JIFX 24-1 Quad Charts

Event Dates: 23 – 26 October 2023
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Last Update: 24 October 2023

PROJECT INFORMATION

Organization Name:	Test Flight of CTOL and VTOL Demonstrators
Principal Investigator:	Odys Aviation
Technology Readiness Level:	Axel Radermacher
Research Area of Interest:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Funding	A) Unmanned Aerial Systems

PROPOSED EXPERIMENT OVERVIEW

Odys will experiment with 2-3 prototypes called Caspar, Homer and Laila in order to gather more data concerning flight characteristics of the air frame. Caspar will be used to experiment with VTOL characteristics using the blown flap and box wing. Laila experiments will focus on flights in and around the air field focused on forward flight, taking off and landings, Homer will focus on experiments with a full transition from VTOL to forward flight at subscale sizes. Odys is interested in further experimentation in both controlled and uncontrolled environments and would like to fly at Camp Roberts McMillan airfield for uncontrolled environments and in the aeronautics lab at Naval Post graduate school for controlled environments testing of the full transition capable prototype.

SYSTEM DESCRIPTION

An electric VTOL aircraft with a box-wing architecture, utilizing deflected slipstream technology
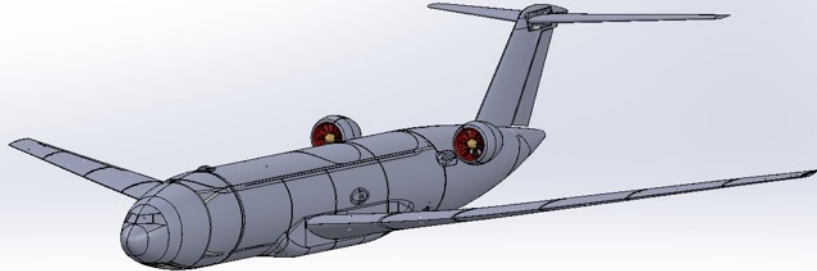

Vulcan Scout Card
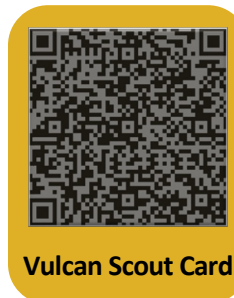
A-04: Novel Aeroservoelastic Scaled Model Demonstrator
CANCELLED

PROJECT INFORMATION

Organization Name:	M4 Engineering, Inc.
Principal Investigator:	Myles Baker
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Demonstrate the integration of embedded instrumentation (pressure, acceleration, and fiber optic strain measurements), embedded data acquisition and logging, scaled model design approaches for aeroservoelasticity, and scaled model fabrication approaches tailored to wing structures using a 150lb, 15% scale model of the 737-900 with a wing span of 12ft. In these flight tests, we will demonstrate basic manual-control functionality with a safety pilot. If successful with sufficient time and budget remaining, we will also demonstrate stabilized flight with the autopilot and waypoint navigation using the QGC ground control system and fully autonomous flight (other than takeoff and landing). In addition to the 12ft wingspan vehicle, we intend to test a smaller scale vehicle with a wingspan of 69.5in. The critical wing geometry is identical to the larger scale vehicle's wing geometry.

SYSTEM DESCRIPTION

To carry out the experimental test plan, a subscale remotely piloted flight test vehicle will be utilized. The configuration is based on a commercial transport (737-900), and is sized to carry 50 lb of payload, which will include a FOSS interrogator needed for shape measurement and control. The vehicle is an all-electric configuration with TOGW of 150 lb (50 lb payload, 50 lb airframe, 50 lb batteries), with a wing span of 12 feet.

IronClad Secure Flight Controller Enhancements

IronClad offers advanced autonomy features, best-in-class cybersecurity, and non-proprietary, open-source-based flight control software all in SWaP-efficient package

Airborne Smart Comms Relay with MANET: Automatically adjusts loiter pattern to maximize coverage from MPU5/Silvus/etc. payloads

Optimized flight path generated in real-time; approved autonomous flight

Reducing Operator Burden: Integrate SIGINT payloads, flight controls, EO/IR control, autonomously orbit/view RF sources of interest. Pattern of life analysis/alerts: Operator alerted when AOIs change

PROJECT INFORMATION

Organization Name:	Asymmetric Technologies, LLC
Principal Investigator:	Robert Hettler
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Funding	Federally (USSOCOM, Air Force)

PROPOSED EXPERIMENT OVERVIEW

Test enhancements to IronClad Secure Flight Controller that reduce sUAS operator burden, including EO/IR change detection algorithms, autonomous flight adjustments for smart airborne communications relay, and GPS-denied navigation. All enhancements run onboard IronClad under cybersecurity controls.

SYSTEM DESCRIPTION

IronClad Secure Flight Controller is a cybersecure autopilot and mission computer in one small SWaP package that can fly any small UAS, including legacy systems. IronClad uses versions of open-source flight and ground control software to avoid outdated, vendor-locked avionics packages for sUAS. Under Air Force and SOCOM funding, enhancements are being developed that reduce operator burden and provide enhanced mission capabilities.

Integrating X3 with commercially available Pixhawk ecosystem
X3 installed

PROJECT INFORMATION

Organization Name:	ANELLO Photonics
Principal Investigator:	Walter Stockwell
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

ANELLO is developing the smallest, lowest power optical gyro currently available. We will fly a 6-axis IMU system using ANELLO's SiPhOG technology to explore the ability to navigate a UAS using the IMU plus other sensors with an aim to enable navigation capabilities in GNSS-challenged environments. We will fly our UAS with equipment installed, and use post-processing of data collected to iterate on GNSS-challenged algorithms. Flying at JIFX gives us access to larger airspace to allow for BVLOS flying.

SYSTEM DESCRIPTION

ANELLO will test navigation systems and technologies based on our SiPhOG technology. SiPhOG is the world's smallest, lightest optical gyro based on solid state technologies.

A-09: GPS-Denied Navigation & Autonomy: Vision Based Navigation Systems

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
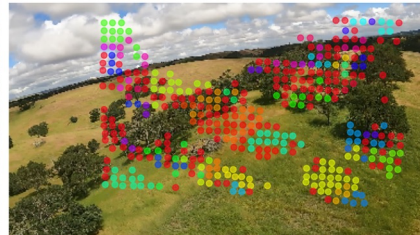23 – 27 October 2023

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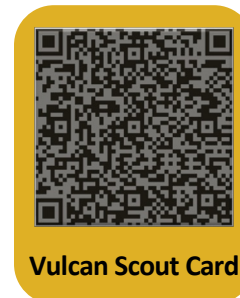
PROJECT INFORMATION

Organization Name:	Rhoman Aerospace
Principal Investigator:	Thomas Youmans
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in a laboratory environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Funding	Both Federally & Internally

PROPOSED EXPERIMENT OVERVIEW

GPS-Denied Navigation & Autonomy: Vision Based Navigation Systems
Testing of GPS-Denied Navigation & Autonomy: we plan to measure the modelled performance and flight routes of UAV flying without GPS using the vision-navigation solution that we're developing versus the measured performance of the vehicle. We aim for tests to, from, and around the CACTF area as well as up along Generals Rd in the tree/nature environment.

SYSTEM DESCRIPTION

The core technology of the system is a no-Emit GPS-Denied UAV Navigation system that allows a UAV to fly towards the rough area of a target in a GPS denied environment, identify and find the target, performance reconnaissance and take photos of the target, and return to launch, without GPS. The system uses various passive sensors and compute elements to deploy the algorithms that create the solution.

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PROJECT INFORMATION

Organization Name:	GreenSight
Principal Investigator:	Mitch Jones
Technology Readiness Level:	TRL 5: Component and/or breadboard validation in relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Funding	Federally (DARPA)

PROPOSED EXPERIMENT OVERVIEW

GreenSight plans to test our new fixed wing UAS, ILED SA4. This is an electric long range UAV designed to operate autonomously in swarms at long range. In this experiment, we plan to obtain flight data on various modes of flight, including takeoff, climb, cruise, dash, and landing. During these flights we plan to obtain power and control logs to give us insight into the efficiency and stability of the aircraft in various conditions. JIFX presents a unique opportunity to test our aircraft at higher altitude and higher speed than what we are allowed to do under public airspace regulations. Flight data obtained during this experiment will be very valuable in understanding the limitations of the airframe.

SYSTEM DESCRIPTION

ILED SA4 is a fixed wing, electric, autonomous UAS. It has a wingspan of approximately 2 meters and a flight weight of approximately 35 lbs. It is powered by a single electric motor located on the tail of the aircraft and has control surfaces on the wings and tail. The aircraft is designed to be pneumatically launched through its central tail boom, though in this experiment it will be taking off and landing using landing gear from a runway. Command, control, and telemetry are done via a wireless link and the UAV is capable of autonomous flight using GPS and other sensors. The heart of the avionics is the GreenSight UltraBlue NDAA compliant flight control stack.

B-01: INVICTUS_CANIS

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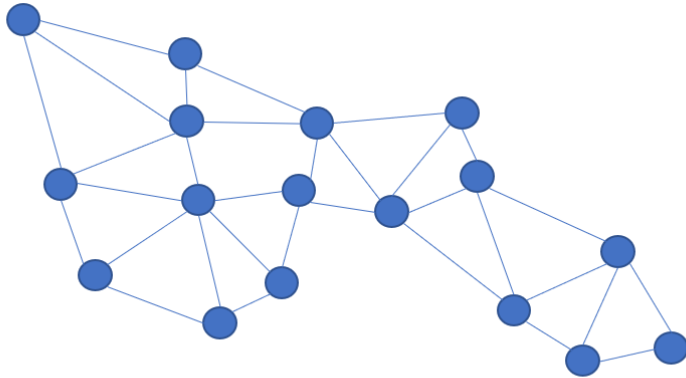23 – 27 October 2023

Figure 1 Mesh network

PROJECT INFORMATION

Organization Name:	QuantumShield
Principal Investigator:	Samuel Lavery
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

This JIFX experiment aims to test a novel solution to "Brutzman's Problem".
To restate the famous novel attack vector discovered by Professor Brutzman and conveyed to us at a prior JIFX event: drones store time series sensor data in plaintext, and if that text were to be recovered by an adversary it could be used to determine the point of origin. As the chance of that point of origin being sensitive and probably proximal to a human, Dr. Brutzman believes this could be bad. We believe he may be correct.

