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JOINT SURVEILLANCE TARGET ATTACK RADAR SYSTEM (Joint STARS)

TABLE OF CONTENTS

PREFACE

This manual provides doctrine and the tactics, techniques, and procedures (TTP) for the employment of the Joint Surveillance Target Attack Radar System (Joint STARS). It also describes the equipment, function, and placement on the battlefield.

This manual describes the doctrine and TTP for the E-8 aircraft crew down to the individual ground station module (GSM) operator. Appendix A is classified and contains Joint STARS mission planning factors. Appendixes B through D describe specific Joint STARS techniques and procedures.

This manual is designed for use by commanders and their staffs; all MI commanders, their staffs, and trainers; and MI personnel at all echelons. It applies equally to the Active Army, United States Army Reserve (USAR), and Army National Guard (ARNG). It is intended for commanders and staffs of joint and combined commands; content may be applicable to United States Navy (USN), United States Marine Corps (USMC), United States Air Force (USAF), and the military forces of allied countries.

The proponent of this publication is the United States Army Intelligence Center and Fort Huachuca, Fort Huachuca, AZ. Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Intelligence Center and Fort Huachuca, ATTN: ATZS-TDL-D, Fort Huachuca, AZ 85613-6000.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

This manual does not implement any International Standardization Agreements but complies with Standardization Agreement (STANAG) 5620, Standards for the Interoperability of Fire Support Automatic Data Processing (ADP) Systems.

Chapter 1

INTRODUCTION

We will never again want to fight without a Joint STARS kind of system

—LTG William C. Key, USMC
Commanding General, 2d Marine Division
(during DESERT STORM)

Joint STARS provides continuous wide area surveillance of surface activity. It serves the ground component commander in much the same way as the Airborne Warning and Control System (AWACS) serves the Air Component Commander (ACC).

WHAT IS JOINT STARS?

Joint STARS is an Army and Air Force multiservice system designed to provide real-time surveillance, intelligence, targeting, and battlefield management information to the Land Component Commander (LCC).

MISSION

The primary mission of Joint STARS is to provide dedicated support to the corps commander and other ground commanders, under the overall direction of the Joint Force Commander (JFC).

One Joint STARS consists of an Air Force owned E-8 aircraft staffed by Air Force and Army personnel and GSMs staffed by Army personnel. Figure 1-1 shows a GSM deployment. Three to five positions onboard the E-8 are staffed by Army personnel who provide tasking and reporting channels between the E-8 and the GSMs.

WHAT DOES IT PROVIDE?

Joint STARS provides Ground Component Commanders (GCCs) access to near-real-time (NRT) radar imagery data that is valuable and accurate and supports the decisionmaking process. Joint STARS provides—

- A value-added capability because it provides NRT indications and warnings (I&W) of threat activity during peacetime or pre-hostilities.

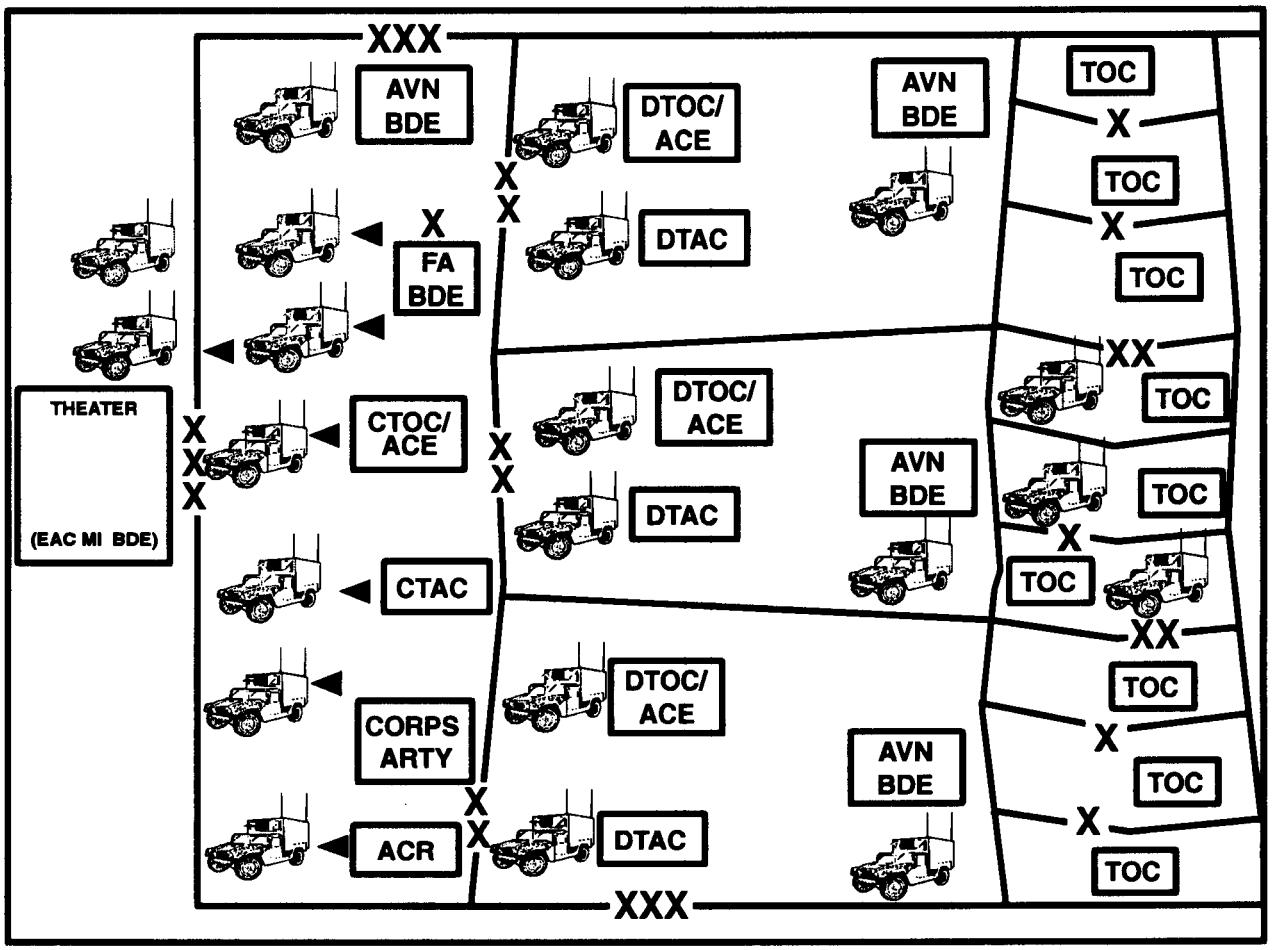


Figure 1-1. GSM deployment.

- A tool that aids the commander in positioning his forces and determining probable places and times for attack and defense.
- The capability to dynamically display moving and massing targets over an entire corps sector about every 60 seconds.
- Intelligence support to those commanders fighting on a fluid battlefield where deep attacks may be defined in all directions.
- The ability to cross-cue other intelligence sensors.
- Immediate NRT response to cross-cuing from other sensors.
- A system that enables all echelons to focus on their area of interest (AI) and to monitor the entire corps sector for I&W, battle management, and targeting purposes.

- Radar imagery in all but the most severe weather.
- The only Wide Area Surveillance System that has the resolution and real-time capability necessary to aid the commander in the future sensor-oriented battle management process. Joint STARS operators receive radar data from deep in the threat rear area. This data includes—
  - — Railhead activities.
  - — Assembly areas.
  - — Lines of communications (LOCs) (as in convoy activity or staging areas).
  - — Movement of threat units from garrison locations to field sites.
  - — Airfield activities.
  - — Displacement of artillery units.

MAJOR COMPONENTS

The Joint STARS major components listed below are fully explained in Chapter 2.

- The E-8 aircraft, which includes—
  - — A communications suite.
  - — Operations and control (O&C) consoles.
  - — Multi-mode radar.
  - — An aircraft self-defense suite (SDS).
- The GSM.

AIR FORCE E-8 AIRCRAFT STAFFING

The E-8 aircraft is authorized a crew of 21 personnel, 3 to 5 of which are Army personnel. They either fly the aircraft or perform mission operations. (See Figure 1-2 for crew member titles and duties and Figure 1-3 for the layout of the E-8 mission crew.)

TITLE	DUTIES
	FLIGHT CREW
Pilot	-Flies aircraft.
Co-Pilot	-Flies aircraft.
Navigator	-Navigates aircraft.
	MISSION CREW
Mission Crew Commander (MCC) (USAF)	-Senior mission crew member onboard (USAF). -In charge of all E-8 functional activities. -Final authority for E-8 mission decisions.
Deputy Mission Crew Commander (DMCC) (USA) (1)	-Senior Army person onboard. -Joint Force Land Component Commander (JFLCC) representative. -MCC ensures air tasking orders (ATOs) are accomplished. -Deconflicts Army radar service request (RSR) requirements with MCC. -Supervisor of airborne search and track operator (ASTO). -Communicates with GSM via UHF radio.
Airborne Surveillance Officer (ASO) (USAF)	-Surveillance section manager. -Coordinates with DMCC for RSR approval. -Coordinates with SD for target development and handover. -Assists with sensor management and system status.
Airborne Surveillance Technician (AST) (4)(USAF) (2)	-Responsible for surveillance functions within an area of responsibility (AOR). -Develops targets and establishes tracks on significant targets. -Can be the radar manager if assigned. -Can be the Joint Tactical Information Dissemination System (JTIDS) manager if assigned. -One E-8 - 4 assistants.
Airborne Search and Track Operator (ASTO)(1) (USA)	-Same functions as AST within an AOR. -Responsible to airborne target surveillance supervisor (ATSS). -Communicates with the GSM.
Senior Director (SD) (USAF) (1)	-Manages weapons section. -Directs employment of direct attack aircraft (DAA). -Coordinates with other USAF command and control (C^2) for immediate DAA and clearances to attack unplanned targets.
Weapons Director (WD) (1)(USAF) (2)	-Responsible to SD. -Provides attack support to assigned DAA and attack helicopters for position and disposition of both preplanned and immediate targets. -Is also a qualified STO.
Communications System Technician (CST) (USAF) (1)	-Responsible to MCC for establishment and maintenance of datalinks, communications, navigation, self-defense, and related avionics equipment.
Sensor Management Officer (SMO) (USAF) (1)	-Responsible to MCC for establishment, optimum configuration and maintenance of consoles and radar subsystems.
Self-Defense Officer (SDO) (USAF) (1)	-Responsible for aircraft self-defense. -Coordinates with airborne intelligence technician (AIT) for latest air and ground threat. -Tracks threats and alerts MCC and pilot. -Can be done by navigator.
Airborne Target Surveillance Supervisor (ATSS) (TSS) (USA) (1)	-Senior Army noncommissioned officer (NCO) onboard aircraft, responsible to DMCC. -Is Army requirements manager. -Coordinates communications. -Responsible for radar allocation, collection priorities, and management or Army RSRs. -Coordinates with ASO for Army RSRs.
Sensor Technician (ST) (Contractors) (3)	-Unique to E-8A. -Assists radar management officer (RMO), SMO, communications system operator (CSO), and CST in system operation.

Figure 1-2. E-8 crew members.

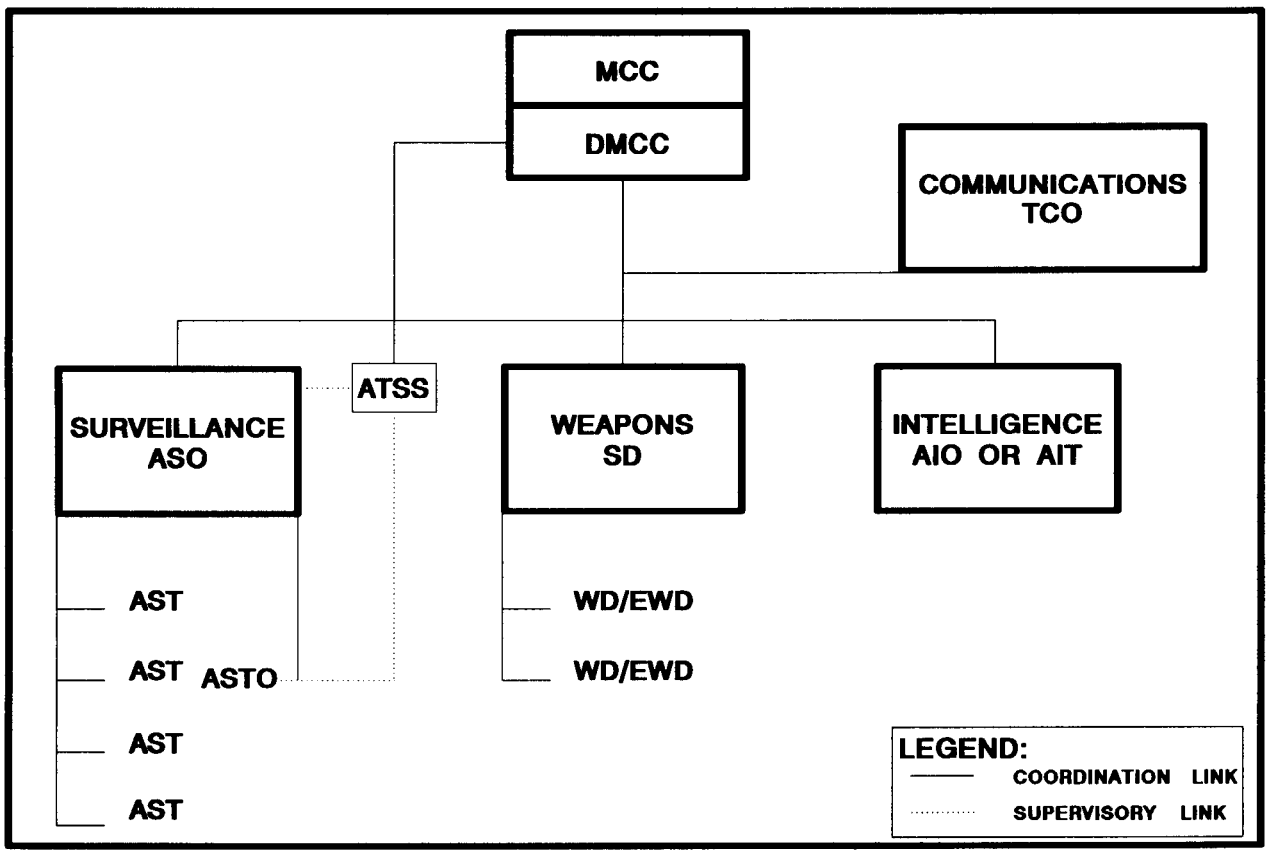


Figure 1-3. Layout of the E-8 mission crew.

GROUND STATION MODULE

Each GSM has two consoles and requires six operators per GSM for 24-hour operation. Two imagery ground station operators (IGSOs) and a team leader-are required to man each GSM shift. MOS 33T soldiers perform unit level intermediate maintenance. (Chapter 6 contains additional data on 33T responsibilities.)

TEAM LEADER:

There are two NCOs assigned to each GSM site. One is also designated as site noncommissioned officer in charge (NCOIC). In addition to the normal shift duties, NCOIC responsibilities are discussed in Chapter 3.

Chapter 2

EQUIPMENT

. . . from a warfighter's perspective, tactical intelligence was not good. What I got, I had to get myself. It was late and did not give me the chance to exploit. You would have thought that someone would have given me access to Joint STARS.

—LTG Ronald Griffith, US Army
CG, 1st Armored Division
(during Operation DESERT STORM)

Joint STARS components consist of two major subgroups:

- The Air Force E-8 aircraft.
- The Army Ground Station Module.

AIR FORCE E-8 AIRCRAFT

The E-8 aircraft is a militarized Boeing 707-300 series aircraft. The aircraft currently carries a flight and mission crew of 21 Army and Air Force personnel.

Currently, there are 3 very high frequency (VHF), 12 ultra-high frequency (UHF), and 2 high frequency (HF) radios on the E-8. In addition, there are 2 Joint Tactical Information Dissemination Systems (JTIDSs) and 1 Surveillance and Control Data Link (SCDL) data terminal for digital communications. The E-8 will have this communication suite and a Constant Source terminal. Constant Source is a signals intelligence (SIGINT) feed into the E-8 which allows correlation of Joint STARS data with other intelligence data.

The E-8 is equipped with a phased-array radar antenna housed in a 26-foot canoe-shaped radome located under the forward part of the fuselage. The E-8 houses the radar equipment in the forward bottom cargo bay directly above the radome. The cargo bay can be accessed from inside the plane, allowing for limited inflight maintenance of the radar.

In addition to communications antennas, the E-8 aircraft has two SCDL antennas. One SCDL antenna is mounted on the top, and one is mounted on the bottom of the E-8 aircraft to provide a continual datalink to the GSM, even when the E-8 turns during flight. Figure 2-1 shows the configuration of the interior of the E-8.

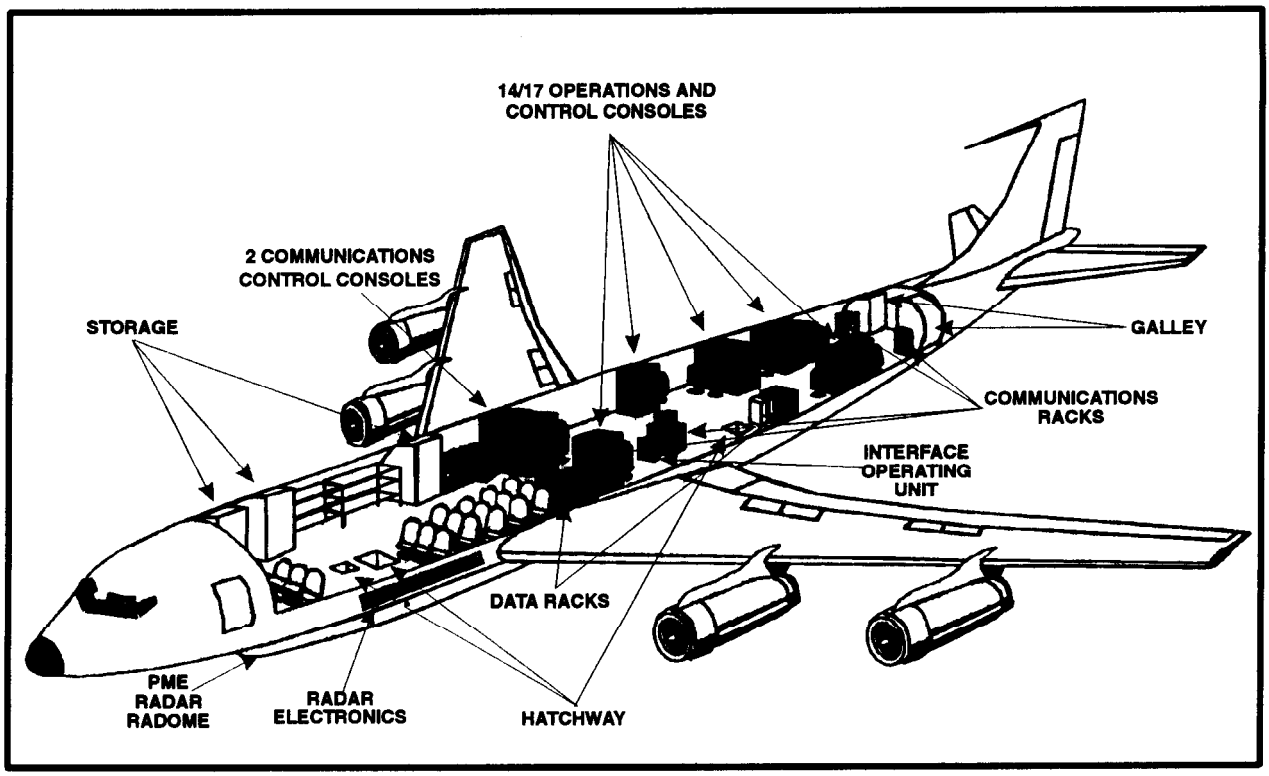


Figure 2-1. Configuration of interior of the E-8.

FLIGHT CAPABILITIES:

The E-8 operates at a maximum ceiling of 42,000 feet with a planning endurance time of 11 hours (20 hours 'with in-flight refueling). The crew can be expanded to 35 personnel for extended missions. A normal mission profile provides for 8 hours of on-station time with 2 hours' total transit time to and from the orbit area.

COMMUNICATIONS:

A 5-channel intercommunications system, which links all workstations and flight crew positions, provides the internal communications for the E-8. This system allows the functional areas of flight, command, surveillance, weapons, intelligence, and maintenance to conduct mission coordination in flight. There are also three plug-in communications boxes not associated with workstations which can be used while walking around or standing behind a workstation.

The external communications provide voice and data transmissions for line-of-sight (LOS) and non-line-of-sight (NLOS) communications.

The communications suite allows the mission crew to provide voice and digital information. The crew conducts mission coordination with a variety

of command, control, communications, and intelligence (C^3I) and sensor platforms, weapons systems, and ground command, control, communications, computers, and intelligence (C^4I) nodes. Satellite communications (SATCOM) provides capability for NLOS communications to Joint C^4I nodes, to GSMs out of LOS, and during force projection operations when GSMs have not arrived in theater.

The communications suite also allows for digital links over JTIDS, SCDL, and Constant Source. JTIDS provides digital processed intelligence reports and targeting updates into the E-8. It also allows E-8 operators to pass information to other Air Force platforms and C^4I nodes such as AWACS. The Joint STARS moving target indicator (MTI) and synthetic aperture radar (SAR) data are transmitted over the SCDL to all GSMs within LOS.

The SCDL also allows for reprocessed radar data which includes tracked versus unknown indications, target locations, E-8 location and speed, and information time tags. The SCDL carries the RSR and freetext messages from the GSM to the operators on the E-8. Figure 2-2 shows the SCDL and JTIDS information exchange capabilities.

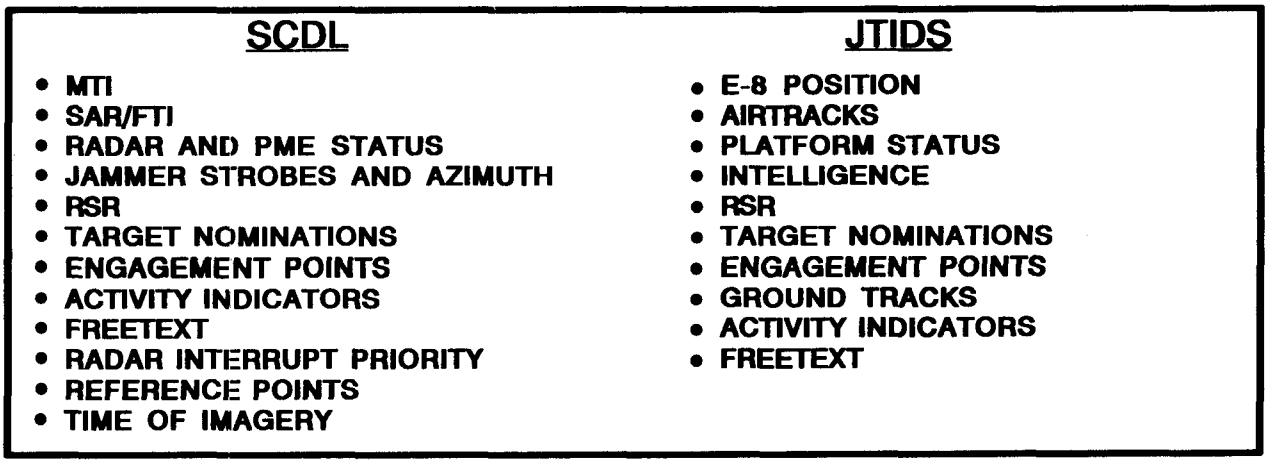


Figure 2-2. SCDL and JTIDS information exchange capabilities.

The following are major communications equipment on the E-8:

- 3 x VHF radio, RT-1300C Single-Channel Ground Airborne Radio System (SINCGARS).
- 3 x VHF collocation filters, F-1613/A.
- 3 x VHF crypto TSEC KY-58.
- 12 x UHF agile filters (E-8 only).
- 12 x UHF radios, AN/ARC-l64/HAVE QUICK.

- 12 x UHF crypto TSEC KY-58.
- 2 x HF radios, RT-1341 (V) 3/ARC 190.
- 2 x HF crypto and VT (E-8 only).
- 2 x HF crypto KY-75.
- 2 x JTIDS Class II (with KGV-8 crypto).
- 1 x SCDL air data terminal (ADT) (with KGV-8 crypto).
- 1 x Constant Source with commander's tactical terminal (CTT). The name of the CTT has been changed to joint tactical terminal (JTT). All references to CTT are hereinafter referred to as JTT.

Operation and Control Console Capabilities. The O&C console subsystem allows the mission crew to access the radar data in real-time on their consoles. These are basically the same capabilities that exist in the GSMs as shown in Figure 2-3. The workstations allow operators to tailor the radar products to their needs. They can access databases to provide amplifying information on friendly and enemy order of battle (OB), receive and send freetext messages over SCDL, and conduct crew coordination. The operators can perform history playback, construct SAR mosaics, track targets, and perform target position predictions. There is also a printer capability to provide prints of time-designated screen displays with complete annotations.

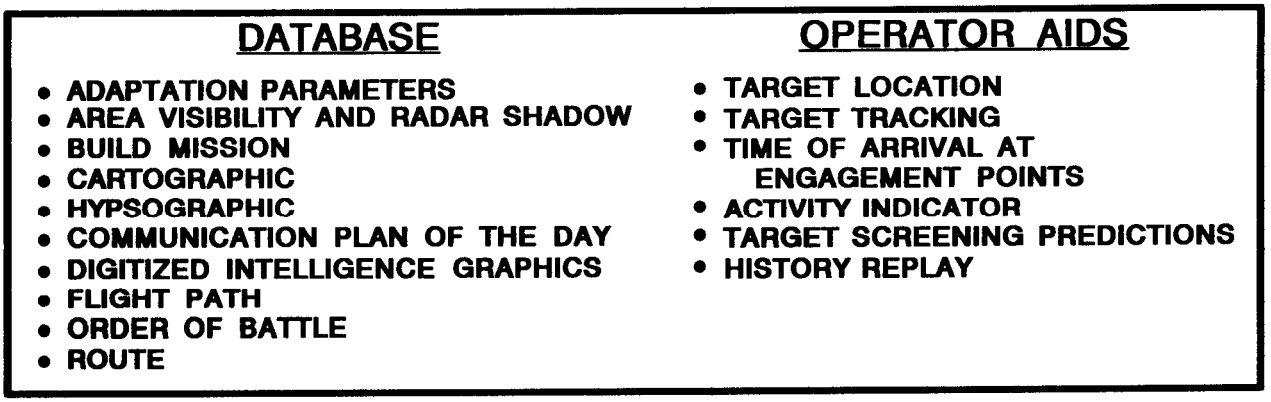


Figure 2-3. Operations and control console capabilities for Block I LGSMs.

The mission crew can zoom in or out on the surveillance area by adjusting the scale parameters on the cartographic image displayed on their console screens. The operator can measure and display distance and azimuth

between specific geographic points contained in the database and between selected targets. All necessary graphics, including standard military symbols, can be drawn or retrieved from the database for display on the screens.

The operators can conduct time and route prediction. The estimated time of target arrival to selected points or along selected routes can be predicted along with the route predictions. This reinforces the targeting capabilities of the system. Mission crew members (in coordination with DAA, ground or naval weapons systems, and land forces) can track designated target sets into specified kill zones. They can then notify the supported weapon systems or forces of target arrival or target deviation from the predicted route in NRT.

The time compression function refers to the ability to record MTI radar data over time and then fast forward the data frames (similar to a commercial video cassette recorder [VCR]). This capability is useful in tracking the target start point, route, and end point over a selected period. This provides the cue on where to image the target with SAR. The SAR helps identify possible assembly areas, command posts (CPs), logistics sites, and defensive positions for targeting.

The time integration function refers to the ability of the system to overlay successive frames on top of each other over a selected period and display them all at onetime on the screen. This allows for the rapid identification of main supply routes (MSRs) and LOCs. From this information, possible rest sites, assembly areas, and logistics sites, for example, can be determined. The time integration function is in all GSMs. This function also provides cross-cuing for other sensors (or SAR) to confirm and target the locations. The operator must be careful when analyzing this type of target signature; other targets such as powerlines and concertina wire could be confused with “route-like signatures” targets.

Radar Capabilities. The E-8 radar is capable of looking deep into hostile and potentially hostile areas to detect, locate, classify, and track a variety of targets. It can be operated in two basic radar modes:**MTI** and **SAR.** The primary MTI mode is called wide area surveillance (WAS). WAS is the prime mode in radar which covers beyond a notional corps area called the ground reference coverage area (GRCA). Figure 2-4 shows an example of GRCA.

The interleaving capability of the radar allows the system to perform multiple operations (such as MTI, sector search, and SAR) without disrupting the WAS revisit rate (unless many operations are being conducted simultaneously). The mission crew and GSM crew operators do not see any major disruption of data on their screens because

of the high processing capability and NRT transmission of the radar data over SCDL.

The MTI mode locates moving vehicles, rotating antennas, and slow-moving aircraft. This mode presents dots on a workstation monitor representing targets moving at a given speed on the ground. The radar can perform a target classification function of tracked versus wheeled versus unknown (Block I series of GSMs only). The location of the target or target sets can be selected in either universal transverse mercator (UTM) or latitudinal and longitudinal coordinates.

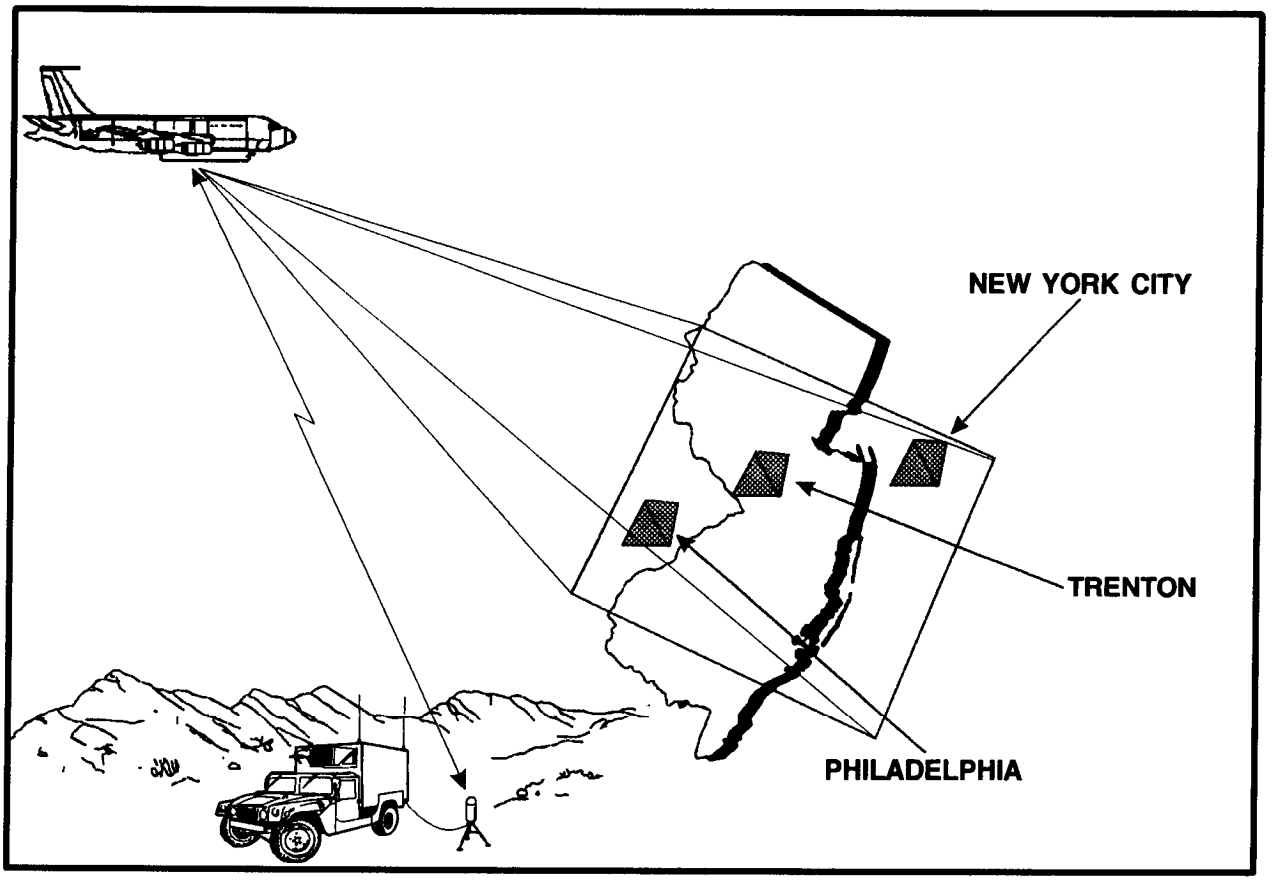


Figure 2-4. Ground reference coverage area (GRCA).

In addition to WAS, MTI consists of four other sub-modes: **sector search** (SS), **attack planning** (AP), **attack control** (AC), and **small area target classification** (SATC). These subsets of MTI are used in special cases when a critical and scarce targeting asset is used against a high-payoff target (HPT). The MTI sub-modes are used for the following:

- SS occurs when the radar is focused on a smaller field of view and provides image updates to the requesting GSM faster than the WAS revisit rate.
- AP updates the workstation faster than the SS mode.
- AC updates the workstation even faster than the AP mode.
- SATC differentiates between wheeled and tracked vehicles.

The radar can also be operated in SAR and fixed-target indicator (FTI) modes. In the SAR mode it can produce a still radar image of a given target, installation, or piece of terrain. It is best used to locate those moving targets that have become stationary and are suspected to be in a given area. Stationary targets are detected and registered in their geographic position in the SAR image. This SAR function is usually cued by activity previously seen in the MTI mode. The vehicles targeted are automatically detected and highlighted. A SAR image looks much like a black and white picture negative with highly radar reflective surfaces showing up as bright spots.

The FTI mode provides a display of only the stationary targets. The targets are more easily recognized because in the FTI mode the target dot is presented on the screen without any surrounding terrain.

SAR also allows limited target damage assessment (TDA) in addition to its targeting application. The images do not allow an operator to determine if a vehicle has been destroyed, only that it is stationary. It can show damage to large manmade structures, such as bridges.

Self-Defense Suite Capabilities. The SDS on board the E-8 is designed to provide some measures of defense against air and ground threats. The SDS provides the aircrew with continuous situational awareness and has an end-game countermeasures package designed to protect the aircraft from various types of air- and ground-launched missiles. it receives threat information over JTIDS and Constant Source terminals from AWACS, Airborne Command and Control Center (ABCCC), RIVET JOINT, other air- and ground-based sensors, and C^3I nodes. The navigator staffs this position and conducts all navigation functions in addition to the SDS functions.

ARMY GROUND STATION MODULES

The GSMs have evolved through several product models. (See Figures 2-5 and 2-6 for an overview of Joint STARS GSM evolution and capabilities.)

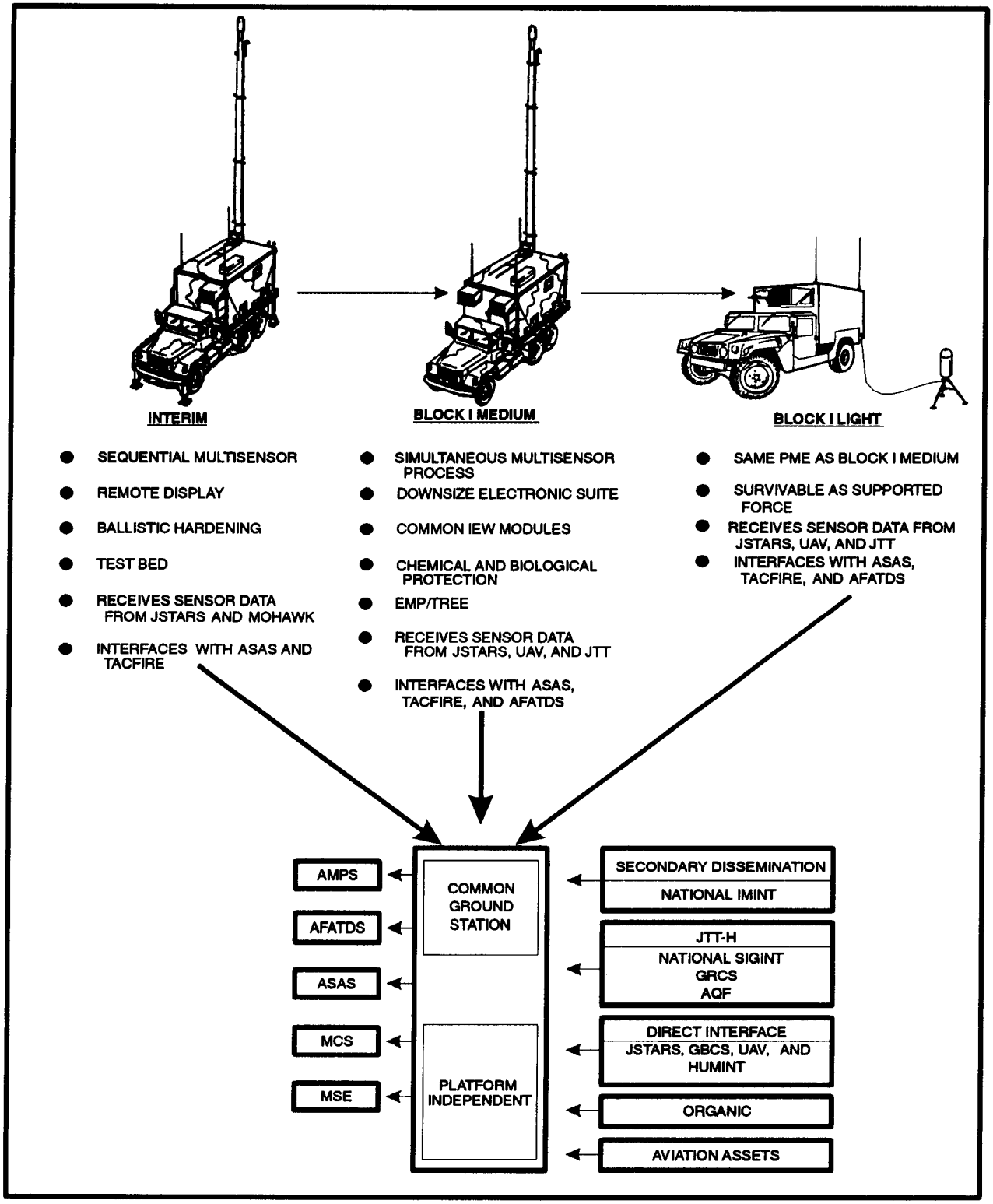


Figure 2-5. JSTARS GSM evolutionary program.

