Chapter 4

Theater High Altitude Area Defense System

This chapter describes the Theater High Altitude Area Defense (THAAD) system. This system is deployed to defend theater and corps commanders' assets.

MISSION

4-1. The THAAD system serves as a high altitude defense against ballistic missiles. It is capable of detecting and intercepting ballistic missile threats in and above the atmosphere.

SYSTEM DESCRIPTION

4-2. A THAAD battery is made up of missile rounds, launchers, a radar, a BM/C3I segment, and ground support equipment (the FUE battery in 2006 will have 16 missiles, 1 radar, 2 launchers, and 1 BM/C3I segment). THAAD is designed to perform its mission in a centralized, decentralized, or autonomous mode of control. It will take advantage of threat data from external sources such as early warning/detection sensors and communications assets.

Radar

4-3. The THAAD radar is a high resolution, multimode, X-band, phased-array radar. It is a mobile radar system capable of being transported from site to site by aircraft and tow vehicles. The overall purpose of the radar is to identify, classify, track, and report the position of hostile vehicles to the THAAD battery Tactical Operations Center. The THAAD radar consists of several components rather than the traditional single piece of hardware: Antenna Equipment Unit, Electronics Equipment Unit, Cooling Equipment Unit, and Prime Power Unit. The radar components are all C141 aircraft transportable and are roll-on/roll-off capable on FAST ships and rail transport.

4-4. The radar uses fence, volume, and cued search modes, and provides fire control functions of surveillance, acquisition, track, discrimination, missile engagement support, and kill assessment for the THAAD system. Figure 4-1, page 4-2, shows a typical layout for the radar subsystem (the Operator Control Unit will not be a part of the fielded system).

4-5. The radar detects a potential object of interest, verifies that the detection is of legitimate interest, and initiates the track. The radar classifies the object as an air breathing threat, a TBM, or other. The radar classifies the TBMs as specific missiles such as ND-1 or SS-21. The radar identifies a threat TBM based on the predicted ground impact point. The radar provides track data concerning targets, THAAD missiles, kill vehicles (KV) and other objects. Just prior to hand over, the radar generates target object map (TOM) data consisting of location data for the target, KV and associated objects.

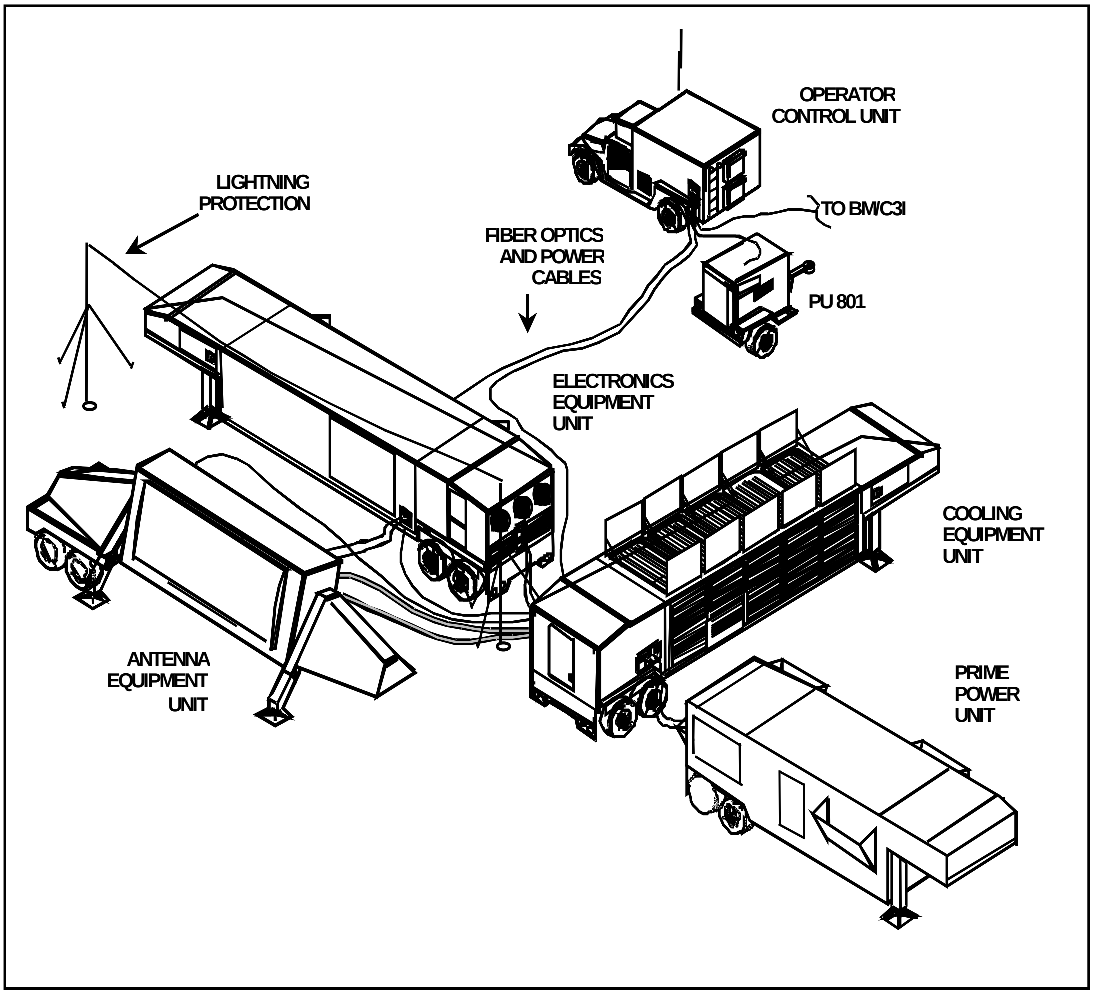

Figure 4-1. THAAD Radar Components

4-6. **Antenna Equipment Unit**. The AEU consists of an X-band, phased array antenna and an electronics package. The AE transmits radio frequency (RF) energy to support search, track, and interceptor uplink/downlink. The AE includes the capability to transmit multiple RF beams sequentially and receive beams simultaneously. The AEU has both front and rear leveling jacks. The M1088 Family of Medium Tactical Vehicles (FMTV) or a commercial semi-tractor moves the AEU. The AEU performs fence, volume, and cued search and serves as the communications link to in-flight missiles. The antenna can be positioned from zero to eighty degrees in elevation (figure 4-2, page 4-3).

4-7. The EEU provides the AEU with 208V ac uninterruptible power. The PPU provides the AEU with 4160V ac, 3-phase, 60 Hz input power and with

120/208V ac, 3-phase power via the CEU. Coolant is supplied by the CEU between 30 and 56 degrees centigrade, at a rate of 1370 liters per minute. Silicate free ethylene glycol (antifreeze) is used to cool the AEU during operation.