SYSTEM DESCRIPTION

Without going into details, we believe we can engineer a solution such that a group of drones can depart, derive a mission specific shared key and record data via quantum resilient, replicated, enciphered digital ledger.

Such a ledger can be generated and cryptographically designed such that a large group of drones can depart on a long term mission, derive a master key, securely communicate in such a way that data logged is only decipherable on mission completion and the return of any single active drone.

Upon return, such a cryptographic system could be designed to only export the decryption master key upon satisfactory response to a post quantum signature challenge.

We will need a way to surface mount a number of cryptographic LoRAWAN communication and sensing devices to a group of drones. No other RF communications channels will be used and the devices will be as light weight as possible.

B-02: Phalanx Shield Multi-Domain

PROJECT INFORMATION

Organization Name:	Innovative Algorithms
Principal Investigator:	Jay Chesnut
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Experiment will test aircraft capabilities and endurance, communications characteristics of the sUAS under development as well as the performance of the UAS detection module as integrated into the overall Phalanx Shield system. Sensor capabilities and integration with Phalanx Shield 3.0 elements will be evaluated. Data will be collected in the Phalanx Shield system as well as from observational record-keeping for comparison to previous data sets

SYSTEM DESCRIPTION

The Phalanx Shield multi-domain sensor system with integrated small UAS and other detection equipment and software

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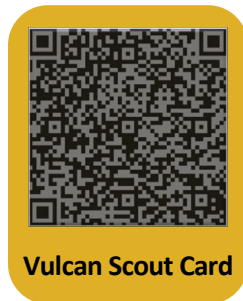
B-03: Autonomy Components for Unmanned Ground Vehicles

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
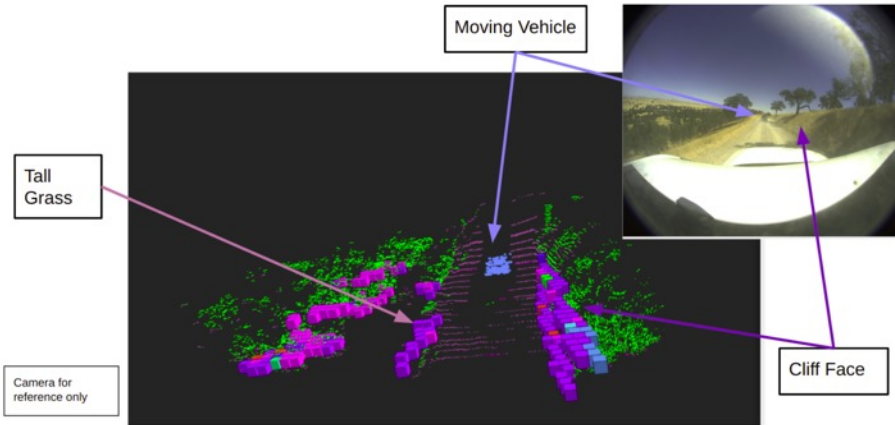23 – 27 October 2023

Figure. BlueSpace's perception algorithms detect the necessary dynamic and static features to enable leader/follower and map generation in off road environments.
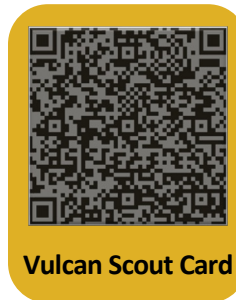
PROJECT INFORMATION

Organization Name:	BlueSpace.ai
Principal Investigator:	Jeremy Templeton
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

* Autonomous ground operations require a number of components for robust operation in contested domains
* Our experiments will obtain data to assess and drive development of two key components needed for DOD autonomy uses:
- Leader/follower path planning - assess dynamic path planning algorithms based on tracking a leader's position and motion state
-- Challenges will include: temporary occlusion, partial occlusion, dust, and offroad terrain
- Local map generations technologies will be experimented with to
-- Improve GPS-denied positioning and navigation accuracy
-- Return useful information to the warfighter in the field
* Evaluate our motion-first perception algorithms' ability to detect and track a low flying drone (stretch objective, pending collaborative opportunities)

SYSTEM DESCRIPTION

* BlueSpace provides autonomy solutions without traditional dependencies on AI, training data, and HD maps
* Our software leverages 4D sensors with our proprietary algorithms based on math and physics to deliver autonomy in any domain
- Industry-leading positioning accuracy (CTE<0.3%) using 4D Lidar/Inertial Odometry in any location on any terrain
- Motion-first perception provides detects and tracks objects with industry-leading motion estimation, no AI necessary
* Learn more at http://bit.ly/BlueSpaceDemos

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PROJECT INFORMATION

Organization Name:	Firestorm
Principal Investigator:	Ian Muceus
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

SOCOM requested Firestorm demo our Tempest system with mesh network capability, companion compute resources, and various other payloads that can be deployed. Firestorm intends to demo fully-autonomous takeoffs, waypoint navigation, and landings during this exercise. We'll demonstrate integration with ground control stations, mission planning software, and custom-built flight software stacks.

SYSTEM DESCRIPTION

Firestorm is developing a foundationally modular UAS, designed around MOSA / WOSA concepts, while extending modularity to the physical airframe elements. Firestorm's powerful in-development OCTRA board controls all mission-critical systems and has the flexibility for deep customization and integration with a wide and continually growing array of peripheral systems and sensors. Our ethos of creating a Warfighter-focused platform ecosystem with common subsystems, partnerships, integrations, and end-user customization and development, means that costs can be driven down, truly delivering affordable mass and attritablilty. Firestorm leverages advanced manufacturing techniques to lead a completely new approach to UAS design, development, and scalability.

Recent events across the globe highlight the glaring advantage to forces who capitalize on rapid iteration of weapons systems. Firestorm aims to bring this overmatch potential to the US and our partner nations. Firestorm aims to democratize the air.

PROJECT INFORMATION

Organization Name:	Naval Postgraduate School & Saronic Technologies
Principal Investigator:	Sean Kragelund
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

The NPS NIX IAS faculty/student team will test a space-based communications architecture enabling over-the-horizon ISRT and C2 for an autonomous surface vessel (ASV). This experiment will coincide with sea trials of a prototype ASV conducted by NPS and Saronic Technologies, an NPS CRADA partner, in Texas. During these sea trials, ASV operator(s) at Camp Roberts will connect an ASV interface to the JIFX network in order to test and measure the connectivity, throughput, and latency of the cloud-based architecture used to provide beyond line-of-sight C2 and data relay. This experiment will asses the performance of the developmental communications architecture, inform NPS thesis research, and guide future capabilities development.

SYSTEM DESCRIPTION

The NPS student team is researching how Naval Special Warfare (NSW) can combine proliferated Low-Earth Orbit (pLEO) architectures and small autonomous surface vessels (ASVs) to enable Over-the-Horizon Targeting (OTH-T). Leveraging a CRADA between NPS and Saronic Technologies, the operational concept employs a tightly-integrated suite of communications architectures, autonomy for robust communications-aware behavior, and a new, purpose-built autonomous vehicle.

B-06: WeatherHive Swarming Meteorological Measurement System
CANCELLED

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PROJECT INFORMATION

Organization Name:	GreenSight
Principal Investigator:	Eli Davis
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

This experiment will test deployment and control of a swarm of nano drones. Each aircraft will gather meteorological measurements and perform takeoff, landing, and coordinated control from a central hive ground station. We would also like to test the range and altitude limits of our aircraft. We are constantly improving our design and would like to test and validate its performance

SYSTEM DESCRIPTION

Weatherhive is a reusable, low cost, on demand, 1D-3D meteorological sounding system which provides real-time weather intelligence in austere environments. The system is based on a swarm of 250g nano drones deployed from a hive ground station which provides charging, deployment, and communication/control
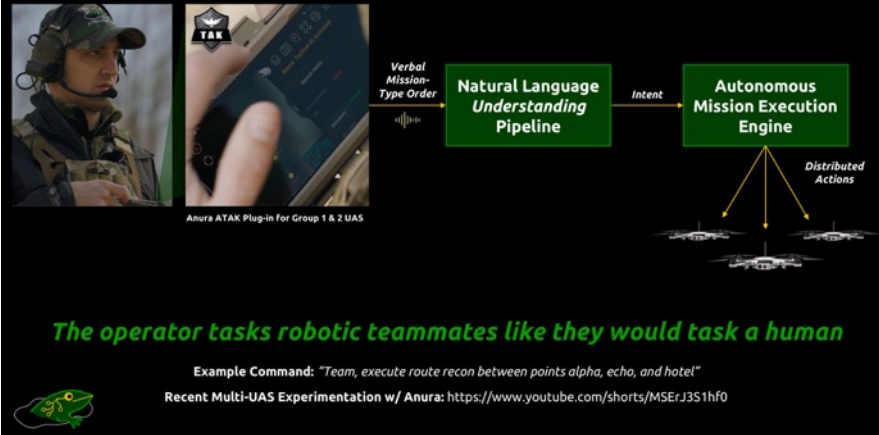
Anura for Multi-UxS Control Experiment Overview

Anura ATAK Plug-in for Group 1 & 2 UAS

The operator tasks robotic teammates like they would task a human

Example Command: *"Team, execute route recon between points alpha, echo, and hotel"*

Recent Multi-UAS Experimentation w/ Anura: https://www.youtube.com/shorts/MSErJ3S1hf0

PROJECT INFORMATION

Organization Name:	Primordial Labs
Principal Investigator:	Mick Adkins
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	B) Unmanned Systems (UxS) Design, Deployment, Operation, Networking and Control
Funding	Both Federally & Internally

PROPOSED EXPERIMENT OVERVIEW

Our experiment is focused on using our Tactical AI Assistant, Anura, to control teams of heterogeneous UxS. We will use Anura's Conversational Human-Machine Interface (C-HMI) to task the team of UxS via team-level and direct (via call-sign) mission-type orders. We will be measuring how well Anura's autonomy engine translates the intent of the operator to tasking for each UxS. We will also be assessing how well the engine carries out the tasking.

SYSTEM DESCRIPTION

Primordial Labs is developing Anura, a Tactical AI Assistant for UxS that drastically reduces operator cognitive burden.

Anura provides a simple and intuitive Conversational Human-Machine Interface (C-HMI) to make tasking robots, like UAS, just as simple as talking to a human teammate.

This C-HMI is paired with our modular, platform-agnostic autonomy engine which provides a unified & natural method of control for all unmanned systems.

All processing is performed at the edge with no reach-back to any servers.