SYSTEM	PRIME MOVER	GENERATOR	COMMUNICATIONS	INTERIOR AND CAPABILITIES
INTERIM GROUND STATION MODULE (IGSM) AN/TSQ-132(V)1	5-TON CARGO TRUCK AND 5-TON SUPPORT CARGO VEHICLE (M-923 SERIES WITH S-679 SHELTER 100-FOOT PNEUMATIC MAST, FRONT AND REAR LEVELING SYSTEM, AND ENVIRONMENTAL CONTROL UNIT.	2 X 30 kW 50 TO 60 Hz GENERATORS WITH ENVIRONMENTAL COVERS AND A 100-FOOT POWER CABLE.	2 X AN/VRC-92 (SINCGARS) VHF RADIOS, 1 X AN/VRC-83 UHF RADIO, 2 X TA/312 FIELD PHONES, 1 X KY-68 (MSE). ** MSE AND SINCGARS CAN TRANSMIT TACFIRE MESSAGES DIGITALLY.*	2 OPERATOR MONO-COLOR CONSOLES WITH MENU-DRIVEN FLAT PANELS, KEY-BOARD AND TRACKBALL, AND COLOR AND BLACK AND WHITE PRINTERS. RECEIVES WAS, SS, AP, AC MTI IMAGERY, AND SAR IMAGERY FROM E-8 AIRCRAFT. RECEIVES MTI IMAGERY FROM MOHAWK AIRCRAFT.
MEDIUM GROUND STATION MODULE (MGSM) AN/TSQ-168	5-TON CARGO TRUCK AND 5-TON SUPPORT CARGO VEHICLE (M923 SERIES) WITH S-751 SHELTER, 30-FOOT HEAVY MAST, AND TWO ENVIRONMENTAL CONTROL UNITS.	2 X 30 kW 50 TO 60 Hz GENERATORS WITH ENVIRONMENTAL COVERS AND A 100-FOOT POWER CABLE.	2 X AN/VRC-92 (SINCGARS) VHF RADIOS, 1 X AN/VRC-83 UHF RADIO, 2 X TA/312 FIELD PHONES, 1 X KY-68 (MSE) WITH FAX, 1 X 2 CHANNEL JTT, 1 X SATURN RADIO (SATCOM), STU-III, AND 1 X CELLULAR PHONE. ** MSE AND SINCGARS CAN TRANSMIT TACFIRE AND ASAS MESSAGES DIGITALLY.* ** CANNOT OPERATE WHILE ON THE MOVE.* ** HAS LGSM SOFTWARE.*	2 OPERATOR CONSOLES (COLOR) WITH ON-SCREEN WINDOW TYPE PANELS, KEYBOARD AND TRACKBALL, AND COLOR AND BLACK AND WHITE PRINTERS. CAN CALL UP ON-SCREEN DIGITAL E-MAPS, DATED DATA, AND JTT ICONS. RECEIVES WAS, SS, AP, AC, SATCOM MTI IMAGERY, FTI IMAGERY, AND SAR IMAGERY FROM E-8 AIRCRAFT. RECEIVES UAV ELECTRO-OPTICAL AND INFRARED IMAGERY.
LIGHT GROUND STATION MODULE (LGSM) AN/TSQ-178	2 X HMMWVs WITH SHELTERS. 1 X 30 - FOOT MAST ON SUPPORT SHELTER OR GROUND-MOUNTED TRIPOD. CAPABLE OF OPERATIONS ON THE MOVE.	2 X 15 kW 50 TO 60 Hz GENERATORS. PROVIDES ELECTRICITY FOR OPERATIONS ON THE MOVE OR IN A STATIC MODE.	2 X AN/VRC-92 (SINCGARS) VHF RADIOS, 1 X AN/VRC-83 UHF RADIO, 2 X TA/312 FIELD PHONES, 1 X KY-68 (MSE) WITH FAX, 1 X 2 CHANNEL CTT, 1 X SATURN RADIO (SATCOM), STU-III AND 1 X CELLULAR PHONE. ** MSE AND SINCGARS CAN TRANSMIT TACFIRE AND ASAS MESSAGES DIGITALLY.* ** CAN RECEIVE JSTARS IMAGERY WHILE ON THE MOVE.*	2 OPERATOR CONSOLES (COLOR) WITH ON-SCREEN WINDOW TYPE PANELS, KEYBOARD AND TRACKBALL, AND COLOR AND BLACK AND WHITE PRINTERS. CAN CALL UP ON-SCREEN DIGITAL E-MAPS, DATED DATA, AND JTT ICONS. RECEIVES WAS, SS, AP, AC, SATCOM MTI IMAGERY, FTI IMAGERY, AND SAR IMAGERY FROM E-8 AIRCRAFT. RECEIVES UAV ELECTRO-OPTICAL AND INFRARED IMAGERY.
COMMON GROUND STATION (CGS)	2 X HMMWVs WITH SHELTERS. 1 X 30-FOOT MAST ON SUPPORT SHELTER OR GROUND-MOUNTED TRIPOD. CAPABLE OF OPERATIONS ON THE MOVE.	2 X 15 kW 50 TO 60 Hz GENERATORS. PROVIDES ELECTRICITY FOR OPERATIONS ON THE MOVE OR IN A STATIC MODE.	UNKNOWN - SYSTEM BASED ON LGSM.	HAS SAME CAPABILITY AS LGSM PLUS 3-CHANNEL JTT, IMPROVED SATCOM, AVIATION INTERFACE LINK, AND SECONDARY IMAGERY INPUT THROUGH JTT.

Figure 2-6. GSM capabilities.

The first system was called the Interim Ground Station Module (IGSM). The current system is the Block I series (Medium Ground Station Module [MGSM] and Light Ground Station Module [LGSM]). The future system will be the Block II Common Ground Station (CGS).

INTERIM GROUND STATION MODULE:

The IGSM (AN / TSQ-l32(V)1) is an S-679 shelter on a modified 5-ton cargo truck. It is staffed by a team of six Army personnel and consists of a ground data terminal (GDT), a communications system, and an operations system. Together, these systems allow operators to manipulate data received from the E-8 aircraft. Figure 2-7 shows the configuration of the IGSM.

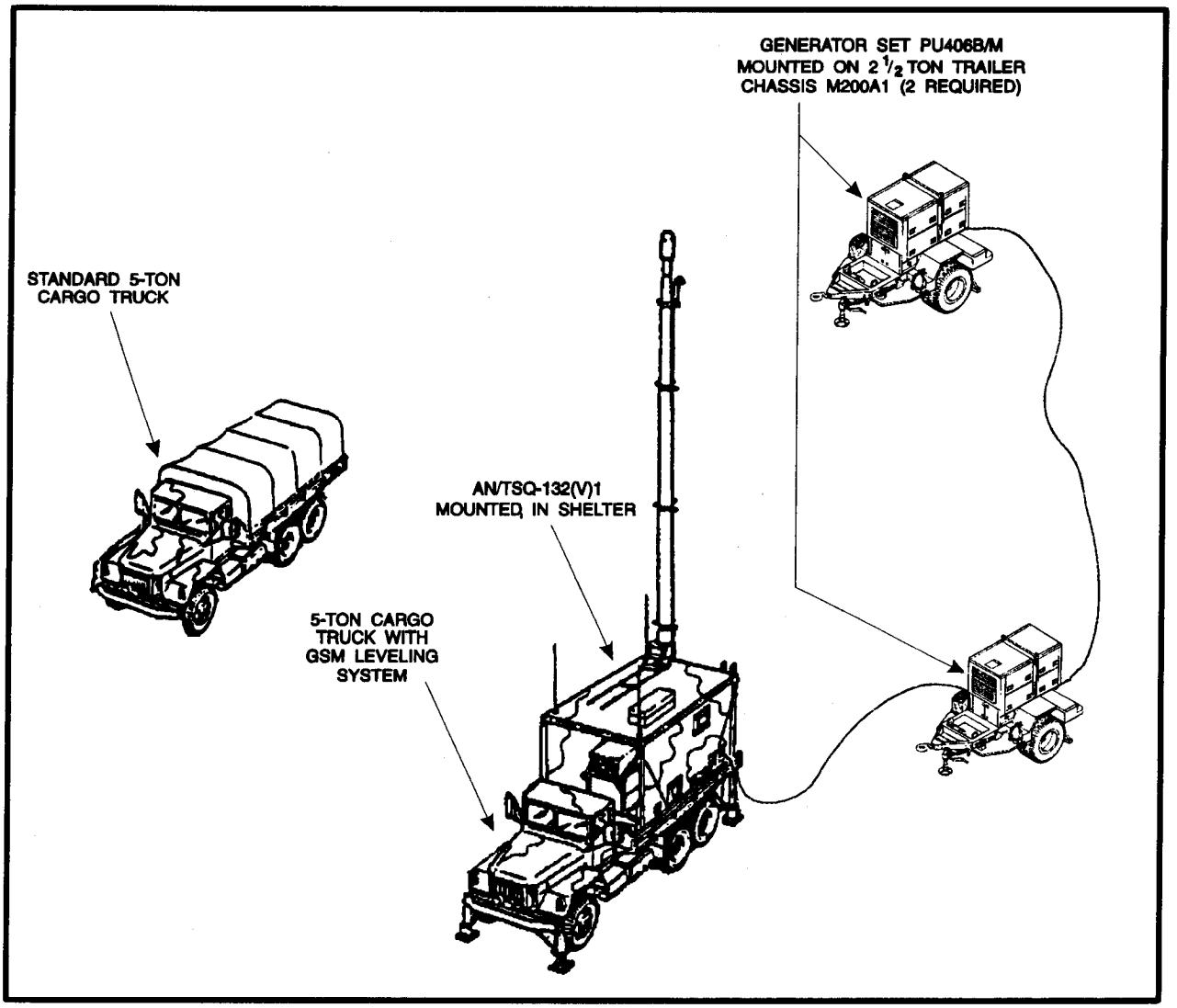


Figure 2-7. IGSM diagram.

Exterior. The IGSM system is comprised in part by two 30 kW 50 to 60 Hz generator power units which connect to the IGSM shelter via a control monitor and a 100-foot power cable on all IGSMs. These generators are towed by two M-923 series 5-ton cargo trucks. One five-ton truck is unmodified and is used as a support truck to carry spare equipment and

other mission-essential items. The other 5-ton truck is modified with a mechanical leveling system and is used to carry the IGSM shelter. The IGSM shelter is an S-679 which has intake and exhaust vents, an environmental control unit, and a retractable 100-foot pneumatic mast and cable reel system as modifications. Atop the mast is the SCDL and a UHF antenna.

Interior. The IGSM shelter houses two operator consoles, each consisting of a scan screen, two menu driven flat panels, and a militarized keyboard and trackball. Figure 2-8 shows the interior of an IGSM. These consoles receive data from the GDT via input and output controllers. The GDT consists of a digital-to-digital converter (DDC), 400 Hz converter, lower control unit, Joint STARS interface unit (JSIU), and SCDL.

Graphics (roads, borders, cities, and overlay control measures) are digitized from maps onto the screens via a digitizer, small and large plotting boards, and a map "bug." (A map bug is an electronic device that allows operators to trace map data and graphics and transfer information to the computer, which enables maps and graphics to be displayed on the operator's monitor.) Data and graphics are stored on removable disks.

The AYK-14 computer controls the system. An AN/VRC-83 UHF radio provides voice communications with the E-8 aircraft. Two TA-312/PT telephones, now in all IGSMs, provide voice communications. The third TA-312 has been replaced by mobile subscriber equipment (MSE), KY-68, which is used for landline secure voice communications. SINCGARS (AN/VRC-92) radios are used to transmit TACFIRE data. Hard copies of messages are printed on a line printer, and a three-color screen printer produces a color hard copy of the forward screen. Figure 2-9 shows at a glance what the Joint STARS MTI and SAR can and cannot do for the commander.

Capabilities. The IGSM receives NRT data to include MTI and SAR from the E-8 platform and MTI from the Mohawk UPD-7 platform. Figure 2-10 is an example of IGSM interfaces. The IGSM is able to receive Joint STARS MTI imagery.

The types of MTI that can be received are WAS, SS, AP, AC, and SATC. This data is then analyzed and disseminated to supported units via available communications systems. Each operator—

- Can display historical data based on operator designated times. Each operator can also measure and display distance and azimuth between specified geographic points contained in the database and between selected targets.

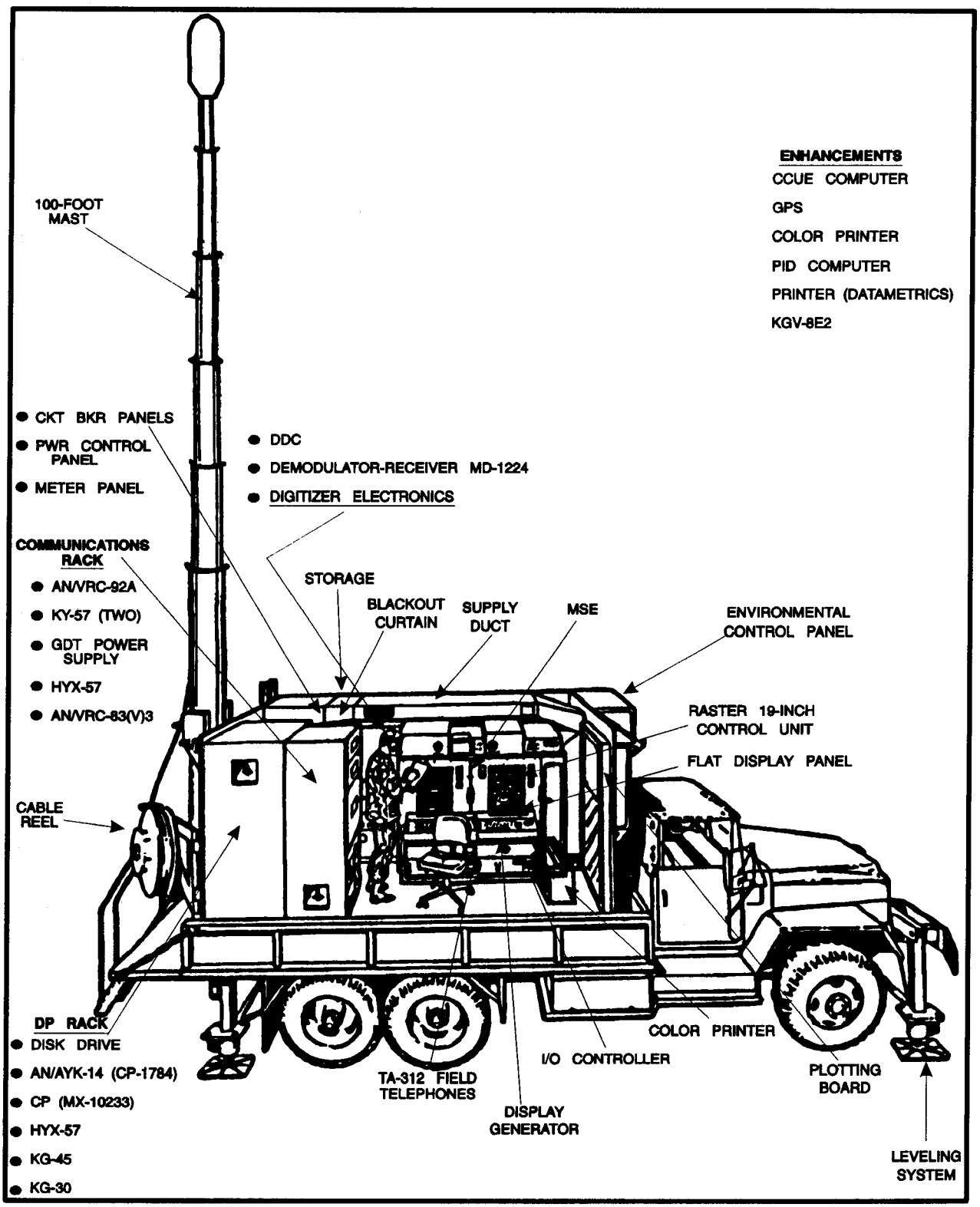


Figure 2-8. IGSM Interior.

JOINT STARS MTI CAN SHOW—

- Ground vehicles the size of a jeep or larger moving at speeds greater than 3 mph.
- Slow-moving aircraft (fixed wing and rotary wing).
- LOC convoy movement, with direction, speed, location, and time.
- Choke points based on traffic analysis.
- Operational bridges and causeways due to traffic existing on structure.
- Possible locations of logistical sites, CPs, and rest stops; for example, look at areas where dots move to and then disappear.
- Target classification: Tracked, wheeled, and unknown type of vehicle.

JOINT STARS MTI CANNOT—

- See through hills and mountains because of terrain masking.
- Identify, for example, the difference between a T-72 or T-55 tank moving on a road.
- Tell you where static defended areas are; if they are manned, with what type of weapon system or if they are vacant.
- Locate, track, and identify people moving on the ground.
- Detect or track rockets or tactical ballistic missiles in flight.

JOINT STARS SAR CAN—

- Through pattern analysis, confirm the presence of occupied (or unoccupied) artillery, surface-to-air missile (SAM), and air defense artillery (ADA) sites.
- Provide images of defensive positions; for example, trenches and revetments.
- Support limited TDA; that is, on bridges (by looking for traffic on them).

JOINT STARS SAR CANNOT—

- Tell you what kind of vehicles are in a particular location, only that there are (or are not) vehicles in a particular location.
- By itself, detect mobile SSM units. (The Joint STARS must cue or be cued by other sensors.)
- Build a theater-level mosaic for you (because the SAR frame is relatively small compared to the view given by MTI radar).

Figure 2-9. Shows what JSTARS MTI and SAR can and cannot do.

- Is capable of digitizing selected portions of military maps by using a digitizer board inside the GSM. The digitized information can then be displayed on the screen with the MTI dots on the map. The operators can also draw all necessary graphics, including standard military map symbols on their screens to aid in data exploitation.

- Can build and maintain 16 target files. The operator can use the target sets in the target files to automatically track targets. The operator can also predict the estimated time of arrival or estimated target location of selected targets along selected routes to specified points or times.

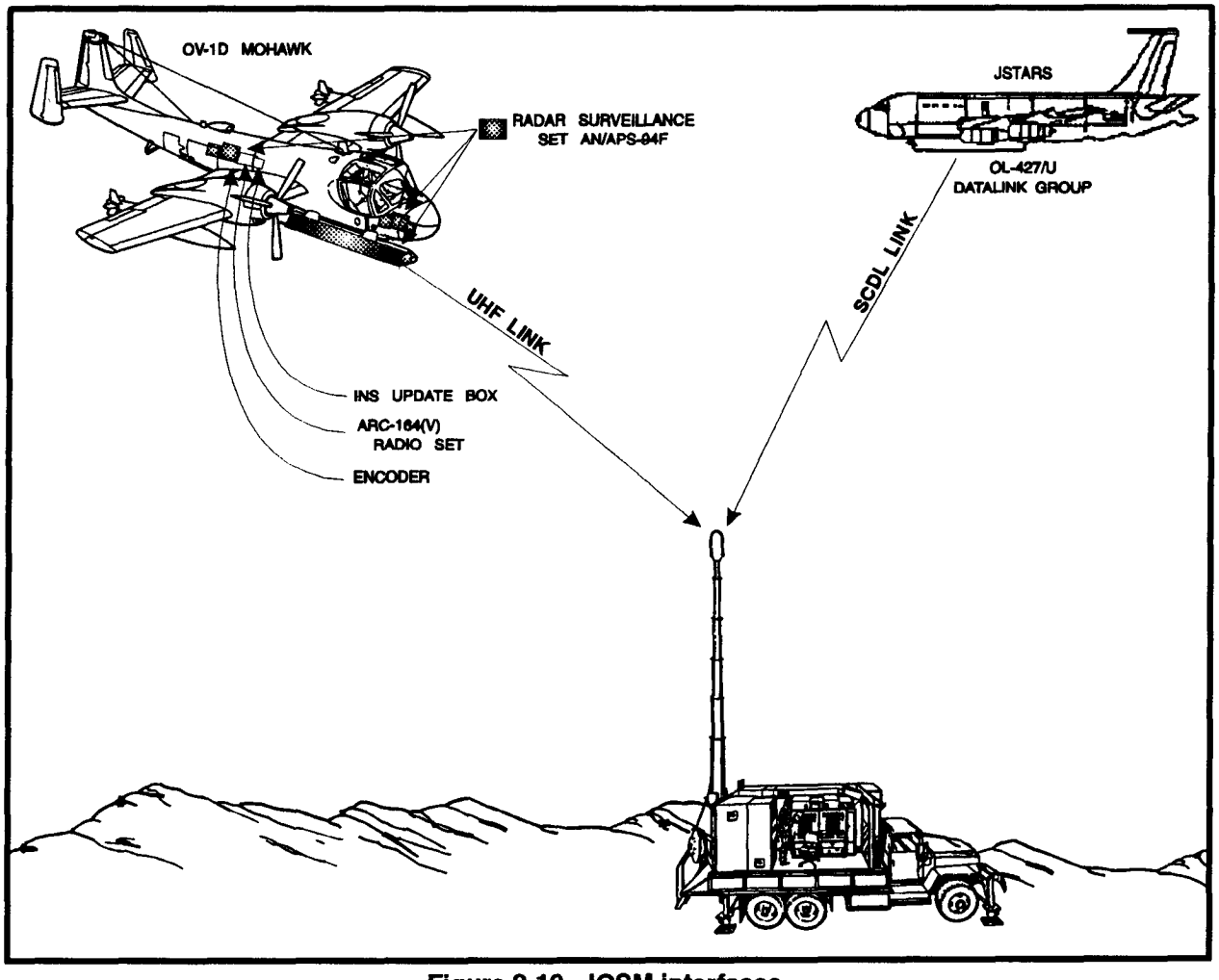


Figure 2-10. IGSM interfaces.

Operators can store, recall, and display historical data in single frame, time compression, and time integration modes. The targeting aspects of this capability are obvious. The operator, in coordination with the fire support element (FSE), can track designated target sets into specified kill zones, notify the FSE when they arrive in the kill zone, or if they have deviated from their theoretical routes—all in NRT.

- Has a secure voice and datalink with the Tactical Fire Direction System (TACFIRE). Immediate taskings can be sent via secure voice or wire via TACFIRE channels, and the results of the taskings can also be sent via this link. The operators also have a color printer in the IGSM that can print designated screen displays with annotations upon request. The operators can also display a listing of all messages in the database for reference.

The IGSM operator can communicate with supported units via voice landline, UHF, VHF, TACFIRE, MSE, or SCDL freetext messages to the E-8 or other IGSMs. He can also send a hard copy via messenger. The IGSM may request images of a specific area through voice communication with the E-8 or an RSR for any type of MTI coverage via the SCDL.

BLOCK I, MEDIUM GROUND STATION MODULE (MGSM)

The MGSM (AN/TSQ-l68) is an S-751 shelter mounted on a modified 5-ton cargo truck. It is staffed by a team of six Army personnel and consists of a GDT, a communications system, and an operations system. Together, these systems allow operators to manipulate data received from the E-8 aircraft. Except where noted, the MGSM has the same capabilities as the IGSM.

EXTERIOR:

The MGSM system is comprised of two 30 kW 50 to 60 Hz mobile generator power units which connect to the MGSM shelter. These generators are towed by two M-923 series 5-ton cargo trucks. One 5-ton truck is unmodified and is used as a support truck to carry spare equipment and other mission-essential items. The MGSM shelter has a positive over-pressure system, an environmental control unit, and a retractable 30-foot pneumatic mast and cable reel system as modifications. The SCDL is mounted on top of the mast.

INTERIOR:

The MGSM shelter houses two operator consoles, each consisting of a high resolution screen and a militarized keyboard and trackball. These consoles receive data from the JSIU. Graphics (roads, borders, cities) are digitized from maps onto the screens via a digitizer and a map “bug.” Data and graphics are stored on a data storage cartridge. An AN/VRC-83 UHF radio is used for voice communications with the E-8. The AN/VRC-92 SINCGARS radios are used to transmit voice and data messages to TACFIRE.

COMMUNICATIONS:

The GSM can pass information to its supported units, to the E-8, or other GSMs via voice landline, UHF, VHF, hardwire KY-68, MSE, facsimile (FAX), hard copies, SCDL freetext, SATCOM, cellular telephone, 312, and STU-III messages. Operators may request images of a specific area through voice communication with the E-8 or an RSR for any type of Joint STARS imagery via the SCDL.

CAPABILITIES:

The Block I MGSM receives real-time MTI data and NRT SAR from the E-8 platform. It can pull up UAV data or video on a small "window" on the console screen. The Block I MGSM is able to receive Joint STARS WAS, SS, AC, AP, and SATC. This data is then analyzed and disseminated to supported units via several available communications systems.
Figure 2-11 shows the characteristics of the Block I MGSM. Only a total of 12 MGSMs will be built.

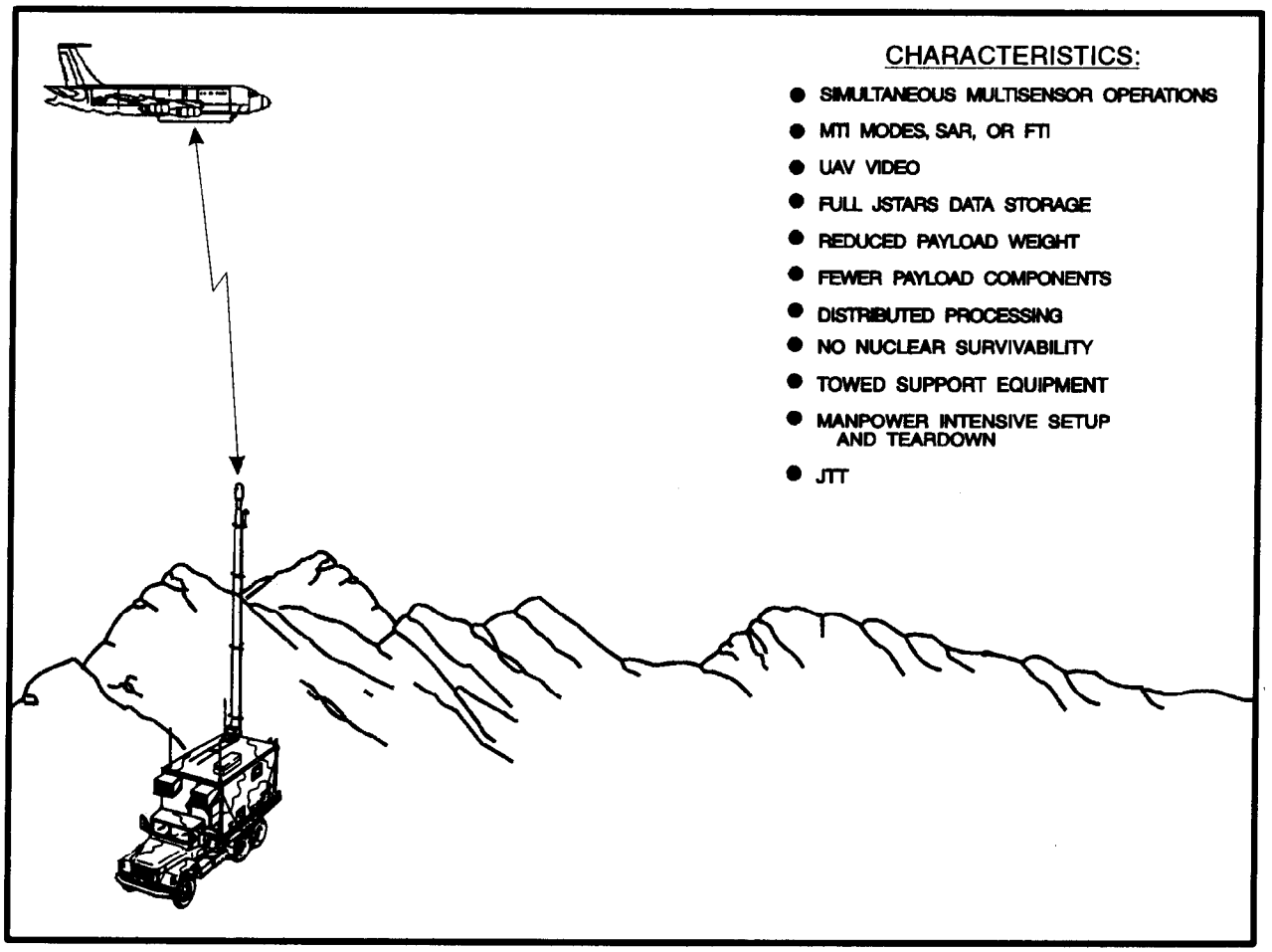


Figure 2-11. GSM Block I MGSM characteristics.

BLOCK I, LIGHT GROUND STATION MODULE (LGSM)

The LGSM, AN/TSQ-l78, is transported on two high mobility multipurpose wheeled vehicles (HMMWVs) with trailers. One HMMWV is configured as the mission operations vehicle and primary mission equipment.

The vehicle also provides CTT, VHF, UHF, and UHF SATCOM communication capabilities. The second HMMWV is configured as the support vehicle with generator trailer. Primary component in the support vehicle is a 30-foot SCDL mast or ground-mounted tripod. Other components in the support vehicle include two crew seats, camouflage netting, and cables.

EXTERIOR:

The LGSM system is comprised, in part, of two 15 kW 50 to 60 Hz mobile generator power units which connect to the LGSM shelter. These generators are towed by two HMMWVs. The LGSM shelter has a positive over-pressure system and environmental control unit. The LGSM can use a removable SCDL head mounted on a tripod in lieu of the mast.

INTERIOR:

The mission support LGSM shelter houses two operator consoles, each consisting of a high resolution screen and a militarized keyboard and trackball. These consoles receive data from the CTT, UAV ground control station (GCS), all-source analysis system (ASAS) and TACFIRE, WAS, SS, AP, AC, SATC, MTI, FTI, and SAR imagery. Graphics (roads, borders, cities) are digitized from maps onto the screens via a digitizer and a map "bug." Data and graphics are stored in data storage cartridges. AN/VRC-83 UHF and VHF radio are used for voice communications with the E-8. AN/VRC-92 SINCGARS radios are used to transmit voice and TACFIRE data. A KY-68 MSE secure telephone is used to transmit information to and from ASAS. Copies of messages are printed on a line printer, and a three-color screen printer produces a color hard copy of the console screen.

COMMUNICATIONS:

The Block I MGSM is exactly the same as the LGSM in communications equipment.

CAPABILITIES:

The Block I LGSM has virtually the same capabilities as the Block I MGSM except that it is transported by a different prime mover and has SATCOM receive on-the-move capability. Also because of the inherent flexibility built into the LGSM, it is easy to achieve technological upgrades and accomplish vehicle reconfiguration to support operations. For example, the vehicles can move with the Tactical Operations Center (TOC), receive SCDL data on the move, and setup quickly to support the commander. Figure 2-12 shows LGSM characteristics.

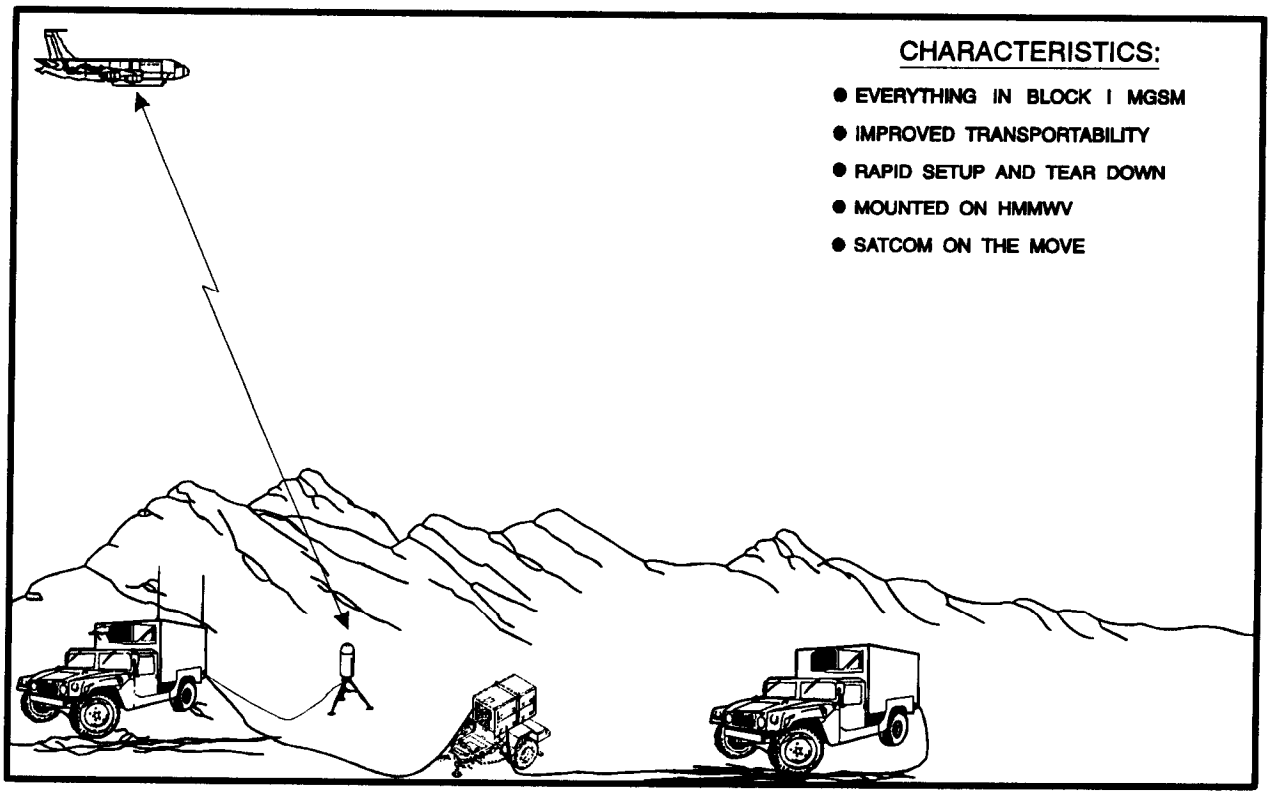


Figure 2-12. GSM Block I LGSM characteristics.

COMMON GROUND STATION (CGS)

The CGS will provide commanders a greatly expanded and automated capability to receive, process, correlate, and display NRT intelligence data from all available sensors. Evolutionary growth and retrofit of existing GSMs will upgrade capabilities and functions.

The CGS will have all the functions of the GSMs, to include improvements in processing, data reception, and data distribution. CGS will be able to receive, process, and correlate data directly from new and/or additional sensors and processors such as Advanced QUICKFIX (AQF), ground based common sensor (GBCS), and tactical exploitation of national capabilities (TENCAP) systems. The CGS—

- Provides the commander with a fully adjustable, deployable, mobile, and responsive intelligence processing capability to satisfy operational requirements using GSM mission equipment.

- Receives and stores secondary imagery for integrated use in the system.
- Provides full imagery, message, and analytical interface with ASAS.
- Provides capability to maintain and manipulate related intelligence and electronic warfare (IEW) databases. It displays situation and database information in a graphic format.
- Provides capability to access IEW common databases.
- Prepares, maintains, and disseminates current enemy situation graphics. Corps and division will provide periodic updates.
- Provides multiple, simultaneous displays selected manually or automatically, and incorporates these products as a minimum. For example:
  - — Live full motion video (such as National Television Standards Committee or Phase Alternating Line) from camera, tape recorder, or video disc.
  - — Forward-looking infrared (FLIR) input.
  - — Other electro-optical or infrared imaging capable system input as technology permits.
- Simultaneously receives, processes, and displays data (annotated imagery, text, graphics) from any combination of the following systems:
  - — Assigned or attached sensors through manual or automated inputs as designated.
  - — GBCS, AQF, and long range surveillance units (LRSUs).
  - — GUARDRAIL Common Sensor (GRCS) and Airborne Reconnaissance Low (ARL).
  - — National sensor systems.
- Requests information or collection support through ground processors.

Initially, the CGS requires secondary data distribution and communications capability, such as SATCOM or MSE between GSMs.

Chapter 3

MISSION OPERATIONS

This chapter covers both Ground Station Module (GSM) and E-8 mission operations.

On 30 January 1995 the Commanding General of TRADOC and the Commander of the Air Combat Command completed a Joint STARS review. This review confirmed the enduring value of Joint STARS as a critical airborne radar surveillance system and a proven force multiplier. Its integral characteristics of interoperability and combined warfighting cannot be duplicated.

GROUND STATION MODULES

The GSM can operate in a dual van configuration. Two GSMs can be linked via intershelter cables. Personnel consist of four operators and two shift leaders. Although the descriptions below describe different duties for the different positions, any GSM operator is trained to perform all GSM tasks.

NONCOMMISSIONED OFFICER IN CHARGE:

The NCOIC is responsible for the GSM operation during missions. The NCOIC may also be one of the team leaders. The NCOIC—

- Receives the daily mission and ensures the GSM is operational throughout the mission.
- Obtains and maintains SCDL Lock with the E-8, and sends RSR and SCDL freetext messages.
- Tasks and supervises the two operators, updates map, situation, and OB overlays, and performs voice communications with the E-8.
- Communicates with the user in all aspects to include reporting activity, receiving updates on the GSM mission, and receiving briefings.
- Supervises all personnel on the GSM teams; performs quality control of incoming requests and outgoing reports.
- Manages operator workload by assigning each operator specific assigned areas of responsibility (AORs) and prioritizing taskings as they are received.
- Ensures mission equipment is operational.

- Prepares site surveys.
- Directs GSM and supporting equipment setup to include placement and camouflaging; schedules preventive maintenance checks and services (PMCS), and arranges support such as security, fuel, meals, and medical support.
- Determines equipment placement.
- Performs other implied duties to include fuel, meals, security, and medical attention.

ASSISTANT TEAM LEADER:

The assistant team leader is the second ranking noncommissioned officer (NCO). He is the second shift leader. He also performs NCOIC duties when the senior NCO is absent or incapacitated.

GSM OPERATOR:

The GSM operator—

- Initializes and updates digitized graphics during a typical mission, searching and tracking targets.
- May also send and receive TACFIRE and ASAS messages and keeps a log of the mission.
- Performs PMCS and other duties as assigned by the senior operator.
- Sets up and tears down sites.
- Operates the IGSM during missions.

PREPLANNED AND BASELINE TASKINGS

Before the mission starts, the GSM crew must have a minimum amount of pre-planned mission and baseline taskings to support the intelligence collection process. These taskings are given to the team leader during mission briefs. The GSM receives immediate taskings and mission changes from the G2/G3, Collection Manager, or S2/S3 (or the FSE), depending upon echelon and unit being supported.

The GSM operators work these preplanned and baseline taskings during the mission execution. Their products are the reports and imagery copies which go to their supported unit. If there are no immediate taskings received, the operators continue to work baseline taskings. If an immediate tasking is received, the GSM operators complete the baseline tasking and

then start working on the immediate tasking. Once the operator completes the immediate tasking, he works baseline taskings until another immediate tasking is received.

The NCOIC must ensure no operators are over tasked or under tasked. Other mission taskings, along with intelligence preparation of the battlefield (IPB) graphics, are in the supported command's collection plan. The collection manager must provide this information 1 to 2 hours prior to the start of GSM operations. Figure 3-1 is an example of a generic mission tasking checklist. Figure 3-2 shows examples of immediate taskings.

ITEM	NEEDED	ONHAND
BASELINE TASKING	Yes / No	Yes / No
COLLECTION PLAN	Yes / No	Yes / No
COMMANDER'S INTENT	Yes / No	Yes / No
SITUATION UPDATE		
Weather	Yes / No	Yes / No
Friendly Unit Mission	Yes / No	Yes / No
Known Enemy Units and Locations	Yes / No	Yes / No
Known Friendly Units and Locations	Yes / No	Yes / No
COLLECTION AND TARGETING DATA		
Supported Unit's PIR (by priority)	Yes / No	Yes / No
R&S Plan	Yes / No	Yes / No
NAI List	Yes / No	Yes / No
TAI List	Yes / No	Yes / No
Event Template	Yes / No	Yes / No
MCOO	Yes / No	Yes / No
Decision Support Template	Yes / No	Yes / No
Situation Template	Yes / No	Yes / No
Doctrinal Template	Yes / No	Yes / No
TERRAIN ANALYSIS	Yes / No	Yes / No
SORs/SIRs	Yes / No	Yes / No
INTSUMs	Yes / No	Yes / No

Figure 3-1. Generic mission tasking.

1. Report any movement by TAIs 4, 6, and 8 as they occur effective 1200Z to 1800Z.
2. Confirm or deny enemy defensive positions are occupied at XY1234.
3. Unidentified SAM 8 radar emitting from vic JK2468 at 0945Z, confirm status, location; monitor for activity.
4. Increased TACCOMM at RT2478 at 0812Z associated with bde CP; determine status, size, activity; track and report movement as it occurs.
5. Confirm or deny enemy presence at airstrip located at FG3456.
6. HUMINT reports heavy cross-country movement by enemy armor vic DF1234 at 0915Z. Confirm status and location, determine size, and track and report movement.
7. LRSU confirms enemy armor battalion moving south on route 66 vic BS1347256 at 1257Z. Notify FSE via TACFIRE when lead vehicle enters TAI 14.

Figure 3-2. Examples of immediate taskings.

