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NORTH ATLANTIC TREATY ORGANIZATION (NATO)
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NATO LETTER OF PROMULGATION

9 December 2020

1. The enclosed Allied Artillery Publication AArtyP-02, Edition A, Version 1, NATO COUNTERBATTERY FIRES DOCTRINE, which has been approved by the nations in the Military Committee Land Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2644.

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Brigadier General, HUNAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
BEL	• Belgium has very limited resources in terms of counter battery. • Belgium will apply this STANAG according to the acquisition process of specific equipment for executing counter battery missions.
DNK	• DNK does not currently operate WLR systems. When implemented STANAG 2644 will be fully ratified. • DNK does not use the function Counter Battery Officer (CBO). The duties associated with this position are executed by the Fire Support Officer.
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1 GENERAL OVERVIEW

1.1. INTRODUCTION

1.1.1. General

1. General. Formations from NATO and Partners for Peace (PfP) nations may be called upon to operate in a complex, multi-national environment throughout a range of operations across the spectrum of conflict. Common understanding of terminology, tactical and technical planning, and conducting operations is vital to achieving the Commander's desired effects and operational success. This publication should be read in conjunction with AArtyP-01 (NATO Joint Fire Support Procedures for Land Operations), AArtyP-03 (Artillery Procedures for Automatic Data Processing (ADP) System Interoperability), AArtyP-05 (NATO Joint Fire Support (JFS) Doctrine for Land Operations), and ATP 3.9.2 (Allied Tactical Doctrine for Land Targeting).

2. Aim of AArtyP-02. The aim of this publication is to provide guidance to all staff officers involved in the planning and conduct of NATO Counterbattery Fires within the overall campaign. The AArtyP-02 describes fundamentals and those procedures the Alliance will likely use in training, exercises, or for large-scale multinational operations. The AArtyP-02 provides baseline interoperability methods available to conduct Counterbattery operations within the Alliance in cooperation with the forces supported across the entire mission spectrum.

3. Scope of AArtyP-02. This scope publication addresses JFS personnel from all tactical levels and other branches, including commanders, involved in land operations.

1.2. DOCTRINAL REFERENCES

1. AArtyP-01 (D) NATO Joint Fire Support Procedures for Land Operations (2019). Information regarding fire support procedures can be found in AArtyP-1.[1]

2. AArtyP-03 Artillery Procedures for Automatic Data Processing (ADP) System Interoperability (2009). Information regarding automatic transmission of formatted messages and the use of voice communications between national systems not addressed in the AArtyP-02 can be found in AArtyP-03.[1]

3. AArtyP-05 (C) NATO Joint Fire Support (JFS) Doctrine for Land Operations (2018). Information regarding sensors integrated with Targeting, Battlefield Management, and coordination measures not addressed in the AArtyP-02 can be found in AArtyP-05.[1]

4. ATP-3.3.5.1 Joint Airspace Control Tactics, Techniques, and Procedures (April 2016). Additional Information regarding Air integration not addressed in the AArtyP-02 can be found in ATP-3.3.5.1.[1]

[1] It is assumed that reader has reviewed and understands the mentioned publication.

5. ATP-3.9.2 (A) Allied Tactical Doctrine for Land Targeting (May 2018). Additional Information regarding tactical level targeting not addressed in the AArtyP-02 can be found in ATP-3.9.2.[1]

6. ATP-3.3.2.1 Tactics, Techniques & Procedures for Close Air Support and Air Interdiction.[1]

7. APP-28 NATO Tactical Planning for Land Forces.[1]

1.3. INTRODUCTION TO COUNTERBATTERY TERMINOLOGY AND DEFINITIONS

1. **Counterbattery Fires** are fires delivered for the purpose of destroying or neutralizing the enemy's fire support system. Adversary's integrated fire support capabilities include, but are not limited to, fire support platforms, command and control nodes, acquisition assets for example Fire Support Teams, weapon locating systems, and logistics. Counterbattery Fires can be accomplished by using land, air, or sea asset(s), to include non-lethal capabilities, to achieve the commander's desired effects. The two categories of Counterbattery Fires are reactive and proactive.

2. **Reactive** fire provides an immediate response to destroy, neutralize, or suppress adversary's indirect fire systems (IFS) once acquired. Reactive fires respond primarily to adversary's IFS mortar, artillery, and rocket platforms immediately following adversary engagements or actions directly or indirectly focused against friendly forces. Reactive fires require quick response capabilities to optimize effectiveness.

3. **Proactive** fire seeks to deliver effects on adversary's IFS through the Targeting process and joint fire support planning process before the adversary's IFS can deliver effects on friendly forces. Successful execution of proactive fires greatly reduces the need for reactive fires. Proactive fires require pattern and predictive analysis to focus the appropriate Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) assets. Proactive fire is integrated with the manoeuvre commander's operations through the targeting process and consequently should follow the NATO targeting methodology.

4. **Weapon Locating Systems (WLS)** Throughout this document, it is acknowledged that other active and passive, tactical land and air, acquisition assets can produce target information and/or trigger other assets that can produce target information, assisting the commander's Counterbattery effort. In recognition of this fact, the term Weapon Locating Systems (WLS) are viewed as acquisition assets that are active or passive, land and air that are used to achieve desired effects throughout the Counterbattery effort. In any case, the "supported" multinational echelon should be made aware of the capabilities, limitations, and specific requirements of a "supporting" WLS by such means as liaison officers (LO) or unit commanders.

CHAPTER 2 COMMAND AND CONTROL

2.1. COMMAND, KEY PERSONNEL, CELLS, AND ROLES

2.1.1 Force Fire Support Headquarters (Force FS HQ)

1. Force Fire Support Headquarters is a role designated by the Commander at the Brigade, Regiment, Division, Corps, or Land Component Command level for the Senior Field Artillery HQ organic, attached, or placed under the operational control of that command. The supported commander specifies the responsibilities of the Force FS HQ and, if necessary, the duration of those responsibilities.

2. When multinational echelons share the battlespace in support of operations, integration and synchronization of the Counterbattery plan may be difficult. System limitations, capabilities, and/or terminology differences, as well as differences in Rules of Engagement (ROE) or National caveats all play a factor. In this case the Commander may designate a Field Artillery echelon as a Force FS HQ. When established, the Force FS HQ may be entirely or partially responsible for planning, managing, and executing Counterbattery operations, (e.g. WLS, deconfliction of frequencies, deconfliction of common sensor boundaries [which is a line depicted by a series of grid coordinates, grid line, phase line or major terrain feature that divides WLS search areas into WLS management areas], operational control, and cueing guidance) to ensure friendly WLS are able to acquire targetable intelligence while developing the Counterbattery plan. The Force FS HQ will also deconflict any issues related to Counterbattery that cannot be resolved between participating nations.

2.1.2. Commander

1. The commander is ultimately responsible for the counterbattery operations within his formation. The commander provides clear, concise guidance and intent for counterbattery operations. All risk associated with counterbattery operations requires commander's approval and guidance.

2. Role: (below are tasks specific to counterbattery which commander is responsible for but not limited to)

a. Provides guidance and intent for counterbattery operations

b. Provides approval pertaining to risk of counterbattery operations

c. Approval authority, unless delegated of counterbattery plan

2.1.3. Joint Fire Support Element (JFSE)

1. JFSE is the element responsible at all levels (Company, Battalion, Brigade, Division, and Corps) for the overall planning, coordinating and employment of all allocated Joint fire Support (JFS) assets. It coordinates national and multinational reconnaissance assets, land-based fire support systems, army aviation, air forces, and naval forces/ naval air forces contributing to JFS. The required JFS capabilities are integrated at the respective levels in the coordination elements/ fire support elements. Major tasks of all JFSE are JFS planning, coordination, and implementation as well as provision of advice to the commanders and headquarters. It is the single point of contact for JFS coordination at all levels. This element should always be tailored to the mission and to

2. Role: (below are tasks specific to counterbattery which JFSE is responsible for but not limited to)

a. Advises respective echelon commander on counterbattery operations to include proactive and reactive counterbattery procedures

b. Provides oversight on counterbattery operations to include WLS planning and employment

c. Provides guidance for counterbattery operations

d. Provides guidance on counterbattery integration to the unit's airspace plan

2.1.4. Fire Support Officer (FSO)

1. The primary responsibility of the FSO is to ensure the integration of the joint fire support plan with the scheme of manoeuvre, both during planning and execution. Integrating joint fire support must achieve synergy between the different assets and effects. The FSO is also the link to the higher echelons JFSE for the planning and coordination of external fire support. The FSO is the manoeuvre commanders advisor for all joint fire support related matters.

2. Role: (below are tasks specific to counterbattery which FSO is responsible for but not limited to)

a. Plans, coordinates, and synchronizes lethal and non-lethal assets to support counterbattery operations.

b. Coordinates with the appropriate operations element for security and engineer support

c. Assists JFSE with counterbattery operations oversight.

d. Assists with counterbattery planning

e. Ensures counterbattery plan supports scheme of manoeuvre

f. Implements reactive counterbattery procedures

g. Ensures reactive counterbattery procedures is rehearsed

h. Develops sensor to shooter linkage

2.1.5. Counterbattery Officer (CBO)

1. The CBO is the primary advisor to the commander and subject matter expert for counterbattery operations. The CBO plans, coordinates, and synchronizes WLS. The CBO is an integral part of targeting and fires planning. The CBO works closely with JFSE chief, FSO, WLS commander, and intelligence cell. The CBO is the primary producer and maintainer of the counterbattery appendix to fire support annex of operations order.

2. Role: (below are tasks specific to counterbattery which CBO is responsible for but not limited to)

a. Acts as the principal advisor on counterbattery operations and employment of WLS.

b. Develops and refines counterbattery plan to include WLS

c. Develops electromagnetic countermeasures

d. Assists with WLS planning with WLS commanders

e. Assists intelligence cell with proactive counterbattery procedures

f. Develops and recommends reactive counterbattery procedures

g. Manages counterbattery cell operations

h. Recommends target selection standards (TSS) for counterbattery operations

i. Recommends attack guidance for counterbattery

j. Develops and recommends sensor to shooter linkage

k. Provides inputs to targeting for assessment and WLS plan

l. Manages WLS within respective echelon

m. Recommends WLS control to include centralized, decentralized or combined

n. Recommendations supported and supporting relationships

o. Recommends cueing guidance, zones and positioning of Weapon Locating Radars (WLR)s

p. Coordinates security and engineer support for WLS

q. Recommends common sensor boundaries

r. Recommends survivability criteria and deception for WLS

s. Provides inputs to ISTAR collection plan

t. Recommends Airspace Control Means Requests (ACMREQ)s to be included in the unit airspace plan

2.1.6. Intelligence Cell

1. The intelligence cell produces adversary IFS course of action and order of battle (ORBAT). Intelligence cell is comprised of multiple source intelligence reporting that should be layered with Acoustic Weapon Locating systems (AWL)[2]/ WLR acquisitions to fully understand adversary IFS employment.