C-02: Night-time Detection of Small Uncrewed UxS Systems with Security Cameras

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PROJECT INFORMATION

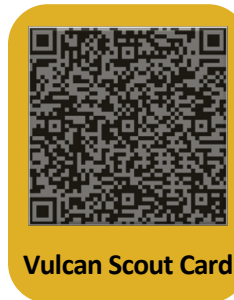|	
Organization Name:	Image Insight Inc
Principal Investigator:	Eric Rubenstein
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	C) Countering Unmanned Systems
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

The objective of the proposed test is to evaluate key parameters of the performance of the LaUDS (LiDAR and UxS Detection System) software, which detects both optical and near-infrared (NIR) emission with COTS cameras. LaUDS is principally used during night and low light operations, and has been used to detect: UAS, UGV, LiDAR, space satellites, rockets, and artillery fire.

We propose to characterize the detection performance of LaUDS against UxS systems operated during JIFX under a range of conditions, hopefully including nighttime operations.

This evaluation will provide a qualitative and quantitative evaluation of the LaUDS detector performance. The test will evaluate the system's ability and reliability in detecting the targets' emissions at various distances, offset angles, and motion of the UxS.

SYSTEM DESCRIPTION

Image Insight is developing a low-cost, video analysis capability, called LiDAR and UxS Detection System (LaUDS,Ñ¢), to automatically and autonomously detect and track LiDAR emitters such as commercial and military UAS, UGS, USV, and other optical/infrared (OIR) transients like laser target designators, artillery or rocket fire, and muzzle flashes. Using security cameras and LaUDS software, LaUDS augments current counter-UAS (c-UAS) and counter-sniper systems used by militaries across the world, and by special police units in high-risk urban areas. It will help protect military bases, vulnerable public sites, pedestrian gathering areas, and critical infrastructure. Adversary nations and terrorists use uncrewed systems generally, and particularly UAS, for lethal attacks, for intelligence collection, and to achieve other effects. UxS can conduct swarm attacks. Although DoD is spending hundreds of millions of dollars on dedicated c-UAS systems, there is still a gap in coverage, especially for small-UAS (sUAS) and during night or low-light operations.

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PROJECT INFORMATION

Organization Name:	Stucan Solutions Corp
Principal Investigator:	Stuart Taylor
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	C) Countering Unmanned Systems
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

SUPERION is an agile and responsive SIGINT capability delivering a high-end, 360¬∞, passive RF detection capability between 400MHz and 6GHz. The system delivers effective alerting against RF signals of interest, including drone/UAS targets, at FOBs / advanced reconnaissance positions, military installations, and strategic locations. Currently, ground forces do not have access to such an all-encompassing capability that is available in a dismounted soldier format, and which can be rapidly deployed in austere environments.

SYSTEM DESCRIPTION

SUPERION is a 24/7/365, scalable, modular passive Radio Frequency (RF) drone/Unmanned Ariel System (UAS) detect, track and identify (DTI) capability with a proven track record in the UK mainland, Europe and overseas with several Defence, Security and commercial organizations. SUPERION provides an operator with timely, accurate and actionable intelligence on drone(s)/UAS and GCS activity. The system was developed and refined around a signals intelligence (SIGINT) capability, therefore not only is SUPERION able to provide a "distracted" operator drone(s)/UAS DTI intelligence it also provides an electronic surveillance (ES) feature able to identify: emerging/infrequent threats, V/UHF communications i.e. Push to Talk (PTT) / Combat Net Radio (CNR)), Improvised Explosive Device (IED) trigger signaling, development of a RF pattern of life (PoL) or support to surgical jamming. SUPERION can perform protocol decoding; exploitation of Direct Remote ID which gives reporting of 3D positional information from compliant and in some cases non-compliant drones.

Goals: Interoperability, availability, and standards for critical communications

Today: Internet / Tomorrow: Hybrid quantum-classical Internet

PROJECT INFORMATION

Organization Name:	QuantumShield
Principal Investigator:	Samuel Lavery
Technology Readiness Level:	TRL 2: Technology concept and/or application formulated.
Research Area of Interest:	D) Communication and Networking
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

This experiment at JIFX will focus on quantum networking, an emerging domain that seeks to combine quantum computing and traditional secure telecommunications infrastructure to enable ultra-secure communication. Our team will test an emulated quantum cryptographic 'one-time-pad' basic quantum symmetric cipher, integrated into the index selection procedure of a novel digital signature algorithm. We will attempt to support keys of increasing bit size using a cloud-based quantum simulator to get a baseline set of constraints for working in the ultimate disrupted, disconnected, intermittent and low-bandwidth (DDIL) environment, the quantum field itself. While we acknowledge the simulated nature of the quantum computer we will attempt to integrate with, we feel these types of experiments, that mix future and present technologies in basic ways can yield useful insights that can help inform future research directions.

SYSTEM DESCRIPTION

Assuming that JIFX, or another team cannot provide a spare working Rydberg natural state quantum computer, we will instead leverage the AWS Braket service to run the simulations on a virtualized QuEra Aquila based one instead. As we have never programmed a quantum computer before, this will be a very simple quantum cryptographic cipher. The basic research knowledge we seek to obtain is how future integrations may function, and how quantum information may be used to increase the fundamental security of practical post quantum cryptographic systems that we use today.
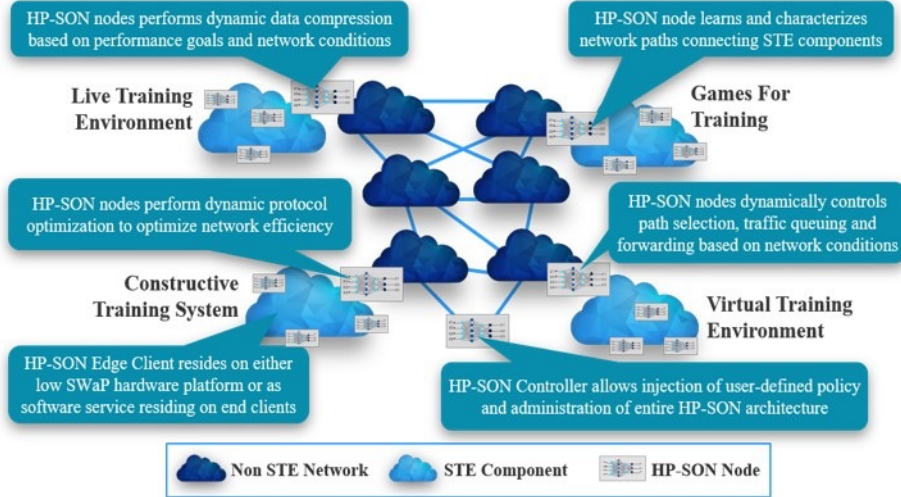
The future may be closer than we think. While unrelated to our work, DARPA is currently designing future quantum network cards through its QuNET program. Our goal is to perform something similar(but not really thought out as well), using simulated quantum computers.

HP-SON nodes performs dynamic data compression based on performance goals and network conditions

HP-SON node learns and characterizes network paths connecting STE components

Live Training Environment

Games For Training

HP-SON nodes perform dynamic protocol optimization to optimize network efficiency

HP-SON nodes dynamically controls path selection, traffic queuing and forwarding based on network conditions

Constructive Training System

Virtual Training Environment

HP-SON Edge Client resides on either low SWaP hardware platform or as software service residing on end clients

HP-SON Controller allows injection of user-defined policy and administration of entire HP-SON architecture

Non STE Network   STE Component   HP-SON Node

PROJECT INFORMATION

| Organization Name:	Sabre Systems Inc.
Principal Investigator:	Jack Burbank
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in laboratory environment.
Research Area of Interest:	D) Communication and Networking
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

Evaluate the performance of the High Performance – Synthetic Training Environment (HP-SON) solution in austere network environments. Through use of AI/ML-based approaches, the system learns network user activity and network performance in order to create predictive network analytics. In these tests, we would conduct three activities:

1) simulate our own network user traffic demonstrating performance over the JIFX wireless network,
2) interface with the JIFX network and demonstrate performance improvements using JIFX video traffic flowing from UAS systems, and
3) interface with the JIFX network to conduct passive monitoring and capture (data collection to feed training data for algorithms)

SYSTEM DESCRIPTION

The HP-SON consists of two key pieces: 1) a 3U rack-mount server that acts as a "smart router" that performs network learning, and 2) an end-host software client that performs data compression. No other components are required to conduct the proposed experimentation, except for laptop computers provided by Sabre for stand-alone experimentation and for data collection

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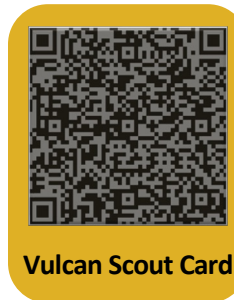
D-03: Advanced Communication Integration; Mesh Networking; Low Bandwidth Data Transmission; Energy Efficiency; Cybersecurity & Encryption

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PROJECT INFORMATION

Organization Name:	Somewear Labs
Principal Investigator:	Brian Tatum
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations
Research Area of Interest:	D) Communication and Networking
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Our experiment will include a low data mesh backhaul to satellite at ranges beyond 5km for communication offset from satellite transmissions.
Additionally, we will demonstrate autonomous backhaul and data routing over cell, mesh, and satellite, that can successfully be sent in sub-T, inside buildings, and dense foliage

SYSTEM DESCRIPTION

Somewear Labs provides a multi-networked solution using low bandwidth mesh and low bandwidth satellite for autonomous network management across cell, mesh, and satellite to maintain data resiliency for tactical networks. This solution coupled with our full stack software solution that includes a fully supported ATAK integrated plug in provides an AES 256 encrypted communication in any remote environment with pole-to-pole coverage. Our Software suite delivers encrypted and enclaved security for easy to join interoperability with host nation, partner forces, and other supporting elements.
Somewear's goal is to provide a truly resilient system for command, control and communications to ensure mission effectiveness anywhere in the world. Our SWaP is 6oz, utilizes obfuscation methods to reduce RF signature by operating mesh in the ISM band under 1 watt of power, and leveraging Short Burst Data satellite transitions at 1ms data burst and an average power of .8watts

PROJECT INFORMATION

Organization Name:	Naval Postgraduate School
Principal Investigator:	Dr. Alex Bordestky
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	D) Communication and Networking
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

Proof of concept Surface-to-Surface experiment with a total of 52 miles BLOS communication link in the Monterey Bay area

Experiment on 24OCT:
1000 – 1200: Meet & Bench Test Get together in NPS CENETIX Lab (Root-202).
1200 – 1300: Lunch break
1300 – 1430: Each team proceed to the predefined locations, equipment setup
1430 – 1500: LPWAN long range communication experiment
1600 – 1630: B2B arrival and hot wash in CENETIX Lab.

