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

SBIR Fiscal Year 2024.1 Phase I Awards

Project Title	Company
24.1-FH1: Integrated Perception and Communication System for Cooperative Driving Automation	Aiwaysion, Inc
24.1-FH1: Enhanced Decentralized V2V Communications Leveraging the Potential of Automotive RADAR	InnoTech Systems Inc.
24.1-FH1:ViRaCom: Integrating Vision and Radar for Multi-Modality Joint Sensing and Communication in Cooperative Driving Automation	JFL Solutions LLC
24.1-FH2: Apollo: A Patent Pending Mobile Device for Onsite Carbonation of Recycled Concrete Aggregate	KLAW Industries LLC
24.1-FH2: Rapid and Continuous RCA Carbonation With Vapor Loss Minimization	Nalari Scientific, LLC
24.1-FH3: Enhanced GPR system for Rapid Assessment of Concrete Bridge Deck Chloride Content	Infrasense, Inc.
24.1-FH3: On-site, Robust Detector System for Non-destructive Chemical Analysis at Depth	Radiation Monitoring Devices, Inc.
24.1-FH3: Detect3C: Advancing the Assessment of Concrete Chloride Content Through Non-destructive Techniques	X-wave Innovations, Inc.
24.1-FM1: Trailer Stability Sensor	Integrated Solutions for Systems, Inc.
24.1-FR1:Portable Inspection Automation for Trackwork Structures	The Sensor Group, LLC
24.1-FT1:Thermally Controlled Integrated Energy Storage Device for Electric Vehicle Applications	PolyMaterials App, LLC
24.1-FT2: Risk Alleviation via Detection of Information Anomalies in Network Cybersecurity Events (RADIANCE)	Protection Engineering Consultants, LLC
24.1-FT3: The Reduction of Auxiliaries Power Demand using Fuel-Fired Heaters on Battery Electric Buses	ReVolt Battery Technology Corporation
24.1-NH1: Eyes on the Road, Eyes on You: Next Generation Computer Vision for Improved Road Safety and Enhanced Driver Awareness	BlueFusion Inc
24.1-NH1: Visual Integration of Language Models in Automotive Safety (VILMAS)	Mosaic ATM, Inc.
24.1-NH2: Development of an Automated Seat Belt Detection and Driver Feedback System	SaferStreet Solutions

Project Title	Company
24.1-NH4: Deployable Vehicle Interface Mechanism (DVIM)	Physical Sciences Inc.
24.1-NH5: Feasibility Study for a Drone-Based Blood Delivery System	Darkflite Inc
24.1-NH5: Blood Logistics Integrity | Security (BLIS): A Comprehensive Prehospital Blood Logistics Solution for Post-Crash Care Enhancement	Legacy Innovation Inc.
24.1-NH6: Driving Accessibility Forward: The Development of a Universal Wheelchair Anchor	Tool., Inc.
24.1-PH1: Development of a Test Kit to Evaluate Biocide Efficacy in Limiting Microbiologically Influenced Corrosion	MIC Monitor LLC DBA Corrolytics
24.1-PH1: Causal AI Simulation Tool for Reducing Internal Corrosion Damage in Hazardous Liquid Pipelines	Senslytics Corporation
24.1-PH2: Flame and Environment Resistant Multilayer Hazardous Materials Placard	NanoSonic, Inc.
24.1-PH3: Acoustic Emission Health Monitoring System for DOT Pressure Cylinders	FBS, Inc.
24.1-PH4: Mechanical System for Detection of High Energy Coupling Events	Friedman Research Corporation
24.1-PH5: Zerotinous Materials: Biodegradable Firework Components	Biointerphase, Inc.