2. Role: (below are tasks specific to counterbattery which Intelligence Cell is responsible for but not limited to)

a. Recommends and coordinates cross- coordination assets for counterbattery operations

b. Assists CBO with defining and refining adversary IFS COA and enemy ORBAT.

c. Coordinates multiple intelligence collections to assist with proactive counterbattery procedures

[2] AWL can be referred to sound ranging system

d. Defines adversary fire support system to include:

(1) Sensor to shooter linkage

(2) Adversary Targeting priorities

(3) Electronic Warfare (EW) threat

(4) Adversary scheme of fires

2.2. CONTROL

2.2.1. General

1. There are several options for conducting Counterbattery operations at any echelon. Two recommended methods are centralized and decentralized Counterbattery operations. Commanders may also choose to have a mixture of both centralized and decentralized operations based on mission variables and the ability to command and control Counterbattery operations.

2.2.2. Centralized Counterbattery

1. Centralized Counterbattery is when the commander executes his Counterbattery operations through a single headquarters. Typically, this is accomplished by designating a Force FS HQ. When given this role, the Force FS HQ coordinates, integrates, and synchronizes all Counterbattery operations. During centralized operations the controlling headquarters, usually the Force FS HQ, executes both proactive and reactive Counterbattery Fires. WLS may be held under centralized control. Centralized control optimizes coverage to support the commander's intent. Regardless of which headquarters exercises control, subordinate battalions may be tasked to provide logistical, survey, and security support because of the dispersal of WLS across the area of operation. Proactive Counterbattery is conducted through targeting using a mixture of collection assets, to include WLS and delivery systems. Reactive Counterbattery is accomplished by conducting positioning authority over WLS and designating specific field artillery units as Counterbattery firing units.

2.2.3. Decentralized Counterbattery

1. Decentralized Counterbattery is when the commander does not designate a single headquarters to execute Counterbattery operations. During decentralized operations, each subordinate echelon is responsible for its own Counterbattery down to the Brigade level. For example, the Field Artillery Battalion in a Brigade is responsible for Counterbattery in the Brigade's area of operations. WLS and firing units are positioned by their organic headquarters instead of the Force FS HQ. The Brigade Commander may further decentralize Counterbattery operations by assigning a direct support relationship between a WLS and a subordinate firing unit. Decentralized operations streamlines the process of acquisition to fire time however, it is critical that airspace control means are considered.

2.2.4. Combined Counterbattery

1. The Combined Counterbattery consists of both centralized and decentralized counterbattery fires. For example, Force FS HQ maintains WLS management across multiple echelons to de-conflict coverage and frequencies, while allowing subordinate echelons flexibility to control counterbattery operations within their respective area of operations.

2.2.5. WLS Command and Control

1. To exercise effective command and control of WLS, the commander of the supported unit must be aware of the Command and Control Relationships and Fire Support Relationships which exists between himself and units allocated to him for his mission. The relevant terms for fire support units including WLS are listed in AArtyP-05.

2. Throughout this doctrine, it is acknowledged that different WLS equipment possess varying capabilities and can produce results in either target information form and/or as a call for fire. In recognition of this factor the word “system” should be viewed in the widest context to include, the Fire Support Command, Control, Communication, and Information (C3I) systems as well. This doctrine does therefore not mandate where the result is to be produced – it can be either on the WLS itself, or it could be within the C3I System to which the WLS is connected. In any case, the “supported” nation should be made aware of the capabilities, limitations and specific requirements of a “supporting” WLS by such means as liaison officers or WLS commanders.

3. Weapon locating systems play a key role in defeating the adversary’s surface-to-surface indirect fire support system. Without accurate targeting data, our own indirect fire systems are of limited value. These WLSs are one of the primary means of locating adversary indirect fire platforms. They provide a 24-hour capability to detect and identify hostile weapons systems.

a. Specific functions of WLSs include:

(1) Locating adversary indirect fire systems.

(2) Generating artillery target information.

(3) Generating fire missions.

(4) Registering and adjusting friendly artillery and mortars.

(5) Validating the location of friendly fires.

(6) Providing information to allow friendly forces to take force protection measures.

(7) Electronic support measures e.g. passive listening and interference detection.

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CHAPTER 3 PLANNING CONSIDERATIONS

3.1. Counterbattery Planning and NATO Tactical Planning for Land Operations

1. General. Counterbattery operations are imperative for the ability to protect friendly forces, combat functions and facilities from adversary indirect fires. Planning of counterbattery operations must be nested with the commander's guidance, intent, and overall support the friendly scheme of manoeuvre. Counterbattery planning is not separate from a formation's planning process, but integrated and parallel.

2. Aim. The aim of this chapter is to provide Counterbattery planning guidance to the Commander and staff throughout the NATO Tactical Planning for Land Forces Process and operations.

3. Staff planning considerations. A thorough development of field artillery intelligence is necessary for the proper deployment of Weapons Locating Systems (WLS), the timely and effective acquisition of adversary fires, the coordination of cueing and survivability criteria, and the execution of Counterbattery operations. Field Artillery Intelligence is an integral part of combat intelligence and is vital to the survivability of target acquisition and delivery platforms on the battlefield. It is an indispensable element to the Artillery Commander in his/her ability to exercise Command. WLS position areas are selected based on Intelligence Preparation of the Operational Environment (IPOE), the range capabilities of the WLS, and a comprehensive analysis of the operational battlespace. A thorough analysis of the mission variables Mission, Enemy, Terrain, Troops, Time, Civil considerations (METT-TC), can provide which factors are most important to consider. WLS are deliberately positioned to acquire adversary weapons, prevent loss of the WLS to adversary action, and avoid unnecessary movement. This maximizes WLS coverage and cueing time. Through thorough analysis of the enemy Order of Battle (enemy ORBAT), staffs can begin to derive additional information such as, but not limited to:

a. Formation designation

b. Types of systems

c. Number of systems

d. Capabilities of each system (munitions, ranges, rates of fire, rate of march)

e. Dispositions: deployment distances between firing units in relation to manoeuvre missions of each echelon; (direct support versus Counterbattery)

f. Logistical capability

g. Communication nodes and capabilities

h. Counterbattery capability: WLS assets, ranges, typical battlefield emplacements

i. EW threat/capabilities to friendly Counterbattery WLS

3.1.1. Phases of Counterbattery Planning

1. During each phase of the NATO Tactical Planning for Land Forces Process, the staff focuses energy in developing specific Counterbattery products and details any additional planning considerations that are required to create an effective Counterbattery plan. This will be used as a tool to annotate best practices as they relate to planning through the lens of Counterbattery. It is acknowledged that each step below may be conducted in a different manner depending on the nation and that the inputs and outputs of each step may produce slightly different results. The Counterbattery process begins with the commander's guidance, IPOE, and selection of tentative high-value targets early during the planning process and continues throughout operations.

2. Counterbattery Focus by Phase:

a. Receipt of the Mission

(1) Task Organization (Friendly/Adversary)

(2) Adversary indirect firing systems, capabilities, composition and disposition

(3) Request the following information from supporting command WLS to facilitate the supported commands Counterbattery planning process:

1. Type of system
2. Active or passive
3. Range of the system(s)
4. Frequencies used (if applicable)
5. Detection capabilities
6. Manning requirements

(4) Recommended changes to Task Organization.

b. Mission Analysis

(1) Running estimates

(2) Assist in drafting the ISTAR collection plan to ensure incorporation of Counterbattery efforts throughout the development of in the collection plan

(3) Assist intelligence cell with IPOE as is relates to adversary indirect firing capabilities. Refer to Chapter 5, Section IV Proactive counterbattery procedures, Initial counterbattery analysis.

(4) Obtain enemy ORBAT from the intelligence cell

(5) Identify screening crest opportunities and probable WLS positions within the area of operations

(6) Identify adversary EW detection and attack capabilities that can locate or target the WLS.

(7) Assist Targeting section with High Payoff Target List by determining the value of each of the adversary indirect firing systems/sensors that can affect friendly manoeuvre by phase

(8) Determine sensor to shooter linkage

(9) Obtain communications architecture from higher headquarters

(10) Determine WLS logistical requirements

(11) Issue warning order 1 (WNGO) to WLS commander

c. Course of Action Development

(1) Develop initial Counterbattery plan and support relationships (Task and Purpose) identify possible Radar Reserved Area (RRA) record grids location

(2) Determine proposed Common Sensor Boundaries (CSB)

(3) Determine cueing guidance based on EW threat and friendly scheme of manoeuvre

(4) Identify cueing agent(s)

(5) Determine priorities and initial zone placement by phase.

(6) Determine size of Counterbattery target(s) to recommend standard fire order and attack guidance to achieve the Commander's desired effects.

(7) Integrate multiple WLS that includes Joint Fire Support Team (JFST), Reconnaissance (RECCE), and Unmanned Aircraft System (UAS) into counterbattery plan

(8) Develop quick-fire plan

(9) Determine Weapon Locating System (WLS) protection capabilities

(10) Ensure the Counterbattery plan supports the scheme of maneuver and is tailored to each COA

(11) Refine WLS positions, responsibilities, and Locating Zones

(12) Develop triggers for WLS movements

(13) Determine threat to WLS by position

(14) Develop survivability/ deception plan

(15) Validate sensor to shooter link

(16) Validate collection plan ability to provide battle damage assessment (BDA)

(17) Identify risk associated with counterbattery plan

(18) Confirm communication and reporting plan

(19) Provide input to Fire Support Coordination Measures (FSCM) and Airspace Coordination Means (ACM) development necessary for permissive fires

(20) Review/recommend criteria for Target Selection Standards, Attack Guidance Matrix/Effects Guidance Matrix, and High Payoff Target List

(21) Develop an initial draft Counterbattery Appendix to Fire Support Annex for operation order

d. Course of Action Analysis

(1) Fire direction systems setup

(2) Validate Fire Support Coordination Measures

(3) Validate Airspace Control Means

(4) Refine the Counterbattery planning products and the Counterbattery appendix

(5) Create initial Deployment Command or Radar Deployment Order.

(6) Provide refinements to the ISTAR collection and radar plan

(7) Validate cueing schedule and zone requirements based on friendly scheme of manoeuvre

(8) Identify cross-boundary counterbattery requirements

(9) Define risk associated with counterbattery plan

e. Course of Action Comparison

(1) Provide refinements in order to finalize the Counterbattery and ISTAR collection plan

(2) Weigh risk associated with counterbattery plan

f. Course of Action commander’s decision

(1) Provide refinements to finalize the Counterbattery and ISTAR collection plan

(2) Provide risk associated with counterbattery plan to commander

(3) Issue warning order 2 (WNGO) to WLS commander

g. Orders Production

(1) Finalize Counterbattery appendix to fire support annex of the operation order.

