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VRSG™ Visuals in JTAC Simulation

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A JTAC trainee at the Air National Guard Simulation Lab running MetaVR VRSG and Afghanistan database (on the middle computer). On the left is a ROVER IV, and on the right is FalconView map of the same area. On the desk are ASTI VOIP handheld terminals that simulate radios.

The Air Combat Command (ACC) at Langley, VA, recently approved MetaVR Virtual Reality Scenario Generator™ (VRSG™) version 5.5 or higher and the Air Force Research Lab Joint Terminal Attack Controller Training Rehearsal System (JTAC TRS) as systems that can be used by trainees to complete JTAC simulator-based terminal attack control requirements. The ACC issued this approval as a result of the MetaVR software capabilities demonstrated during a recent series of JTAC simulated scenarios orchestrated by networked Air National Guard sites during a simulation summit. With this approval, the training hours JTACs spend using MetaVR software now contribute to approved simulator training credits for terminal attack control requirements.

The ANG TACP/ASOC Industry Simulation Summit, hosted by the 182nd Air Support Operations Group and held at the Peoria Air National Guard Base in Peoria, IL, June 22 - 26, 2009, demonstrated simulation training resources with JTAC soldiers in attendance. During the summit, MetaVR's technology was shown as it is used operationally within the Peoria Air National Guard's simulation infrastructure for training JTACs. MetaVR's Afghanistan terrain was featured as part of the event; it was streamed as real-time video to an actual ROVER portable video display device. The simulated threats and the telemetry for the video stream from the UAV camera payload operator were provided by the Iowa Air National Guard Distributed Training Operations Center (DTOC) for Distributed Mission Operations.

Image on the cover: *VRSG real-time screen capture of a third-person view of the desktop-based JTAC simulation acting as a first person shooter on MetaVR's Afghanistan database. Inset image shows what the trainee sees from the desktop.*

Air National Guard JTACs recently developed their own desktop close air support training simulators in which soldiers use MetaVR VRSG in a first person shooter mode with a gamepad as the navigation device. Working in the JTAC mode of VRSG's First Person Simulator™ (FPS), a trainee sees targeting and designating symbology similar to what the operator would see in a range finder or laser designator.

Collaborating with other players in a simulated exercise while using the MetaVR software's game-like interface, a JTAC trainee at the desktop can simulate walking and using binoculars and designator devices, while interacting and communicating with others such as a pilot via a simulated radio over the network. The JTAC trainee views a UAV feed provided by VRSG through a ROVER, while locating common reference points for carrying out a mission and laser designating a target. The EG 0601.1 and MISB 0104.5 metadata encoding in the VRSG video stream stimulates the fielded ROVER hardware as if it was receiving telemetry from a real ISR asset such as a UAV.

Trainees can call out target coordinates through a voice interface on a simulated radio over the network. VRSG also transmits a laser designator protocol data unit in DIS format that can be read by other simulators on the network to simulate a digital hand-off of coordinates. The service-developed Air National Guard JTAC simulator was demonstrated at the Simulation Summit; it helped provide the basis for the recent approval by ACC to allow MetaVR software to be used for simulated JTAC training.

MetaVR's virtual Afghanistan terrain, shown in several images in this brochure, is optimized for ground attack training missions in JTAC simulations, such as A-10 missions.

Real-time VRSG rendering of an A-10 entity flying over the Kabul province region of MetaVR's virtual Afghanistan. Inset image is of a trainee using MetaVR VRSG software inside the Air Force-developed JTAC TRS.

Using subject matter experts, the DTOC develops and maintains a series of training scenarios that create simulated threats on the network for the Air National Guard sites. It also creates a Multiple Unified Simulation Environment/ Air Force Synthetic Environment for Reconnaissance and Surveillance (MUSE/AFSERS) simulated UAV camera video feed that the Air National Guard uses to jointly simulate a close air support mission on geospecific terrain that correlates across both facilities' simulation applications. The JTAC simulations are fully interoperable with the A-10 Full Mission Trainers, F-16 Air National Guard simulators, the MUSE/AFSERS program, and the Army National Guard TUAV trainers, as well as others.

Among other technologies used for JTAC training is the JTC TRS with its virtual trainer dome. The dome environment provides the JTAC operator with a fully immersive simulation that attempts to replicate what the soldier will see with the unaided eye in the real world. All visual cues that the trainee would see in the real world are simulated in the dome.

The JTAC TRS, developed at AFRL in Mesa, provides a high-fidelity, fully immersive, realistic training and rehearsal environment with real-time sensor, simulator, and database correlation. Its primary focus is to provide a persistent total air-ground virtual training environment for networked air/ ground training and mission rehearsals. This system is used to train both JTAC and combat air crews assigned to accomplish complex missions in close proximity to ground forces. The JTAC TRS connects to distributed mission operations networks to enable geographically separated high-fidelity close air support platforms and JTAC and CCT teams to train together. Additionally, the JTAC TRS enables operators to conduct Joint Close Air Support (JCAS) training and mission rehearsal using tailored, dynamic scenarios that are relevant to mission tasking.

The dome component of the JTAC TRS uses VRSG and Mersive Technologies' camera-based auto-calibration software for warping and blending the multi-projector display. The projectors for the dome are provided by Electric Picture Display Systems. The dome display, designed and supplied by Immersive Display Solutions, consists of a transportable 5.0-meter diameter fabric display providing a 220-degree horizontal FOV. The Mark VII laser ranger finder, M22 binoculars, and Ground Laser Target Designator (GLTD) II simulated devices used in the dome were designed and built by Minerva Engineering.

The deployable JTAC Virtual Trainer Dome using MetaVR VRSG software. Image courtesy of AFRL, Mesa, AZ.

Operator inside the JTAC TRS, looking through a simulated laser designator. Image courtesy of AFRL Mesa.

VRSG real-time screen capture of a scene on MetaVR's virtual Afghanistan, which the operator on the left sees when looking through the simulated laser designator with embedded 3D graphics hardware. With information such as the laser code, the target location, and the compass rose, this view is the same view as seen in the FPS desktop-based JTAC simulator. The desktop and dome simulators produce the same designator view.

The JTAC TRS, built by Lockheed Martin, uses 19 VRSG channels, 14 of which are for the dome itself. There are 7 VRSG channels for 360-degrees around the bottom half of the dome, and another 7 channels for the top half of the dome. The remaining VRSG channels are used for various emulated hand-held command and control (C2) devices inside the dome (binoculars, laser range finders, and so on), a sound channel, and a single AAR/stealth channel. The simulator is a high fidelity, realistic, fully immersive, real-time visual environment with sensor, simulator, and database correlation. The DIS/HLA compliant system interoperates with legacy systems and provides the capability to network with other air and ground simulators, including simulators of the A-10 program.

The dome does not use VRSG imagery directly as it is projecting on a curved surface instead of a flat one. To compensate for the curved surface, the imagery rendered by VRSG must be distorted before going into the projector. This process is called *distortion correction*. Another characteristic of curved displays is that the projectors have areas of overlap, which makes the image brighter in these areas. The process of correcting this issue is called *edge blending*. VRSG supports the Mersive Sol Server, which provides automated distortion correction and edge blending within the IG.

** The information in this brochure is not an endorsement by the Air Combat Command or the Air National Guard of MetaVR products.*

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