# The Joint STARS Common Ground Station: A New Tool for the Maneuver Commander

**by Captain Mike Monnard**

*The last time COL Smith conducted a brigade-level training exercise with his unit, the intelligence infrastructure of his brigade combat team was limited to the organic assets of his direct support Military Intelligence company and the various scouts supporting his brigade. The unit is now preparing for deployment, but this time COL Smith has a new tool in his kit bag: The Joint Surveillance and Target Attack Radar System (Joint STARS) Common Ground Station. Before COL Smith can employ this piece of equipment, he and his staff must understand the system, its requirements for employment, and the techniques for exploiting its capabilities.*

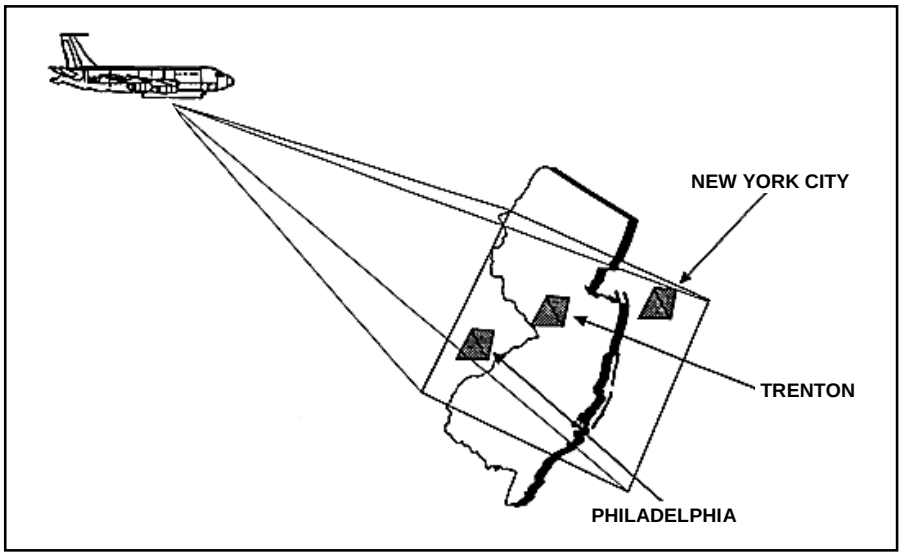
**Mounted on a HMMWV, the Common Ground Station processes data from multiple sensors, including the J-STARS E-8C aircraft, unmanned aerial vehicles, and other intelligence platforms.** –Motorola Photo

Upon completion of the Army's Transformation concept, each direct support MI company will possess a Joint STARS Common Ground Station (CGS) which will provide the Brigade Combat Team (BCT) with a rapidly deployable, mobile, and responsive intelligence processing capability. However, tactical intelligence officers and maneuver commanders may not thoroughly understand the system, its requirements for successful employment, or the techniques for exploiting its phenomenal capabilities.

Joint STARS is comprised of two major components: the Joint STARS E-8C aircraft and the Common Ground Station. The Joint STARS E-8C, a modified Boeing 707, is maintained and operated by the Air Force. The Common Ground Station (AN/TSQ-179 mission shelter), to include all subsystems, is maintained and operated by the Army. It consists of a ground data terminal, communications system, and operations system mounted on an M1097 HMMWV.

The Joint STARS phased array radar can survey up to 62,000 square kilometers every 60 to 90 seconds. This area is referred to as the Radar Reference Coverage Area (RRCA). The Ground Reference Coverage Area (GRCA) is smaller than the RRCA and remains under constant surveillance, regardless of the position of the E-8C aircraft. The GRCA is normally 150 km by 150 km. The accompanying illustration puts this in perspective: the system could survey a ground coverage area that incorporates most of New Jersey, plus the cities of New York, Philadelphia, and Trenton.

