

AFATDS Gunnery Technical Fire Direction

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“The mission of the Field Artillery is to destroy, neutralize or suppress the enemy by cannon, rocket and missile fires and to help integrate all fire support assets into combined arms operations....The gunnery problem is an indirect fire problem. Solving the problem requires weapon and ammunition settings that, when applied to the weapon and ammunition, will cause the projectile to achieve the desired effects on the target.”

*FM 6-40 Tactics, Techniques and Procedures (TTP)
for Field Artillery Manual Cannon Gunnery*

Gunnery is an age-old tradition for Field Artillerymen. It can be divided into two parts: tactical and technical fire direction.

Legacy Force fire direction systems operate differently for Field Artillery cannon and rocket systems. Earlier software versions of the Advanced FA Tactical Data System (AFATDS), one of the Army battle command system (ABCS) digital systems, concentrated on tactical fire direction. Version 6 (V6) software, for the first time, will integrate technical fire direction with AFATDS' tactical fire direction capabilities and calculate solutions for both cannon and rocket systems.

V6, formerly called A99, is scheduled for release in April and will be fielded through the summer of 2003. The naming convention for software versions of AFATDS recently has been modified to align with the releases of ABCS software versions and the Army's unit set fielding plan. The current version of ABCS is 6.3 with Version 7 slated for release in FY04.

This article outlines what soldiers and Marines can expect in AFATDS Version 6 with technical fire direction.

Historical Background. The tactical fire direction system (TACFIRE) provided the initial tactical fire direction for cannon battalions, FA brigades, division artilleries and corps artilleries. The initial fire support automation system (IFSAS) replaced TACFIRE and provided the Army National Guard its first tactical automation capability. AFATDS was developed as a replacement for IFSAS and as the fire support component of the Army tactical command and control system (ATTCS), now referred to as ABCS.

AFATDS has been providing integrated, automated support for planning, coordinating and controlling all fire support assets: FA cannons, rockets and missiles plus mortars, air support, naval surface fire support (NSFS) and attack helicopters. As a tactical fire direction system, AFATDS automatically processes fire requests; generates multiple tactical fire solutions for missions; monitors mission execution; supports the creation and distribution of fire plans (fire planning); automates artillery target intelligence; accounts for the fire unit status, ballistics and ammunition; and processes meteorological and geometry data. AFATDS fundamentally changes tactical fire support by decentralizing the decision-making process, moving it from the fire direction center (FDC) to the fire support element (FSE).

For well over two decades, soldiers and Marines have depended on the battery computer system (BCS) to provide cannon technical fire direction and the multiple-launch rocket system (MLRS) fire direction system (FDS) to provide rocket and missile technical fire direction. Technical fire direction applies the correct weapon and ammunition settings to achieve the desired effects on the target at the desired time.

BCS computes firing data based on each gun's location, muzzle velocity, target location, observer location, aiming point and the effects of meteorological data on the trajectory. BCS also provides fire commands to the cannon artillery delivery systems in the battery. In Paladin units, BCS sends target information to the Paladin's automated fire control system (AFCS) for it to compute the ballistic solution.

FDS, on the other hand, does not send fire commands to the launchers. In fire mission processing, FDS determines

which launcher(s) will shoot from which firing point(s) and only sends target information for on-board calculations. FDS checks for violations of battlefield geometry, fire support coordinating measures (FSCMs), air corridors and down-range mask violations. It also applies commander's criteria and manages communications.

AFATDS Technical Fire Direction. Ultimately, AFATDS software V6 will replace BCS and FDS in the firing units. It provides essential BCS and FDS capabilities while improving situational awareness, communications and operational flexibility. However, AFATDS does not perform all tasks in precisely the same manner as BCS and FDS do.

AFATDS V6 gives users some of the look and feel of both BCS/FDS and Microsoft Windows. In the currently fielded BCS and FDS software versions, soldiers and Marines use the upper, middle and lower displays. AFATDS V6 shows the same data in its "Fire Control Status" and "Weapon Status" windows.

