U.S. DOT's Small Business Innovation Research (SBIR) Program

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SBIR Fiscal Year 2024.1 Phase II Awards

Project Title	Company Name
24-FH1: Enhanced Decentralized V2V Communications Leveraging the Potential of Automotive RADAR	InnoTech Systems, Inc.
24-FH1: ViRaCom: Integrating Vision and Radar for Multi-Modality Joint Sensing and Communication in Cooperative Driving Automation	JFL Solutions, LLC
24-FH2: Apollo: A Patent Pending Mobile Device for Onsite Carbonation of Recycled Concrete Aggregate	KLAW Industries, LLC
24-FH3: Enhanced GPR system for Rapid Assessment of Concrete Bridge Deck Chloride Content	Infrasense, Inc.
24-FH3: Detect3C: Advancing the Assessment of Concrete Chloride Content Through Non-Destructive Techniques	X-wave Innovations, Inc.
24-FM1: Trailer Stability Sensor	Integrated Solutions for Systems, Inc.
24-FT2: Risk Alleviation via Detection of Information Anomalies in Network Cybersecurity Events (RADIANCE)	Protection Engineering Consultants, LLC
24-NH2: Development of an Automated Seat Belt Detection and Driver Feedback System	SaferStreet Solutions
24-NH4: Deployable Vehicle Interface Mechanism (DVIM)	Physical Sciences, Inc.
24-NH5: Prehospital Post-Crash Care Systems Improvement	Darkflite, Inc.
24-NH5: Blood Logistics Integrity | Security (BLIS): A Comprehensive Prehospital Blood Logistics Solution for Post-Crash Care	Legacy Innovation, Inc.
24-NH6: Driving Forward: The Development of a Universal Wheelchair Anchor	Tool., Inc.
24-PH1: Test Kit to Evaluate Biocide Efficacy in Limiting Microbiologically Influenced Corrosion	Corrolytics, Inc.
24-PH1: Causal AI Simulation Tool for Reducing Internal Corrosion Damage in Hazardous Liquid Pipelines	Senslytics Corporation
24-PH2: Flame and Environment Resistant Multilayer Hazardous Materials Placard	NanoSonic, Inc.
24-PH4: Fabrication and Demonstration of Mechanical Sensor for Detection of High Energy Coupling Events	Friedman Research Corporation

InnoTech Systems, Inc. (La Crescenta, CA)

Enhanced Decentralized V2V Communications Leveraging the Potential of Automotive RADAR

PI Name: Fred Daneshgaran   **PI Email:** fred@innotech-sys.com

Abstract: InnoTech Systems, LLC has developed an alternative, non-traditional, and reliable method of communication for Vehicleto-everything V2X applications by leveraging existing automotive RADAR sensors. The goal is to enable more efficient Cooperative Driving Automation (CDA) functions. The company's groundbreaking technology utilizes the capabilities of pre-installed automotive RADAR sensors to create economical, secure, low-latency communication channels for V2X applications. Compared to conventional C-V2X technology, InnoTech's solution is significantly more cost-effective, reducing infrastructure, device, and operational expenses, while delivering extremely low latency, which is critical for safety-critical applications. Among the standout features of our technology is its utilization of existing frequency bands, specifically those already allocated for automotive RADAR, which eliminates the need for costly service agreements with mobile network operators. The system also benefits from the use of prevalent hardware, leveraging RADAR sensors already installed in most modern vehicles for safety functions, thereby minimizing additional hardware requirements. The system provides low-latency communication, enabling V2X interactions at latency levels significantly lower, potentially by orders of magnitude, than current C-V2X technologies. During Phase I, InnoTech successfully completed analytical and simulation-based development of its solution via Model-in-the-Loop (MIL) and Hardware-in-the-Loop (HIL) testing and demonstrated real-time data transmission over RADAR utilizing FPGA for signal processing.

