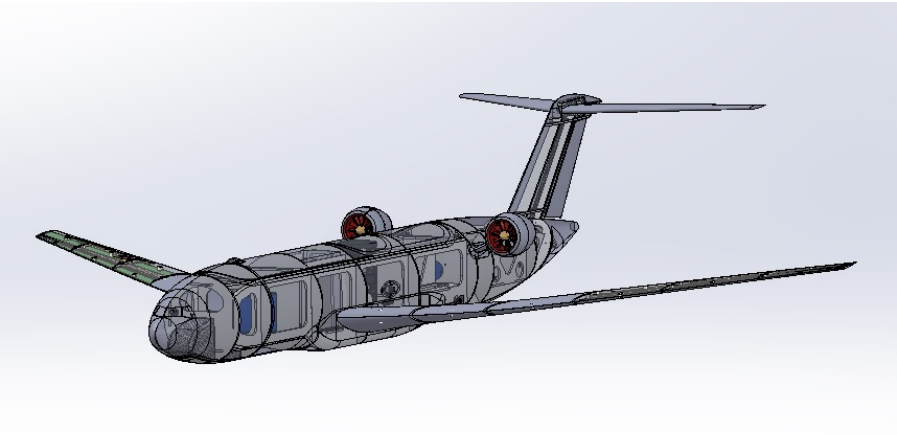
A-01: Novel Aeroservoelastic Scaled Model

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	M4 Engineering, Inc.
Principal Investigator:	Myles Baker
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

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.

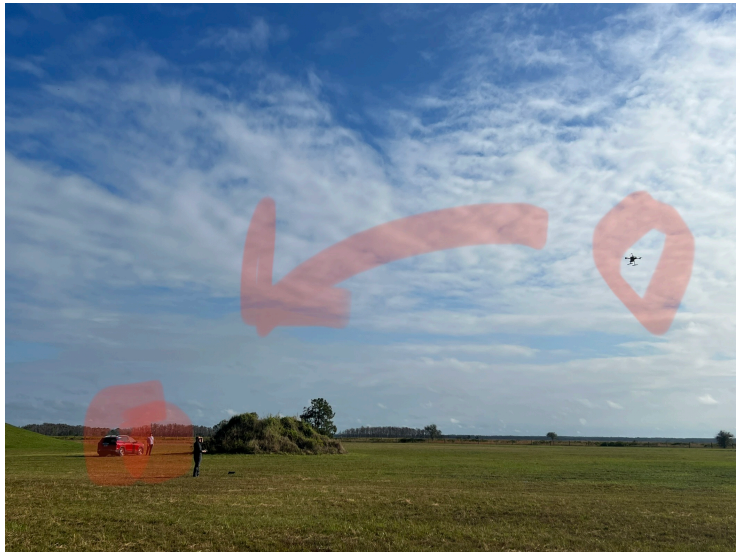
In these flight tests, we will demonstrate basic manual-control functionality with a safety pilot. If successful with sufficient time and budget remaining, we will also demonstrate stabilized flight with the autopilot and waypoint navigation using the QGC ground control system and fully autonomous flight (other than takeoff and landing).

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.

A-06: Vision Navigation for GPS Denied Environments

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Rhoman Aerospace
Principal Investigator:	Thomas Youmans
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in laboratory environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

We will fly the UAV with various vision systems to track features of the environment and use those tracked features for navigation. We may test this system along with a logistics cargo delivery system for autonomous resupply through contested airspace.

SYSTEM DESCRIPTION

The solution uses various standard visual odometer and SLAM systems combined with custom algorithms to detect most track able pixel-sets and custom algorithms to extract features and downsize data prior to use in VO and SLAM systems. Custom VO and SLAM systems may also be deployed.

A-07: Dronehub, Autonomous Batter and Payload Swap, Drop and Rearm for Drones

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Airrow Inc.
Principal Investigator:	David Kaye
Technology Readiness Level:	TRL 5: Component and/or breadboard validation in relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

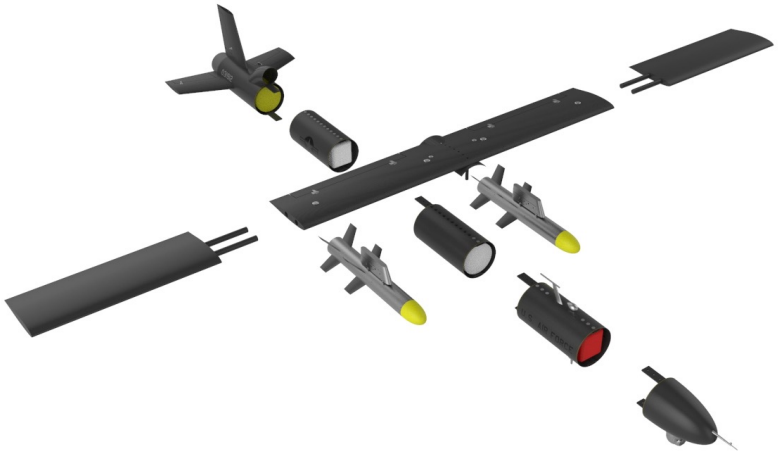
Our demo will consist of automating a drones flight with a payload to a pre-determined or actively determined location. Initiating a remote payload drop. Returning to home, landing autonomously, having a new battery and payload armed on the drone. Initiating a subsequent swap, drop and rearm.

SYSTEM DESCRIPTION

Our technology is a critical part of the support needed for the primary area of interest 1. Autonomy and area of unmanned aerial vehicles.

A-08: Aerial Vehicle

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Firestorm Labs
Principal Investigator:	Chad McCoy
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	A) Unmanned Aerial Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

We do not intend to fly our system duyring this event. We were invited to attend by the combat development shop at Damneck.

SYSTEM DESCRIPTION

Fully modular systems, from propulsion to payload. We are user defined and entirely 3D printed at the edge.

A-09: Exploration of Multispectral Imaging in Camouflage Detection using an UAS Platform

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023

Hupel, Tobias, and Peter Stütz. 2022. "Adopting Hyperspectral Anomaly Detection for Near Real-Time Camouflage Detection in Multispectral Imagery" Remote Sensing 14, no. 15: 3755.

PROJECT INFORMATION

Organization Name:	Naval Postgraduate School
Principal Investigator:	Stergios Barmpas
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	A) Unmanned Aerial Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Use of a COTS multispectral sensor integrated in a COTS UAS to investigate camouflage and battlefield anomalies detection.

SYSTEM DESCRIPTION

The experiment will explore the capability of the combination of COTS multispectral sensors and UAS's to detect and identify camouflage and battlefield anomalies, in comparison to ordinary visible and IR sensors.

