Department of the Navy SBIR/STTR Transition Program

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Topic # N191-007

Data Analytics Tools for the Automated Logistics Environment (ALE)

Mosaic ATM, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-231

Transition Target: E-2D Hawkeye

TPOC:
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https://www.flickr.com/photos/mcasiwakuni/32283181790/

Other transition opportunities: The DoD needs the highest quality maintenance data to improve maintenance, logistics, and training efficiencies. There is an increasing opportunity to leverage artificial intelligence (AI) and machine learning (ML) for aircraft sustainment. Therefore, potential for commercialization of this technology throughout DoD is significant and we are actively pursuing solicitations supporting NAVAIR, NAVSEA, Air Force Software Maintenance Squadrons, and the Joint AI Center (JAIC). Similar solutions are being built for commercial airlines, transportation operators, construction, energy, and the rapidly growing unmanned aircraft system (UAS) industry.

Notes: Mosaic reduced risk in Phase I by focusing on developing proof-of-concept algorithms to deploy in an early prototype to evaluate integration, performance, and visualizations. The Automated Logistics Environment (ALE) Analytics Application (ALE AA) showcases Mosaic's data science expertise using extremely large volumes of data found in E-2D ALE flight packets. Mosaic's software mined hundreds of thousands of lines of advisories, cautions, warnings (ACAWS) data and built-in-test (BIT) failures to provide extremely useful descriptive analytic visualizations. The data pipeline created provides a foundation for continuous modeling with advanced data science techniques.

*Image: Iwakuni, Japan (Feb. 2, 2017) Five U.S. Navy E-2D Hawkeyes with Carrier Airborne Early Warning Squadron 125, land at MCAS Iwakuni. (USMC photo by Lance Cpl. Jacob A. Farbo)

WHAT

Operational Need and Improvement: The vast amount of data collected by US weapons systems presents a great opportunity to improve readiness. Applying advanced analytics to aviation sustainment enables machine learning (ML) for predictive maintenance to improve mission capability rates. Development focused on forecasting weapon replaceable assembly (WRA) and circuit card assembly (CCA) failures could facilitate improved data-driven decision support tools and lead to efficient supply chain management (SCM) and higher fleet readiness.

Specifications Required: The government customer desires a prototype software toolset capable of machine learning, data mining, and identifying trends to improve maintenance procedures and readiness. The solution must be web-based or a closed loop effort as information technology framework, methodologies, and technologies determine the sustainment barriers once fielded. It must adhere to agnostic, non-proprietary, interoperable and best industry development processes as this will ensure seamless integration of the toolset.

Technology Developed: Mosaic ATM has designed and developed a cloud-based, advanced analytics computing platform to improve fleet readiness. The platform ingests data from various sources, reduces the data for quicker processing, and offers virtual machines for hosting advanced artificial intelligence (AI) and machine learning (ML) algorithms. Specific applications to-date include a predictive maintenance model for the E-2D Advanced Hawkeye, exploiting Maintenance Action Form (MAF) data and Advisory, Caution, and Warning system (ACAWS) data collected by the E-2D's Automated Logistics Environment (ALE). The model is a deep learning neural network that forecasts weapon replaceable assembly (WRA) and circuit card assembly (CCA) failures to inform and guide aircraft maintenance and logistics.

Warfighter Value: Mosaic's advanced analytics platform has the potential to revolutionize aircraft readiness. Leveraging existing large data sets, improvements in processing, and high-confidence machine learning techniques, Mosaic has been able to quickly develop and deploy predictive maintenance algorithms in a continuous integration / continuous deployment (CI/CD) environment. These data stream analytics enable operators to efficiently manage critical aviation supplies and perform maintenance to optimize aircraft mission capability rates in a resource constrained environment.

WHEN

Contract Number: N68335-20-C-0808 **Ending on:** September 22, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Base: MS1 - Access to Comprehensive E-2D Data Archive	Low	Secure access to flight packet data	3	January 2021
Base: MS2 - Develop ALE AA Beta	Low	ALE AA Beta demonstration	4	September 2021
Base: MS3 - Deploy ALE AA Beta in Test Environment	Low	Successful deployment in test environment	6	March 2022
Base: MS4 - Access to Navy Software for Deployment in Live Environment	Low	Secure access to live deployment environ	7	September 2022
Option: MS5 - Develop ALE AA 1.x	Med	ALE AA 1.x demonstration	8	December 2022
Option: MS6 - Deploy ALE AA 1.x in Live Environment	Med	Successful deployment in live environment	8	January 2023

HOW

Projected Business Model: Mosaic is leveraging existing data collection by ALE to focus on developing algorithms to assist technicians in performing maintenance before malfunctions occur. We are actively pursuing opportunities to deploy those algorithms throughout the Naval Aviation Enterprise as well as commercial aviation. We are leveraging existing consulting services to Fortune 100 companies in predictive analytics and machine learning for many of these vertical market segments. The addressable market is in excess of $15 million in license fees and sales.

Additional investment required to bring this technology to market will be funded internally by Mosaic. We have made a significant initial investment and have sound financial operations to ensure the viability and opportunity for the proposed technology to be pursued through commercialization. Over the next three years, Mosaic has a budget of over $500,000 of internal funding to support the commercialization of technology such as will be produced in this Phase II.

Company Objectives: This project is focusing heavily on developing predictive maintenance micro services using maintenance action forms (MAF) from the Naval Aviation Logistics Command Operating Maintenance Information System (NALCOMIS) and in-flight performance monitoring data from the E-2D Hawkeye. We intend to take a similar approach with other Naval aircraft. We will use MAF data from NALCOMIS as the foundation for development and then seek to ingest in-flight performance monitoring data from other Naval Aviation aircraft.

The ultimate goal is to deploy explainable advanced analytic tools throughout the Naval Aviation Enterprise to optimize fleet readiness. We anticipate additional Navy opportunities include the FA-18 Super Hornet, EA-18 Growler, P-8 Poseidon, MQ-4C Triton, MQ-25 Stingray, and SH-60 Seahawk.

Potential Commercial Applications: Outside of the DoD, we are already marketing a similar approach with our existing commercial air carrier customers.

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