Aiwaysion, Inc. (Seattle, WA)

Integrated Perception and Communication System for Cooperative Driving Automation

PI Name: Wei Sun   **PI Email:** wsun@aiwaysion.com

Abstract: This project aims to develop an Integrated Perception and Communication System designed for Cooperative Driving Automation (CDA), deployable on both infrastructure and vehicles. This system amalgamates advanced sensing modules (cameras, LiDAR, radar), edge computing units, and diverse communication making in dynamic driving environments. The system aims to revolutionize CDA by improving safety, efficiency, and traffic management, contributing to the USDOT's vision of a safer, more efficient, and technologically advanced transportation future.

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

InnoTech Systems Inc. (La Crescenta, CA)

Enhanced Decentralized V2V Communications Leveraging the Potential of Automotive RADAR

PI Name: Kash Olia   **PI Email:** kash@innotech-sys.com

Abstract: Widespread adoption of Cooperative Driving Automation (CDA) in transportation systems is growing rapidly. Meeting the extensive communication requirements—ensuring reliability, cybersecurity, and safety for such systems—poses significant challenges. One major hurdle is the establishment of robust communication protocols to ensure seamless, low-latency, and secure data exchange between vehicles and various elements of the transportation infrastructure. Achieving interoperability among diverse vehicle types, brands, and communication standards is another significant challenge. Furthermore, ensuring the reliability and low-latency communication necessary for safety-critical applications demands sophisticated technologies. Leveraging the existing array of sensors and processors found in modern vehicles could be highly beneficial in addressing these challenges. This proposal specifically focuses on this challenge, particularly exploring how existing RADAR systems can be utilized to establish secure, reliable, and low-cost communications between vehicles. This low-latency communication link proves highly advantageous in safety-critical applications, particularly where traditional Vehicle-to-Cloud (V2C) systems face challenges due to extended processing times and communication delays between vehicles and the cloud, and internal to cloud networks. This innovation could unlock significant possibilities for enabling real-time communication in safety-critical applications like Cooperative Collision Warning System (CCWS), Cooperative Maneuvering and Over-the-Air (OTA) Software Update.

Company Website: 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   **PI Email:** fang.zhou@jflsln.com

Abstract: In the evolving domain of Cooperative Driving Automation (CDA), the integration of vehicular and infrastructural systems is pivotal for transforming transportation, aiming to bolster safety, mobility, environmental sustainability, situational awareness, and traffic flow efficiency. Despite the advancement of CDA algorithms and the availability of communication technologies like Cellular Vehicle-to-Everything (C-V2X), the challenge of melding these technologies for real-time CDA persists, hindered by the limitations of standalone sensing and communication systems. Addressing this challenge, we introduce ViRaCom, a novel plug-and-play system that amalgamates RadCom—a joint radar and communication technology—with cost-effective cameras to facilitate robust and efficient cooperative multimodality sensing and communication under various conditions, including adverse weather and low ambient lighting. While RadCom contributes to communication and radar-based object detection, its efficacy is constrained by low spatial resolution and environmental clutter. Conversely, vision-based sensing offers high resolution and rich semantic information, complementing radar's geometric data. This integration not only capitalizes on the mature radar and camera technologies prevalent in the automotive industry but also aligns with the objectives of the SBIR call, proposing a compact, integrated module for multimodal perception.

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 creates a new, mobile, and scalable device called Apollo™, capable of carbonating recycled concrete at a ready mix concrete plant 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 eliminate the technical barriers facing Apollo™ to 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 aligns concrete producers' financial interests to turn one of our most significant waste streams into an end market for sequestered carbon.

Company Website: https://klawindustries.com/

Nalari Scientific, LLC (Atlanta, GA)

Rapid and Continuous RCA Carbonation with Vapor Loss Minimization

PI Name: Daniel Deocampo   **PI Email:** deocampo@nalariscientific.com

Abstract: The purpose of this project is to provide proof of concept for Nalari Scientific's Aggregate Carbonation System, which provides a means of continuous, high-throughput, carbonation of Recycled Concrete Aggregate (RCA), in a portable, easy to use, easy to maintain system. This system will enhance the performance of RCA for concrete manufacture, improving workability and concrete strength while significantly reducing the cost of manufacture and lowering the CO_2 emissions of concrete pavement projects. The project uses Nalari Scientific's proprietary inlet and outlet aggregate regulators that provide continuous aggregate feed while preventing vapor loss, along with a carbonation chamber ensuring proper aggregate hydration and carbonation. This proof of concept will be shown by building a ~⅓-scale demonstration device, with comprehensive technical evaluation of the methods, and establishing validation techniques that are usable by technicians in practical operation. Based on production costs and energy consumption, the project will compare the economic and environmental costs of concrete manufacture using carbonated recycled concrete aggregate, versus newly mined aggregates, assuming a variety of transport distance scenarios.