B-01: Carbon Dioxide-Derived Jet Fuel Demonstration

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Air Company
Principal Investigator:	Stafford Sheehan
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
Experiment Location:	SLAMR Facility at the Naval Postgraduate School

PROPOSED EXPERIMENT OVERVIEW

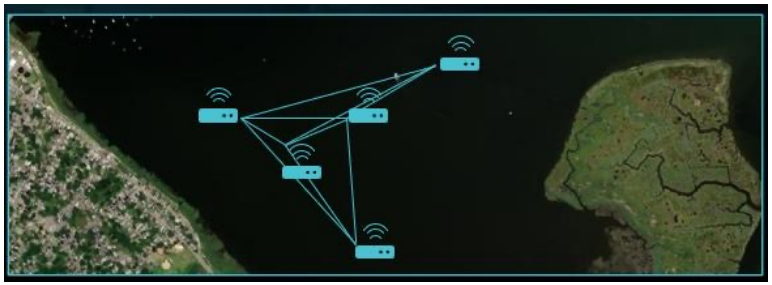
We propose to power two SeaFox USVs, one with Jet-A derived from fossil fuels, and one with Jet-A produced by Air Company's process from carbon dioxide and water. Comparative data will be collected between the two USVs, such as amount of fuel consumed over a set duration and maximum speed. The hypothesis is that Air Company's fuel has identical performance for marine vehicles as the current Jet-A being utilized. This will help to enable further testing with the ultimate goal of generating fuel on-site for marine operations.

SYSTEM DESCRIPTION

Air Company has developed technology that produces fuel on-site from carbon dioxide (which can be captured from the air or water), water, and electricity that meets the chemical specifications as a drop-in Jet-A. The fuel is currently produced in a pilot plant situated in Brooklyn, New York, and would be transported to the SLAMR site beforehand. Previously, fuel produced from this system successfully flew a UAV as part of the Air Force's Project FIERCE.

B-04: Portable Electronic Ghost Signature (PEGS)

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Booz Allen Hamilton
Principal Investigator:	Marjorie Misasi
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
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Proposed PEGS experiment is to conduct RF transmission performance evaluation for two self-contained prototype PEGS units, by measuring the power and bandwidth signal characteristics, with an RF receiver implemented (spectrum analyzer). Optimal experiment would be to range test over water (up to 10 nautical miles) for the payload long range transmissions and utilize local command and control for local transmissions. The threshold experiment would be to range test over an open field with the RF receiver implementation moving via vehicle to set standoff distances (0.5 mile, 1 mile, etc..) to establish experimental performance degradation. The PEGS team can bring two PEGS prototypes, RF receiver, antennas, vehicle, command and control device, licenses for VHF/UHF/HF bands, water tanks for equipment cooling and thermal measurement equipment.

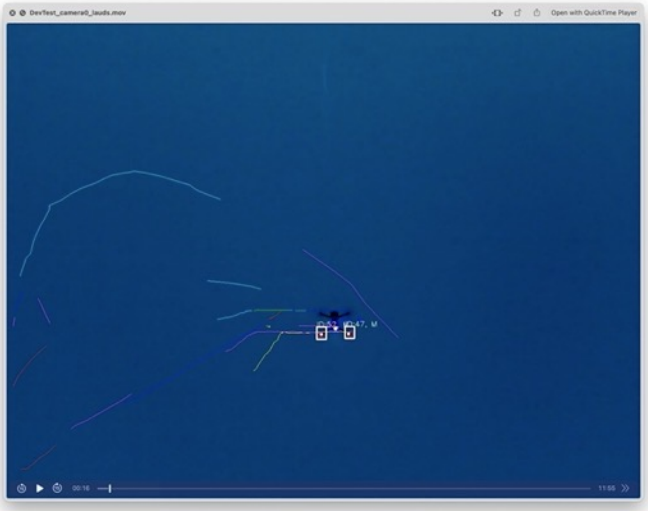
SYSTEM DESCRIPTION

Ability to store and toggle through a library of EMS waveforms and provide high-fidelity EMS representation of a wide range of signals, module waveforms, and systems waveforms enables users to alter and augment RF transmission postures.

C-01: Night-time Detection of Small Unmanned Aerial Systems with Security Cameras

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Image Insight Inc.
Principal Investigator:	Eric Rubenstein
Technology Readiness Level:	TRL 5: Component and/or breadboard validation in relevant environment.
Research Area of Interest:	C) Countering Unmanned Systems
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

The objective of the proposed test is to evaluate key parameters of the performance of the LaUDS (LiDAR and UAS Detection System) software.

We hope to characterize the detection performance of LaUDS against the range of UAS systems intended to fly during JIFX during a range of conditions, hopefully including night time 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 UAS.

SYSTEM DESCRIPTION

Image Insight Inc. (I3) is developing a low-cost, video analysis capability, called LiDAR and UAS Detection System (LaUDS,Ñ¢), to automatically and autonomously detect and track LiDAR emitters such as commercial and military UAS and other optical/infrared (OIR) transients like laser target designators, artillery and rocket fire, and muzzle flashes. Using security cameras and LaUDS software, the system 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 UAS for lethal attacks, for intelligence collection, and to achieve other effects, and 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.

D-01: Radio Integration System (RIS) 4.0 Operational Assessment

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	USSOCOM - PEO-C4
Principal Investigator:	Meghan Saporito
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	D) Communication and Networking
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

The purpose of the Operational Assessment will be to show the capability of the RIS 4.0 to meet USSOCOM-selected requirements from the RIS Capability Production Document, while being used by trained operators in a relevant operational environment. USSOCOM plans to issue a limited Fielding and Deployment Release (F&DR) based on the results of the Operational Assessment. All radios being used are currently fielded assets from USSOCOM. The assessment concept is to spot check selected radio communications capabilities to ensure that the RIS 4.0 internal components, wiring, configuration, and software do not degrade current radio capabilities. Additionally, RD-TSX (NAG) will collect data on selected system suitability issues such as transportability and operational availability.

SYSTEM DESCRIPTION

RIS 4.0 is the fourth generation of the RIS production line. The system is an integrated product led by the Government and supported by various contractors as needed. RIS 4.0 is a radio rack system, consisting of off-the-shelf commercial products, designed to support the Army Navy Portable Radio Communications (AN/PRC) next generation tactical communication (NGTC) radios. For this Capability Demonstration, RD-TSX (NAG) will focus on two variants of the RIS 4.0: Specialized Mobile Radio Transit System Amplifier (SMRTS-A) and Specialized Mobile Radio Transit System Base Station (SMRTS-B). The RIS 4.0 is designed to provide at least two amplified channels. RIS 4.0 is designed to be transportable: SMRTS-A by one operator and SMRTS-B by two operators. SMRTS-B includes a radio gateway designed to support two internal radios and two external radios. The RIS 4.0 is designed to be configurable by the operator in both hardware and software.

D-02: Quick Deploying LTE Microcell Networks using Ad-hoc Mesh Technology

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Beamlink
Principal Investigator:	Aprad Kovesdy
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	D) Communication and Networking
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Test the set up process of multiple LTE base stations (preferrably by participants other than Beamlink engineers).

Once enabled, test the data rate between base stations using the mesh network. Test the range of the mesh network and produced LTE signal from each base station. Then, test the data rate, latency, and jitter on connected devices, primarily user equipment (i.e. smartphones) through the LTE connection and WiFi connection provided by the base station access points.

Test real world applications running on the network, including common applications used by first responders.

Test the ability of each microcell to withstand outdoor conditions including dust, temperature, and humidity.

Test the off-the-grid capability of the microcells by using solar panels and battery packs to power one, some, or all of the microcells.

If possible, test network intrusion and malware attacks on the network through user equipment with simulated malware or network intrusion software installed.