Company Website: https://www.innotech-sys.com/

JFL Solutions, LLC (La Canada Flintridge, CA)

ViRaCom: Integrating Vision and Radar for Multi-Modality Joint Sensing and Communication in Cooperative Driving Automation

PI Name: Fang Zhou

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Abstract: The ViRaCom project is dedicated to developing an integrated joint sensing and communication platform for Cooperative Driving Automation (CDA). By combining high-resolution camera systems with advanced radar modules, ViRaCom delivers robust, real-time sensor fusion and V2X connectivity for enhanced environmental perception and driving automation. The system employs adaptive algorithms and a high-level decision maker to dynamically allocate sensing and communication resources and ensure optimal performance under diverse operational conditions. Phase II focuses on refining our software and firmware solutions, optimizing hardware integration, and validating system performance through rigorous laboratory and field testing. This integrated approach will yield a scalable and cost-effective ViRaCom Integration Suite ready for commercialization.

Company Website: https://www.jflsln.com/

KLAW Industries, LLC (Binghamton, NY)

Apollo: A Patent Pending Mobile Device for Onsite Carbonation of Recycled Concrete Aggregate

PI Name: Jacob Kumpon   **PI Email:** jacob@klawindustries.com

Abstract: The concrete industry faces a massive economic and environmental challenge as quality virgin aggregates become increasingly difficult to source.

Recycled concrete aggregate (RCA) is readily available yet has remained drastically underutilized throughout the nation's transportation industry due to performance challenges with various factors critical for concrete production, including water absorption coefficient and alkali-silica reaction history.

The proposed project completes the development of a new, mobile, and scalable device called Apollo™, capable of carbonating recycled concrete at ready mix concrete plants or in the field at a construction site. Apollo™ is a patent-pending device that brings carbonation capabilities to ready-mix plant operators and contractors with an advanced rolling process that fundamentally changes the economics of RCA carbonation.

The project objective is to demonstrate carbonated RCA's performance properties, complete a 40-yard infrastructure project, and begin user testing with ready-mix concrete plants that have signed letters of support. Adopting waste streams for paving applications is a common practice, with supplementary cementitious materials (SCMs) and recycled asphalt pavement (RAP) widely used in the industry today. Scalable carbonation eliminates RCA's performance challenges and turns one of our most significant waste streams into a quality aggregate source for cost savings.

Company Website: https://klawindustries.com/

Infrasense, Inc (Woburn, MA)

Enhanced GPR system for Rapid Assessment of Concrete Bridge Deck Chloride Content

PI Name: Ken Maser   **PI Email:** kmaser@infrasense.com

Abstract: Chloride infiltration into concrete is the major cause of bridge deck damage, and knowledge of the degree of chloride infiltration is needed for decisions related to the type, extent, and timing of preservation and rehabilitation efforts. A new method based on a novel implementation of ground penetrating radar (GPR) was evaluated in Phase 1 of this project. This method demonstrated the feasibility of predicting chloride content using GPR data alone on a small group of bridge decks. By calibrating the GPR data for variations from deck to deck, a single chloride-GPR relationship (or "master-curve") was obtained for all decks, which showed a reasonable correlation.

The Phase II project seeks to improve and implement the methodology demonstrated in Phase I by refining the master curve concept through testing and evaluation of a larger group of decks. The implementation will be using a vehicle mounted 3DGPR system coupled with automation of the data analysis with a developed software application. This system will be able to rapidly scan a deck in 15-30 minutes with minimum traffic interference and produce chloride content statistics and contour maps that can be used by bridge owners to project the remaining deck life and determine appropriate rehabilitation strategies.

Company Website: https://infrasense.com/

X-Wave Innovations, Inc. (Gaithersburg, MD)

Detect3C: Advancing the Assessment of Concrete Chloride Content Through Non-Destructive Techniques

PI Name: Michael Whiteman   **PI Email:** mwhiteman@x-waveinnovations.com

Abstract: Chloride infiltration causes corrosion in steel reinforcements, compromising concrete structures' integrity and longevity. Traditional assessments using invasive core sampling and laboratory testing are time-consuming, disrupt traffic, and offer limited spatial insight, hindering effective maintenance strategies. X-wave Innovations, Inc., in collaboration with the University of Nebraska-Lincoln, is developing Detect3C for rapid, non-destructive concrete chloride assessment. This technique accurately profiles chloride content, significantly reducing field work and resource demands, while providing comprehensive data across and through entire bridge deck with minimal traffic disruptions. Phase I demonstrated the feasibility of our approach and Detect3C's effectiveness. In Phase II, we will develop a fully-functional Detect3C prototype and further validate its capability for rapid, non-invasive, comprehensive assessment of bridge deck chloride content.