The radar has two operating modes, Moving Target Indicator (MTI) and Synthetic Aperture Radar (SAR). MTI is the primary operating mode and is used to locate moving vehicles, rotating antennas, and slow moving aircraft. SAR can provide a medium resolution photo-like radar image of a specified area on the ground. Fixed Target Indicator (FTI) is a sub-function of the SAR mode, and is used to display stationary targets.




**Joint STARS Ground Reference Coverage Area (GRCA)**


**The systems on the J-STARS E-8C provide a Synthetic Aperture Radar mode that can produce photo-like radar pictures of the battlefield and a Moving Target Indicator mode that tracks anything moving in the battlespace.**

The radar cannot operate in both modes simultaneously, but can switch modes so quickly that it is transparent to the users of Joint STARS data.

*COL Smith has just received the Execute Order and is ready to move to the Sea Port of Embarkation (SPOE). The BCT will be among the first units into country and the division commander has told him that Joint STARS will be available to support his operations. Prior to their departure, COL Smith calls the brigade signal officer into his office because he is concerned about spectrum management and what the CGS will need to communicate with the Joint STARS aircraft.*

Prior to establishing a secure data link, UHF voice communication is the primary means of contact between the E-8C and the CGS. Once established, the Surveillance and Control Data Link (SCDL) — a Joint STARS-unique, jam-resistant, two-way up-and-down data link — provides for free text messaging as its primary means of communication. As many as 15 CGSs can establish a secure, two-way data link with the E-8C, while an unlimited number of CGSs can receive data. All links require line of sight between the CGS and the aircraft.

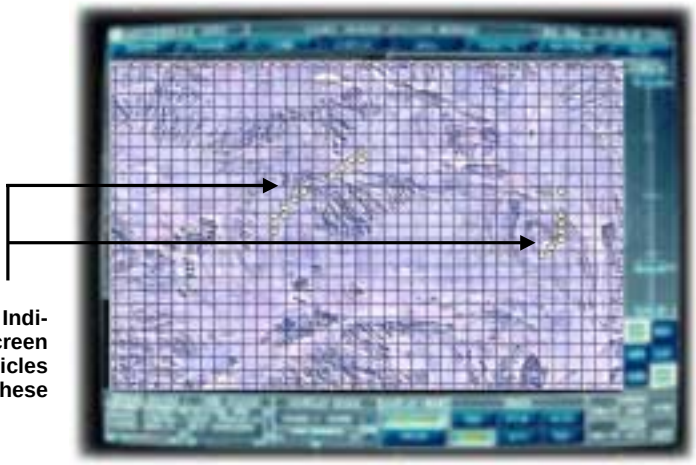
The Surveillance and Control Data Link is used to broadcast E-8C data to the CGS, transmit radar service requests from the CGS to the aircraft, transmit digital free text messages between the CGS and the aircraft, and transmit E-8C location and speed updates to the CGS. The CGS receives, stores, processes, correlates, disseminates, and displays near-real-time radar imagery from the Joint STARS E-8C. It can also receive, display, and disseminate unmanned aerial vehicle (UAV) video from a UAV ground control station and secondary imagery from theater and national sources. Additionally, signals intelligence data is received from the Intelligence Broadcast System (IBS) via the Joint Tactical Terminal.

*Upon arrival in theater, COL Smith and his BCT begin the RSOI process. He observes his unit conducting precombat checks and inspections in assembly areas within the seaport of departure (SPOD). COL Smith still does not fully understand what the CGS will need in order to provide his BCT with a better intelligence picture. He grabs the S2 and MI company commander and asks for a brief regarding the unique requirements of the CGS.*

The CGS is authorized six Imagery Ground Station Operators (MOS 96H). The crew consists of one staff sergeant (CGS team leader), one sergeant (assistant team leader), and four ground station operators. The crew is trained to operate the system, provide hard and soft copy products, establish interfaces with all systems, and provide basic level analysis of Joint STARS imagery products. The CGS team's analysis is limited to determining if the moving target indicator data represents moving vehicles or is simply ground clutter, and determining ground patterns which may define certain types of enemy activity (i.e., assembly areas, battle positions, and disposition).