SYSTEM DESCRIPTION

Beamlink is designing a portable cellular network that consists of small, lightweight, and low power microcells that have an estimated free space range of 0.5 to 2.5 miles and can communicate over LTE protocols (and band up to 6 GHz) and WiFi (2.4 GHz and 5 GHz) protocols. Each microcell connects to one another using an ad-hoc mesh protocol over unlicensed frequency bands. One or more microcells are connected to backhaul using SpaceX's Starlink constellation. One or more microcells are connected to power using a Jackery 100W solar panel and associated battery pack, or mains AC power.

Smartphones and sensors can connect to the LTE network using either a scannable eSIM QR code or a physical SIM card. Laptops, tablets, or any other devices can also connect using a short range WiFi access point built into each device.

Beamlink microcells are managed remotely using a cloud application with GPS tracking.

D-03: SeaDragon

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Quantum Shield
Principal Investigator:	Samuel Lavery
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	D) Communication and Networking
Experiment Location:	SLAMR Facility at the Naval Postgraduate School

PROPOSED EXPERIMENT OVERVIEW

Undersea communication is extremely difficult due to multitude of factors. The rise of quantum computing and current quantum resilient digital signatures based on lattice cryptography are likely unworkable in highly constrained networking environments. Trechend is a proprietary quantum resilient digital signature algorithm that is being proposed to NIST's open call for PQC digital signatures that are short and fast to verify.

Using two modified JANUS Trechend enabled webRTC servers and a pair of underwater modems we intend to establish a secure post-quantum communication channel using a Trechend signed ephemeral key.

We will attempt to establish a secure communication channel using Trechend variants at NIST level 1,3,5 and will attempt a variety of communication patterns and record all networking statistics for later analysis

SYSTEM DESCRIPTION

By producing smaller keys and signatures, many difficult problems become easier to solve. Trechend can make underwater communications more secure against quantum computers. Trechend also works within the existing hardware TMP 2.0 standard, where lattice signatures struggle to fit inside a fixed 4k IO buffer. There are many hardware, software, and protocol applications that could benefit from a more efficient core cryptographic primitive.

D-04: USMC COC 5G Wireless Data Gathering

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	AT&T
Principal Investigator:	Robby Schimelpfening
Technology Readiness Level:	D) Communication and Networking
Research Area of Interest:	TRL 4: Component and/or breadboard validation in laboratory environment.
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

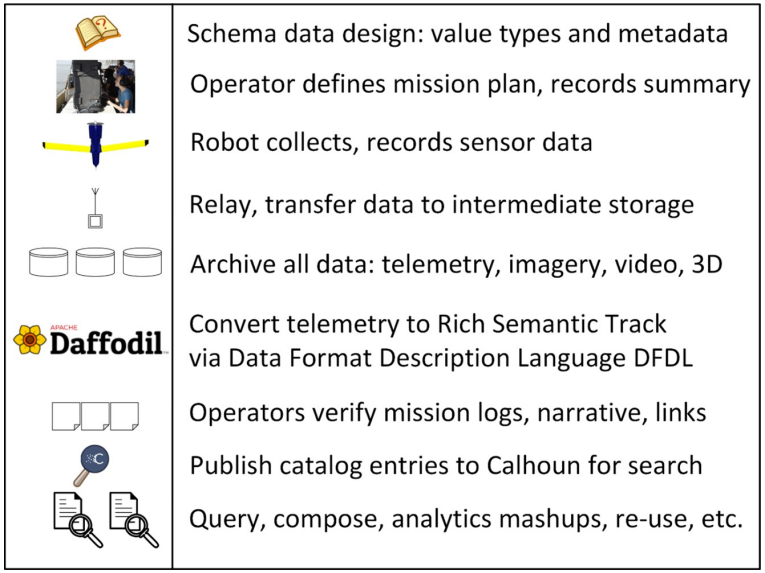
Utilizing a mobile 5G system, mobile 5G devices and an existing milspec tent at Camp Roberts, conduct field experiments to determine signal strength, range, signal loss and data throughput when operating a 5G system in a tent environment.

SYSTEM DESCRIPTION

Enables rapid deployment and relocation of USMC Mobile Operations Centers in the field.

D-05: Data Strategy for Unmanned Systems

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Naval Postgraduate School (NPS)
Principal Investigator:	Don Brutzman
Technology Readiness Level:	D) Communication and Networking
Research Area of Interest:	TRL 5: Component and/or breadboard validation in relevant environment.
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Data Strategy for Unmanned Systems Field Experimentation (FX), Simulation and Analysis: Abstract. Data collection and analysis techniques for robot experiments are haphazard and incomplete. Building best-practice workflows for data and metadata from unmanned systems can leverage both field experimentation (FX) and simulation to support archival data re-use and repeatable analysis. Reusable end-to-end data workflows are needed. Building on multiple open standards, open-source tools, and authoritative data formats, ongoing NPS CRUSER work is focused on applying Data Format Description Language (DFDL) techniques to archival recording/playback of mission orders, recorded telemetry and sensor streams.

SYSTEM DESCRIPTION

Efforts at JIFX 23-2 will assess previously collected data assets, consider current practices, and plan next-step developments of an NPS Data Archive. Our goal is to support both experimenters and long-term users of their results. This necessary capability may enable an even-larger context, namely a Data Strategy for Unmanned Systems field experimentation (FX), modeling and simulation (M&S) supporting Live-Virtual-Constructive (LVC) synthesis, data repositories, and repeatable analysis. A full end-to-end toolchain built using open capabilities has the potential to address these important needs. Our design memorandum describes component technologies that together can establish such an information infrastructure. Failure to implement a shared data strategy blocks necessary interoperability of human-machine teams.

D-06: Small Tactical/UAV SATCOM and data compression

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

VersaWave APPLICATIONS

- Small UAS BLOS communications for C2 and Data
- Small Manned ISR or special mission platforms such as Caravan or King Air
- Tactical or Non-standard vehicle communications
- Wildfire C2 and remote survey aircraft communications (rotary and fixed wing)
- Small Fly-away communication kits (Pelican case)
- JADC2/ABMS BLOS connectivity for ground, air or maritime assets
- BLOS connectivity for range/lab testing and demonstrations (e.g., unattended sensor)
- SATCOM for low signature ground, maritime or airborne platforms
- Demonstrated ability to integrate with MANET and cellular networks (USAF demo)
- Ability to stream ATAK data, provide BLOS SA

Simple to integrate to any asset or platform that requires BLOS comms

Honeywell Confidential - ©2022 by Honeywell International Inc. All rights reserved.