In the window, operators will find many of the same symbols as in BCS and FDS. This will help reduce training time. The upper display shows the mission and the phases of that mission. The middle display shows which guns were selected and which responded to the mission. The lower display shows what type of mission the guns are executing.

AFATDS allows the operator to review the recommended fire solution. If necessary, the operator can modify the technical solution and have AFATDS recalculate the mission data before it is sent to the cannons or launchers.

AFATDS allows operators to manage muzzle velocity/muzzle velocity variations, masks and registration data and track the status of Paladin and non-Paladin howitzers. V6 uses the NATO Ballistic Kernel (NABK) to calculate the ballistic solutions for cannon projectiles.

In interfacing with Paladin, AFATDS can send "Fire Orders" that contain the tactical fire control solution but leaves technical computations to the howitzer or AFATDS can send howitzer commands that include a complete ballistic solution. In M198, M109A5 or M119 units, AFATDS interfaces with the gun display units (GDUs), just as BCS does, and provides the complete firing solution.

AFATDS allows MLRS units to track the status of individual launchers, man-

age ammunition, process mission selection and reassignment, conduct rocket flight path predictions and manage both the M270 and M270A1 launchers. AFATDS uses the MLRS flight path algorithm to compute the rocket flight path predictions and checks airspace control measures three dimensionally.

Just like FDS or any other tactical system, AFATDS requires training to become familiar with certain tasks. Soldiers and Marines will learn procedures during new equipment training (NET) or new software training (NST) and through courses at the Field Artillery School, Fort Sill, Oklahoma.

Intervention Points (IPs) at the Battery and Platoon Levels. In processing missions, firing units should use IPs selectively. AFATDS automatically will process missions based on the commander's guidance. (See the article "What the Commander Needs to Know About Guidance in AFATDS" by Colonel James G. Boatner in this edition.) However, if IPs are used, most missions are not auto-processed.

The fire support officer (FSO), fire support NCO (FSNCO), fire direction officer (FDO) or the fire direction NCO (FDNCO) always should use the "Deny Mission" and "Coordination Required" IPs. During training events, at the commander's discretion, units may want to establish additional IPs.

It should be noted that tactical IPs used by the FSE should not be set at the battery level if the battalion FDC is in the fire mission chain. The battalion FDC already should have made the tactical fire direction decisions. An IP for tactical fire direction should never be set at the battery or platoon levels except when the platoon is taking calls-for-fire directly from sensors, such as forward observers (FOs), radars, etc.

During mission processing with an IP on, the mission will appear in the "Intervention" window shown in Figure 1. This window is where the FDO first will see the AFATDS recommendation. Before the FDO can accept the recommendation, he must view the attack options shown in Figure 2 and the cannon or rocket/missile technical solution shown in Figures 3 or 4 on Page 32.

In cannon units, if the FDO doesn't accept the AFATDS recommendation, he can select a platoon to send the mission to. At the platoon level, if the FDO doesn't accept the AFATDS recommended solution, he can select the howitzer to send the mission to. AFATDS

Intervention

Intervention | **Attack Options** | Cannon Tech Soln | Missile Information | Rkt/Msl Soln

Tgt Number: NLT:

Tgt Type: Msn Value:

Msn Type: Precedence:

| Filter | Result |
|--------------|--------|
| Duplication | Pass |
| BuildUp | Pass |
| Tss | Pass |
| Exclusion | Pass |
| Route to IEW | Pass |

Attack Options

- FA Cannon
- Rocket/Missile
- Mortar
- Air
- Aviation
- Naval Gun
- Naval Land Atk MSL
- Naval Cruise MSL
- Mass All Systems

| Opt | Tgt # | Unit ID | Munitions | Qty | Go/NoGo | % | Crd |
|-----|-------|---------|-----------|-----|---------|---|-----|
| | | | | | | | |

Recommendation

Figure 1: IP for Mission Processing Turned On. This window shows the fire direction officer (FDO) the AFATDS recommendation for the first time.

