Department of the Navy SBIR/STTR Transition Program

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NAVAIR

Topic # N08-006
P-8A IAT Fleet Metrics Functionality for Structural Life Management
Technical Data Analysis, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-261 - Health and Usage Monitoring; PMA-275 - V-22 Program; PMA-276

Transition Target: P-8A Poseidon

TPOC:
(301)342-9359

Other transition opportunities: MQ-4C Structural Fatigue Life Tracking (SFLT) program

Notes: Fleet Metrics is an advanced product for Individual Aircraft Tracking (IAT) based data management.
Flight Visualization for Fatigue Life Management:
• Illustrates any damaging regimes encountered in flight
Mission Planning and Prognostics:
• Evaluation of past aircraft usage and predicting when maintenance will be needed
• Evaluate what-if scenarios on future missions and provide detailed information on its effect on maintenance, component replacement times
Gross Weight/Center-of-Gravity Estimation for Fleet Planning:
• Estimates GW/CG pre- and post-flight. Accepts inputs of multiple aircraft loading configurations and provide new GW and CG for pre-flight planning and post-flight analysis and evaluation
Post-Flight Analysis Tools:
• View and validate any operational exceedances during the flight. Identify any hard landings and allow the user to evaluate the impact these landings have on aircraft fatigue life.

https://www.navair.navy.mil/product/P-8A-Poseidon

WHAT

Operational Need and Improvement: Studies have shown that it is no longer sufficient to simply track the usage and flight hours of each aircraft. Each aircraft is flown in a unique manner. Factors such as gross weight, mission, environment, and even pilot tendencies can make every maneuver more severe or benign than assumed during aircraft design. This leads to a vast majority of aircraft being retired earlier than necessary. Therefore, with an Individual Aircraft Tracking (IAT) system tied into enhanced data management, formerly conservative fatigue retirement times can be more accurately determined, eliminating costly and unnecessary premature aircraft retirement. Similarly, such a system can be used to flag safety issues, tailor maintenance to actual usage, offer design enhancements based on known usage, and provide insight into in-service events (e.g., hard landings requiring inspection or grounding).

Specifications Required: The tool should include the following components: design of an innovative fatigue life tracking algorithm, a novel data management system, and component specific sensor for storing the data. As part of this effort, evaluate current state of the art component sensor technology for applicability in an aircraft environment. Since HUMS systems and capabilities differ between aircraft platforms, the system should have an open, adaptable architecture. The tool should leverage as much actual aircraft usage and load data as possible to minimize conservatism required in the fatigue life determinations, but since data is inevitably lost, gap filling methods should be included. Consideration should also be given to the fact that these components could move between aircraft.

Technology Developed: Fleet Metrics is an advanced product for Individual Aircraft Tracking (IAT) based data management in direct support of PMA-290 and as a future enterprise solution for multiple Naval aviation assets.

Warfighter Value: The successful development of this application leads to establish a fleet-wide IAT based data management tool for all P-8A Poseidon aircraft, based on Fleet Metrics/ACTS, giving data analysis and prognostics capabilities to optimize fatigue life management and enable optimal data storage and data access. Studies by TDA have shown that every 10% of missing or erroneous flight data could lead to a 5% reduction in available aircraft years of service. With aircraft acquisitions costs of approx. $140M per aircraft, even a 1% increase in data utilization across 50 aircraft would save $70M.

WHEN

Contract Number: N68335-19-C-0546 **Ending on:** August 5, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Flight Visualization Demonstration Module for Fatigue Life Management	Low	Successful demonstration with fleet representative data; e.g., P-8A MFDAU	4	August 2021
Develop Mission Planning and Prognostics Demonstration Module	Low	Successful estimation based on extrapolation of in-service fleet structural fatigue life predictions	4	August 2021
Design Gross Weight (GW) and Center of Gravity (CG) Demonstration Module for Fleet Planning	Low	Successful prediction of GW/CG (5% threshold) when compared to measured flight data	5	August 2021
Develop Post-Flight Analysis Demonstration Module	Low	Successful demonstration with fleet representative data; e.g., P-8A MFDAU	6	August 2021

HOW

Projected Business Model: TDA – an engineering and software development consulting firm – provides engineering expertise and customized software solutions in the fields of aeronautical and mechanical engineering, statistical data analysis, web-based business transaction management, and software development. We specialize in combining two distinct fields: engineering and software development.

Upon effective demonstration of this tool for P-8A, TDA intends to extend the tool to other US Navy aircraft designs. TDA will also approach other US military branches (USAF, US Army) as well as aircraft OEMs. Commercialization of the technology is a software product used for aircraft fleet data management. TDA's commercialization strategy beyond DoD will include making key strategic partnerships with OEMs such as Boeing and Northrop Grumman.

Company Objectives: Based on the demonstrated Phase II.5(e) technology development results, additional funding will be sought via a Phase III SBIR for implementation into other new TMS (e.g., MQ-4C). TDA has extensive experience with the P-8A and MQ-4C. Any new TMS under consideration for US Navy adoption has potential to benefit from this technology, given that the earlier in a program applied, the less uncertainty in usage. TDA seeks meetings with persons associated with Primes and Program Offices that would be able to utilize this technology.

Potential Commercial Applications: This software tracking system will have broad application in both the commercial and military industry where life limited components are used.

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