PROJECT INFORMATION

Organization Name:	Honeywell
Principal Investigator:	Eric Pavklick
Technology Readiness Level:	D) Communication and Networking
Research Area of Interest:	TRL 9: Actual system proven through successful mission operations.
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

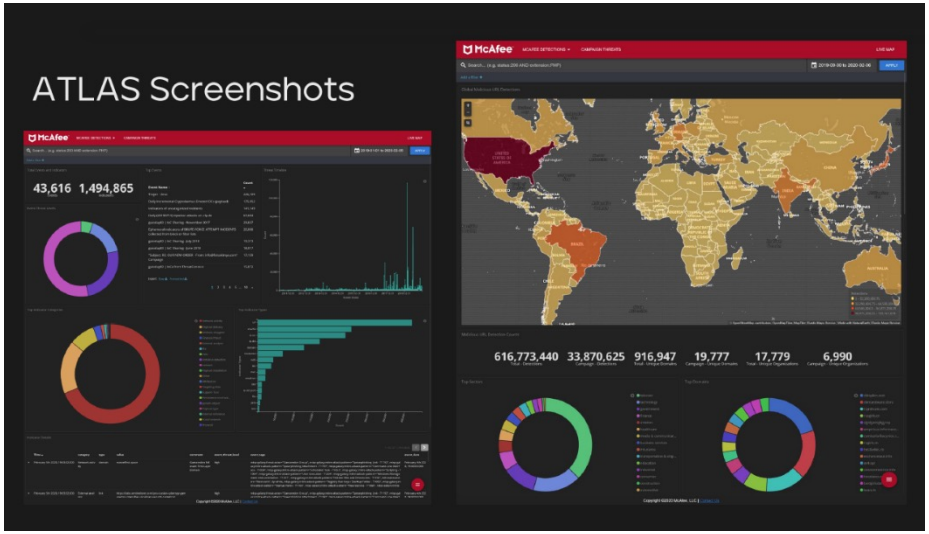
Demonstrate BLOS data exchange with a 1kg SATCOM solution with ability to be vehicle mounted, manpackable, or on any Unmanned system, along with associated quantum cybersecurity and data compression. Demonstrate ability to publish ATAK data over a network BLOS, and C2 data and FMV data.

SYSTEM DESCRIPTION

SATCOM System is a 1Kg SATCOM solution that uses Swift Broad Band L-band commercial services at up to 200Kbps. It is currently flying on over a dozen unmanned assets, as well as, vehicle mounted and tactical applications. The system can use a small NUK processor to add quantum encryption and unique data compression software technology. Q3.23 upgrades will increase the data rate to 500Kbps with modest increase of weight to 1.5Kg, and additional of 5/4G capability.

E-01: Cyber Situational Awareness

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Trellix (Formerly McAfee + FireEye)
Principal Investigator:	Michael Reilly
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	E) Cyber, Cyber Security, and Electronic Warfare
Experiment Location:	SLAMR Facility at the Naval Postgraduate School

PROPOSED EXPERIMENT OVERVIEW

Advanced Threat Landscape Analysis System (ATLAS) gives Commands unique global insight into the malicious file, domain, and IP detections seen worldwide from Trellix's billions of sensors around the globe.

The data is aggregated from various Trellix (McAfee + FireEye) data sources to provide the latest global emerging threats with data such as industry sector and geolocation.

ATLAS correlates these threats with campaign data containing research done by the McAfee Labs Advanced Threat Research (ATR) team as well as open source data, to provide a dedicated view for campaigns consisting of events, dates, threat actors, IOCs, and more for complete Cyber Situational Awareness of any AOR.

SYSTEM DESCRIPTION

Malicious detection/query data from TITAN Unified Metrics Store (UMS)
Data sources: Repper, REST, RealProtect, JCM, ABT
Campaign data from corporate MISP server
Enrich detection data with industry sector, customer names (internal only), correlated campaign data, parsed event tags (threat actor, threat tools, etc), & more
Ingested into Elasticsearch & displayed in Kibana with custom dashboards and visualizations. New ATLAS data is processed once per day. Updates are not finished at the same time every day due to variable data processing times/amount of data. There are 4 main types of data:
Daily aggregation of Trellix malicious file detections of the previous day
Daily aggregation of Trellix malicious domain detections of the previous day
Daily aggregation of Trellix malicious IP detections of the previous day
Daily new or updated Trellix MISP campaign data
Updates require internet access in order to sync with Amazon S3. Data is downloaded in Elasticsearch Snapshot format.

E-02: WIXPO

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	ARONETICS
Principal Investigator:	John Aron
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
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

I would setup the systems and see how the testing works in the JIFX environment. This is an experiment in your environment, not a demonstration.

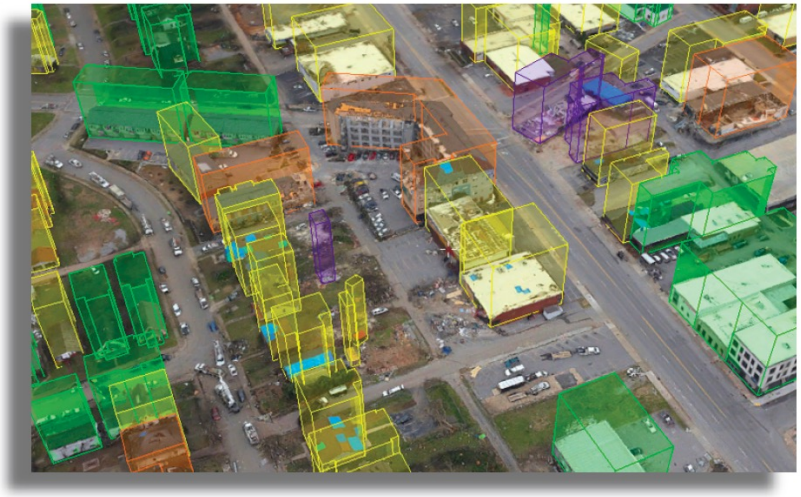
I would need a few work stations to load the technology on to and experimenting of what occurs in 3, 6, 9, 18, 36, 92 hours.

SYSTEM DESCRIPTION

Regardless of where you have your computing resources and data, how do you protect and tamper-proof your data?
Information security isn't in the clouds or found with analysis of the network flow. It is found deep in your computing platform.

F-01: SOF OPPS

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Skyline Software Systems
Principal Investigator:	Blair Jenkins
Technology Readiness Level:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Research Area of Interest:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

The SOF-OPPS performance factor is measured in the speed and quality of the data delivered that is relative to the end user needs. In plain language, SOF-OPPS can collect, process, and deliver actionable intelligence products expeditiously to give the user a tactical or strategic advantage. In addition, our goal is to evaluate how this new ISR tool can be employed at the leading edge of the battle space and to determine the exact needs of the user.

SYSTEM DESCRIPTION

Special Operation Forces - Operational Planning Suite (SOF-OPPS), Skyline's turn key total solution that provides professional-grade photogrammetry 2D/3D models to optimize imagery datasets and provide highly detailed models. Coupled with the powerful analytical tools included with SOF-OPPS, end-users can perform a multitude of mission essential tasks to include: Route Reconnaissance, CTR, BDA, Mission Planning and¬† AAR. In addition SOF-OPPS can be used by higher command for near real time Situational Awareness (SA) of the battlespace and integrated into the Common Operational Picture (COP). SOF-OPPS is a true "all-in-one" mission planning and battlefield GIS intelligence solution that is field ready today and includes a collection vehicle, camera, in-field processing system and the complete suite of analytical tools, all of which can be scaled to meet any need of the warfighter.