Company Website: https://www.x-waveinnovations.com

Integrated Solutions for Systems, Inc. (Huntsville, AL)

Trailer Stability Sensor

PI Name: David Hodo   **PI Email:** david.hodo@is4s.com

Abstract: Improper maintenance on semi-trailers has a major impact on the handling & stability. Excessive tire wear, improper tire pressure, etc. all reduce trailer stability and increase the likelihood of stability events & accidents. Current safety/maintenance inspections do not adequately capture the overall safety/drivability of the trailer and do not check all factors that influence stability. An advanced trailer stability monitoring system could provide the same near-term stability alerts as current ESC systems, while also evaluating long term changes in the vehicle's dynamics to detect maintenance issues or improper loading that could lead to future accidents. In this effort, a small, low-cost trailer monitoring system will be developed that integrates with a wide range of vehicle and trailer sensors and makes use of accurate system dynamics models to detect both rapid changes in stability that could indicate that something is broken as well as a wear/maintenance issue.

Company Website: https://www.is4s.com

Protection Engineering Consultants, LLC (Dripping Springs, TX)

Risk Alleviation via Detection of Information Anomalies in Network Cybersecurity Events (RADIANCE)

PI Name: Kundan Goswami   **PI Email:** kgoswami@protection-consultants.com

Abstract: Cybersecurity of a transit agency's interconnected information network is critical to the agency's operation and maintenance. The FTA is concerned about the emergence of new vulnerable points in transit information network systems caused by the overwhelming number of agile cyber threats. Safeguarding these vulnerable points against an ever-evolving spectrum of cyber threats is necessary. Numerous ML solutions exist for cybersecurity intrusion detection. Most of these solutions perform poorly with disparate, limited data collected in various formats from a transit agency's cyber-physical systems and stored for a limited duration. The existing solutions either raise false alarms or fail to detect novel cyber intrusion events. During Phase II, PEC will continue to develop a novel ML solution called RADIANCE, which is a data- and application-type agnostic algorithm to effectively detect cyber intrusions from limited information and provide actionable intelligence.

Company Website: https://www.protection-consultants.com/

SaferStreet Solutions (Penfield, NY)

Development of an Automated Seat Belt Detection and Driver Feedback System

PI Name: Timothy Hogan

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Abstract: This SBIR topic seeks to resolve two problems: First, is to increase the national seat belt use rate. A driver feedback sign specifically designed for seat belt detection is an effective countermeasure against unbelted driving. The second problem is the cost and effort of observational seat belt studies. This will be addressed by the development of an automated seat belt detection device.

Company Website: https://www.saferstreetsolutions.com

Physical Sciences, Inc. (Andover, MA)

Deployable Vehicle Interface Mechanism (DVIM)

PI Name: Alex Moerlein **PI Email:** amoerlein@psicorp.com

Abstract: Vehicle wheelchair restraints need to provide secure connection of the wheelchair into the vehicle and survive potential crash loads. The current practices for wheelchair users operating or riding in a vehicle are either to transfer from their wheelchair to a seat in the vehicle, or to restrain the wheelchair within the vehicle using a 3- or 4-point tiedown system. To address this need, PSI is developing the Deployable Vehicle Interface Mechanism (DVIM). The DVIM adapter attaches to the rear of a wheelchair & provides docking geometry for an anchoring system to attach to. The DVIM system is designed to be lightweight while still being strong enough to withstand 30 mph, 20g frontal impacts in accordance w/ ANSI/RESNA WC-4 Section 19 (WC19) regulating the use of wheelchairs as seats in motor vehicles, & 13 mph, 10g side impacts. The deployable nature of the DVIM enables the user to stow the adapter when not in use, further reducing the impact of the system on wheelchair feel & function.