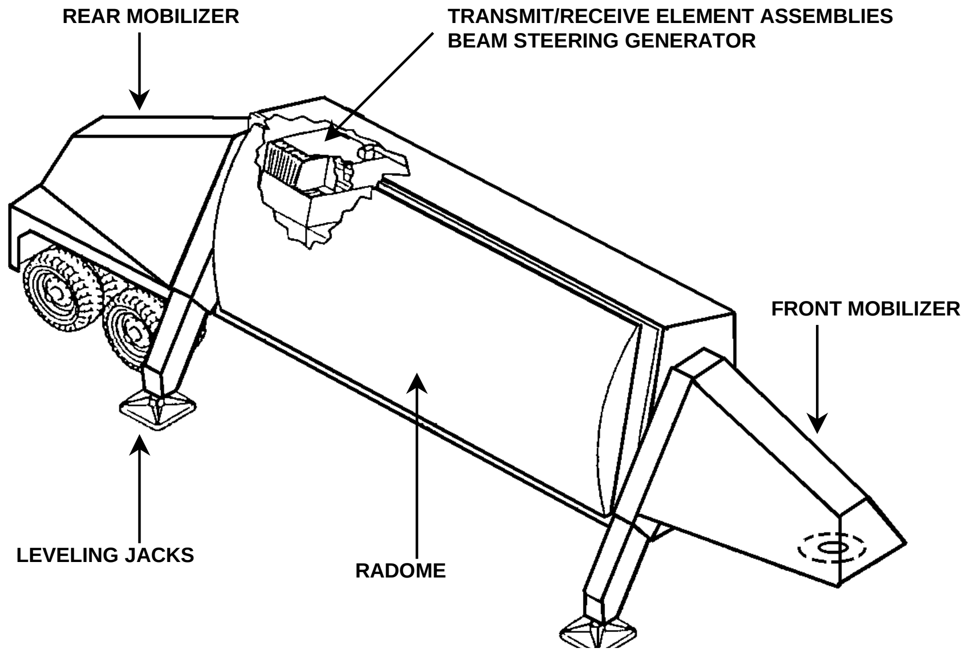

Figure 4-2. THAAD Antenna Equipment Unit

4-8. **Electronics Equipment Unit**. The electronics equipment unit (EEU) is an environmentally controlled shelter housing the electronic equipment used to generate the timing and control signals required for radar operation and signal processing. The EEU consists primarily of the receiver, recorders, and signal processor and data processing equipment of the radar. All equipment is enclosed in a trailer that is pulled by the M1088 Family of Medium Tactical Vehicles or a commercial semi-tractor with a kingpin adapter, and transported by C-141 and larger aircraft. The trailer includes an environmental control unit and an NBC vestibule and filter. The trailer has air-ride suspension on the main dolly set and the kingpin mechanism (figure 4-3, page 4-4).

4-9. **Cooling Equipment Unit**. The Cooling Equipment Unit (CEU) (figure 4-4, page 4-4) provides liquid cooling required for the AEU. It is equipped with a power distribution unit (PDU) which distributes the prime input power from the prime power unit (PPU) to the rest of the radar components. The trailer has an air-ride suspension on both the main dolly set and the kingpin mechanism. The coolant lines have quick disconnect fittings for rapid march order and emplacement. A status panel with alarm center provides status and warning of coolant overheating and fan failure. The CEU has low coolant pressure and coolant reservoir level indicators. A low temperature, oil-fired boiler provides for fast equipment start-up. The cooling system contains a 50-gallon reservoir capacity and features an air separator for rapid voiding of air prior to supplying coolant to the AEU.

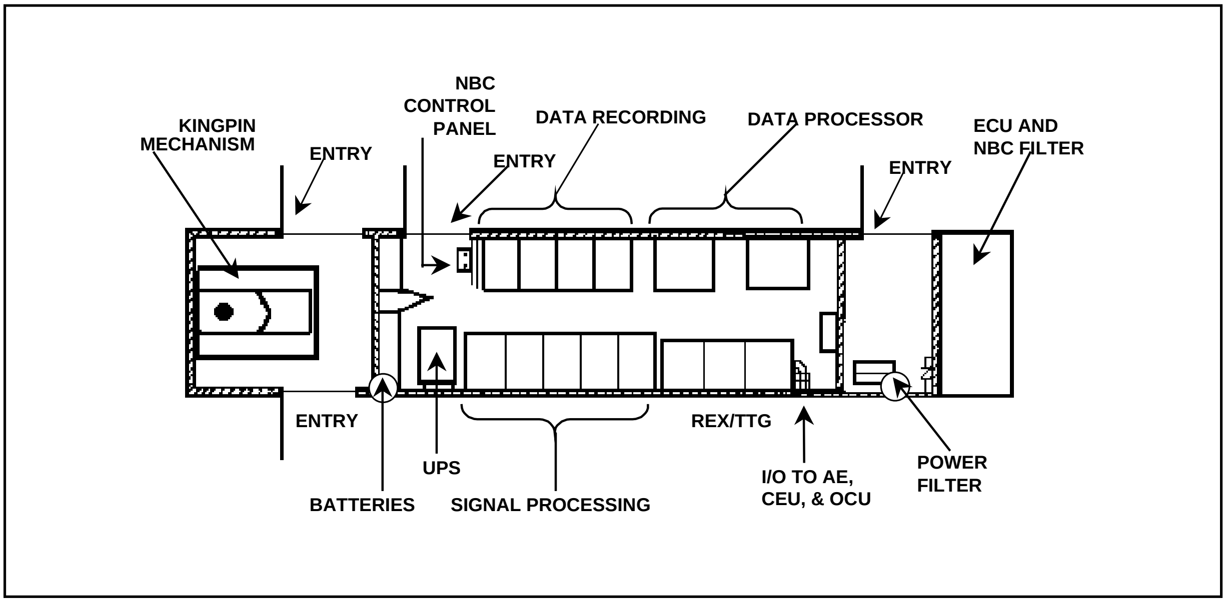

Figure 4-3. Electronics Equipment Unit

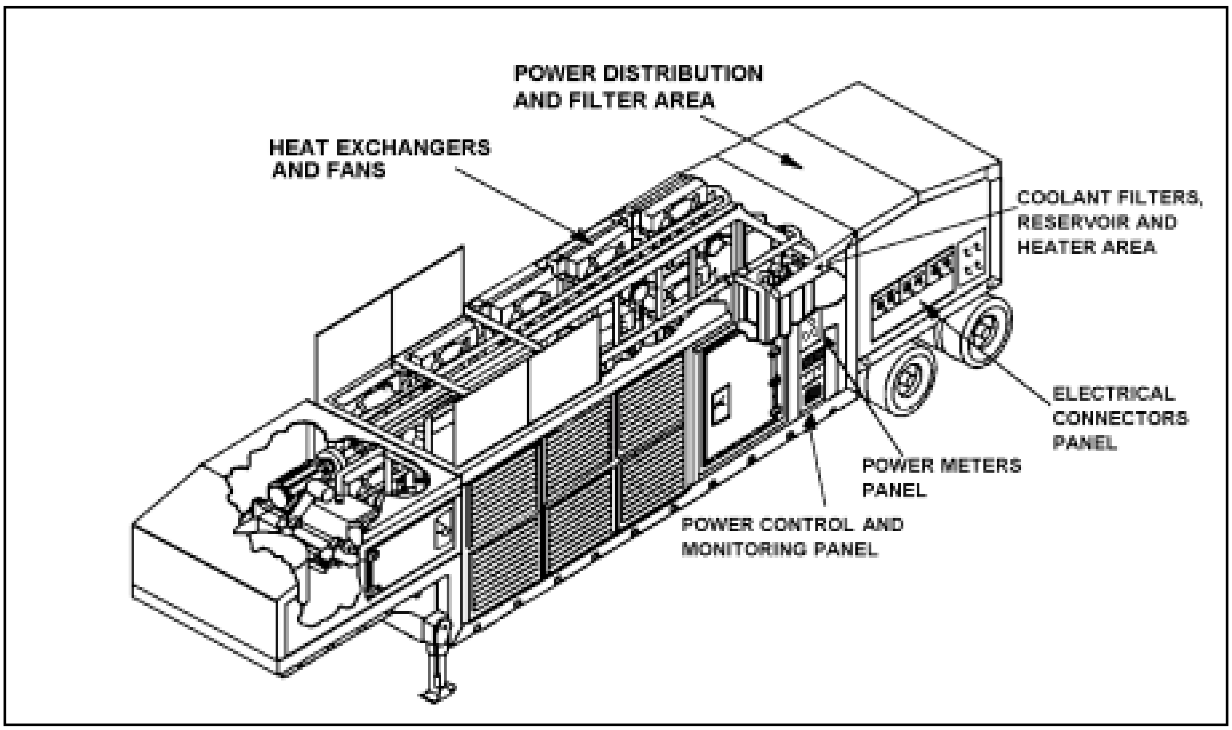

Figure 4-4. Cooling Equipment Unit

4-10. **Prime Power Unit**. The prime power unit (PPU) is a transportable unit that furnishes primary AC power to the CEU for distribution to the other THAAD radar components. The PPU consists of a diesel engine, alternator, fuel system, air intake and exhaust system, battery charging system, and associated control and interface panels. The PPU generates 1.3 megawatts of continuous 4160-volt, 3-phase power. It operates on approximately 90 gallons of JP8 fuel per hour. Military fuels compatible with the PPU engine are JP-8, JP-5, DF-1, DF-2, and JET A-1.The PPU has storage capacity for one hour of operation, and interfaces with tankers for extended operations (figure 4-5).

