SAVIT
SMALL ARMS VIRTUAL INDOOR TRAINER
SAVIT - REAL WEAPON ACCURACY

The SAVIT system provides an effective, realistic training of small arms firing. SAVIT functions cover all phases of modern firing training, from basic weapon skills theory, marksmanship training up to tactical training.

SAVIT allows individual marksmanship training at static and moving targets up to a distance of 5,000 m and group tactical training of tactical decision making, communication within the squad, and coordination of fire and targets prioritization.

SAVIT’s ballistics software realistically simulates all weapon types and ammunition types and the influence of weather conditions. SAVIT generates 3D immersive visual cues with different virtual terrains, target models, battlefield effects and different weather conditions. SAVIT consists of shooting posts, training weapons, visual system, a precision aimpoint detection system, sound system and instructor operator station. SAVIT has scenario editor software to create or edit fight scenarios.

SAVIT includes software for detailed exercise evaluation and database system for storing the results, generating reports and monitoring progress of individuals and groups.

CBT E-LEARNING

The theoretical training phase of the trainee starts with Computer Based Training (CBT) lessons and finishes with a exam to test knowledge transfer.

CBT lessons are focused on theory of the safe handling of weapons, methods and rules of the fire, functional principles of weapons, maintenance of weapons, ballistics theory, ammunition types and their use.

MARKSMANSHIP TRAINING

SAVIT marksmanship training focuses on individual training shooting drills. Marksmanship training exercises provide basic scenarios such as shooting at different distances or shooting at static or moving targets. Marksmanship training allows training of trigger control, aiming procedure, postures and engagements, reloading and weapon malfunction clearance. Shooting exercises can be conducted in a 3D virtual model of real shooting range with the targets configured in accordance with applicable shooting doctrine. The virtual targets can be programmed to represent static, moving, lifting and bobbing targets. The target hit zones with score can be defined by the user. The system allows weapon zeroing for individual trainees.

TACTICAL GROUP TRAINING

Each trainee can be equipped with a different type of weapon and fulfill his assigned role within the squad/section. SAVIT can simulate combat situations in open terrain, urban areas or inside buildings. Training scenarios are focused on fire coordination, targets prioritization, communication within the group and covering fire. The system allows movement in a virtual terrain using a joystick integrated on the training weapon. Tactical scenarios can incorporate basic Forward Observer training.

SAVIT can be extended by a shoot-back system for evaluation of a trainee’s covering and return fire.

JUDGEMENTAL TRAINING

Judgemental Training is based on video scenarios that are to train shoot/don’t shoot decision making on the basis of positive target identification and threat assessment. Video scenarios allow branching based on the results of separated phases of the exercises.
The static version of SAVIT is built into the training room infrastructure. The size of the system is defined by the number of connected SAVIT modules, each 3 m in width and suitable for four trainees. SAVIT allows up to five modules to be connected to create a system with a width of 15 meters suitable for 20 trainees. SAVIT can also be supplied with a panoramic projection system with a horizontal angle of 180 deg, 270 deg or 360 deg.

Edge blending technology is used for the interconnection of images of individual modules on the projection screen ensuring a seamless image over the whole projection area.

The server is located in a separate airconditioned room.

The training observer lounge with instructor space and CO₂ filling station.

The main portable system components are integrated into a compact anti-shock and waterproof transport case (SYSBOX), which dimensions are 60 x 100 x 40 cm and the weight is 65 kg.

The Projection Screen (3 x 1.8 m) is supplied in a separate ruggedized case. The portable SAVIT size is suitable for one to four trainees. Connecting of portable SAVITs enables the system to be configured for up to 20 trainees.

The Portable SAVIT system runs on two laptops.
**THE VISUAL SYSTEM**

The system supports geo-typical and geo-specific virtual terrains. The virtual terrains can be of various types, e.g. such as the European, desert, jungle or winter terrains. Terrain sizes are from 5 x 5 km up to 50 x 50 km. The visual system is able to display targets at a distance of up to 6 km.

The system realistically simulates weather conditions, collision effects between the virtual objects, ammunition effects and ammunition interaction, including dynamic changes in the terrain. SAVIT is provided with terrain and scenario editor software enabling the creation of own virtual terrains with vegetation, buildings, roads or water areas. SAVIT uses a COTS graphic engine.

**AUDIO SYSTEM**

SAVIT generates the realistic surround sounds effects of the weapon shots, sounds of vehicles, aircrafts and battlefield background sounds. The system simulates sound flight time and Doppler Effect.
SAVIT supports all types of small arms such as pistols, rifles, sniper rifles, machine guns, grenade launchers and anti-tank weapons.