1. Deployment Command or Radar Deployment Order.

2. Planned RRAs

3. Zone management

4. Cueing guidance, agent, and schedule

5. Electronic Warfare threats

6. Survivability criteria

7. Common Sensor Boundaries

8. Frequency integration

9. Required information for tactical control of Counterbattery
10. Reporting criteria

(2) Provide inputs to Targeting products

1. High Payoff Target List (HPTL)
2. Target Selection Standards (TSS)
3. Attack Guidance Matrix (AGM)
4. Effects Guidance Matrix (EGM)
5. ISTAR collection plan

3.2. Special Counterbattery Planning Considerations

3.2.1. Airspace Considerations to Counterbattery Operations

1. General. Air and Land integration addresses potential conflict(s) between friendly entities that operate within air and land domain during Counterbattery operations. Airspace integration should complement the Counterbattery fight by positive and procedural Airspace Control Means (ACM) using time, lateral, and/or altitude integration methods. When integrating fires with air, both trajectory and maximum altitude of the munition must be considered. An appropriate ACM and/or FSCM should be established to create a permissive surface to surface environment, minimizing coordination requirements and allowing for coordination at the lowest echelon. This facilitates air and aviation while engaging planned targets and conducting Counterbattery operations. Planning and implementing various methods of Counterbattery is important to defeat the adversary's IFS capabilities. Integration between higher, lower, and adjacent joint fires elements enables efficiency to detect and deliver on unanticipated or unplanned targets within the operational environment. During operations, the unit's airspace plan should be updated regularly based on pattern analysis provided by the Counterbattery element and predictive analysis provided by the intelligence cell. A detailed COA analysis of the selected course of action is necessary to identify potential airspace conflicts between all airspace users (i.e. Army aviation, organic Unmanned Aircraft (UA), joint air assets, and IFS). A detailed COA analysis also allows the development of a collaborative unit airspace plan that resolves the conflicts in accordance with the commander's airspace priorities and risk guidance. The refinement of the airspace plan needs to account for adversary locations and friendly indirect firing systems. The unit airspace plan should facilitate a permissive Counterbattery plan, if possible. Additionally, the unit airspace plan must be rehearsed to validate integration of airspace users and support of the commander's intent.

2. Airspace Clearance. The Airspace clearance (of fire) can be defined as the authorization granted by the agency responsible to control the airspace in this instance the airspace control authority (ACA) to an IFS unit to use, with fire, a specific volume of the airspace for a specific time window, guaranteeing the safety of the other airspace users. This authorization has the aim to manage the airspace in order to prevent/avoid any friction between airspace users. The Airspace Clearance is an integral part of the Counterbattery operations because units have to submit ACMREQs in order to be authorized to use the

airspace. The way to submit these requests may vary whether they are referred to a proactive or reactive counter battery fire. The procedures to request and then obtain the airspace clearance are specified in chapter 5.

3. Airspace Management/Control Cell. The Airspace control/coordination cell will coordinate and/or de-conflict airspace if needed for surface to surface attack option. According to the Airspace Control Plan issued by the ACC, if max ordinance of surface to surface fires is beyond Coordination Level (CL) or Coordinated Altitude than further coordination with establishing agency or HQs must be conducted to obtain the airspace clearance. Deliberate planning for ACMs from outputs of proactive counterbattery procedures will expedite surface to surface fire for counterbattery procedures. Constant communications between airspace management/ control cell, JFSE, and CB cell is critical for reducing delay in mission processing.

3.2.2. Battlespace Considerations to Counterbattery Operations

1. General. Terrain management is currently achieved by establishing spatial or temporal controls of deployed forces in order to coordinate all aspects of activities. These controls consist of boundaries, maneuver control measures, FSCMs, defined routes, terrain allocation and other restrictions to freedoms of action that reduce the risk of fratricide, whilst enabling maneuver and maximizing the use of terrain.

2. Radar Reserved Area . An area reserved exclusively for the positioning of WLR assets. RRAs are established based on planned WLR positions to mitigate safety hazards and enable sufficient use of terrain to support mission. The size and dimension of the radar reserved area is based on WLR capabilities, WLR mission, and METT-TC.

3.2.3. Specific WLS Considerations

1. Zones. Zones help focus the Commander's priorities throughout the areas of responsibility. Zones are an essential element when protecting essential friendly operations and identifying adversary locations. Zones are created and modified based on pattern and predictive analysis. Zones are also created to protect the force throughout the operation. Zones should be prioritized to achieve the Commander's intent and should include a risk level the Commander is willing to assume when an acquisition is detected coming from or going into an active zone. The level of risk should allow Counterbattery to be conducted with a quick response, mitigating deliberate clearance battle drills. Zones are created to identify the importance of protecting friendly forces from eminent danger or responding to high payoff targets. Zones help achieve the military advantage within the acceptable risk levels established by the Commander. Additionally, zones help WLS maximize detection and delivery assets, synchronizing efforts to gain a desired effect. An end state of proper zone planning is establishing planned ACMs and FSCMs to expedite Counterbattery fires which enables other delivery platforms such as aircraft to focus on moving targets or less desirable artillery targets. For more information refer to chapter 5 WLS and zones.

2. Cueing. Cueing is the process designed to prompt or notify the WLS to begin acquiring hostile firing systems. Cueing can be triggered from additional ISTAR or acquisition systems, predictive analysis, shelling reports, or assigned cueing agents. The Cueing Agent is a command and control element that has the authority to direct the WLS locating zone and search time. When multiple systems from multiple nations share the battlespace in support of operations, cueing schedules/guidance should be integrated to ensure friendly systems do not jam or interfere with one another. The critical factor when planning the WLS cueing is responsiveness and survivability. Cueing allows the WLS to locate adversary positions during initial volleys of fire, preferably the first rounds. Examples of cueing agents consists of JFST, aerial observers, EW, RECCE, intelligence personnel, JFSE, targeting officers, and other ISTAR assets.

a. **Techniques for cueing**: situational and demand. Situational and demand cueing, found in chapter 4 of this document, may be used separately or in conjunction with each other. Random cueing schedules based solely on hours of the day is not recommended and is usually ineffective. Unnecessary cueing provides the adversary an opportunity to use direction finding to locate active WLS. Therefore, event and intelligence driven cueing provides maximum support during critical phases of the battle. The shorter time the WLS transmits, the lower the probability that the adversary will conduct direction finding and obtain a fix on the WLS. Transmission time should be reduced based on the adversary's detection capabilities to prevent being acquired.

3. WLS Survivability Criteria. Systems are susceptible to adversary land attack, air attack, indirect fires, and electronic warfare. IPOE assists with identifying possible threats and their capabilities. WLS are typically not manned or equipped to defend themselves from adversary attacks. When determining the proper amount of security required to defend the WLS and crew, the pre-determined locations of the WLS and likely threats must be identified and analyzed. During the planning process, the staff must establish the criteria that requires the WLS to reposition for survivability purposes. Adversary airborne sensors, ground sensors, and artillery effects must be taken into account prior to conducting movement from the compromised location. When loss of communication occurs between the controlling HQ and WLS, the survivability moves may be executed by the WLS operators in accordance with pre-approved survivability criteria. The following survivability criteria should be presented by the staff, approved by the commander and managed at the controlling HQ. The following are survivability criteria examples:

a. Site compromised by adversary air or reports of adversary UAS

b. Site compromised by adversary land forces, to include unknown status of civilian personnel

c. Electromagnetic Interference (EMI)[3] of WLS

d. Near-miss adversary indirect fires

e. Accumulative radiation time. This time is based on the adversary's electronic warfare capability and current threat level

[3] Electromagnetic Interference (EMI): Any electromagnetic disturbance, whether intentional or not, which interrupts, obstructs, or otherwise degrades or limits the effective performance of electronic or electrical equipment. AAP-6

f. Total time in position. This time is based on the adversary's detection capabilities and the cover and concealment provided at the WLS current location

g. Recommend minimum movement based on METT-TC considerations

3.2.4. Air and Land Attack Protective Measures

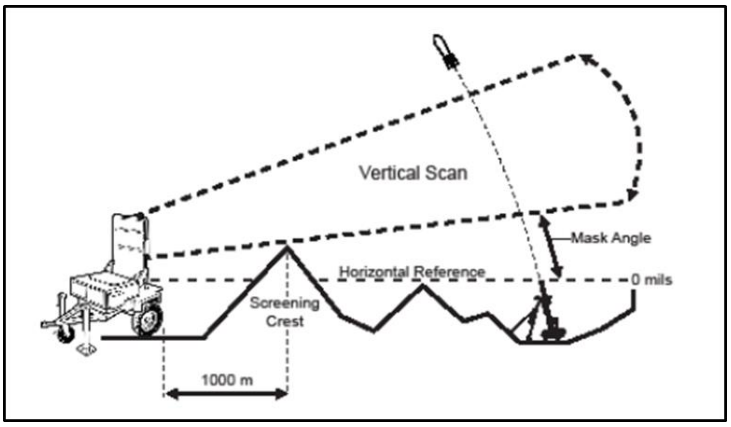
1. General. Personnel controlling WLS can take precautions to protect against air and land attacks. The best protection against a direct attack is to select areas that prevent direct observation by adversary forces. This is important since most attacks by indirect fire or special purpose forces are initiated as a result of direct observation. Security measures may include dedicated manoeuvre forces, military police to provide on-site security, or mutual support provided by units in the vicinity. Mutual support arrangements might consist of early warning or incorporation in the supporting unit's defense plan. WLS personnel must protect themselves by using cover, concealment, screening crest, tunneling, or orienting on soft background.

2. Cover. WLS equipment should be placed in a defilade, hardened structure, or a prepared position to protect the WLS and crew. This provides the crew and some equipment with protection from hostile fire. The WLS can only be placed in a location that provides cover without obscuring line of sight. Placing the WLS in a covered position also helps dissipate noise, lowers susceptibility to direct observation, and reduces any WLS thermal and infrared signatures. In situations where a defilade or prepared position is unavailable, the WLS crew should consider burying the power cables. The data cable is one of the most vulnerable components of the WLS functionality; it is susceptible to damage by indirect fires or by vehicles driving over the cable.

3. Concealment. Maximum use of natural concealment, such as trees and shrubs, should be considered in selecting a site for WLS. Obstructions that reduce the WLS capabilities and acquisition abilities need to be avoided. Buildings and other manmade structures can be used to conceal section equipment and reduce signature. Concealment is also affected by where the WLS site is located. IPOE should identify likely adversary observation points. When possible, WLS sites should be selected that avoid direct observation from these areas and should include the use of camouflage netting. If the scattering camouflage netting is used, use caution as it may cause damage to emitting WLS. Before deciding whether or not to use camouflage netting, the electronic warfare threat must be considered. If the position is less than ideal, the WLS crew may be allotted less than normal time to displace after radiating. Selecting positions with natural or existing manmade cover and concealment is best. Engineer assets may also be tasked to provide prepared positions.

4. Screening Crest. Increases the survivability of active WLS by serving as a defense against adversary observation (visual and infrared), direct fire, and electronic countermeasures (ECM). The use of a screening crest is critical when an adversary has ECM capabilities. The screening crest diffracts emitting WLS beams, making it difficult to determine the direction of the WLS. The use of two screening crests protects the WLS, making it more difficult for the adversary to locate. See figure 1.