SYSTEM DESCRIPTION

- Typical LPWAN node power requirements: 5V, 100mA
- LPWAN node maximum transmit power: 20dBm
- Communication frequency band of 915MHz, modulation: CSS, SF: 12, BW: 125KHz
- Network node cost as low as $100

Mantle Architecture
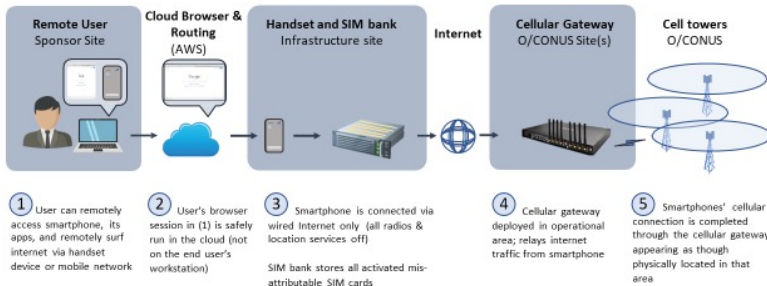
Core One Proprietary Information

A new way to create, manage, and protect mobile digital signatures at scale

Mantle leverages commercial cellular carriers' mobile networks to access the Internet from our gateway back end, providing effective mobile digital signature management.

① User can remotely access smartphone, its apps, and remotely surf internet via handset device or mobile network

② User's browser session in (1) is safely run in the cloud (not on the end user's workstation)

③ Smartphone is connected via wired Internet only (all radios & location services off)

SIM bank stores all activated mis-attributable SIM cards

④ Cellular gateway deployed in operational area; relays internet traffic from smartphone

⑤ Smartphones' cellular connection is completed through the cellular gateway, appearing as though physically located in that area

CORE ONE

PROJECT INFORMATION

Organization Name:	Core One Solutions, LLC
Principal Investigator:	Eric Aull
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	E) Cyber, Cyber Security, and Electronic Warfare
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Our experimental plan involves evaluating different technical approaches to overriding the native Android smartphones audio and video devices with those in use by a remotely located operator.

Should there be more than one viable technical solution, we will setup parallel experimental demonstrations of the different solutions and evaluate them.

Our experimental demonstration would be to use our platform to make and complete Signal calls to a local cell phone. Laptops equipped with a webcam will be setup to remotely access our signature-managed Android smartphones. These remote smartphones will initiate or join a Signal audio or video calls made to smartphones we will provide onsite during the experiment.

SYSTEM DESCRIPTION

A mobile-network based mis-attribution platform to provide signature-managed mobile communications and mobile app use to protect and support various mission use cases.

It is comprised of a cloud-based infrastructure to provide remote web access to a bank of smartphone devices whose network traffic is routed to the Internet via cellular gateways deployed near a local mobile carrier's cell tower in the AO. The smartphones and associated SIMs are in an RF isolated environment, allowing centralized mis-attributable acquisition, configuration, control, and signature management of these components.

Using our capability, operators robustly appear to the mobile carrier and to mobile app providers as though they are physically in a location with the actual smartphone device when both the operator and the smartphone are thousands of miles away.

Operators can remotely access a signature-managed mobile device and maintain the desired digital and physical patterns of life necessary to support and safeguard operational activities.

PROJECT INFORMATION

|	
Organization Name:	SecureData
Principal Investigator:	Joe Kigin
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration
Research Area of Interest:	E) Cyber, Cyber Security, and Electronic Warfare
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

SecureData's SecureUSB and SecureDrive will allow any C5ISR operator to be able to utilize these drives to securely store and control access to sensitive ISR data. The Experimentation plan would be to coordinate with the other collaborators/experimenters to show how the SecureDrive can be easily paired with their technologies to allow for safe, easy data storage, access, and transportation when in a contested environment utilizing a USB-port/cable.

SYSTEM DESCRIPTION

SecureData's SecureUSB and SecureDrive are Hardware-encrypted (NSA/NIST / FIPS 140-2 Level 3) portable data-storage devices, ranging from 8GB to 8TB, are designed to promote and prevent unauthorized data-breaches by accident/intention, as recently experienced again by the DoD. The Secure units easily fit in your hand/pocket, weigh between 1-8 oz, are made of aircraft-grade aluminum. The SecureData USB/SSD drives provides the Operator with the highest level of Encryption capability (XTS AES 256-bit) with a physical keypad which can be programmed to lock-down after unsuccessful attempts and which can utilize a blue-tooth capability to allow for Remote access/control (eg. "geo-fencing") which can lock-down a drive outside of a certain perimeter, but which does not allow access to the drive's data/contents
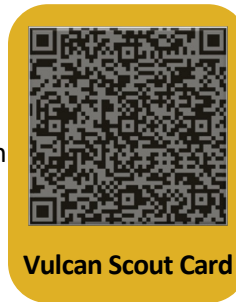
Vulcan Scout Card

PROJECT INFORMATION

|	
Organization Name:	Aronetics
Principal Investigator:	John Aron
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in a laboratory environment.
Research Area of Interest:	E) Cyber, Cyber Security, and Electronic Warfare
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Thor presents a single autonomous and adaptive plural machine learning (ML) meta-network which operates as a cooperative system within the existing network and tools. This system is a segment of a distinct and different dedicated data layer intended for sole analysis of the entered architecture(s) across various networks of nodes.

SYSTEM DESCRIPTION

Thor, differentiates between normal and abnormal cyber behavior and operates on x86 and ARM compute machines not limited solely to mobile devices and Field Programmable Gate Array (FPGA) architectures. It can be used in data centers, laptop, server and virtualized CPUs, mobile phones or in satellite constellations. Because of Thors' location, the analysis of the threat is external to the ring in which any user operates a system, unlike current solutions.

Vulcan Scout Card
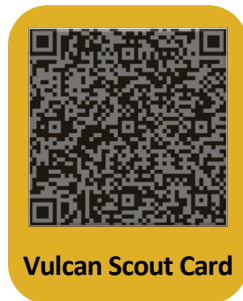
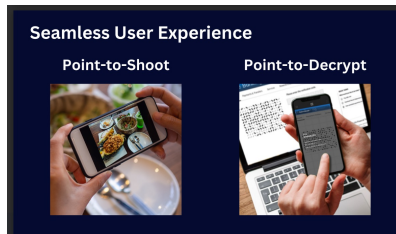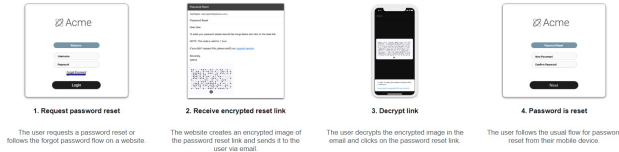# E-04: Encrypted Secure Data-sharing in Contested/Compromised Environment

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

How it works

In the event of your email account being compromised, hackers cannot manipulate Cyphlens images

You can use encrypted images to conduct business without worrying about whether email accounts have been compromised.

1. Request password reset
The user requests a password reset or follows the forgot password flow on a website.

2. Receive encrypted reset link
The website creates an encrypted image of the password reset link and sends it to the user via email.

3. Decrypt link
The user decrypts the encrypted image in the email and clicks on the password reset link.

4. Password is reset
The user follows the usual flow for password reset from their mobile device.

Seamless User Experience

Point-to-Shoot   Point-to-Decrypt

PROJECT INFORMATION

Organization Name:	Cyphlens
Principal Investigator:	Joe Kigin
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	E) Cyber, Cyber Security, and Electronic Warfare
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Cyphlens proposes using common COTS End-User-Devices (EUD'sp), eg. Android/Apple smart-phones and Windows/Android tablets/laptops to demonstrate how even in a known compromised/contested environment that C5ISR, HIPAA/PII, DCAA/DCMA and other mission-critical data can be safely shared and viewed with minimal concern that the data can be obfuscated; We will collaborate with the DoD users and Technology demonstrators and show them how they can operate in more-resilient and more-secure CONOP.

SYSTEM DESCRIPTION

Cyphlens turns any mobile device into a powerful decryption device, providing a unique technology to encrypt/decrypt your mission-critical C5ISR information in a way that increases operational resilience while greatly reducing the comms threat. Most cybersecurity defenses focus on stopping hackers at the login page. Cyphlens provides a second-level of defense against the ones who break through. With Cyphlens, accessing, viewing and sharing transactional data becomes more secure against advanced targeted attacks and malware, by going beyond traditional encryption (eg. encryption at-rest, in-transit, and in-use) to create a fourth state - "data-in-view." This includes visual representations of encrypted data, similar to but very different from commonly-used QR codes. Cyphlens will enable the DoD to determine who can access sensitive data, while also enabling greater control - where can the data be accessed, when can it be accessed, how many times can it be accessed, and how long can it be accessed.

Vulcan Scout Card
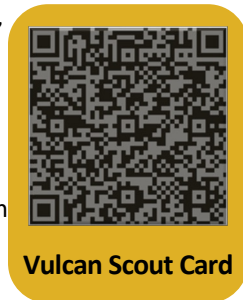
F-01: LEVER_GUARD

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

PROJECT INFORMATION

Organization Name:	QuantumShield
Principal Investigator:	Samuel Lavery
Technology Readiness Level:	TRL 3: Analytical and experimental critical function and/or characteristic proof of concept.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

This experiment at JIFX, based on successful prior experiments, establishing a of primary RF control link, will test the ability for a swarm of drones to transition into a secondary RF communications subsystem, with the ability to perform secure communications over a custom software defined cryptography based frequency hopping mesh network.

A swarm of drones leaves on a mission, initial coordination occurs over a long range RF link, such as LoRAWAN, during the mission enrollment period. After the initial phase, all drones will share the same set of initial mission data and derive secure mission data and communications keys, dynamically and synchronously.

Once the synchronization phase is complete, a preliminary and reliable low power LFSS mesh network can be established across the drone swarm. The final phase of the experiment is to test secure broadcast, replication, and enciphered storage of mission sensor data for later physical extraction under secure conditions.

SYSTEM DESCRIPTION

Our core technology is the Trechend programmable cryptographic system. While digital signatures are one use case, the number of potential other applications is still unbounded. In this experiment, we intend to leverage post quantum cryptography and off the shelf software defined radios, in coordination with the FCC/JIFX/Camp Roberts staff to establish a bounded frequency hopping mesh network. We will need to leverage other teams' flights, and surface mount our communications devices and piggyback on their drones. We will orchestrate using the base LoRAWAN control link.