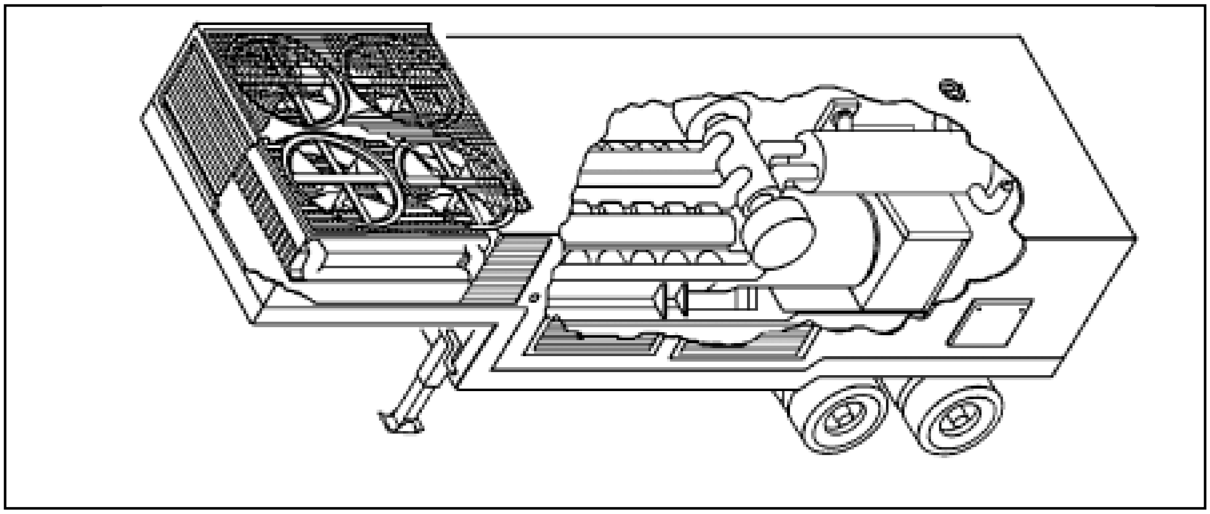

Figure 4-5. Prime Power Unit

4-11. **Operator Control Unit**. The Operator Control Unit (OCU) contains three workstations for control and monitoring of the radar. The OCU interfaces with BM/C3I, and is housed in a lightweight shelter that is mounted on a HMWWV. The OCU functions will be incorporated into the electronics equipment unit in the objective system.

Battle Management/Command, Control, Communications, and Intelligence

4-12. To accomplish the mission of conducting the air battle, commanding the forces, and exchanging information with joint forces and lower-tier defense systems, the THAAD weapon system requires a BM/C3I segment at the battery (figure 4-6, page 4-6) and battalion command levels. The BM/C3I unit coordinates and synchronizes EO and FO activities with lower-tier units, higher echelon units, and joint command centers. BM/C3I uses a netted, distributed, and replicated (NDR) architecture to ensure uninterrupted execution of engagement operations and Force operations functions.

4-13. The Battle Management/Command, Control, Communications, and Intelligence (BM/C3I) segment consists of three major components: a Tactical Operations Station (TOS), a Launch Control Station (LCS), and a System Support Group (SSG). The TOS and LCS are HMMWV-mounted shelters that are powered by trailer-mounted 15 kw generators (PU-801 series). Both have identical environmental control units and Gas Particulate Filter Units (GPFU) providing NBC protection.

4-14. **Tactical Operations Station**. The TOS is the operational module for the BM/C3I segment and contains two servers and two identical workstations. The TOS exchanges data and voice with the LCS via a high-capacity dual fiber distributed data interface (FDDI) local area network (LAN). The fiber-optic lines carry data and voice communications to the LCS. The TOS also has a DNVT that provides voice and data communications to the MSE equipment. A laser printer provides quality hard copy print out in black and white or color. An ECU provides environment control function selection and station temperature control. An uninterruptible power supply (UPS) provides a backup power source used when the primary power to the shelter is interrupted. It allows the operator 10 to 14 minutes to perform an orderly shutdown of equipment to prevent damage.

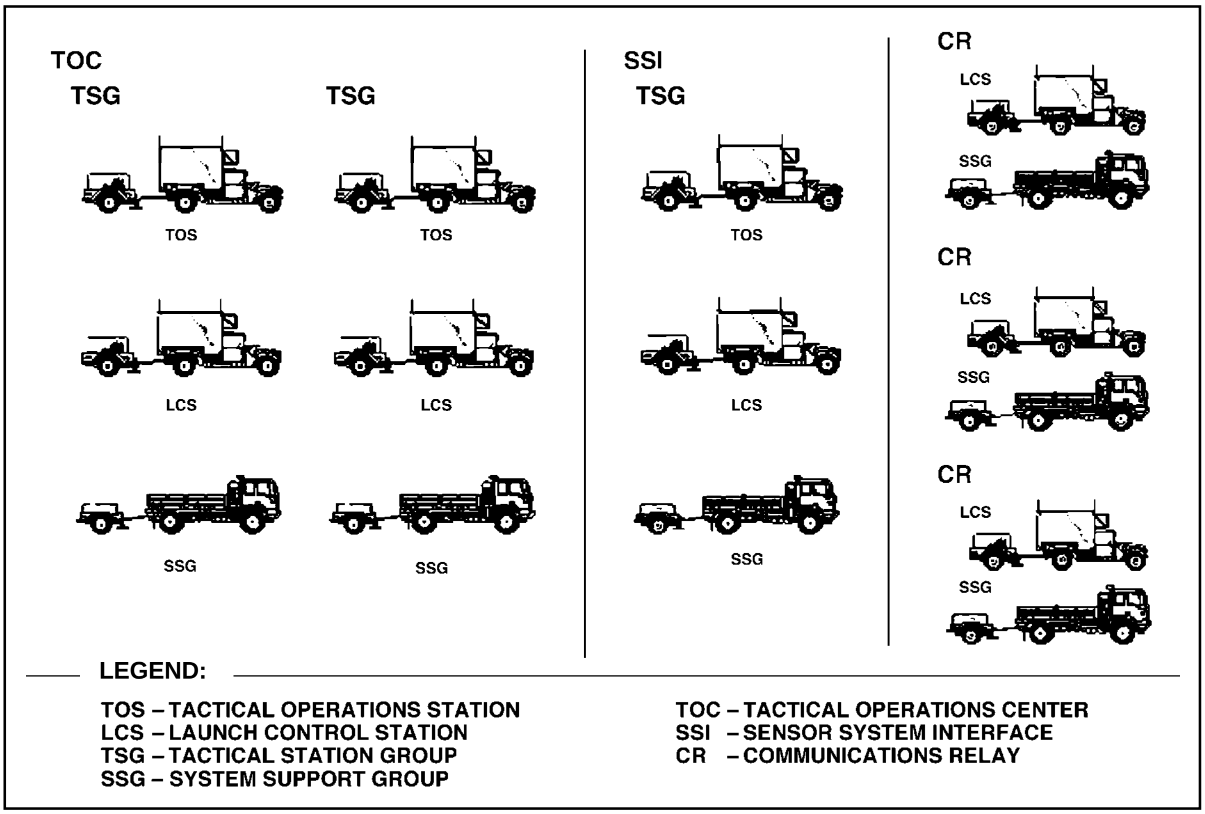

Figure 4-6. Battery BM/C3I Configuration

4-15. **Launch Control Station**. The LCS includes an M1113 Heavy HMMWV, a trailer mounted PU-801 generator, and a modified S-788 shelter equipped with an EPU. Consistent with its primary function as a multi-purpose communication element, the LCS includes the communications processing subsystem, fiber optic cable interfaces, and an extensive communications suite for internal and external tactical communications. The communications suite includes equipment to permit data communications via Tactical Digital Information Links B and J (TADIL B and J), US Message Text Format (USMTF) and the Intelligence Broadcast System (IBS). It also provides data and voice communications via the Area Common User System

(ACUS) and the AN/VRC-99, and voice communications via the Combat Net Radio (CNR). Other communications equipment includes a Global Positioning System (GPS), AN/PSC-5 Single Channel Satellite Terminal, AN/URS-5 Joint Tactical Terminal (JTT), circuit switching equipment, and Communications Security (COMSEC) device. The LCS has a roof-mounted dual batwing antenna for the CTT/H-R terminal. There are four ground-mounted antennas for the SINCGARS VHF radio sets and for the PLGR.

