VEHICLE-CPS

4-Phase CPS Delivery Plan

1-Year Delivery from Date of First Disbursement

Civil Protection Systems · Borda Milan Pyramid · Framework VEHICLE · DOI 10.5281/zenodo.20046955

Pilot Scope	Positioning Accuracy	Detection Logic	Delivery Model
Up to 1,000 bracelets	UWB/BLE target architecture	Real-time CPS simulation and anomaly detection	Four phased disbursements

Prepared for institutional review, audit, phased research collaboration and controlled pilot evaluation.

VEHICLE Systems Lab · Bolivia · 2026

Confidential draft for governmental, civil protection and institutional security agencies

1. Institutional Purpose

This proposal presents VEHICLE-CPS as a staged research and technology development initiative for civil protection, VIP security support and real-time simulation. The document is designed for governmental agencies, civil protection authorities, security innovation units and institutional partners that may wish to review, audit, validate and eventually support the development of the system.

The proposal does not constitute an operational alert, accusation or deployment claim. It is a structured institutional submission for technical review, scientific discussion and phased research collaboration.

2. What a CPS Means in This Proposal

A Cyber-Physical System, or CPS, connects physical devices with digital models. In practical terms, sensors, bracelets, local servers, dashboards, mathematical models and response protocols work together to observe a real environment, analyze changes in real time and support human decision-making.

In VEHICLE-CPS, the physical layer is represented by UWB/BLE bracelets, anchors, access gates and local computing devices. The digital layer is represented by the VEHICLE mathematical framework, the Borda Milan Pyramid, anomaly detection logic, dashboards and operational simulation. The objective is to support civil protection and security teams without replacing human command authority.

3. Strategic Route for Institutional Adoption

Step	Purpose
1. Review	Institutional and technical reading of the proposal, public records and architecture.
2. Audit	Independent review of security, data, architecture and mathematical logic.
3. Validation	Controlled simulation and pilot validation under agreed conditions.
4. Agreement	Institutional cooperation agreement or research support framework.
5. Phased Funding	Four disbursements aligned with milestones, deliverables and audit points.
6. Prototype	Construction and validation of the CPS bracelet pilot system.
7. Delivery	Delivery of the pilot kit and documentation within one year from the first disbursement.
8. Support	Technical support, training and handover after delivery.

4. Pilot Scope: Up to 1,000 Bracelets

The proposed pilot is designed around a controlled kit of up to 1,000 bracelets. The kit is intended for research, controlled simulation, training and eventual institutional evaluation. It is not presented as a final mass-deployment system without prior audit and validation.

- Up to 1,000 UWB/BLE bracelet units for the pilot scope.
- Local CPS module with no direct internet requirement for its main operational function.
- Real-time simulation and local dashboard for institutional testing.
- Documentation, training and controlled evaluation protocol.
- Architecture aligned with the Borda Milan Pyramid and Framework VEHICLE.

5. Security Principle: Local Operation Without Direct Internet Dependency

For security reasons, the main CPS operational module is designed to function without a direct internet connection. This reduces exposure surfaces, limits dependency on external connectivity and supports sensitive environments where local control, autonomy and data containment are priorities.

Connectivity may be used only for controlled updates, technical support or documentation exchange when expressly authorized by the receiving institution. The operational design favors local servers, local audit, local data governance and supervised human command.

6. Technical Base: Bracelet and CPS Layer

Component	Target Function
UWB/BLE Bracelet	Identification, proximity and node participation within the CPS field.
UWB Anchors	Local positioning references and triangulation support.
Access Gates	Activation and verification points for pilot entry flow.
Local Server	Runs CPS logic, simulation layer, dashboard and event data locally.
Dashboard	Displays sectors, alerts, node discontinuities and operational status.
Borda Milan Pyramid	Layered conceptual architecture for tension, regimes and response modeling.

The technical specifications remain subject to supplier availability, regulatory review, component validation and the final architecture approved during Phase 1. The proposal intentionally includes experimental margin and error reserve because prototype development requires controlled iteration before reliable delivery.

7. Investment Structure: Four Phases of USD 80,000

The development model is organized into four funding phases of USD 80,000 each. Each disbursement is connected to a technical stage, a measurable output and an institutional review point. The first disbursement activates the official one-year delivery clock for the 1,000-bracelet pilot scope.

Phase	Amount	Main Objective	Institutional Output
Phase 1	USD 80,000	Architecture validation, supplier confirmation, experimental design and initial procurement planning.	Approved technical baseline, safety review and implementation plan.
Phase 2	USD 80,000	Prototype construction, bracelet batch preparation, local CPS module and controlled simulation tests.	Prototype kit, simulation results and error correction report.
Phase 3	USD 80,000	Pilot integration, field calibration, security audit, documentation and training preparation.	Validated pilot system, audit package and training materials.
Phase 4	USD 80,000	Final delivery, support activation, institutional handover and post-delivery adjustments.	Delivered kit, support plan and final technical dossier.