Coordination is not limited to the collection of intelligence data; administrative data is needed for the correct configuration of the GSM. This type of data includes frequencies, codes, keying materials, callsigns, and parameters to interface with TACFIRE, UAV, SATCOM, SCDL, and ASAS as well as other communications systems. Figure 3-3 shows a mission administrative checklist. Figure 3-4 shows the tasking cycle.

Through coordination with the supporting command, the GSM NCOIC will attend the operations order (OPORD) briefing and receive the commander's intent and intelligence tasking requirements. These mission specifics are in the collection plan. Appendix A (classified) has more information on Joint STARS mission planning factors.

ITEM	NEEDED	ONHAND	POINT OF CONTACT
JSTARS Flight Data Orbit: Enter Point (Orbit): Mission Altitude: GRCA: Time on Target: Time on Station: Time off Station: Mission Duration: Callsigns: Freqs (UHF): Datalink:	Yes / No	Yes / No	POC: _____
Supported Unit's Data Radio Freqs (VHF Voice or TACFIRE): Key Material (Radios): Callsigns: MSE Drop: Key Material (MSE): Callsign: Phone Numbers: ASAS/TACFIRE ID#s:	Yes / No	Yes / No	POC: _____
JTT Data TIBS Net Freqs: TDDS (TRAP) Net Freqs: TOPS (TRADIX-B) Net Freqs: TRIXS Net Freqs: GPL Net Freqs (3 Channel only): Key Material for each JTT Net:	Yes / No	Yes / No	POC: _____
SATCOM Data Telemetry Data: Freqs: Key Material:	Yes / No	Yes / No	POC: _____
Other GPS Site location: Other GSM Sites: Other GSM Freqs: STU-III Key (if onhand): Cellular Phone Info (if onhand): Brick Radio Freqs (if used): TA-312 Hookup Node: Medic/Emergency Medical Service Fuel Point/Support			POC: _____ POC: _____ POC: _____ POC: _____ POC: _____ POC: _____ POC: _____ LOC: _____

Figure 3-3. Mission administrative checklist.

- General enemy situation from the intelligence estimate, current intelligence, and latest intelligence summaries (INTSUMs).
- Specific orders and requests (SORs) and specific information requirements (SIRs).
- NAIs and TAIs, with special attention to the AOR for each operator.
- Event and situation templates (if available).
- General instructions for the GSM crew.
- Commander's intent.
- Collection priorities (PIR at that given time).
- HPTs and attack guidance information when supporting fire support or aviation.

Figure 3-4. The tasking cycle.

The GSM NCOIC creates his plan for mission and personnel management. He briefs his crew on the tasking requirements for the mission. The individual operators then update their graphics and databases during this mission preparation time. Figure 3-5 is an example of baseline tasking.

The NCOIC or shift leader is responsible for coordinating individual GSM RSR tasking requirements with the next higher echelon GSM or GSM control. This also provides the double check against the requirements flow from unit to corps G2 through Air Operations Command (AOC) or battlefield coordination element (BCE) to the aircraft; this ensures double or triple tasking does not occur.

E-8 TASKING

The ACC, through the Joint Forces Air Component Commander (JFACC), controls the E-8 aircraft. The LCC designates the corps commanders or units to be supported, who in turn will determine the required coverage area, effective employment times of coverage, and radar priorities. When required, the ACC deploys with adequate aircraft to provide 24-hour coverage of the designated GRCA.

ENEMY SITUATION. The enemy has been reinforcing his forward deployed units at X, Y, and Z and we expect him to conduct his main attack at ALPHA with a supporting attack at BRAVO. Lead elements are the 1st and 2d Inf divisions followed by the 3d armored division. We believe the attack will commence within the next 12 hours.

PIR - 1. What are the enemy's immediate and subsequent objectives?
2. What is the location and disposition of his NBC capable units?
3. Where is the 3d armored division?

NAIs 3, 6, 9, and 12 are key within the next 12 hours.

TAIs 2, 4, 6, 8, and 10 are the engagement areas we wish to target the enemy within the next 12 to 18 hours.

SORs - 1. Report on all bn strength and higher movement at NAIs every 30 minutes.
2. Report on all SSMs and ADA activity as noted.
3. Report on all suspected reconnaissance activities in the forward base areas (4 vehicle groupings or larger).
4. Report on all bn and bde sized assembly areas.

OTHER - Be prepared to develop target data for bn and larger assembly areas and SSM and artillery units as requested.

Figure 3-5. Example of baseline tasking.

E-8 subsystems' specific parts and personnel replacements would be pushed into the theater supply and replacement system from the supporting wing to the operations squadron. Examples of support would be radome and SCDL equipment and software upgrades support. The wing would also be responsible for locating any continental United States (CONUS) parts which may be required.

These requirements are passed to the AOC through the BCE for Joint STARS mission planning and tasking, as shown in Figure 3-6. The JFACC determines the number of Joint STARS aircraft and orbits needed to provide the required coverage. In support of the JFC's guidance and campaign objectives, the JFLCC allocates the corps commanders or units to be supported and for how long.

During mission execution, the corps commanders or units being supported request changes in coverage area, times, or radar parameters; they coordinate these changes by direct communication with the E-8 mission crew.

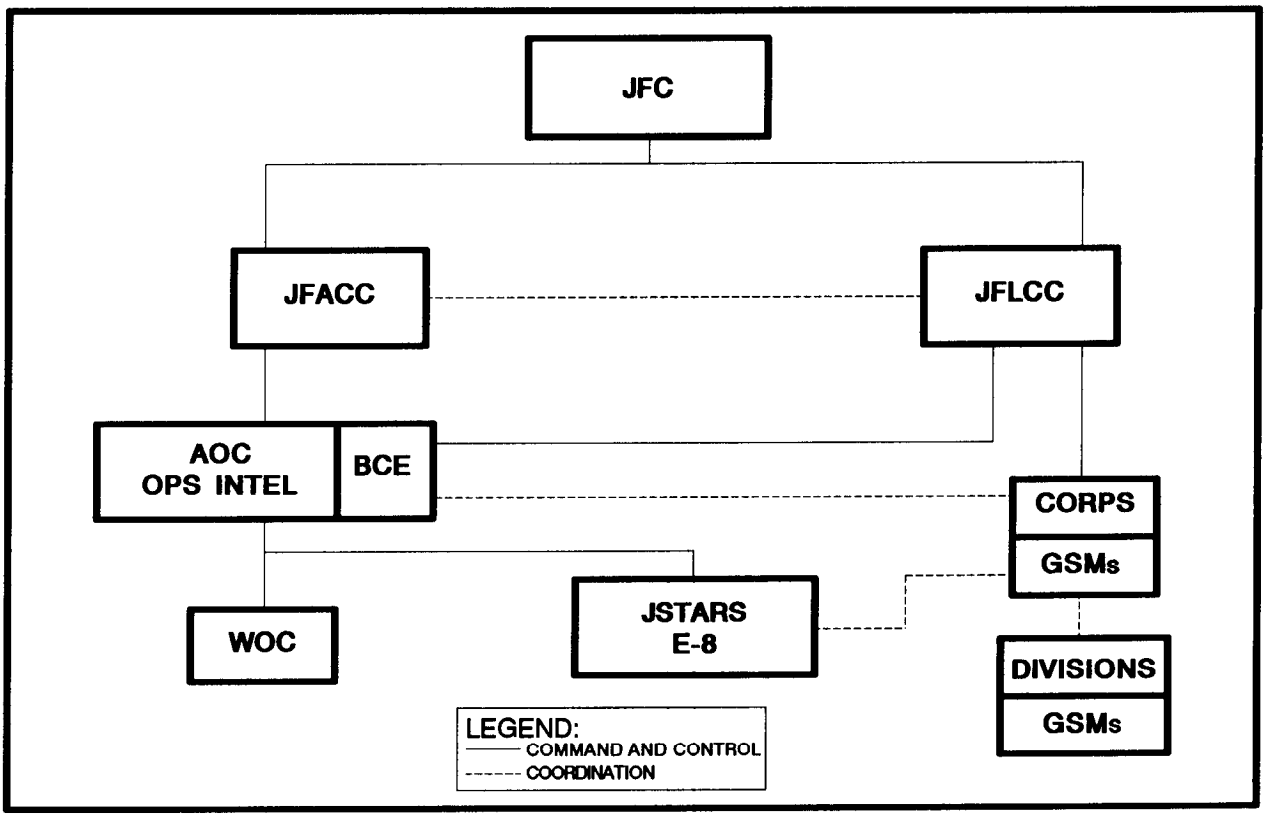


Figure 3-6. E-8 mission tasking.

DUAL AIRCRAFT OPERATIONS:

Individual commands may sometimes need two Joint STARS E-8 aircraft flying simultaneously to cover their mission area. This requirement would stem from terrain masking the radar, a larger than normal corps front, peculiar sector shape, or unprotected flank. Figure 3-7 shows possible flight orbits for two aircraft supporting a normal corps sized frontage in Korea.

When two aircraft are used to cover a corps area, two GSMs will also be needed. Each GSM will interface with one aircraft. The corps commander or G2 will designate which of the GSMs will interface with the second aircraft. The two GSMs should then be collocated at the Analysis and Control Element (ACE) with remote displays side-by-side in the ACE. This gives the commander the ability to view the complete imaged and overlapping areas. GSM crews will need to be in constant contact with each other so not to duplicate collection and targeting efforts.

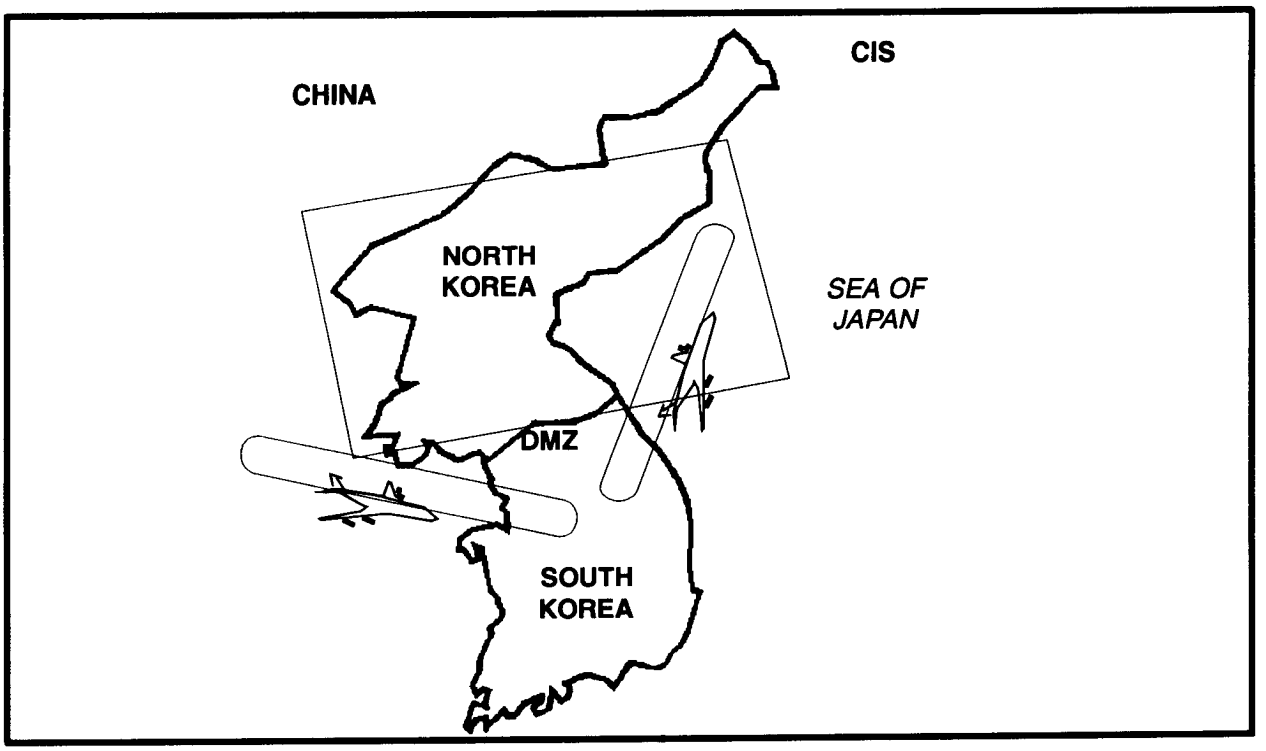


Figure 3-7. Example of dual aircraft operations supporting one command.

BATTLEFIELD COORDINATION ELEMENT:

The BCE is the LCC's designated liaison within the AOC. The BCE is divided into six sections: operations, intelligence fusion, ADA and airspace, plans, airlift, and intelligence. The BCE mirrors the functions of the AOC staff in planning tomorrow's and executing today's air tasking order (ATO). This includes dynamic coordination reacting to a fluid battlefield. Each corps headquarters has liaison officers within the BCE to provide this coordination.

Below corps level, commanders will determine their required coverage area, effective times of employment, times of coverage, and radar priorities. These requirements are forwarded by supported elements through the normal collection management process. All requirements from subordinate units are consolidated at the corps G2 (in coordination with the G3 and the fire support coordinator [FSC] or fire support officer [FSO]). The G2 will then forward them to the JFACC through the BCE or AOC for inclusion in the ATO.

In a multiple corps environment, the JFLCC consolidates corps requirements and forwards them to the BCE or AOC.

Immediate changes in the Joint STARS mission (for example, coverage area, time, or radar priorities) are sent directly to the E-8 mission crew or by coordination with the BCE or AOC. Figure 3-8 shows the real-time mission coordination.

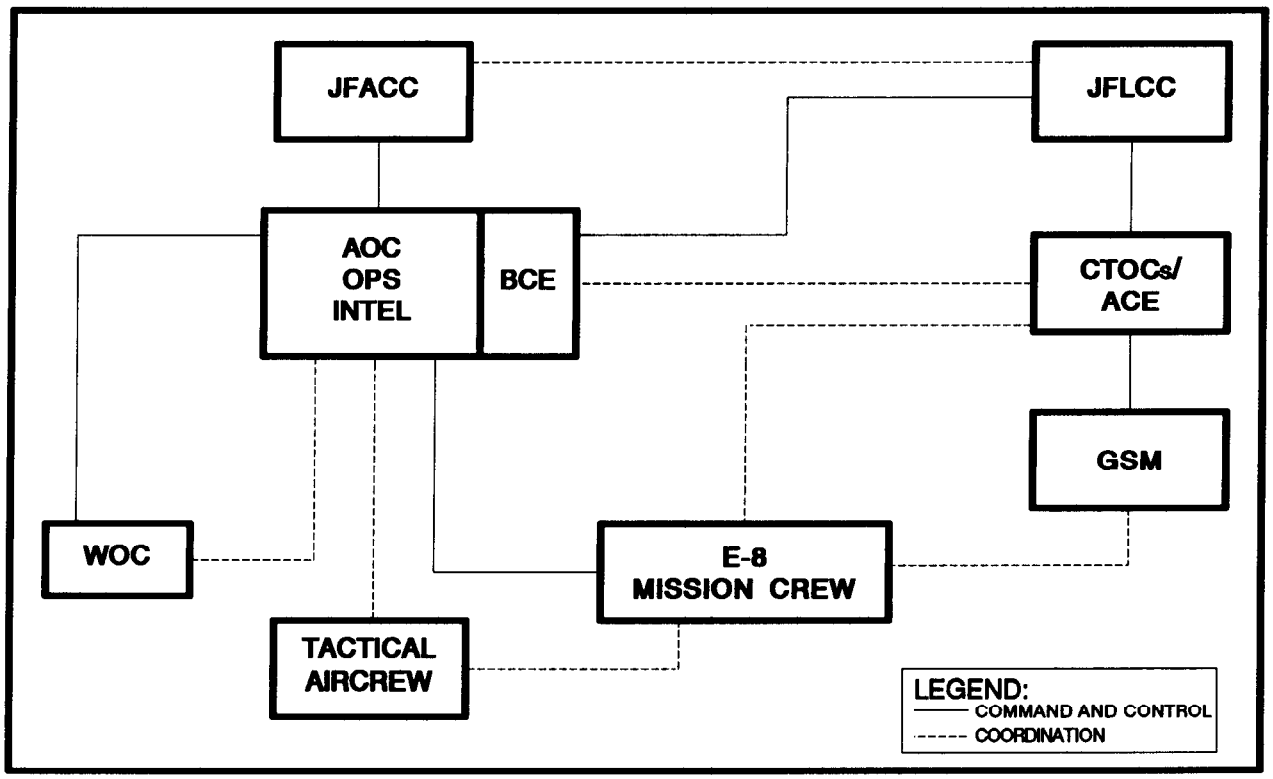


Figure 3-8. E-8 real-time mission coordination.

If the aircrew is unable to resolve the conflict, the BCE or AOC is the next higher authority. The aircrew will execute any request to change the GRCA that does not require an aircraft orbit change. Changes to the GRCA that require an orbit change must be approved by the AOC before the changes go into effect.

The AOC coordinates Air Force requests for a change in the radar priority or mode in the GRCA. This includes changes to the GRCA that may interfere with established corps priorities. The AOC, through the BCE, coordinates these requests with the supported corps or units before executing the change.

AIR TASKING ORDER PROCESS:

Once the JFC approves the JFACC's recommendations, the AOC tasks Joint STARS aircraft through the ATO. The ATO is the means by which the

Joint STARS E-8 aircraft is normally tasked. Figure 3-9 is an example of the ATO process.

1. Requirements are consolidated at the corps G2, corps G3, and FSE. If there is no corps, then requirements would be consolidated at the highest maneuver headquarters (for example, division or even brigade).

2. Requirements are then forwarded to the BCE. Because there is an aircraft staffed by Air Force personnel by definition there will be an AOC to provide C^2 of all Air Force aircraft. The BCE is always present in the AOC.

3. The BCE consolidates and forwards requirements to the JFACC through his AOC staff for inclusion into the ATO.

REMEMBER:

A. The ATO is the means for implementing Joint STARS mission support.
B. The ATO tasks the Joint STARS aircraft and attack sorties to accomplish specific missions.
C. The ATO is published 24 hours in advance of execution to allow sufficient time for aircrew and supporting elements to plan the mission.
D. Once issued, the ATO is valid for 24 hours, starting at the stated "as of" time.
E. While the ATO is time specific, the ATO planning, coordination, and execution process is continuous.

Figure 3-9. ATO process.

The ATO tasks the E-8 (and other Air Force aircraft sorties) to accomplish specific missions and provides sufficient detail to enable the E-8 crew to execute its mission. The ATO lists all the callsigns, radio frequencies, units to be supported, orbits, and direct attack aircraft (DAA) with preplanned targets to be updated by Joint STARS, WAS radar area of coverage, take-off time, and mission duration.

The AOC issues the ATO in sufficient time for the aircrew and supporting elements to plan their missions and covers a specific period (normally 24 hours). Preplanned Army attack aviation, unmanned aerial vehicle (UAV) flights, Army Tactical Missile System (ATACMS) firings, and airborne intelligence collectors appear in the air control order (ACO).

The ACO is transmitted along with the ATO, but it is a separate order. Information concerning orbit locations, altitudes, flight routes, station times, target locations, launch points, and gun-target lines are provided here. This information is a tool to resolve sister service battlefield efforts. The ACO also includes USMC and USN aerial efforts not covered in the ATO.

E-8 MISSION PLANNING:

The E-8 crews extract the necessary information from the ATO to plan their next mission. The Deputy Mission Crew Commander (DMCC) contacts the supported corps G2 collection manager for the commander's requirements and intent, which he briefs to the crew. The airborne intelligence officer (AIO) or airborne intelligence technician (AIT) briefs the latest intelligence update. Figure 3-10 is a sample ATO extract.

REPORTING

The Joint STARS produces a variety of report types and formats. These reports are considered either internal to the Joint STARS (exchanged between the E-8 and the GSM) or external (sent to other systems from the E-8 or the GSM).

INTERNAL REPORTS:

The SCDL provides the standard operating link for exchanging reports between the E-8 and the GSM. Reports over SCDL fall under freetext or RSRs. The RSRs are electronically formatted messages which request additional imagery mode (for example, SS, AP, AC, SAR, FTI).

For further details and sample messages, see Appendix A (classified). The GSM and E-8 can also exchange situation reports over secure voice UHF radios.

EXTERNAL REPORTS:

The E-8 provides electronically formatted messages to Air Force C^3I nodes (ground-AOC and air-ABCCC) and DAA (F-15E) through Air Force communication networks.

The datalinks and networks provide tactical information exchanges among the Air Force C^3I nodes and target updates and inflight reports between the DAA and the E-8 aircraft.

The E-8 provides secure voice communication to USAF C^3I nodes and DAA using UHF, VHF, and SATCOM equipment.

Theater ATO

Example Mission Line For Joint STARS

TASK UNIT/4411 JSS//
MSNDAT/6001/22F/JOINT STARS 01/1E-8/ABC/-/-/-/26001/36001/
MSNLOC/011330Z/012130Z/W386A/ALT350
REFUEL/MOGAS 02/6602/W108/ALT270
AMPN/REMARKS ID A K J E L M
COMMENTS JOINT STARS//
NARR/REMARKS: 4411JSS
UNIT REMARKS A
SEE TANKER SPINS FOR AAR INFO
REMARKS SECTION A

PRIORITIES
A. SUPPORT SURVEILLANCE REQUIREMENTS OF XX CORPS, GRCA CENTER POINT XXXX

B. LOCATE AND COORDINATE ATTACKS ON XX UNITS AS WELL AS OTHER ARMOR, ARTILLERY, CHEM/BIO WPN IN AOR

C. COLLECT INTEL AS REQUIRED

D. SURVEIL AND VERIFY RADAR SIGNIFICANT TARGETS CONTAINED IN THE ATO TO THE EXTENT POSSIBLE

SPECIFIC TASKINGS
--REPORT AND TRACK RESERVE FORCES MOVEMENT
--REPORT CONCENTRATIONS OF ARMOR MOVEMENT
--REPORT BRIDGE CROSSINGS OR BRIDGING ACTIVITIES
--PROVIDE TARGET UPDATE TO THE FOLLOWING MISSION NUMBERS: XXXX, XXXX, XXXX
--DEVELOP IMMEDIATE TARGETS IN JOINT STARS DESIGNATED AOR; PROVIDE TARGET DATA TO INBOUND FLIGHTS
--SUPPORT ABCCC TARGETING REQUIREMENTS TO EXTENT POSSIBLE
--SUPPORT UPDATING OF EW/GCI/SAM SITES
--IDENTIFY CHANGES IN EXISTING LOCS OR NEW LOCS

AIR CAMPAIGN CONSIDERATIONS
PRIORITY 1 COUNTER-AIR – MAINTAIN AIR SUPERIORITY NECESSARY TO DEPLOY AND EMPLOY FRIENDLY FIGHTERS - CONDUCT SEAD TO SUPPORT FRIENDLY STRIKES.

PRIORITY 2 AIR INTERDICTION – INTERDICT LOCS TO ISOLATE XX UNITS. ATTACK XX GROUND FORCES. SHAPE THE BATTLEFIELD TO SUPPORT OFFENSIVE OPERATIONS.

PRIORITY 3 STRATEGIC OFFENSIVE ATTACK – CONTINUE TO STRIKE PRIORITY X TARGETS, THOSE STILL REMAINING AND THOSE REQUIRING ADDITIONAL TARGETING DUE TO BDA AND INTEL REPORTS.

PRIORITY 4 CAS AS REQUIRED
AGAIN, AS A REMINDER: THE ATO IS THE VEHICLE THAT TASKS THEATER AIR ASSETS. THE EXAMPLE ATO TASKING FOR JOINT STARS PROVIDES MISSION NUMBER, CALLSIGN ORBIT LOCATION, AND TIME ON/OFF STATION. JOINT STARS WILL ALSO RECEIVE AIR-TO-AIR REFUELING AT A DESIGNATED TIME DURING THE MISSION. REMARKS SECTION "A" PROVIDES THE E-8 WITH ITS MISSION PRIORITIES AND SPECIFIC TASKING THAT REFLECTS AIR OPERATIONS CENTER CONSOLIDATION OF AIR FORCE AND ARMY NEEDS.

Figure 3-10. Sample ATO extract.

The Block I series has interface with ASAS, TACFIRE, and Advanced Field Artillery Tactical Data System (AFATDS).

One of the pre-formatted electronic messages from ASAS is called the multiple assets tasking message (MATM). Another type of ASAS report is

a direct tasking called request for information (RI). The TACFIRE protocol message format is called an Artillery Target Intelligence-Target Criteria Message (ATI-TCRIT). The GSM response message is a response to request for information (RRI). This message can use the ASAS RI format or the GSM freetext format.

- Artillery Target Intelligence-Coordinate Report (ATI-CDR).
- Fire mission-call for fire (FM-CFF).
- System-plain text message (SYS-PTM).

The GSM operators also have the capability to send freetext messages, such as size, activity, location, unit, time, equipment (SALUTE) reports if needed.

The IGSM and the Block I series of GSMs can also produce hardcopy products upon request. This print screen option offers time segmented color pictures of the viewed portions within the GRCA. Color prints are copied in a thermal color printer within the GSM. All hardcopy information can be hand carried to the supported command. The GSM operator will maintain a record copy within the GSM.

The IGSM and the Block I series of GSMs have UHF and VHF communications to transmit secure voice situation reports (SITREPs) to supported units including Army aviation, maneuver brigades, artillery units, and C^3I nodes.

RADAR SERVICE REQUESTS

The maximum number of GSMs that can directly coordinate at one time with the aircraft is 15. The controlling headquarters and Corps G2 establish a "NET CONTROL" GSM. This does not imply that this GSM will not receive radar imagery but that as an additional duty, it ensures that the O&C console operators onboard the aircraft are not overwhelmed with RSRs from the rest of the GSM operators.

POST MISSION ANALYSIS

Work station operators or intelligence analysts can conduct after-action analyses from Joint STARS imagery, technical information, and graphics that are stored on magnetic tape or in the disk drive. Post mission analysis can (upon direction) be completed by both Army and Air Force analysis

personnel after completing each ground or air mission. This includes but is not limited to in-depth imagery exploitation of Joint STARS radar products, GSM, and E-8 mission log analysis, after-action reviews (AARs), and lessons learned.

POST MISSION IMAGERY EXPLOITATION

The GSM team conducts post mission imagery exploitation at all echelons by reviewing the previously recorded mission data. The in-depth analysis is correlated with all-source information to support future planning and targeting. This exploitation allows processed Joint STARS imagery products to be disseminated to the respective echelons (shown in parentheses below) with amplifying information not available from the raw imagery products. The database affords the analyst with the opportunity to—

- Look for infiltration and exfiltration points (for example, special operations).
- Develop battle damage assessment (BDA) and TDA.
- Follow theater ballistic missiles (TBMs) movement from known launch sites or garrison locations.
- Assist in developing enemy situational templates (G2 or S2).
- Analyze potential assembly areas, logistic areas, TOC sites (G2 or S2).
- Service historical logs (Army, USAF).
- Analyze mission logs.
- Analyze both GSM and E-8 imagery logs and SAR. This analysis contributes to BDA information. The BDA is taken from SALUTE reports, SITREPs, and in-flight reports received by the GSM and E-8 operators from supported combat units and DAA. The information from the logs can be consolidated from flight and crew debriefings. This information can be disseminated to any echelon through SITREPs as needed.
- Analyze mission logs at GSM and E-8 level. This analysis can validate existing standing operating procedures (SOPs) and contribute to developing future SOPs, crew drills, position duties and responsibilities, doctrine, and TTP.

MULTIPLE ASSET INTEGRATION

As the Joint STARS becomes more mature, and as new IEW systems are fielded, the GSM will have an increased capability to integrate imagery and data from multiple sources in real time.

GROUND STATION MODULE-UNMANNED AERIAL VEHICLE

The Block I GSM is currently connected to the UAV GCS via two 300-foot cables. The Block I GSM operator can pull up UAV data or video on his console screen in the form of a smaller "window" on the larger screen. Given that the UAV is flying at the same time that the Joint STARS aircraft is flying, this additional capability is invaluable to the commander. UAV and Joint STARS flight paths complement each other. For example, Joint STARS can cue the UAV to a possible high-value target (HVT) set. Joint STARS (or UAV) can then confirm what the other sensor has detected and the HVT can then be attacked by a Multiple-Launch Rocket System (MLRS), attack helicopters, or USAF assets.

Another example of Joint STARS and UAV's complementing each other is the use of UAV imagery when Joint STARS radar is affected by terrain masking. The UAV is not affected because it can fly directly over the masked area. The collection manager could use the UAV to cover those areas the E-8 aircraft cannot see during a mission. Doing this, the commander could then literally "see" all the battlefield in NRT. Figure 3-11 shows the Joint STARS and UAV relationship.

The UAV operator feeds its video data from its GCS into the GSM. Once the GSM operator calls up a UAV window, he can quickly confirm or deny enemy presence and do limited correlation of assets using both Joint STARS and UAV data. The CGS includes an antenna to give the operator the capability to receive UAV data directly into the GSM vice going through the GCS. See Chapter 4 for information on UAV and Joint STARS cueing.

JOINT TACTICAL TERMINAL

The JTT, like the UAV, is another tool that the GSM operator can use. A JTT is installed inside the GSM and is connected to the operator's console (see Appendix D).

SIGINT icons are overlayed on the operator's console screen. On the screen he sees the ellipse and possible transmitter type (for example,

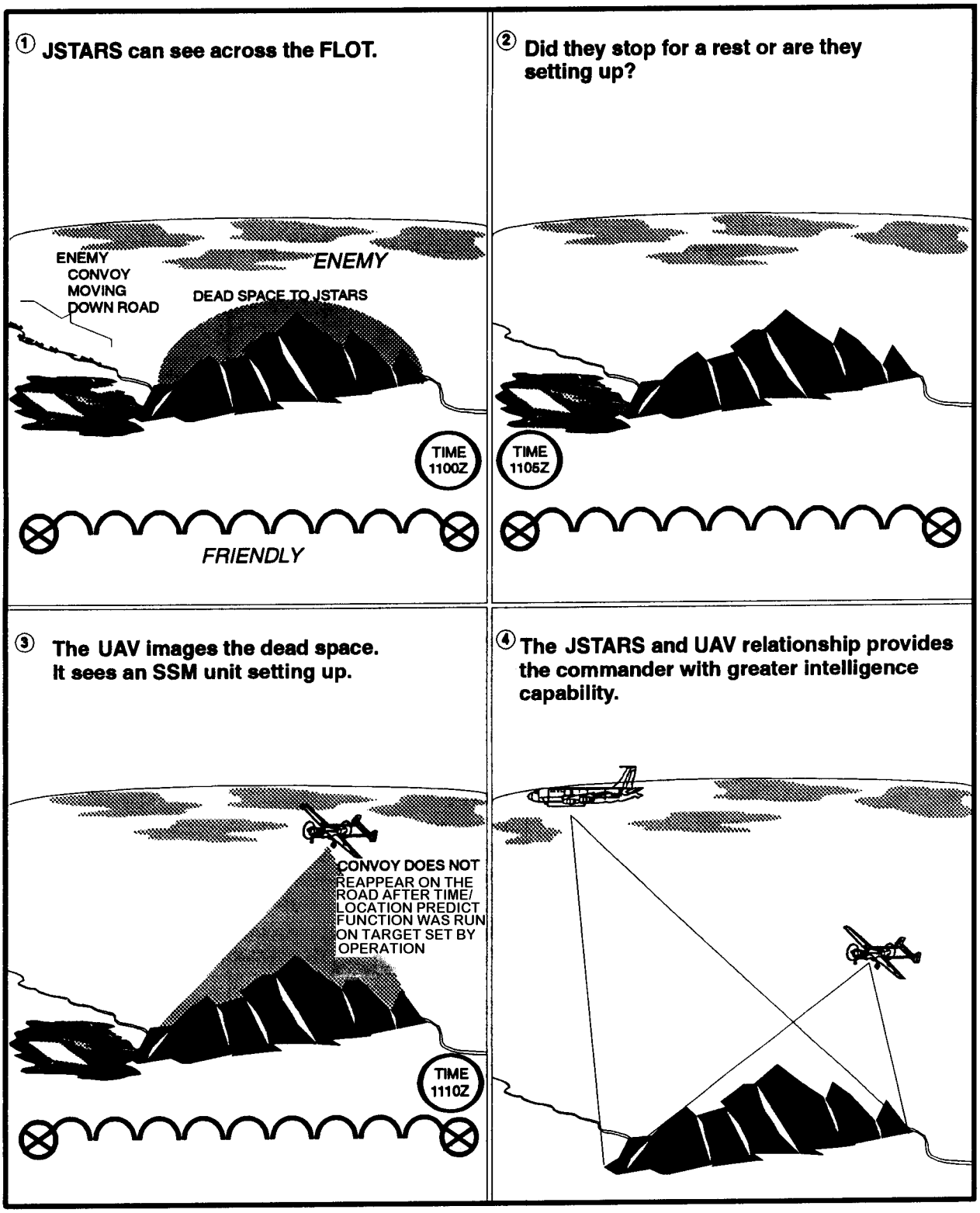


Figure 3-11. JSTARS and UAV relationship.

R-122 radio or END TRAY radar depicted on the screen for a general area). The operator then correlates this with MTI or SAR to confirm or deny additional enemy presence in that area. (The presence of an active air defense artillery [ADA] radar would bean indicator that there may be elements of an ADA unit nearby. A SAR image would confirm or deny this.) Figure 3-12 shows the Joint STARS and JTT relationship.

The GSM now can confirm or deny enemy activity first detected by another sensor, but the operator must be told to do this function via a message he would receive from an external source. This could be either a preplanned or an immediate tasking, depending on the situation. The GSM operator can use these additional tools to refine his products to better support the commander. Examples follow:

- LRSU team 6 has just spotted an enemy armored column of unknown size moving SW along HWY 3 vic BV23456718 at time 212100Z OCT 95. Joint STARS: Confirm or deny this activity and indicate current location and strength of this enemy force.

- Theater Army SIGINT sources report enemy higher headquarters (HQ) communications activity associated with surface-to-surface missiles (SSM) units. All-source analysis element's communications activity is at BT13572468, the garrison location of the 51st SSM Bale. Request Joint STARS monitor all traffic of two or more vehicles leaving the garrison location and report locations of these small groupings as they occur for the next 8 hours.

- Enemy prisoner of war report 222100Z FEB 95 states that the main CP of the 99th Armored Div is located at BU98765432. (It is now 230600Z FEB 95.) Joint STARS: Confirm or deny any enemy movement or activity located vic this area.

- With these additional capabilities, the GSM operator can integrate these assets with the E-8 radar picture at leisure, or be directed to do this via message or telephone call. Being able to do this in NRT will give the commander an even higher degree of confidence in the GSM product and allow him to target enemy forces with greater accuracy.

- For example, it is 232200Z FEB 95; GSM operator 1 with the corps tactical command post (TCP) has just received the mission to locate a suspected SSM battery located vic BJ12347890 that had just (5 minutes prior) fired an SSM at location Y. The GSM operator will then review his historical E-8 radar data; see if a UAV was flying in the vic of the SSM battery during the firing time and also check to see if the JTT can give any side lobe data from the meteorological radar—this radar is normally active where the SSM unit is present and the SSM battery is about to fire.

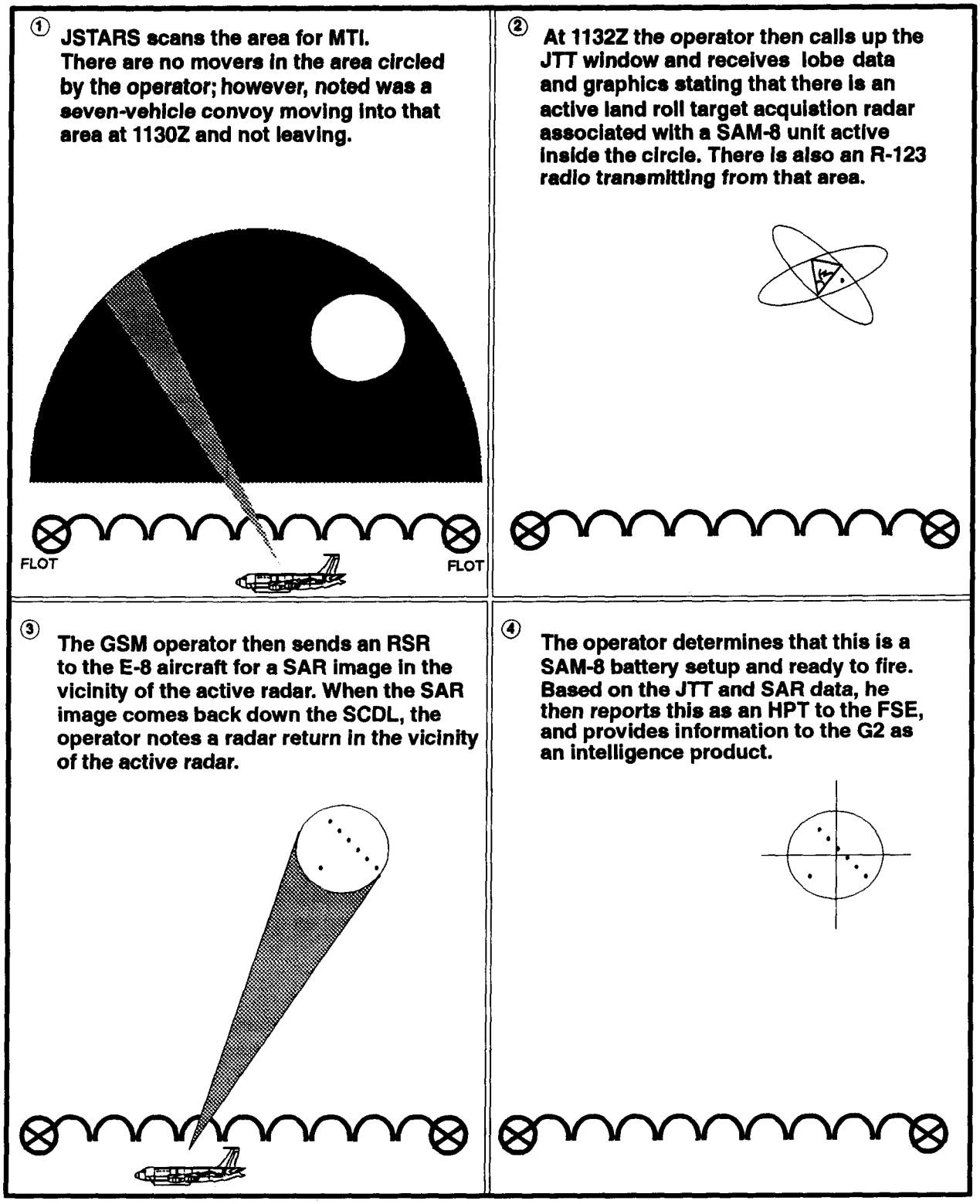


Figure 3-12. JSTARS and JTT relationship.

- Ideally, the E-8 historical radar showed 4 vehicles moving into a firing position (the data disappeared from the screen); the operator then watched the same area after the SSM was fired and saw 4 movers going SE at 20 km/h at 232207Z FEB 95 at BJ11447980. A UAV was flying in the same general area and on UAV imagery 232208Z FEB 95, 4 vehicles associated with SSM activity were noted in the same general area. The analyst at the JTT noted that an END TRAY radar was active at vic BJ12347812 at 232155Z FEB 95. The GSM operator tracked these 4 vehicles in NRT to vic BJ22335122 where they stopped at 232207Z FEB 95. He then sent a message via his TACFIRE link to the FSE for target servicing.

GROUND STATION MODULE-SATELLITE COMMUNICATIONS

The Block I GSMs have SATCOM uplink capability and receive on-the-move capability. All the radar data from the E-8 aircraft is transmitted to a stationary GSM and then relayed to a GSM on the move via a SATCOM link. A secondary SATCOM link for the GSM can be the TROJAN Special Purpose Integrated Remote Intelligence Terminal (SPIRIT) System. Figure 3-13 shows the GSM and SATCOM linkup.

