



Approaching Reality—DiSTI Uses GL Studio to Create First Fielded 3D Virtual Environment for Navy’s F/A-18 Maintenance Trainer

Background:

The U.S. Navy’s F/A-18 is a multi-mission, highly maneuverable fighter/attack aircraft that can operate from either aircraft carriers or land bases. Extremely versatile, the aircraft’s roles include fighter escort, suppression of enemy defenses, reconnaissance, forward air control, day and night strike missions and more. As such, it has played an important part in U.S. military operations, beginning with the 1986 strikes against Libya through nearly every deployment since then, including Operation Desert Storm and the Iraq war.

To keep pace with ongoing demands for training maintenance personnel, the Navy contracted with American Systems Corporation to develop and deliver the Simulated Aircraft Maintenance Trainer, or SAMT to the Naval Air Station in Oceana, Virginia and in Lemoore, California. This state-of-the-art, PC based maintenance trainer is designed to simulate the avionics, electrical, fuel, engines, flight control/hydraulic and armament systems of the aircraft. It consists of two 61” plasma touch screens, a physical cockpit, a simulated cockpit that fully replicates the form, fit and function of the actual F/A-18 cockpit including electronic displays, as well as an instructor-led operator station.

To ensure the trainer offered the most immersive, photorealistic virtual environment possible, American Systems teamed with DiSTI and its advanced GL Studio toolkit to develop the interactive 3D objects for the SAMT. GL Studio is DiSTI’s flagship product offering for developing real-time, 3D human to machine interfaces for use in computer based training, maintenance and part task trainers, full mission simulators and safety critical applications.

Executive Summary

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| Prime Contractor: | American Systems Corporation (ASC) |
| Government Client: | U.S. Navy, NAS Oceana, Virginia and NAS at Lemoore, California |
| End System: | F/A-18 Simulated Aircraft Maintenance Trainer |
| Engagement Overview: | Create high-fidelity, photo realistic 3D, objects for the Navy’s F/A-18 Simulated Aircraft Maintenance Trainer (SAMT) |
| Challenge: | The Navy needed to increase training throughput to ensure annual training goals were met; content had to be highly immersive to fully replicate behaviors of the actual craft |
| Solutions: | DiSTI’s program management and systems engineering services, using its GL Studio software suite as the development tool |
| Results: | <ul style="list-style-type: none"> • Unparalleled realism, immersion and situational awareness • Significant cost savings due to reduced reliance on hardware devices and physical consumables • Higher retention rates reduced classroom time, driving higher training throughput levels • Leverages clients’ existing investment in training aids and development tools by extending the life of the simulations |

Challenge:

U.S. Navy requirements called for an efficient training environment that would increase student throughput while simultaneously ensuring high comprehension and retention levels for the military personnel undergoing the training. With cost also a key factor, the graphical elements used in the lessons needed to be reusable across all scenarios with little to no redevelopment efforts. Most importantly, the training content had to deliver a natural, realistic, highly sophisticated degree of interactivity in order to replicate the actual look, feel and behaviors involved in maintaining the complex, real world aircraft.

Solution:

DiSTI delivered a solution that matched the Navy's criteria on all counts, delivering the first ever fully immersive virtual 3D maintenance trainer to be fielded. Working in tandem with American Systems Corporation, as well as SIMTECH Services Corp, who developed the system simulation models and provided F/A-18 subject matter expertise, DiSTI developed comprehensive, 3D, fully immersive objects for the SAMT using its GL Studio software. Creating more than 500 animated maintenance and troubleshooting tasks involved in maintaining the aircraft, the 3D environment included graphical simulations for every facet of the electrical, hydraulic and fuel systems.

The immersive training environment allows students to "walk" around the aircraft, open aircraft compartments, attach simulated test equipment, diagnose faults, remove and replace equipment and observe realistic operation of complex mechanical systems. Using a large plasma display with a touch sensitive screen, the students can view the aircraft from any desired angle, as well as create multiple views of the aircraft, providing the means to perform tasks that require simultaneous access to different areas of the F/A-18.

Unlike less sophisticated tools that simply contain hotpoints that bring up a photo or a video clip when activated, the 3D graphical elements generated through GL Studio for the SAMT are fully interactive and immersive, giving student complete situation awareness at every phase of their training.

In addition to the development of aircraft environment for the SAMT, DiSTI also created 3D objects for dozens pieces of modeled test equipment used to diagnose and troubleshoot the F/A-18. Students are able to disconnect cables, use and test equipment to measure signals via a multimeter, oscilloscope, reflectometer

and other testing devices. The trainer also includes 3D simulations of munitions and other stores, allowing the student to load and unload the aircraft in any supported configuration.

Results:

The use of GL Studio for the development of the F/A-18's Simulated Aircraft Maintenance Trainer has enabled the Navy to achieve a wide range of benefits, including a higher knowledge transfer rate pertinent to the real aircraft; the ability to increase training throughput and meet annual training goals; reduced class time due to higher overall retention rates as a result of the immersive nature of the training, combined with the instantaneous feedback.

From a development standpoint, the 3D elements created for the SAMT are readily transferable and reusable for other training devices saving development time and money by eliminating the need to recode the same virtual environments twice. Because GL Studio objects are completely reusable, the Navy can continue to leverage the graphical assets created under this contract. NAVAIR has already been able to reuse parts of the SAMT on the PC Simulation contract awarded to Carley Corporation.



3D Image of the F/A-18 Simulated Aircraft Maintenance Trainer with close up of the landing gear and radar.