To exploit the capabilities of the CGS, the mission shelter must remain in close proximity to the supported TOC. However, the primary emplacement criteria is line of sight from the data link antenna to the aircraft. Placing the antenna on a three-meter mast attached to the shelter, or remoting it on a tripod up to 100 meters away, often improves the line of sight, but if remoting the antenna does not provide line of sight to the aircraft, the unit must move. To retain connectivity, Remote Work Stations (RWS) are often set up in the TOC while relocating the CGS up to one kilometer away to gain line of sight with the aircraft.

Coordination and communication between the CGS and the E-8C is critical for efficient and effective operations. Communication between the BCT battle staff and the aircrew is done via the data link or secure voice. To ensure success, units must develop an SOP that includes procedures for dynamic re-tasking and addressing the following coordination requirements:



**In Moving Target Indicator Mode, the screen highlights all vehicles on the move, like these columns of tanks.**

### From BCT to E-8C

-Current OPORD and enemy front line trace
-Current PIR
-Special requirements

### From the E-8C to BCT

-On/off station times
-GRCA coordinates
-Orbit locations

To disseminate its products, the CGS connects directly to the Army's digitized command and control systems. These include ASAS, Maneuver Control System (MCS), and the Advanced Field Artillery Tactical Data System (AFATDS). The ground station is connected to ASAS either by LAN or direct hardwire and, if necessary, via the Mobile Subscriber Equipment (MSE) Network. The CGS is connected to AFATDS the same way, or via the Single Channel Ground and Airborne Radio System (SINCGARS) as an over-the-air data link. To communicate with Army aviation, the ground station includes an Improved Data Modem (IDM) to forward freeze-frame MTI data and receive AH-64D Longbow Apache fire control radar images.

The ground station can simultaneously display collateral level SIGINT reports, video imagery from UAVs, imagery products from U2 and ARL, and fire control radar freeze-frame pictures from Longbow Apaches

*The BCT is prepared for its first mission in theater. They have just received the OPLAN brief from the joint task force. As COL Smith sits down to prepare his planning guidance to the brigade staff, he wonders how the CGS can assist the BCT during the upcoming military decision-making process (MDMP) and impending battle.*

The ground station supports the BCT in the offense by providing enemy locations, battle positions, large obstacles, and the location and movement of reserve forces. With this information, the commander can shape the battlefield before crossing the line of departure. For example, during mission analysis and COA development, the CGS might be focused on where and how the enemy is establishing defensive positions. Using the SAR mode, the ground station provides supplemental imagery of defensive positions and large obstacles. Add to that Joint STARS moving target indicator and SIGINT overlays, along with UAV information, and the battle staff can formulate a more effective attack plan.

During the battle preparation phase, the ground station can provide targets and also information as to how the enemy is reacting to preparatory fires. During the battle, the ground station concentrates on any enemy movement and subsequent commitment of reserves. Joint STARS MTI provides most of the combat information. As the enemy moves to and from battle positions, the ground station cues the UAV to confirm any activity, and when movement of the reserve is detected, other intelligence sensors are notified or repositioned to identify and track the movement.

The CGS supports defensive operations by using all available sensor feeds to determine the enemy's main attack and follow-on forces. The Joint STARS moving target indicator is the primary sensor for detection of enemy forces as they depart assembly areas and move into combat formations. The CGS will detect and track enemy movement, allowing the commander to see how the enemy is arraying his forces. By using MTI to cue the UAV, the BCT commander can clarify the enemy disposition in sufficient time to reposition forces and set the conditions for destruction of the enemy.

