On the Gun Line

Firing First-Round FFE

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"Bandit 6, this is Alamo 6. Your battery's FFE [fire for effect] for that last mission did not achieve effects. The rounds impacted 300 meters from the target. Why was your battery unable to mass on target? *Over.*"

Battery commanders never want to hear a radio transmission such as this one. And they don't have to.

FM 6-40 Tactics, Techniques and Procedures (TTP) for Manual Cannon Gunnery discusses the five requirements for accurate, predicted fire—for achieving first-round FFE: 1. accurate target location and size, 2. accurate gun location, 3. accurate weapon and ammunition information, 4. accurate meteorological information and 5. accurate computational procedures. When fires don't result in a first-round FFE, we tend to point a finger at the fire direction center (FDC) for failing to meet the five requirements (all but the first, which is the forward observer's responsibility). In fact, the firing platoon's calculation accuracy and procedural attention to detail also can make the difference between a first-round FFE and a waste of ammunition.

This article provides information for the howitzer section chief, gunnery sergeant and platoon sergeant to help them achieve accurate, predicted and massed fires. The guns must provide the FDC accurate information for a first-round FFE; they then must fire the correct projectile, powder and fuze using correct procedures.

Units are more prone to make mistakes in some parts of the firing procedures. This article lists those and organizes them by the five requirements for accurate, predicted fire—likely problems from the 13B perspective.

1. Accurate Target Location and Size. This requirement is the responsibility of the forward observer. Common survey at the firing point links the gun position with the target location. But the gun line can't influence the accuracy of the target location and size.

2. Accurate Gun Location. Errors in location are generally caused by incorrect or sloppy advance party and occupation procedures. The following errors will affect the gun position reported to the FDC.

• *Implementing incorrect procedures before, during and after advance party operations.*

– Not establishing common survey—orienting station (OS) grid and altitude, azimuth (AZ) of orienting line (OL), distance to the end of orienting line (EOL) and description of the EOL.

– Determining the incorrect OS grid and altitude via the position and azimuth determining system (PADS), precision lightweight global positioning system receiver (PLGR), map spot or hasty traverse.

– Not declinating the aiming circles and M2 compasses before reconnaissance, selection and occupation of position (RSOP).

– Failing to clear the aiming circle away from all magnetic attractions.

– Failing to tighten the instrument-fixing screw securely on the aiming circle, which causes errors in the readings given to the howitzer.

– Failing to use a plumb bob while leveling the aiming circle.

– Failing to first roughly orient the 0-3200 line when measuring an AZ or an orienting angle (OA).

– Failing to verify survey—the AZ to the EOL within plus or minus 10 mils.

– Reporting the incorrect cant compensation for each howitzer location (no more than 90 mils).

– Giving an incorrect initial deflection to the gun guide at the pantel stake.

– Measuring the distance from the aiming circle to the gun position incorrectly.

– Using an improper base length to perform subtense for distance measuring (for example, using the M16 when the distance is greater than the values in the appropriate table).

– Measuring and computing the vertical angle (VA) incorrectly.

– Reporting the incorrect piece-to-crest to the FDC.

– Reporting the incorrect deflections to the FDC.

– Reporting the incorrect executive officer's minimum quadrant elevation (QE) to the FDC.

• *Failing to lay the battery or platoon completely or correctly*. The laying memory aid TLABSPAP stands for trails, lay, aiming point identified, boresight (verified), safe (verification of lay), prefire checks performed, ammunition prepared and position improvement.

– Reading the red numbers on the aiming circle rather than the black numbers on the azimuth scale.

– Moving the lower motion on the aiming circle when the procedure requires moving the upper motion.

– Boresighting incorrectly.

– Determining the incorrect sight picture between the panoramic telescope crosshairs and the aiming circle.

– Failing to level the bubbles on the panoramic telescope mount and elevation quadrant.

– Moving the panoramic telescope inconsistently.

– Setting incorrect data on the panoramic telescope.

– Failing to zero-out the gunner's aid counter when corrections are not needed.

– Failing to set 3200 on the reset counter after sighting in the primary aiming reference point (i.e., the collimator).

– Failing to obtain a proper sight picture on an aiming reference point (i.e., the collimator).

– Failing to center the pitch level and the cross-level on the panoramic telescope mount after the howitzer is traversed or the cannon tube is elevated or depressed.

– Using incorrect settings on the elevation quadrant.

– Moving the traversing hand wheel inconsistently and failing to compensate for backlash.

• *Placing the MlAl Collimator Incorrectly.* (Placing the collimator between 2400 and 2800 mils will minimize displacement with the panoramic telescope. The required distance is between four and 15 meters. Optimum distance from the gun must be within five to 12 meters. The collimator should not be placed higher or lower than four meters above or below the panoramic telescope.)