We would like to try using HackRF One devices as the secondary SDR system. We have applied for an STA but need to coordinate on details before completing the application. If that is not possible, we will downgrade to Thread based standard RF mesh networking. This mode has no frequency hopping and would be a more detectable signature.

Vulcan Scout Card

Vulcan Scout Card

F-02: Multi-Domain Expeditionary Artificial Intelligence and Behavior Analysis at-the-edge for Tactical Surveillance Application

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1

23 – 27 October 2023

PROJECT INFORMATION

Organization Name:	Gantz-Mountain Intelligence Automation Systems, Inc.
Principal Investigator:	Greg Wilson
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Funding	Federally (USSOCOM, US Air Force, US Army)

PROPOSED EXPERIMENT OVERVIEW

Gantz-Mountain will continue experiments in expeditionary artificial intelligence and behavior analysis as the edge for tactical surveillance applications. Specifically, this will include integration of software upgrades to improve robustness along with exploring logistical applications for the technology. Additionally, the MT-5 will pass near real-time alerts and imagery of threat behaviors across Mission Command systems (TAK, COPERS, etc.). Capability Experimentation goals:

-Techniques to increase robustness of AI-driven Behavior Analysis at the tactical-edge

- Explore Autonomy and Human Machine Teaming applications for expeditionary AI and behavior analysis

-Slew-to-Cue of Long-Range Intelligence Sensor Node (LRISN) from trigger

- Implementation of third-party classifiers

SYSTEM DESCRIPTION

MT-5: The world's toughest Warriors and First Responders deserve custom built expeditionary smart surveillance technology with Artificial Intelligence and Behavior Analysis at-the-edge to guarantee success. Gantz-Mountain Intelligence Automation Systems Inc. has pioneered revolutionary turn-key smart-edge surveillance and intelligence automation systems to answer this call.

Vulcan Scout Card

F-03: Dismounted Position & Navigation Sensor (DPNS)
CANCELLED
Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

PROJECT INFORMATION

Organization Name:	Stucan Solutions Corp
Principal Investigator:	Stuart Taylor
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

DPNS delivers a low SWAP-C boot mounted 3D positioning, navigation and team tracking capability to the dismounted user, in the absence of GPS. This allows for precise 3D situational awareness in GPS-challenged environments such as urban canyons, buildings, caves, tunnels and areas with heavy Electronic Counter-Measures (ECM and hostile RF jamming). Dismounted infantry soldiers currently don't or have limited ability to track users in GPS challenged environments.

SYSTEM DESCRIPTION

DPNS is a footwear mounted low SWAP-C GPS Denied Position & Navigation System. The System has several innovations to give outstanding (relative) real-time 3D positional accuracy, in the complete absence of a GPS/GNSS signal (inc. 3D positioning within buildings/underground). These innovations include an ensemble of low-cost solid state IMUs, algorithms that use characteristics of the human walk/gait to significantly reduce inaccuracies/drift with virtually no distance drift over time. Other features are wireless QI charging and open interface for integration into any C2 application. The DPNS system is currently supplied with a dedicated Android App, but the architecture will support ATAK integration. DPNS has been designed to operate fully within GPS-denied/degraded environments (e.g. buildings, urban canyons and underground) and complex RF environments where GPS and/or ECM jamming is present.

PROJECT INFORMATION

Organization Name:	QuantumShield
Principal Investigator:	Samuel Lavery
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	G) Situational Awareness
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

This experiment at JIFX, while entirely scientifically valid on its own, is going to establish a technical basis for more advanced experimentation. In this experiment, we intend to provide some number of battery powered secure communication devices that are connected to a private LoraWAN network. While it's tempting to say this type of system could be used in an emergency as an alert, we do not want the legal or moral liability of having produced something labeled as such, and have it fail. Rather, to demonstrate our ability to perform post quantum cryptographically authenticated broadcast messaging, we propose an 'Everything is OK' indicator LED on the outside of the communications device. NPS staff will be given the sole authority to broadcast an alert indicating that everything is OK, during the experimentation window. This will cause the LED to flash until the 'OK' acknowledgment button is pressed.

SYSTEM DESCRIPTION

We plan to setup an industrial LoRAWAN network to cover a large range and enable a number of experiments. Using AWS IoT Core with customizations, and a certified LoRAWAN gateway made by Browan, (https://devices.amazonaws.com/detail/a3G0h000007dlLKEAY/Outdoor-Micro-Gateway) we would like to setup a base network. From there, link various Rasberry Pi based devices to test custom cryptographic functionality in the austere JIFX environment. Each device will be issued custom X.509 based credentials and additional extended PKI infrastructure will be created in support. Our novel cryptographic system supports a mode of operation known as attribute-based cryptography, and this will be a demonstration of attribute based digital signatures. Only keys with NPS attributed secrets will be able to issue the broadcast.
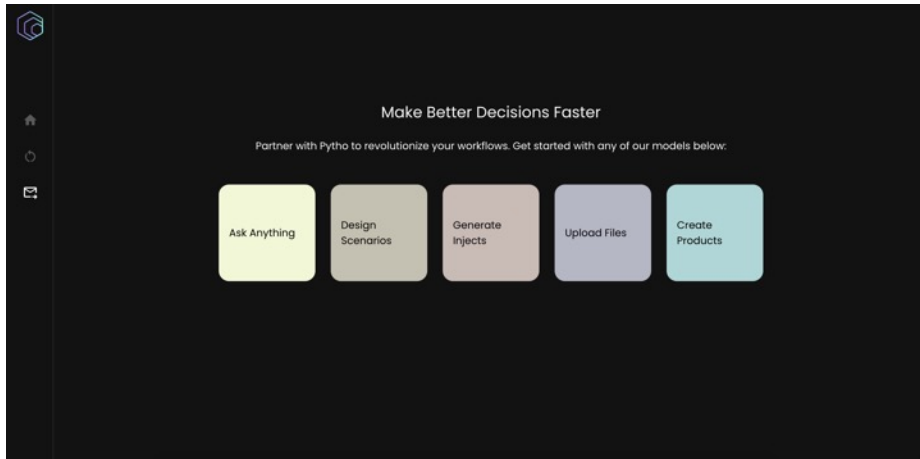
PROJECT INFORMATION

Organization Name:	PythoAI
Principal Investigator:	Michael Mearn
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	G) Situational Awareness
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Our innovative technology allows warfighters to ""chat"" with vasts amounts of data and knowledge bases so that they can make better decisions faster. Our solutions also allows warfighters to create complex products in a fraction of the time including scenarios for LVC training, drafts of intelligence and operational reports, course of action recommendations, products associated with Intelligence Preparation of the Battlespace, maps and overlays, and much more.

We plan to have warfighters at JIFX use our technology in the daily context of their duties to show them the power of what generative AI can do to their workflows. We will measure success through usage of our platform and verbal/written feedback on the experience and value add. The necessary data to evaluate success will be collected through our platform and our support team.

SYSTEM DESCRIPTION

Our real-time knowledge management and decision support platform will transform the way the warfighters conduct their daily duties. Our technology is not just a chat interface; it is a platform powered by a centralized body of organized knowledge that allows teams to:
- Easily pre-process data
- Instantly access raw data stored in vector databases
- Have a conversation with that data using natural language
- Generate complex responses and products based off of that data
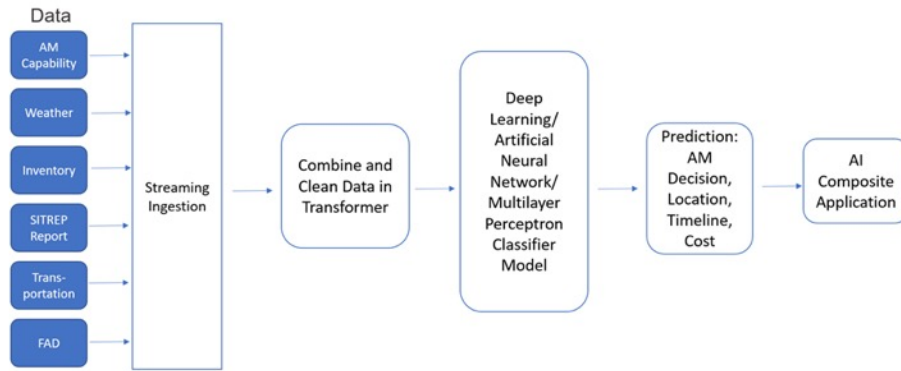

Vulcan Scout Card
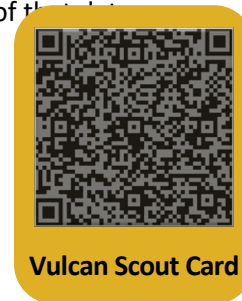
G-03: Shipcom AI Expeditionary Advanced Base Operations to Improve Logistics in a Contested Environment

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1

23 – 27 October 2023

Shipcom AI EABO Solution Architecture

PROJECT INFORMATION

Organization Name:	Shipcom Federal Solutions, LLC
Principal Investigator:	Vik Chauhan
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	G) Situational Awareness
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Our AI-leveraged solution will provide immediate impact to support Expeditionary Advanced Base Operations (EABO) in a contested environment. This will facilitate efficient supply, distribution and storage practices for fuel sources for tactical vehicles, power systems, batteries, and other equipment and supplies needed to support the war fighter.

We will establish a supply web that uses AI to create and train a demand fulfillment algorithm. Demand fulfillment will be optimized dynamically, based on multiple constraints and inputs, with the objective of supply delivery to the right place at the right time. The algorithm will include:

- Weather
- Contested environment "black zones"
- In theater manufacturing capabilities
- Multi-mode transportation capabilities
- SITREP/enemy actions - Weapon Engagement Zone (WEZ)
- Inventory location, qty, PLM?
- FAD/Urgency of Need

SYSTEM DESCRIPTION

Shipcom AI-infused EABO will deliver a novel application for AI/ML and data analytics capabilities with the potential to materially impact supply operations in a contested environment. Our EABO solution is muti-tiered. This allows us a lot of flexibility and gives us a lot of control especially on disconnected / disadvantaged environments. We provide "process based" synchronization rather than database synchronization as used by mail and messaging vendors. Furthermore, Shipcom AI is an end-to-end Responsible / Ethical AI platform with data engineering and machine learning platform for engineers, scientists, analysts, and DevOps to streamline ML solution development, deployment, management, monitoring, and governance.
Key Benefits include Access to Critical Logistics Data, Elimination of latency issues, Low code / no code software for rapid implementation, Completely functional on a secure network. Mobility, and Real time Analytics

Vulcan Scout Card
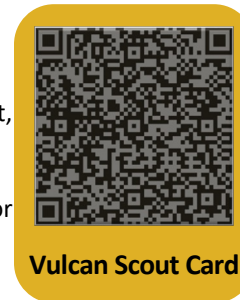
G-04: Drone Droppable Robots for Situational Awareness

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

PROJECT INFORMATION

Organization Name:	Squishy Robotics, Inc.
Principal Investigator:	Douglas Hutchings
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	G) Situational Awareness
Funding	Federally (ONR, NIST, NSF)

PROPOSED EXPERIMENT OVERVIEW

Squishy Robotics's robots are remote sensors that are deployed where it is not safe or practical to send a first responder to improve situational awareness and support decision making.