F-02: C2MP

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Skyline Software Systems
Principal Investigator:	Blair Jenkins
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Experiment Location:	SLAMR Facility at the Naval Postgraduate School

PROPOSED EXPERIMENT OVERVIEW

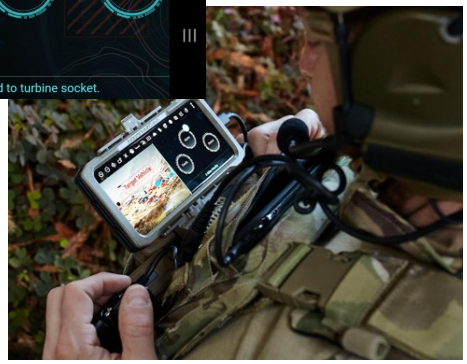
Our goal is to perform near real time production of 3D models and 2D imagery products from onsite collections, along with performing mission critical planning and GIS analytics. Additionally, Skyline will be gauging how the Warfighter will employ this data which will enable Skyline to drive further developments or tailor the existing platform to specific needs.

SYSTEM DESCRIPTION

C2MP, Skyline's turnkey total solution that provides professional-grade photogrammetry 2D/3D models to optimize imagery datasets and provide highly detailed models. Coupled with the powerful analytical tools included with C2MP, end-users can perform a multitude of mission essential tasks to include Route Reconnaissance, CTR, BDA, Mission Planning and AAR. In addition, C2MP can be used by higher command for near real time Situational Awareness (SA) of the battlespace and integrated into the Common Operational Picture (COP). C2MP is a true "all-in-one" mission planning and battlefield GIS intelligence solution that is field ready today and includes a collection vehicle, camera, in-field processing system and the complete suite of analytical tools, all of which can be scaled to meet any need of the warfighter.

F-03: The Frontline Perception System (FPS)

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	TurbineOne
Principal Investigator:	Ian Kalin
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

TurbineOne will experiment with applying multiple edge-deployed machine learning models with the Frontline Perception System (FPS) analyzing disparate video and SIGINT sensor feeds ,Äì showing that users can harness ML even in comms-contested environments. The FPS is currently able to build and apply one model to one sensor ,Äì this experiment seeks to combine and deploy multiple user-built ML models (ie. pose + gun detection) onto one sensor feed and generate smart alerts that are sent to the user,Äôs mobile ATAK or laptop device. The user will label relevant video screenshots to build a model in FPS, then test the model themselves. This demonstration will be conducted without the Internet or the cloud to simulate battlefield connectivity. We will measure the reduction (10x expected) in manual feed monitoring time compared to the workflow of receiving an ML detection alert as well as model detection accuracy.

SYSTEM DESCRIPTION

The FPS has a host of features that set it apart from other software for situational awareness and ISR including: ML without connection using edge computing; Data convergence and sensor fusion to overcome vendor lock; Automated PED system for both detection and new ML algorithm building; and No-code design so Soldiers (not data scientists and programmers) can create new models.

With the FPS, users will be able to easily build and tune ML models, then apply that ML model to any sensor feed in the network and instantly start receiving alerts ,Äì all without cloud connection. This is a revolutionary capability that will drastically reduce PED analysis time by eliminating manual feed monitoring for the analyst in the JOC and the operator in the field. We have proven this capability in past engagements with AFSOC, NIWC PAC, and Army DEVCOM.

F-04: Expeditionary Artificial Intelligence and Behavior Analysis at-the-edge for Tactical Surveillance for Multi-Domain Operations

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Gantz-Mountain Intelligence Automation Systems, Inc.
Principal Investigator:	Greg Wilson
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	F) Intelligence, Surveillance, and Reconnaissance (ISR)
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Capability Experimentation goals:

- Increase robustness of AI-driven Behavior Analysis at the Tactical Edge
- IIncrease robustness of comms backhaul to include MANET Radios
- Situational Awareness with Tip and cue UAS via WinTAK/ATAK
- AI target hand-off to autonomous ISR systems to compress targeting cycle

SYSTEM DESCRIPTION

Gantz-Mountain is continuing to experiment with its tactical intelligence automation system with smart unattended ground surveillance systems that feature artificial intelligence and behavior analysis at-the-edge for expeditionary surveillance in support of multi-domain operations (MDO).

G-01: Holographic Situational Awareness

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Avalon Holographics
Principal Investigator:	Russ Baker
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	G) Situational Awareness
Experiment Location:	Unsure -

PROPOSED EXPERIMENT OVERVIEW

We will provide a short overview of our technology, then demonstrate a series of holographic battlespace visualization content on both our 1st-gen and 2nd-gen prototypes. We will collect qualitative feedback from user experts on their impressions and evaluation of the benefits of the technology, as well as numerical judgments of the relevant value and perceived cognitive and comfort impacts of using the display for 3D visualization, as compared to the 2D displays we will also show the content on. We will also ask for their opinion on how the technology compares to VR and AR solutions (we will not have these available for direct comparison).

Primary performance measures are qualitative, and where feasible quantitative, feedback on user experience in the evaluation of:

- Cognitive effort
- Viewer comfort, avoidance of typical 3D side-effects
- Ease of use
- Ease of communication with colleagues

SYSTEM DESCRIPTION

Avalon Holographics makes professional holographic displays and systems that revolutionize the way people produce, view and understand visual content. By replicating the experience of looking at real objects, Avalon's holographic displays produce realistic, comfortable, and headgear-free immersive experiences that facilitate collaboration while reducing cognitive load. In defense applications, these displays are anticipated to significantly improve Situational Awareness and OODA loop performance for command staff and teams while evaluating a Common Operating Picture.

A system consists of a tabletop or desktop display driven by a graphics computer, which would be fed by existing battle management software. The current experimental setup leverages a holographic viewer application that can take inputs from applications such as SIMDIS and other simulation software that utilize similar datasets and formats (such as DIS/HLA).

G-02: Man-Portable all-in-1 Weather System

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Vaisala Inc.
Principal Investigator:	Bob Cook
Technology Readiness Level:	G) Situational Awareness
Research Area of Interest:	TRL 7: System prototype demonstration in an operational environment.
Experiment Location:	Unsure

PROPOSED EXPERIMENT OVERVIEW

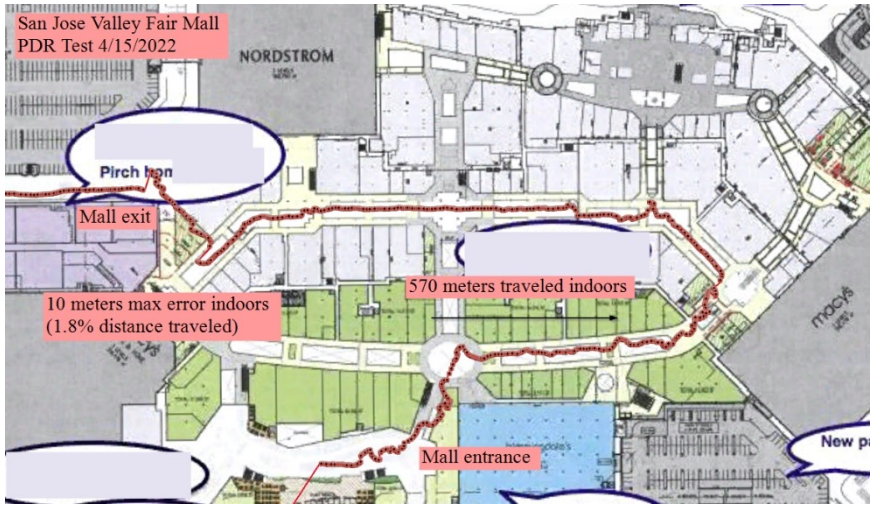
Data from this experiment will be viewable at the system location as well as transmitted via an Iridium modem (included in the prototype) to any relevant data-collection site.