Intervention

Intervention | **Attack Options** | Cannon Tech Soln | Missile Information | Rkt/Msl Soln

Meets Mission Cutoff: Number of Active Missions:

Number of Missions with Lower Priority:

- FA Cannon
- Rocket/Missile
- Mortar
- Air
- Aviation
- Naval Gun
- Naval Land Atk MSL
- Naval Cruise MSL

| Opt | Seg? | Unit ID | Caliber | 🔊 | 🌳 | 🕒 | 📺 | 📏 | 👤 | 🗑️ |
|-----|------|------------|---------|-------|---|---|---|---|---|----|
| 1 | No | 2 C 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |
| 2 | No | 1 C 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |
| 3 | No | 1 B 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |
| 4 | No | 2 B 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |
| 5 | No | 1 A 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |
| 6 | No | 2 A 1-37FA | 23CVDA | 155MM | Y | | | | Y | Y |

Munitions

| Shell | Model | Lot | Rounds | Volleys | Fuze | Model | Lot |
|---------|-------|-----|--------|---------|------|-------|-----|
| Adjust: | | | | | | | |
| FFE#1: | | | | | | | |
| FFE#2: | | | | | | | |

Unit Data

Range (m):

Reaction Time (sec):

Angle T (mils):

Operational Status:

Recommendation

Deny Mission, No Capable Units/Systems

Figure 2: Attack Options

Intervention

Intervention Attack Options Cannon Tech Soln Missile Information Rkt/Msl Soln

TOF: 31

FFE 1

| Wpn | Cap | MOC | # Rnds | Shell Category | Shell Model | Shell Lot | Prop Color | Prop Lot | Prop Charge | Fuze Category | Fuze Model | Fuze Lot | Fuze Time | DF | QE |
|-----|-----|-----|--------|----------------|-------------|-----------|------------|----------|-------------|---------------|------------|----------|-----------|------|-----|
| 1 | Y | DNL | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |
| 2 | Y | WR | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |
| 3 | Y | DNL | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |
| 4 | Y | DNL | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |
| 5 | Y | DNL | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |
| 6 | Y | DNL | 1 | HE | M107 DC | A | WB | W | Four | PD | M557 | P | 0.0 | 2495 | 483 |

FFE 2

| Wpn | Cap | MOC | # Rnds | Shell Category | Shell Model | Shell Lot | Prop Color | Prop Lot | Prop Charge | Fuze Category | Fuze Model | Fuze Lot | Fuze Time | DF | QE |
|-----|-----|-----|--------|----------------|-------------|-----------|------------|----------|-------------|---------------|------------|----------|-----------|----|----|
|-----|-----|-----|--------|----------------|-------------|-----------|------------|----------|-------------|---------------|------------|----------|-----------|----|----|

Recommendation

Send FO to GDU GUN 1, GDU GUN 2, GDU GUN 3, GDU GUN 4 GDU GUN 5, GDU GUN 6

Accept Recommendation Recalculate Deny Unsupportable Cancel Help

Figure 3: Attack Options with Cannon Technical Solution

Intervention

Intervention Attack Options Cannon Tech Soln Missile Information Rkt/Msl Soln

Tgt Number: AA1004 Location: 5 65716 038 58053 200 11

| Unit ID | Attack Option | Aimpoint | Munition Model | Munition Type | Qty | MOC | DP | NET/TOT | NLT | Firing Point | Next Point Type | Next I |
|---------|---------------|-------------|----------------|---------------|-----|------------|----|---------|-----|--------------|-----------------|--------|
| 2/3/A | 1 | 5 65716 038 | M30 | JEG | 6 | When Ready | | | | | | |

