



FRC East Team DINO wins NAVAIR Challenge

MARINE CORPS AIR STATION CHERRY POINT, N.C. (Sept. 29, 2016) — Six members of Fleet Readiness Center East's Propeller Integrated Product Team of In-Service Support Center won the first Naval Air Systems Command Data Challenge that culminated in a two-day summit Sept. 13-14 at the Naval Postgraduate School in Monterey, California.

The Data Innovations Negating Obsolescence Team, or Team DINO, consisting of Derrick White, Jonathan Markl, Chris Parry and Andrew Hunter of the Propulsion and Power Engineering Department, and Pam Lawley of the Aviation Readiness and Resource Analysis Department, and Glenn Pangburn of the Industrial and Logistical Maintenance Planning Sustainment Department beat out 33 teams for the initiative that focused on improving readiness by using NAVAIR data sources.

"This team was a perfect blend of experienced individuals and recently hired engineers producing a unique level of creativity," said Mark Meno, Research and Engineering Group (Air-4.0) head.

The initiative began in March, led by Rear Adm. Francis Morley, NAVAIR vice commander, and the Integrated Business Capabilities Team, and sought to create visualizations, algorithms and data manipulation methods that could help identify and predict factors affecting readiness.

After months of collaboration and thousands of hours of work, five teams emerged as finalists who presented their ideas to NAVAIR leadership and data science specialists from private industries at the summit.

"What we discovered during the Data Challenge is that, within NAVAIR, we have all of the personnel and tools to address and mitigate readiness issues, but they are spread out between different teams and sites," said Markl, an aerospace engineer with Team DINO. "Creating a community centered on data science will hopefully bring some of these ideas to the forefront and allow them to become standard practices within the command."

Insight from all teams will improve data validation methods and enhance tools implemented in future developments to Vector, a web-based tool that integrates more than 15 data sources and provides visualizations. Vector is the web-based version of the powerful Integrated Logistics Support Management System readiness data analysis tool that each type/model/series team has been using to help identify and manage readiness and cost degraders affecting their specific TMS platforms.

Team DINO focused its efforts on identifying the strengths and weaknesses of Vector. They found that Vector was an effective tool for determining what parts were affecting readiness, but proved ineffective in pinpointing reasons and projecting future action once parts are identified.

The team tackled these questions by incorporating methods used by the Research and Engineering Group, Air-4.0, for root cause analysis and predictive models for component failures. By combining data sources from Vector and incorporating additional data from the Joint Deficiency Reporting System and the Integrated Reliability-Centered Maintenance System, the team was able to automate data scrubbing processes and cross-check sources for validation. Being limited to only those programs available on an Navy Marine Corps Intranet seat, the team developed a spreadsheet tool using Program Management Activity 231 aircraft and maintenance data as a proof of concept. The tool included aircraft level visualization for inventory and flight hour tracking, and component level analysis. The component-level tools included modules for risk assessment, root cause analysis and metric comparison tools by TMS, squadrons and bureau numbers.

Crunching the numbers

Team DINO focused on component level predictive tools that use a Monte Carlo Simulation to project future



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component failures to address the challenge of improving readiness. Monte Carlo is a mathematical method of using a random number generator with a known distribution to project the likelihood of possible outcomes. Applying this method to a Weibull distribution — a continuous probability distribution that models the life of a component to failure — revealed accurate failure times for a given population. The Monte Carlo method also allows for "what-if" scenarios to be programmed into the outcome to account for factors affecting supply such as aircraft procurements or retirements, overhaul interval changes, component reliability changes, and wartime part use surges.

Application of the knowledge and insights gained throughout the Data Challenge will help NAVAIR PMAs improve platform readiness. The Propeller IPT is using the tool created by Team DINO to quickly diagnose failure causes and supply shortages, and aid the team in providing mitigation. One example was a known supply shortage. The team was able to use the tool to identify the cause of an increase in failures and provide suggestions for mitigation through maintenance awareness training.

"They were able to fully leverage their blended skills resulting in the development of a powerful tool that will undoubtedly provide broad readiness improvements going forward to not just the propeller community but Naval Aviation at large," said Meno. "We are proud (and in awe) of our Cherry Point teammates."

Team DINO plans to continue to use and develop their tool to address future readiness issues and to lead the way in moving from reactive to proactive to predictive in the Propeller IPT and beyond.

(Editor's note: The article is a modified version of a longer work at <https://myteam.navair.navy.mil/corpapps/NAVAIRComm/NAVAIRBlog/Lists/Posts/Post.aspx?ID=191>.)