The commander has access to all the E-8 radar coverage, even while moving, with no gaps in Joint STARS coverage. Once the GSM stops with the CP to set up, the operator can review all the recorded radar data and begin to work his missions. TROJAN SPIRIT can be used in lieu of the onboard SATCOM; however, TROJAN SPIRIT is the only SATCOM for IGSM.

OPERATIONAL EMPLACEMENT

The GSM is employed in a wide variety of operational settings ranging from EAC down to maneuver brigade. Because of the inherent flexibility built into the GSM, it provides tailored support to intelligence collection as well as targeting by field artillery or aviation assets and battle management at all echelons.

If there is only one GSM at any one of these levels, the GSM is considered a **shared** asset that provides intelligence battle management and targeting data support to the commander. If there is more than one GSM at a given level, then each can be given more specialized missions. For example, when the G2 controls the GSM, it will do more intelligence-related functions than targeting functions. If the FSE controls the GSM, it will do more targeting-related functions vice intelligence functions. FSE targeting is a coordinated effort between the FSE and G2. The GSM can be operationally employed at each echelon as follows.

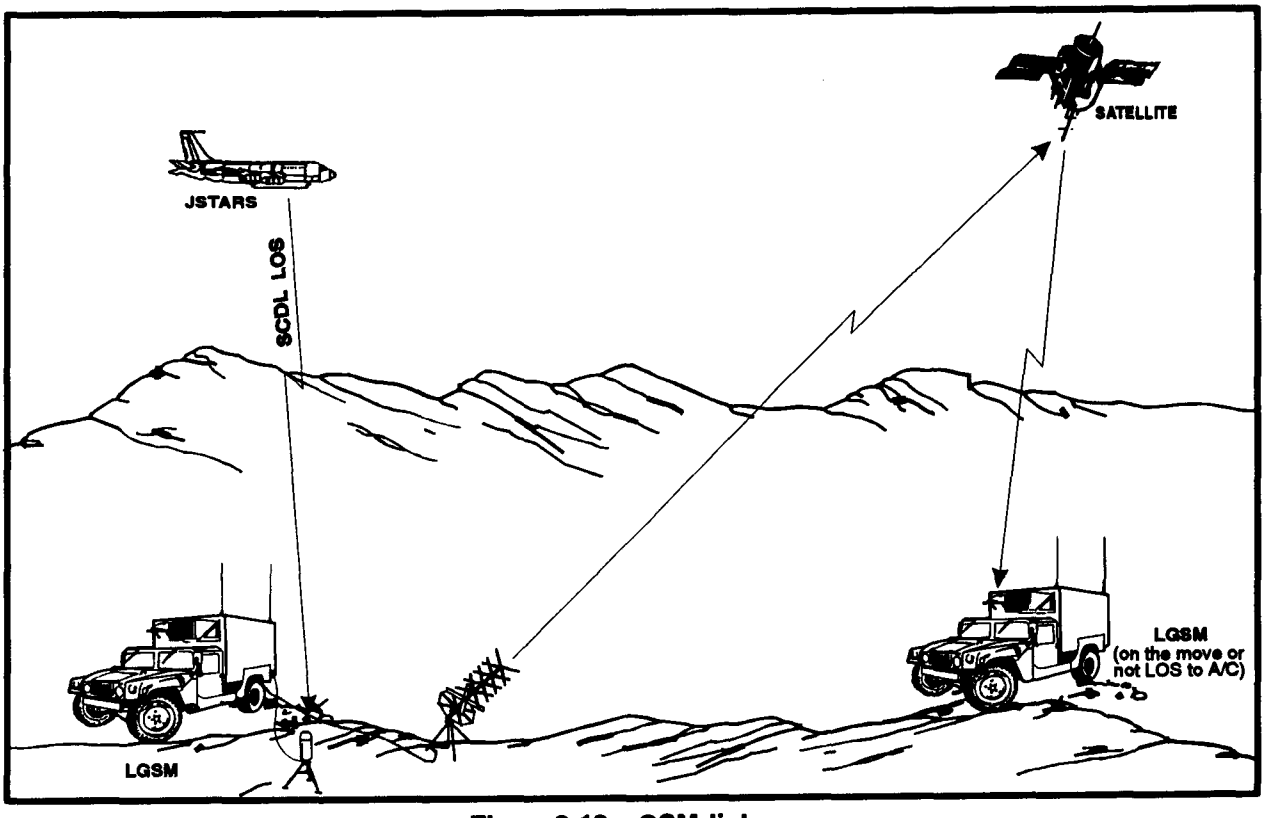


Figure 3-13. GSM linkup.

ARMY THEATER:

The GSMs that support this echelon are initially assigned to the Theater Army MI brigade. The commander may place the GSM in the Joint Intelligence Center (JIC), the Theater Army ACE; a Deployable Intelligence Support Element (DISE); or the BCE (collocated with the USAF AOC).

At Theater Army, GSMs focus on situation awareness and target development. Joint STARS provides the commander an "overhead view" and an unprecedented advantage over his adversary. For tasking purposes, the J2 collection manager, in coordination with the FSE and Joint Intelligence Directorate (J2), provides baseline administrative guidance.

Once the GSM operator receives his mission priorities for the day, and the aircraft is on-station, he generates reports based on his baseline taskings. These reports can then be sent to the requestor via TACFIRE or ASAS. If the TACFIRE is not working at this echelon or links are not available, GSM reports can be sent via secure telephone (TA-312), secure FM radio, FAX, or couriered by messenger if necessary.

CORPS AND DIVISION:

Figure 3-14 is an example of Joint STARS support to DTOC or CTOC. At the Corps, the GSM will be employed in support of the ACE—

- At the corps main CP.
- With the artillery headquarters or corps main CP.
- With the tactical corps CP.
- With the aviation brigade and ACR.

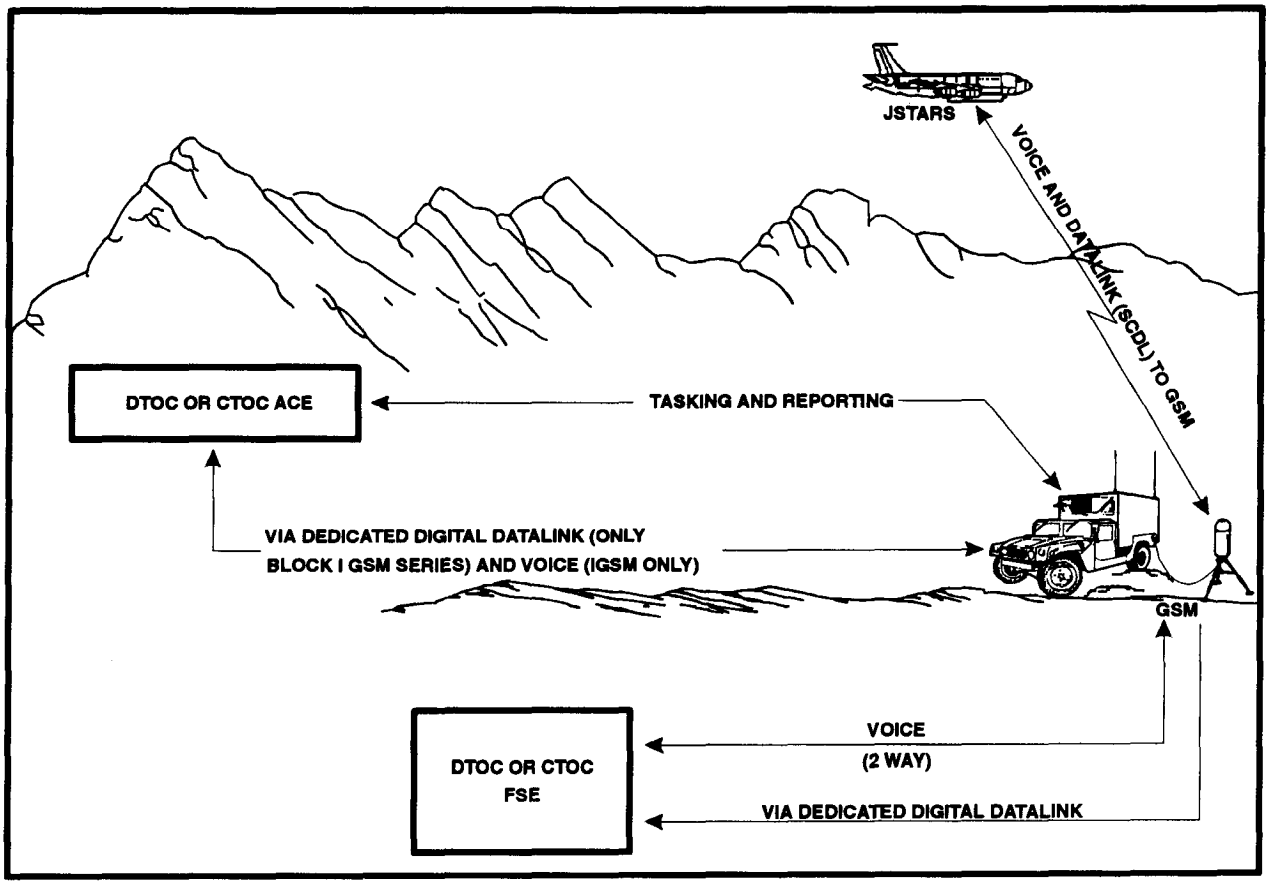


Figure 3-14. JSTARS support to DTOC or CTOC.

CORPS TARGETING:

Targeting is the primary function when the GSM is employed in direct support (DS) of fire support nodes. The FSE specifies the fire support target numbers for use by the GSM operator. The target number block is specified in the fire support annex to the OPORD. Fire support target numbers are by standard North Atlantic Treaty Organization (NATO) STANAG 5620 and are comprised of two alpha characters and four numeric characters (for example, AZ0001 to AZ1000). Target number

blocks are assigned to the GSM operator to reduce target number redundancy in the fire support system. The GSM operator assigns the target number prior to transmitting digital TACFIRE messages to the fire support center.

Target acquisition is a principal subset of targeting. The GSM can perform target acquisition in support of units from battalion through corps and EAC. Figures 3-15 and 3-16 are examples of Joint STARS GSM support to corps and division artillery CP and ACE. Typical fire support nodes where GSMs can be employed in a DS role are—

- Corps FSE.
- Corps artillery CP.
- Field artillery brigade CP.

Currently, the Joint STARS GSM interfaces with these organizations through the TACFIRE. Depending upon communications assets available and proximity to the TACFIRE shelter, operators can use combat net radio (CNR) or MSE to pass digital data between these systems. The Army Command and Control Master Plan (AC^2MP) defines the architecture for the Army Tactical Command and Control System (ATCCS). The fire support control component of ATCCS is the AFATDS, replacing TACFIRE. Joint STARS GSMs are capable of interfacing with AFATDS.

Figure 3-17 shows the Joint STARS Block I GSM support to corps, division, and brigade FSE. Immediate taskings are sent to the GSM operator through TACFIRE links or FM radios. The operator disseminates his reports through the methods previously mentioned. For artillery operations by corps artillery assets, the GSM operator can use the following paths:

- Sensor to GSM.
- GSM to corps FSE via TACFIRE link or voice communications.
- Corps FSE to, for example, corps MLRS battalion fire direction center (FDC) via TACFIRE/AFATDS.
- Corps MLRS battalion FDC to MLRS battery FDC to TACFIRE/AFATDS link.

Figure 3-18 shows normal FSE channels for Joint STARS data. The corps FSE may authorize a quick fire channel between the corps GSM and firing battery to expedite an attack. Figure 3-19 shows an example of quick fire channels. Here, the flow would be—

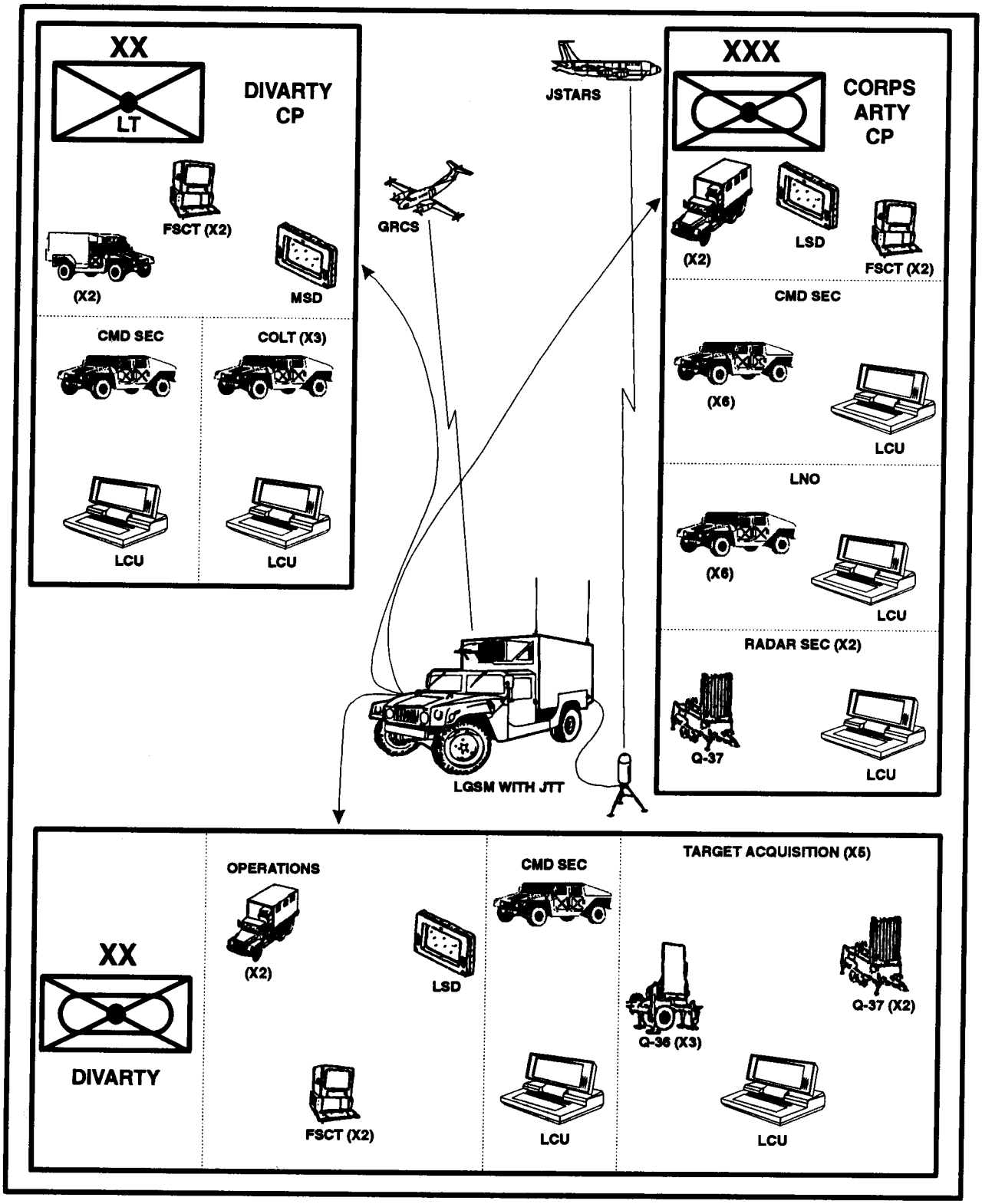


Figure 3-15. JSTARS GSM support to corps and division artillery CP.

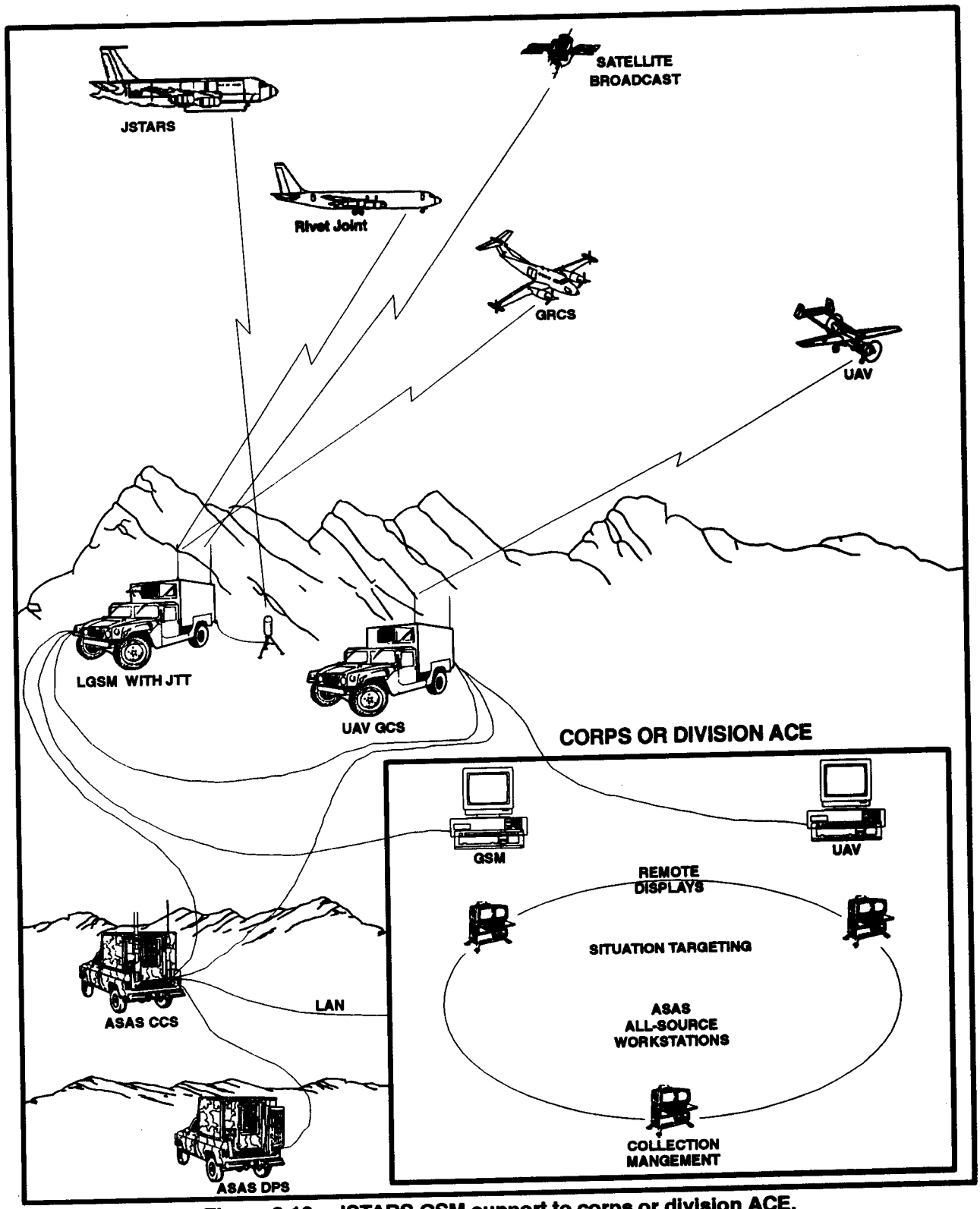


Figure 3-16. JSTARS GSM support to corps or division ACE.

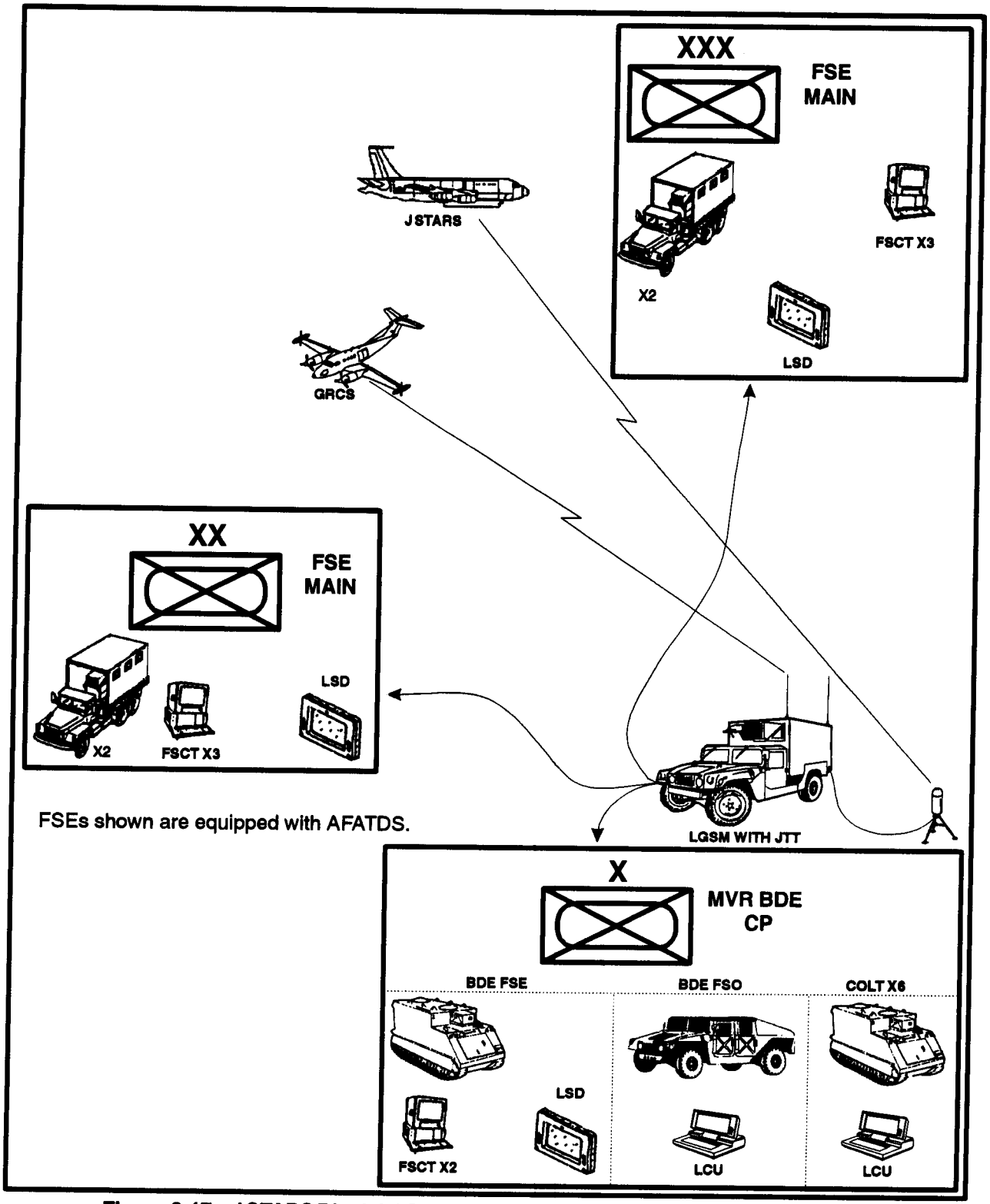


Figure 3-17. J STARS Block I GSM support to corps, division, and brigade FSE.

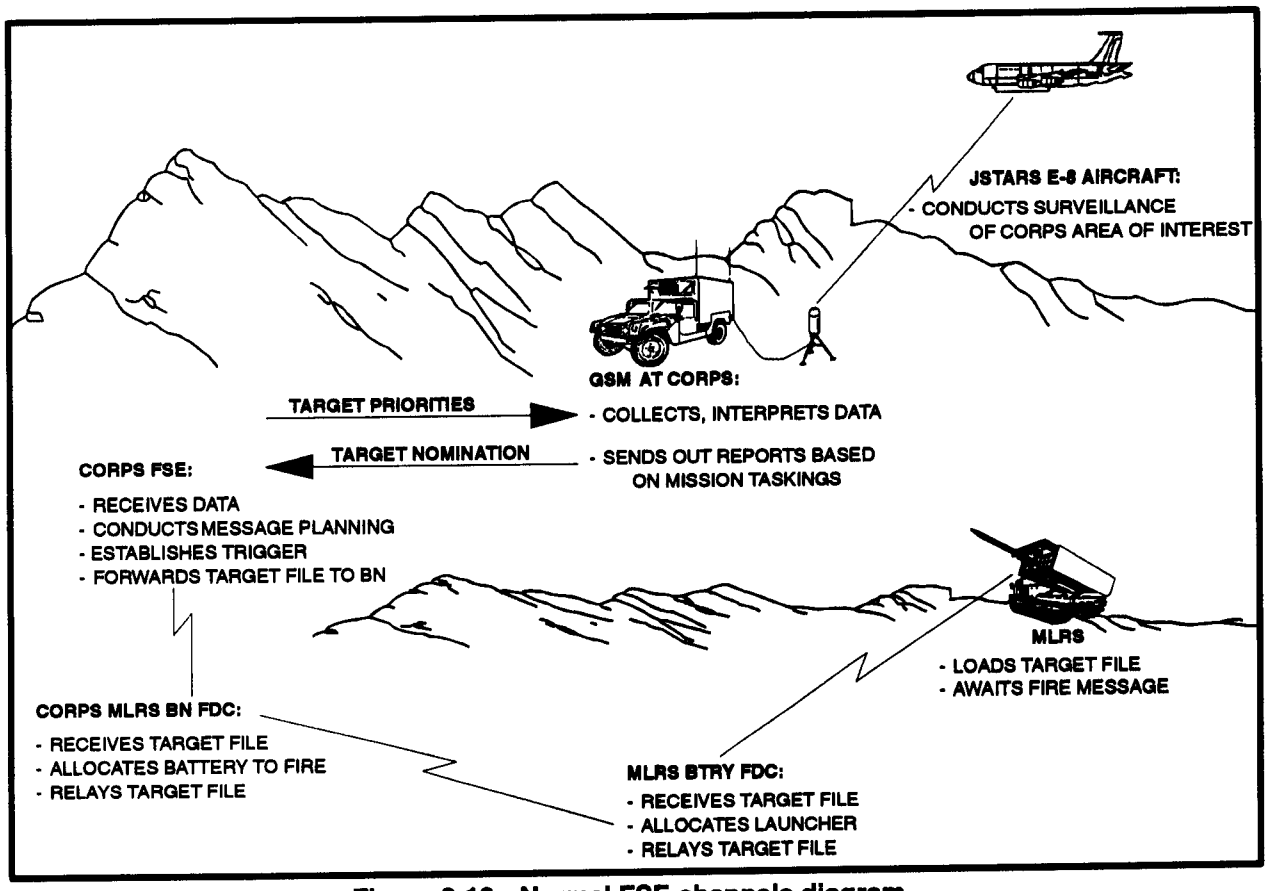


Figure 3-18. Normal FSE channels diagram.

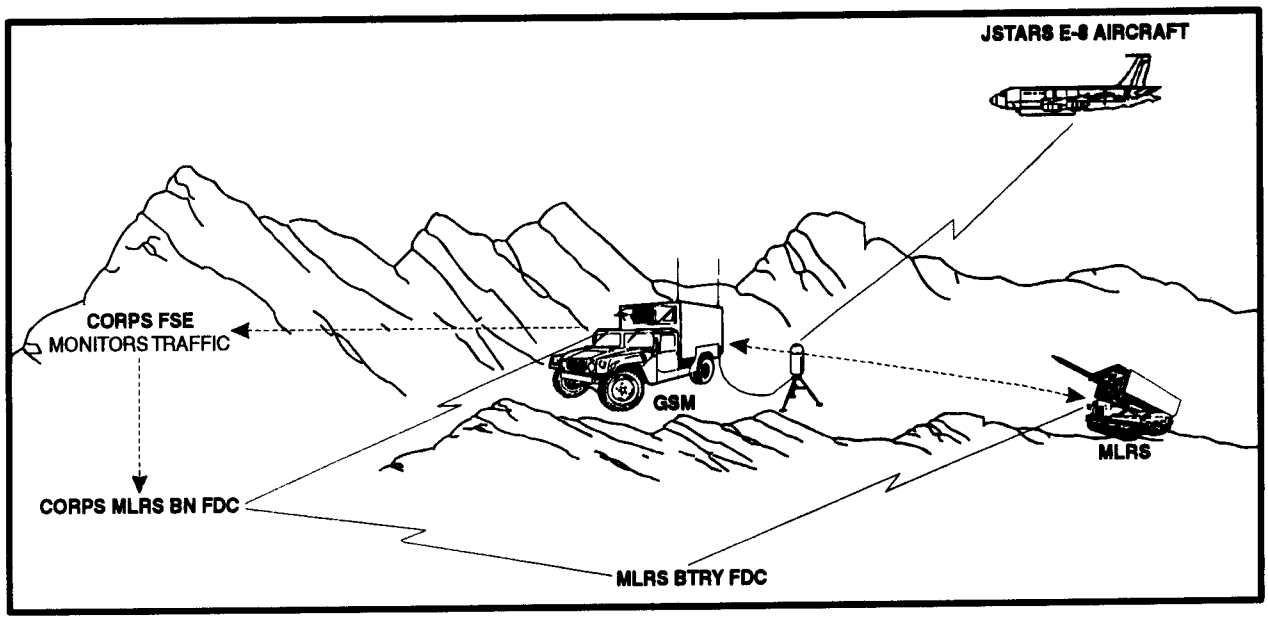


Figure 3-19. Quick fire channels.

- Sensor to GSM.
- GSM to corps artillery (MLRS) battalion FDC.
- Corps MLRS battalion FDC to battery FDC to MLRS launcher. The FSE would monitor traffic.

CORPS TACTICAL COMMAND POST:

The G2 tasks the GSM at the corps TCP. If the corps has more than one GSM in support, coordination must take place among the GSMs to ensure no over or underlap in coverage and reporting. Figure 3-20 and the vignette show how all of this coordination supports the commander.

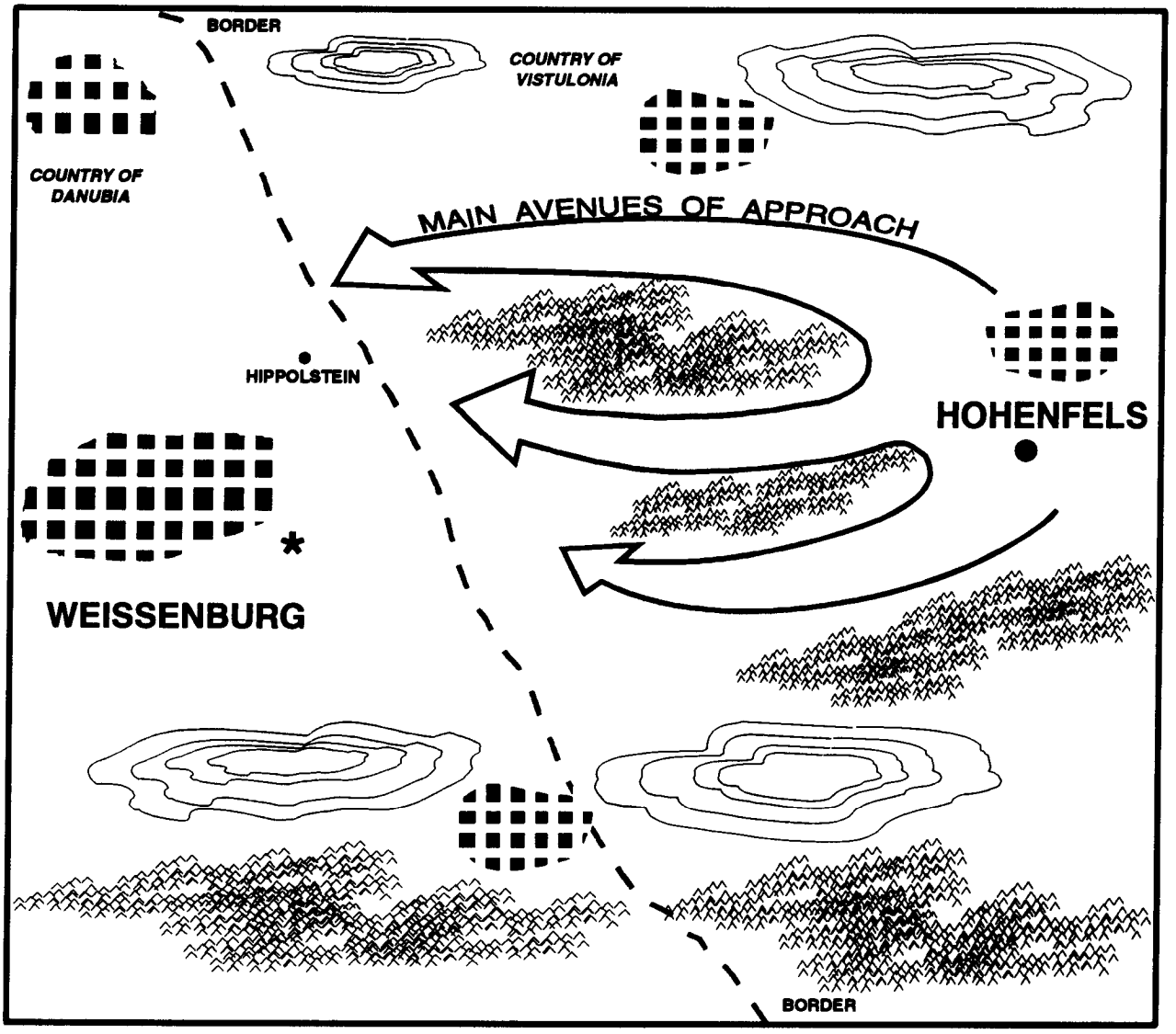


Figure 3-20. Map of area of operation.

US Forces consisting of advanced elements of the II Corps have recently deployed to the country of Danubia at the request of their President Octavio Augustein, to assist in noncombatant evacuation operations (NEOs) and as a show of force to deter any possible aggression from the neighboring hostile country of Vistulonia. Historically, possession of the eastern-most province of Danubia, rich in mineral deposits, has been disputed by Vistulonia. As a result of the II Corps deployment, the already unfriendly relationship between these two countries rapidly deteriorated even further.

National intelligence assets have indicated that sometime in the next 12 hours the armed forces of Vistulonia will launch a surprise attack on Danubia with a limited objettive of seizing the eastern provincial capital of Weissenburg and disrupting the US NEO effort.

Currently, II Corps elements are moving into defensive positions in the eastern province around the capital city. A Joint STARS GSM is currently located in the corps main CP within the ACE, and another GSM is located with the corps FSE. There are elements of an MLRS battalion in country. Elements are 2 batteries consisting of 18 launchers, and a C^2 element available for general support (GS) artillery fire support to the corps.

The corps G2 has indicated that the Vistulonia 22d Motorized Infantry Regiment, garrisoned at Hohenfels, will spearhead the surprise attack. This unit is the pride of the Vistulonia armed forces and is their best equipped, and most well-trained unit with modern light armored vehicles. The outcome of their surprise attack will hinge upon the success or failure of this unit in combat.

The II Corps commander has been given the authority to engage the Vistulonian forces that enter into recognized Danubian territory. Additionally, he has been given the mission of precluding the seizure of the provincial capital of Weissenburg. The corps commander's intent is to disrupt and destroy the main body, known to contain the regimental command element, as soon as it crosses into Danubian territory with minimal collateral damage. Through careful IPB analysis, the G2 has determined that the surveillance of the terrain and avenues of approach into Hippolstein will be key to friendly forces successfully defending Danubia and blunting the attack of Vistulonia forces.

Intelligence has just confirmed that the 22d Motorized Infantry Regiment is in assembly areas around Hohenfels. The Joint STARS aircraft is now flying and is in dedicated support to the II Corps. Its first requirement is to look for any movement from the Hohenfels area heading west. The IPB process has determined that this regimental CP is an HVT (see

Figure 3-21) to the enemy and therefore an HPT to friendly forces (see Figure 3-22).

The II Corps targeting cell has approved the attack guidance matrix (AGM), and the target will be neutralized using organic fires (see Figure 3-23).

(NOTE: This is only a type of attack guidance matrix (AGM). The G3, S3, and FSE develop actual matrices on the basis of the tactical situation.)

The corps commander wishes to isolate the regimental CP elements from its reconnaissance elements through the use of mines delivered by Danubian artillery units. The main body entering the minefield is the trigger mechanism to engage the stopped or significantly slowed column with MLRS fires. Additionally, an AH-64 element has been given the mission to destroy the reconnaissance units in engagement areas North or South (2A [N] or O2 [S]) of Hippolstein. It also has been given an order mission to re-engage the main body, given a post strike assessment from Joint STARS. The commander has been briefed on the concept of the operation and has given it his approval.

It takes approximately 5 minutes to send the appropriate messages from the GSM through the various FDCs to the MLRS launcher. The battery FDCs must add in multiple aimpoints, and the launcher has to compute its initial and final technical computations and lay on target.

Jumping forward in time, it is now night and Joint STARS has detected vehicle movement in the known assembly areas of the 22d Motorized Infantry Regiment vic Hohenfels. The Joint STARS has confirmed that there are vehicles in tactical columns and that they are holding west toward the border. Because of the nature of EAC and national intelligence assets, it has been a challenge in the past to receive information quickly enough to be used for targeting. Now with Joint STARS, this process allows the tactical commander to receive real-time intelligence across his area of influence and area of interest that can be used to enhance the targeting process.

We have already entered the targeting process, using the DECIDE-DETECT-DELIVER-ASSESS assets methodology by deciding on the value of the 22d Motorized Infantry Regiment's Main CP and making it a high priority target on our AGM. Target acquisition asssets and attack assets have been allocated to this target. The Joint STARS has detected movement of these columns and now we enter the DELIVER phase of the targeting process. Next we assess for battle damage.

PRIORITY	CATEGORY	SHEET NUMBER	DESCRIPTION
1	LOC	XX, XX	POL and Ammo Depots Maneuver
2	Maneuver	XX, XX	Deployed Elements Movement
3	NBC	XX, XX	Weapons Technical
4	Fire Support	XX, XX, XX	Fire Direction Weapons Air Support Weapons
5	RSTA	XX, XX, XX XX, XX, XX	Reconnaissance Patrol Target Acquisition Battery Radar Intercept and Sound Ranging Command Observation Post Airborne Sensors
6	EC	XX, XX	Communication Jammers, Intercept, and DF
7	C^3	XX, XX, XX, XX	Main Command Post Forward Command Post Rear Command Post Alternate Command Post

Figure 3-21. Example of a high-value target list.

PRIORITY	CATEGORY	SHEET NUMBER	DESCRIPTION
1	C^3	XX, XX	Forward Command Post Main Command Post
2	RSTA	XX, XX, XX, XX	Reconnaissance Patrol Target Acquisition Battery Command Post Command Observation Post Airborne Sensor
3	EC	XX	Intercept and DF
4	NBC	XX, XX	Technical Weapons
5	Maneuver	XX, XX	Deployed Elements Movement
6	LOC	XX, XX	Maneuver Movement
7	Fire Support	XX, XX	Air Support Fire Direction

Figure 3-22. Examples of a high-payoff target list.

PHASE/EVENT: Attack through the security zone				
HPT LIST	**WHEN**	**HOW**	**EFFECT**	**REMARKS**
COP	P	GS ARTY	N	PLAN IN INITIAL PREPARATION
RSTA/OPS	P	GS ARTY	N	PLAN IN INITIAL PREPARATION
2S1/2S3	P	MLRS	N	PLAN IN INITIAL PREPARATION
2S6/SA9/SA13	P	GS ARTY	S	SEAD FOR AVIATION OPERATIONS
REGT CP	A	MLRS	N	
RESERVE BN	P	AVN BDE	D	INTENT TO ATTACK RESERVE BN IN ENGAGEMENT AREA
LEGEND: A - as acquired D - DESTROY I - IMMEDIATE		N - NEUTRALIZE P - PLANNED S - SUPPRESS		

Figure 3-23. Example of an attack guidance matrix.

The corps FSE has directed the corps artillery to attack the target and has authorized the interface, known as a quick fire channel, between the corps artillery TACFIRE shelter and the GSM to expedite this attack. The FSE will continue to monitor the traffic. The GSM is sending the corps artillery TOC the status of the reconnaissance elements and main column. This information includes location of elements, number of vehicles, speed of column, direction of travel and target prediction information to critical points, like the border, which will allow the operators and fire direction officers to engage the Vistulonian forces at critical times.