SYSTEM DESCRIPTION

Forward-deployed troops need weather information to support virtually all types of operations. Available weather-sensing systems are either too large to be practical or too small to be accurate. The Vaisala prototype system is a single case able to be quickly set up and includes everything needed to detect and report weather conditions at the site. The purpose of sending the system to JIFX is to get practical information from users on how the prototype system might be made more suitable for use in a practical warfighting environment.

G-03: IHM GPS Denied Navigation

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Yotta Navigation
Principal Investigator:	Andrew Hazlett
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	G) Situational Awareness
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Yotta Navigation plants on conducting data collection for 10 types of complex motion in the CACTF simulated operational environment. The motion will assist creating online motion models for classification and GPS denied navigation with complex motion types. Yotta Navigation will test to be able to provide positioning at less than 5% position error over distance traveled in GPS denied environments while crawling through CACTF tunnels and complex motion indoors.

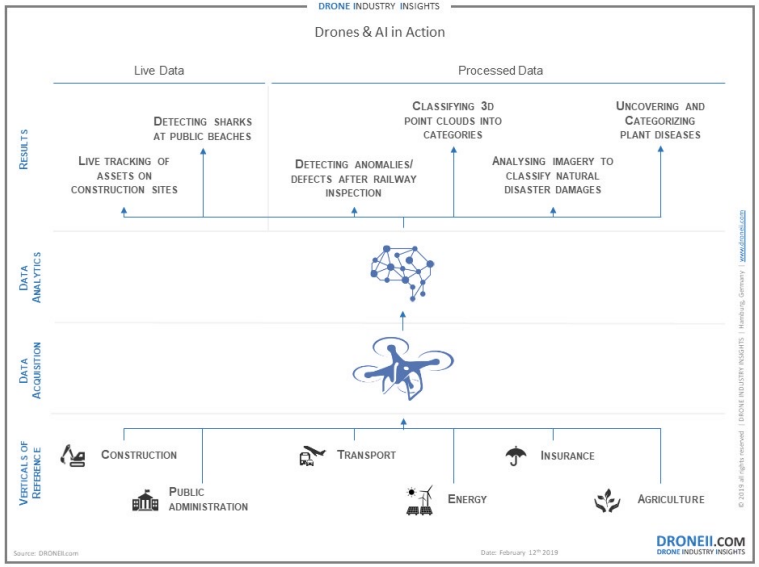
SYSTEM DESCRIPTION

Intelligent Human Motion is Yotta Navigation Corporation's latest advancement in real-time dismounted human motion tracking and positioning. IHM provides real-time human motion event profiles for both time series and spacial analysis. The IHM Nav based positioning engine fuses motion sensors, radio frequency (RF) positioning and geographical data to provide an accurate and robust navigation system. IHM Nav provides continuous positioning in GPS denied conditions, including indoor and subterranean environments, and GPS jamming/spoofing attacks. IHM Nav also enables GPS duty cycling power saving, providing a critical solution to battery longevity and heat generation reduction for M-Code receiver handheld integration. IHM combines the large amounts of sensor data into actionable insights to provide situational awareness of human actions and location. IHM has been applied to tactical operations, human performance analysis, medical based studies, geolocation based marketing and sports tracking apps.

G-04: Situational Awareness using Streetlight Camera on NEMA Socket for Rapid Deployment

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2

6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Navio International, Inc.
Principal Investigator:	Ernest Brown
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	G) Situational Awareness
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Our product is best described in these videos.

We would like to learn the effectiveness of our units in detecting stealth military units and tactical drones.

https://youtu.be/_3Ij3G-vhzw Utility Security

https://youtu.be/S0fDMrqshMM Hyperlocal Weather (e.g. Heliports)

SYSTEM DESCRIPTION

Our system instantly plugs into the NEMA socket at the top of streetlights.

Our four cameras are analyzed by Intel Movius Vision Processors.

That data, along with other sensor data (e.g. WeatherStation) is sent via wifi, Lora, cellular, or Globalstar satellite to our Cloud Alert Platform and Customer API's.

G-06: Weather Hive – Automated Wind and Meteorological Sensing For Atmospheric Modeling and Situational Awareness

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Greensight Agronomics, Inc.
Principal Investigator:	James Peverill
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	G) Situational Awareness
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

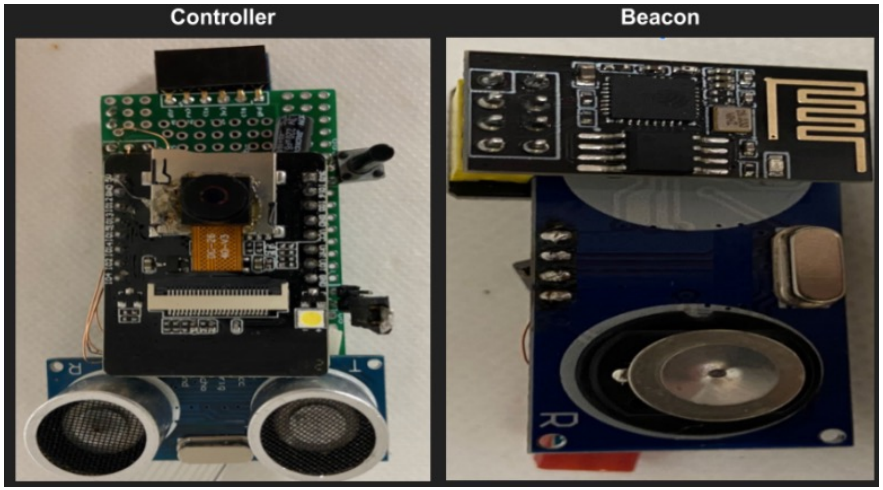
GreenSight plans to test software, sensors, and algorithms onboard their Dreamer UAS platform for autonomous operations and measuring of wind and meteorological conditions. Accurate measurement of current and forecast weather conditions can improve the effectiveness and safety of defense and civil aviation operations. Accurate current and historical wind and meteorological measurements are not always available for current and future areas of interest. This experiment will provide essential data for development and validation of current and developmental algorithms and platforms.

SYSTEM DESCRIPTION

The Dreamer UAS is an established platform utilized primarily for GreenSight's commercial operations. The system has been proven through continuous development, production, and operations. This platform will be used to gather control, state, and sensor data for real-time and post processed wind and meteorological measurements from surface to high elevations.