Robots data must be reliably communicated to a user interface and first responders. Squishy Robots have an analog radio for video and an ISM-band mesh radio for numerical data. In order to better communicate to end-users, the capabilities of the Squishy Robots, we propose to conduct a series of communications tests at CACTF and McMillan Airfield. A series of robots will be deployed at the site mimicking robot deployment in a real-life scenario, to characterize. throughput, latency, and delivery rate.

Robots can be deployed by dropping from a drone, throwing by an end-user, or native ground mobility. A series of experiments will be conducted characterizing the locomotion capabilities of the ground robot system in a variety of operationally relevant scenarios.

SYSTEM DESCRIPTION

Squishy Robotics, Inc. develops sensor robots that enable the deployment of sensors, cameras, and communication devices in remote, dangerous, or austere environments for Intelligence, Surveillance, Reconnaissance, and Situational Awareness applications.

These robot platforms have the unique ability to be deployed by dropping from drones or aircraft into mission-relevant locations. The unique pairing of ground-based sensor robots and aerial vehicles ensures rapid deployment to sites of interest and persistent monitoring beyond the battery lifetime of the drone. Additionally, some robots are ground-mobile; able to locomote independently. Robots carry and protect a customizable, mission-specific payload. The 4-GasPLUS sensor payload is optimized for situational awareness in local, county, and state-level Hazardous Materials (HazMat) operations and contains gas sensors (LEL, O2, CO, and H2S), six camera, GPS, and communications capabilities. The CamsPLUS sensor payload contains a range of daylight, thermal, and zoom cameras, optimized for explosive ordnance disposal and security applications.
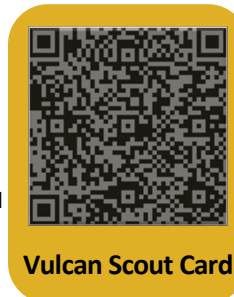
Vulcan Scout Card

PROJECT INFORMATION

Organization Name:	Premise Data
Principal Investigator:	John Wishart
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in laboratory environment
Research Area of Interest:	G) Situational Awareness
Funding	Internally
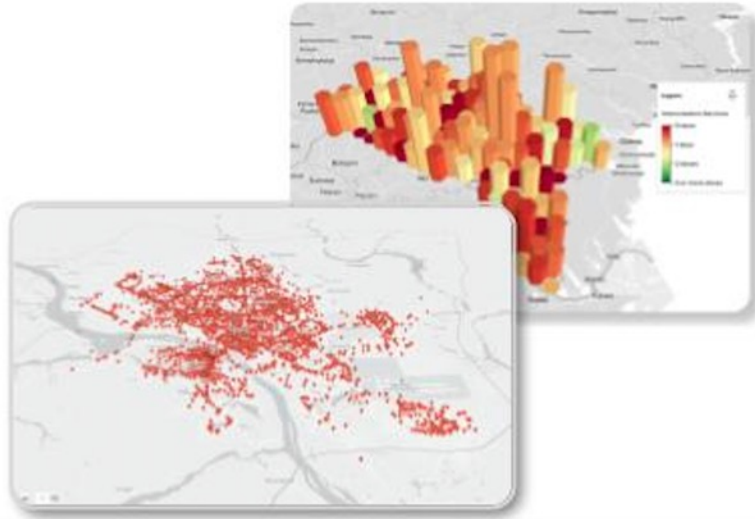
PROPOSED EXPERIMENT OVERVIEW

Analyze historical Premise contributor videos and collect an additional 30 videos from a crisis zone such as Ukraine or Niger. We will ask "How do you feel about your town and the current security situation?" We will ID key themes and disaggregated the data based on respondents' demographics and home locations. Provide access to previously inaccessible groups in near real-time.

Topic modelling and incorporates deep learning transformer models, such as ChatGPT and Google's Bard, to establish semantic relationships between phrases. QualScale can go beyond traditional word frequency-based approaches and effectively capture evolving themes and phenomena described in open text, video and audio data. The integration of language models enables more accurate topic labelling, condensed topics, and the generation of hierarchical topic structures. Leveraging topic models and advanced language models to automate the analysis of large volumes of unstructured data.

SYSTEM DESCRIPTION

QualScale is an innovative approach that combines topic modelling with state-of-the-art language models to analyse open text, video, and audio messages shared by citizens on their smartphones through the Premise App. QualScale builds upon recent advances in topic modelling and incorporates deep learning transformer models. The introduction of deep learning transformer models provide a mechanism to link phrases through their in-context semantic relationships. Models have begun to leverage these semantic relationships, but there are only few examples that have incorporated the current wave of highly-performant LLMs into their algorithms
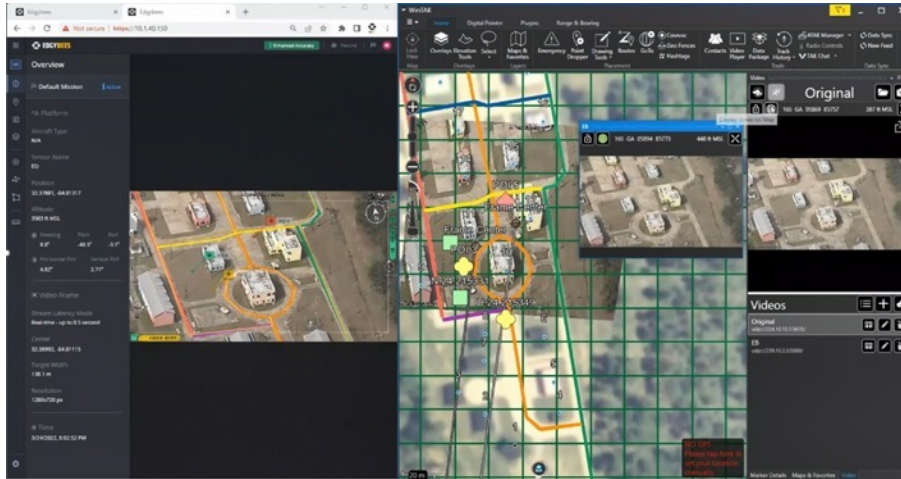
PROJECT INFORMATION

Organization Name:	Edgybees Inc.
Principal Investigator:	Sheffy Glassberg
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	G) Situational Awareness
Funding	Federally

PROPOSED EXPERIMENT OVERVIEW

Edgybees MX will enhance a multicast MISB 0601 compliant stream and multicast/unicast it back to the network in less than 120 miliseconds.

The Edgybees-out stream will be consumed on a TAK device alongside the original stream.

The users will share the same KMLs between TAK and Edgybees MX for better Situational Awareness and common language.

The pilot/sensor operator will add a Point of Interest (POI) on the Edgybees MX video screen and note its MGRS as it appears on Edgybees MX. The POI will be sent as a CoT message to TAK.

The TAK user will place and send a CoT message from his TAK to Edgybees. The MGRS of these CoTs will be noted as well.

All the collected coordinates will be placed on the base map and the differences will be collected and compared using the Edgybees and the Original streams.

The FMV footprint will also be measured.

SYSTEM DESCRIPTION

Edgybees MX georegisters Full Motion Video (FMV) in real-time to allow Enhanced Situational Awareness (SA) and educated decision making.

Edgybees MX accurately overlays GIS data, e.g., street maps, street names, landmarks, and other mission critical data such as mission planes, trackers, and CoT over the video.

The enhanced stream can be consumed over a Google Chrome webpage and/or using any existing PED-like tool.

The API-based system allows for rapid integrations with customer specific tools and capabilities, e.g., IRC chat channels, and CoT.

The integrated CoT API allows the pilot and the end-user instantly collaborate over the video and over TAK devices.

The enhanced stream can also be correctly overlaid on top of the TAK map to enhance SA and collaboration even more.

Edgybees MX delivers CAT1-like* accuracy at the fingertips of the ISR/UAS crew and the dismounted end-users.

PROJECT INFORMATION

Organization Name:	modelspace incorporated
Principal Investigator:	Terence Higgins
Technology Readiness Level:	TRL 3: Analytical and experimental critical function and/or characteristic proof of concept.
Research Area of Interest:	G) Situational Awareness
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Having attended JIFX 22-1, we plan to build on our previous experimentation with participation from fellow experimenters, observers and vendors. modelspace LIVE is a data collection and analysis platform that leverages the US military mission-cycle process of planning, execution and analysis, and novel and emerging technologies, to provide warfighters advanced decision-making abilities for the highly complex battlefields of the future.

SYSTEM DESCRIPTION

Integrating elements of automation, machine learning, cloud computing and advanced data analytics, modelspace LIVE aims to be the mission planning, execution and analysis platform of the future. Overhauling the user/warfighter experience in military mission planning and analysis, while underpinning the entirety of the mission-cycle process with data collection and analysis, LIVE presents analyzed data to decision-makers at all levels, objectively increasing efficiency and effectiveness, while lowering risk to mission and the force.