Company Website: https://www.psicorp.com

Darkflite, Inc. (Brighton, MI)

Prehospital Post-Crash Care Systems Improvement

PI Name: James McClearen

PI Email: james@darkflite.com

Abstract: Darkflite proposes a Phase II effort to develop, test, and validate a drone-based blood delivery system that supports prehospital emergency care for motor vehicle crash victims, with a focus on rural and high-fatality areas. Building on Phase I feasibility findings, this project integrates autonomous UAV technology with EMS dispatch systems to rapidly deliver blood products to accident scenes. The proposed system includes temperature-controlled blood transport containers, automated flight planning software, and drone hardware—laying the groundwork for eventual transition to FAA Part 135 operation through a certified operator partner.

The work plan follows a structured approach across three stages: Concept & System Design, Technology & Regulatory Preparation, and Testing & Commercial Feasibility. Phase II activities include SOP development, 9-1-1 integration, drone and container optimization, test flying site selection, FAA coordination, and real-world test flights in collaboration with Acadian Ambulance and Airspace Link. The expected outcome is expected to be a validated, scalable, and safe medical logistics system that improves response times and patient outcomes.

The project aligns with U.S. DOT and NHTSA goals to reduce roadway fatalities and demonstrates a novel approach to closing critical care gaps through autonomous drone delivery. Results will inform a commercialization roadmap and future scale-up strategy.

Company Website: https://www.darkflite.com

Legacy Innovation, Inc. (Boise, ID)

Blood Logistics Integrity | Security (BLIS): A Comprehensive Prehospital Blood Logistics Solution for Post-Crash Care

PI Name: Jeffrey Dalton   **PI Email:** jeff@legacy.us

Abstract: BLIS creates a reliable, scalable prehospital blood/biologic supply chain to support EMS/First Responders for steady-state operations, public health emergencies, and military large scale combat operations. BLIS collects whole blood for the Armed Services Blood Program (ASBP), who manages this newly-created Prehospital Blood Supply (pBS) for distribution to military and civilian EMS.

Phase II advances prototypes and integration for: BLIS Label with embedded sensors for real-time temperature control; BLIS Data & Inventory Management System - secure platform for end-to-end tracking and predictive analytics; BLIS Containers - energy-efficient, durable, reusable units maintaining optimal blood/biologic temperatures; and multimodal delivery to EMS/First Responders including (future) drone.

The goal is to demonstrate the technical feasibility and operational concepts of BLIS, short of formal FDA/FAA approval processes, to enhance emergency response capabilities and improve patient outcomes.

Company Website: https://www.legacy.us

Tool., Inc. (Marblehead, MA)

Driving Forward: The Development of a Universal Wheelchair Anchor

PI Name: John Fiegener   **PI Email:** john@toolinc.com

Abstract: Building on the successful Phase I development of a prototype anchor system for wheelchair securement, Tool Inc. will advance a universal, automated, and UDIG-compliant docking system for powered and manual wheelchairs. The system is designed to support independent use by the wheelchair occupant and integration across a wide range of transportation modes, including autonomous vehicles (AVs), transit, and personal vehicles. In Phase II, Tool will lead detailed mechanical and electrical engineering development, supported by the University of Michigan Transportation Research Institute for crash simulation, sled testing, and user validation.

Key collaborators include a committed commercial partner, who will provide prototype manufacturing, engineering reviews, and in-kind funding as part of a potential path to commercial production. Additional in-kind supporters include major automotive OEMs, tier-one component suppliers, leading manufacturers of wheelchair restraint systems, and leading advocacy groups such as the SecureRide Coalition, Spina Bifida Association, and Muscular Dystrophy Association.

The Phase II effort will refine and validate the system across vehicle platforms and use cases, delivering a manufacturable, crash-tested, and user-validated design. This program directly supports DOT goals for wheelchair usage and safety, while setting the stage for impactful commercialization through an unprecedented coalition of regulatory, academic, and industry stakeholders.

