WEAPON SCORING SYSTEMS

**Parker Meggitt
Defense Systems Division**

Weapon development and crew proficiency training are essential to maintaining an effective military. Central to satisfying these objectives is the ability to accurately measure the endgame performance of guided weapons and the closest point of approach for ballistic rounds as they pass their intended target.

Parker Meggitt Defense Systems Division has been the leader in this market for over 35 years. Our radar systems are installed in virtually all US military aerial and surface-based targets, as well as many foreign military targets. Our doppler radar vector projectile tracking systems are the worldwide standard for guided weapon test and evaluation, and provide not only a full three-dimensional endgame trajectory relative to the target, but also weapon attitude, which is critical to warhead effectiveness assessment. Our doppler radar scalar projectile tracking systems are used worldwide against all gun types, round calibers and firing rates for gunnery training and qualification. Parker Meggitt's scoring technology is field-proven, day or night, all weather, and works against all types of subsonic and supersonic rounds.

GSQ-106 Score Processor

The GSQ-106 is the newest variant of Parker Meggitt's score processing stations designed to operate in conjunction with our doppler radar scoring systems.

It is compatible with the VDOPS, AN/DSQ-50A, SVDOPS, SBVS, VSS and ProTrak doppler radar scoring systems. Although most often used in combination with customer-supplied range telemetry, it can be expanded to include telemetry receiver capabilities for use as a standalone ground station in support of target operations where range telemetry is not available. Intercept data is transmitted from the target platform via a telemetry downlink to the GSQ-106 where it is processed for event detection and recorded in real-time. IRIG or GPS time data is then combined with the input data stream to provide time synchronization to other range instrumentation systems. That data is processed to produce score results via both color graphical and standard text displays, as well as hardcopy.

The GSQ-106 is the standard USAF score processor and used with all USAF aerial scoring operations.

Shrink Vector Doppler Scoring System

The SVDOPS-A Vector Doppler Scorer model CMDI-125B, is a non-cooperative missile-scoring radar that is optimized for use with mid-scale aerial targets, but can be configured for land and sea targets as well.

Integration of the radar unit with any target vehicle is made via a customized installation kit that contains the required installation hardware (cables, antennas, and mounting hardware). The SVDOPS-A target set, along with a compatible ground station, provides a complete vector score with associated attitude for all missile types, and includes a 3D reconstruction of the missile trajectory throughout the entire scoring volume. Trajectory data of the projectile is time-tagged with customer supplied timing information for absolute time-position information of the passing projectile.

Vector Scoring System

The Vector Scoring System (VSS) is a full-scale aerial target vector scoring system that is optimized for use with full-scale aerial targets such as the QF-16 and other similar sized targets. The VSS is an improved version of the proven QF-4 VDOPS target set. It employs the same telemetry data link and PCM format as that used with VDOPS, and operates with the same score processing station (GSQ-106) as the VDOPS.

The VSS system consists of a target set, telemetry link and compatible score processing station. Designed for use against air-to-air and surface-to-air missiles, VSS provides missile trajectory and attitude data during missile intercept endgame. Integration of the air set with any target vehicle is made via a customized installation kit that contains the required installation hardware (cables, antennas, TRIMs and mounting hardware). Data is transferred in real time from the air set via a telemetry link to a remote score processing station for post mission analysis and display.

The score processing station (GSQ-106 or GSQ-228) provides a complete vector score with missile attitude for all missile types and includes a reconstruction of the missile trajectory throughout the entire scoring volume.

VSS provides unparalleled non-cooperative vector scoring capabilities and will be the standard USAF vector scorer for the next generation of full-scale aerial targets.

AN/TSM-196B
Common Scoring Support Equipment

The Common Scoring Support Equipment (CSSE) is MDSI's latest generation of doppler radar flight line support equipment. CSSE is compatible with all target installations of the AN/DSQ-50A, SVDOPS, VDOPS and VSS scoring systems. The system consists of a Receiver Processor Unit (RPU), a Radar Input Simulator (RIS), one or more Radar Antenna Couplers (RAC), one or more Telemetry Antenna Couplers (TAC), and associated cabling for interconnecting the RAC with the RIS, and the TAC with the RPU.

