

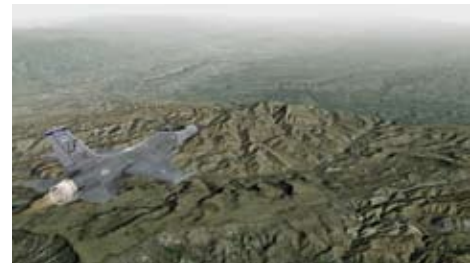
VRSG™ Visuals in F-16 Simulation



<http://www.metavr.com>
sales@metavr.com
US 617-739-2667



Real-time VRSG rendering of F-16C entities stored in canopy hangars at the airfield on MetaVR's virtual Luke Air Force Base.



Real-time VRSG rendering of an F-16C entity in flight over the virtual Barry M. Goldwater Range.



Real-time VRSG rendering of Luke Air Force Base.

In 2010, MetaVR™ Virtual Reality Scene Generator™ (VRSG™) visuals came online for simulators at three F-16 training facilities: Luke Air Force Base, Vermont Air National Guard F-16 Mission Training Center, and Air Force Research Lab.

Luke Air Force Base upgrades F-16 training simulators with MetaVR visuals

Luke Air Force Base (AFB) in Glendale, AZ, purchased 53 MetaVR VRSG licenses in 2010 for use in their F-16 full-mission training simulators. MetaVR's software will be fielded on Commercial Off The Shelf (COTS)-based PC image-generators (PC-IG) using the latest game-level 3D graphics cards. These VRSG licenses replaced the Presagis Lyra-based solutions in four training dome systems for the U.S. Air Force Air Education and Training Command (AETC) which were installed at the site in 2007 and 2008.

F-16 network training center

Luke AFB is a major training base of the AETC for providing advanced flight training to fighter pilots. The upgraded F-16 flight cockpit simulators are located at the base's Network Training Center (NTC) facility. The MetaVR VRSG licenses will be used to equip 4 dome-based systems that contain a full cockpit replica of an actual F-16.

Luke AFB, which is located about 20 miles northwest of Phoenix, is the primary U.S. Air Force training facility for F-16 fighter pilots, who now regularly train to use night-vision goggles. With the newly installed systems, pilots will use real Night Vision Goggles (NVGs) that will be stimulated by Christie Digital Systems Matrix StIM projectors. The solid state LED projectors provide simultaneous and independent control over both the visible and near-IR spectrum using LED illumination.

Image on the cover: Real-time VRSG rendering of an F-16C entity approaching the airfield on MetaVR's new virtual Luke AFB.

Delivered systems and virtual terrain

For each F-16 cockpit trainer, the VRSG multichannel visual system includes 10 out-the-window (OTW) channels and 2 sensor channels. The systems also include new COTS PC hardware to replace Concurrent PCs.

As part of the sale, MetaVR built and delivered high-fidelity geospecific 3D terrain of Luke AFB, to include the airfield and the Barry M. Goldwater Range (BMGR). The terrain, built from natural color imagery, is in MetaVR's round-earth Metadesic format from natural color imagery. Imagery of the area of Arizona around Luke AFB is 1-meter resolution, BMGR is 0.50 m and the Luke airfield with its immediate on-base surroundings is .30 m resolution.

The BMGR is one of three tactical ranges in the Luke AFB area, spanning several hundred square kilometers. The range serves the U.S. Air Force and the U.S. Marine Corps as a training area for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support. As well, pilots and JTACs train for strike and close air support missions at BMGR.

MetaVR's Luke Airfield model replaced the Presagis airfield model.

56th training squadron

Luke AFB is the home of the 56th Fighter Wing and the 56th Training Squadron (TRS). The mission of the 56th TRS is to provide academic- and ground-based instruction to support training F-16 pilots and weapons directors. The 56th TRS trains almost one-half of all the Air Force's new fighter pilots each year. It conducts F-16 academic and device training in accordance with major command formal syllabi including initial instruction, transition courses, senior officer courses, Thunderbird and aggressor pilot instruction, forward air control, night systems and Block 50 specialized conversion courses. The 56th TRS also provides academic, simulator and live mission training for more than 75 upgrading weapons directors annually.