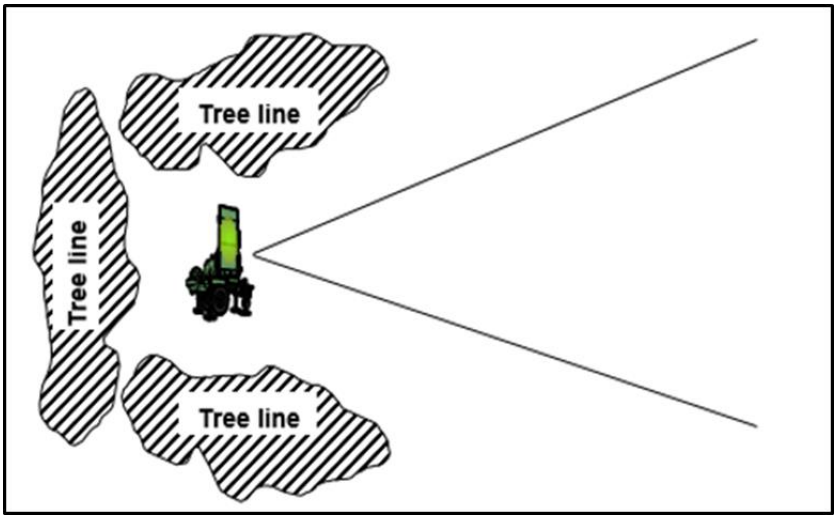
Figure 1. Screening Crest -Example



5. Tunneling. Tunneling is the technique of reducing adversary detection from the side, top, and back of the active WLS by reducing side lobe radiation using vegetation or manmade structures. Additionally, tunneling can be accomplished digging in, developing berms, or sandbagging the position. The use of tunneling will reduce vulnerability to direction finding.

a. Orienting on a soft background such as foliage, tree lines, or brush reflects the active WLS emissions and makes it more difficult to direction finding. Hard backgrounds such as rock, buildings, bunkers, or other structures also reflect WLS emissions; however, soft backgrounds are better than hard backgrounds. The optimum background is a soft background above a screening crest.

Figure 2 WLR Tunneling - Example



6. Electronic Warfare threats and cueing guidance. Adversary electronic capabilities must be considered when developing cueing schedules to determine when cueing can occur and for how long. Intelligence and targeting teams conduct daily electronic warfare threat assessments which dictate changes in WLS procedures. Threats are assessed as high, medium, or low; land and/or air. Depending on the threat level, Intelligence and targeting teams establish cueing guidance, to include authorized agents, communications links, and conditions under which the WLS may be cued. Specific cueing guidance must be established to fully exploit the WLS capabilities and still minimize or eliminate unnecessary radiation that may result in the WLS being located by adversary Electronic Intelligence. Electronic

intelligence is a signal that is analyzed and compared to recorded data for known signal types. If the signal type is recognized, the source of the signals location can be identified.

a. The use of a screening crest and tunneling are critical when an adversary has, or is suspected to have, electronic countermeasures capabilities. Maximum continuous transmission time for WLS should be minimized when an EW threat exists. When multiple WLS from multiple nations share the battlespace in support of operations, cueing schedules/guidance should be deconflicted by the Force FS HQ to mitigate the detection and potential subsequent electronic attack of friendly systems.

3.2.5. WLS Contingency, Integration, and Analysis

1. Counterbattery Command Post Contingency. Prior to conducting survivability moves of Command Posts, criteria to transfer the Counterbattery fight to an alternate command post must be developed and rehearsed during the planning process. The criteria must account for multiple scenarios to include immediate and deliberate moves. The Commander must designate a primary and alternate command post responsible for the Counterbattery fight. The alternate Command Post must possess the ability to command and control the Counterbattery fight until the main Command Post relocates and resumes control of the Counterbattery responsibility. During the planning process, staff members should establish the minimum information required to conduct Counterbattery operations. An example of this information includes:

a. WLS status

b. Current Deployment Command or Radar Deployment Order

c. Cueing schedule/guidance

d. Communication with higher HQ and subordinates (including the WLS)

e. Status and location of designated indirect firing systems (if applicable)

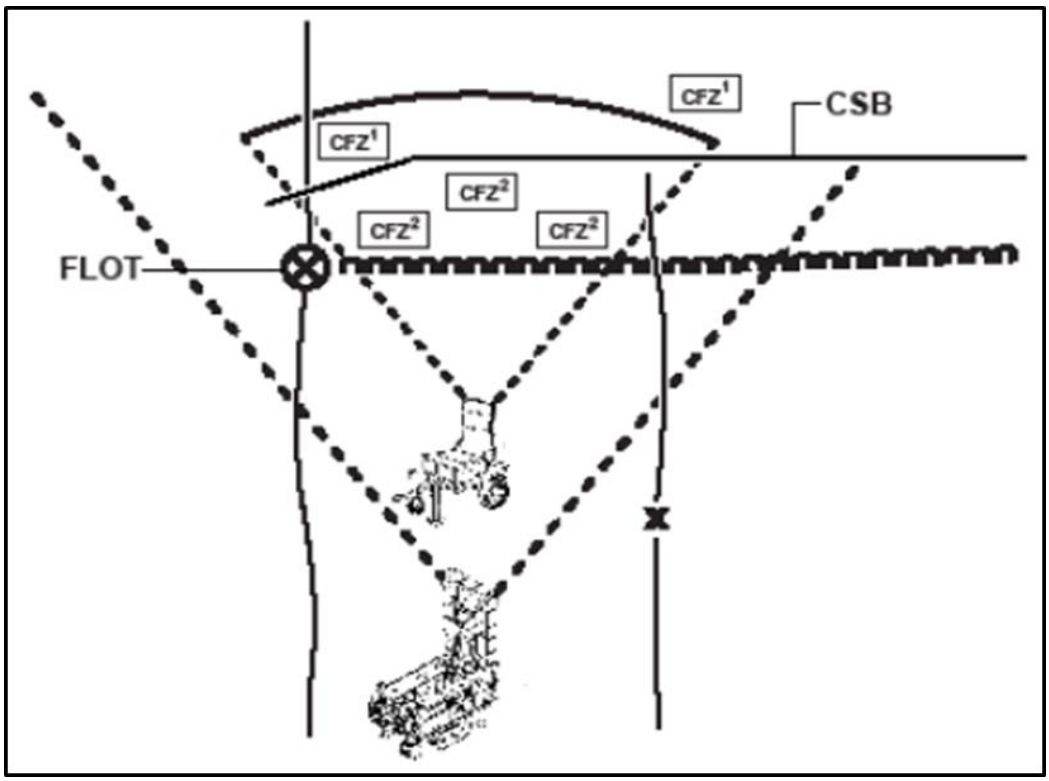
f. Procedures to follow if communication loss occurs with the Force FS HQ , Command Post, or WLS

2. Common Sensor Boundary. A common sensor boundary (CSB) is an identifiable boundary or phase line that divides target acquisition locating zones. CSBs may divide the close and deep area of operation or areas of operation between adjacent formations. The CSB is not a FSCM, although the CSB may coincide with the Coordinated Fire Line (CFL). The Force FS HQ must coordinate CSBs to delineate acquisition reporting in environments that use multiple WLS during operations. A common sensor boundary also reduces target duplication between WLS and increases effectiveness during combat operations. The CSB means that no credible acquisitions are processed short of the CSB by WLS and long of the CSB by subordinate formations. During centralized control, the volume of targets may overwhelm a WLS causing target duplication or false acquisitions. Methods of reducing or eliminating target duplication are area separation e.g. the establishment of unique areas for individual WLS (capability dependent), or the establishment of CSBs. Minimizing target duplication can be executed using the following methods.

a. Area separation, CSB
b. WLR separation

When multiple WLS from multiple nations share the battlespace in support of operations, CSBs may be required. During centralized operations, the Force FS HQ should manage and disseminate CSBs. During decentralized operations, CSBs should be coordinated between adjacent units but reported to the Force FS HQ for situational awareness, general support operations, and expertise guidance.

Figure 3 Common Sensor Boundary - Example



3. Frequency Integration. When multiple WLS from multiple nations share the battlespace, frequencies must be deconflicted to ensure friendly WLS do not interfere with one another. Most WLS produce radio-frequency radiation on specific bandwidths, which can cause interference with other WLS or electromagnetic systems. Active emitters can interfere with WLS coverage by attenuating or jamming the WLS beams. Emitters, in close proximity, may also cause jamming or increase the false location rate. Inadvertent EMI can be avoided by careful planning of WLS positions. During the planning process and throughout the targeting process, planners need to consider the proximity of WLS, adhering to the nation's separation requirements, if any. The tactical situation may require positioning of the WLS within a static location. This requires careful consideration of site selection and improvement. When operating in a combined environment, participating nations are required to integrate frequencies as well as physical space. This is necessary to ensure optimal operations of all WLS and to prevent possible damage due to high power levels on conflicting frequencies. The Force FS HQ is responsible facilitating frequency integration through WLS management by echelon. Reporting requirements of subordinate echelons are necessary.

4. Analysis. Analysis provides the staff with the type of adversary weapon system, number of times the adversary attacks, locations the adversary occupies, what the adversary is targeting, and drives the creation or refinement of zones, cueing guidance, and the units' airspace plan. Prior to conducting Counterbattery, the staff uses analysis to feed into its targeting process and deploy its WLS, providing intelligence driven information, and predicting when and where to observe. This process synchronizes detection and delivery assets across the formation and prioritizes the requests for Joint assets from higher headquarters, if required.

Conceptualizing how the adversary arrays its own detection and delivery forces on the battlefield is crucial. Understanding the terrain and mobility corridors, to and from possible Artillery Maneuver Area (AMA) or Artillery Reserved Areas (ARA), will assist in the overall analysis process. Pattern analysis helps confirm or deny predictive analysis and reduces response times by allocating assets through the targeting process. The goal is to achieve the Commanders desired lethal or non-lethal effects on the adversary's integrated fire support systems through planned and scheduled detection and delivery windows.

3.3. Tactical Considerations

1. Mission. Weapons Locating Systems must be positioned where they can best accomplish their mission. Several factors drive positioning in relation to mission considerations. The supported unit, commander's guidance, the requirement to establish priority zones, associated command and support relationship, and required area of search dictate in general where the WLS can be positioned.

2. Enemy. The adversary situation and capabilities greatly influence where a WLS can be positioned. A thorough analysis through IPOE is essential in determining multiple WLS locations. IPOE influences positioning in two ways. First, IPOE identifies the areas where adversary systems are anticipated. This information and the commander's targeting guidance dictate the positioning and orientation of the WLS. Secondly, IPOE identifies threats that must be considered when positioning the WLS. These threats may include suspected locations of land threats or special purpose forces, electronic warfare threats, major land and air avenues of approach, and anticipated requirements for repositioning.

3. Terrain. Terrain effects movement, cover, concealment, communications, and positioning. In mountainous terrain, identifying positions that maximize the WLS range and capabilities is difficult. Terrain may also narrow the locating zone because of inadequate electronic line of sight. On the other hand, flat or open terrain makes concealment difficult. Heavy rains, snow, sand storms, and dust storms can weaken the WLS signal, degrading or preventing the probability of detection.

4. Troops. The size of the area to be covered and the number of WLS available affect both positioning and employment. When multiple WLS are available to support a unit, smaller search areas may be assigned to specific WLS. Positions should be selected that facilitate mutual support between WLS. This allows one WLS to assume all of or part of another WLS locating zone and priority zones during displacement and movement. Security may be required for each WLS. Occupying the WLS in the vicinity of another unit may be required for security purposes.

5. Time Available. The time available for reconnaissance, liaison, movement, occupation, and position improvement must be considered. Mission requirements and the amount of time available to position WLS may require that a WLS initially is situated in a less than optimum position then reposition at a later time as mission requirements dictate.

6. Civil Considerations. Civilians on the battlefield may affect positioning and WLS operations. Positioning requirements may include additional security considerations when there is a hostile local populace. In addition to direct threats, movement routes may become blocked or congested by the local populace, refugees, or obstacles. However, a cooperative or friendly populace may enhance positioning options. Fixed facilities or other civil structures may become available for use considering national caveats.