Company Website: https://www.nalariscientific.com/home

Infrasense, Inc. (Woburn, MA)

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

PI Name: Adam Carmichael   **PI Email:** info@infrasense.com

Abstract: An assessment of chloride infiltration into bridge decks is key to making decisions relating to the type and extent of repair, yet current test methods are time-consuming and provide limited local information. Ground penetrating radar (GPR) has shown promise as a potential chloride detection method. However, GPR correlation with chloride content varies from deck to deck and additional data are needed to calibrate for other variables. This project seeks to develop a method that can work for all bridge decks by more fully exploiting the information potential of GPR and incorporating information from other available non-destructive evaluation (NDE) methods that will be used to "calibrate" the GPR results to the local deck conditions. Previously collected data on decks that have accompanying chloride sample data will be evaluated and variations from deck-to-deck will be assessed with a parametric study using a well-established electromagnetic modeling program. The results of that modeling effort will suggest companion NDE measurements to calibrate for the deck-to-deck variations. A prototype system will be proposed and field tested on multiple bridge decks to confirm the feasibility of the method and to develop recommendations and specifications for Phase II development.

Company Website: www.infrasense.com

Radiation Monitoring Devices, Inc. (Watertown, MA)

On-site, Robust Detector System for Non-destructive Chemical Analysis at Depth

PI Name: Mary Abud   **PI Email:** mabud@rmdinc.com

Abstract: The non-destructive assessment of thick, dense materials, (i.e., concrete) for infiltration of impurities, such as chlorides, can be accomplished using identical methods deployed on the Moon, Mars, or other asteroids. The method relies on the moderation or capture of neutrons, which interact with specific elements to produce specific gamma-ray and neutron signals directly related to the constituents within the surface. Radiation Monitoring Devices (RMD) has developed a compact, gamma-ray and neutron detector for these types of measurements, and we plan to deploy these instruments with a pulsed neutron generator for assessing the elemental concentrations within concrete. Specifically for chlorine, the high-energy gamma rays can be readily detected, while neutron spectroscopy is used to constrain the material concentrations and depths. The nature of the measurement will probe the concrete to at least a few feet down without the need for core drilling and off-site material analysis. Using existing hardware, RMD will design, fabricate, and demonstrate a system for mapping the chloride concentrations in bridge deck material.

Company Website: www.rmdinc.com

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

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

PI Name: Jennifer Duan   **PI Email:** jduan@x-waveinnovations.com

Abstract: Chloride infiltration is a leading cause of corrosion in steel reinforcements within concrete structures, significantly compromising their structural integrity and longevity. Traditionally, assessing chloride content has relied on invasive core sampling and laboratory testing, which are time-consuming, disrupt traffic, and provide limited spatial insight, hindering the development of effective maintenance strategies. These methods often fail to deliver the necessary data for informed decision-making. X-wave Innovations, Inc., supported by the University of Nebraska-Lincoln and TechOpp Consulting, Inc., proposes to develop a technique for rapid, non-destructive concrete chloride content assessment, Detect3C. Detect3C aims to determine the chloride content profile in concrete structures through rapid, non-destructive evaluation methods. This technique would significantly reduce the time and resources required for assessments while providing comprehensive and accurate data across and through the entire bridge deck with minimal field work and traffic disruptions. In Phase I, the feasibility of our proposed approach and the ability of the developed Detect3C for concrete chloride content assessment will be demonstrated. In Phase II, a prototype system will be developed and field tested at the Nebraska Outdoor Bridge Laboratory. This technology will aim to transform bridge maintenance practices by facilitating thorough assessments with minimal physical intervention and infrastructure impact.