Two real-time VRSG renderings of scenes at the airfield on the virtual VT ANG base, Burlington, VT.



One of the 4 cockpit simulators at the new F-16 Mission Training Center, located at the VT ANG base, Burlington, VT. The multi-channel synchronized view, driven by VRSG, is rendering the VT virtual terrain built by MetaVR. Photo courtesy of SSgt. Dan DiPietro, 158 FW, Vermont Air National Guard.

VT Air National Guard opens new F-16 Mission Training Center

The Vermont Air National Guard (ANG) uses over 90 MetaVR VRSG licenses in their four-ship simulators at the F-16 Mission Training Center (MTC) located at the VT Air National Guard (ANG) facilities at the Burlington International Airport, Burlington, VT.

About the mission training center

In June 2010, the F-16 MTC officially opened with a ceremony that included U.S. Sen. Patrick Leahy, Lt. Gen. Christopher D. Miller, the Air Force's deputy chief of staff for strategic plans and programs, and top National Guard officials. At the ribbon-cutting event, MetaVR and the contractor team of International Simulation & Training Systems (ISTS) and Lockheed Martin were given awards for engineering excellence.

The Center's mission is to train F-16 fighter pilots from across the U.S. in a first-of-its-kind graduate-level setting. Ten pilots can be trained at a time in exercises conducted on a local network or in Distributed Mission Operations (DMO) collaboration with the Iowa Air National Guard's Distributed Training Operations Center (DTOC) in Des Moines, IA.

About the simulators

The site consists of 4 F-16 full mission trainers, instructor/operator stations (IOS) for each cockpit, and an after-action review capability. Each cockpit consists of a 360-degree wraparound display based on the A-10C FMT seamless M2-DART display. The original M2-DART display used one projector for each of the 8 display facets. The contractor team enhanced this design by using 2 or 3 projectors on each of the 8 display facets, for a total of 18 HD projectors.

Inside the wraparound display sets a high-fidelity cockpit with functional buttons, switches, and multi-function displays

(MFDs). The MFDs can display targeting pod video in electro-optic (EO), infrared (IR), or ground-mapping radar. An instructor/operator station (IOS) exists for each cockpit. The IOS establishes the environment the simulator will fly in, to include geographic location, weather, time-of-day. The IOS also controls the threat environment using the AFRL XCITE target generator. The IOS includes a large flat-screen TV that can simultaneously display a replica of out-the-window scene, heads-up display, and both multi-function displays.

Unique to this installation is its novel approach to night vision goggle (NVG) training. The visual system uses a stimulate approach rather than a simulate approach to NVG training. The pilot wears his real NVGs while in the cockpit, so he can become accustomed to the form-factor and limited field-of-view. Using the Polhemus SCOUT tracker, the pilot is head-tracked with 6 degrees of freedom, enabling the image generator to know at any moment the exact location and viewing direction of the pilot's head. The SCOUT tracker is an AC magnetic head tracker that requires no mapping effort to run at high accuracy within the full mission simulators. The image generator renders an NVG area of interest (AOI) inside a cone visible to the goggles. Imagery rendered inside the NVG AOI is modified to stimulate NVGs and display covert lights. Imagery rendered outside the NVG AOI is rendered as normal unaided-eye, and covert lights are not visible outside the NVG AOI. This forces the pilots to look through the NVGs to be able to see the scene in sufficient detail at night for flying.

