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Adaptive Gaming and Training Environment for Maintenance Operations

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**SBIR**

**COMPANY NAME:**

Charles River Analytics  
Cambridge, MA

**TECHNICAL PROJECT OFFICE:**

AFRL Airman Systems Directorate,  
Wright-Patterson AFB, OH

**SPONSORING ORGANIZATION:**

Air Force Life Cycle Management Center

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*The Air Force SBIR/STTR Program supported development of a virtual aircraft maintenance trainer that is currently being adapted for the F-15E Strike Eagle. (Air Force photo 2nd Lt. Mitchell Lichtenwald)*

## VIRTUAL SOLUTION COULD REVOLUTIONIZE AIRCRAFT MAINTENANCE TRAINING

A Massachusetts-based company is building a virtual aircraft maintenance trainer for the Air Force that would allow for larger class sizes and troubleshooting scenarios that are difficult to present in a traditional live setting.

With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer Program, Charles River Analytics developed the underlying software and is refining it to provide maintenance training for the F-15E Strike Eagle. The technology combines high-resolution graphics with automated system feedback to teach complex maintenance procedures.

Working with the Air Force Research Laboratory, Charles River Analytics advanced the technology and then partnered with the Instructional Technology Unit at Sheppard Air Force Base in Texas to understand its needs for virtual maintenance training on the F-15E. According to 2nd Lt. Mitchell Lichtenwald, a program lead in AFRL's Airman Systems Directorate, this three-party collaboration is key in making progress toward something that has never before been accomplished in the maintenance field.

"Currently, you have to go to the flight line to actually teach something like this," Lichtenwald said. "This new effort is really about helping the warfighter to train better."

The company is in the early stages of a two-year effort to transition the technology and the expectations are that it will eventually be applicable to any aircraft.

## THE NEED FOR A BETTER SOLUTION

Traditional maintenance training routinely costs the government in terms of manpower, upkeep and upgrades, while being limited to static content that does not address the needs of trainees with varied skills.

Classes are typically limited to fewer than 10 students per instructor with access to only a single aircraft near the flight line. To practice a procedure, students take turns as the instructor carefully observes in order to prevent catastrophic mistakes that could damage the equipment. In addition to students spending long periods of time observing each other, rather than executing procedures, this setting makes it difficult to illustrate broad troubleshooting scenarios.

By providing a virtual maintenance trainer—even just for familiarity training—instructors can manage more students, students can perform the procedures in parallel, and the system can monitor and address potential errors without the concern for costly system damage.

## BEHIND THE TECHNOLOGY

Also known as MAGPIE – which stands for Maintenance Training Based on an Adaptive Game-based Environment Using a Pedagogic Interpretation Engine – the new system will be a combination of intelligent tutoring, game-based virtual training and intuitive scenario editing. Up to 20 students can be on the system at once.

Students using MAGPIE will also get to see things break, which is something that cannot easily be simulated in live training, according to Sean Guarino, principal scientist at Charles River Analytics.

The system includes an intelligent tutoring framework that identifies students who need the most instructor assistance, and recognizes and characterizes errors so students can focus on their individual learning needs. Additionally, the system will include a suite of authoring tools for course designers and instructors to readily extend and/or rearrange training content to improve scenarios.

## AIR FORCE SBIR/STTR SUPPORT WAS CRITICAL

The successful completion of the initial Air Force SBIR/STTR project included a prototype of MAGPIE. When the transition for the F-15 is complete, the company expects to have a full-scope intelligent virtual maintenance training tool that can be readily adapted to any vehicle or aircraft.

Reaching that milestone will open a wide range of opportunities across the Department of Defense and commercial industry. Commercialization success, such as that, is a critical benchmark for participants in the Air Force SBIR/STTR Program as it helps to bring down costs and get technology to the warfighter while stimulating the economy through small business growth.



### AIR FORCE SBIR/STTR PROGRAM

AFRL/SB | 1864 4TH STREET | WRIGHT-PATTERSON AIR FORCE BASE | OHIO | 45433  
800-222-0336 | AFSBIRSTTR-INFO@US.AF.MIL | WWW.AFSBIRSTTR.COM