SAVIT offers replica guns, modified weapons and instrumentation kits for real weapons. All training weapons are equipped with sensors for monitoring the weapon status and evaluation of proper weapon handling.

The system allows the simulation of weapon malfunctions and evaluates malfunction clearance procedures.

The lifetime of training weapons is typically higher than 1.5 million shots.

Simulated training weapons can be replicas of real weapons or modified real weapons. Replica weapons are high fidelity copies utilizing some parts from the original weapons, such as trigger mechanism, sights, housing or stock. Replica weapons are suitable for those types of weapons where originals are not available or are very expensive. Modified original weapons re-uses major weapon parts such as bolt receiver, trigger block or parts of the barrel. Both replica and modified weapons are completely safe and cannot be used for firing live or training ammunition. The simulated weapons can be completely tether-less using data radio communication and compressed gas recoil system. Simulated weapons can be equipped with a unique double stage recoil system, to ensure realistic shooting effects.

SAVIT simulates the high-precision ballistic trajectory of a projectile including the effects of wind speed and direction, air pressure, temperature, Coriolis forces, bullet drift and dispersion.

The ballistic simulation compensates for aimpoint detection errors such as parallax error, distance estimation error and elevation angle error, caused by the trainees distance to the screen.

Target damage effects are evaluated based on the target geometric vulnerability model, type of ammunition, ammunition impact speed and ammunition impact angle. Ballistics of ammunitions like shot-gun, grenades or mines is simulated for each sub-projectile.

High accuracy of aimpoint position detection and aiming trajectory recording is one of the most important parameters of a shooting simulator, influencing the training value of the entire system.

The SAVIT aimpoint detection system consists of a weapon laser transmitter with an accurate laser beam profile and a Projection Screen Sensing Camera with a resolution of 2048 x 1088 pixels and a frame rate of 300 fps. The high resolution of SAVIT cameras enables the outstanding accuracy of 0.05 mrad of aimpoint position detection. The high frame rate of SAVIT camera ensures non-jamming aiming point assignment to the individual weapons, even if laser beams from 12 weapons converge at the same point on the projection screen.
SNIPER TRAINING

SAVIT can be provided with an Electronic Scope with an integrated video chip. The Electronic Scope provides a high resolution image of the target and high accuracy aimpoint detection.

The visual system provides special effects such as air mirage that causes an optical shift of the target position at longer distances.

CONVERSION KITS FOR REAL WEAPONS

Conversion kits allow quick and easy integration of real weapons into training without any modification or degradation of the real weapon.

Conversion kits provide the same simulated functions as replica weapons and comprise a recoil simulation module, a sensor module and a weapon interface module. The recoil simulation module for the pistol replaces the barrel and the magazine. The recoil simulation module for the rifles and machine guns is attached to the silencer mount. The contact-less sensor module is inserted into the trigger mechanism and provides complete weapon status. The weapon interface module is attached to the trainee’s belt and provides weapon control and wireless communication with the system. The weapon interface module is also connected to a source of compressed gas. Compressed gas could be supplied from paint-ball CO2 bottle, also attached to the trainee belt. Such configuration allows the trainee the freedom of movement.

TRAINING EVALUATION

Application evaluation and After Action Review AAR provides the trainees and instructor with immediate feedback during exercise and the overall results of the finished exercise. The system allows the monitoring of the status of all weapons connected to the training, including:

- Amount of ammo in magazines
- Magazine ID
- Ready to fire status
- Weapon safety status
- Single or burst mode
- Butt pressure
- Correct reloading procedure
- Triggering
- Weapon stability
- Weapons cant angle
- Sight range and wind adjustments

Instructor can monitor and evaluate aiming trajectory, aimpoint and hit point positions simultaneously for multiple trainees presented in a graphical view. The system allows the instructor to create scripts to define the criteria for the evaluation of complex procedures such as:

- Correct target selection
- Reaction time
- Speed of weapon reloading
- Correct weapon malfunction solving
- Correct trigger pull procedure
- Shooting at prohibited situations
- Shooting rhythm
- Correct elevation adjustment

Pass or fail on the criteria is graphically indicated to instructor by the colour coding. Feedback to the trainees is provided via an evaluation form displayed on the projection screen.

A completed exercises can be replayed and paused at any selected timepoint. The results of an exercise can be stored in a result database. The data may be sorted by date, trainee, groups, exercises or high score.