Company Website: 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 handling and stability. Excessive tire wear, improper tire pressure, and worn or damaged hardware components all significantly reduce trailer stability and increase the likelihood of stability events and accidents. Current safety and maintenance inspections do not adequately capture the overall safety or drivability of the trailer and do not check all factors that influence stability, such as the condition of the suspension system and current load balance. An advanced trailer stability monitoring system, based on accurate truck/trailer stability models and capable of evaluating sensor data over long time periods, could provide the same near-term stability alerts as current electronic stability control (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 slow changes that could indicate a wear or maintenance issue that could lead to a later failure.

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

The Sensor Group, LLC (Tucson, AZ)

Portable Inspection Automation for Trackwork Structures

PI Name: Andrew Griffis   **PI Email:** andy@thesensorgroup.com

Abstract: TSG proposes to develop a portable computer vision kit that is compatible with existing track work structures and enables both realtime and offline assessments to be made based on field work conducted with the kit such that 49CFR regulatory requirements can be assessed. Phase 1 will produce a proof of concept and Phase 2 action plan such that a prototype can be built and tested in Phase 2, with Phase 3 opportunities opening with FRA and existing railroad companies TSG is already serving through its commercial partners.

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

PolyMaterials App, LLC (Tampa, FL)

Thermally Controlled Integrated Energy Storage Device for Electric Vehicle Applications

PI Name: Manoj Ram   **PI Email:** manoj.ram@polymaterialsapp.com

Abstract: PolyMaterials has developed a modern technology to manage the temperature rise in batteries to avoid thermal runaway in energy storage system. PolyMaterials is proposing to develop under DOT SBIR Phase I, an integrated adaptor that will reduce the risk of thermal runaway and could be easily integrated into the EV batteries resources/facilities with minimum investment. The proposed integrated technology will be the first of its kind to save thermal runaway and would be implemented in a wide range of EVs, electronics and peak power grid assistance, drones, emergency power back, and many power devices. The project includes modeling, design, manufacturing, and integration of components into an efficient energy storage device in Phase I. Performance integration, risk assessments, and detailed cost benefit analysis will be performed in Phase II. Raytheon has identified the business opportunity, and we will be partnering in the Phase II program for validation and commercialization of the technology for thermal runaway applications. Phase III will see the commercial transition of our technology for commercial and DoD applications. PolyMaterials anticipates its position as a preferred alternative for energy storage applications and positions itself to secure contracts that are currently established in the energy storage value chain.

Company Website: https://www.polymaterialsapp.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, such as battery electric bus charging infrastructure, agency webpage/login pages, database management, information technology systems, etc., caused by the increasing agility, overwhelming number, and capability of cyber threat actors. Safeguarding these vulnerable network points against an ever-evolving spectrum of cyber threats is necessary. Numerous Machine Learning (ML) solutions exist for cybersecurity risk assessment in the open literature. Most of these solutions perform poorly with disparate and limited data, which is the case under consideration due to data collected in various formats from real-time operations, customer interface, and information technology of a transit agency and stored for a limited duration. The existing solutions either raise false alarms or fail to detect novel cyber intrusion events. By leveraging recently concluded research, PEC proposes to develop a novel ML solution called RADIANCE that can effectively tackle disparate data and efficiently detect cyber intrusions from limited information. The proposed solution is data-type agnostic, which will allow it to work with other intrusion detection system groups and jointly form a complete system.

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

ReVolt Battery Technology Corporation (Houston, TX)

The Reduction of Auxiliaries Power Demand using Fuel-Fired Heaters on Battery Electric Buses

PI Name: Jan Naidu   **PI Email:** jan.naidu@revoltbatterytechnology.com

Abstract: Ambient external temperature and factors, such as topography, number of passengers, battery capacity, and surface conditions influence the range of battery-powered electric buses. A significant factor influencing the distance e-buses cover is the buses' heating and air conditioning (HVAC), which contributes to greater than 50% of the use of battery power in North America's frigid and warm weather regions.