At time 1827, an enemy reconnaissance element is approaching the Danubian border. The GSM transmits a message to the Corps artillery TACFIRE shelter with this information. Danubian artillery units are ready to employ a minefield and are awaiting the command to fire.

At time 1829, the actual border is being crossed by the Vistulonian forces. The rules of engagement and preconditions have been met to allow friendly forces to engage hostile forces.

At time 1832, a second enemy reconnaissance element is approaching the border.

At time 1845, the GSM predicts the arrival of the second reconnaissance element moving toward the border, and its arrival at Hippoltstein at 1907.

At time 1855, the GSM operator detects the movement of the main body moving from assembly areas and predicts its arrival at the border at 1906 Joint STARS continues to monitor.

At time 1906, as predicted, the main body crosses the border and the GSM computes the expected arrival time into the engagement area. The MLRS unit is sent a fire mission, with instructions: "FIRE AT MY COMMAND!"

At time 1912, 6 minutes pass. The lead vehicle of the main body hits an anti-armor mine and halts; the next vehicle attempts to go around and strikes a mine and stops; the column slows, and comes to a halt. The GSM operator detects this, and a radio message is sent, and this triggers the MLRS fires (time of flight [TOF] 68 seconds). Eighteen launchers will fire 216 rockets with bomblets into a kill zone 1 km wide by 3 km long along the stopped column. Joint STARS will then monitor and report any movement of vehicles out of the engagement area, triggering an immediate restrike by MLRS or attack helicopters from the attack helicopter battalion (ATKHB).

DIVISION

At division, the GSM can be employed in support of the ACE at the division main CP, the aviation brigade at division, or at one of the division maneuver brigade CPs. Figure 3-24 shows the division battle. An additional GSM will support the Division Tactical Command Post (DTAC) or FSE.

The commander can keep one GSM at the division main CP and deploy one with the TCP. The IGSM must be in a fixed position approximately 15 to 30 minutes in order to set up and be prepared to receive data.

With two GSMs, the one in a fixed location can provide voice and imagery updates to the moving LGSM via tactical SATCOM secure radio on radar return highlights during the move (for example, heavy convoy movement on LOC A from 1400 to 1500Z; no significant activity noted elsewhere in sector).

The advantages of having the GSM at the TCP are threefold:

- The commander can look at the screen to see the situation as it happens.

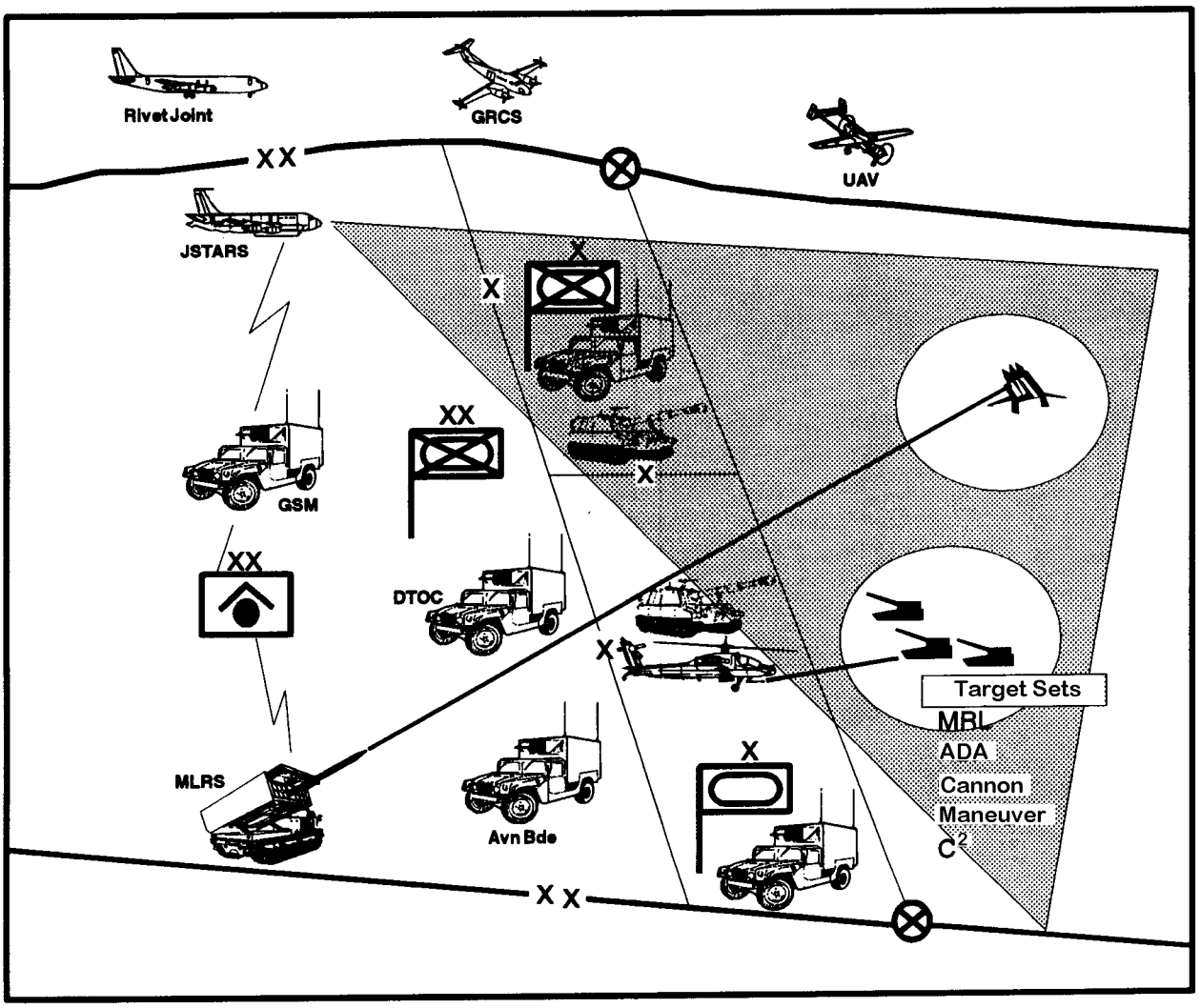


Figure 3-24. Division battle.

- The commander has on-the-move situation update capability with LGSMs.
- The FSE can target, based on the situation up front, where decisions are being made.

ARMORED CAVALRY REGIMENT (ACR)

The ACR, with respect to GSM operations, is similar to that of division. Figure 3-25 shows the ACR battle.

The S2 produces a reconnaissance and surveillance (R&S) overlay for the GSM team so that the operators can annotate these areas as graphics on

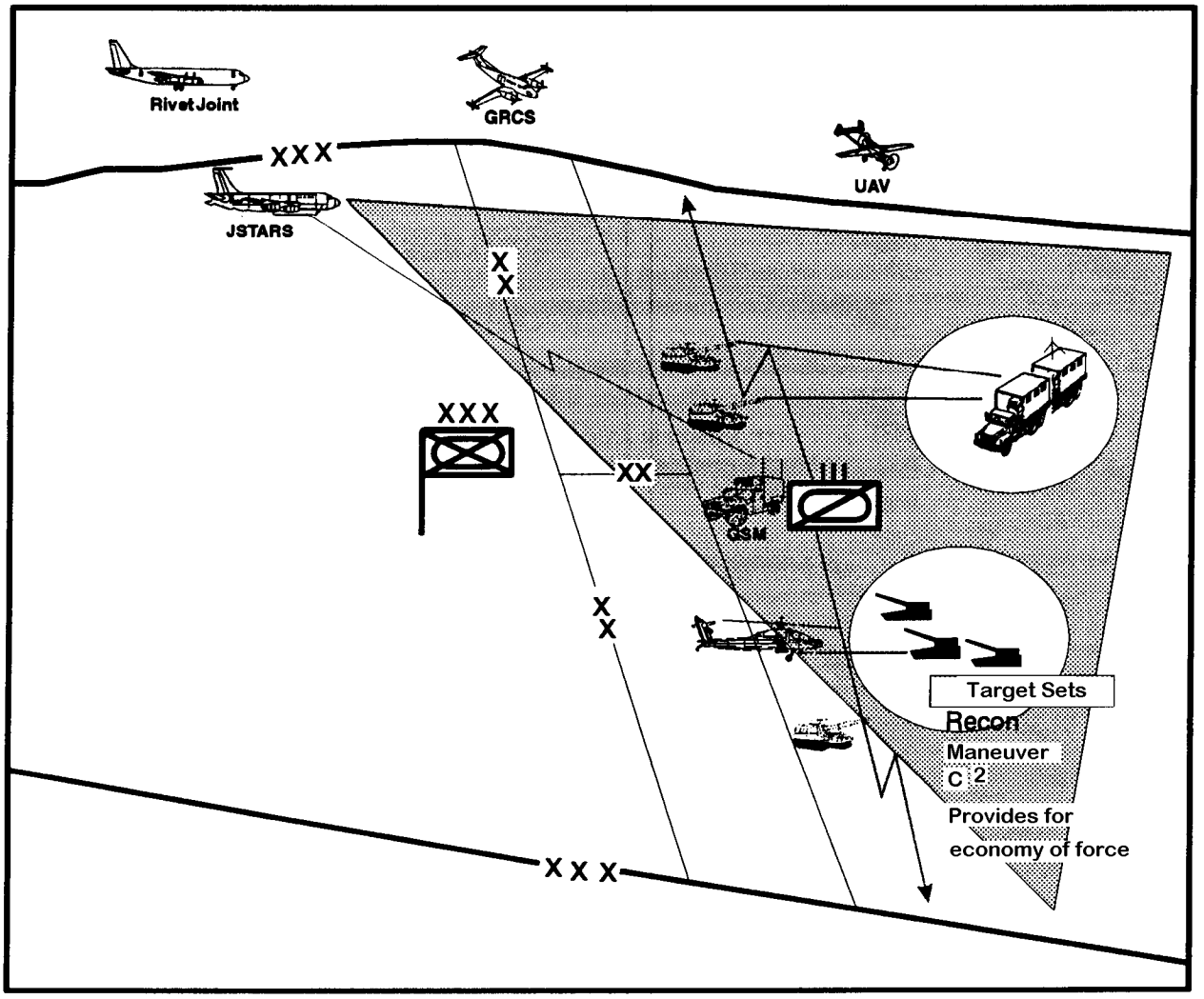


Figure 3-25. ACR battle.

their screens. The taskings, as well as the overlays, should arrive at the GSM 1 to 2 hours prior to aircraft on-station time to allow the operators enough time to enter the necessary graphics.

AVIATION BRIGADE CORPS AND DIVISION

Joint STARS provides corps and division aviation assets with a much improved ability to anticipate events on the battlefield. It augments organic cavalry and reconnaissance assets and provides integrated updates to support the IPB process. Joint STARS improves aviation support of close, deep, and rear area operations by providing an NRT picture of enemy and friendly forces. Commanders can then use aviation assets to better mass superior combat power at the decisive time and place on the battlefield.

Joint STARS provides the ATKHB in NRT information for targeting, surveillance, and situational awareness using secure voice radios. Objectively, the GSM link to the Aviation Tactical Operations Center (AVTOC) allows Joint STARS data to be integrated with the AMPS for pre-mission planning while helicopters are enroute. Secure voice or secure data bursts provide updates. Joint STARS supports aviation operations by providing battle management (situation and target development) and targeting information to the corps and division aviation brigade TOCs. This information can then be transmitted to subordinate battalions through the Army Battle Command Systems (ABCS).

LOS communications is limited when helicopters fly at nap-of-the-earth (NOE) altitudes. Therefore, transfer of Joint STARS information using LOS VHF and UHF radios is limited. Information may have to be retransmitted through others platforms (such as the ABCCC) based on C^2 support requirements.

For high priority, deep strike missions, the E-8 aircraft may provide Joint STARS support via secure radio to Army aviation assets in flight. Division and corps G3 channels must specify this relationship well in advance of the mission. A near-term communications improvement will come in the form of the NOE communications package for aviation units. This package includes increased power amplifiers (SINCGARS) and relocated antennas that provide more reliability. Additionally, the new HF radio will allow for secure voice data communications out to a minimum of 300 km.

CURRENT EMPLOYMENT:

An example of a specific Joint STARS employment in support of aviation units is discussed below. Figure 3-26 shows aviation brigade current system data flow.

Planning. The brigade S2 provides air operations instructions (AOI) to GSM operators. This AOI includes battle engagement area, ingress and egress routes, and target location and disposition. The GSM crew—

- Monitors areas for activity and provides to the S2 on-call reports based on console screen time compression and time integration analysis.
- Responds to immediate taskings for target updates as requested.

Execution Cycle. The GSM crew monitors the AOI and provides an overwatch function. As required, GSM crews—

- Provide requestor changes in target speed, time of arrival, and formations.

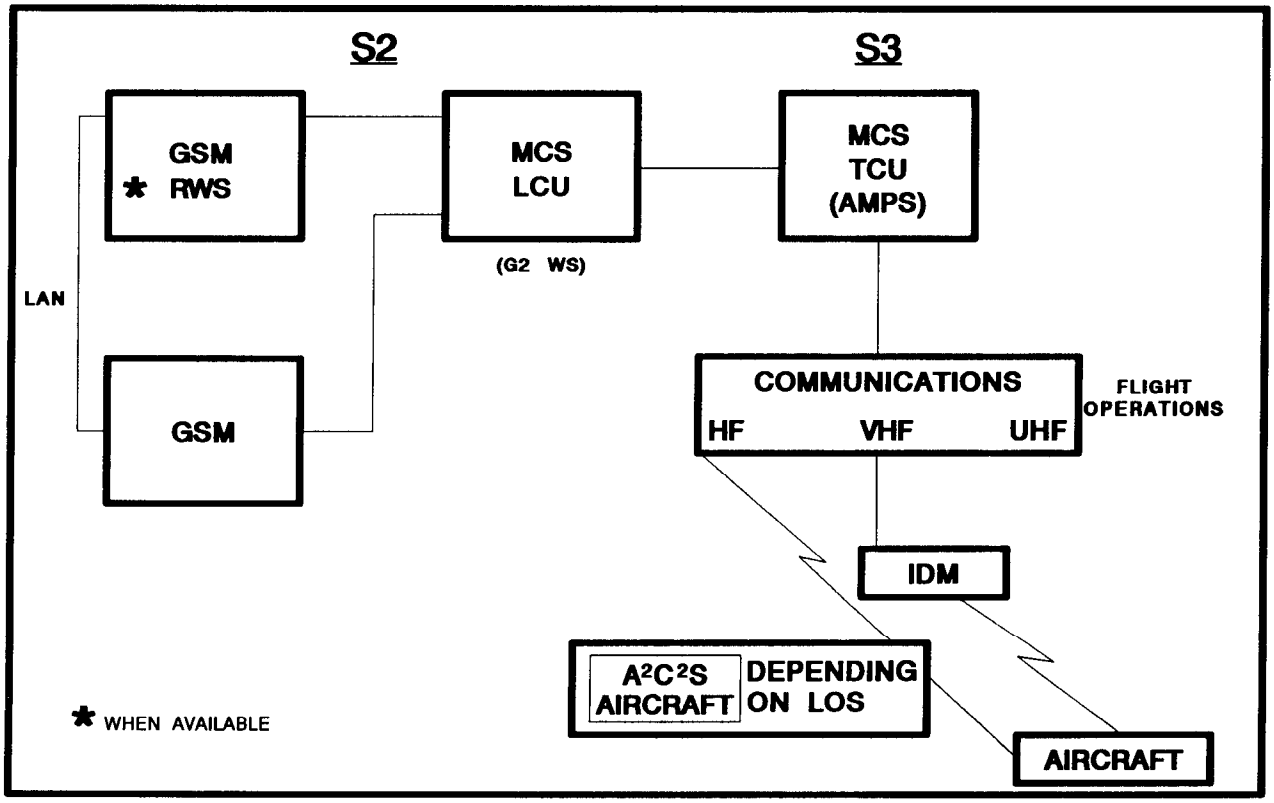


Figure 3-26. Aviation brigade current system data flow.

- Update pictures (situation awareness), new enemy targets, and the friendly situation.

The S3 sends mission or target changes directly to the GSM operator (for example, via hardcopy message, telephone call). Communications range problems can be overcome through prearranged coordination with the E-8 operator, brigade S2, signal officer, and the GSM NCOIC.

Communications Path. E-8 SCDL to GSM, GSM to AVTOC's S2/S3 on local area network (LAN) (ASAS), S2/S3 to aircraft via secure voice VHF, UHF, or HF.

FUTURE EMPLOYMENT:

An example of a possible Joint STARS employment in support of aviation units in the future is discussed below and shown in Figure 3-27. Other initiatives include transmission of imagery from attack helicopter to GSM and E-8 imagery to the Army Airspace Command and Control System (A^2C^2S).

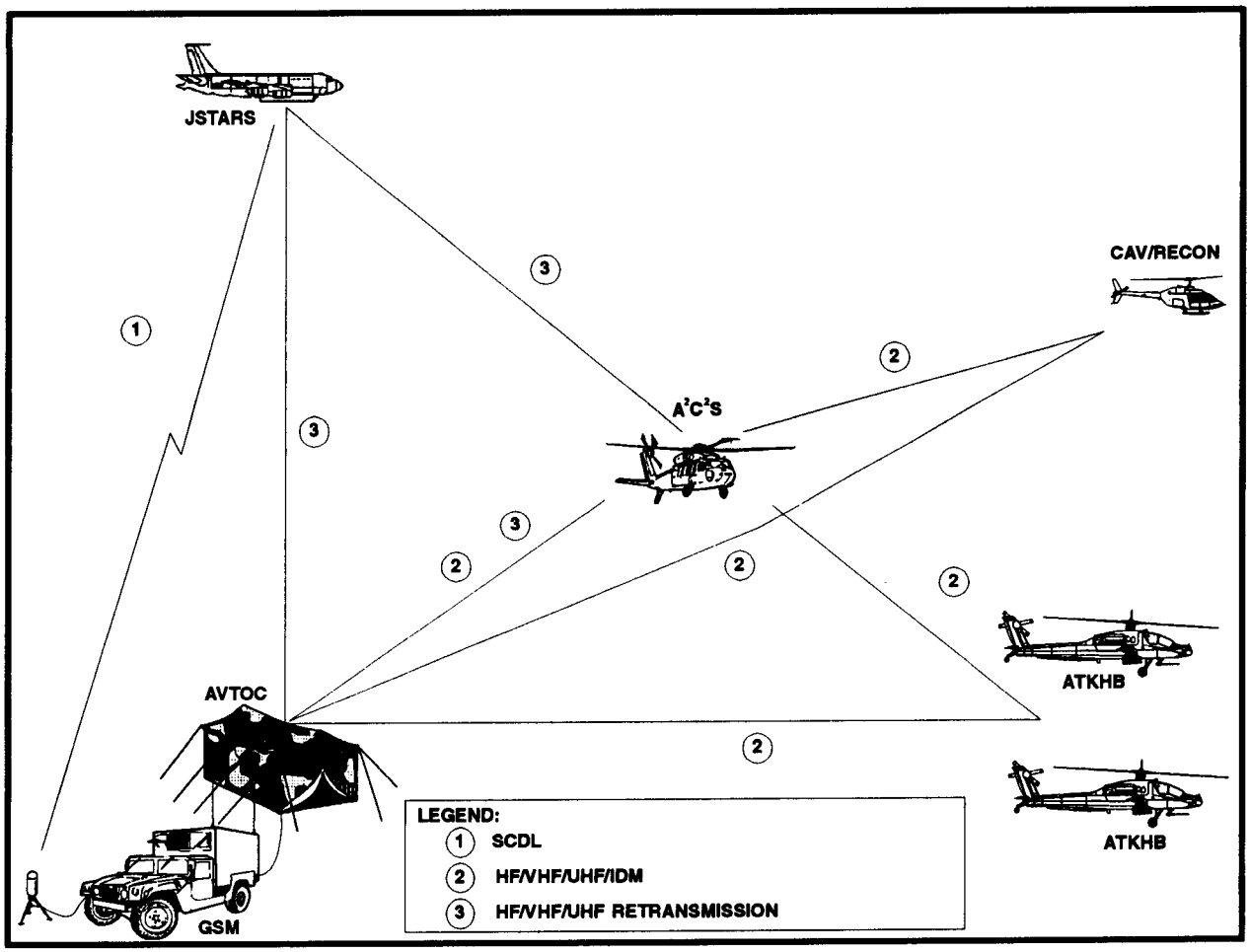


Figure 3-27. Future system data flow.

Pre-Mission Planning. During this stage, GSM updates from time integration and time compression functions on the screen are fed into the Aviation Mission Planning System (AMPS) via the established coordination digital datalink to the AVTOC. AMPS planning data on board the C^2 helicopter goes to attack aircraft commander via data transfer module (DTM).

Execution. GSM data is sent to the C^2 helicopter via AMPS aviation assets using secure data bursts. Support to Army aircraft out of communications range comes through E-8 retransmission GRCS, A^2C^2S, or other C^2 media as specified in the OPORD. The A^2C^2S or Air Mission Commands can also retransmit digital burst updates from ATKHB direct to AVTOC or through A^2C^2S to update pictures (for example, BDA, OB new targets, equipment, unidentified forces).

Communications Path. Communications from GSM to ATKHBs and A^2C^2S are through an improved data modem (IDM). An AVTOC can also be used to retransmit communications via an IDM.

MANEUVER BRIGADE

The maneuver brigade will generally employ its GSM with the analysis and control team (ACT) in the brigade TOC.

The GSM NCOIC obtains a copy of the brigade event template or R&S plan in order to create these graphics on the screen. This will assist in coordination of taskings and provide the operator a better understanding of the mission.

FSE taskings are sent to the GSM via hardwire digital or FM secure voice links established between the GSM and TACFIRE. Intelligence taskings are given to the GSM operator via telephone call or by hardcopy message. If TACFIRE links are not available, then TA-312 field telephone or couriers can be employed. Reports in response to preplanned (baseline) or immediate taskings are sent to the requestor by the means which they were received.

The brigade FSE, along with the ACT and GSM, is at the TOC. Hardware digital or FM secure voice should be established between TACFIRE and the GSM. The FSO can look at hardcopy reports or at the GSM remote display for information on enemy forces nearing or inside kill zones, engagement areas, or preplanned targets.

Chapter 4

ECHELON SUPPORT AND PRODUCTS

At the strategic level (intelligence) was fine. But we did not get enough tactical intelligence—front line battle intelligence.

—General Merrill A. McPeak
Chief of Staff, USAF

GSMs operate differently, depending upon echelon and unit they support. Understanding the system and tasking becomes even more critical. For example, an artillery brigade's GSM operates differently than a Corps Tactical Operations Center (CTOCs) GSM. Team work between GSMs is also essential on the battlefield. One brigade's GSM may have to cover another brigade's sector if its GSM is down for maintenance or is performing operations on the move.

A GSM in a force projection brigade and another GSM supporting a corps DISE may have to split the coverage area so that the operators are not overwhelmed with collection tasking. Splitting the coverage area would be done until other units arrive in theater with their GSMs. GSM operators will also have to be flexible to changing mission profiles. GSMs can be quickly shifted if other GSMs are destroyed by enemy fire or encounter maintenance problems.

ECHELONS ABOVE CORPS (THEATER ARMY)

The commander's mission needs dictate the placement of the two GSMs at this echelon. The mission could be in support of the JIC, the Theater ACE, the DISE, or the AOC or BCE. Its prime missions are—

- Battlefield management.
- Theater level targeting.
- In-depth analysis.
- Strategic and tactical planning.
- Multinational and multiservice coordination and planning.

CORPS AND DIVISION GSM PRODUCTS AND APPLICATIONS

With a corps size area of interest and operations, the GSM operator can quickly become overtasked if the system is expected to collect against a multitude of point NAIs throughout this area. When collecting against NAIs,

operators zoom into this area, 1:50,000 scale or less (about 14 km square area), and lose sight of area situational developments.

At corps and division, area control boxes that overlay NAIs are used instead of the NAIs. This prevents the operator from limiting Joint STARS capability by zooming in on a small area. As an example, a 50 km control box could be used for MSRs; this would give the command the same information as four or five NAIs, and the operator would never lose sight of the coverage area. A corps or division should use only 4 to 8 high-value NAIs during an 8-hour mission. Figure 4-1 shows usage of an area control box. Divisions and force projection brigades with large fronts and deep AIs should also use this concept so that the GSM operator is not overtasked. Joint STARS reports include—

- Number.
- Type.
- Heading.
- Speed and location.

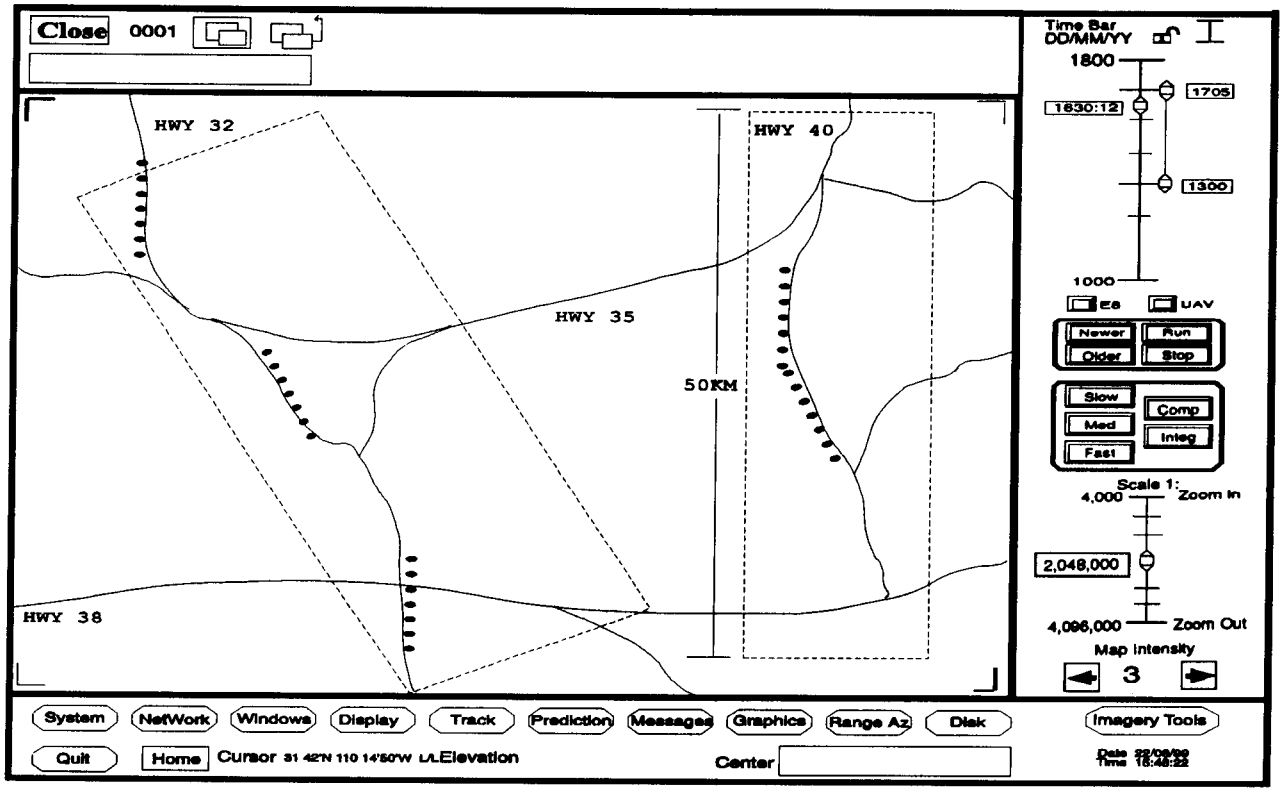


Figure 4-1. Usage of an area control box.

BRIGADE AND CAVALRY SUPPORT APPLICATIONS AND PRODUCTS:

Joint STARS GSMs area critical link in C^3I at brigade and ACR levels. A brigade or ACR's concerns are enemy operations that will impact friendly operations within 12 to 24 hours.

Commanders can now make key decisions in maneuver, targeting, and offensive and defensive operations because of the unique Joint STARS ability of viewing the evolving battlefield.

Collection managers and S2s must provide Joint STARS operators operations and collection graphics in order for the operators to provide the commander a complete situational overview. Figure 4-2 shows Joint STARS imagery with operational and intelligence graphics.

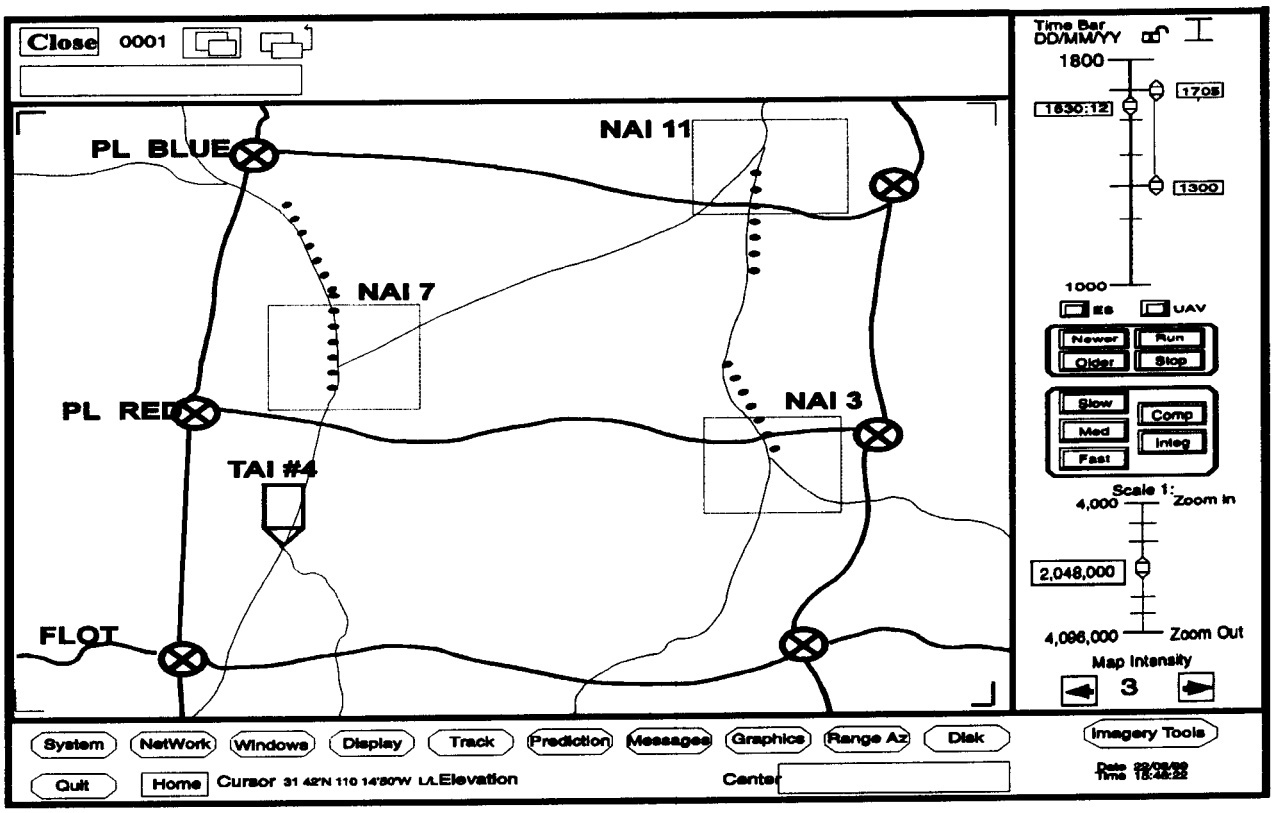


Figure 4-2. JSTARS imagery with operational and intelligence graphics.

AVIATION APPLICATIONS AND PRODUCTS:

Joint STARS can be used in support of most division and corps aviation operations. Three main areas where Joint STARS can be of high value are in support of interdiction (attack) missions, insertion operations, and aeroscout missions.

Besides intelligence collection, Joint STARS can provide targeting, preplanned interdiction missions, and target updating to the attack force, via secure FM, during the operation.

The ability to locate enemy air defense systems through the JTT is extremely valuable during mission planning and while operations are underway. This information is displayed on the operator's screen and on a hardcopy color print, with imagery graphics and JTT data. It can be used to update the command's air event template. Figure 4-3 shows Joint STARS targeting in support of aviation operations (with JTT information).

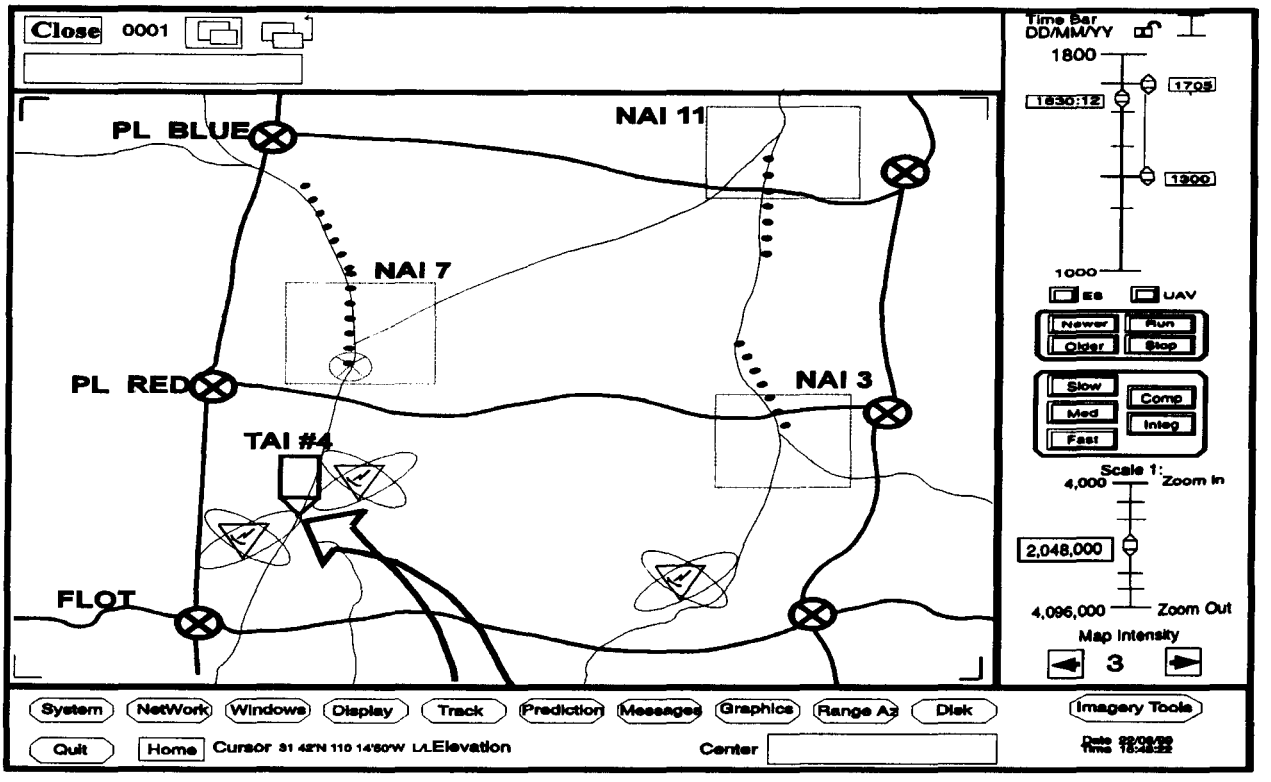


Figure 4-3. JSTARS targeting in support of aviation operations (with JTT information).

Joint STARS is also an excellent tool for insertion operations. The GSM's viewing screens can zoom into any given area within the Joint STARS aircraft's radar footprint. Operators can provide analysis of the area locating moving or fixed targets as well as information on active ADA associated radars. The operators can provide a hardcopy color print overlaid on digital terrain data or E-maps. Figure 4-4 shows Joint STARS imagery in support of insertion operations. GSM operators can provide updated information directly to the helicopter if the status of the area has changed while the mission is underway.

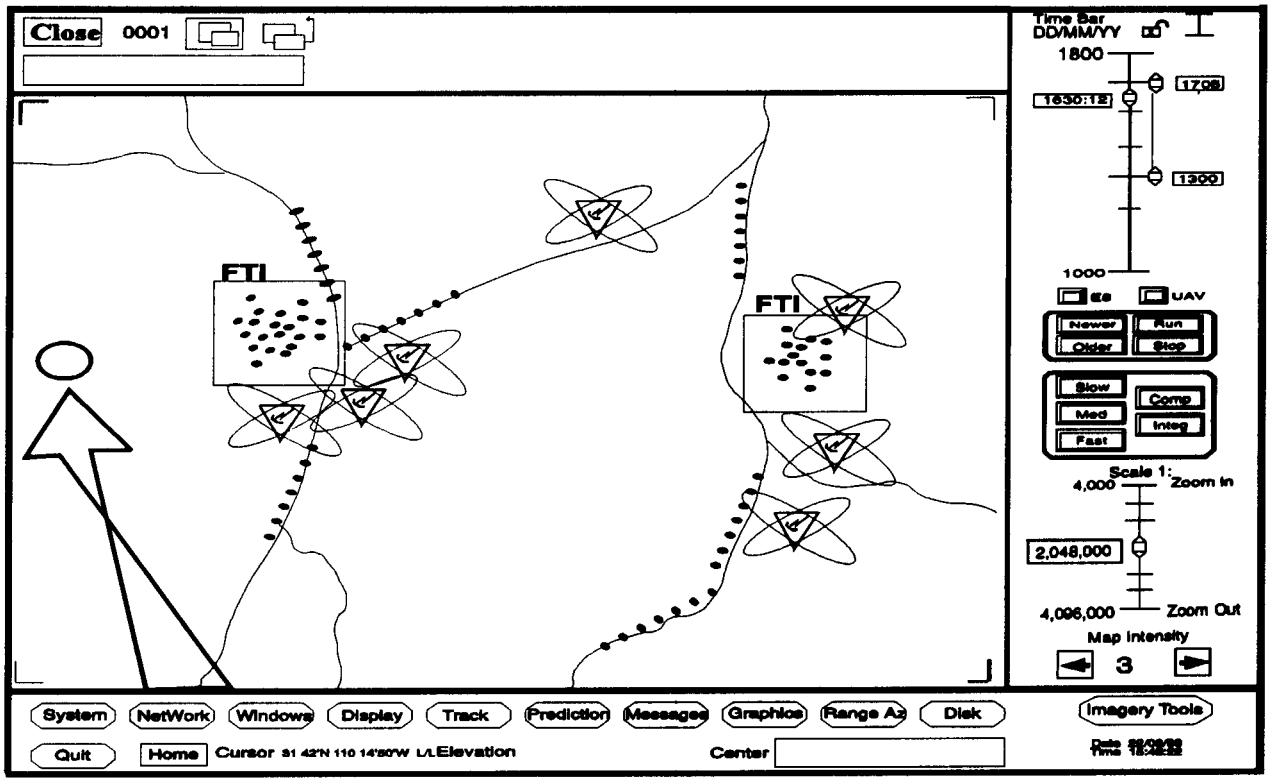


Figure 4-4. JSTARS imagery in support of insertion operations.