AFRL F-16 X-DTTs installed at Aviano AFB, Italy, upgraded with MetaVR visuals

The Air Force Research Laboratory (AFRL), Warfighter Readiness Research Division, updated their F-16 Experimental Deployable Tactics Trainer (X-DTT) simulators in 2010 to use MetaVR visuals and Immersive Display Solutions portable domes. The F-16 X-DTTs are



One of the F-16 X-DTT simulators at AFRL using MetaVR multi-channel visual systems. (Note that the seams that appear in this test installation of the dome will be eliminated in the final installation.) Image courtesy of Air Force Research Lab (AFRL).

deployable, medium fidelity, in-theater training systems for keeping the warfighter proficient between missions. For this update, AFRL purchased 26 MetaVR VRSG licenses to replace its SDS International AAcuity PC-IG systems for the simulators. The MetaVR software runs on the existing image generator hardware with no changes required.

The X-DTT photograph in this brochure shows one of the upgraded simulators during integration and testing prior to the delivery to the U.S. Air Force in Aviano, Italy.

Each F-16 X-DTT has six projected views on the partial dome in addition to a sensor view. Each system can be used as a standalone training tool or networked with other simulators to participate in larger exercises.

The systems are similar in design to MetaVR's and Immersive Display Solutions' JTAC MiniDome, with differences specific to the F-16 X-DTT. The domes are constructed of fiberglass in order to provide the best possible surface that minimizes seams and reduces blemishes. Each dome is a 3.0-meter (diameter) display, providing 220-degree horizontal field-of-view (FOV) x 90-degree (+60/-30) FOV. The visual solution includes six Projection Design FL32 WUXGA projectors with wide-angle lenses; each projector has 1920 x 1200 pixel resolution. The integration between MetaVR VRSG and Scalable Display

Technologies' EasyBlend FX software provides for geometry warp and the auto alignment (edge blend) of all VRSG channels, resulting in a seamless image. The system has an average blended resolution of 11.5 million pixels, which is approximately 4.8 arc-min/OLP. An integrated adjustable truss system supports all the projection equipment, auto alignment cameras, and the HUD projector. (The HUD projector is not shown in the photograph.)

AFRL is a research organization chartered to develop state-of-the-art training technologies and methods that support the 21st century warfighter. The primary goals of the research division are to develop or evaluate various technologies as training and research tools and to investigate training effectiveness through assessment in a distributed mission operations (DMO) environment. The training research environment at AFRL/Mesa is comprised of various simulation systems and performance measurement tools that provide warfighters with opportunities to develop and refine their knowledge and skills required to be successful in a combat environment.

The goal of the X-DTT simulators is to provide pilots with the ability to practice and maintain air combat skills in forward operating locations. These simulators are intended for use by deployed pilots who generally perform missions in support of real world operations with limited or no sorties or flying range space available for training opportunities and who might incur deficiencies in critical mission skills needed for other theaters.

The medium-fidelity X-DTT simulator consists of an F-16 Block 30 aircraft shell with the actual F-16 Operational Flight Program (OFP) and high-fidelity aircraft stick and throttle. These simulators provide the essential F-16 cockpit switches on a touch-screen LCD in front of the pilot.

Previously, the X-DTT simulator's visual system was made up of three 30-inch Apple Cinema High Definition LCDs and the SDS International AAcuity Personal Computer Image Generation System.

As part of an ongoing effort to enhance the fidelity of the simulator, AFRL replaced the visuals with MetaVR VRSG and replaced the monitors with the portable domes from Immersive Display Solutions as described above. AFRL is currently conducting research to examine the effectiveness of medium-fidelity X-DTT simulators for training air combat skills.

The updated F-16 X-DTT simulators were delivered to and installed at the Aviano Air Base, Italy, in October 2010.

Background material for F-16 X-DTT at AFRL was extracted from the paper *Impact of Visual Scene Field of View on F-16 Pilot Performance* from the Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2007.

For more product information, pricing, and ordering, see MetaVR's web site at www.metavr.com or contact sales@metavr.com.

MetaVR, Virtual Reality Scene Generator, VRSG, Metadesic, First Person Simulator, IRserver, the phrase "geospecific simulation with game quality graphics", and the MetaVR logo are trademarks of MetaVR, Inc. Metadesic is protected by US Patent 7,425,952. All other brand or product names are trademarks of their respective companies.

Copyright © 2011 MetaVR, Inc.