We explore using fuel-fired heaters and heat pumps for heating or cooling e-buses via a tech-economic feasibility study. Our research will build on previous work to explore, model, and size alternative auxiliary power units that could supplement energy demand for the available technological options that can be used for transit buses. Secondly, the specific energy consumption of various heating systems in different operating conditions will be simulated and analyzed. The insights from this research work can provide a foundation for optimizing power usage by HVAC systems in e-buses, size lithium-ion batteries, plan for grid capacity, and simulate energy utilization models for public transit or freight vehicles in the future.

Company Website: www.revoltbatterytechnology.com

BlueFusion, Inc. (Boston, MA)

Eyes on the Road, Eyes on You: Next Generation Computer Vision for Improved Road Safety and Enhanced Driver Awareness

PI Name: Ramesh Annavajjala   **PI Email:** ramesh@bluefusion.tech

Abstract: Our proposed project aims to revolutionize road safety and traffic management through the development of advanced computer vision algorithms for concurrent driver status monitoring and road traffic analysis. Leveraging a sophisticated dual-camera sensor setup with one camera focused on external road conditions and the other on driver monitoring, our solution integrates a modified YOLO (You Only Look Once) object detection and classification algorithm. This modified YOLO algorithm is meticulously trained using rich datasets generated by our dual camera system. The external camera captures real-time data pertaining to traffic dynamics, vulnerable road users, and evolving road conditions. Simultaneously, the internal camera monitors the driver's behavior, enabling the algorithm to detect indicators of drowsiness, inattention, or incapacitation. By combining these insights, our system provides a holistic understanding of the driving environment, fostering a comprehensive approach to road safety. The key innovation lies in the adaptability of the YOLO algorithm, which is tailored to the unique requirements of our dual-camera system. This customization ensures optimized and accurate object detection and classification, enhancing the system's ability to identify not only common traffic elements but also specific driver-related parameters. Throughout this project, our focus will be on refining, training, and validating the algorithm using diverse datasets.

Company Website: https://bluefusion.tech

Mosaic ATM, Inc. (Leesburg, VA)

Visual Integration of Language Models in Automotive Safety (VILMAS)

PI Name: Miguel Peko   **PI Email:** mpeko@mosaicatm.com

Abstract: Improving the safety of our Nation's drivers and vulnerable highway users is a moral imperative. With the advent of cutting-edge artificial intelligence and machine learning (AI/ML) technology, we are on the precipice of a revolutionary leap in the ability to save lives, prevent injuries, and reduce costs through crash prevention via innovative research.

Visual Integration of Language Models in Automotive Safety (VILMAS), leverages state-of-the-art approaches and advancements in object detection routines able to determine the mental and physical readiness of drivers as well as the potential impact to pedestrians or other road users. VILMAS uniquely offers a holistic and context-aware assessment of driver readiness from moment to moment within their individual driving situation combined with the ability to determine the potential impact of vulnerable road users external to the vehicle and driver being evaluated.

Company Website: https://mosaicatm.com/

SaferStreet Solutions (Penfield, NY)

Development of an Automated Seat Belt Detection and Driver Feedback System

PI Name: Tim Hogan   **PI Email:** TimHogan@saferstreetsolutions.com

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.

The objective of this project is to develop a roadside seat belt detection system that can:
- achieve 99.5% accuracy under various traffic, weather, and lighting conditions
- be deployed in 15 minutes by an untrained individual
- operate for 3 days with no intervention

Company Website: www.saferstreetsolutions.com

Physical Sciences Inc. (Andover, MA)

Deployable Vehicle Interface Mechanism (DVIM)

PI Name: Michael Tieman   **PI Email:** mctieman@psicorp.com

Abstract: The U.S. Department of Transportation is dedicated to improving access and equity in transportation for all Americans. Wheelchair users experience significant costs and barriers to safe transportation in private and public vehicles. Vehicle wheelchair restraints need to provide secure connection of the wheelchair into the vehicle and survive potential crash loads.