Aimpoint # Easting Shift Northing Shift Altitude # Rounds

Send

Recommendation

Send FO to 1 2 A 3-27FA 18FABXVIIIICORPS

Accept Recommendation Recalculate Deny Unsupportable Cancel Help

Figure 4: Attack Options with Rocket and Missile Solution

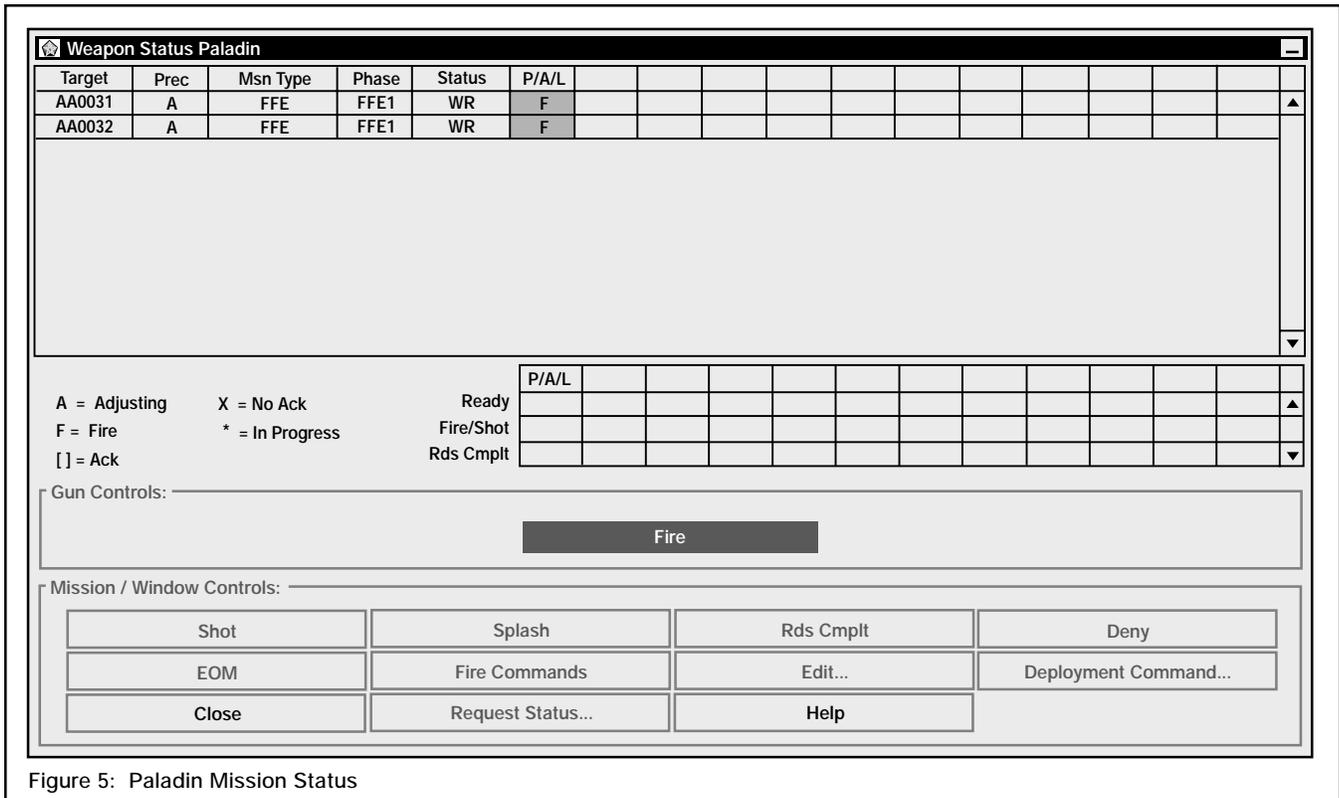


Figure 5: Paladin Mission Status

will recalculate the firing data when the operator overrides the recommended solution.

In MLRS batteries, the FDO can select the launcher to send the mission to. If the mission should fail at the launcher, he can reassign the mission or relay it through the platoon operations center (POC).

The cannon and rocket/missile FDO also can monitor the status of the mission at all times. Figure 5 shows the status of Paladin missions, Figure 6 the status of MLRS missions and Figure 7 on Page 34 the status of M109A5 and towed artillery missions.

Even though AFATDS will be fielded from echelons above corps (EAC) down to the firing platoon, technical fire direction is only available to those units that have delivery systems in subordinate units in their database. For example, a corps FSE can't select a Paladin or MLRS launcher to fire if the weapon isn't in one of its subordinate units.