G-07: Identification Friend or Foe Sensor

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	DropDrone
Principal Investigator:	Daniel Campbell
Technology Readiness Level:	TRL 4: Component and/or breadboard validation in laboratory environment.
Research Area of Interest:	G) Situational Awareness
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

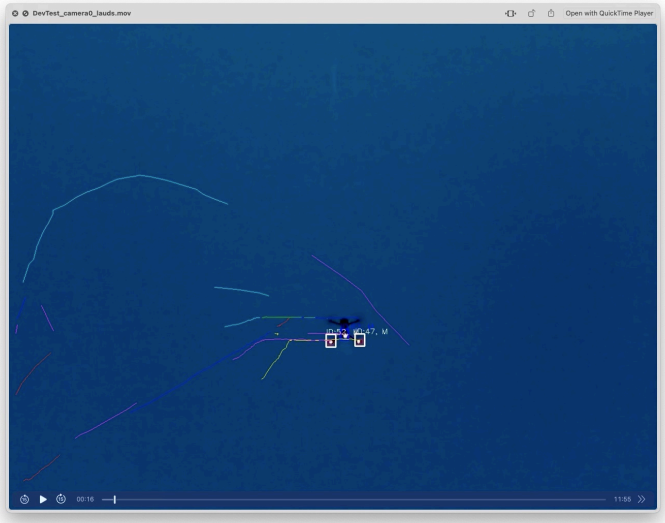
Any experimenter with an unmanned vehicle of stationary physical system can be provided with IFF detection capabilities.

SYSTEM DESCRIPTION

Enable operators to identify friend or foe from an unmanned vehicle or stationary unit.

G-08: Radiological Detection with Security Cameras

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 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:	G) Situational Awareness
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

The objective of the proposed test is to evaluate the ease of integration of the developmental GammaPix EOD retrofit kit onto various UGV and UAS platforms. GammaPix software products use a proven, TRL 9 software capability that uses 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 integration and employment of GammaPix EOD kits with a range of UGV and UAS systems during JIFX.

The test will evaluate the system's capability and reliability during rapid integration in austere, mission relevant environments.

SYSTEM DESCRIPTION

The GammaPix EOD capability fills a gap in current EOD operations by enabling standard EOD UGV to detect radioactive threats without expensive dedicated detectors or alternatively, jury-rigged field additions of personal radiation detectors duct-taped to a UGV. Our experiment is intended to assess the practicality of employing this new, DoD-funded capability to a broad range of UGV and UAS. It has already been successfully employed using a small ROS robot in developmental field tests, but JIFX would provide the opportunity to integrate with a wider set of platforms in an austere environment that represents expected scenarios.

H-01: Data at the Edge

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Premise Data
Principal Investigator:	John Wishart
Technology Readiness Level:	TRL 6: System/subsystem model or prototype demonstration in a relevant environment.
Research Area of Interest:	H) Defense Support to Civil Authorities (DSCA)
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Premise Data manages a global information community that enables ground truth insights and reflections through an app-based marketplace to validate, aggregate, and visualize data. The Experiment will collect up to 1000 photo, video, and survey submissions of critical infrastructure, sentiment, and route assessments capture during a simulated or real-world unfolding man-made or natural disaster from 6-10 FEB 2023. Sentiment data will be kluged with ACLED, GDELT, and other news and social media sources and visualized in our IRIS, Gray Zone COP, and Priority5's visualization tools. Provide actionable insights highlighting changing conditions and emerging trends that could impact and influence the operational environment. Measure, assess, evaluate, and provide predictive analysis on USG, host nation, and adversary operations, activities, and initiatives. Integrating Premise Data's contributor network with Priority5's modeling and simulation capabilities with a unique AI-supported geospatial common operating picture (COP), enables a mission-oriented understanding of critical infrastructure interdependencies.

SYSTEM DESCRIPTION

There has not been an integration of disparate data sources, including crowd-sourced local data and software and algorithms to enable predictive analytics, threat detection and mitigation, and response to movements of people, critical commodities. In a rapidly unfolding crisis, there is a dearth of accurate information. Social media and traditional news sources may be slow in reporting and full of mis/disinformation. Additionally, individuals and people-groups may provide information that is biased in support of their tribal or regional requirements at the expense of other areas in need. An independent survey tool, Premise circumvents those biases using crowdsourced data collection. The experiment will detail support to command and control and ISR-like reconnaissance capability providing a single-pane-of-glass for planners and decision makers.

I-01: SlateSafety BAND V2

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	SlateSafety
Principal Investigator:	Zachary Braun
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	I) Health and Safety
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

SlateSafety intends to test new features of its health and human performance wearable, the BAND V2, and how effective it is for military personnel.

The experiment intends to qualitatively and quantitatively test the usefulness, reliability, comfortability, accuracy, and ease-of-use of the BAND V2 for military use cases.

We plan to measure the data via two surveys: one given to leaders/administrators of the system that ingest and analyze aggregated BAND V2 data and another given to those that wear the BAND V2 and are able to analyze their personal data.

This JIFX event will allow us to leverage the expertise of operational personnel that are focused on human performance monitoring.

SYSTEM DESCRIPTION

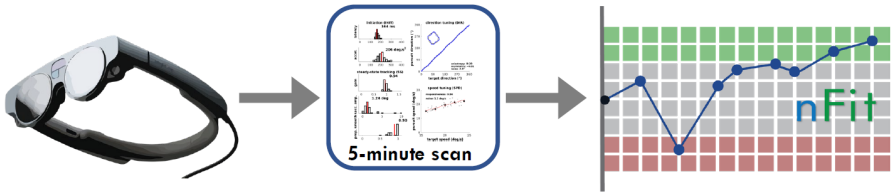
The system's most important differentiator is practicality. It is incredibly simple to set up and use on a daily basis for very large groups. The wearables sync data automatically, are comfortable to wear, are durable, and do not cause distractions.

With this data, instructors and medics have the ability to supervise the wellbeing and location of large groups from one centralized dashboard. Researchers can access the data via API to evaluate the effectiveness and risks of training and analyze long-term health trends. Students can analyze their performance after personal or instructor-led training and exams.

In 2021, Whoop sensors were used by Army paratroopers in training to inform them when to tell their instructors that they are exhausted. The glaring problem with Whoop is that the students still had to divulge the information themselves, leading to miscommunication, and that the data was unavailable to other Army stakeholders. With SlateSafety, the data would flow automatically to a central datastore that allows instructors and medics to receive notifications and allows researchers to incorporate the data into their studies. The Whoop study concluded that wearables improve behavior but did not lead to lasting adoption because not enough Army stakeholders were bought in.

I-02: Eyetracking Tools for Neurophysiological Monitoring

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	neuroFit
Principal Investigator:	Dorion Liston
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	I) Health and Safety
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Technologies for assessment of human performance necessarily involve tradeoffs between sensitivity, cost, and logistics. The US Army issued a SBIR 22.4 topic ,Wearable Technologies for Physiological Monitoring Open Topic, with the objective ,to identify new wearable technologies to address current and future Army needs, for physiological monitoring, human performance, and neurocognitive function. With support from NPS, neuroFit developed a proposal to perform A-B testing of two form factors of our oculometric technology (oculometrics is the use of eye-movement-based measurements to quantify functional neurocognitive performance), our desktop product neuroFit ONE which resembles traditional clinical equipment one would see in an optometry office and a wearable headset form factor (Magic Leap 2). Our proposal was selected for funding by the program; neuroFit and NPS are establishing a CRADA to support this JIFX 23-2 experiment.