Existing wheelchair mounts are unique to the particular vendor and not interchangeable. They often project downward or backward, limiting ground clearance or interfering with assistants who might help push the wheelchair. The DOT needs a mount that is lightweight, strong, and stows out of the way when not in use.

PSI proposes to develop the Deployable Vehicle Interface Mechanism, a lightweight deployable bracket for attaching a wheelchair to an automated mount inside a passenger vehicle. PSI's design allows the DVIM to fold up out of the way when not in use while still meeting crash loads (20g frontal impact, 10g lateral impact with midsize male). The system will be user-operable from the wheelchair, with a simple and intuitive control to fold and deploy the DVIM.

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

Darkflite Inc (Brighton, MI)

Feasibility Study for a Drone-Based Blood Delivery System

PI Name: James McClearen   **PI Email:** james@darkflite.com

Abstract: Our proposal focuses on leveraging drone technology to revolutionize prehospital post-crash care systems improvement. Drones offer unparalleled advantages, including rapid response times and the ability to access hard-to-reach areas, such as rural regions or disaster zones. By utilizing drones for medical supply delivery, we can significantly reduce the time it takes to provide life-saving blood products and medical tools to crash victims and emergency responders. This swift response capability can help stabilize patients and improve their chances of survival while awaiting further medical attention. Additionally, integrating drones into emergency response infrastructure enhances resilience and preparedness, ensuring critical medical supplies reach those in need promptly, even in the face of unforeseen emergencies or natural disasters. Ultimately, our innovative drone-based solution aims to save lives by enhancing emergency response times and accessibility, thus contributing to a reduction in fatality rates and overall improvement in emergency preparedness within the U.S. transportation system. As part of our proposal, we will produce a comprehensive report covering technical, regulatory, and operational aspects working with renowned experts, to outline a drone-based blood delivery solution in preparation for a potential phase 2 effort.

Company Website: www.darkflite.com

Legacy Innovation Inc. (Boise, ID)

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

PI Name: Arrenvy Bilinski   **PI Email:** arrenvy@legacy.us

Abstract: The BLIS (Blood Logistics, Integrity and Security) System tackles bottlenecks and fills gaps in the blood and biologic supply chain to ensure timely delivery, equitable access, and efficient resource management. Reach is extended in rural communities and frontier areas with a novel, drone-led, multimodal, hub and spoke and point-to-point delivery network.

BLIS Boxes use advanced thermoelectric technology with continuous verifiable temperature control to protect product integrity and prevent wastage during cold chain transport from the blood donor (collection/processing) to the prehospital patient. Blood can be warmed during transport for immediate transfusion on arrival at a post-crash site. BLIS System biologic data tracking can be used for logistics planning, inventory management, and biologic research.

BLIS streamlines delivery logistics and facilitates rapid blood transfusions in critical moments following accidents. With an estimated 11,000 paramedic-level Emergency Medical Services (EMS) agencies nationwide and with less than 1% of EMS agencies carrying blood products, a broader need for equitable access to prehospital blood transfusion services exists nationwide. BLIS empowers EMS agencies of all sizes and locations to efficiently access and administer life-saving blood products. As a dual-use solution for both civilian and military, BLIS scales to offer à la carte options for varying needs.