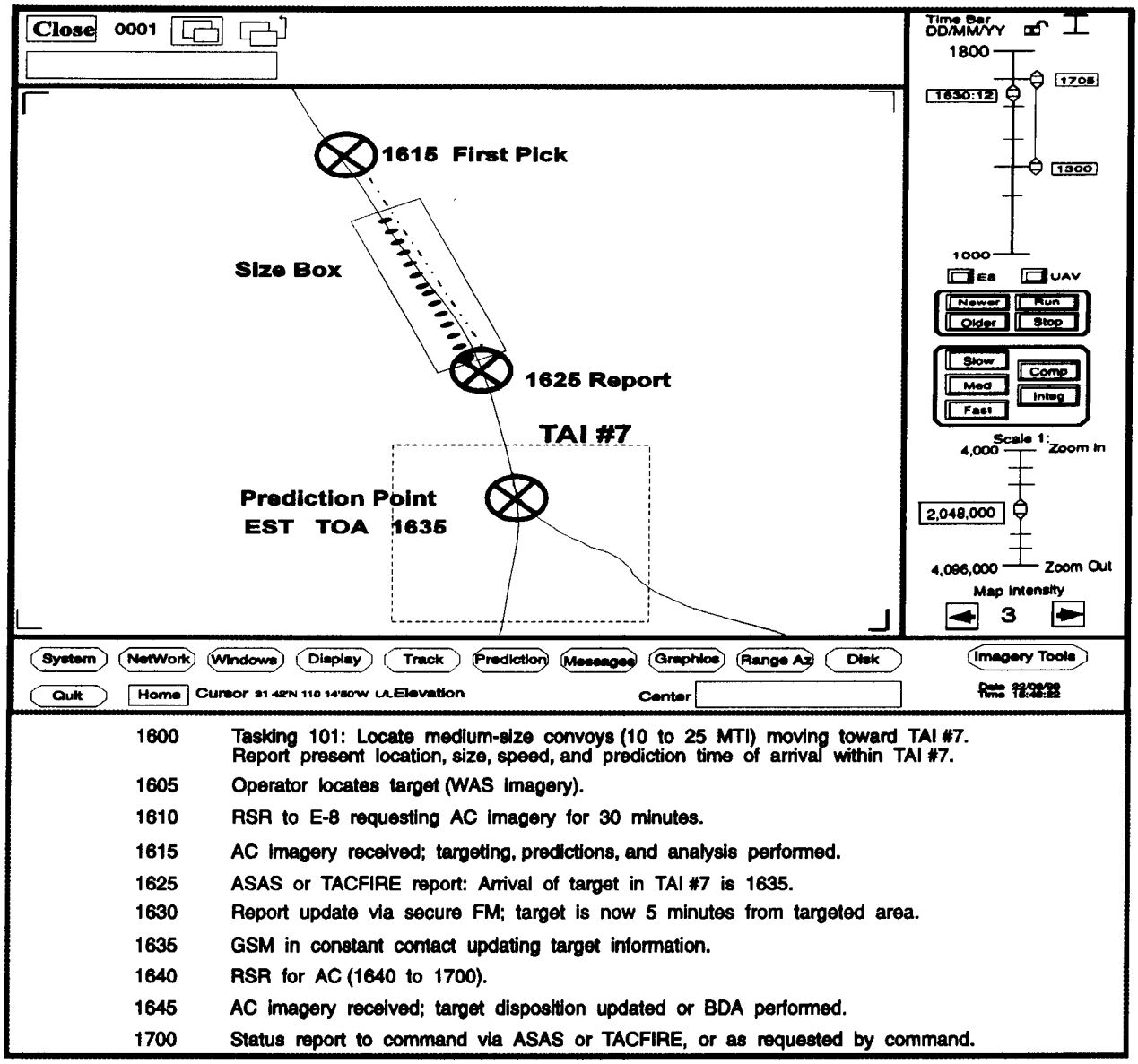
Joint STARS GSMs cue aeroscout operations by the aviation brigade, ACR, or through direct contact to the air asset via secure FM. The GSM operators will need the operational graphics air event template to plot in their database.

JOINT STARS SUPPORT TO THE TARGETING PROCESS:

The main support to division and corps artillery is in the form of targeting. Joint STARS can locate, track, identify wheeled and tracked vehicles, and predict arrival times and coordinates of moving targets. The system can bracket areas and give the commander a count of fixed targets within that area. This targeting information can be autofilled in preformatted TACFIRE or ASAS messages and can be sent electronically, hardwire, or digital FM to the commander. Figure 4-5 is an example of Joint STARS support to the targeting process.

JOINT STARS AND UAV CROSS-CUEING AND JOINT OPERATIONS:

No other intelligence collection systems complement one another more than Joint STARS and UAV. Each system's strength supports the other's weakness. UAV's ability is extremely limited when used for general search and detection over unfamiliar terrain. UAV is effective when used to observe point targets or conduct route reconnaissance. Joint STARS with



1600	Tasking 101: Locate medium-size convoys (10 to 25 MTI) moving toward TAI #7. Report present location, size, speed, and prediction time of arrival within TAI #7.
1605	Operator locates target (WAS imagery).
1610	RSR to E-8 requesting AC imagery for 30 minutes.
1615	AC imagery received; targeting, predictions, and analysis performed.
1625	ASAS or TACFIRE report: Arrival of target in TAI #7 is 1635.
1630	Report update via secure FM; target is now 5 minutes from targeted area.
1635	GSM in constant contact updating target information.
1640	RSR for AC (1640 to 1700).
1645	AC imagery received; target disposition updated or BDA performed.
1700	Status report to command via ASAS or TACFIRE, or as requested by command.

Figure 4-5. Targeting process.

area coverage can locate targets to direct UAV to investigate. This gives the command increased ability to analyze the battlefield. By combining both, the command can receive a single product—fused imagery and information. Figure 4-6 shows Joint STARS imagery and UAV imagery fused into a single product.

Examples of Joint STARS-UAV cueing modes **—OBSERVATION-CUE-OBSERVATION—** are discussed below.

- Joint STARS locates moving targets through MTI (observation); UAV flies to confirm (cue); operator identifies and observes (observation).

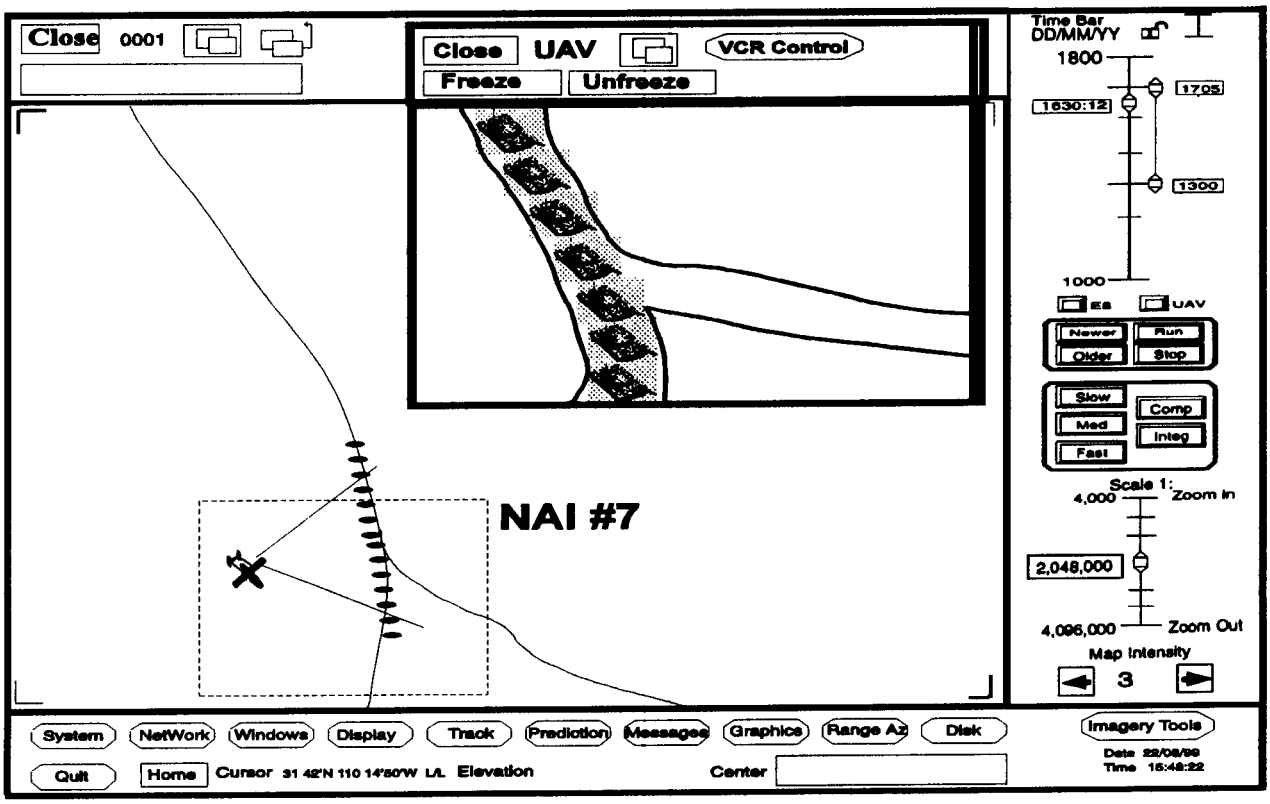


Figure 4-6. Example of JSTARS and UAV fused intelligence.

- UAV identifies moving targets; Joint STARS tracks the target, updates its disposition, and passes information on for targeting. This is done through the use of MTI, SS, AC, AP, and SATC radar modes.
- UAV observes temporary stationary target; Joint STARS confirms the target through SAR or FTI radar mode, then observes for movement.
- Joint STARS takes a SAR image of a given area based on other intelligence; UAV flies to confirm, identify, and provide the command more visual intelligence.

In some scenarios the collection manager, G2/S2, or the commander may want simultaneous collection of certain targets. This may be useful in directing targeting operations, intelligence collection, BDA, or even in operations other than war (OOTW) (for example, identification of drug-processing facilities, guerrilla camps, massing of arms, or treaty verification).

The GSM currently receives UAV imagery and telemetry data via two wire cables between the GCS-UAV and the GSM. To display UAV imagery, the GSM operator creates a UAV video window in the operator display. Joint

GSM operator creates a UAV video window in the operator display. Joint STARS imagery, UAV imagery, and SIGINT data icons can all run or be displayed simultaneously.

Joint STARS imagery and UAV imagery are recorded in two separate recording devices within the GSM. This provides an excellent database of imagery for post-analysis and change-detection analysis. Cueing operations must be directed and approved by the S2 or collection manager. In certain situations the S2 or collection manager may authorize direct cueing coordination between UAV and GSM operators. The operators of the two systems can communicate via MSE, AN/VRC-92, or AN/TA-312.

OPERATIONS OTHER THAN WAR:

With the changing world—post cold war—military forces are called upon more often for OOTW. OOTW may be combative or noncombative in nature. These operations are numerous with possibly no two exactly the same. Joint STARS, with its standoff WAS capability, is ideal to support a large number of these missions. This standoff capability provides intelligence collection in support of national interest without violation of another nation's airspace. Joint STARS is well suited to support the missions listed below.

Drug Interdiction. Joint STARS can locate drug processing facilities, camps, and agricultural areas. The system can confirm or deny activity at these sites (SAR and Spotlight modes); trafficking routes to observe for activity on airfields, roads, waterways, or cross-country (MTI, FTI, and Spotlight modes); vectoring in air mobile and ground operations or supporting host nation (HN) interdiction operations (MTI or Spotlight modes).

Guerrilla Activity. This involves locating operation centers and encampments (SAR and FTI), as well as tracking of "some" insurgency activity (Spotlight modes).

HN Security Operations. This involves detecting buildup of heavy arms by bordering nations or internal factions (all modes). It also involves cuing and directing counterinsurgency operations based on imagery (all modes).

Monitoring Treaties and International Agreements. This involves observing arms movement, buildup, and positioning of forces (all modes). It also involves observing possession of illegal weapons (SAR, JTT, and cross-cueing).

Peacekeeping and Humanitarian Aid. This involves locating hostile activity and the direction of humanitarian aid based on the hostile action or its potential (MTI and Spotlight modes). It also involves monitoring friendly aid convoys in a potentially hostile environment for success (MTI and

- Unimproved field strip (#1).
- Abnormal cross-country movement (#2).
- Waterway activity (#3).

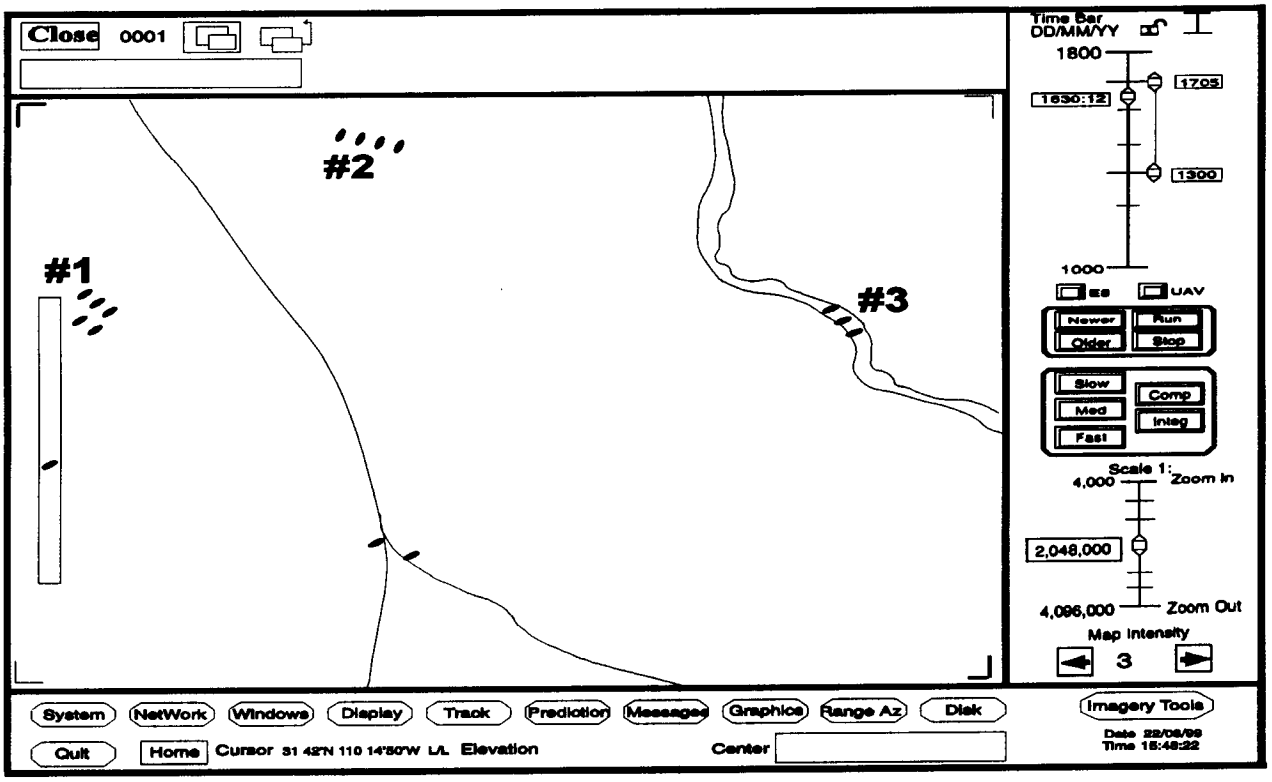


Figure 4-7. JSTARS OOTW support.

FUTURE CAPABILITIES

The next generation system scheduled to replace the GSM is the CGS. Similar in appearance and function to the LGSM, the CGS is a leap forward in technology and function. This system increases the commander's ability to assess the battlefield situation; it also increases the speed of accessing intelligence not normally found at a brigade level command. The following features will be improved in the CGS.

JTT SYSTEM:

The JTT system will be upgraded from a two-channel, receive-only hybrid system to the three-channel, receive-only system. This will allow access to the Secondary Imagery Dissemination System (SIDS) via the general

purpose link (GPL). The CGS operator will be able to open a window on the operator's display and call up digitally stored imagery from corps or EAC databases. The digital imagery would already be annotated and thoroughly analyzed. (See Appendix D.)

UAV INTERFACE:

The CGS will have its own antenna to intercept the downlink from UAV. This antenna will eliminate the currently required hardware interface with the GCS-UAV.

AVIATION INTERFACE:

The third capability is the interface with aviation assets (for example, A^2C^2S, Kiowa-Warrior, Apache-Longbow, and Comanche). There are two modes being tested for interface: data message and secondary imagery.

Data Message Interface. The data message interface will be similar to the LGSM's ASAS and TACFIRE interface via IDM. The attack or scout helicopters possess the capability of electro-optical and infrared imaging. A datalink could be established so the aviation commander can see the battlefield through his assets and use this information in either the intelligence collection or operations control mode. Some air assets may also receive uplink capability so that the commander may have visual battlefield information in the A^2C^2S helicopter.

Secondary Imagery Interface. Secondary imagery, Joint STARS imagery, UAV imagery, and JTT SIGINT data used simultaneously are examples of change detection of an area. Figure 4-8 shows multiple sensor imagery with JTT SIGINT data in change detection operations. Other uses of secondary imagery include obstacle and fortification detection and in-depth analysis of an area and targeting operations.

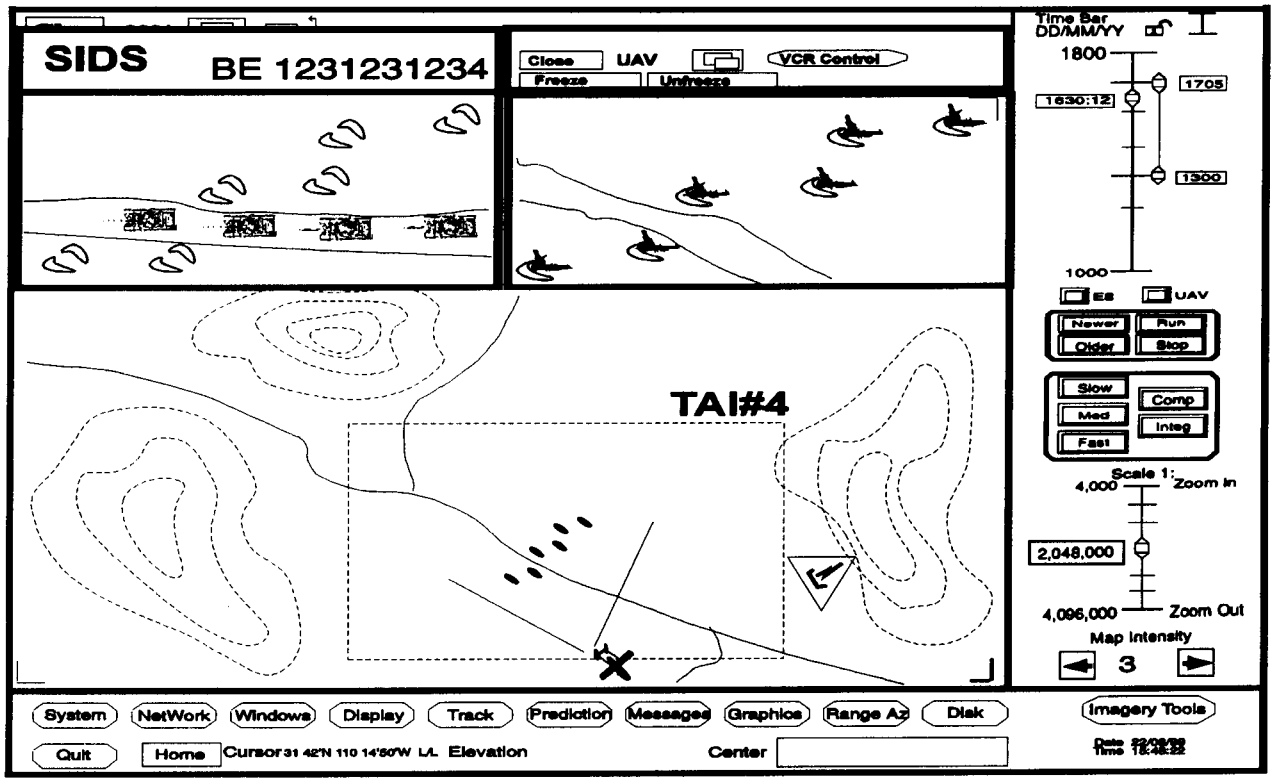


Figure 4-8. Example of multiple sensor imagery.

Chapter 5

SURVIVABILITY

DESERT STORM provided the materiel and combat developers a rare opportunity to assess the current capabilities of a full scale development system in a wartime operational environment.

—LTC John W. Holmes
US Army Operational
Test and Evaluation Command

The Joint STARS GSM can deploy virtually anywhere to support the commander's needs to support his operations. It can be located from relatively secure sanctuary areas in the rear to forward CPs on the battlefield. As a result of this great flexibility, it faces a variety of threat levels and types. When in operation, the GSM is not in continual data and voice communications with the aircraft. The GSM is also linked to the TACFIRE and ASAS on the ground. Because of the hardwired links to TACFIRE and ASAS, the GSM has the capability to operate in a totally passive mode. However, jamming and sabotage are a threat.

THREAT

The threat to the Joint STARS GSM is classified into two categories:

- Jamming the SCDL or the UHF and VHF radios to the E-8 aircraft.
- Sabotaging the GSM.

JAMMING THE SCDL LINK:

Correct communications security (COMSEC) procedures help reduce radio communications vulnerability. The SCDL is relatively jam resistant. Active enforcement of secure communications procedures for voice transmissions over supporting networks will reduce vulnerability. For example, the operator can—

- Employ frequency hopping.
- Decrease transmission distance. (Given the orbit of the aircraft at a specified time; this is not always a possibility.) (See classified Appendix A.)
- Reduce transmission time. This involves communication between GSM radios and the aircraft. Voice formats should be planned to achieve brevity and uniformity (for example, stay on the air long enough to conduct business, then get off the air).

SABOTAGING THE GSM:

The GSM has a unique recognition profile to enemy visual reconnaissance. The main GSM physical signature is the SCDL antenna that rises vertically to 100 feet on the IGSM and 30 feet on the Block I GSMs. Using proper security procedures in active garrison and field sites reduces vulnerability to the sabotage threat.

SURVIVAL MEASURES AGAINST CONVENTIONAL THREATS

Locating the GSM to take advantage of concealment and cover reduces the vulnerability. GSM personnel must be proficient in camouflaging urban, desert, and wooded environments to supplement natural concealment and cover. The GSM faces the same threat of destruction by fires as the unit or CP to which it is assigned. The GSM does not provide any protection against direct or indirect fire weapons.

The GSM has an inherent recognition profile to enemy visual reconnaissance because of its SCDL antenna. To operate efficiently, its antenna must have LOS to the aircraft. If the antenna is extended to its full height to achieve LOS, this will create a unique profile which helps identify the GSM. Natural silhouetted terrain features can be used to reduce the antenna's profile. Mounting the SCDL on the tripod vice the main mast can also reduce the antenna profile.

Although the GSM's antenna cannot be camouflaged without degrading reception, the shelter may be camouflaged. Shape-disruptive painting and the Lightweight Camouflage Screen System (LCSS) reduce visual or electronic detection of the GSM.

SHAPE-DISRUPTIVE PAINTING:

This is commonly called pattern painting or camouflage. It reflects in the near infrared band of the electromagnetic (EM) spectrum like nature's colors. This type of painting helps equipment to blend in with the natural surroundings and reduces detection from image-intensifying sensors.

LIGHTWEIGHT CAMOUFLAGE SCREEN SYSTEM:

LCSSs provide excellent cover when properly used. They are radar scattering or radar transparent. The radar scattering screen contains minute fibers of stainless steel which inhibit the passage, reflection, and return of a threat radar signal. The radar transparent version is made without these fibers. It can be used to protect the GSM without altering its effectiveness to link to the aircraft. LCSSs can usually be set up in 20 to 25 minutes.

SURVIVAL IN A NUCLEAR, BIOLOGICAL, AND CHEMICAL, ENVIRONMENT

The GSM has protection against the effects of EM pulse.

To protect against the nuclear, biological, and chemical (NBC) threat, the GSM and GSM shelters, antenna group, and exterior and interior finishes are painted with nontoxic chemical agent resistant paints.

The Block I GSMs are designed to maintain positive pressure for collective protection or to be operated by personnel in individual NBC protective clothing. Personnel leaving the shelter should always be in proper mission-oriented protective posture (MOPP) as determined by the environment.

Standard NBC alarms are used outside the shelter to provide a local alarm warning of detected chemical agents. When an NBC attack occurs, outside personnel should be in MOPP 4 and erect a protective entrance as soon as possible. This allows the mission to continue without opening the shelter door. (See FM 3-4.)

When in an NBC environment, extreme caution must be used to avoid contaminating the interior of the shelter. Should contamination occur, all work must be conducted in MOPP 4 until the interior can be decontaminated. For the exterior of the shelter and the vehicle, the appropriate decontamination kits and solutions should be used. (See FM 3-5.)

OPERATIONS SECURITY

Operations security (OPSEC) is the process of denying adversaries information about friendly capabilities and intentions. OPSEC—

- Is accomplished by identifying, controlling, and protecting indicators associated with planning and conducting military operations and other activities.
- Is a common-sense approach applied systematically to a unit's situation and mission.
- Requires a totally integrated effort by commanders, staffs, units, and individuals. The result is security of the force.

Good OPSEC provides the best method of battlefield survival and keeps the enemy from locating GSM stations. Under the OPSEC umbrella, three actions are taken:

- To protect the true status of friendly activities and operations and counter-surveillance.
- To eliminate or reduce enemy SIGINT and related electronic warfare (EW) capabilities and activities that threaten the United States Army counter-signals intelligence (C-SIGINT).
- To create a false picture of friendly activities and operations to mislead the enemy into actions which are counter to their intentions and deception.

GSM crews must practice good OPSEC as soon as the GSM is deployed. All operators should know reporting procedures and SCDL frequencies as well as GSM UHF and VHF radio coordination frequencies. Operators should be knowledgeable of datalink initialization parameters.

PHYSICAL SECURITY

The GSMs overall physical security plan should be designed to safeguard its personnel, property, and operations. The supporting command provides physical security. GSM physical security procedures should, when possible, include—

- Locating the GSM adjacent to a sensitive compartmented information facility (SCIF) for the TOC.
- Placing supplemental barbed wire and concertina wire to further protect the system.
- Controlling access (concertina wire, only when appropriate).
- Knowing or being aware of friendly combat units that could provide additional security.
- Properly classifying, handling, safekeeping, and destroying all intelligence information.

Chapter 6

MAINTENANCE AND LOGISTICS

Joint STARS proved to be one of the most, if not the most, significant technological successes of the Persian Gulf War.

—LTC John W. Holmes
US Army Operational
Test and Evaluation Command

Joint STARS GSMs were originally designed under a five-tier maintenance plan (operator, organizational, DS, GS, and depot). This chapter incorporates the five-tier plan into the two-tier maintenance process **— field level** and **sustainment level.**

MAINTENANCE

The Block I GSM maintenance plan is designed to maximize "on-equipment" repair to rapidly restore the GSM to normal operation. On-equipment repair is maintenance performed on individual pieces of equipment within the GSM without removing the equipment from the shelter. On-equipment repair requires the minimum of maintenance tasks, support equipment, personnel, and repair facilities. TM 11-5865-299-20, Part Two, contains a maintenance allocation chart that defines grouping of components, assemblies, modules, component names, functions to be performed, active maintenance time requirements, and required maintenance equipment.

FIELD LEVEL MAINTENANCE:

Field level maintenance consists of operator and organizational level maintenance tasks.

Operator Maintenance. Operator maintenance is the lowest level of maintenance performed on the GSM. It is normally initiated with operator PMCS. PMCS is conducted before, during, and after operation as well as weekly, monthly, quarterly, and annually in accordance with the appropriate GSM technical manuals. The operator is responsible for initial fault detection and isolation. Since the Block I GSM is designed to facilitate modular replacement of components, the operator is authorized to remove and replace components as stated in the technical manual. To aid the operator in diagnostics, 90 percent of the equipment in the GSM has been designed with built-in-tests (BITs), which facilitate thorough fault isolation.

Organizational Level Maintenance. Organizational and unit level maintenance includes PMCS as discussed above, modular removal and replacement, replacement of line replaceable units (LRUs), and limited "off-equipment" maintenance. The main type of maintenance that is done at unit level is non-system maintenance, maintenance on the prime mover, support vehicles, generators, communications equipment, and COMSEC equipment.

SUSTAINMENT LEVEL MAINTENANCE:

Sustainment level maintenance consists of DS and GS repairs.

Direct Support Maintenance. DS maintenance provides both "on-equipment" and "off-equipment" maintenance. The on-equipment maintenance support will fault isolate the 10 percent of the faults detected but not isolated by the GSM operator. LRU removal and replacement restores the equipment to operational status. Off-equipment maintenance includes limited repair of electro-mechanical and mechanical devices. This also includes screening of GO and NO-GO circuit cards.

General Support Maintenance. GS maintenance performs "off-equipment" maintenance that exceeds the "time to repair" constraints or capability of DS maintenance. It includes further fault diagnosis and isolation of modules to internal shop replaceable unit components. Repairs will include adjustments, alignment, and repair in accordance with the government-furnished equipment (GFE) and GSM allocation charts.

DEPOT LEVEL MAINTENANCE:

Depot level maintenance is in accordance with procedures in the appropriate technical publications. GSM depot level maintenance is performed by the contractor at the contractor factory. The contractor provides common spares parts, replaceable modules, stock depot level GSM unique spares, and unique repair parts, as required.

SOFTWARE:

The Communications-Electronic Command (CECOM) is responsible for initial purchase of system-related software. Software lifecycle support is dependent on future development of the Block I program. CECOM is responsible for evaluating and procuring replacement software and future upgraded GSM software. Table 6-1 lists the maintainability and testability characteristics and requirements of the hardware.

BATTLE DAMAGE ASSESSMENT AND REPAIR (BDAR):

BDAR is designed to rapidly return disabled electronic equipment to operational status. This is done by repairing, bypassing, or alternating components to restore minimum functions required to support combat missions with the Block I GSM. BDAR is divided into two areas: BDA and

Table 6-1. Maintainability and testability characteristics and requirements.

Mean Time to Repair:	- 30 minutes at operator or unit level - 60 minutes at intermediate level
Maximum Time to Repair:	- 60 minutes at operator or unit level - 3.5 hours at intermediate level
Repairs:	- 90% faults diagnosed unit level - 10% faults diagnosed intermediate level
BIT:	- 90% detection of all LRU failures - 80% isolation to single card or module - 2% or less false alarm rate

NOTE: No operation intervention beyond initiation of BIT.

battle damage repair. BDA is divided into three types of assessments: extent of damage, repairs needed, and location and method to repair. (See TM 11-5865-299-20 for task summaries.) Other pertinent BDAR information concerning the Block I GSM is in TM 11-5800-215-BD.

LOGISTICS

Block I GSMs are supportable using the standard Army Logistics System. Initially the contractor field service representative will order those GSM peculiar parts needed to keep the system working. The GSM NCOIC will order and maintain proper accountability of all other supplies not peculiar to the GSM.

TRANSPORTABILITY:

The GSM is transportable by all transportation modes (for example, highway, air, rail, and sea). There are no constraints involving the GSM. Transportability approval of the GSM is in accordance with AR 70-47, Appendix F, and appropriate technical manuals.

AIRWAY (AIR FORCE):

Baseline figures for a GSM section were used to determine transportability requirements. Deployments to extreme environments would probably increase baggage and pallets requirements. These figures are based in part upon operational experience. No C-17 specific load plans were researched, but GSMs can be airlifted in it.

The baseline IGSM and MGSM section load consists of—

- The MGSM and IGSM in a modified S-280 (S-751 and S-679) shelter on a 5-ton truck (M-923) prime mover.
- One 5-ton (M-923) support truck without shelter.
- Two power generator trailers.
- One supply or spares 463L pallet.
- One supply or personal baggage 463L pallet.

The baseline LGSM section load consists of—

- One GSM in an A-3189543 shelter on a HMMWV.
- One support HMMVW with an S-788 shelter.
- One power generator trailer.
- One supply or spares 463L pallet.
- One supply or personal baggage 463L pallet.

Air Force Airlift. The LGSM can be transported on C-130E, C-141B, and C-5A aircraft. The GSM can only deploy on C-5A aircraft.

Airlift, GSM Breakdown. As an alternative in an emergency, C-141B aircraft can be used to transport the GSMs. In order to use C-141B aircraft, the modified S-280 shelters must be removed and loaded separately from the prime mover. This requires a 12,000-pound crane being available at both loading and unloading sites. Section personnel require 1 hour to break down the GSM, and 1 hour to reconfigure it. The GSM modified S-280 shelters can be palletized on 463L pallets using tie-down straps and carried by C-130E and C-141B aircraft.

The following is a breakdown by GSM variant section showing how many Air Force aircraft, by type, are required to deploy:

- 1 LGSM section on 2 C-130Es.
- 1 LGSM section on 1 C-141B with 3 open 463L pallet spaces.
- 3 LGSM sections on 1 C-5A with 4 open 463L pallet spaces.
- 1 GSM section on 2 C-141Bs (S-679 shelter removed).
- 2 GSM sections on 1 C-5A with 8 open 463L pallet spaces.

The E-8. The E-8 is self-deployable from Melbourne, FL (pre-initial operational capability [IOC]) and Robins AFB, GA (post-IOC). The E-8 requires the same runway and air base facilities as other Boeing 707 variants, E-3 (AWACS), and KC-135 tankers.

HELICOPTERS (ARMY):

The GSM modified S-280 shelter when removed from the prime mover can be lifted by a CH-47D helicopter using 10,000 and 25,000 pound slings. The LGSM A-3189543 shelter on the HMMWV is also transportable by CH-47D helicopter.

RAIL:

All GSMs can be transported by 50-foot flatcar within CONUS and an 11.3 meter flatcar outside continental United States (OCONUS). Blocking and tie-down materials are required to secure the system during rail movement.

HIGHWAY:

There are no major problems anticipated with the movement of the GSM either on or off highways. The prime mover should be able to drive under standard secondary road bridges in the areas of the world where employment is possible. Currently, the GSM will drive to its location or, if the distances are long, a low-boy tractor-trailer rig is used to transport the GSM. The latter method saves some of the inherent wear and tear on the vehicles normally associated with motor convoys.

WATERWAY:

Movement via ship has been verified through analysis. Blocking and tie-down materials are required. The GSM can be transported by the following ships:

- LACV-30.
- LCM-8.
- LARC-LX.
- LCU 1466.
- LASH LIGHTER.
- Seabee Barge.

Chapter 7

TRAINING

MI soldiers must master the technical, tactical, and leadership skills required to employ and maintain sophisticated intelligence systems on the battlefield.

—FM 34-1, 27 September 1994

Operator training is the same for all versions of the GSM. Maintenance training is developed based on logistic support analysis (LSA) generated by the contractor. The US Army Intelligence Center and Fort Huachuca (USAIC&FH) is the proponent for training and approves a critical tasklist covering all operator and maintenance tasks for the GSM. Training development is structured and executed using the systems approach to training (SAT) process. All Department of the Army (DA) Joint STARS operator and maintenance personnel attend institutional training.

IMAGERY GROUND STATION OPERATOR (96H)

Upon completing basic training, the soldier arrives at USAIC&FH for initial entry training and advanced individual training. In addition, soldiers currently holding MOS 96H (Aerial Intelligence Specialist) undergo retraining as an IGSO. Enlisted personnel are trained to operate and perform operator and unit level maintenance on the Joint STARS GSMs, to include—

- GSM operation and operator and unit level maintenance.
- Basic imagery analysis techniques.
- Reporting of targets from radar, electro-optical, and infrared collection systems.

The IGSO is trained in the following areas at Skill Level 1.

- Common Soldier Tasks.
- Operation of the MGSM and LGSM.
- Communications, such as load KY-57 TSEC; use of signals operations instructions (SOI).
- Pre-mission activities, such as conduct mission briefings, site selection, emplacement, system initialization.

- Mission activities, such as establish and maintain communications with the E-8, and emergency procedures.
- Post-mission activities, such as record mission data, conduct crew rotation briefings, GSM shut down.

MAINTAINER (33T)

The 33T is responsible for non-operater GSM maintenance.

UNIT TRAINED CRITICAL TASKS

The following are unit trained critical tasks:

- Operate and license on 15 and 30 kW diesel generator.
- Operate and license on tactical vehicles.
- Use unit SOPs.
- Perform TOC and ACE operations and GSM interface.

UNIT SUSTAINMENT TRAINING AND CREW DRILLS

Playback of previous missions is available for sustainment of some operator tasks. Crew drills on **Prepare for Operations** and **Prepare for Redeployment** keep soldiers proficient at preparing the GSM and associated equipment for operations and redeployment. Collective training is tailored by the unit mission essential task list (METL).

PRE- E-8 TRAINING REQUIREMENTS:

All Army E-8 enlisted crew members must complete 96H IGSO initial entry training and advance individual training. An Army Class III flight physical and Air Force physiological training must also be completed prior to attending initial qualification training (IQT).

Before arriving at the Joint STARS wing, individuals will complete or be scheduled for Air Force survival, evasion, resistance, and escape (SERE); and Air Force Water Survival Training courses. These requirements can be waivered for pre-IOC contingency deployments on E-8. All soldiers must have a minimum of a SECRET clearance.

E-8 CREW TRAINING:

Mission crew training includes formal and informal training conducted by the Joint STARS Joint Task Force (JTF), Joint Army and Air Force cadre, and contractor instructors at Melbourne, FL. The informal training is conducted daily in support of developmental requirements, demonstrations, tests, evaluations, and contingency training requirements. In the advent of a contingency deployment, the formal training is also conducted.

Primary Training. The primary training is provided by existing experienced Joint Army and Air Force cadre and contractor instructors. The training emphasizes system operations, operational procedures, and tactical command and control intelligence (C^2I) interfaces. Pre-deployment training consists of multiple training tracks covering generic training requirements and crew member specific requirements. This training is conducted at the Joint Test Task Force (JTTF).

Academic Training. Academic training includes the following subject areas:

- E-8 life support and emergency procedures training.
- Joint STARS capabilities and functions, to include the GSM.
- Joint STARS radar imagery familiarization.
- US Army and US Air Force organization, doctrine, and tactics.
- Aircrew specific position duties and responsibilities.
- Crew coordination.
- Mission crew simulator and laboratory training.
- Enemy organization, doctrine, and tactics.

Flight Training. Flight training is conducted after the crew members complete the academic training. This training includes any available flights to include the deployment flight. Currently, an Army mission crew member is considered to meet IQT status after 20 flight hours.

POST-IOC E-8 TRAINING:

Mission crew training is formalized training conducted by the 19th Wing Training Squadron located at Robins AFB. This IQT is conducted by a Joint Army-Air Force contractor training cadre in accordance with formal courses approved by the Training and Doctrine Command (TRADOC) and the Air Force.

The IQT will minimally qualify crew members prior to assignment to an operations squadron. The operations squadron conducts military qualification training (MQT) on unit procedures. A squadron trainer evaluates the crew member prior to being cleared as mission ready. In addition, the two operations squadrons conduct recurring collective training, which is called continuation training.

The primary emphasis of the IQT is on the training of aircrews in system operations, operational procedures, and tactical C^2I interfaces. IQT consists of multiple training tracks covering generic training requirements and crew member specific requirements.

Flight training is conducted after the crew member successfully completes the academic and simulator training. This training is projected to average 10 to 13 flights. The first training sortie flight is considered a demonstration flight with the student performing limited duties under instructor supervision. The final flight is a flight evaluation by a qualified flight examiner.

Continuation training is designed to maintain and test crew proficiency. It is conducted in the mission crew simulator and on board the E-8. This is integrated into existing Army and Air Force exercises.

Embedded training simulation (ETS) is required to augment mission crew ground simulators. This capability is realized using aircraft hardware with ETS software to generate simulated targets and threats on appropriate displays in-flight. Air and land tracks are also simulated. Embedded training is required for mission crew operators plus the navigator.

BASIC NONCOMMISSIONED OFFICER COURSE

Prior to promotion to staff sergeant, sergeants attend the Basic Noncommissioned Officer Course (BNCOC) at Fort Huachuca. BNCOC consists of common core NCO training followed by military occupational specialty (MOS) training. Future staff sergeants are taught to—

- Task-organize and supervise GSM crews and operations.
- Brief and debrief both their users and crews.

- Employ all-source cueing, disseminate GSM products, train the crew, and consolidate the post-mission analysis from each shift into one complete report for the user.

LEADER, WARRANT, AND OFFICER TRAINING

The following courses at USAIC&FH and the Field Artillery School are modified to incorporate necessary instruction on Joint STARS doctrine and tactics. Training includes system overview, mission planning, employment, capabilities, and limitations of the system.

- Basic Warrant Officer Course.
- Senior Warrant Officer Course.
- Officer Basic Course.
- Officer Advanced Course.
- Advanced Noncommissioned Officer Course.