• *Failing to center the cross-level vial on the M1A1 collimator.*

• *Placing the M1A2 aiming posts incorrectly.*

• *Selecting a distant aiming point (DAP) incorrectly.* (It must be a minimum of 1500 meters, stationary.)

• *Selecting an unstable firing platform (spades and brakes).*

3. Accurate Weapon and Ammunition Information. The following examples of poor ammunition management and weapon and equipment maintenance affect the unit's ability to mass fires.

• *Setting incorrect charges.*

• *Firing with inconsistent powder temperature.* (Errors in powder temperature usually cause range errors.)

– Failing to calibrate the thermometer.

– Failing to ensure the powder canister selected gives the most accurate temperature for the entire powder lot.

• *Handling ammunition improperly and storing it incorrectly.*

– Failing to establish a standing operating procedure (SOP) for ammunition storage and handling.

– Storing projectiles and propellant on the ground instead of on the required six-inch (minimum) dunnage.

– Storing projectiles and propellants in direct sunlight or rain.

– Removing the grommet protecting the rotating band before the round is placed in the bustle rack.

– Failing to clean dirty projectiles before loading.

– Dropping projectiles or pallets of projectiles.

– Failing to inspect powder for dampness before loading.

• *Reporting an inconsistent projectile weight to the FDC.* (This will cause range errors.)

• *Reporting the incorrect shell model and lot and powder model and lot.* (This also will cause errors in range.)

• *Placing the propellant inconsistently or improperly in the chamber.*

• *Ramming the round inconsistently.*

• *Using the wrong fuze or setting it incorrectly.*

Disciplined crew drill is a necessity. The section chief must know the standard, train to the standard and adhere to the standard.

• *Failing to use a fuze wrench when tightening fuzes.*

• *Firing a dirty or oily tube or one with cracks.*

• *Firing with a loose muzzle brake.*

• *Firing with an inconsistent recoil.*

• *Failing to inspect for stripped land and grooves between rounds.*

• *Firing with worn trunions or unleveled trunions.* (This causes the fire control equipment not to be parallel with the gun tube.)

• *Firing with inconsistent chamber conditions (moisture and heat) or breech conditions (spindle, obturator pad and split rings).*

• *Conducting incomplete or improper fire control alignment tests (FCAT).* (These must be conducted in accordance with the technical manual.)

– Conducting the micrometer and end-for-end tests on the M1A1 gunner's quadrant incorrectly.

– Failing to perform comparison tests with the alignment devices to verify their accuracy (i.e., M139 or M140).

• *Firing with loose sight mounts and tube droop.*

• *Calibration—failing to measure the muzzle velocity with the M90 velocimeter each time the powder lot changes.* (Poor calibration procedures cause a battery or platoon to mass fires inconsistently.)

4. Accurate Meteorological Information. The section chief and above on the gun line have nothing to do with ensuring the meteorological information the FDC receives and computes accurately reflects the actual weather conditions. But the weather (air *temperature*, air density, wind direction and wind speed) significantly affects the projectile in flight. The FDC requests the met; but too often, the gun line experiences significant changes in weather and fails to ensure the FDC has requested a new met.

5. Accurate Computational Procedures. The computation of firing data in the FDC must be accurate, and FDC accuracy starts at the gunnery sergeant and howitzer section chief level. The following examples depict the types of computational errors that can occur on the gun line.

• *Determining incorrect data during advance party operations:*

– Computing the declination constant incorrectly for the M2A2 aiming circle.

– Calculating mathematical errors in the subtense.

– Adding negative and positive numbers incorrectly to determine the VA.

– Calculating the executive officer's minimum QE incorrectly.

• *Computing errors during laying operations.*

– Computing mathematical errors while laying by the OA, grid azimuth, aiming point-deflection or reciprocal lay methods.

– Calculating mathematical errors while laying with the M2 compass.

• *Computing errors in measuring the accuracy of the lay for a specific piece or the platoon or battery.*

– Calculating errors in the backward azimuth rule.

– Measuring the azimuth of the line of fire without survey control.

– Measuring the OA with survey control.

Although the crew drill doesn't fall cleanly within one of the requirements for accurate, predicted fires, without a doubt it is key to the firing unit's ability to provide accurate, predicted fires. In this case, "crew drill" goes beyond the scope of firing to include actions during the preparation to fire. Disciplined crew drill is a necessity. The section chief must know the standard, train to the standard and adhere to the standard.

"Alamo 6, this is Bandit 6. We have reviewed our data and procedures, both in the FDC and on the gun line, and as a result, we developed a massing checklist for our howitzer section chiefs, gunnery sergeants and platoon sergeants to follow. Over.

"Bandit 6, this is Alamo 6. Good to hear the problem is solved; get your guns *hot*. Over.

"Alamo 6, this is Bandit 6. Roger, *getting hot*. Out."

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