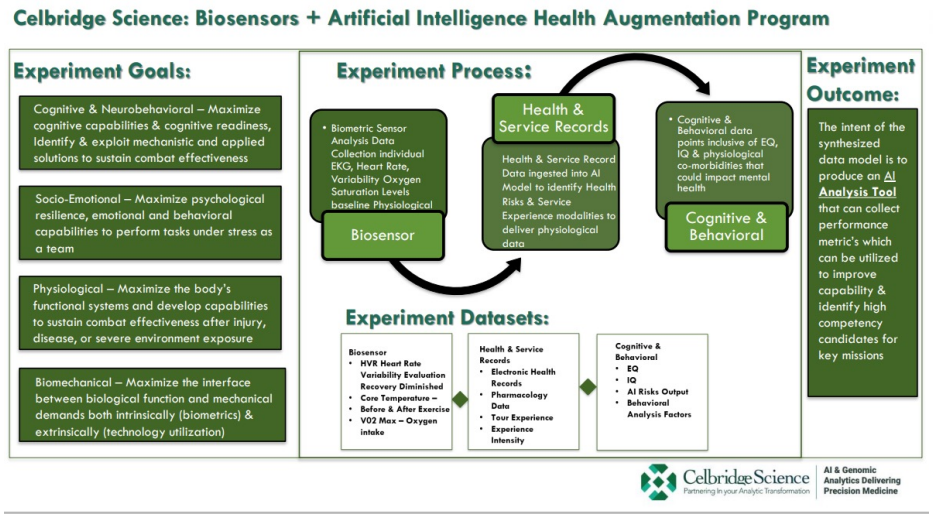
SYSTEM DESCRIPTION

Technologies for assessment of human performance necessarily involve tradeoffs between sensitivity, cost, and logistics. On the low-cost and deployable side of this tradeoff, wearables have the potential to fill operational gaps for physiological monitoring and are well-matched for eye-movement-based oculometric technologies. Eye-movement-based metrics have the advantage of being a relatively direct readout of signal processing in neural circuits, thus promising a new and innovative toolkit for use in these research areas:

Health and Safety / Force Protection Equipment and Wearable Technologies
Health and Safety / Warfighter Performance Enhancements
Health and Safety / Reduced Stress of the Force

I-03: Biosensors, Artificial Intelligence Health Augmentation Program

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Celbridge Science LLC
Principal Investigator:	Patrick Hogan
Technology Readiness Level:	TRL 7: System prototype demonstration in an operational environment.
Research Area of Interest:	I) Health and Safety
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Celbridge Science proposes to utilize Bio-Sensors and Artificial Intelligence to document and correlate data to illustrate performance benchmarks for floors and ceilings of physical fitness and task readiness.

Our Bio-Sensors recommended for this experiment are wireless wearable sensors to automatically and continuously collect and analyze an individual's EKG, Heart Rate Variability Oxygen Saturation Levels and Core Body Temperature. (These are the key performance indicators for readiness for missions)

Celbridge Science is proposing utilizing our Artificial Intelligence Algorithms to create numerical scales for mission readiness depending upon the complexity of the mission. Our proposed experiment can identify capabilities, enhance performance and develop performance ceilings and floors that can be utilized to support the maximization of human performance through analytics. Our existing AI which is currently being utilized by Veteran Clinics to pre-identify health conditions such as Depression and Post Traumatic Stress Disorder.

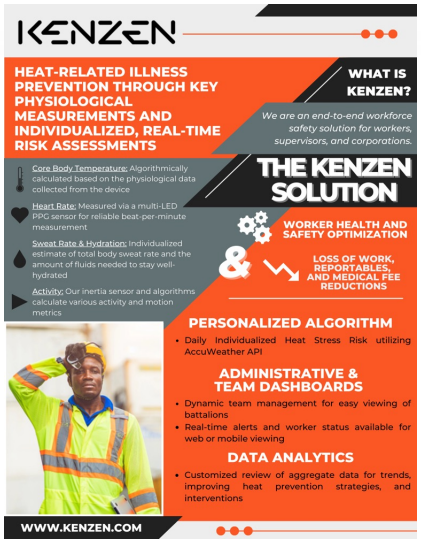
SYSTEM DESCRIPTION

Our innovative approach to Rapid Body and Health Detection and Monitoring is that Our assessment processes the war fighter data at an exact point in time, where state and trait factors are collected. The war fighter moves into our collection cohort where various study measurements are collected (e.g., inertial measurement units, physiological biomarkers, gait kinematics, etc.). Together with the baseline data (Health & Service Records + Cognitive & Behavioral) this collected data is then processed, analyzed (using traditional methodology and machine learning), and interpreted to create predictive models that can apply to operational settings and subsequently the intent of the synthesized data model outcome is to produce comprehensive competency models that can be incorporated into war fighter training to enhance candidate performance and mitigate degradation.

The models developed within AI will feed the overarching programmatic goals by providing the sustained field operations data to help strengthen the diverse approach to modeling utilizing field and lab data for war fighter (individual), squad and platoon elements.

I-04: Heat Illness Prevention

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023



PROJECT INFORMATION

Organization Name:	Kenzen
Principal Investigator:	Kyle Hubregtse
Technology Readiness Level:	TRL 9: Actual system proven through successful mission operations.
Research Area of Interest:	I) Health and Safety
Experiment Location:	NPS Field Laboratory at Camp Roberts

PROPOSED EXPERIMENT OVERVIEW

Kenzen would like to test the adoptability of our technology with members US Government and their agencies. The experiment would include having up to 10 members wear our technology during various training exercises in dangerous environments to evaluate how each member responds to the alerts and form factor of our technology.

SYSTEM DESCRIPTION

Kenzen uses a non invasive wearable to accurately predict core body temperatures. The current standard for core body temperature is an ingestible pill or rectal probe. Our technology would give anyone wearing it, the tool necessary to prevent thermal stress or heat related illness.

J-01: Hand-Free Rappelling/Descent device

Naval Postgraduate School Joint Interagency Field Experimentation (JIFX) 23-2
6 – 10 February 2023

PROJECT INFORMATION

Organization Name:	Bailout Systems
Principal Investigator:	Michael Ragsdale
Technology Readiness Level:	TRL 8: Actual system completed and qualified through test and demonstration.
Research Area of Interest:	J) Expeditionary Operations
Experiment Location:	Unsure - We need a facility to jump and lower from an elevated position. Essentially, a building, tower, or any elevated platform that we can attach an anchor and jump, lowering individuals hands-free.

PROPOSED EXPERIMENT OVERVIEW

From an elevated position 20-50 feet, attach an anchor allowing us to demonstrate a hands-free rappel/descent using our device. We will have our device on one line, and a backup device on a separate line to ensure safety. Both of these lines can be attached to an approved anchor. User(s) with an approved harness (we can provide or members can use their own approved harness) will clip into both the demonstration and backup device and simply lower from position hands-free. The backup device will automatically lock, arresting the descent, if descent speed meets or exceeds 3 m/s. Videos can be seen on our website (https://www.bailoutsystems.com/) of both the device and backup.

SYSTEM DESCRIPTION

Bailout Systems has created a platform technology that enables users to rappel or descend from any elevated position hands-free. The device is roughly the size of a hockey puck and can use multiple line sizes from 6mm to 11mm, making this device and system extremely small and compact. Because this technology does not use friction, as all rappelling devices on the market, our technology can be scaled to use a 6mm line for 100-500 pounds or much larger lines and loads into weights of 10-20,000 pounds. Our current device and technology enable users to have a safe, hands-free rappel by removing user error from the drop while simultaneously reducing costly training time and injury. This technology could lower dogs, personnel, and cargo to the ground with minimal user input.