E-8 MISSION CREW:

Requirements for E-8 crew leaders are warrant officers (350D) with a military education level (MEL) B and officers with MEL 6.

The E-8 mission crew should also complete the Defense Sensor Imagery Application Training Program (DSIATP).

PRE-IOC E-8 ARMY AIRCREW TRAINING:

Army E-8 enlisted aircrew receive IGSO training prior to assignment to the Joint STARS aircraft. The 350Ds and 35Cs receive Joint STARS familiarization training in their advanced course. An additional skill identifier (ASI) of A1 is awarded to enlisted E-8 aircrew members. Individuals should complete Air Ground Operations School (AGOS) before assignment.

DEPUTY MISSION CREW COMMANDER, 350D AND 35C:

At a minimum, the officer filling the DMCC position is a field grade officer and must bean advanced course graduate. Additionally, the officer should attend or have similar training as provided by AGOS, DSIATP, and Command and General Staff College (C&GSC).

JOINT AND COMBINED TRAINING:

Joint STARS training occurs in CONUS and all OCONUS theaters. Peacetime surveillance missions are used to provide continuation training to the Joint STARS mission crew when the E-8 is not involved in exercises or contingencies. Primary emphasis is on training aircrew and supported

units in Joint STARS operations, capabilities, operational procedures, and tactical C^3I interfaces. Airborne training activities are conducted in conjunction with Air Force and major Army command (MACOM) training exercises and deployments.

APPENDIX A

JOINT STARS MISSION PLANNING FACTORS

THIS APPENDIX IS CLASSIFIED AND NOT CONTAINED HEREIN.
It is published separately as FM 34-25-1 A.

APPENDIX B

GROUND STATION MODULE COMMUNICATIONS

One of the most critical functions for C^2 of the GSM is to establish communications and datalinks. Each GSM relies on multiple means of communications and data transfer. Without these nodes, the operational capability of the GSMs would be severely diminished. Additionally, each supported echelon and command will have different communications, cryptographic material, and datalink requirements.

Ultimately, each command will be responsible for establishing all internal C^2 nets to include providing the supporting GSM the command's SOI, crypto, and other COMSEC information. For the GSMs within corps or division, it is imperative that a net is setup for cueing operations, information sharing, and requesting RSRs through GSMs with aircraft uplink approval. Figure B-1 shows the GSM nets within corps and division.

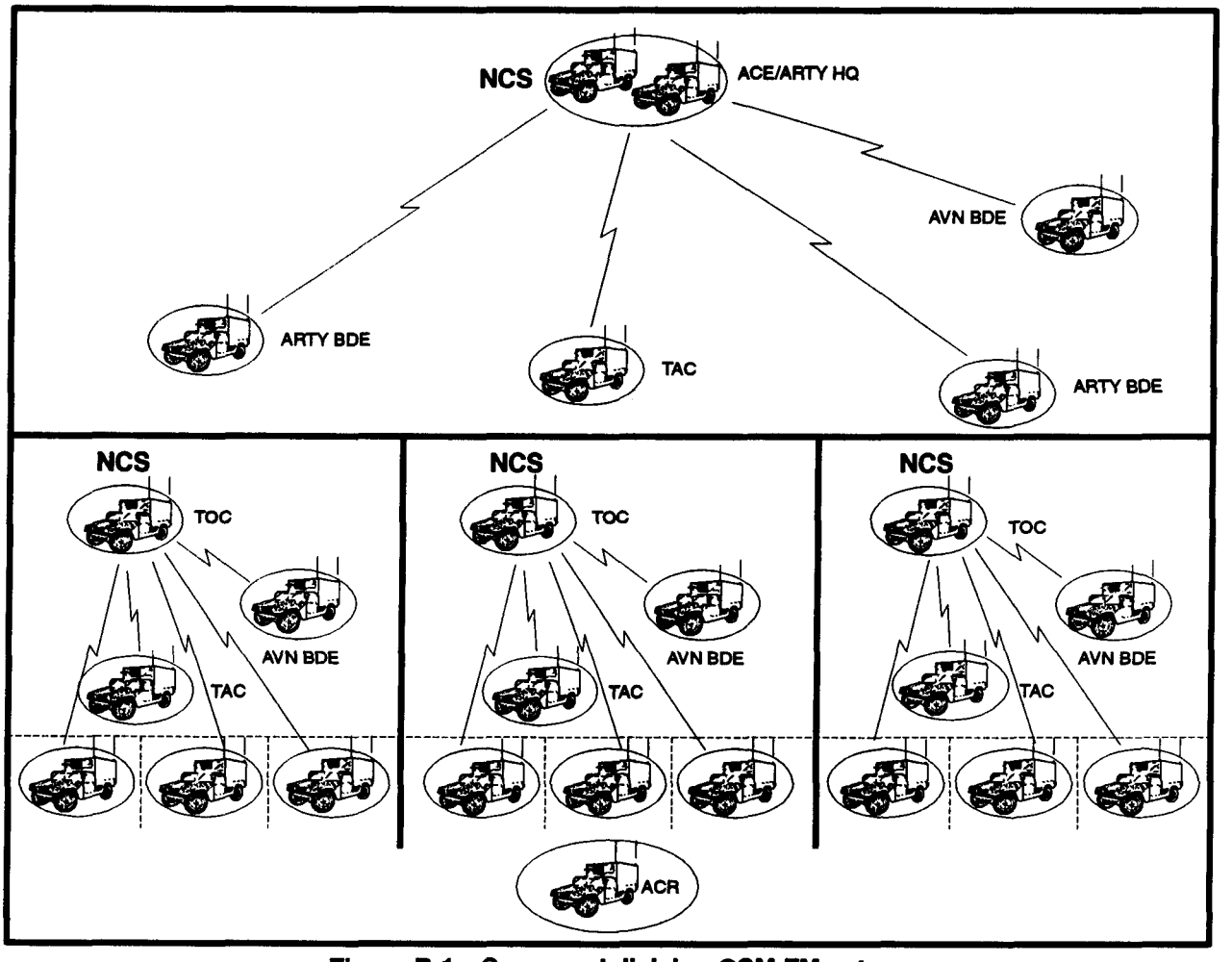


Figure B-1. Corps and division GSM FM nets.

Each corps will receive uplink capability for only 15 GSMs. The corps G2 is responsible for dividing this capability between the corps, subordinate divisions, and the ACR. An example would be:

- 5 GSMs within the corps maintain uplink capability.
- 3 GSMs within the division maintain uplink capability (based on a 3-division corps).
- 1 GSM with the ACR maintain uplink capability.

The GSMs located with the ACE at corps and division would be the net controlling station (NCS) and control the uplink asset management. The division G2 or collection manager would initially assign which GSM will have the uplink capability. The other GSMs would be receive-only.

CONNECTIVITY

Multiple means of communications and data transfer provide maximum flexibility, reliability, and responsiveness to battlefield commander's operational needs. The GSM provides multichannel VHF, UHF, and SATCOM communications, as well as MSE, STU-III, cellular telephone, TA-312, and secure FAX. Figures B-2 through B-6 show communications connectivity and information flow at various echelons and units.

CRYPTOGRAPHIC MATERIAL, COMMUNICATIONS SECURITY, AND SIGNALS OPERATIONS INSTRUCTIONS

The cryptographic and signal logistics requirements for all the electronic equipment within the GSM is immense. A brigade will normally not be able to support a GSM with all of its cryptographic and signal requirements. Corps and divisions, through their COMSEC account, will have to request the majority of the cryptographic material required by the GSMs, which includes—

- Joint STARS SCDL (KVG-8).
- JTT (Tactical Reconnaissance Intelligence Exchange System [TRIXS], Tactical Related Applications [TRAP], Tactical Data Information Exchange System-Broadcast [TRADIXS-B], GPL, Tactical Information Broadcast Service [TIBS]).
- SATCOM.
- Other GSM systems (AN/VRC-83 and AN/VRC-92).

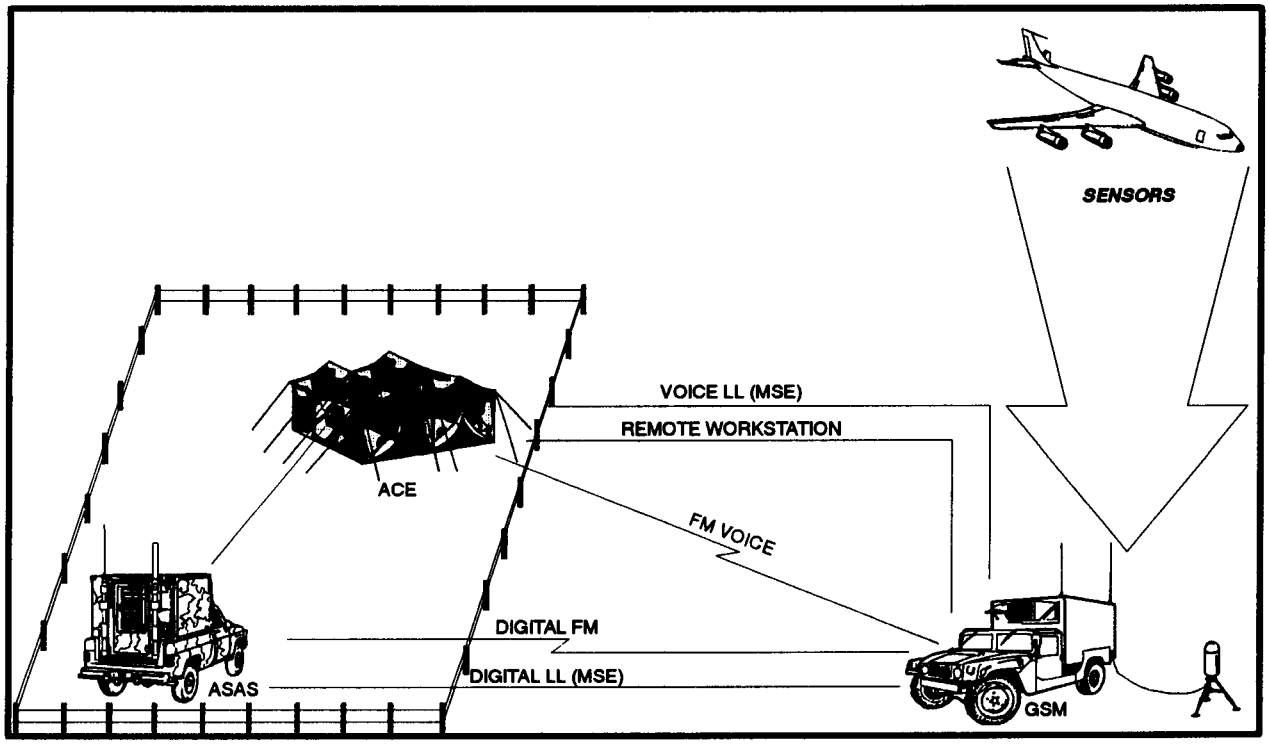


Figure B-2. GSM and ASAS-ACE connectivity.

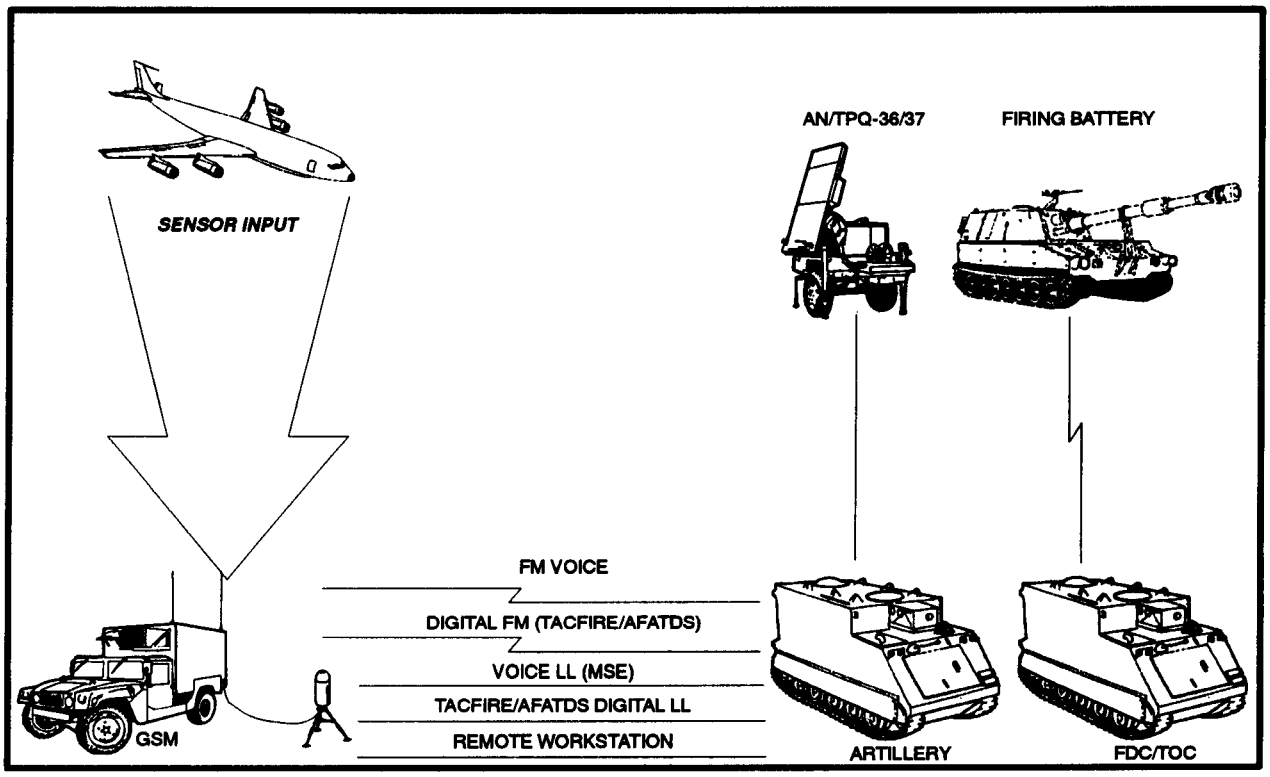


Figure B-3. Artillery connectivity.

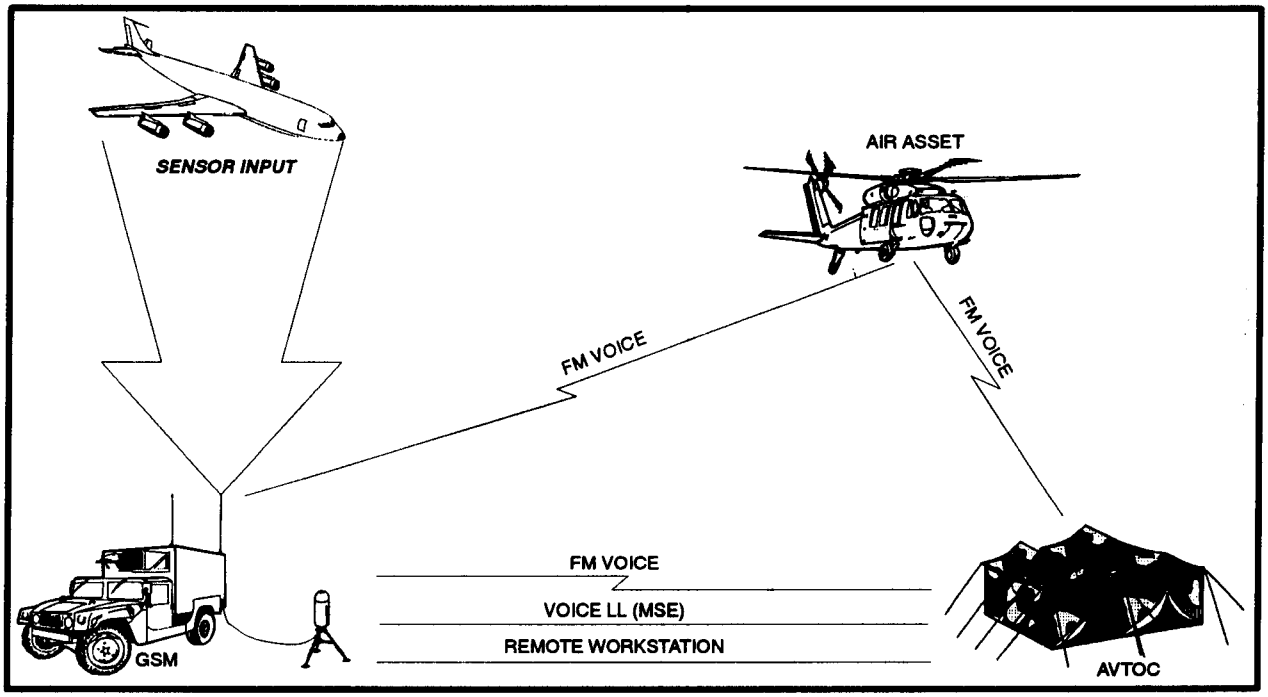


Figure B-4. Aviation connectivity.

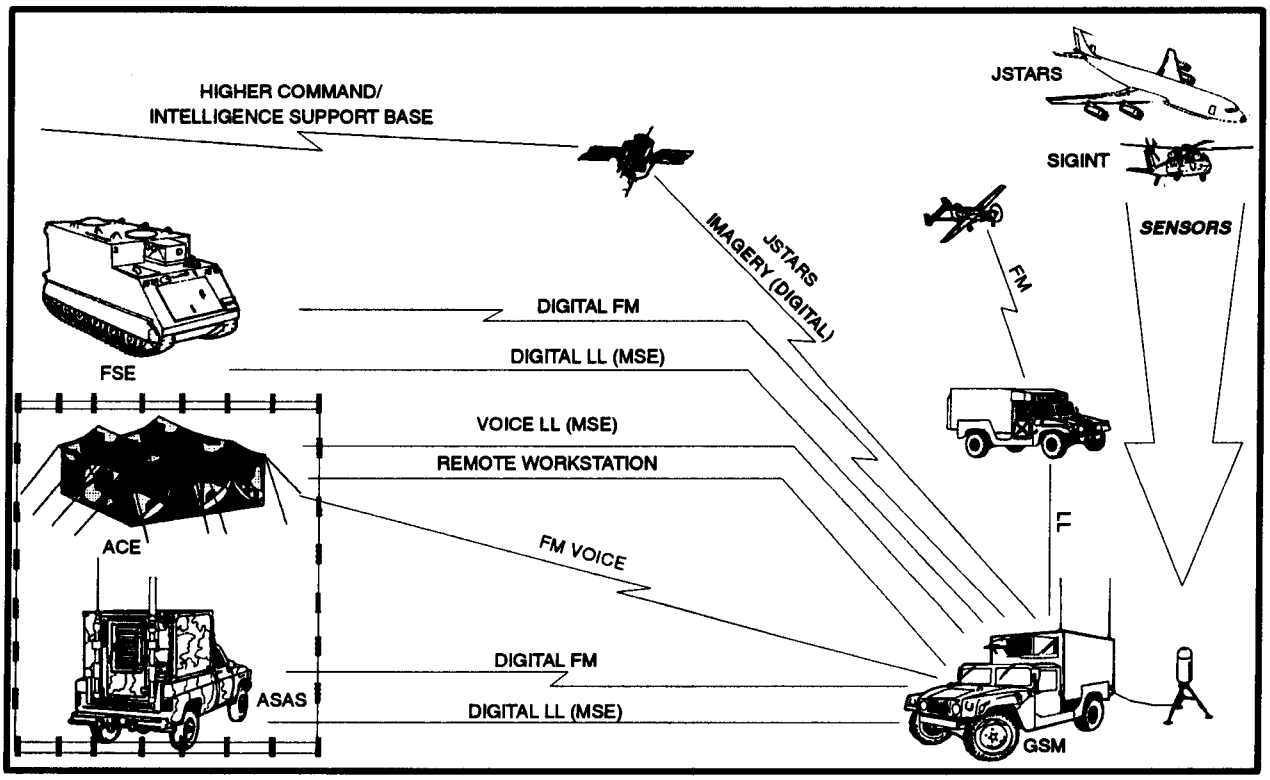


Figure B-5. Entry force brigade.

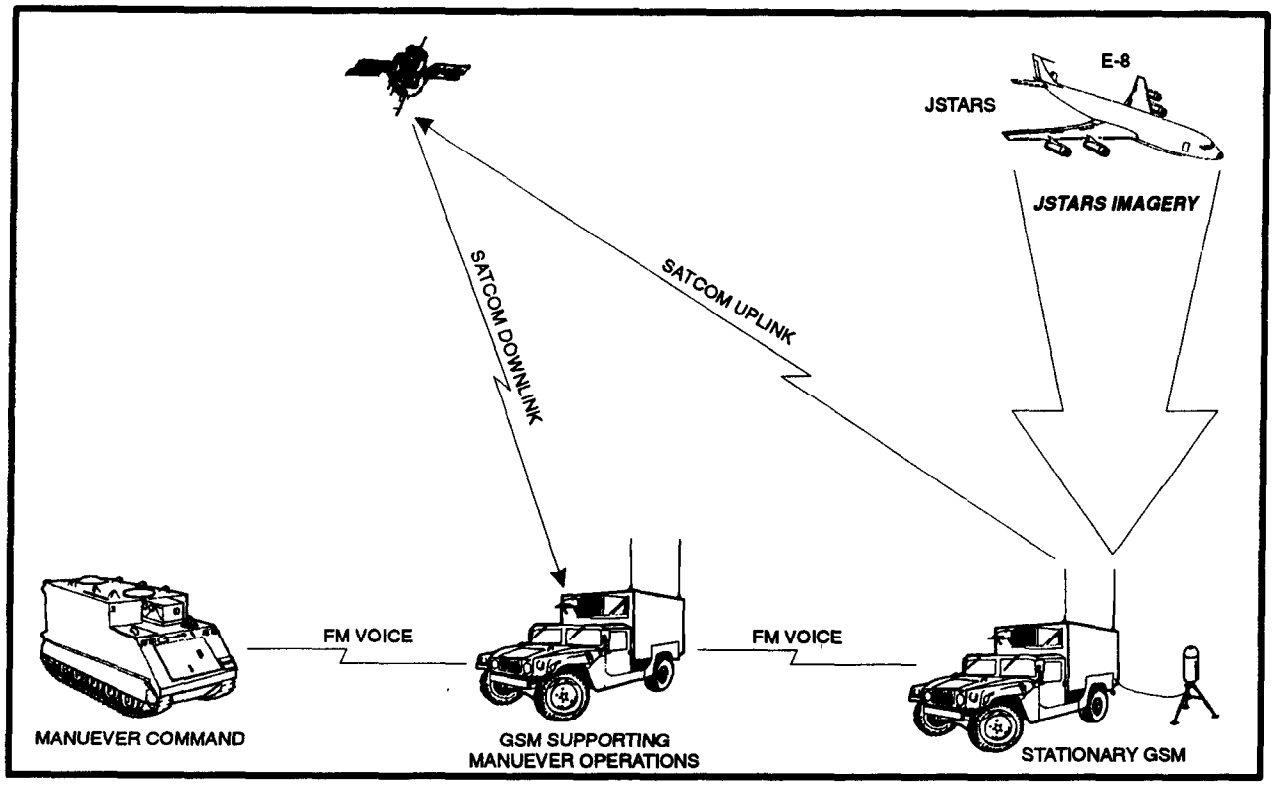


Figure B-6. On-the-move operations.

In the field, TRAP and TRADIX-B are used with the new terms (Tactical Data Dissemination System [TDDS] and Tactical Onboard Processing System [TOPS]). (See Appendix D.)

The MI brigade (corps) and MI battalion (division) will maintain and distribute all JTT, Joint STARS SCDL, and GSM communications net cryptographic material. The MI unit is responsible for disseminating it. Theater Army GSMs will be supported by Theater and Army level COMSEC accounts.

When initially establishing the COMSEC requirements for their subordinate Joint STARS GSMs, MACOMs must coordinate with the Army Joint STARS detachment located with the Air Force E-8 squadron at Robins AFB for Joint STARS contingency cryptographic material. The cryptographic material is then requested via COMSEC channels and will be maintained at corps level in the MI brigade as well as at EAC. Other units which hold GSM contingency missions (such as 111th MI Brigade, Joint Test Facility, and Joint STARS Training Facility) will also hold contingency cryptographic material.

During Joint STARS mission planning and prior to mission operations, EAC and corps level units will coordinate through their Air Force liaison officer (LNO) and BCE for SCDL parameter data, flight tracks, aircraft callsigns, radio frequencies, and mission information (time on station, altitude, GRCA, time of station).

The corps MI brigade must pass this information down to supporting divisions and the ACR. Each division MI battalion must distribute this information to supporting brigades. Non-organic GSMs deployed to support other Army units will coordinate through the Ml brigade or battalion for signal support. GSM teams supporting other services (for example, USMC, USN) will receive Joint STARS mission information, frequencies, and cryptographic material from EAC and Theater MI units. Units unsure of cryptographic support should contact the Army Joint STARS detachment.

All units receiving GSMs are required to integrate the GSM communications requirements into their SOIs. Corps and division communications and electronic officers are responsible for this integration and for assisting subordinate units in defining their requirements. Figure B-7 lists all communications and data systems within the LGSM. Figure B-8 shows responsibility and requirements for each Army echelon and unit.

SYSTEM	NODE	MODE
AN/VRC-92A (SINCGARS)	TACFIRE, ASAS, VOICE	VHF
AN/VRC-83	AIRCRAFT TO GSM COMMUNICATIONS	UHF
MSE (KY-68)	TACFIRE, ASAS, VOICE, FAX	DIGITAL LL
AN/USR-5 (JTT)	TRIXS, TRAP, TRADIX-B, GPL, TIBS	UHF
AN/VRC-140 (SATURN)	GSM-TO-GSM (SATCOM)	UHF
STU-III	COMMERCIAL	SECURE LL
CELLULAR PHONE	COMMERCIAL	UNSECURE-FM
UAV INTERFACE	UAV	LL
TA-312	INTERNAL GSM, OTHER	LL
TA-1035	INTERNAL GSM, OTHER	LL

Figure B-7. Communications and data transfer systems.

SYSTEM	FREQ	PARAMETER DATA	CRYPTO	REQUIREMENT	ECHELON FOR:
CORPS:					
SATCOM	YES	YES	YES	Order/Stock/Disseminate	All
TRIXS	YES	YES	YES	Order/Stock/Disseminate	All
TRAP	YES	YES	YES	Order/Stock/Disseminate	All
TIBS	YES	YES	YES	Order/Stock/Disseminate	All
TRADIX-B	YES	YES	YES	Order/Stock/Disseminate	All
SCDL LINK	YES	YES	YES	Order/Stock/Disseminate	All
VRC-83	YES	YES	YES	Order/Stock/Disseminate	All
VRC-92A (VOICE)	YES	YES	YES	Order/Stock/Disseminate	Corps
MSE (KY-68)	NA	YES	YES	Order/Stock/Disseminate	Corps
ASAS (FM)	YES	YES	YES	Order/Stock/Disseminate	Corps
ASAS (MSE)	YES	YES	YES	Order/Stock/Disseminate	Corps
TACFIRE (FM)	YES	YES	YES	Order/Stock/Disseminate	Corps
TACFIRE (MSE)	NA	YES	YES	Order/Stock/Disseminate	Corps
STU-III	NA	NA	KEYS	Order/Stock/Disseminate	Corps
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	Corps
DIVISION:					
SATCOM	YES	YES	YES	Order/Stock/Disseminate	Div Units
TRIXS	YES	YES	YES	Order/Stock/Disseminate	Div Units
TRAP	YES	YES	YES	Order/Stock/Disseminate	Div Units
TIBS	YES	YES	YES	Order/Stock/Disseminate	Div Units
TRADIX-B	YES	YES	YES	Order/Stock/Disseminate	Div Units
SCDL LINK	YES	YES	YES	Stock/Disseminate	Div Units
VRC-83	YES	YES	YES	Order/Stock/Disseminate	Div Units
VRC-92A (VOICE)	YES	YES	YES	Order/Stock/Disseminate	Div Units
MSE (KY-68)	NA	YES	YES	Order/Stock/Disseminate	Div Units
ASAS (FM)	YES	YES	YES	Order/Stock/Disseminate	Div Units
ASAS (MSE)	YES	YES	YES	Order/Stock/Disseminate	Div Units
TACFIRE (FM)	YES	YES	YES	Order/Stock/Disseminate	Div Units
TACFIRE (MSE)	NA	YES	YES	Order/Stock/Disseminate	Div Units
STU-III	NA	NA	KEYS	Order/Stock/Disseminate	Div Units
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	Div HQ
ACR:					
SATCOM	YES	YES	YES	Stock	ACR
TRIXS	YES	YES	YES	Stock	ACR
TRAP	YES	YES	YES	Stock	ACR
TIBS	YES	YES	YES	Stock	ACR
TRADIX-B	YES	YES	YES	Stock	ACR
SCDL LINK	YES	YES	YES	Stock	ACR
VRC-83	YES	YES	YES	Stock	ACR
VRC-92A (VOICE)	YES	YES	YES	Stock	ACR
MSE (KY-68)	NA	YES	YES	Stock	ACR
ASAS (FM)	YES	YES	YES	Stock	ACR
ASAS (MSE)	YES	YES	YES	Stock	ACR
TACFIRE (FM)	YES	YES	YES	Stock	ACR
TACFIRE (MSE)	NA	YES	YES	Stock	ACR
STU-III	NA	NA	KEYS	Stock	ACR
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	ACR
ARTILLERY BDE:					
SATCOM	YES	YES	YES	Stock	ARTY BDE
TRIXS	YES	YES	YES	Stock	ARTY BDE
TRAP	YES	YES	YES	Stock	ARTY BDE
TIBS	YES	YES	YES	Stock	ARTY BDE
TRADIX-B	YES	YES	YES	Stock	ARTY BDE
SCDL LINK	YES	YES	YES	Stock	ARTY BDE
VRC-83	YES	YES	YES	Stock	ARTY BDE
VRC-92A (VOICE)	YES	YES	YES	Stock	ARTY BDE
MSE (KY-68)	NA	YES	YES	Stock	ARTY BDE
ASAS (FM)	YES	YES	YES	Stock (IF NEEDED)	ARTY BDE
ASAS (MSE)	YES	YES	YES	Stock (IF NEEDED)	ARTY BDE
TACFIRE (FM)	YES	YES	YES	Stock	ARTY BDE
TACFIRE (MSE)	NA	YES	YES	Stock	ARTY BDE
STU-III	NA	NA	KEYS	Stock	ARTY BDE
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	ARTY BDE

Figure B-8. Signal information needed.

SYSTEM	FREQ	PARAMETER DATA	CRYPTO	REQUIREMENT	ECHELON FOR:
AVIATION BDE:					
SATCOM	YES	YES	YES	Stock	AV BDE
TRIXS	YES	YES	YES	Stock	AV BDE
TRAP	YES	YES	YES	Stock	AV BDE
TIBS	YES	YES	YES	Stock	AV BDE
TRADIX-B	YES	YES	YES	Stock	AV BDE
SCDL LINK	YES	YES	YES	Stock	AV BDE
VRC-83	YES	YES	YES	Stock	AV BDE
VRC-92A (VOICE)	YES	YES	YES	Stock	AV BDE
MSE (KY-68)	NA	YES	YES	Stock	AV BDE
ASAS (FM)	YES	YES	YES	Stock (IF NEEDED)	AV BDE
ASAS (MSE)	YES	YES	YES	Stock (IF NEEDED)	AV BDE
STU-III	NA	NA	KEYS	Stock	AV BDE
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	AV BDE
COMBAT BRIGADES (DIV):					
SATCOM	YES	YES	YES	Stock	BDE
TRIXS	YES	YES	YES	Stock	BDE
TRAP	YES	YES	YES	Stock	BDE
TIBS	YES	YES	YES	Stock	BDE
TRADIX-B	YES	YES	YES	Stock	BDE
SCDL LINK	YES	YES	YES	Stock	BDE
VRC-83	YES	YES	YES	Stock	BDE
VRC-92A (VOICE)	YES	YES	YES	Stock	BDE
MSE (KY-68)	NA	YES	YES	Stock	BDE
ASAS (FM)	YES	YES	YES	Stock (IF NEEDED)	BDE
ASAS (MSE)	YES	YES	YES	Stock (IF NEEDED)	BDE
STU-III	NA	NA	KEYS	Stock	BDE
"CELL PHONE"	YES	YES	NA	Fund (NOT Required)	BDE
ECHELONS ABOVE CORP/THREATER:					
SATCOM	YES	YES	YES	Order/Stock	EAC
TRIXS	YES	YES	YES	Order/Stock	EAC
TRAP	YES	YES	YES	Order/Stock	EAC
TIBS	YES	YES	YES	Order/Stock	EAC
TRADIX-B	YES	YES	YES	Order/Stock	EAC
SCDL LINK	YES	YES	YES	Order/Stock	EAC
VRC-83	YES	YES	YES	Order/Stock	EAC
VRC-92A (VOICE)	YES	YES	YES	Order/Stock	EAC
MSE (KY-68)	NA	YES	YES	Order/Stock	EAC
ASAS (FM)	YES	YES	YES	Order/Stock	EAC
ASAS (MSE)	YES	YES	YES	Order/Stock	EAC
STU-III	NA	NA	KEYS	Order/Stock	EAC
"CELL PHONE"	YES	YES	YES	Fund (NOT Required)	EAC
* EAC AND THEATER SHOULD HOLD CONTINGENCY CODES, CRYPTO, AND SOIs.					
FORCE PROJECTION BRIGADE: * ALL INFORMATION IS RECEIPTED FROM PARENT UNIT.					
NON-STANDARD ARMY UNITS AND INTERSERVICE SUPPORT: * ALL INFORMATION IS RECEIPTED FROM THEATER. SCDL AND VRC-83 FREQUENCIES AND DATA CAN ALSO COME FROM AIR FORCE LIAISON.					

Figure B-8. Signal information needed (continued).

APPENDIX C

CONTINGENCY OPERATIONS

Upon Joint Chiefs of Staff (JCS) notification, the Joint STARS can support contingency operations worldwide. Figure C-1 shows examples of worldwide deployment. This support includes—

- Detecting enemy forces.
- Identifying movement and major thrusts.
- Providing targeting information to decisionmakers.
- Aiding weapons and attack aircraft as required (by providing target, location, speed, and heading data).

Joint STARS provides battle management support through situation development and target development. For situation development, Joint STARS can alert the commander as to enemy intentions if US Forces are going to land or be inserted into a potentially hostile area. Joint STARS can tell the commander if hostile forces are moving to reinforce, preparing to attack, or if they are withdrawing. The commander then, faced with the dilemma of having to balance his force, will know where it is relatively safe to enter vice where enemy forces have massed to eject US Forces.

For target development, Joint STARS gives the commander a long-range capability to assist the targeting process early. Joint STARS, because of its deep and continuous-look capability, gives decisionmakers and target planners more response time. Joint STARS gives the commander the real-time capability for targeting.

For example, in a contingency operation where Joint STARS is in support, the commander has a brigade sized force which he is going to insert in the vicinity of a major seaport. The Joint STARS aircraft has been on-station for the past 3 days gathering real-time data to give to the decisionmakers a picture of what hostile forces await them and where these forces may be.

On the day of the insertion Joint STARS is flying. The USAF has also scrambled a squadron of F-15E's in support of the ground commander. The Joint STARS aircraft sees 3 separate 50-vehicle convoys each about 75 km out from the insertion zone with tracked and unknown vehicles heading towards the insertion zone. Special Forces units on the ground send a burst transmission to the joint force command confirming that all three convoys are carrying armed soldiers in trucks and armored personnel carriers.

Joint STARS radar data is processed and analyzed on the aircraft, a target track is then sent via the JTIDS link to the AOC. At the AOC, the Joint STARS data and intelligence from other sources is quickly correlated. The AOC contacts the F-15E squadron to interdict these 3 columns before they can come into contact with the brigade about to be inserted. The F-15E squadron commander then gets on the net with the Joint STARS aircraft and asks for target updates. The Joint STARS O&C operators are now authorized from the AOC to talk directly to the ABCCC aircraft, also in sector.

The ABCCC will in turn provide targeting instructions to the F-15E squadron. The Joint STARS O&C operators provide target updates to the squadron via the ABCCC until enemy forces are in visual contact by the fighters. The F-15E squadron destroys all 3 enemy columns before they have a chance to disrupt the brigade insertion. The brigade insertion takes place as planned with no friendly casualties resulting.

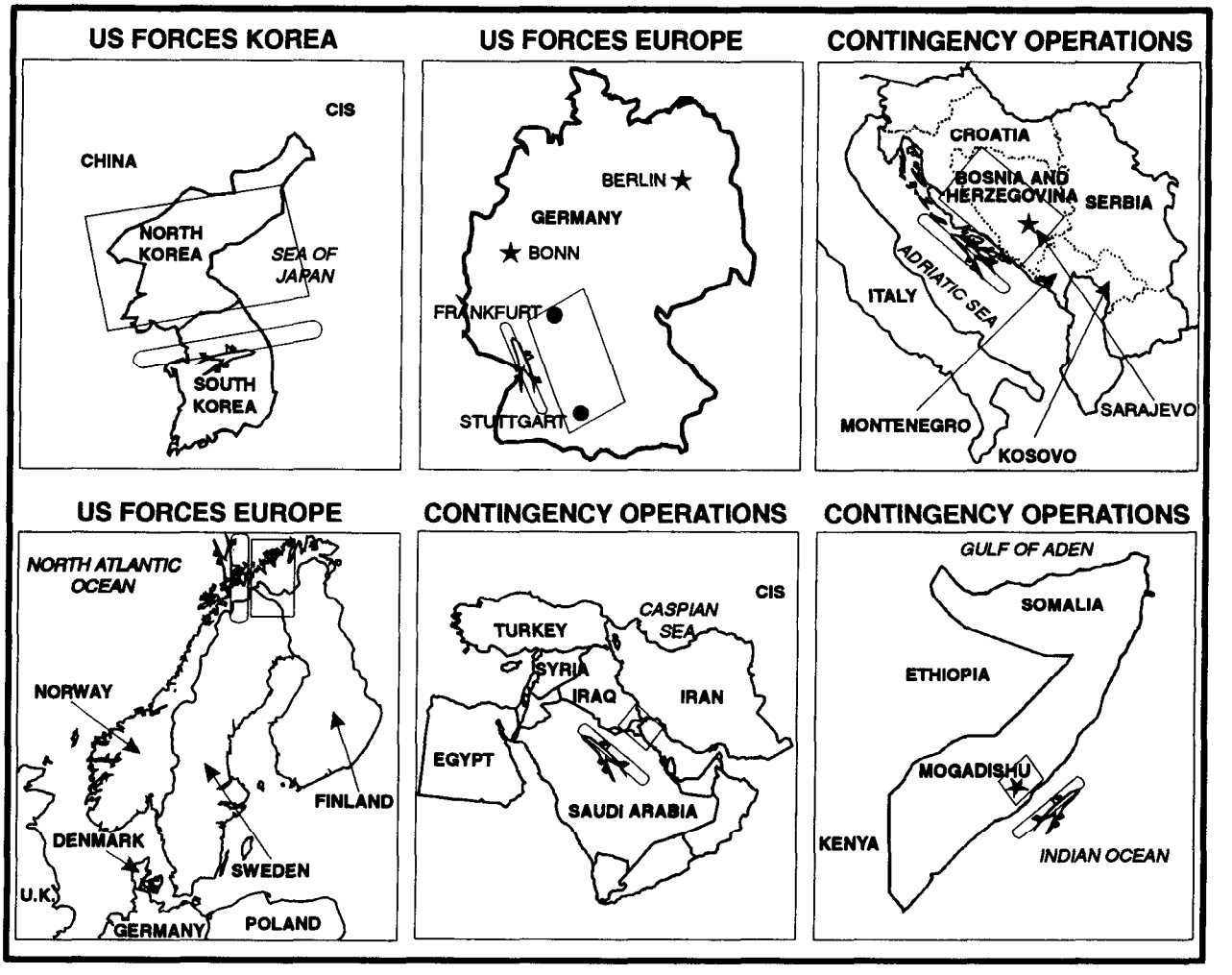


Figure C-1. Worldwide deployment.