Testing and Fielding. Each version of AFATDS software goes through operational and user tests to ensure it can accomplish its critical tasks. This test integrates AFATDS and other systems and platforms that must interface with AFATDS to ensure the "total system" can perform its critical tasks.

V6 software was tested extensively in 2001 and results indicated that AFATDS

was capable but still required some software corrections. The software was corrected, and AFATDS passed a government confidence test in December 2001 at Fort Sill. This confidence test allowed the government to ensure that all corrections were properly applied and that V6 functioned as required, including accomplishing all critical tasks of BCS and FDS.

Headquarters, Department of the Army (DA) determines the priority of the fielding plan and can and does change the plan as needed. There is a fielding plan

for units receiving AFATDS as new equipment and a plan for fielding units with software upgrades. Units scheduled for an AFATDS equipment fielding will undergo a different process than units already fielded with Version A98 software.

New Software Training (NST). Units with A98 will undergo V6 NST that covers all improvements and changes to AFATDS and concentrates on technical fire direction. Some units may need an equipment upgrade before the V6 NST because the ultra computer

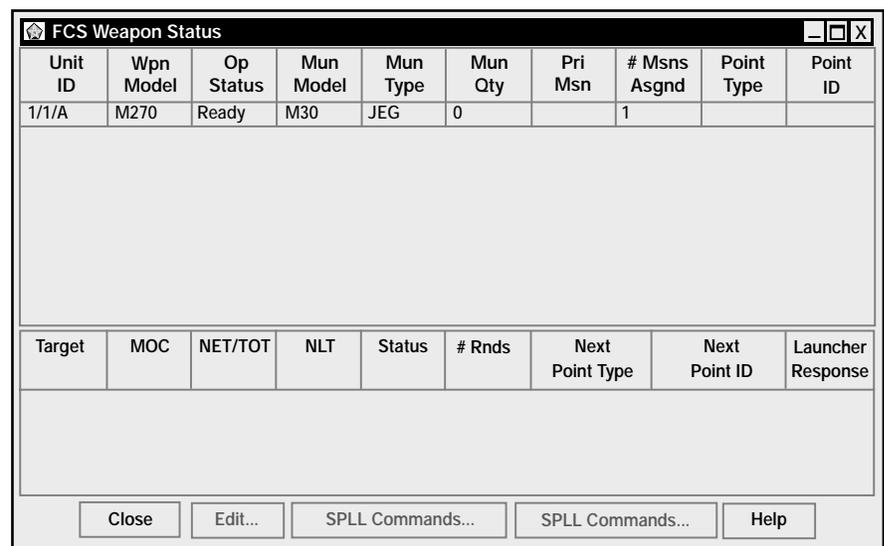


Figure 6: MLRS Mission Status

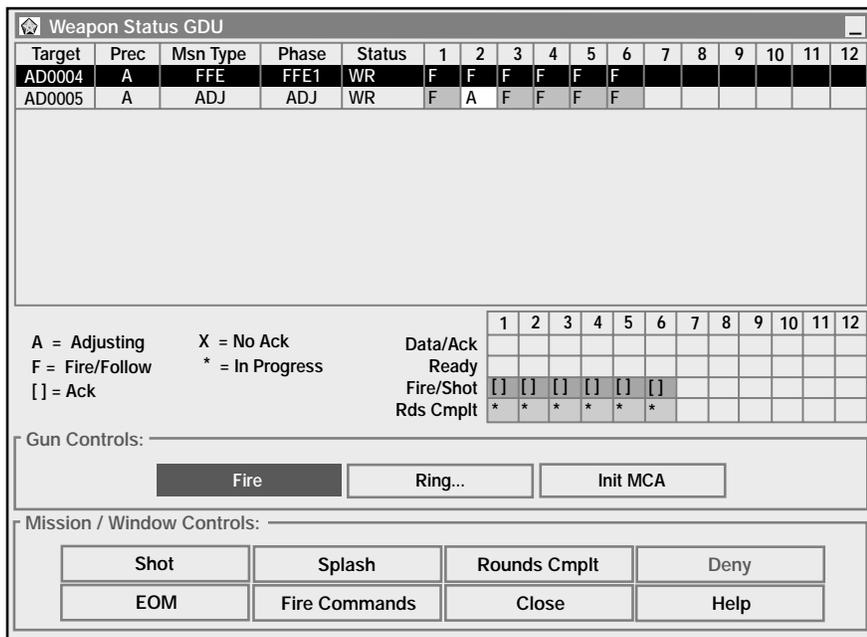


Figure 7: M198, M119 and M109A5 Mission Status

units (UCUs) and the earlier issued compact computer units (CCUs) used for A98 will not support the processing required for the common Army software components of V6.

The US Army Communications and Electronics Command (CECOM) NET team (NETT), based at Fort Sill, trains units for 120 hours (about three weeks) in a school-approved program of instruction (POI). NETT will contact brigade, division artillery and separate battalion points of contact (POCs) to coordinate their V6 upgrade training. Soldiers may get information on where their units are in the V6 upgrade plan at <https://akocomm.us.army.mil/afatds/>. An Army Knowledge Online (AKO) password is required. To obtain an AKO password, visit the AKO web site at <http://www.us.army.mil> and log in as a new user.

New Equipment Training (NET). A unit receiving AFATDS as new equipment receives a new material in-briefing at least 12 months before fielding (active units) or 18 months before fielding (National Guard units). This briefing covers all the logistics issues associated with the fielding. It also gives the unit instructions on what to expect of the new equipment, how the unit will support NET and what to do with its old equipment. In some cases, the old tracked vehicles are upgraded with installation kits to support the new equipment.

