLD — and adapts them on receipt. New formats may be agreed case by case. The following list is representative; the definitive set for a given platform is confirmed during the onboarding session.

Preferred / native	Also accepted (representative)
STANAG 4817 / AEP-105 (HIBW)	OTH-GOLD; Link 16 (STANAG 5516); VMF (STANAG 5524)
	NFFI (STANAG 5527); Cursor-on-Target (CoT); KLV (STANAG 4609)
	GMTI (STANAG 4607); ASTERIX; AIS; ADS-B
	NMEA 0183; MAVLink; JSON / REST; CSV

The session also agrees the schema, the required fields, the update cadence, and the validation criteria.

6 VALIDATION AND GO-LIVE

- a. Telemetry is published as STANAG 4817 onto the broker.
- b. The originator confirms the operational baseline and validates the messages — the pre-COP integration check — before the data is trusted downstream.
- c. On a clean baseline, the platform's contacts are admitted to the COP.

7 SCALING AND ENGAGEMENT MODELS

Integration is incremental: once one UXV is established end to end, the same pattern is repeated for each subsequent platform. Two engagement models are offered.

7.1 UXV Registration (Preferred)

Platforms are registered up front so that endpoints, formats, and sequencing can be planned across the whole fleet before integration begins. This is the recommended model for more than a small number of vehicles.

7.2 Ad-hoc

For one or two UXVs, integration may proceed directly, without a full registration, and be formalised subsequently.

8 NATIONAL AUTHORITY AND CUSTOM SOLUTIONS

8.1 Industry Support on a Nation's Behalf

With national authority, the originator may work directly with an industry integrator on that nation's behalf, so that the nation need not broker every technical detail.

8.2 Custom Bridges

Where a platform exposes a proprietary API, the originator can provide a stand-alone bridge that translates that API onto STANAG 4817 — for example, a dedicated bridge for a Saildrone unmanned surface vehicle that speaks its native API on one side and the bus on the other.

8.3 Exception — API-Based Vendors

Where a platform is integrated through the vendor's own API (as with Saildrone), the NetBird enrolment and endpoint assignment of Sections 3 and 4 do **not** apply. The originator stands up the bridge and pulls from the vendor API. The vendor provides only:

- a. an API key, scoped to the data to be read;
- b. the API documentation; and
- c. a point-of-contact confirmation for the integration.

The API documentation is the critical input; its completeness governs the pace of the integration.

9 INTEGRATOR CHECKLIST

- a. Point of contact for the NetBird token, and the connecting host.
- b. Platform type/domain and sensors aboard (EO/IR, etc.).
- c. Video direction (push or pull); if pull, the RTSP stream/sub-stream URLs and ports per sensor.
- d. Telemetry data format (STANAG 4817 preferred; otherwise as emitted).
- e. Engagement model: UXV Registration or ad-hoc.
- f. API-based vendors only: an API key, the API documentation, and a point-of-contact confirmation. Sections 3 and 4 do not apply.

ANNEX A — GLOSSARY AND ABBREVIATIONS

Abbreviation	Expansion
ADS-B	Automatic Dependent Surveillance — Broadcast
AEP	Allied Engineering Publication
AIS	Automatic Identification System (maritime)
API	Application Programming Interface
ASTERIX	All-Purpose Structured Eurocontrol Surveillance Info Exchange
CoT	Cursor-on-Target
COP	Common Operating Picture
CSV	Comma-Separated Values
EO/IR	Electro-Optical / Infrared
GMTI	Ground Moving Target Indicator (STANAG 4607)
HIBW	High-Information-Bandwidth
KLV	Key-Length-Value metadata (STANAG 4609)
NFFI	NATO Friendly Force Information (STANAG 5527)
OTH-GOLD	Over-the-Horizon Targeting GOLD message format
RTSP	Real-Time Streaming Protocol
SRT	Secure Reliable Transport
STANAG	Standardization Agreement (NATO)
UDP	User Datagram Protocol
USV	Unmanned Surface Vehicle
UXV	Unmanned Vehicle (any domain)
VMF	Variable Message Format (STANAG 5524)