I-01: Tactical and Operational Radiological Detection and Tracking with Mobile & CCTV Cameras

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
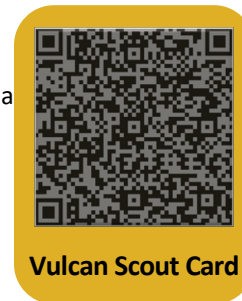23 – 27 October 2023
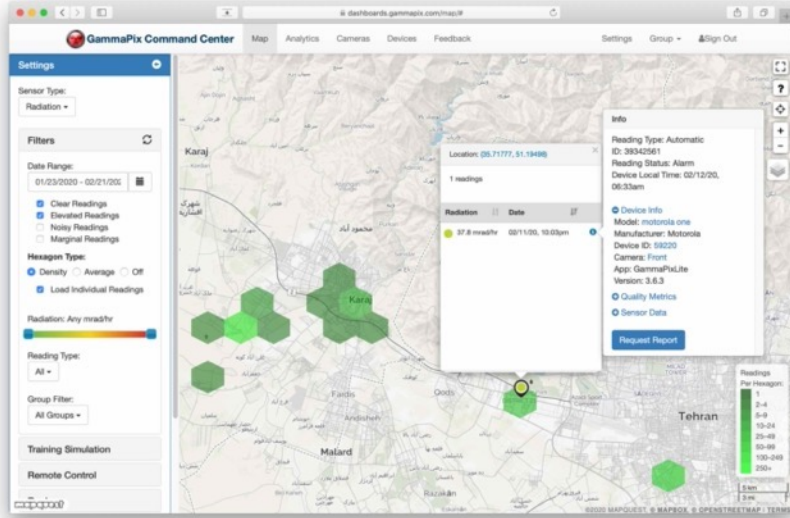
PROJECT INFORMATION

Organization Name:	Image Insight Inc
Principal Investigator:	Eric Rubenstein
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	I) Health and Safety
Funding	Federally (U.S. Air Force (AFWERX SBIR Phase 2 with AFCEC's EOD))

PROPOSED EXPERIMENT OVERVIEW

The objective of the proposed test is to evaluate the ease of training and the success of operation of the GammaPix Pro ionizing radiation detection system and its newest component, the GammaPix EOD retrofit kit, which integrates with UGV, UAS, and other warfighter platforms. GammaPix software products use a proven, TRL 9 software capability that enables unmodified cameras to detect and measure ionizing radiation. Image Insight is currently executing an Air Force Phase 2 SBIR contract to build a very low cost camera-based radiation detection kit. This kit will be attached to Explosive Ordnance Disposal (EOD) unmanned ground vehicles (UGV).
We will characterize the ease of training, integration and employment of GammaPix EOD kits with a range of UGV and UAS systems during JIFX, and the ease and efficacy of GammaPix apps.
The test will evaluate the system's capability and reliability during rapid integration in austere, mission relevant environments.

SYSTEM DESCRIPTION

Image Insight Inc. (I3) developed a low-cost, video analysis capability, called GammaPix. to automatically and autonomously detect and measure ionizing radiation. GammaPix software uses Image Insight's proprietary algorithms to turn every digital camera (network cameras, smartphones, and webcams) into an ionizing radiation detector. GammaPix-enabled cameras have been employed by public safety and national security organizations to detect ionizing radiation. By analyzing video from security cameras and smartphones with GammaPix software, military and Public Safety organizations build a distributed sensor network that detects radioactive sources and materials. GammaPix-enabled cameras work together to create a comprehensive detection capability that serves as a critical part of the nuclear detection architecture. This network of detection nodes would likely provide the first notice of a radiological threat, and provide both a preliminary location, and a time-tagged track as it evolves, filling a gap in coverage...at theater and global scale.

Vulcan Scout Card

PROJECT INFORMATION

Organization Name:	PicoGrid
Principal Investigator:	Anthony Lugo
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment
Research Area of Interest:	J) Expeditionary Operations
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

In the upcoming JIFX exercise, we plan to integrate data from Picogrid Helios into the COPERS Common Operating Picture (COP) system. The goal is to evaluate the efficiency, reliability, and real-time situational awareness enhancements provided by this integration in a simulated defense environment.

The experiment will include a variety of scenarios that mirror real-world conditions, such as waterside security, remote surveillance, and perimeter Enforcement.

SYSTEM DESCRIPTION

The Picogrid Platform is an AI-driven force protection solution designed to address the challenges of securing expansive and complex environments, such as the Indo-Pacific AOR. The system consists of two main components:
1) Orion: A cloud-based command and control platform equipped with autonomous threat detection algorithms and secure user management features.
2) Helios: A tactical sensor pod built for agile combat employment missions, complemented by an integrated commercial satcom link to ensure connectivity in the field. Developed in collaboration with AFVentures, the Picogrid Platform is DoD-validated and commercially available. Currently deployed at multiple Air Force bases, the system has proven its efficacy by detecting numerous critical security incidents and significantly reducing manpower requirements. With over 12 successfully executed defense contracts, including SBIR projects, the Picogrid Platform offers a cost-effective, adaptable, and robust solution for AI-driven force protection

Vulcan Scout Card

PROJECT INFORMATION

Organization Name:	Castor Energy
Principal Investigator:	Varnell Castor
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	K) Infrastructure and Power
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

To provide high-density electricity access to field Warfighters and their equipment, Castor Energy's experiment pertains to the electrical generation, storage, and distribution of high-density electricity, namely a high-powered electromagnet (HPEM) that:
1) can be constructed within a palm-sized (pocket-sized), carry-on model to produce high density electricity for Warfighters while on the go
2) can be constructed to produce 1000W or more within a palm-sized setting using a electromagnetic induction process
3) can convert AC to DC for easier charging of equipment batteries
4) can provide electrical output stacking capabilities to offset its miniature size (small but powerful) by adopting power amplifying transformers
Castor Energy plans to measure the experiment above by:
1) developing a HPEM model with the capabilities listed above
2) measuring the experiment using a Digital Multimeter with display to measure electrical output, specifically, testing DC Voltmeter, Ohm Volt Amp Test, and Continuity Detector.

SYSTEM DESCRIPTION

System pertains to the electrical generation, storage, and distribution of high-density electricity from Castor Energy's flagship Power Amplifying Linear Generator, which is a scalable High-Powered Electromagnet (HPEM) that is currently handheld or palm-sized, utilizes electromagnetic induction and power amplifying transformers to generate 1.2kW of electricity over time due to its capability to not only generate electricity through a push-down/pull-up process where work can be implemented from a pneumatic, combustible, or gravitational source, but also immediately store and stack electrical output using transformers that enable electrical amplification through new AC-to-DC electricity stacking atop pre-existing electricity.

Because of its combined generator and power amplifying transformer design, system can provide floating electrical output, in which DC-outputted, high-density electricity is continuously made accessible through its electrical recycling subsystem, which enables fast charging and allows for the electrical energy to be accessed for 3-5 minutes before dissipating when no push-down/pull-up work is implemented.


Vulcan Scout Card

K-02: Air to Electricity and Water Microgrid

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

PROJECT INFORMATION

Organization Name:	Castor Energy
Principal Investigator:	Varnell Castor
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	K) Infrastructure and Power
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

To provide high-density electricity access to field Warfighters and their equipment, Castor Energy's experiment pertains to the electrical generation, storage, and distribution of high-density electricity, namely an Air to Electricity and Water Microgrid power backpack that:
1) is a 40lb or less carry-on model to produce and store high density electricity for Warfighters while on the go, 2) can be constructed to produce 4.8kW or more using 4 x High Power Electromagnets supporting the electromagnetic induction process, 3) can convert and utilize 24/7-accessible air into storable thermal energy as pneumatic force resource, and 4) can harvest airborne water for hydration purposes

Castor Energy plans to measure the experiment above by:
1) developing an Air to Electricity and Water power backpack model with the capabilities listed above, and 2) measuring the experiment using a Digital Multimeter with display to measure electrical output, specifically, testing DC Voltmeter, Ohm Volt Amp Test, and Continuity Detector.

SYSTEM DESCRIPTION

System pertains to the electrical generation, storage, and distribution of high-density electricity from Castor Energy's flagship microgrid, namely the Air to Electricity and Water Microgrid, which is a scalable generator, and battery storage system that utilizes hybrid solar and pneumatically-triggered High-Powered Electromagnets (HPEM) to produce resilient/reliable high density electricity as it adopts 4 of our High Power Electromagnets (HPEM, 1.2kW of stackable electricity over time), has a killswitch-based, low voltage air compressor motor to shut down motor operations in order to conserve power as well as harvest airborne water, comes with batteries to store excess electricity and comes with an inverter to plug-and-play equipment.

System can provide floating electrical output, in which DC-outputted, high-density electricity is continuously made accessible through its electrical recycling subsystem, which enables fast charging and allows for the electrical energy to be accessed for 3-5 minutes before dissipating when no push-down/pull-up work is implemented.

Vulcan Scout Card
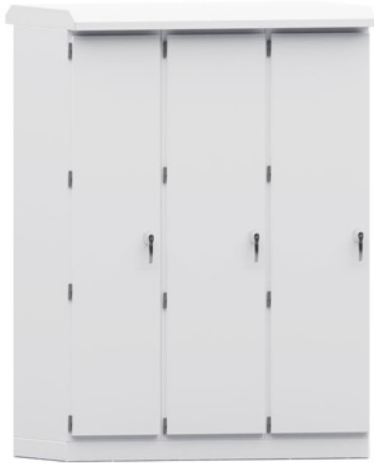
PROJECT INFORMATION

Organization Name:	Veloce Energy
Principal Investigator:	Greg Seligman
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations
Research Area of Interest:	K) Infrastructure and Power
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

We will be deploying our innovative above ground FastGrid technology: EV Charging Infrastructure and VPort (BESS). We will validate the VPort (BESS) and how it can support charging loads off minimal electric supply. Our system is agnostic and can be used with any EV Charger manufacture. For this event we will be partnering with Evolectric to explore our technology capability.