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

Tool., Inc. (Marblehead, MA)

Driving Accessibility Forward: The Development of a Universal Wheelchair Anchor

PI Name: Richard Marshall **PI Email:** richard@toolinc.com

Abstract: Drawing from the extensive background and recent advancements in wheelchair transportation safety, Tool., Inc. will develop an effective anchor system for the diverse world of wheelchair securement, addressing key safety, compatibility, and autonomy challenges for wheelchair users. Recent research and development, underpinned by standards such as RESNA WC18, WC19, and ISO 10542-1, highlights the critical need for adaptable securement systems in both manual and power wheelchairs. This initiative is enriched by the partnership with the University of Michigan Transportation Research Institute (UMTRI) and the SecureRide Coalition. UMTRI is a leader in the field, with contributions to developing side impact testing emphasizing the project's alignment with cutting-edge safety research. By leveraging UMTRI's expertise in crash simulations, along with insights from industry thought leaders in the area into user needs and standards, Tool is well-positioned to design an effective and widely usable anchor for transportation. This collaborative approach, underscored by a commitment to enhancing mobility and ensuring safety across transportation modes, sets the stage for impactful innovations in wheelchair securement, with a keen eye on broad applicability to facilitate wider adoption and integration into future transportation systems.

Company Website: https://toolinc.com/

MIC Monitor LLC DBA Corrolytics (Cleveland, OH)

Development of a Test Kit to Evaluate Biocide Efficacy in Limiting Microbiologically Influenced Corrosion

PI Name: Sai Prasanna Chinthala   **PI Email:** s.p.chinthala@corrolytics.com

Abstract: Microbially influenced corrosion (MIC) accounts for about 40% of internal corrosion in gas transmission pipelines, contributing to an estimated annual cost of $7 billion. MIC poses significant risks, leading to productivity loss, increased downtime, environmental damage, and personnel injury. Identifying MIC presents a challenge due to the complex relationship between microorganisms and corrosion, as multiple factors influence corrosion, and different mechanisms can result in similar corrosion patterns. Current techniques often lack the ability to differentiate between microbial and other forms of corrosion, requiring highly technical expertise and often providing delayed detection.

To address these challenges, Corrolytics has developed a test kit aimed at monitoring microbial corrosion and evaluating the efficacy of biocides and chemical treatments. The test kit fills a crucial knowledge gap for asset integrity managers and corrosion engineers, providing faster, more accurate detection of MIC. Through partnerships with industry leaders and successful validation with real-world samples, Corrolytics has demonstrated the effectiveness of its technology. With the support of PHMSA funding, Corrolytics aims to further refine its test kit to evaluate biocide efficacy, paving the way for enhanced corrosion monitoring and control in pipelines, ultimately reducing downtime, environmental damage, and operational costs.

Company Website: https://corrolytics.com

Senslytics Corporation (Peachtree Corners, GA)

Causal AI Simulation Tool for Reducing Internal Corrosion Damage in Hazardous Liquid Pipelines

PI Name: Blake Bixler   **PI Email:** blake.bixler@senslytics.com

Abstract: Internal corrosion is a major challenge for hazardous liquid pipeline operators and can be difficult to detect. Even when corrosion is identified, it's hard to determine the cause. Early identification of corrosion coupled with a clear understanding of the corrosion mechanism and the most effective way to slow corrosion growth can prevent damage to assets, the environment, and human safety while saving pipeline operators money. No data or quantitative risk assessment tool reliably provides this information today. Senslytics is developing CorroSim: an AI corrosion simulation application using its proprietary causal Intuition AI technology, that can understand and model influencers of internal corrosion behavior, differentiate aerobic vs. anaerobic microbial-influenced corrosion, and extend interpretation to new situations. Upon completion of phase II, this product would enable engineers to perform simulations to determine the most effective method for addressing internal corrosion. The proposed solution uses a hybrid AI approach that combines data with subject matter expert knowledge codified into the model. It produces reliable, definitive interpretations while overcoming the challenges machine learning runs into with limited data availability. The benefits of the proposed solution to pipeline operators include reducing internal corrosion and optimizing corrosion management spending, ultimately minimizing environmental and human safety risks.