Company Website: https://toolinc.com/

Corrolytics, Inc. (Cleveland, OH)

Test Kit to Evaluate Biocide Efficacy in Limiting Microbiologically Influenced Corrosion

PI Name: Joshua Davis

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Abstract: Microbially influenced corrosion (MIC) is responsible for approximately 40% of internal corrosion in gas transmission pipelines, contributing to an estimated $7 billion in annual costs. MIC poses serious risks, including productivity losses, unplanned downtime, environmental harm, and potential safety hazards. Detection is challenging due to the complex interplay between microbial activity and corrosion processes—many factors can contribute to corrosion, and microbial and non-microbial mechanisms often produce similar damage patterns. Existing detection methods are often slow, require specialized expertise, and struggle to distinguish MIC from other corrosion types.

To overcome these limitations, Corrolytics has developed a test kit designed to monitor microbial corrosion and assess the effectiveness of biocides and chemical treatments. The kit addresses a critical need for asset integrity managers and corrosion engineers by enabling faster, more accurate MIC detection. Validated through partnerships with industry leaders and successful testing on real-world pipeline samples, the technology has demonstrated its practical utility. With PHMSA funding, Corrolytics aims to further refine the test kit to enhance biocide efficacy assessment, supporting improved corrosion management, reduced downtime, lower environmental impact, and significant cost savings for pipeline operators.

Company Website: https://corrolytics.com

Senslytics Corporation (Peachtree Corners, GA)

TRAIDMA (Transit Reliability and AI Driven Maintenance Architecture)

PI Name: Rabindra Chakraborty   **PI Email:** rabi.chakraborty@senslytics.com

Abstract: Senslytics aims to deliver a secure, cloud-based corrosion simulation platform (CorroSim) capable of forecasting corrosion growth and remaining life across liquid pipeline segments using explainable, causation-based AI logic. With our proven causal AI engine (CausX AI), we will simulate corrosion behavior in liquid pipelines, factoring in operational, chemical, and microbial variables. This will allow engineers to run multiple scenarios to evaluate treatment strategies, plan interventions, and reduce high-consequence failures.

Company Website: https://www.senslytics.com/

NanoSonic, Inc. (Pembroke, VA)

Flame and Environment Resistant Multilayer Hazardous Materials Placard

PI Name: Bradley Gibbons

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Abstract: Despite their importance, commercial HAZMAT placards are not stable to mild heat < 150 °C or flame exposure, and experience significant weathering over months of outdoor exposure. The lack of durability of commercial HAZMAT placards has potentially serious consequences for first responders and the surrounding environment when dealing with a hazardous materials incident. NanoSonic has developed a prototype HAZMAT placard that is stable to extended flame exposure at temperatures over 600 °C while maintaining readability. NanoSonic's self-extinguishing HybridShield resin was used as the base of the pigmented layer, preventing flame spread from the base of the placard to improve readability even after several minutes in the flame. In this Phase II effort, NanoSonic will continue to improve the performance to flame exposure and temperatures up to 1200 °C, test for extended weathering stability, and improve interlayer adhesion to promote durability.

Company Website: https://nanosonic.com/

Friedman Research Corporation (Austin, TX)

Fabrication and Demonstration of Mechanical Sensor for Detection of High Energy Coupling Events

PI Name: Garrett Mattos   **PI Email:** gmattos@friedmanresearch.com

Abstract: We have created a prototype mechanical detection system design that can notify yard operators when a tank car is subjected to a high energy coupling event. The feasibility of the system to work in an operational environmental and service conditions without operator involvement for a minimum service life will be demonstrated. Scaled physical testing has been conducted to verify that the detection system notification threshold is accurate and can be calibrated to a desired input. We will proceed with low volume pilot fabrication and continue to refine the system design with full scale railcar testing both in controlled impact testing and in service railcar performance testing, as well as high energy based durability testing. We will create a plan for initial low-volume production and distribution to tank car owners in response to industry indication of interest and support.

Company Website: https://www.friedmanresearch.com/