4-16. **System Support Group**. The SSG consists of an M-1078 Light to Medium Tactical Vehicle (LMTV) equipped with an electric crane installed in the cargo bed and a towed PU-802 generator. The SSG is also used to support fiber optics cable laying activities and to transport additional items of equipment required for THAAD Battery operations. Transported equipment includes communications ancillary equipment (e.g., antennas, antenna masts, fiber optic cable assemblies), site preparation equipment (e.g., concertina wire, camouflage netting), and soldier support items (e.g., duffel bags, rations). The generator provides a backup source of power for the TOS and LCS.

Tactical Station Group

4-17. The basic BM/C3I group is the Tactical Station Group (TSG), which consists of a TOS and LCS linked together with fiber optic cables, and a SSG. The TSG can operate independently as a communications relay (CR), or be combined with another TSG to form a battery or battalion tactical operations center (TOC). A TSG can be attached to a remote radar site where it functions as a sensor system interface (SSI). These various functional groups are discussed in the following paragraphs.

4-18. **THAAD TOC**. The THAAD TOC normally consists of two Tactical Station Groups (TSG). Although all necessary TOC functions can be accomplished using one TSG, to ensure against total system failure during the ballistic missile battle a second TSG shadows the first TSG. The THAAD TOC may be configured as follows:

- **Alternative #1 (two TSGs)**. One TSG performs engagement operations while another TSG performs force operations and provides hot back up for engagement operations (normal configuration).
- **Alternative #2 (two TSGs)**. One TSG performs engagement and force operations while another TSG is a hot back up for both engagement and force operations.
- **Alternative #3 (one TSG)**. One TSG performs engagement and force operations without a back up.

4-19. **Sensor System Interface**. The SSI is a TSG configured with a subset of TOC functionality to provide remote radar management. The SSI provides the interface between the remote radar and the EO/FO TSG. The SSI provides direct sensor tasking and management functions for its associated radar in response to direction from its EO/FO TSG.

4-20. **Communications Relay**. A CR (group) consists of a single LCS and SSG. It provides both data relay and voice relay whenever point to point communications capabilities are exceeded because of distance or terrain masking. A CR may be used to provide communications relay between:

- **TOC and Launchers.** In exercising control of any remote THAAD element via a CR, communications between the TOC and the CR are usually via JTIDS. Communications between the CR and launchers is by fiber optic cable.
- **TOC and SSI**. In exercising control of remote radar via a CR, communications links between the TOC, CR, and SSI are usually via JTIDS.
- **THAAD TOCs**. The communications link between two or more THAAD TOCs using CRs is usually via JTIDS.
- **TOC and external agencies or nets**. The communications link between a TOC and CR is usually JTIDS with the link between the CR and external agencies/nets as required. A TOC may communicate directly with external agencies without using a CR.

Launcher

4-21. The purpose of the launcher is to provide a platform for elevating and launching missiles. The THAAD launcher consists of a modified U.S. Army model M1075 Palletized Load System (PLS) truck, missile round pallet (MRP), electronics module, generator, and battery pack (figure 4-7).

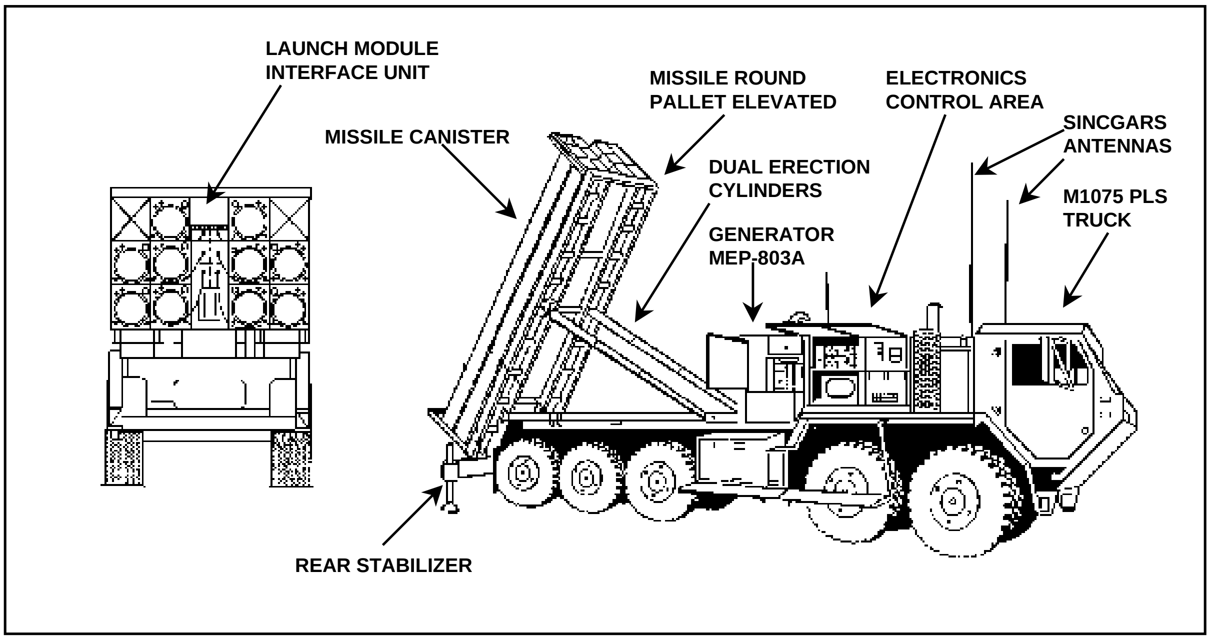

Figure 4-7. THAAD Launcher

4-22. The launcher can carry eight missile rounds to a designated site and be available to launch within 30 minutes of arrival. Reload can also be accomplished within 30 minutes. All rounds may be fired in rapid sequence or individually. Launcher emplacement can be done on inclines of up to ten degrees. The launcher can be transported on any Navy cargo ship, flatbed railroad car, or Air Force C141 and larger cargo aircraft. Once emplaced, the battery TOC controls the launchers through a fiber optics link to a LCS.

4-23. **Modified PLS Truck**. The PLS truck was modified by removing or relocating some PLS standard equipment, adding rear outriggers, stabilizers, work platforms, a hydraulic erection system, and a class VI safe for classified material storage. THAAD equipment installations include an electronics module, 10 kw generator, wiring harness, electrical motor-driven hydraulic back-up pump, and a ground rod driver. Two SINCGARS radios are installed in the cab for voice communications.

4-24. **Missile Round Pallet**. The missile round pallet is equipped with dual hydraulic cylinders for elevation purposes. The missile round pallet is used to support and erect a minimum of eight missiles to the launch elevation angle. The MRP incorporates an Azimuth Determination Unit (ADU) that provides azimuth alignment information for the launcher during combat operations and a missile umbilical junction box that provides truck-to-MRP electrical interface. The missile round pallet has forklift pockets for ground handling.

4-25. **Electronics Module**. The electronics elements are incorporated into the launcher electronics module on the curbside between the cab and the missile round pallet. The elements include the launch control unit, a precision lightweight global positioning system receiver, power distribution unit, and a rechargeable battery. The 10 kw generator recharges the battery and is mounted on the roadside between the missile round pallet and the engine on sliding rails to provide maintenance access.