7. Risk. Risk is a fundamental consideration when establishing a framework for Counter Battery Operations and the assumption of risk is a Command Responsibility. Commanders at all levels evaluate risk based on the Joint Force Commander's acceptable level of risk pursuant to the phase and concept of the operation. Risk exists on a continuum and can never fully be mitigated, it can however, be transferred both up and down the chain of command. Generally, high risk operations prioritize mission accomplishment over the preservation of resources (men, material, munitions); medium risk seeks to balance risk to mission and resources; while low risk prioritizes the preservation of resources at the expense of immediate mission accomplishment. The degree of acceptable risk may vary by time, location, or resource.

Counter Battery operations should be oriented toward maximum responsiveness during reactive operations, and system efficiency during proactive operations, while simultaneously minimizing risk to mission and risk to troops. Risk mitigation during Counter Battery Operations is executed through the deconfliction and integration of airspace, the establishment of zones, and the resourcing of additional assets (WLS, IFS) to offset losses, establish redundancy, and ensure a persistent sensor to shooter linkage. Joint Fire Support staff must recommend mitigation measures, which are appropriate to the level of risk being assumed by the Commander for a given operation.

3.4. Technical Considerations

1. Technical. Technical aspects of organic, attached, and supporting Weapon Locating Radars (WLR)s should be considered to ensure the friendly force is postured to maximize the capabilities of their detection assets. This will also enable the staff to expedite fire mission processing on adversary High Payoff Targets, achieving the Commander's desired effect. The following are technical considerations for WLRs:

a. Locating Zone. The Locating Zone is the area where the WLR can locate targets.

b. Aspect Angle. The aspect angle is the angle between the WLR antenna and the path of the projectile.

c. Vertical scan. The vertical component of the detection area is vertical scan. This area extends vertically from the locating zone to the maximum scan elevation of the WLR. There must be a sufficient amount of vertical scan at the points where an object passes through the detection area for the WLR to track the object, estimate the point of impact (POI), and compute targetable information.

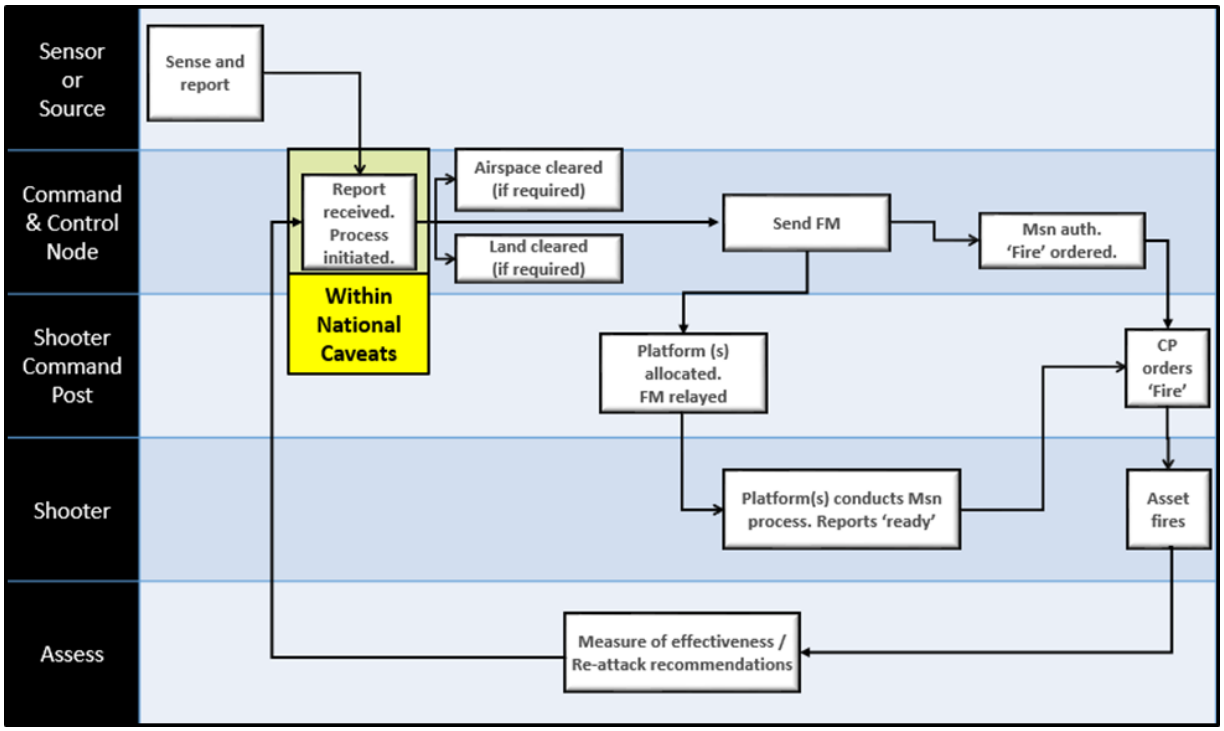
d. Track Volume. The amount of track volume is calculated using the remaining vertical scan after accounting for variations in terrain elevation.

e. Slope analysis. The slope of the land should be such that the WLR can be levelled. Slope analysis is conducted during IPOE.

f. Electronic Line of Sight. The overriding consideration in the selection for a WLR site is electronic line of site. All WLRs must have an electronic line of sight to the projectile being detected to acquire. Verifying the electronic line of sight before occupying the site can save valuable time by eliminating untenable sites.

2. Rehearsals. Sensor to shooter technical rehearsals are vital to successfully reduce the total processing time for Counterbattery missions and exercising the unit's communication plan. Rehearsals help synchronize the formation and create a common picture of how the force will employ its joint fires assets. Units must allocate the proper time to execute technical and sensor to shooter rehearsals in order to identify potential conflicts in the plan associated with target detection and engagement. Counterbattery injects should be included in all rehearsals to provide a realistic complex combat environment. Counterbattery injects add a dynamic component to a deliberate plan, allowing time for the force and staffs to conceptualize detection and delivery assets in time and space, without overwhelming either. Counterbattery injects also allow the staff to validate the positioning of the delivery assets while taking into consideration airspace clearance, the trajectory of the round, and gun target line with respect to active ACMs based on known friendly howitzer locations and adversary predicted firing locations. Rehearsals must also exercise the legal and policy considerations that apply to each nation in a coalition. Rules of engagement for Counterbattery and target identification may vary between contributing nations within a coalition and must be clearly understood so target engagement authorities can be exercised in the most expedient manner possible. The Targeting Working Group identifies any critical authorities, responsibilities, and accountabilities early in the planning process to ensure the Counterbattery system is capable of enabling reactive fires once operations commence. See figure 4 as an example sensor to shooter flow chart. Please note, figure 4 is only an example, not a standard.

Figure 4. Sensor to Shooter Flow Chart - Example



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CHAPTER 4 COMMUNICATIONS AND INTEROPERABILITY

4.1. Communication Methods

4.1.1. Overview

1. General. Communications are typically established over staff and command channels. However, these channels may be modified depending on command instruction and standard operations procedures. Participating nations must establish effective liaisons, digital systems, and voice communications to achieve all aspects of Counterbattery and enhance interoperability between NATO and PfP formations. It is recommended that organizations establish a Primary, Alternate, Contingency, and Emergency (PACE) procedures to reduce loss of communications within the sensor to shooter architecture. All attempts possible should be made to ensure the sensor is able to communicate with a fire support element using organic communication capabilities and/or one of the following methods.

2. Aim. The aim of this chapter is to highlight interoperability methods currently in use or that may be used to achieve the Commanders Counterbattery plan.

4.1.2. Methods

1. Liaison Officer. An effective Liaison Officer (LO) is an integral part of the planning process and must fully understand both, the supported and supporting Commander's intent, the clearance of fires, and fires terminology. Broad LO responsibilities and tasks are listed below.

LO Responsibilities and Tasks	
WLS considerations	
	• Command relationships for each WLS • Mission type • Tactical situation for the last and next 24 hours • Duration of the task • Adversary Artillery threat • Frequencies and required de-confliction of WLS • FSCMs, ACMs, and CSBs • WLS priorities by phase of the operation • Active and/or passive requirements supporting the scheme of manoeuvre • Acquisition reporting channels and procedures • Movement restrictions • Survivability criteria • WLS deployment plan • Deception plan • Strength and composition of friendly WLS • Locations and locating zones for each WLS • Maintenance status and requirements

Upon arrival	
Verify the concept of operations with the host unit commander/staff.	• Report to the supported unit commander and staff principal with responsibility over liaison personnel. • Identify necessary daily/special briefings to attend and establish schedule for reporting information and situation updates within the formation. • Be prepared to brief capabilities and limitations and present unit locations. • Establish communications with subordinate and higher headquarters and provide reliable primary, alternate, contingency, and emergency means of communication. • Understand communication systems, and connectivity requirements. • Identify any specific requirements e.g. language, interpreter, customs etc. • If there is a multi-national aspect to the supported unit's Counterbattery plan; ensure there is a common understanding with the National Implementation Operation Procedures (NIOP) to facilitate the requirements for ASCA communication requirements (e.g. establishment of the gateway).
During Deployment	
Maintain an effective rapport with the host unit commander and staff	• Determine how the formation will be employed and report on all matters within the scope of the mission at hand. • Maintain an accurate journal of all situation reports (SITREPs) submitted, actions taken, and information received. • Ensure the LO's location at the host unit headquarters facilitates all phases of the operation. • Be prepared to brief the current status and represent the nation to the Commander. • Maintain continuous situational awareness of the units planning and execution cycles. • Offer clear, concise, and accurate information. • Establish reliable communications within the staff to maintain understanding of adversary EW capabilities that will dictate changes in normal radar communication procedures. • Understand the Emission Control (EMCON) policy and make recommendations as required.

2. Weapon Locating System Communications. Normally use voice and/or digital communications to communicate with the supported unit. WLS acquisitions and mission data are normally transmitted to the supported fire control system or controlling headquarters. If digital communications are unavailable, the WLS operator uses standard voice procedures to pass target information to the supported unit. If established, the Force FS HQ should furnish the assigned WLS C2 connectivity to ensure effective interoperability and Counterbattery operations. When a Force FS HQ is not assigned, the Field Artillery unit supporting the operation should conduct these responsibilities for assigned WLS.

4.2. Interoperability

4.2.1. Methods

1. The Artillery Systems Cooperation Activities (ASCA). ASCA is a software protocol/interface that supports sharing key Command and Control and Fire Support information. It is a fire control messaging standard which consists of message formatting rules, message structure, message content, and handling rules for the transmission of data. ASCA is developed alongside NATO IFS Fire Control procedures in order to provide data interoperability for the Field Artillery and Mortar community. ASCA provides the technical information which a nation must implement in its own Fire Control system to enable data connectivity with another ASCA member. ASCA is designed to support all military operations at all levels of command, dependent on the Command Post configuration and the Liaison Officer organization of that nation. ASCA facilitates the digital dissemination of targetable information (adversary fire support acquisitions) from the sensor to the shooter. ASCA also enables the multinational Counterbattery effort which protects the force and seeks to achieve the commander's desired effects.

2. Swivel chair method. For nations without ASCA capability, the nation's fire control systems may be co-located to allow for the manual transfer of necessary information from one fire control system to the other. If this is not possible, secure voice communication is required between the nations to facilitate the transfer of data. This requires operators that possess the basic understanding of each nation's fire control procedures. It should be noted that all subsequent corrections will be transmitted in the same manner, meaning that the prosecution of the mission will be slower than normal.