Total staged research and delivery envelope: USD 320,000. Each stage can be reviewed before continuation. This structure reduces risk for the supporting institution and allows the project to advance only after evidence, documentation and audit checkpoints are satisfied.

8. Phase 1 Budget Basis: USD 80,000 for the 1,000-Bracelet Pilot Preparation

To align the first institutional investment with the 1,000-bracelet pilot objective, the Phase 1 amount is structured as a research and preparation budget rather than a final commercial sale. It includes prototype uncertainty, experimentation, technical errors, travel, institutional management and laboratory operations.

Budget Line	Purpose	Amount
Pilot bracelet procurement reserve	Initial purchase planning, sample units, supplier deposits or partial batch activation for up to 1,000 pilot bracelets.	USD 28,000
UWB/BLE anchors, gates and local CPS equipment reserve	Initial technical equipment, calibration components, local server requirements and bench testing materials.	USD 12,000
Software, simulation and dashboard development	CPS logic, local dashboard, simulation routines, data structure, integration and documentation.	USD 10,000
Experimentation and error margin	Controlled failures, replacement parts, firmware iterations, hardware defects, measurement uncertainty and test repetition.	USD 9,000
Security, data and audit preparation	Risk plan, data governance, audit materials, documentation and compliance preparation.	USD 5,000
Travel and institutional coordination	Meetings, presentation logistics, local coordination, agency visits and field assessment when required.	USD 6,000
Laboratory management and administration	Project management, legal/administrative processing, accounting, supplier management and reporting.	USD 6,000
Contingency reserve	Currency fluctuations, shipping changes, customs, component replacement and unforeseen laboratory needs.	USD 4,000

Phase 1 total: USD 80,000. This amount is intended to make the 1,000-bracelet pilot technically and administratively viable, not to hide risk. The inclusion of experimentation, error margin, travel and laboratory management is deliberate and necessary for a serious CPS research project.

9. One-Year Delivery Rule

The delivery period begins on the date the first disbursement is received and confirmed. From that date, VEHICLE Systems Lab will structure the development calendar toward delivery of the pilot kit within one year, subject to the availability of components, customs processes, institutional review times and agreed audit procedures.

Period After First Disbursement	Expected Work

Month 1-2	Technical baseline, procurement plan, supplier confirmation, detailed risk and audit protocol.
Month 3-5	Prototype development, software/simulation layer and initial bracelet/anchor integration.
Month 6-8	Controlled simulation, error correction, security review and documentation.
Month 9-10	Pilot integration, training materials, institutional validation and field calibration plan.
Month 11-12	Delivery preparation, final technical dossier, handover and support activation.

10. Why the USD 80,000 Phase Amount Is Responsible

A CPS is not a simple purchase of bracelets. It is a combined research system involving physical devices, local infrastructure, data governance, mathematical modeling, dashboards, field calibration, security constraints, documentation and institutional coordination. A responsible budget must therefore include the costs of controlled mistakes and learning during experimentation.

- Experimental error is expected in prototype development and must be funded openly.
- Travel and institutional coordination are necessary for agency review, field understanding and trust-building.
- Laboratory management is required to control suppliers, documentation, reporting and accountability.
- A contingency reserve prevents the project from stopping because of component or logistics variation.
- Phased funding protects the institution because each continuation depends on reviewable progress.

11. Ethical and Operational Limits

- VEHICLE-CPS is presented as a research and support system, not as an autonomous law-enforcement tool.
- The system does not replace human command authority.
- The system is not intended for mass surveillance or political persecution.
- The pilot must be reviewed under the legal, ethical and data-protection framework of the participating country.
- Any operational deployment must follow institutional approval, audit, validation and training.

12. Public References and Traceability

Reference	Link
Official website	https://vehiclesystemlab.com
VEHICLE-CPS GitHub repository	https://github.com/vehiclesystemslab/VEHICLE-CPS
Zenodo public research record	https://zenodo.org/records/20046955
ORCID profile	https://orcid.org/0009-0009-9047-1036

13. Institutional Contact

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14. Closing Statement

VEHICLE Systems Lab respectfully submits VEHICLE-CPS for institutional review, audit and staged research collaboration. Even if a receiving agency is not prepared to support the project immediately, the objective is to establish a clear technical record, make the architecture known and keep the door open for future cooperation under a responsible, auditable and phased framework.