Missile Round

4-26. The THAAD missile round consists of a missile assembly and its canister. Eight missile rounds are mounted on the missile round pallet. The missile rounds remain on the pallet through shipment, storage, handling and loading on the launcher until the missile is fired. Indicators and electrical connections are located at the aft end of the canister. The indicators allow the operators to monitor status of the missile round. The electrical connectors are used to connect the missile to the launcher via the launch module interface unit.

4-27. **Canister**. The missile canister weighs 816 pounds, is 261 inches long and 18.1 inches wide. It provides the means to store, transport, and launch the missile. It also provides an environment for missile transportation and can maintain the missile in a ready condition for up to ten years. The canister is designed to allow access to the missile electronically through an umbilical cable connection. The canister is made of a filament wound graphite composite shell.

4-28. Guide pins located at the ends of the canister enable stacking and assembly on to the missile round pallet. Muzzle and breech closures provide a seal that protects the interior of the canister from dust, sand, and moisture. The seals will rupture upon launch and are designed not to cause interference with the launch or adjacent missile launches from the same MRP.

4-29. **Missile Assembly**. The missile assembly (figure 4-8) consists of a single-stage solid propellant rocket booster and a homing kill vehicle (KV). An Interstage assembly provides a structure for mounting the KV to the booster. Descriptions of the missile assembly components follows:

- Booster section. (Composed of the propulsion section, thrust vector control (TVC), and the flare assembly). The booster section contains the propulsion system that provides the initial thrust to get the kill vehicle to the proper altitude and attitude for interception.
- Interstage assembly. Subcomponents are the electronics assembly, separation motor, and the flight termination system. The interstage assembly is the transition region between the propulsion section and the kill vehicle.
- Kill vehicle. The kill vehicle (KV) is designed to destroy its target with kinetic energy and does not include a warhead. It is designed with an infrared (IR) homing seeker that detects and homes on the target to destroy it by body-to-body contact with the KV steel nosetip.

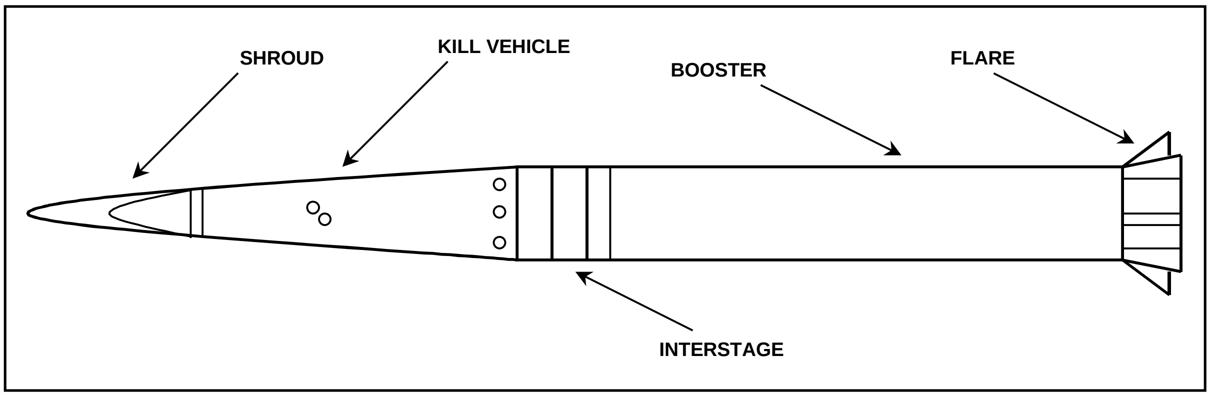

Figure 4-8. THAAD Missile

SYSTEM OPERATIONAL OVERVIEW

4-30. The BM/C3I equipment manages THAAD system operations. The BM/C3I communicates with the radar and the launchers, via radios or fiber optic cables, to gather status data and issue commands. A TSG performs force operations in support of engagement operations as a communications relay or in support of remote launchers and radar. The following paragraphs explain an engagement in functional terms of surveillance, threat evaluation, weapon assignment, engagement control, and missile operations. Figure 4-9, page 4-11, illustrates a THAAD engagement sequence.

Surveillance

4-31. The EO/FO TSG will provide sensor search parameters, threat prioritization, and saturation alleviation rules during initialization. The radar responds to the BM/C3I commands by executing the designated mission profiles. During execution the radar detects tracks, classifies, identifies, discriminates, and types the threat. The radar also determines estimated launch and impact points. The radar passes this information to the

EO TSG for threat evaluation, weapon assignment, and dissemination to external systems and higher echelons. The EO TSG directs radar operations and performance in order to monitor threat priority, avoid saturation, and implement required emission control (EMCON).

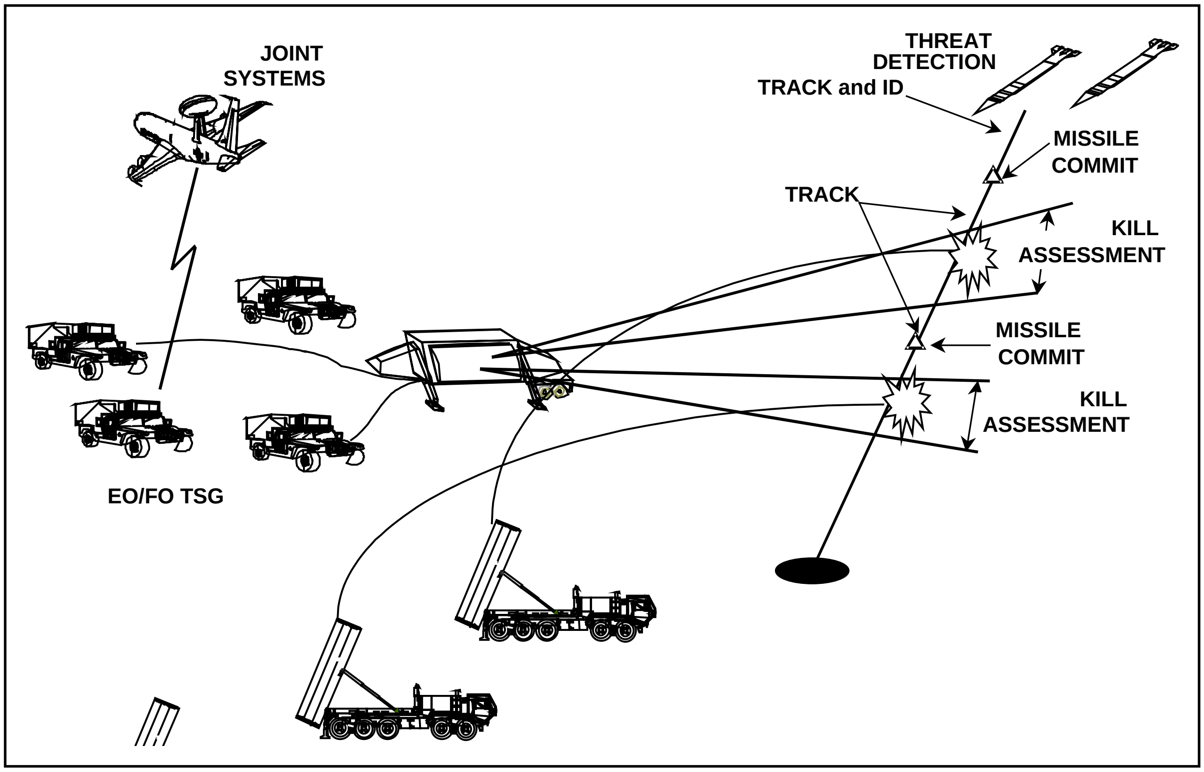

Figure 4-9. THAAD Engagement Sequence

Threat Evaluation

4-32. Threat evaluation involves determining which enemy TBMs pose a threat to the defended area and prioritized assets. It also determines which assets are threatened and the number of TBMs attacking each threatened asset. The system conducts threat evaluation on those TBMs whose track maturity is sufficient to allow for the conduct of meaningful threat-asset pairing.

