



#### Collaborating with Universities and Small Business Innovation Research to Address the USMC's Critical Needs

LtCol. Gabe E. Mata 1st Marine Logistics Group gabino.mata@usmc.mil

Dr. Ying Zhao, Naval Postgraduate School yzhao@nps.edu

#### Mr. Rory Polera, Tagup Inc. rory@tagup.io

Presentation at the 22nd Annual Acquisition Research Symposium and Innovation Summit, May 7-8, 2025 Interactive Virtual Creating Synergy for Informed Change: Transitioning Technology to the Warfighter, NPS (https://event.nps.edu/conf/app/researchsymposium/home#!/program?c=73)

#### ACKNOWLEDGEMENT AND DISCLAIMER

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied of the U.S. Government.



Background



- US Navy and USMC Challenges
  - Need to revolutionize modern warfare with rapid development of emerging technologies
    - unmanned aerial vehicles (UAVs) and AI
- China's strategic military expansion in the South China Sea
  - sophisticated surveillance systems
  - rapidly growing naval presence
  - necessitating an advanced logistical framework to support these remote bases effectively.



## Critical Needs and Approaches



- Rapid resupply, repair, and maintenance to sustain operational capabilities.
- Integrate AI/ML into its operational frameworks as following needs (Mata, 2024)
- Need a holistic strategy
  - Critical gap to establish necessary doctrines and strategies to pace with the full utilization of emerging AI/ML technologies to assist decision-making and operational efficiency for the USMC.
  - For example, "Military-Civil Fusion"
- Need to prioritize the seamless integration of AI/ML technologies into operational doctrines and logistics frameworks.
  - Need to align organizations, technologies, and modern doctrines to enhances the USMC' capability to conduct posture and deterrence-focused operations (e.g., Global Position Network)
  - Need to advocate for a complete overhaul of logistical approaches to support modern military operations (Palmer, 1997; Deputy Commandant for Information, 2024)
- Different roles in the acquisition community
  - Contracting officers, program managers, senior leaders, and engineers can all contribute to the success and agility of the technology transfer
  - the 1st MLG may provide critical needs
  - Naval Postgraduate School can provide research and publish papers for innovative ideas
  - Small business innovation research (SBIR) and small business technology transfer (STTR) companies such as Tagup and Quantum Intelligence can provide innovative ideas, implementation, and technology transformation of many innovation ideas



## DoD's SBIR/STTR Program



- Bottom-up approach to innovation with a Request for Proposal (RFP) process
  - length restrictions
  - demonstration requirements
  - contract structure.
- The RFP Process ensures awarded SBIR/STTR contracts are
  - mission oriented
  - outcomes-driven to drive competition and innovation.
  - maximizes utility of the product or system to the end-user
  - mitigate risk to the DoD.
- The USMC applications can bring momentum for the SBIR companies
  - Critical for the SBIR companies to have a long-term effort up across the DoD and commercialization plan, so the technology can be validated and achieve large-scale results.

# **Case Studies**





An Example of USMC Logistic Enterprise Equipment Maintenance

and Logistics Process Using the LAILOW Framework (Zhao, Hemberg, Derbinsky, Mata, & O'Reilly, 2021)

- Leveraging Artificial Intelligence to Learn, Optimize, and Wargame (LAILOW) framework by Naval Postgraduate School
- LAILOW was funded by the Office of Naval Research (ONR) NEPTUNE (Naval Enterprise Partnership Teaming with Universities for National Excellence) program.
- LAILOW
  - Machine-learn and operation and collaboration patterns from historical data
  - Predict and optimize to maximize efficiency, readiness, and responsiveness
  - Perform "what-if" scenarios, simulations, and wargames to discover vulnerability, emerging scenarios that are not seen in the historical databases, and more importantly discover resilient solutions.



### Warfighting Systems & Human ::tagup Factors Integration (WHI)







Collaborative Learning Agents (CLAs) and Risk Management Framework from Quantum Intelligence, Inc (Quantum):

- CLAs were originally developed under a NAVSEAfunded SBIR Phase I/II.
- Currently, the 1st MLG will work with Quantum is to customize the CLA system (Zhao & Zhou, 2019).
- Address the USMC's challenges and needs, specifically the needs for the Warfighting Systems & Human Factors Integration (WHI) capabilities of integrating maintenance logistics with human elements for optimal return in minimum time, minimum injury, optimal safety, and minimum cost.

An example to demonstrate the CLAs using the data sets of the mishap and incident reports of a marine transportation equipment and related data resources from the I Marine Expeditionary Force (IMEF). The 1st MLG is one of IMEF's organizations.



#### Manifest for Logistics Optimization using ML by Tagup





Manifest in action at 1st MEDLOG

https://www.1stmlg.marines.mil/ News/Videos/videoid/926019/.

- NAVAIR-funded SBIR Phase I/II and underwent testing for a subset of Marine Corps Class VII and IX ground equipment including 880 Light Armored Vehicles (LAVs) and over 8,200 Medium Tactical Vehicle Replacements (MTVRs) (Tugup, 2021).
- Product Manifest has operationalized for medical equipment and supplies (Class VIII)
- Currently used by 1st Medical Logistics Company (1st MEDLOG), supporting their INDOPACOM Area of Responsibility (AOR) via three distinct supply nodes (Camp Pendleton, Marine Rotational Force-Darwin, and the Philippines)







- The SBIR/STTR companies can collaborate with DoD organizations such as the 1st MLG in Phase II product development, testing, production, and sustainment.
- DoD organizations such as the 1st MLG can provides critical needs, infrastructure, and data, and end users' requirements to train AI/ML integration into operational environment and validate the discovered insights.
- NPS can provide defense and military application research environment and publication for innovative ideas of SBIR/STTR companies





# Thank you