SYSTEM DESCRIPTION

Our FastGrid is the only above ground EV Charging Infrastructure and Battery Energy Storage Solution in the market today. Our FastConnect System is modular, scalable, and able to redeploy when needed. Our VPort (BESS) can provide backup and resiliency up to 4 hours. The VPort (BESS) will enable sites to deploy EV Chargers at power levels higher than the existing electric service size as well as proactively load balance the total charger load based on nameplate capacity and electric tariffs

10 Meters

25 Meters

- Track
- Wing
- Power Takeoff

PROJECT INFORMATION

Organization Name:	AirLoom Energy Inc.
Principal Investigator:	Neal Rickner
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	K) Infrastructure and Power
Funding	VC funding
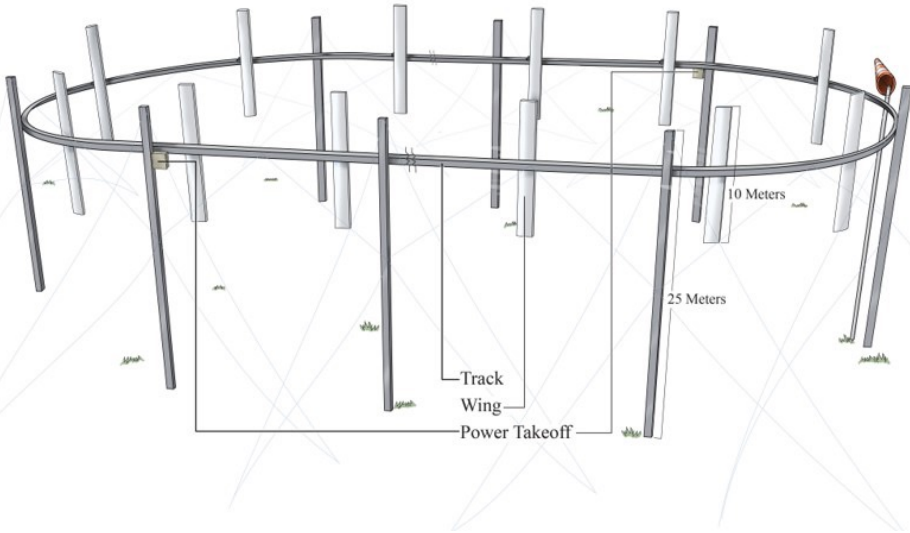
PROPOSED EXPERIMENT OVERVIEW

Airloom and NPS EAG intend to explore the viability of using Airloom's proprietary technology to provide rapidly deployable wind generation systems to forward deployed units in order to meet their energy needs.

Experimentation and testing will include:
- Set up and tear down time of the Airloom system.
- Ideal locations of deployments including near airfields and on ships.
- Energy production and storage metrics.

SYSTEM DESCRIPTION

Airloom harnesses the power of the wind to propel wings along a lightweight track. Our unique geometry generates the same amount of electricity as conventional turbines at a fraction of the cost. Easy to transport, install, and maintain, the AirLoom can be quickly configured to upsize or downsize to electrical demands; a 2.5 MW Airloom can fit inside a standard tractor trailer. The AirLoom also provides location, altitude, and visual signature flexibility.

Vulcan Scout Card

PROJECT INFORMATION

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Organization Name:	OnTo Technology LLC
Principal Investigator:	Steve Sloop
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	L) Mobility and Transportation
Funding	Federally (Defense Logistics Agency)

PROPOSED EXPERIMENT OVERVIEW

This JIFX Battery Deactivation / Render Safe experiment will demonstrate capability to remove hazardous characteristics from lithium batteries (LBs) in a CONUS or OCONUS base environment. There is a need to prevent thermal runaway in spent LBs to help ensure safe recycling and/or disposal, reduce cost for shipping and recycling spent lithium-ion batteries. Examples of military batteries include non-rechargeable "primary" lithium (BA 5590) and rechargeable "secondary" lithium-ion (BB 2590). This experiment will deactivate batteries on-site using a service-trailer. The batteries will be placed in the deactivation vessel and rendered-safe using a method developed in a laboratory environment. After running the deactivation method, the inert-level of the batteries will be confirmed (on-site) with simple experimental methods to measure lithium-chemical-activity of the substrate material. If subsequent treatment is necessary, the procedure will be repeated. "Inertized" batteries will be transported to a US-based destination facility to recycle the critical elements for battery manufacturing."

SYSTEM DESCRIPTION

Deactivation works by adding 2% water and 98% carbon dioxide to a vessel containing a lithium-containing battery and pressurizing and heating the vessel to form lithium carbonate within the lithium-containing battery. The condensed carbon dioxide may help to passivate any remaining lithium in the battery, while water may help the condensed carbon dioxide to reach the lithium through a solid electrolyte interphase (SEI) and/or a passivated layer surrounding stranded active lithium. An example of a treatment that results in relatively low residual lithium is as follows: place the battery into a 4 L autoclave, with 400mL water, seal the vessel and introduce CO_2 to 900 PSI at room temperature. Heat the vessel to 120oC while maintaining the pressure (500-1500 PSI) and let the system dwell for 30 min at temperature. Finally, cool to 40oC in about 30 min (e.g. using a cooling coil), depressurize, open, and remove the battery.
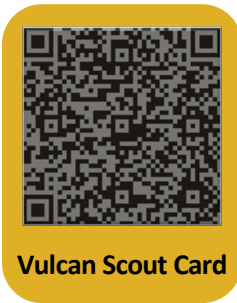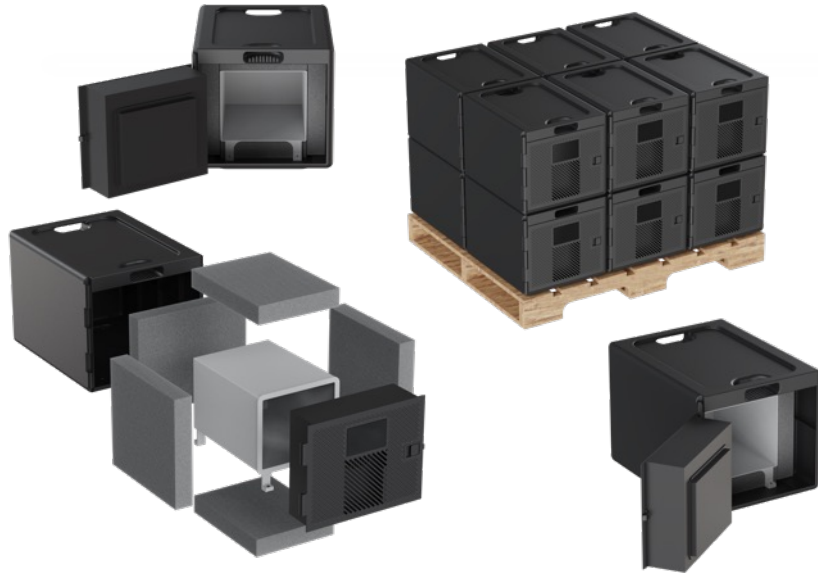

Vulcan Scout Card

PROJECT INFORMATION

Organization Name:	Artyc PBC
Principal Investigator:	Sandor Langer
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	L) Mobility and Transportation
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

We would like to experiment with how our thermal packaging will be able to actively adjust and maintain temperature throughout changing environments. Specifically, our active cooling technology is designed to maintain temperature as the packaging transits between indoor and outdoor environments, is loaded and unloaded from logistics vehicles, and moves around operating bases. In addition, we hope to learn about any design features that would make our containers easier to load and interact with in any of the settings that would be helpful in the military context. Through these learnings, we hope to develop products that work to provide a more mobile, temperature-stable, infrastructure-less, cold chain solution that works to get critical, temperature-sensitive supplies where they are needed.

SYSTEM DESCRIPTION

Artyc uses highly optimized heat pump systems to keep cargo at its ideal stabilization temperature. With an active heating and cooling system, our onboard processor adjusts the power supplied to the cargo volume to maintain the correct temperature and greatly extends the time during which that temperature can be maintained as compared to passive cooling systems like dry ice or cold packs. Artyc's containers can both heat and cool and switch between those modes automatically, allowing for it to adjust to a variety as well as changing environs. Our units can log environmental and location information and provide live updates at set intervals as well as on events. Artyc builds containers in multiple sizes and for a variety of different types of shipments.

Vulcan Scout Card

L-04: Exploring Rapid, Efficient Electrification of Existing Fleet Vehicles within Existing Operations. CANCELLED

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 24-1
23 – 27 October 2023

PROJECT INFORMATION

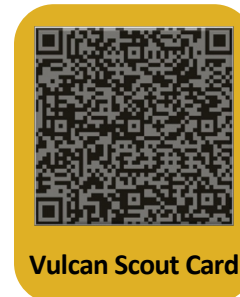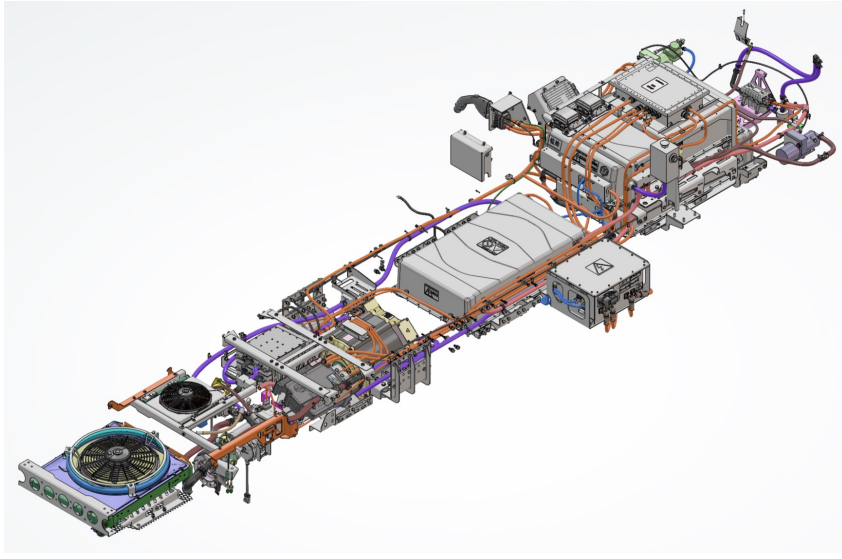|	
Organization Name:	Evolectric
Principal Investigator:	Bill Beverly
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	L) Mobility and Transportation
Funding	Internally

PROPOSED EXPERIMENT OVERVIEW

Evolectric possesses an electrification kit technology which can replace existing combustion engine vehicles with a 100% smart electrified powertrain system. We plan to evaluate how the Evolectric system integrates with commercial and US government electric charging infrastructure in an austere environment. We will evaluate physical fit with self sourced measurement equipment. We will also evaluate system operation within electrical tolerances via system parameter comparison. We may also simulate charging times.

SYSTEM DESCRIPTION

Evolectric has designed a proprietary electrified powertrain system which includes battery packs, motors, power electronics, cabling, electronics, and thermal systems. The system is modular and expandable to increase/decrease battery capacity or motor power if needed for specific use cases. This system is complemented with Evolectric's embedded software and controls development to enable a rapid and turnkey retrofit electrification of a vehicle which has already seen between 5-10 years of usage (and is a good candidate for upcycling rather than replacing). Evolectric also enables a data pipeline for vehicle fleet operators which can be utilized to help track, optimize, and evolve the vehicle's capabilities even after initial deliver. We could continue to iterate and unlock features such as vehicle-to-grid, vehicle-to-vehicle charging, ADAS sensors, house-power export, etc...