Weapon Assignment

4-33. Weapon assignment involves the selection and scheduling of available launchers and missiles against attacking TBMs. It is an iterative process that is repeated at fixed intervals or upon the occurrence of an event that alters the weapon assignment basis. The system first determines available battlespace, first shot, last shot, best shot opportunity, and the available engagement opportunities. Based on the number of engagement opportunities available and the number of missiles allocated according to defense objectives, the system selects a method of fire. The system uses shoot-look-shoot as the method of fire where feasible.

4-34. The system examines launcher-target combinations with a view toward selecting intercept points that maximize system effectiveness and scheduling intercepts so that the radar is not overloaded and scheduling launchers that can best support the engagement. The system plans subsequent shot opportunities for execution, if required. Based on the above, the system selects for implementation the set of launcher-target schedules most nearly satisfying the decision criteria. Launch time is predicated on achieving an intercept point location accuracy that is good enough to ensure that the missile possesses sufficient divert capacity and that the target will be in the missile seeker's acquisition field of view.

Engagement Control

4-35. Engagement control involves determining the fire control solution and those BM/C3I and radar functions associated with controlling the engagement through kills assessment and possible re-engagement. After missile commit and prior to launch, the system determines the final trajectory, monitors launch and launch time, establishes the guidance and track update schedule, and schedules radar and communications support resources. During missile flyout, the EO TSG determines guidance and target information and transmits them to the missile through the radar. The radar tracks the missile and target through intercept and provides kill assessment data to the EO TSG. In case of a miss, re-engagement is immediate, battlespace permitting. In case of a miss with an uncertain kill, the system re-identifies the target and reinitiates the threat evaluation and weapon assignment processes and is reengaged if battlespace permits.

Missile Operations

4-36. The following paragraphs summarizes the major actions from the time the EO TSG determines engagement solutions up to destruction of a target by the kill vehicle (KV) with kinetic energy.

4-37. **Prelaunch**. The EO TSG determines the engagement solution and pairs the target with the launcher. It schedules the launch. It also provides trajectory parameters to the radar and launcher, which update the radar, and initializes the missile via the launcher. The missile performs built-in-tests in response to the EO TSG command and relays results back to the EO TSG via the launcher.

4-38. **Launch**. The EO TSG sends the fire command to the missile via the launcher. The missile booster ignites. The launcher then provides the EO TSG the exact time of launch.

4-39. **Boost**. The booster section contains the propulsion system that provides the initial thrust to get the kill vehicle to the proper altitude and attitude for interception. The booster section has two sub-components: the propulsion section and the thrust vector control (TVC). The EO TSG updates actual time of launch and sends it to the radar. The radar provides boost phase update to the in-flight missile. The missile then deploys the booster flares.

4-40. **Postboost**. The EO TSG provides in-flight target and missile status update to the missile via the radar. The booster then separates. The radar provides the EO TSG with the kill vehicle (KV**)** and target status.

4-41. **Midcourse**. The EO TSG provides in-flight target update to the KV via the radar. A divert and attitude control system (DACS) provides the KV with angle of attack and roll control. The KV has a self**-**contained cooling system that cools the seeker when in the IR operation. Seeker cool down begins prior to acquisition.

4-42. **Hand-over and Acquisition**. The EO TSG provides final in-flight target update and target object map (TOM) to the KV via the radar. The TOM is designed to display object details and includes range, altitude, speed, and threat class. The shroud separates from the KV. The seeker begins acquisition mode. The KV matches the seeker scene against the TOM. The KV designates the target and initiates a track file.

4-43. **Target Track**. The KV downlinks processed homing data. The KV steers to aimpoint based on radar estimates and the thrusters' control of the KV attitude.

4-44. **Engage**. The KV resolves the target image and determines the final aimpoint. The KV diverts to intercept and downlinks homing data.

4-45. **Impact and Target Destruction**. The KV hits the target with tremendous kinetic energy to destroy the TBM. The radar updates the EO TSG data and then conducts kill assessment.

Communications Equipment

4-46. Many different types of communications equipment is organic to the THAAD battery. Each has different characteristics and multiple potential uses. These items consist of radio terminal sets, telephone sets, and communications processors. Together they makeup the heart of the THAAD communications system and are described in the following paragraphs.

4-47. **AN/GRC-193A Radio**. The AN/GRC-193A is a long-haul EO HEU secondary radio communication network which supports the air defense coordination net (ADCN).

4-48. **AN/GRC-226 Radio**. The AN/GRC-226 UHF (band 3 only), 15 channel radio operates in the 225 – 400 MHz band. This radio is compatible with radios used in the ACUS network. Two AN/GRC-226 radios are installed in each LCS. The radio provides line-of-sight communications for both voice and data. This is a bulk (trunk) encrypted communications link containing multiplexed voice and data circuits. Each set is comprised of a receiver-transmitter, a baseband assembly, and an antenna assembly.

4-49. **AN/GSQ-240 JTIDS Class 2M Radio**. The JTIDS provides a jam resistant ground-to-air and ground-to-ground data communications. JTIDS is a high-speed data radio that operates in a time-shared data network providing access to theater EO surveillance and targeting information network via a time division multiple access (TDMA) architecture in the 960 MHz to 1215 MHz frequency range. Within the battery, JTIDS supports the EO data communications between the EO TSG and the SSI. The JTIDS terminal, with omnidirectional antenna and telescoping mast makes up JTIDS. The JTIDS may be initialized through any one of the TOS or LCS workstations.

4-50. **Commander's Tactical Terminal**. The CTT is a hybrid two-channel receiver that operates within the 225 MHz to 1.4 GHz UHF frequency range. It provides access to a TIBS intelligence network via either LOS or satellite broadcasts. This terminal is interfaced to a laptop computer that provides THAAD access to intelligence information at theater and national levels. The CTT utilizes the LCS roof mounted dual batwing antenna.

4-51. **Compact Digital Switch**. The Compact Digital Switch (CDS [ON-422]) is the heart of the THAAD's communication capabilities. It can handle over 708 individual circuits (THAAD requires less than its capability). This device routes telephone and data throughout the battery and the external ACUS network. Each LCS contains one CDS, which includes a multi-station intercom system with selective answering capability, audible/visual alerts, and conference calling (intercom, radio, and telephone) capability. The two associated pieces of COMSEC equipment are the speech security equipment and the trunk encryption devices that provide bulk encryption for ACUS purposes. The software used to initialize the CDS is contained in a laptop computer. The software version of the CDS must also be compatible with the software version used by the MSE system. Pre-affiliation lists (routing tables) and individual phone lists must also stay current to ensure maximum interoperability.

4-52. **Encryption Devices**. THAAD has two types of encryption for the ACUS/MSE network. The first is a trunk encryption device (TED), KG-194A. This device performs trunk encryption (e.g. encrypts all the channels in the trunk group) for external connectivity. There are two TEDs per LCS that support the AN/GRC-226 radio and the CDS. They also support the two trunk cable connections (TG1 and TG2) located at the communication demarcation panel. The second device is a KIV-7 that is also routed through the CDS. The KIV-7 supports single channel TADIL B data link encryption. This data link is used to exchange EO data with an Air Force CRC or a Marine TAOC.

4-53. **Fiber Optic Cable**. Fiber optic communications consist of modulator-demodulator equipment connected by cables with four fiber optic strands tied together to form cables capable of carrying data and voice. These cables are in one-kilometer increments. For the fiber optic cables a maximum distance of two kilometers may be used. The BMC3I, radar, LCS, and launcher sections all use the same cable type. At the BMC3I, radar and LCSs, the fiber optic cables are used to interconnect the TOS and LCS in any configuration. These local area network (LAN) configurations are referred to as the fiber optic data distribution interface (FDDI) system.

4-54. **Global Positioning System**. Each major subsystem with the THAAD battery has a GPS. The GPS is used for location identification and time synchronization across the battery. The GPS (PLGR) unit may also be removed from the mounted location and used as a handheld receiver for navigational purposes. However, prior to removing the GPS receiver from the mounted location, the GPS must be inactivated from the THAAD tactical software to avoid system faults.