JOINT STARS CONTINGENCY MISSION

Upon notification from the JCS, Joint STARS will deploy in support of US Forces. Figure C-2 shows a Joint STARS contingency mission deployment.

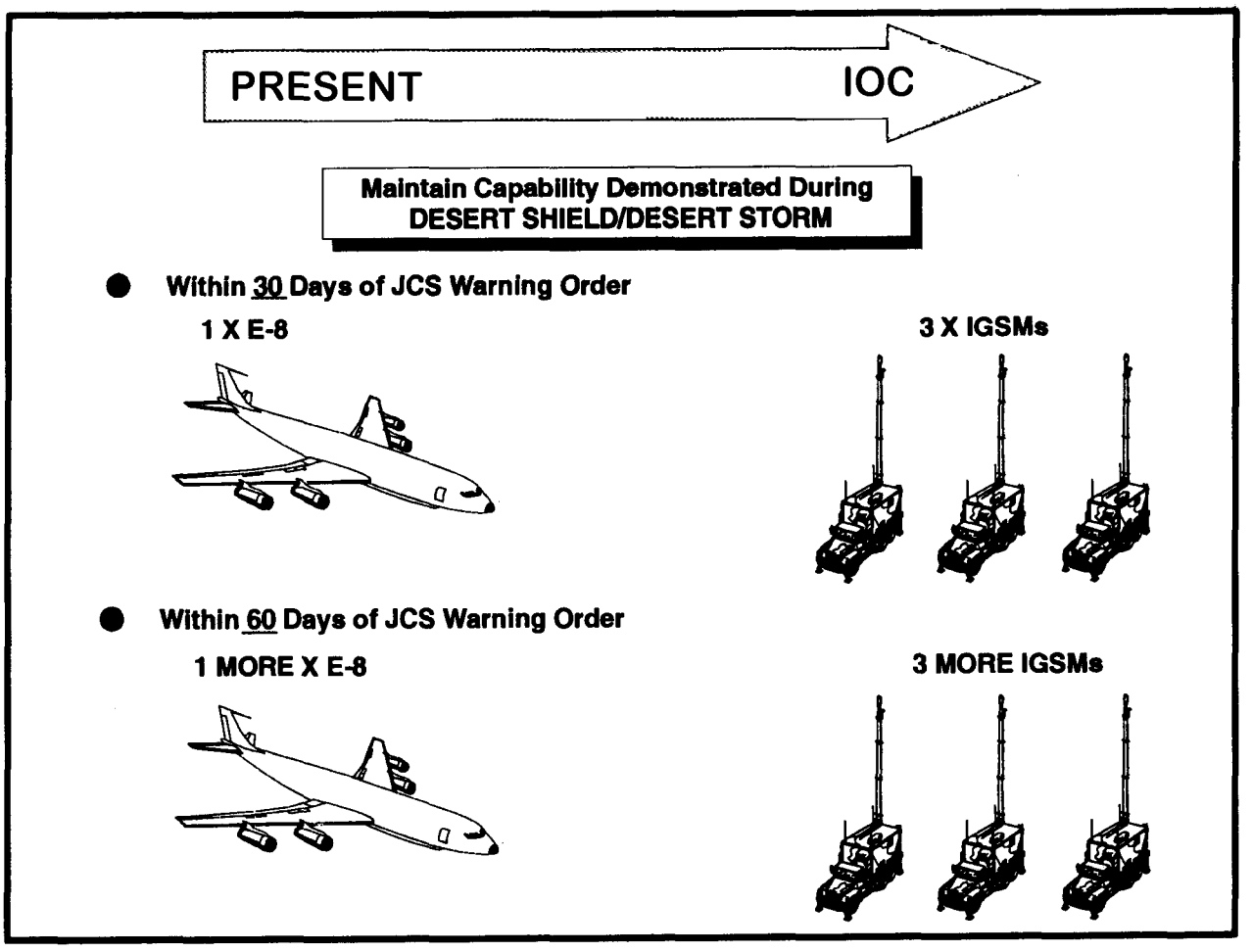


Figure C-2. JSTARS contingency mission deployment.

Initially, 1 GSM team is in support of the senior support headquarters, 1 GSM team to the AOC, and 1 GSM goes to the senior subordinate maneuver command. Follow-on GSMs go to senior maneuver headquarters. Again, 3 GSM teams and 2 aircraft crews are available to deploy on a worldwide basis within 30 days of notification.

Additionallv, a small operational detachment headquarters echelon may deploy with the team and the crews. This section can monitor specific Army and maneuver surveillance, targeting, or attack control tasks and

requirements for timely incorporation into the daily mission profiles in the ATO.

They will also establish and maintain coordination between the senior supported headquarters and the AOC and BCE to ensure Joint STARS mission requirements are included in the ATO and are accomplished. The detachment commander can ensure that Army mission tasks and requirements are included in the Air Mission Profile. The operational detachment headquarters echelon reports debriefs and mission results to the senior supported headquarters for mission evaluation, continuing analysis, and future mission development.

EXAMPLES OF CONTINGENCY OPERATIONS SUPPORT

Joint STARS has deployed in support of the US military to Southwest Asia, as shown in Figure C-3.

Joint STARS has deployed to the crisis area with AWACS and is conducting surveillance of the area in preparation for the arrival of US combat forces. In Figure C-4, Joint STARS provides real-time intelligence and targeting support to the US Forces entering the crisis area.

US Forces have now entered a friendly adjacent country and begin to build up their forces. Joint STARS mission tasks are shown in Figure C-5.

Now US Forces have built up in sufficient strength and begin a counter-offensive. Joint STARS mission tasks are shown in Figure C-6.

Joint STARS could also support US Forces conducting operations from the sea, as shown in Figure C-7. Here the Joint STARS aircraft is deployed and the AOC and BCE have established an operational element on board a naval aircraft carrier off the coast of a hostile country.

Joint STARS will send its radar data via JTIDS to the aircraft carrier to expedite the intelligence and targeting process. The AOC and BCE will forward this to the appropriate air or ground forces. Joint STARS could also deploy one GSM in a nearby friendly country linked via TROJAN SPIRIT or other SATCOM means and relay real-time intelligence and targeting data to USN or USMC Forces.

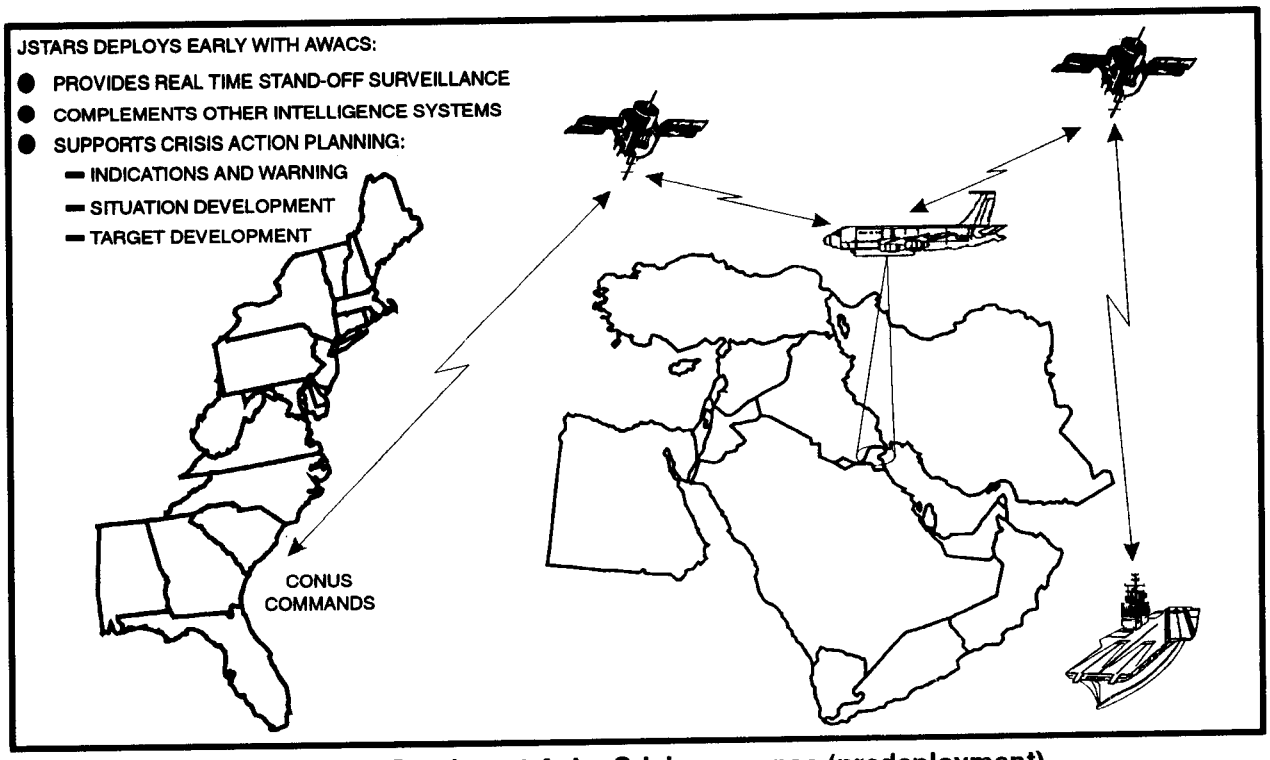


Figure C-3. Southwest Asia: Crisis response (predeployment).

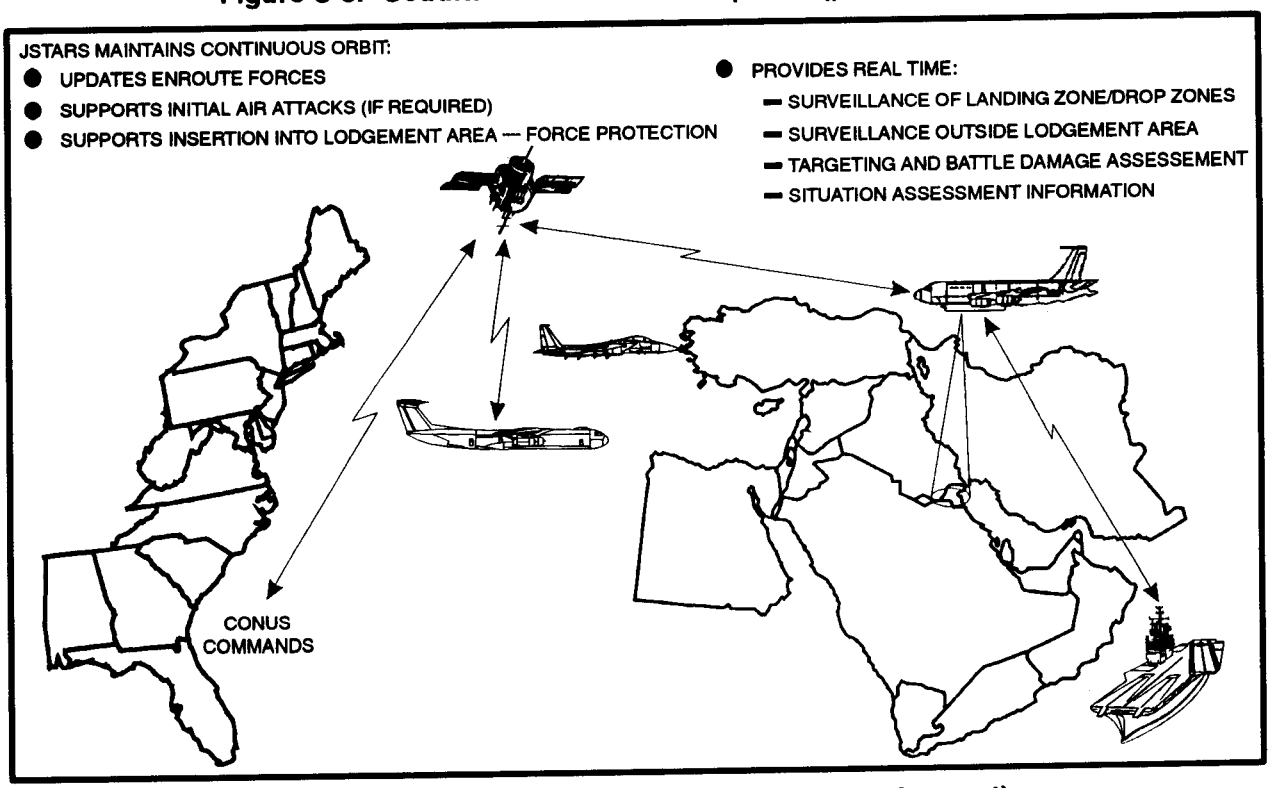


Figure C-4. Southwest Asia: Crisis response (deployment).

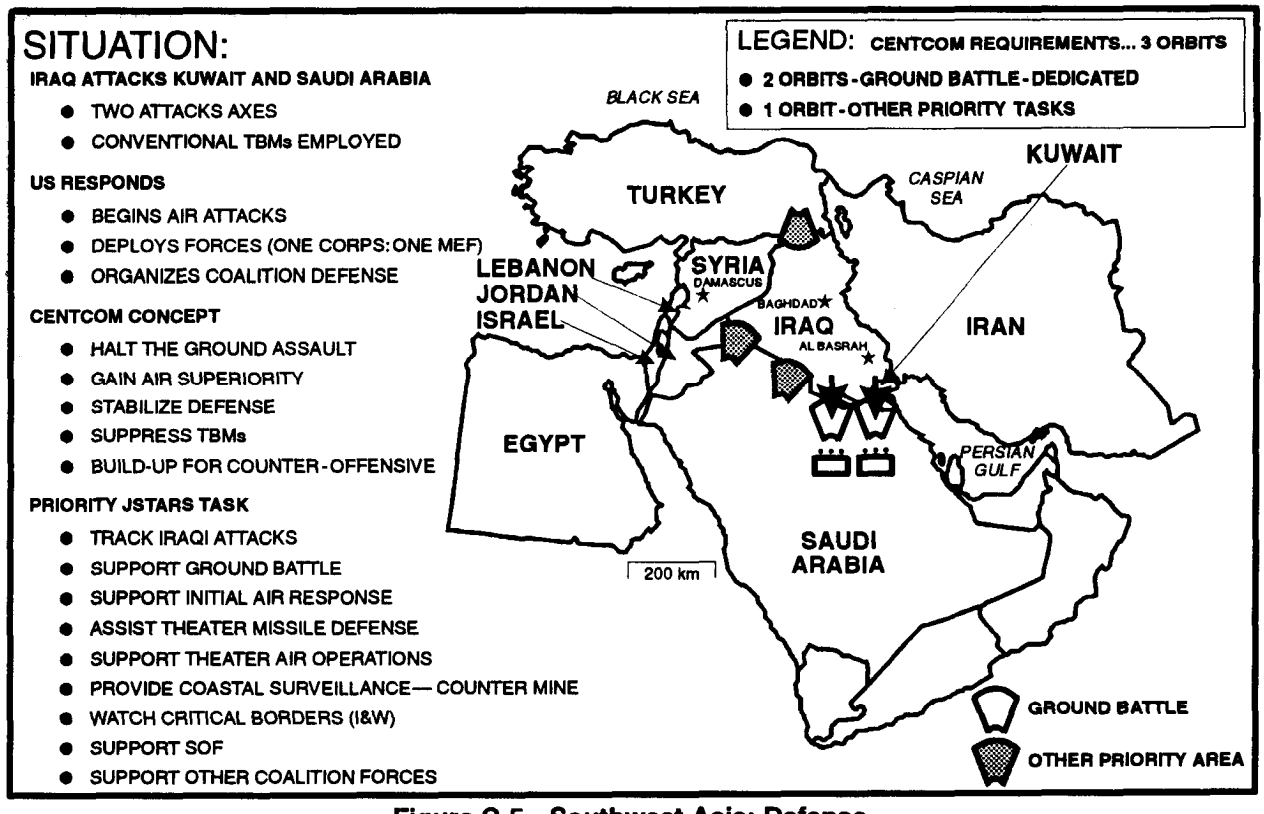


Figure C-5. Southwest Asia: Defense.

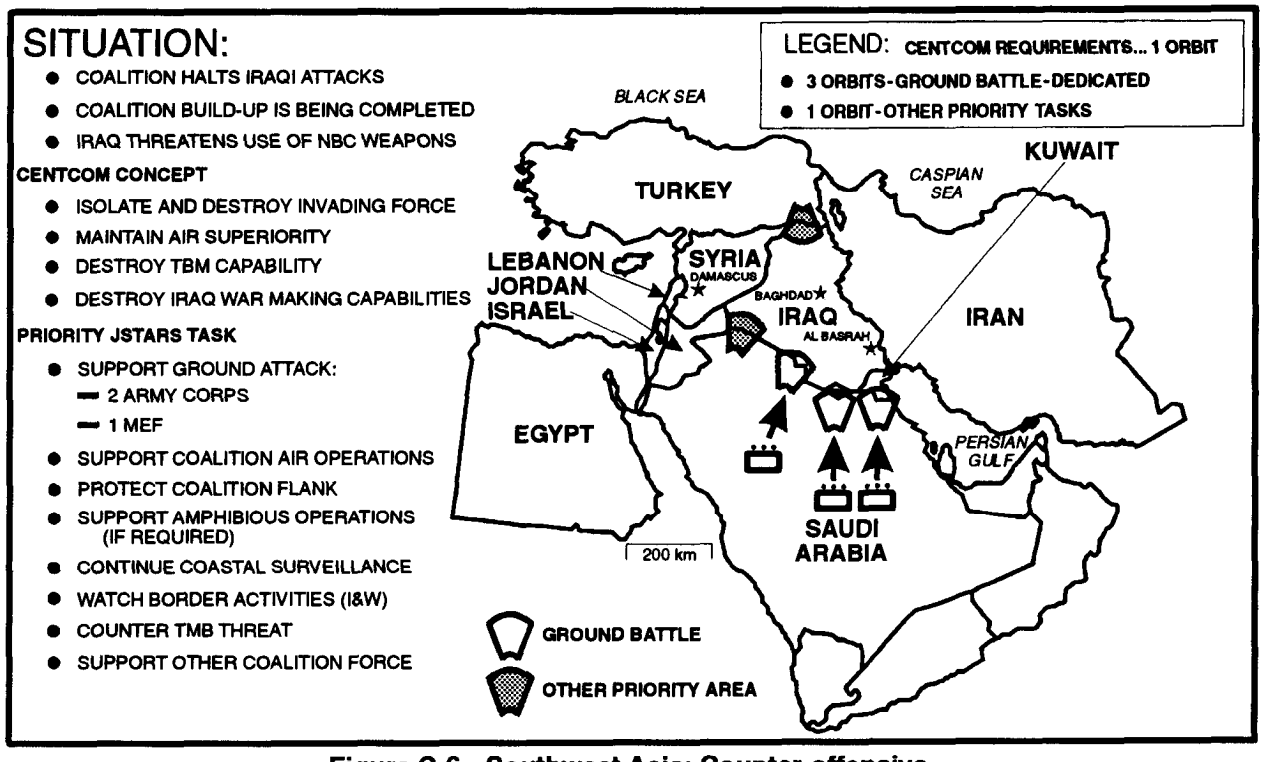


Figure C-6. Southwest Asia: Counter-offensive.

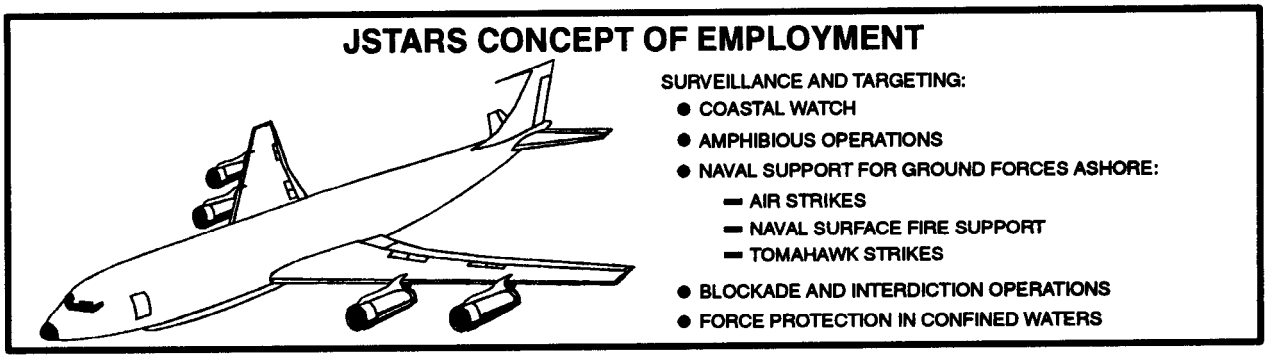


Figure C-7. Operations from the sea.

APPENDIX D

JOINT TACTICAL TERMINAL

The JTT provides a joint service, interoperable intelligence communications system which provides a reliable, airborne relayed SIGINT dissemination path from the Army and Air Force processing facilities and collection platforms to widely dispersed mobile, tactical consumers.

The JTT System consists of a secure, jam resistant, communications network which uses "packetized" Time Division Multiple Access (TDMA) as the method of servicing multiple processing facilities and tactical commanders. All currently fielded JTT/HR (2-channel receive-only) can receive SIGINT data from the current four SIGINT nets, but can only receive and monitor two sources simultaneously. The primary mode of SIGINT information transfer is digital data, while voice is a secondary or backup mode.

The Army's Block I GSM is one of the earliest fielded systems with JTT. Its mission within the GSM is predominantly cueing. SIGINT information is received and displayed as icons on top of Joint STARS imagery on the operator's terminal. If the iconed signal is significant, the operator will request imagery to confirm, deny, or identify the activity surrounding the signal location. The integration of two different types of intelligence, in one viewable form, lets the commander see a complete picture of the battlefield. The GSM also has the capability of printing the JTT messages in text format as well as the iconed signal on top of Joint STARS imagery.

COMMUNICATIONS

Communications from the SIGINT collector to the tactical user, via the ground processing facility (GPF), will be through LOS UHF communications signal or through communications relay links. Communications relay links are established by airborne platforms and communications satellite systems. The airborne relays are on-board the Air Force U-2R and the Army RC-12 intelligence collection platforms.

Relay equipment requires minimum power, and is designed to cause minimum interference to collocated intelligence sensors in the aircraft. All data and voice communications from a processing facility to a field JTT are transmitted to the airborne relay via the interoperable data link (IDL). The relay retransmits the data and voice via the UHF downlink to field JTTs which are within LOS.

JTT NETS

There are four networks, as shown in Figure D-1, that support the dissemination of tactical intelligence.

- TRIXS.
- TIBS.
- TDDS (formerly TRAP).
- TOPS formerly TRADIXS-B).

TRIXS	TIBS	TDDS	TOPS
- Tactical	- Theater	- Global	- Global
- Targeting	- Tracking	- Detection and Cueing	- Detection and Cueing
- USMTF (8 BIT)	- 70-BIT Words	- 256-BIT Words	
- 5 Sources	- Up to 10 Sources	- Fixed Net	
	- Tailorable		

Figure D-1. NET characteristics.

TRIXS:

The TRIXS network provides the data structure and direct, dedicated links to disseminate critical, time sensitive tactical SIGINT reconnaissance, intelligence, and surveillance information to battlefield commanders via LOS transmissions from military aircraft relays. The Army's GRCS and the Air Force's Contingency Airborne Reconnaissance System (CARS) are prime processing facilities in the TRIXS network. This network can support up to five producers and relays simultaneously. Two of the producers within this net are the Army's GRCS (RC-12) and the Air Force U-2R.

TIBS:

The TIBS network provides a capability to disseminate correlated, time sensitive tactical SIGINT information to joint operational users via UHF broadcasts from aircraft or the Fleet Satellite Communications System (FLTSATCOMSYS). Current collection sources of data include the RC-135 (RIVET JOINT), GRCS (RC-12), AWACS, and the U-2R SENIOR Program. This network can broadcast data from up to 10 information producers, each with multiple sensors. An unlimited number of users can have receive capability.

TDDS (TRAP):

The TDDS concept of operation is to collect SIGINT information from multiple SIGINT sources and disseminate them through a UHF SATCOM broadcast to tactical and strategic users. TDDS provides global surveillance information for sensor cueing and integration into databases at field reception locations. Data is forwarded from sensor through processor to military user via FLTSATCOMSYS. This is a worldwide

broadcast. TDDS signals are broadcast over several fixed UHF frequencies through one or more satellites.

TOPS (TRADIX-B):

The TOPS concept is to process and distribute nationally generated tactical SIGINT data to operational forces and commanders worldwide. The information delivered directly to the commanders will support I&W, other sensor cueing, and user mission planning. TOPS information is also disseminated via SATCOM. TOPS signals are broadcast over one of four fixed frequencies channels.

FUTURE JOINT STARS AND JTT CAPABILITY

Advanced JTT Systems will be fielded with the Joint STARS CGS. These terminals will have three-channel (receive-only) capability. The 3-channel JTTs will be able to receive secondary imagery via the new GPL net. It is proposed that one of the uses of the GPL net will be for the SIDS. With the 3-channel JTT, TIBS and TRIXS can now be received simultaneously.

GLOSSARY

ACRONYMS

A

A	as acquired
AAR	after-action review
A^2C^2S	Army Aviation Command and Control System
ABCCC	Airborne Command and Control Center
ABCS	Army Battle Command Systems
abn	airborne
AC	attack control
A/C	Aircraft
AC^2MP	Army Command and Control Master Plan
ACC	Air Component Commander
ACE	Analysis and Control Element
ACO	air control order
ACR	armored cavalry regiment
ACT	analysis and control team
AD	air defense
ADA	air defense artillery
ADP	automatic data processing
ADT	air data terminal
AFATDS	Advanced Field Artillery Tactical Data System
AFB	Air Force Base
AGM	attack guidance matrix
AGOS	Air Ground Operations School
AI	area of interest
AIO	Airborne Intelligence Officer
AIS	Aerial Intelligence Specialist (96H) (Mohawk crew)
AIT	airborne intelligence technician
ammo	ammunition
ampn	amplification
AMPS	Aviation Mission Planning System
AOC	Air Operations Command
AOI	air operations instructions
AOR	area of responsibility
AP	attack planning
AQF	Advanced QUICKFIX
AR	Army Regulation
ARL	airborne reconnaissance low
ARCENT	US Army Central Command
ART	airborne radar technician
arty	artillery
ASAS	All-Source Analysis System
ASI	additional skill identifier
ASL	Authorized Stockage List
ASO	airborne surveillance officer
ASOC	Air Support Operations Center
AST	airborne surveillance technician
ASTO	airborne search and track operator
ATACMS	Army Tactical Missile System
ATCCS	Army Tactical Command and Control System
ATI-CDR	Artillery Target Intelligence-Coordinate Report
ATI-TCRIT	Artillery Target Intelligence-Target Criteria Message
ATKHB	attack helicopter battalion
ATO	air tasking order
ATSS	airborne target surveillance supervisor
avn	aviation
AVTOC	Aviation Tactical Operations Center
AWACS	Airborne Warning and Control System
AQF	Advanced QUICKFIX
az	azimuth

B

B^2C^2	Brigade and Below Command and Control System
BCE	battlefield coordination element
BDA	battle damage assessment
BDAR	battle damage assessment and repair

bde	brigade
bkr	breaker
bio	biological
BIT	built-in-test
BITE	built-in test equipment
bn	battalion
BNCOC	Basic Noncommissioned Officer Course
BSC	battle staff course
btry	battery

C

C^2	command and control
C^2I	command and control intelligence
C^3	command, control, and communications
C^3I	command, control, communications, and intelligence
C^4I	command, control, communications, computers, and intelligence
CARS	Contingency Airborne Reconnaissance System (Air Force)
CAS	close air support
cav	cavalry
CCUE	cross-cuing
CECOM	Communications-Electronic Command
CENTCOM	US Army Central Command
C&GSC	Command and General Staff College
CGS	Common Ground Station
chem	chemical
CIS	communications interface shelter
ckt	circuit
cmd	command
CNR	combat net radio
COB	command observation post
COLT	combat observation and lasing team
COMSEC	communications security
CONUS	continental United States
COP	command observation post
CP	command post
crypto	cryptographic
C-SIGINT	counter-signals intelligence
CSL	contractor stockage list
CSO	communications system operator
CSOT	Constant Source Operators Terminal
CST	communications system technician
CT	communications technician
CTAC	Corps Tactical Command Post
CTOC	Corps Tactical Operations Center
JTT	commander's tactical terminal
JTT-H	commander's tactical terminal-hybrid

D

D	destroy
DA	Department of the Army
DAA	direct attack aircraft
DDC	digital-to-digital converter
DF	direction finding
DISE	Deployable Intelligence Support Element
DIVARTY	division artillery
DMCC	Deputy Mission Crew Commander
DP	Data Processing
DPS	Data Processing System
DS	direct support
DSIATP	Defense Sensor Imagery Application Training Program
DTAC	Division Tactical Command Post
DTM	data transfer module
DTOC	Division Tactical Operations Center

E

EAC	echelons above corps
EC	electronic countermeasures
ECB	echelons corps and below
EM	electromagnetic
EMP	electromagnetic pulse

ETS	embedded training simulation
EW	electronic warfare
EWD	Electronic Warfare Director

F

FAX	facsimile
FDC	fire direction center
FLIR	forward-looking infrared
FLOT	foward line of own troops
FLTSAT	
COMSYS	Fleet Satellite Communications System
FM	frequency modulation
FM-CFF	fire mission-call for fire
freq	frequency
FSC	fire support coordinator
FSCL	fire support coordination line
FSCT	Fire Support Control Terminal
FSD	full scale development
FSE	fire support element
FSR	field service representative
FTI	fixed-target indicator
FSO	fire support officer

G

G2	General Staff Officer at Division/Corps (Intelligence)
G3	General Staff Officer at Division/Corps (Operations)
GBCS	ground based common sensor
GCC	Ground Component Commander
GCI	ground control intercept
GCS	ground control station
GD	government demonstration
GDT	ground data terminal
GFE	government-furnished equipment
GLO	Ground Liaison Officer
GPF	ground processing facility
GPL	general purpose link
GPS	Global Positioning System
GRCA	ground reference coverage area
GRCS	GUARDRAIL Common Sensor
GS	general support
GSM	ground station module

H

HF	high frequency
HGSM	Heavy Ground Station Module
HHC	headquarters, headquarters company
HMMWV	high mobility multipurpose wheeled vehicle
HN	host nation
HOL	Higher Order Language
HPT	high-payoff target
HQ	headquarters
HQDA	Headquarters, Department of the Army
HR	hybrid-receive only
HUMINT	human intelligence
HVT	high-value target
Hz	hertz
HWY	highway

I

I	immediate
ID	identification
IDL	interoperable data link
IDM	improved data modem
IEW	intelligence and electronic warfare
IFSAS	Initial Fire Support Automated System
IFTE	Intermediate Forward Test Equipment
IGSM	Interim Ground Station Module
IGSO	imagery ground station operator
IHFR	Improved High Frequency Radio
IMINT	imagery intelligence
inf	infantry
info	information
INS	Inertial Navigation System
integ	integrate
intel	intelligence

INTSUM	intelligence summary
I/0	input/output
IOC	initial operational capability
IPB	intelligence preparation of the battlefield
IQT	initial qualification training
I&w	indications and warnings

J

J2	Joint Intelligence Directorate
JCS	Joint Chiefs of Staff
JFACC	Joint Forces Air Component Commander
JFC	Joint Force Commander
JFLCC	Joint Force Land Component Commander
JIC	Joint Intelligence Center
Joint STARS	Joint Surveillance Target Attack Radar System
JSIU	Joint STARS interface unit
JSORD	Joint STARS Operational Requirements Document
JSS	Joint STARS squadron
JTF	Joint Task Force
JTIDS	Joint Tactical Information Dissemination System
JTT	joint tactical terminal
JTTF	Joint Test Task Force

K

km	kilometer
km/h	kilometers per hour
kW	kilowatt

L

LAN	local area network
LCC	Land Component Commander
LCSS	Lightweight Camouflage Screen System
LCU	lightweight computer unit
LGSM	Light Ground Station Module
LL	land line
LNO	liaison officer
LOC	line of communications
LOS	line-of-sight
LRSU	long range surveillance unit
LRU	line replaceable unit
LSA	logistic support analysis
LSD	large screen display
LTG	lieutenant general

M

MACOM	major Army command
MARCENT	Marine Central Command
MATM	multiple assets tasking message
MATT	multi-mission advanced tactical terminal
MCC	Mission Crew Commander
MCOO	modified combined obstacle overlay
MCS	Maneuver Control System
MEF	Marine Expeditionary Force
MEL	military education level
METL	mission essential task list
MGSM	Medium Ground Station Module
MI	Military intelligence
MLRS	Multiple-Launch Rocket System
MMCT	mobile maintenance contact team
MOB	main operating base
MOGAS	motor gasoline
MOPP	mission-oriented protection posture
MOS	military occupational specialty
MQT	military qualification training
mph	miles per hour
MSD	medium screen display
MSE	mobile subscriber equipment
MSNDAT	mission data
MSNLOC	mission location
MSR	main supply route
MTF	Message Text Format
MTI	moving target indicator
mvr	maneuver

N

N	neutralize
NA	not applicable
NAI	named area of interest
narr	narrative
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCOES	Noncommissioned Officer Education System
NCOIC	noncommissioned officer in charge
NCS	net controlling station
NEO	noncombatant evacuation operation
NLOS	non-line-of-sight
NOE	nap-of-the-earth
NRT	near-real-time
NTC	National Training Center

O

OB	order of battle
OCONUS	outside continental United States
OFD	operation field demonstrations
OOTW	operations other than war
OPCON	operational control
OPLAN	operations plan
OPORD	operations order
ops	operations
OPSEC	operations security
ORLA	optimum repair level analysis
OSD	Office of the Secretary of Defense
O&C	operations and control
O&O	organization and operation

P

P	planned
PID	Programmable Interface Device
PIR	priority intelligence requirements
PL	phaseline
PLL	prescribed load list
PMCS	preventive maintenance checks and services
PME	Primary Mission Equipment
POC	point of contact
POL	petroleum, oil, and lubricants
pwr	power

R

recon	reconnaissance
regt	regiment
RI	request for information
RMO	radar management officer
RRCA	radar reference coverage area
RRI	response to request for information
R&S	reconnaissance and surveillance
RSR	radar service request
RSTA	reconnaissance, surveillance, and target acquisition
RT	remote terminal
RTO	radio telephone operator
RWS	remote work station

S

S	suppress
S2	US Army Intelligence Officer
S3	US Army Operations and Training Officer
SA	surveillance area
SALUTE	size, activity, location, unit, time, equipment
SAM	surface-to-air missile
SAR	synthetic aperture radar
SAT	systems approach to training
SATC	small area target classification
SATCOM	satellite communications
SCDL	Surveillance and Control Data Link
SCIF	sensitive compartmented information facility
SCUD	missile system (enemy)
SD	senior director

SDO	self-defense officer
SDS	self-defense suite
SE	southeast
SEAD	suppression of enemy air defenses
sec	section
SERE	survival, evasion, resistance, and escape
SIDS	Secondary Imagery Dissemination System
SIGINT	signals intelligence
SINCGARS	Single-Channel Ground Airborne Radio System
SIR	specific information and requirements
SITREP	situation report
SMO	sensor management officer
SOF	Special Operations Forces
SOI	signals operations instructions
SOP	standing operating procedure
SOR	specific order and request
SOTAS	Stand-off Target Acquisition System
SS	sector search
SSM	suface-to-surface missile
SSP	System Support Package
ST	sensor technician
STANAG	Standardization Agreement
STOR	TSS + STO + RTO
STU-III	secure phone
surveil	surveillance
SYS-PTM	system-plain text message
SW	southwest

T

TA	Theater Army
TACAIR	Tactical Air
TAC	tactical
TACC	Theater Air Control Center
TACCOMM	tactical communications
TACFIRE	Tactical Fire Direction System
TAI	target area of interest
TBM	theater ballistic missile
TCO	tactical communications officer
TCP	tactical command post
TCU	Tactical Computer Unit
TDA	target damage assessment
TDDS	Tactical Data Dissemination System
TDMA	Time Division Multiple Access
TENCAP	tactical exploitation of national capabilities
TIBS	Tactical Information Broadcast Service
TOC	Tactical Operations Center
TOF	time of flight
TOPS	Tactical Onboard Processing System
TRADIXS-B	Tactical Data Information Exchange System-Broadcast
TRADOC	Training and Doctrine Command
TRAP	Tactical Related Applications
TRE	Tactical Receive Equipment
TREE	Transient Radiation Effects on Electronics
TRIXS	Tactical Reconnaissance Intelligence Exchange System
TROJAN	Special Purpose Integrated
SPIRIT	Remote Intelligence Terminal
TSO	Target Surveillance Officer
TSS	target surveillance supervisor
TTP	tactics, techniques, and procedures

U

UAV	unmanned aerial vehicle
UHF	ultra-high frequency
UI	unidentified
USA	United States Army
USAF	United States Air Force
USAFE	United States Air Force Europe
USAIC&FH	United States Army Intelligence Center and Fort Huachuca
USAR	United States Army Reserve
USMC	United States Marine Corps

USMTF	United States Message Text Format
USN	United States Navy
UTM	universal transverse mercator

V

VCR	video cassette recorder
VFMED	Variable Format Message Entry Device
VHF	very high frequency
vic	vicinity

W

WAS	wide area surveillance
WD	weapons director
WOC	Wing Operation Command
wpn	weapon
WS	Work Station

References

SOURCES USED

These are the sources quoted or paraphrased in this publication.

Air Force Instruction/Regulation

60-1 Flight Management: Flight Operations. 11 June 1994.
ACCI 13-108 E-8 Operating Procedures-Air Crew. 14 February 1994.

Army Field Manuals (FMs)

3-4 NBC Protection (FM/FM 11-9). 29 May 1992.
3-5 NBC Decontamination (FM/FM 11-10). 23 July 1992.
6-60 Tactics, Techniques, and Procedures for the Multiple Launch Rocket System (MLRS) Operations. 16 September 1992.
34-1 Intelligence and Electronic Warfare Operations. 27 September 1994.
34-2 Collection Management and Synchronization Planning. 8 March 1994.
34-10 Division Intelligence and Electronic Warfare Operations. 25 November 1986.
34-10-3 Trailblazer Operations. 29 March 1990.
34-25 Corps Intelligence and Electronic Warfare Operations. 30 September 1987.
34-35 Armored Cavalry Regiment (ACR) and Separate Brigade Intelligence and Electronic Warfare (IEW) Operations. 12 December 1990.
34-37 Echelons Above Corps (EAC) Intelligence and Electronic Warfare (IEW) Operations. 15 January 1991.
34-80 Brigade and Battalion Intelligence and Electronic Warfare Operations. 15 April 1986.
34-130 Intelligence Preparation of the Battlefield. 8 July 1994.
71-100 Division Operations. 16 June 1990.
100-5 Operations. 14 June 1993.
100-17 Mobilization, Deployment, Redeployment, Demobilization. 28 October 1992.

Department of the Army Pamphlet

525-45 General Operating Procedures for Joint Attack of the Second Echelon (J-SAK).

Army Regulation {AR)

AR 70-47 Engineering for Transportability. 19 August 1985.

Technical Circular (TC)

34-55 Imagery intelligence. 3 October 1988.

Technical Manuals (TMs)

TM 11-5865-299-20 Target Acquisition System, Medium Ground Station Module, AN/TSQ-168(V)1. 26 September 1994.

TM 11-5800-215-BD Operator Unit, Intermediate Direct Support and Intermediate General Support Maintenance Battlefield Damage Assessment and Repair for Communications-Electronics Equipment. 1 December 1986.

Miscellaneous

STANAG 5620 Standards for the Interoperability of Fire Support Automatic Data Processing (ADP) Systems.

DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

DA Form 2028 Recommended Changes to Publications and Blank Forms. February 1974.
FM 34-1 Intelligence and Electronic Warfare Operations. 27 September 1994.
FM 100-5 Operations. 14 June 1993.

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By Order of the Secretary of the Army:

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