3. Quick-Fire. The quick-fire channel establishes a direct link between the sensor and the shooter, or it may have one or more intervening control elements that evaluate and relay traffic. A quick-fire channel may be established using digital (preferred) or voice communications. A quick-fire channel facilitates a rapid response to adversary indirect fire support systems by streamlining the acquisition of adversary indirect fires to a dedicated delivery unit. Ideally a dedicated unit would possess digital capabilities with an automatic loading system to achieve a high rate of fire with a quick response (however, this is not a requirement). For example, one ASCA nation's WLS sends digital acquisitions straight to another ASCA nation's fire control system. Positive controls are required when using a quick-fire channel to ensure all clearance of fires procedures are executed without violations.

4.2.2. ASCA Enabled Features

1. Deployment Command or Radar Deployment Order. The Deployment Command or Radar Deployment Order (RDO) is transmitted by the supported nation to the supporting nation. The message will direct the WLS to move to an AMA or ARA, define the Locating Zone, and provide the mission order for the WLS. Some operation system nations may prefer that the "Deployment Command be used to deploy or move a WLS and the RDO used only to define the Locating Zone and provide mission tasking's. The means for sending a deployment command to a WLS should be outlined between the liaisons and participating nations. The operating systems nation may send, "Search Areas" instead of "Search Parameters." If this happens, the operating systems operator should plot the data on a map to make a determination of what sector data is needed to cover the requested search areas. The operating systems operator should use the data from the ASCA to construct an RDO for the

specified WLS. All attempts possible should be made to ensure that the sensor is able to talk digitally to the shooter through ASCA.

a. **Radar zone management.** Zones can be disseminated digitally through ASCA to participating nation fire control systems.

b. **Cueing.** Cueing and cueing guidance of other nations' WLR can be communicated through ASCA, through a LO package, or over voice communications.

c. **Electronic Warfare threats and cueing guidance.** Cueing guidance based on electronic threat assessments can be communicated through ASCA, through an LO package, or over voice communications.

2. Common Sensor Boundaries (CSB). Coordination of CSBs outside of the planning process can be communicated through ASCA, through a LO, swivel chair method, or over voice communications.

3. Frequency Integration. Coordination outside of the planning process can be communicated through ASCA, through LO, swivel chair method, or over voice communications.

CHAPTER 5 WEAPONS LOCATING SYSTEMS

5.1. Weapon Locating System Overview

1. General. Doctrinal employment considerations, in conjunction with templates and intelligence produced during IPOE, dictate the areas in which the locating zone should be focused, normally Named Areas of Interest (NAI) and Target Areas of Interest (TAI). The location of friendly boundaries, fire support coordinating measures, or friendly scheme of manoeuvre may also affect the assignment of locating zones.

2. Aim. This aim of this chapter is to discuss Weapons Locating System procedures that achieve the Commanders desired end-state.

5.2. Weapon Locating Radars (WLR)

5.2.1 Employment Factors

1. Employment Factors. The essential factors to be considered when employing WLRs include:

a. Designate positioning areas for WLRs.

b. Define a locating zone (LZ) for WLRs.

c. Establish zones (not relevant for all WLR types).

d. Establish cueing guidance.

e. Designate cueing agents.

f. Control WLR movement.

g. Designate who receives WLR targets.

5.2.2 Radar Zones

1. General. Radar Zones are a collection of tools unique to radar operations. Certain zones are used to prioritize radar operations into areas of greater or lesser importance to the commander. Zones are used to focus radar coverage on commander's battlefield priorities. Zones are normally entered in to the Radar system however, it is noted that not all radar systems are capable of using zones, in which case other means may be used depending of the system. The importance is that the system must be able to prioritize the product from the radars. Radar Zones are designed to assist the user in understanding the desired outcome.

2. Design. A zone is a geometric shape defined by a series of grid coordinates or a circle of specified radius. The only exception to this is the Locating Zone which is defined by an azimuth to indicate the left of arc and an azimuth to indicate the right of arc. Targets developed by the radar are displayed for transmission or transmitted automatically depending on the system in order of priority based on the zone from which they were developed.

3. Types of Zones.

a. **Locating Zone (LZ).** An LZ is used to define the entire area that is required to be covered by the counterbattery radars and it is the area in which the radars/platoon is to search. NAIs and/or TAIs can be used to outline the LZ for the radar platoon. The LZ is used as a technical tool to optimise the antenna. It

may also be referred to as a sector (grid coordinates) or arcs (left and right azimuth).

b. **Critical Friendly Zone (CFZ).** A CFZ is an area established around a friendly unit or location that is critical to the success of a commander's plan. When the radar predicts an adversary round will impact in a CFZ, a Priority Call for Fire is generated on the location from which the round was fired. The CFZ does not have to be within the radar's LZ.

c. **Engagement Zone (EZ).** An Engagement Zone (EZ) is an area inside the LZ where the supported unit wants to engage hostile firing systems. An EZ may be placed around a probable adversary fire support position identified during the IPOE process as a TAI. A target identified in an EZ normally generates a call for fire mission, if all requirements for accuracy are fulfilled. An EZ must be in the radar's Locating Zone.

d. **Acquisition Target Report Zone (ATRZ).** An ATRZ is an area that the commander wishes to monitor closely. Any weapon detected in an ATRZ will be reported ahead of all acquisitions other than those from CFZs or EZs. An ATRZ must be in the radar 's Locating Zone.

e. **Censor Zone (CZ).** Censor Zones (CZ) are areas from which the radar is prohibited from reporting acquisitions. A CZ is normally placed around friendly weapon systems to prevent them from being acquired by friendly radars. Care must be used when employing a CZ since the radar ignores all acquisitions coming from the CZ. This may remain true in certain systems even if the hostile weapon is firing from inside a CZ and into a CFZ.

f. **Inhibit Zone (IZ).** Inhibit Zones (IZ) are areas bounded by grid references, within the LZ into which the radar should not radiate. It must be recognized that a given radar will be inhibited throughout the sector or arcs within which the IZ lies.

g. **Remaining Area (RA).** The Remaining Area (RA) is that area of the LZ, not including the IZ, which is not covered by ATRZ, CFZ, CZ or EZ. Reports of activity are generated for the RA. A weapon located in the remaining area of the LZ will result in a report being sent to the CB Cell and intelligence cell.

2. Prioritization. Of all the zones, four are used to prioritize the areas and ensure that the appropriate speed of response is applied for that area. The four zones which indicate priority are, in order; CFZ, EZ, ATRZ and RA.

a. All acquisitions generate an acquisition report. This is normally in the form of an ATI.ATR[4] message giving the firing locations of the hostile weapon system. Depending upon the priority of the zone in which the hostile firing is situated, a call for fire may be initiated, normally in the form of an FM.CFF[5] message. In any case, the zone will indicate to the operator the degree of urgency to be

[4] ATI.ATR. The Artillery Target Report message is transmitted by either nation for information purposes or to generate an immediate call for fire based on target intelligence data. For more information see AArtyP-03

[5] FM.CFF. The Call For Fire message is transmitted between both nations providing support.

accorded to that information. As an example, a hostile system identified as firing into a CFZ will normally result in an immediate FM.CFF.

b. Some current WLRs have the capability to filter the caliber of weapons system which has been detected and thus prioritize the report. Care must be taken by the staff to understand the capabilities of the radar being made available to them and to optimize its functionality.

3. Radar Zone Management. Radar zones are managed to comply with the commander's guidance and intent and are an important part of force protection and the prioritization of fire support efforts. Understanding the manoeuvre commander's plan, and integrating fire support officers into the development, refinement and activation of planned zones are the key to successful radar zone management. Furthermore, the provision of overlapping radar coverage may be essential to the success and must therefore be included in the planning.

a. At all levels, the staff is responsible for the employment of counterbattery WLRs. Accordingly, the staff must be aware of the planning implications and fully understand the counterbattery radar support requirements. The staff is directly involved in the planning, refinement and activation of radar zones. Thus, it is the staff who prioritizes requirements, allocates radar zones to support the scheme of manoeuvre and develops the essential radar deployment information and plan.

b. Basic staff guidelines for zone planning include:

(1) Planning is done by the staff at the upper levels and refinement is done by the radar command post at the lower levels.

(2) Include the radar zone plan in the manoeuvre operations order.

(3) The upper level staffs manage zones by resolving duplication, time phasing zones by priority and including zones on the FS execution/synchronization matrices. Note different NATO countries may have different names for the matrices.

(4) Refine and update zones as the operation progresses.

4. Coordination. Target duplication between WLS is likely to occur during combat operations. In addition, the volume of targets passed from the radars may overwhelm the systems, especially if the radars are under centralized control.

a. Methods of reducing or eliminating target duplication are:

(1) Time separation e.g. turn on and turn off times to individual radars

(2) Area separation e.g. the establishment of LZ to individual radars

(3) Weapon separation (dependent on the radar capability), whereby individual radars are instructed only to identify certain weapons systems

(4) WLS integration by controlling agency to improve accuracy and reliability

5.2.3. Cueing

1. Cueing. Cueing is the process designed to prompt or notify the radar to begin radiating to acquire hostile firing systems. The critical factor when planning radar cueing is responsiveness. Cueing should allow the radar to locate adversary positions during initial volleys of fire, preferably the first rounds. Cueing must be based on near real-time information so that the radar has a high probability of tracking projectiles, when radiating. There are two techniques for cueing: situational, and demand. Situational and demand cueing may be used separately or in conjunction with each other.

2. Situational Cueing. Situational cueing is the preferred technique for cueing radars and is the most responsive. This method ties cueing to events that are determined during the IPOE and tactical planning process. For example, during offensive operations an event may be a breaching or air-assault operation. In a defensive operation, cueing may be tied to suspected adversary phases of fire depicted on the decision support template. Situational cueing focuses the radar on the manoeuvre commander's intent and that which is important.