4-55. **Mobile Subscriber Equipment**. THAAD includes communications equipment that supports an interface into the Army's MSE area common user system (ACUS) network. This equipment functions as a MSE small extension node (SEN); however, unlike other ADA systems this functionality is integrated into the LCS design. Current LCS equipment associated with MSE are: two each AN/GRC-226 radios, encryption devices, compact digital switch (CDS), and the availability to have THAAD non-organic MSE and ACUS communications system connectivity.

4-56. **SINCGARS Radios**. SINCGARS is a VHF single channel, push-to-talk radio which operates either in single frequency or frequency hopping modes at 30 to 88 MHz. The THAAD battery uses several models of SINCGARS. In UOES only, all primary convoy vehicles contain an AN/VRC-87A SINCGARS. The LCS, launcher, and launcher prime mover contain the AN/VRC-90. The LCS radio voice interface is connected to the radio connector panel to provide access for voice circuits. These radios provide the secondary voice communication and support voice on the move for other THAAD elements. Within the battery there are additional SINCGARS radios which are used to support the functions of command, logistics, administration, intelligence, and operations. All SINCGARS contain internal COMSEC capability, mounted (AS-3900) and dismounted antennas (OE-254).

4-57. **THAAD Non-Organic MSR and ACUS Connectivity**. At the communication demarcation panel, there are two (2) types of signal connectors. There are three (3) CX-11230 digital trunk group connectors. These connectors allow THAAD to have curbside signal support. The next types of connectors are binding posts used to extend and connect DNVTs, DSVTs, or individual data circuits to a local subscriber. The wire may be WD-1 or WF-16.

4-58. **Wire**. Wire communications consist of wires connected to field telephones, terminal boxes and switchboards. The wire is either WD-1 or WF-16, which as previously stated, is used to extend the subscriber terminals to the required location.

Internal Communications Networks

4-59. **Battery Mission Operations Network**. The battery mission operations network provides FO and EO command and control. The internal battery network connects force operations and engagement operations TSGs, the radar, and launchers in a variety of configurations using radio and FOC. The EO/FO TSGs are connected to the radar and launchers using fiber optic cable when collocated, or radio to a remote launcher or radar with the use of a CR or SSI, respectively. The FOC system interconnects with the THAAD voice communication subsystem station in the TOS. The battery TOC includes two TOS shelters, one for FO and one for EO, and two LCS shelters that functionally support force operations and engagement operations. Internal communications for each section supports force and engagement operations when emplaced (figure 4-10, page 4-16).

4-60. **Battery Wire/Telephone Network**. The battery wire network is the primary means of voice communications among the battery elements (figure 4-11). It provides access to external telephone networks all primary battery elements.

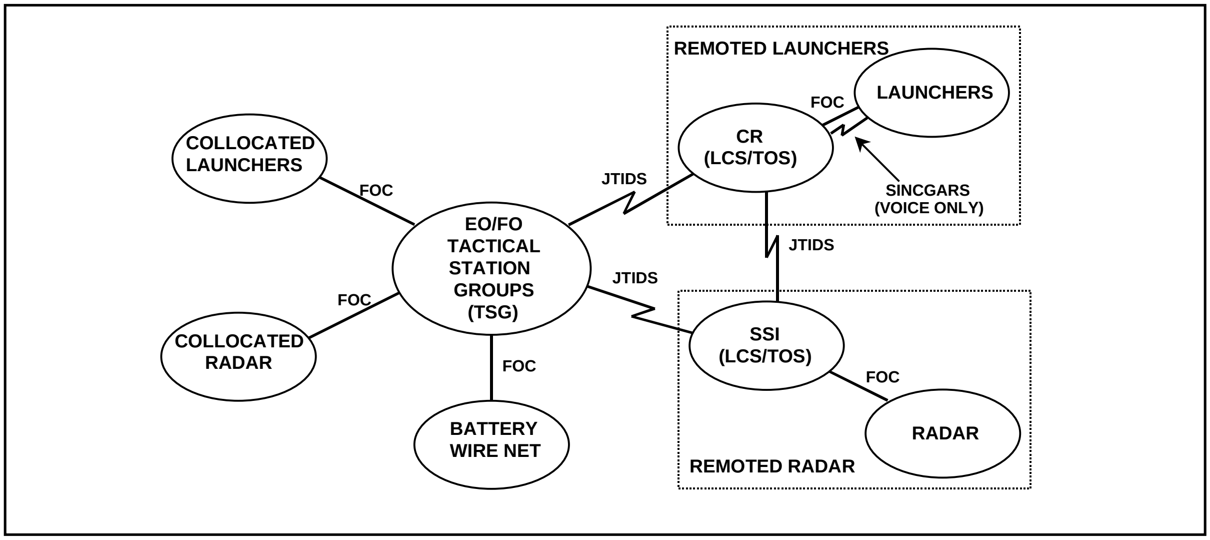

Figure 4-10. Battery Mission Operations Net

4-61. **Battery FM Command Net**. The battery FM command net uses the SINCGARS radios and is primarily used during battery movement, march order and emplacement, RSOP, and when fiber optic or wire communications is not available. The battery command net is a back up to the mission operations network once emplaced and can provide for command and control for the battery when wire and cable communications are not available. The NCS is normally the battery CP (figure 4-12, page 4-17).

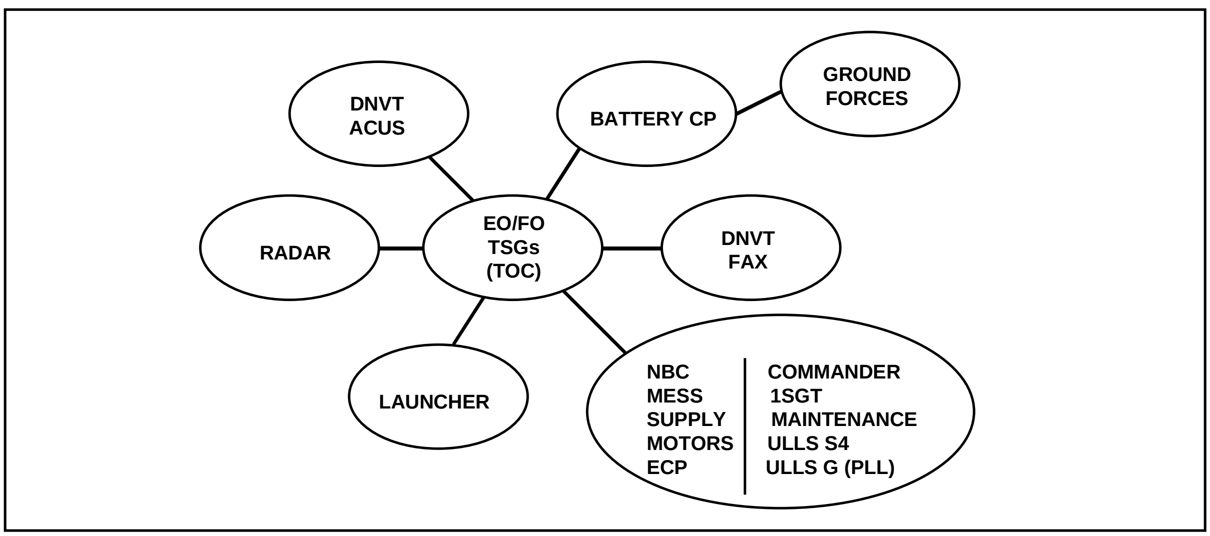

Figure 4-11. Battery Wire/Telephone Net

4-62. **Battery FM Support Net**. The battery FM support net uses the SINCGARS radios. It is primarily utilized during command post emplacement or when there is insufficient fiber optic or wire communications. This radio net is utilized to control mobile maintenance support activities through the TMC for conventional maintenance and contractor logistics support for system maintenance (figure 4-13, page 4-18).