During NET, the unit learns AFATDS from top to bottom: tactical and techni-

cal fire direction. For active units, the training is six weeks, including a one-day Executive Leader Briefing, two weeks of installation and setup, three weeks of lecture/hands-on and one week of validation. For National Guard units, NET is a three-week process (consolidated lecture/hands-on and validation).

Once the unit is fielded and trained, the NETT normally will support requests for follow-up visits to provide assistance. The embedded simulation/stimulation training device (SISTIM) will simulate unavailable tactical units and stimulate live FA unit training on AFATDS. SISTIM will focus the unit training and provide repeatable scenarios to enhance team and other collective training.

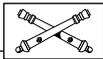
USMC Training. For the current software version of AFATDS, all Marine units that have needed those capabilities already have fielded the system. After V6 with technical fire direction begins fielding, Marine batteries will receive AFATDS with V6, completing the Marine FA fielding.

Marine NET is different than Army NET. Marine NET is three weeks: one week of AFATDS basic operations, one week of technical fire direction and one of AFATDS changes and improvements. Fielded units may request additional blocks of instructions, including the AFATDS Supervisors Course, AFATDS Air Support Class and a Fire Support Coordination Cell (FSCC) Class.

Future AFATDS Improvements. Soldiers and Marines can expect to see

continuing improvements in future versions of AFATDS. In addition to the V6 upgrades, other improvements planned include an update to the NABK and the addition of the new LW 155 howitzer (M777), aimpoint offset calculation for the Army tactical missile system (ATACMS) brilliant antitank (BAT) munitions, the modular artillery charge system (MACS), automated generation of range fans for command posts, a countdown timer for Paladins and MLRS launchers, an active "Fire Control Status" window (a platoon monitor window for MLRS), improvements to MLRS safety and improvements to the target area hazard (TAH) geometry processing.

Once a unit has AFATDS V6 and trains with it, the unit can write or call the Training and Doctrine Command (TRADOC) System Manager for Field Artillery Tactical Data Systems (TSM FATDS) about capabilities or critical tasks needed to improve technical fire direction in AFATDS. Units should include a POC with a telephone number or email address so TSM FATDS may contact him for clarification. POCs can call either the FATDS Software Hotline at 580-442-5607 (DSN 639) or the FATDS Training Hotline at 580-442-3390 (DSN 639) or fax the suggestions to (580) 442-2915 (DSN 639).



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