The CSSE can operate in either a "closed loop mode" or an "open loop mode". Closed loop mode can be used anywhere and provides a high confidence measurement of scoring system performance for pre-mission checkout of targets. This mode requires that the RPU be connected to the RAC via supplied RF cables, with the TAC mounted over the telemetry transmitter antenna. It also requires that the RAC be mounted over the radar antenna(s) and also connected to the RIS via additional supplied cables.

This operating mode produces a complete end-to-end quantitative measurement of the scoring system and mitigates external interference, such as fluorescent lighting in a hangar. Each scorer/target configuration employs its own unique RAC and TAC units with factory installed software calibration constants loaded into the RPU.

The RPU is menu driven with software that supports all CSSE RAC and TAC configurations. The open loop mode uses only the RPU and RIS components of CSSE to provide a subjective measure of performance that can be used on the flight line to provide a go/no go indication just prior to target launch. The open loop mode is not suitable for use inside a hangar.

ProTrak Scoring System

The ProTrak doppler radar system is a software configurable, modular, small, ultra-lightweight, low-cost scorer designed for use on a variety of aerial tow targets, drones and surface targets. Designed for operational flexibility, ProTrak satisfies air-to-air, surface-to-air and air-to-surface scoring requirements. It can be configured using only the RF module and telemetry transmitter with a modified GSQ-109 score processing station or it can be configured with the RF module, a DSP module and a variety of data link and score processing options.

The basic ProTrak configuration using only the RF module, telemetry transmitter and modified GSQ-109, provides a low cost upgrade path for current users of MicroDops. Optional configurations using the RF module and DSP module can support on-target real-time bullet counting or miss distance computation for projectiles or missiles. The scorer can be programmed based on customer requirements for any dead zone or scoring volume out to 40 meters. A new feature previously not available in MicroDops is the ability to determine the miss distance of fused weapons which detonate within the selected scoring volume, but prior to doppler zero occurring. Unlike other acoustic or radar scoring devices, the projectile does not have to pass the target to produce a score when using this system. Two user selectable frequencies are available to support dual-target missions.

Aerial Weapons Scoring System

The Aerial Weapons Scoring System (AWSS) is an air-to-ground scoring system designed for attack helicopter crew qualification training.

AWSS provides objective scoring results of live-fire exercises conducted from attack helicopters firing .50 caliber, 7.62, 20, 30, and 40 millimeter projectiles, as well as 2.75 inch training rockets.
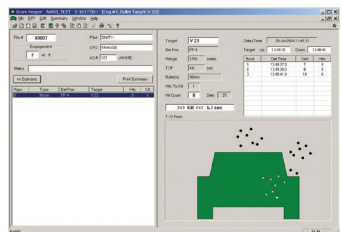
AWSS also has the capability to objectively score simulated Hellfire missile engagements for helicopters equipped with the Hellfire training missile and laser designator.

The system consists of a Bullet Scoring System (BSS), a Rocket Scoring System (RSS), Laser Aim Scoring System (LASS) and a remote Computer Subsystem (CSS) for system control and data reporting. Subsystems are connected to the CSS via a WLAN.

Round Identification and Location System

The Round Identification and Location System (RILS) is a 2D doppler radar scoring system designed for use with stationary or mobile pop-up targets.

Each RILS station automatically detects incoming rounds and provides impact location and identification of projectile types, along with velocity and angle of approach in real time. RILS stations are linked via a WLAN to a remote range operator station. The remote operator station acts as a control and display center that stores results from each station for after action reporting.

If desired, the RILS can generate a preprogrammed hit pulse to knock down the associated target. RILS is adaptable to all target lifters, moving and stationary, and may also be used for hard targets.

Radar Rocket Scorer

The Radar Rocket Scorer (RRS) is a non-cooperative doppler radar scoring system that provides highly accurate projectile tracking and impact point scoring.

The system is optimized for stationary ground target applications. System operation is automatic with projectile detection and scoring done at the target in real time. System monitoring and control is supported through a standard ethernet interface and a WLAN data link. Projectile data captured by the radar is stored locally. Processed data can be transmitted over the data link for remote storage and additional post processing.

Although designed for use with 2.75 inch unguided rockets, RRS can be configured for operation with a variety of smaller caliber rounds and different firing rates.

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