3. Demand cueing. Demand cueing is the activation of a radar once the adversary is known to have begun firing. For demand cueing to be effective, cueing agents must be designated and a responsive communication system between the agents and radar must be established. Specific cueing guidance must also be established to fully exploit the radars' capabilities and minimize or eliminate unnecessary radiation. The situation will dictate who is the best agent to cue the radar and under which specific conditions it should be cued. Possible cueing agents may include:

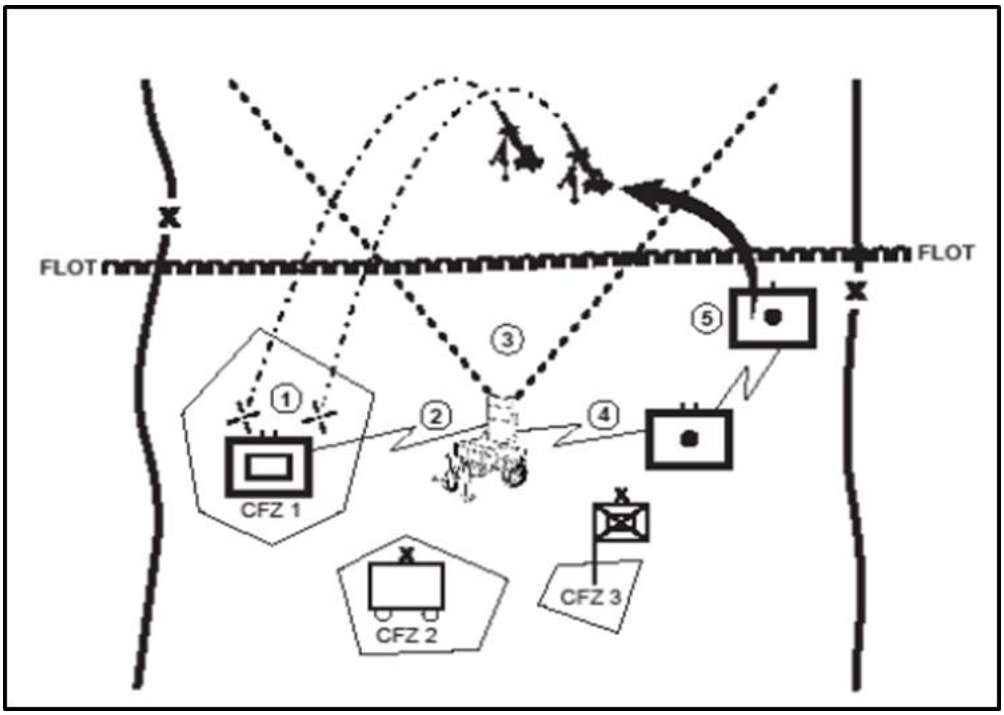
a. Company JFSE

b. Reconnaissance elements including UAs

c. Acoustic Weapon Locating systems

d. Any unit reporting incoming fire through the headquarters

Figure 5. Demand Cueing - Example



4. Figure 5. Demand cueing explanation

a. Step 1 – The friendly force assembly area receives fires from adversary IFS.

b. Step 2 – The CBO or designated cueing agent immediately cues the radar.

c. Step 3 – The WLR responds and locates the adversary IFS.

d. Step 4 – The WLR transmits a call for fire to the supporting CB Cell. CB Cell conducts target processing in accordance with target selection standards and attack guidance.

e. Step 5 – The supporting JFSE sends call for fire message to supporting artillery unit to engage adversary IFS in accordance with attack guidance.

5.2.4 WLR Deployment

1. Deployment. The deployment of counterbattery WLRs is an integral part of fire support planning. It takes the fire support plan, the intelligence collection plan, the effects guidance matrix and the survivability requirements into account and produces a plan for the deployment of the WLRs counterbattery. It involves locations for WLRs, timing for movement and mission tasking.

2. Deployment Factors. Several factors influence the deployment plan consist of:

a. The tactical situation especially:

(1) Named Areas of Interest (NAIs)

(2) Target Area of Interest (TAI)

b. Survivability issues based on the adversary threat.

c. Available terrain; taking into account topography, routes, weather and other units.

d. The characteristics (e.g. detecting range and mobility) of the counterbattery radars in use.

e. Combat Service Support.

3. Site Selection. Coordinating the deployment of counterbattery WLRs is a challenge for formation staffs at all levels. There is always great demand for terrain during operations and it is inevitable that counterbattery WLRs areas overlap with those of manoeuvre units' or artillery units' present or planned deployments. During the planning process the staff selects radar position areas within Radar Reserved Area (RRA) for each WLR in conjunction with the manoeuvre G3/S3 staff. The RRA list is then issued to all formations/units in the OPORD.

a. Some counterbattery WLR's and their operating systems have the ability to create a visibility diagram or capabilities diagrams to support/optimize the selection of positions for WLR's. This ability should be used whenever available to support the bottom up refinement.

4. Minimum information for WLR unit.

a. Mission

b. Tactical Task

c. Purpose

(1) Locate adversary systems

(2) Adjust friendly fires

(3) Predict point of impact of adversary fires

(4) Electronic support measures

d. Location (Primary and Alternate)

e. Time to be ready (Radiate or in position)

f. Locating Zone

(1) A polygon identified by grid coordinates or

(2) A Primary Azimuth, and/or

(3) A Left Arc and Right Arc, and if required

(4) A Minimum and/or Maximum Range, if required

g. Threat Assessment (especially EW)

h. Cueing (Unit designation(s) or timing)

i. Communications (units to report to)

j. Zone Data (Task and purpose)

(1) Grid Coordinates of Corner Points or

(2) Grid Coordinate of Centre Point and Radius

5.2.5 WLR Communications

1. Communications. Weapon locating radars normally use voice and/or digital communications to communicate with the supported unit. Radar acquisitions and mission data are normally transmitted to the supported fire direction center (FDC)/command post (CP) or controlling headquarters. The adversary situation must be considered when planning and conducting communications. Adversary EW capabilities may dictate changes in normal radar communication procedures. Furthermore, the Emission Control (EMCON) policy must be strictly observed.

2. Communication Nets. Counterbattery WLRs normally operate on nets laid down in the parent or supported units' SOP or command instruction. If digital communications are unavailable, the radar operator uses standard voice procedures to pass target information and fire missions to the parent or supported unit FDC/CP. In most cases, the supported unit must provide all communications information.

5.2.6 Other Specific Support Considerations

1. Meteorological (MET). Accurate MET data is crucial to the accuracy of adversary IFS location and friendly fire data. The MET parameters entered during radar initialization affect radar performance by correcting for atmospheric refraction. They are also important in estimating the effect of wind, temperature, and density on the projectile's trajectory.

2. Digital MET. Messages are transmitted to the radar using the MET.CM[6] and/or MET.TA[7] message format. The supported unit must be prepared to receive any requests for MET (MET.RFM). If an automated data processing system is not available then message must be passed by hand/voice and subsequently entered manually. Data elements used by most radars are:

a. Relative humidity

b. Temperature

c. Barometric pressure

d. Altitude of MET data station.

e. Wind speed

f. Wind direction

Some radar systems' software extrapolates temperature, pressure, and relative humidity back to the radar's altitude assuming the standard atmospheric lapse rate and constant relative humidity. However, the most accurate correction for refraction is obtained from the temperature and relative humidity measured at the surface as near the radar as possible.

3. Survey. Accurate survey is essential for successful employment of counterbattery WLR's. It is the responsibility of the Force FS HQ to develop the plan to ensure firing units

[6] MET.CM. Computer Meteorological data is transmitted to either nation requiring it as needed. The data is used in the processing of ballistic data in fire mission processing. See AArtyP-03.
[7] MET.TA. The MET.TA meteorological data is transmitted under the same conditions as the MET.CM. See AArtyP-03.

and WLR's on a common survey. The specific survey data required for typical counterbattery WLR is described below:

a. Site location (normally within 10 meters Circular Error Probable (CEP).

b. Orientation. Azimuth (normally to 1 mil).

c. Vertical angle (normally less than 1 mil).

d. Altitude (normally within 5 meters CEP).

If the accuracy of the survey is in doubt then the supported headquarters must be advised of the likely lower quality of data from the radar. If the supported unit cannot provide the survey data to the accuracies required, the parent unit of the radar may be required to continue to provide survey support.

4. Security. Because of its small size, the WLR cannot provide its own security in a tactical situation. For this reason, the radar must fall under the security of an adjacent unit. Similarly, when deployed, the radar cannot perform other security or administrative functions, such as local defense. The radar falls under the responsibility of the supported unit for these functions.

5.3 Acoustic Weapon Locating Systems (AWL)

1. General. Acoustic Weapon Locating Systems or sound ranging systems are passive sensors. Sound ranging is a method of determining the coordinates of an adversary IFS using data derived from the sound of its guns (artillery, mortar or rockets) firing. Most AWL consists of an array of sensors. A single sensor could be used for the direction of fire only. AWL can be used as an alternate means for WLR. For example, covering areas that can't be covered by WLR and a cueing agent WLRs.

5.3.1 Employment Factors

1. Employment Factors. Acoustic sensors can be used stand-alone for cueing. Most acoustic systems consists of several sensors scattered as an array of sensors. Sensors can be unattended or placed on several types of platforms. The essential factors to be considered when employing AWL include:

a. Time.

b. Survey.

c. Weather.

d. Define LZ for AWL

e. Establish zones

f. Establish cueing agent procedures between AWL and WLRs

g. Command and control of AWL

h. Designate AWL acquisition process

5.3.2 AWL Zones

1. General. Some AWLs can utilize the same zones that WLRs can use. The use of zones for prioritization is based on the capabilities of the nation's respective AWL. Below are some zones that can be utilized by some AWLs.

a. Locating Zone (LZ)

b. Critical Friendly Zone (CFZ)

c. Engagement Zone (EZ)

d. Acquisition Target Report Zone (ATRZ)

e. Censor Zone (CZ)

f. Remaining Area (RA)

2. Prioritization. AWL zones that can utilize certain zones have the same priority as WLRs.

5.3.3 Coordination

1. General. Target duplication between AWL Systems and also between AWL Systems and WLRs is likely to occur during combat operations. In addition, the volume of targets may overwhelm the systems, especially under centralized control.

2. Methods of reducing or eliminating target duplication.

a. Area separation e.g. the establishment of unique areas to individual Sound Ranging System (SRS)

b. Weapon separation (dependent on the AWL capability), whereby individual AWL are instructed only to identify certain weapons systems

c. WLS integration by controlling agency to improve accuracy and reliability

5.3.4 AWL Deployment

1. Deployment. Doctrinal employment considerations, in conjunction with templates and intelligence produced during the IPOE process, dictate the areas in which the AWL Systems search should be focused, normally NAI and TAI. The location of friendly boundaries or FSCMs may also affect the assignment of locating areas. The deployment of AWL Systems is an integral part of fire support planning. The deployment plan is an important outcome from the planning process. It takes the fire support plan, the intelligence collection plan, the effects guidance matrix and the survivability requirements into account and produces a plan for the deployment of the AWL. It involves areas to move to, timings for movement and mission tasking. Several factors influence the deployment plan. These include:

a. The tactical situation especially:

(1) Named Areas of Interest (NAIs)

(2) Target Areas of Interest (TAIs)

b. Survivability issues based on the adversary threat.

c. Available real estate; taking into account topography, routes, weather and other units.

d. Combat Service Support

2. Site Selection. Coordinating the deployment of AWL Systems is a challenge for staffs at all levels. There is always great demand for real estate during operations and it is inevitable that AWL Systems areas overlap with those of manoeuvre units' or artillery units' present or planned deployments. During the planning process the staff selects AMA or ARA for each AWL Systems unit in conjunction with the manoeuvre G3/S3 staff. The AMA/ARA list is then issued to all formations/units in the operation order. Deployment of AWL Systems may need lot of time for unattended ground sensors. Therefore, it should be ordered timely e.g. to provide time for necessary survey. AWL placed on mobile platforms (vehicles) are not limited by time constraints. At a minimum the following information should be supplied to the AWL Systems:

a. Designate position for each microphone.

b. Designate position for analysis centre. If needed

c. Define a locating area (LA).

d. Define alignment.

e. Control AWL Systems movement.

f. Designate who receives target information

5.3.5 AWL Communications

1. General. AWL normally uses voice and/or data communications to communicate with the supported unit. AWL acquisitions and mission data are normally transmitted to the supported FDC/CP or controlling headquarters. The adversary situation must be considered when planning and conducting communications. Adversary EW capabilities may dictate changes in normal AWL communication procedures.

2. Communications Nets. AWL Systems normally operate on nets laid down in the parent or supported units' SOP or command instruction. If digital communications are unavailable, the AWL Systems operator uses standard voice procedures to pass target information and fire missions to the parent or supported unit FDC/CP. In most cases, the supported unit must provide all communications information.