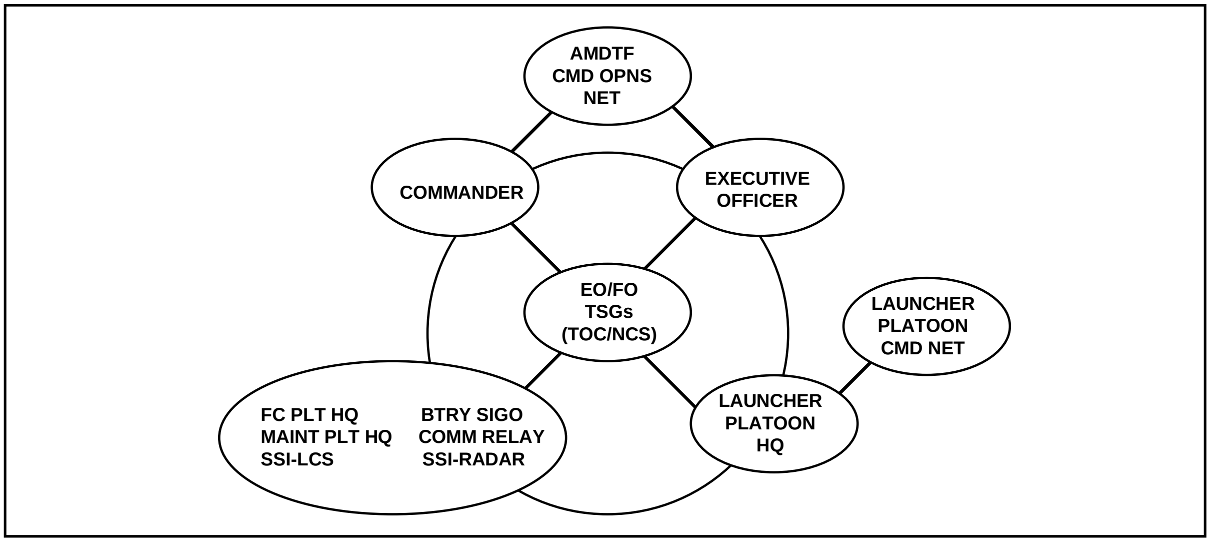

Figure 4-12. Battery Command Net (FM Radio)

4-63. **Launcher Platoon FM Command Net**. The launcher platoon FM command net uses the SINCGARS radios. It is utilized during periods of movement, march order and emplacement, and static operations of site defense coordination (figure 4-14, page 4-18).

External Communications Networks

4-64. THAAD units will exchange or receive operations, intelligence, coordination, support, and planning data with units that are external to the AMDTF. The external networks used are the area common user system, TIBS intelligence, and joint data networks.

4-65. **Area Common User Network**. Doctrinally, Theater Army, EAC, and corps signal brigade resources provide MSE and Tri-tactical (Tri-Tac) communications support as required by the theater commander. This support consists of voice and data over MSE packet networks, and Tri-Tac network services. These communications resources collectively make up the Tri-Tac communication systems at the EAC level, and the ACUS at corps level and below, to include the division levels. The ACUS and or Tri-Tac networks may provide secure EO voice and secure FO voice and fax data connectivity to the THAAD battery depending on the battery's location.

4-66. **Tactical Intelligence Broadcast Service**. The TIBS network provides time-sensitive tactical information to THAAD via UHF broadcast from aircraft and/or the satellite communications system. TIBS provides tactical data and alert and early warning of TBM launches. Data can be filtered based on THAAD specified parameters such as areas of interest, altitudes, specific targets, collection parameters, etc. Up to 20 filters can be selected through software and initiated by the laptop computer workstation. Primary interest in TIBS data is TBM launch.

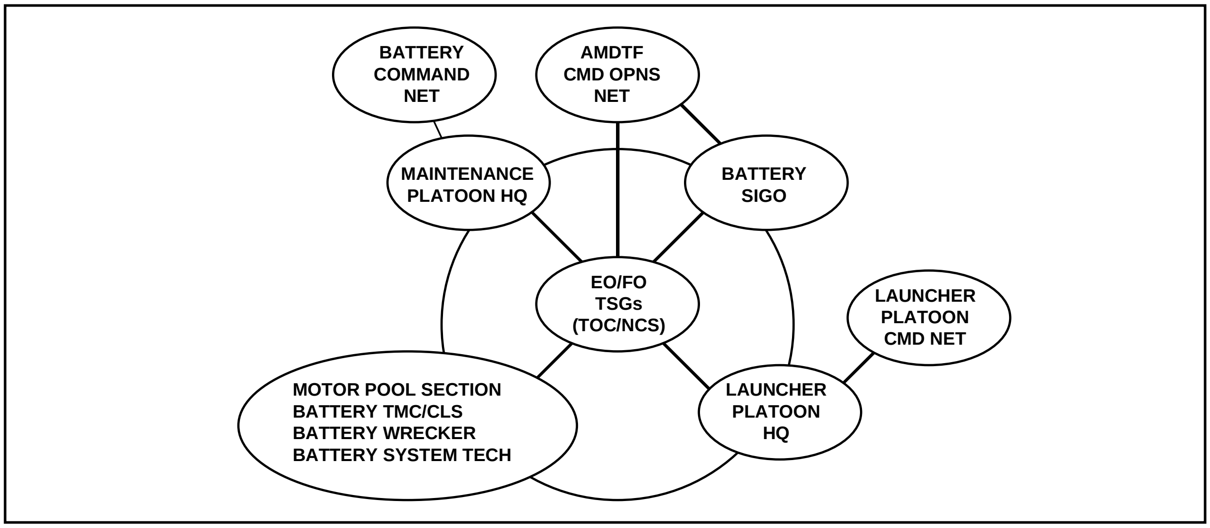

Figure 4-13. Battery Support Net (FM Radio)

4-67. The commander's tactical terminal (CTT) is interfaced to a separate laptop computer in the LCS. This gives THAAD the capability to receive and display (on the laptop) TIBS data. The TIBS data is not integrated into the tactical software. If possible, the unit may acquire the means to remote the laptop to the EO TOS with the use of an extension cable. If not, the LCS operator must monitor both the CDS and CTT laptops and inform the EO/FO TOS operators of pertinent TIBS data via telephonic means. THAAD can use the TIBS data for planning purposes and telephonic warning.

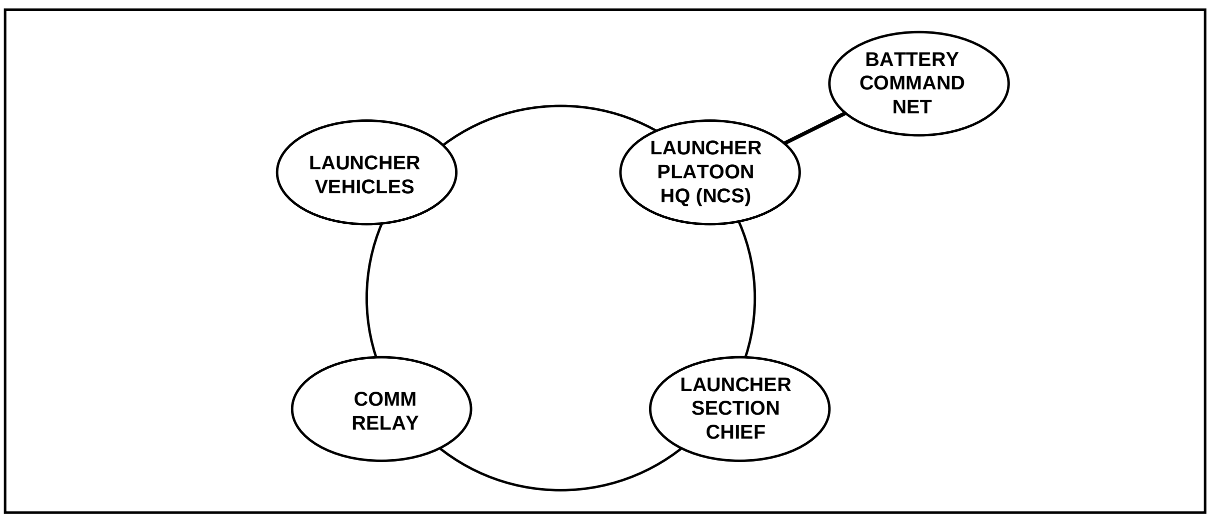

Figure 4-14. Launcher Platoon Command Net (FM Radio)