The ground station supports stabilization and support operations (SASO) with its ability to receive and display multiple sensor feeds. The CGS also provides an electronic record that is used for analysis. The CGS can track friendly convoys, determine traffic volume and track movement on road networks, monitor military motor pools for vehicle deployments, and back-track vehicle movement to determine point of origin.

In a SASO environment, HUMINT and SIGINT might provide the cue to conduct analysis of archived CGS information. For example, HUMINT sources may reveal points and times of threat activity. With that information, CGS records are reviewed by the battle staff to determine originating locations and movement.

*COL Smith has been notified by his S2 that the enemy has penetrated the covering force and a motorized rifle regiment is attacking from the march. He asks the MI company commander the status of Joint STARS, and he is told that the E-8C is on station and the CGS is receiving data. COL Smith tells his staff he wants to attrit the first echelon by 50 percent before it comes into contact with the BCT defense. He then turns to the S2, S3, and FSO and orders them to begin the targeting process.*

The CGS contributes, in varying degrees, to all phases of the targeting process.

**Decide.** The CGS provides information on the disposition and location of enemy forces. The CGS team leader advises the battle staff on areas of masked terrain, as well as what targets the E-8C can detect and track.

**Detect.** Joint STARS is ideally suited to detect moving targets. By comparing MTIs to criteria for targets, along with SIGINT cues and imagery, the CGS can identify specific tracks.

**Track.** The ground station is effective at tracking moving targets and monitoring target areas for changes. The key component to maintaining target continuity is the moving target indicator capability.

**Deliver.** The CGS continues to update the target location, facilitating adjustment of fires, until the attack is complete.

**Assess.** The CGS can provide a correlated sensor product for limited battlefield damage assessment (BDA). The fidelity of the assessment is based on the ground station's correlated moving target indicator, unmanned aerial vehicle, and signals intelligence data.

Not only does the ground station provide the brigade team with target information, but its ability to correlate multiple sensor information on a single screen allows targeting cells to detect, classify, and track potential targets, as well as determine battlefield damage following an attack.

The ground station provides Army aviation the same targeting and battlefield awareness support available to other combat units. In addition, it is an important tool for planning cross-FLOT operations. Specifically, the ground station can pass MTI data via the Improved Data Modem to Apache Longbow aircraft. The only requirement is

radio line of sight between the CGS and the aircraft.

The CGS also provides the commander a means of improving the effectiveness of CAS sorties. The CGS MTI capability is the primary means of improving this effort. When moving targets are detected, the information is forwarded to the TACP and forward air controller, who acquire the targets and direct the CAS aircraft. The commander determines the target and engagement area. The TACP/FAC moves into position. MTI are detected and the information is passed to the TACP/FAC. The ALO continuously updates the TACP/FAC. The TACP/FAC then positively identifies the target, and CAS attacks it.

*"The primary mission of Joint STARS is … to provide dedicated support to ground commanders." (FM 34-25-1)*

Under the Army Transformation Concept, every BCT will possess a powerful tool to support and focus its efforts. The CGS provides the BCT a surveillance platform with a wide variety of capabilities, to include a Near Real Time (NRT) picture of the battlefield. Not only will the CGS detect and track targets in combat and pre-combat formations, but when remoted into the TOC, it will assist the commander in battle management and increased situational awareness. It is, therefore, critical that both tactical intelligence officers and maneuver commanders understand the Joint STARS CGS and its value added to the MDMP and the warfighting capabilities of the BCT.

CPT Mike Monnard was commissioned in September 1992 following graduation from Officer Candidate School. He served with the 1-43 ADA Battalion as an air defense officer until 1996. Upon completion of the MI Transition and Advance Course, he served as a company commander in the 902nd MI Group at Fort Meade, Md. Following command, he served as the division cavalry squadron S2 and 505th Parachute Infantry Regiment S2 at Fort Bragg, N.C. Recently completing 10 rotations as the G2 operations officer for Operations Group, NTC, he currently serves as the light infantry task force S2 trainer.