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

NanoSonic, Inc. (Pembroke, VA)

Flame and Environment Resistant Multilayer Hazardous Materials Placard

PI Name: Amanda Moye   **PI Email:** amoye@nanosonic.com

Abstract: HAZMAT safety placards are a critical component to the safe transport and handling of hazardous chemicals and materials. While majority of these shipments arrive with no issue, transporting large quantities of hazardous material poses significant risk to the environment and local communities in the event of a catastrophic failure. HAZMAT placards provide quick information to first responders and local authorities to quickly identify hazards and appropriately respond to an emergency. For this reason, HAZMAT placards need to be able to withstand high temperature exposure without significant loss of information. The HAZMAT placards should also be stable to harsh conditions endured during transportation including weather, chemical exposure and physical damage. NanoSonic proposes a multilayer HAZMAT placard to impart enhanced flame, temperature, and environmental stability without loss of critical information. NanoSonic's solution combines laser etching, flame resistant coloring, and our novel HybridShield technology to impart enhanced flame resistance and extreme weathering resistance. During this program, NanoSonic will work to optimize the coating and formulation of our HybridShield technology for maximum visibility and environmental stability. A prototype placard will be tested for flame and heat resistance, along with accelerated aging and abrasion studies to measure long term stability.

Company Website: www.nanosonic.com

FBS, Inc. (Bellefonte, PA)

Acoustic Emission Health Monitoring System for DOT Pressure Cylinders

PI Name: Cody Borigo   **PI Email:** Cborigo@gwultrasonics.com

Abstract: Recertifying hydrogen pressure cylinders entails significant cost and time. Detecting flaws in cylinders in a timely manner is crucial for averting catastrophic failures and maintaining safety throughout the cylinder's lifespan. Acoustic emission (AE) exhibits remarkable sensitivity to crack propagation, enabling early detection of crack formation and is currently an approved method for high-pressure DOT cylinder inspection but requires offline testing including over pressurization as part of a carefully-designed test plan. The proposed HydrAE system will provide automated AE evaluation during each normal refill to 100%, leveraging previous datasets and machine learning incorporating multiple AE data parameters to establish a historical index and health assessment model; data will be uploaded to the cloud with automated notifications sent to asset owner/authorities. The HydrAE system will continuously monitor cylinders for abnormal events, such as impacts, between refills with a battery-powered MEMS accelerometer system. The long-term vision for the HydrAE monitoring system is to seamlessly integrate AE technology into hydrogen refilling stations, with only the sensors and low-power impact monitoring system residing on the cylinder. Ultimately, the HydrAE technology would be directly applicable to all DOT pressure cylinders, including composite pressure vessels such as those for hydrogen fuel cell vehicles.

Company Website: www.gwultrasonics.com

Friedman Research Corporation (Austin, TX)

Mechanical System for Detection of High Energy Coupling Events

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

Abstract: We will create a prototype mechanical detection system that is calibrated to notify yard operators when a tank car is subjected to a high energy coupling event. The feasibility of the system to work in representative environmental and service conditions without operator involvement for a minimum service life will be demonstrated. Scaled physical testing will be conducted to verify that the detection system notification threshold is accurate and can be calibrated to a desired input. We will develop a plan for initial low-volume production and distribution to tank car owners.

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

Biointerphase, Inc. (Pittsburgh, PA)

Zerotinous Materials: Biodegradable Firework Components

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Abstract: Biointerphase, Inc., in collaboration with Zambelli Fireworks, proposed the development of Zerotinous Materials, biodegradable plant-based materials for fireworks casings. Zerotinous Materials will utilize biomaterials that are inexpensive, biodegradable, and formulated using Biointerphase's experience developing similar materials to replace non-biodegradable components in professional and consumer fireworks. The Department of Transportation expresses a need to develop a biodegradable material that can replace the non-biodegradable casings used in ground device, cake, and combination device-type fireworks. Biointerphase is a bioengineering company based in Pittsburgh, PA with a mission of restoring and reinforcing biological needs and having core capabilities in biomaterials and biosignals intelligence. The creation of biodegradable materials for fireworks will assist with the restoration of natural habitats by reducing harmful plastic-based pollution and fits within the mission of the organization.

Company Website: https://biointerphase.com/