5.3.6 Other Specific Support Considerations

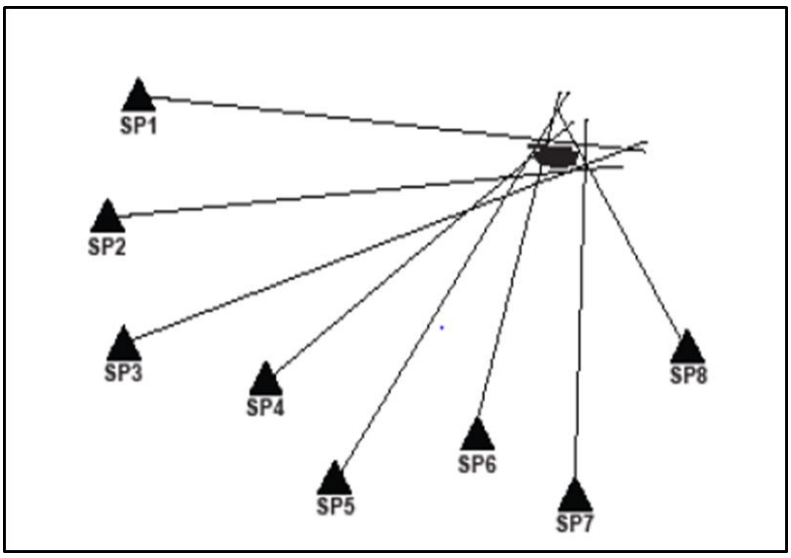
1. Meteorological. Weather has a significant impact on the dispersion of sound waves. Accurate MET data is crucial to the accuracy of AWL Systems. Digital MET messages are transmitted to the AWL Systems using the MET.CM and/or MET.TA message format. The supported unit must be prepared to receive any requests for MET (MET.RFM). If an automated data processing system is not available then message must be passed by hand/voice and subsequently entered manually.

2. Survey. Accurate survey is essential for successful employment of AWL Systems. If the accuracy of the survey is in doubt, the supported headquarters must be advised of the likely lower quality of data from the AWL Systems. Only required for unattended ground sensors.

3. Security. Because of its small size, the AWL unit may not be able to provide sufficient security for itself in a tactical situation. For this reason, the staff must give consideration to this fact by ensuring that AWL Systems falls under the umbrella of the overall unit/formation defense plan.

Figure 6. Acoustic Weapon Locating System Employment – Example of an array of sensors

Example provides understanding of acoustic event and the association of bearings towards event location.



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CHAPTER 6 COUNTERBATTERY PROCEDURES

6.1. Counterbattery Procedure Overview

1. Aim. The aim of this chapter to is to outline procedures for counterbattery operations. These procedures include reactive and proactive procedures within counterbattery operations. The outlined process in this chapter defines essential steps to enhance counterbattery operations within an organization. Organizations may have more or less additions within their procedures depending upon the capabilities of its force.

2. General. Counterbattery operations have consistent variables that must be accounted for within the process. These variables consist of but are not limited to:

a. Airspace and ground clearance

b. Positive identification (PID) of target – Accounts for commander approved PID criteria and observer source. Also, can account for target location error (TLE) from observer source.

c. Target description versus attack option - Target description includes type (tracked, wheeled, and towed) and size. Attack option includes ammunition type, amount, and pattern.

d. Target decay time – How long the target will remain in the last reported position

e. Collateral Damage Estimation (CDE), if required – Dependent on ROE, national caveats, and the commander's guidance.

f. Attack option available – Artillery within range and capable of firing within target decay time. Other attack options on station for example army aviation, Close Air Support (CAS), Air Interdiction (AI), and armed UAS.

These variables can be mitigated through established steps and use of team effort to conduct simultaneous procedures. The end state is to expedite counterbattery fires to achieve the commander's desired effect on adversary IFS. Counterbattery operations consist of reactive and proactive procedures. Both counterbattery procedures are mutually supportive of each other. Organizations that conduct both procedures have higher chance of achieving effects. Key individuals and cells within organization are essential to enable a continuous systematic counterbattery operation.

6.2. Reactive Counterbattery Procedures

1. General. Reactive Counterbattery is the holistic procedure of conducting a battle drill once WLS reports that an adversary IFS is detected. The target data reported will rely on the capability of the WLS. For instance, some WLS will report time of acquisition, target type (mortar, artillery, and rocket), number of volleys, point of impact (POI) of adversary indirect fires and point of origin (POO) of adversary indirect fires. At a minimum, the following begin a near simultaneous procedure.

6.2.1. Procedures

1. Counterbattery Cell. Typically, the counterbattery cell is the initial cell to receive counterbattery related targets from WLS. The cell conducts TSS to validate if the target meets commander's guidance for attack. TSS consists of target type, target location, from EZ, into CFZ, and number of volleys. Target must be validated against FSCMs, battlespace geometries (boundaries), and/or CSB. If target violates FSCMs, battlespace geometries, and/ or CSB then further coordination is required.

a. If target does not meet TSS then data is recorded and forwarded to intelligence cell.

b. If target meets TSS, then counterbattery cell will initialize the reactive counterbattery procedure by distributing target data to other staff sections. The Counterbattery cell will maintain situational awareness of counterbattery process with tracking target decay time, status of attack options, and cross-coordination with ISTAR asset. If target exceeds target decay time then end of mission (EOM) is given. If target is outside of unit's boundaries or beyond a directed CSB than further coordination must be conducted, unless commander has provided alternate directives or prior coordination has already been conducted. Some NATO nations have the capability to use AWLs to initiate the cueing of their WLRs. The CB cell could have a dedicated counterbattery unit with direct communications for call for fire message. However, organizations must ensure air and ground clearance prior to engagement. Other consideration for target validation is the adversary utilizing deceptive fires to draw out friendly artillery assets and WLRs.

2. Intelligence Cell. Once target data is received, the intelligence cell could cross-coordinate with ISTAR asset to maintain PID of target and increase target decay time. Recommended ISTAR assets for cross-coordination are RECCE unit, SOF, UAS, and Ground Moving Target Indicator (GMTI)[8]. Intelligence cell will also record POO and POI to enable refinement to analysis to support proactive counterbattery procedures. If no ISTAR assets are available during counterbattery operations, then once an asset is available, they should verify battle damage assessment (BDA).

3. Joint Fire Support Element (JFSE). The JFSE will coordinate attack options with ground-based fire support systems, army aviation, air forces, and naval forces/ naval air forces contributing to JFS. The critical components for selecting attack asset is based on timeliness and munition effectiveness. JFSE works closely with organic or attached aviation, AIRCOM, and fire direction centre (FDC). JFSE will ensure that attack options do not violate coordinating measures, ROE, and national caveats. JFSE will send a WNGO of call for fire message to field artillery organization to activate artillery assets. The JFSE will ensure that CB cell is aware of shot on call for fire message.

4. Chief of Operations[9]. The chief of operations or delegate verifies ground clearance at POO, if needed and status of friendly forces in vicinity of POI. The chief of operations also maintains primary over watch on total completion of reactive counterbattery procedure. Assist

[8] Nation capabilities or Article 5 dependent

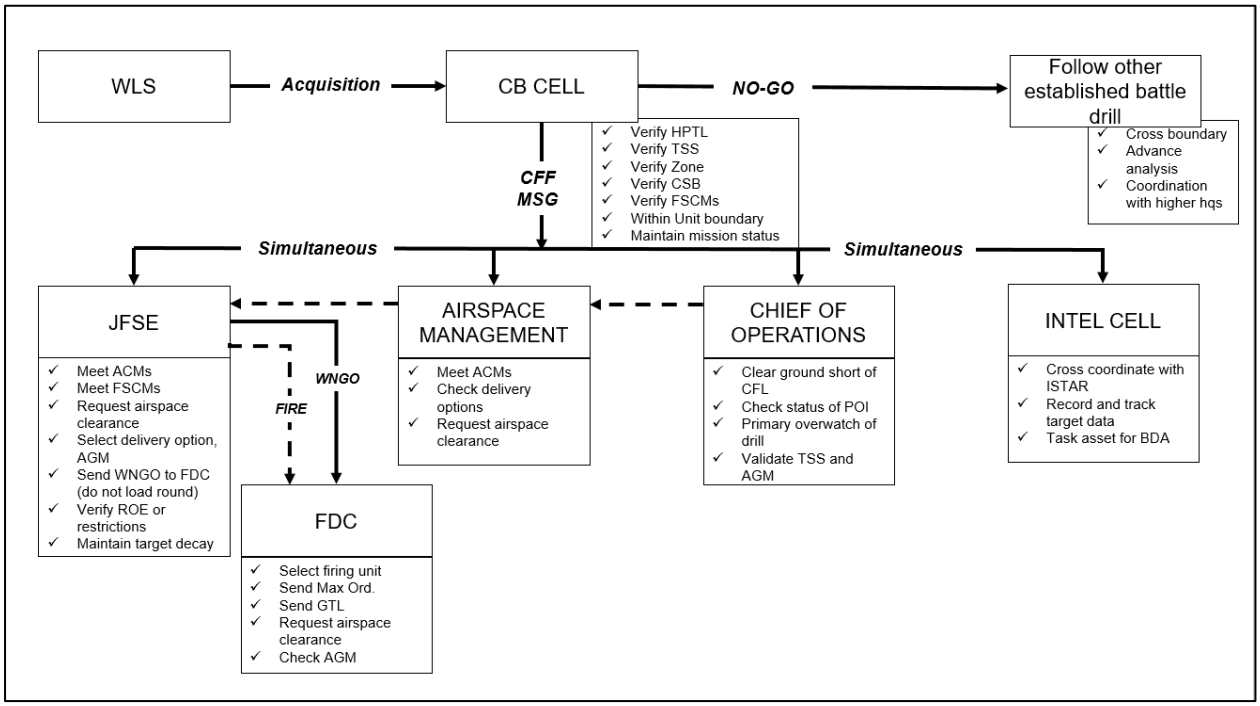
[9] Also known as Tactical Operations Center (TOC) director.

with coordination between higher and adjacent echelons for clearance of fires and/ or engagement with respective unit.

5. Fire Direction Centre (FDC). The FDC will receive WNGO for call for fire message originating from either JFSE and/or CB Cell. The FDC will then direct engagement from select battery or platoon to fire with at my command (AMC). When ready and restricted when ready command can be given if planned FSCMs and ACMs are active to facilitate counterbattery operations. The selected firing unit will then lay on target to provide gun target line (GTL), max ordinance and time of flight. Once cleared for fire the FDC will report verbal and digital shot to JFSE and CB cell.

6. Commander. The commander and/ or target engagement authority (TEA) should provide clear and concise guidance for TSS and attack guidance. This enables units to make dynamic decisions and to reduce the time to achieve effects on the target. However, national caveats and collateral concerns can cause restraints on some organizations. The commander or delegated authority will need to make a decision if target is a military necessity or self-defense. The commander can direct restriction to guided munitions and further PID to reduce collateral damage.

Figure 7. Reactive Counterbattery Procedures - Example



6.2.2. ASM Procedures for Reactive Counterbattery

1. The responsiveness of the Reactive Counterbattery fire is directly related to the settings arranged during the planning process, described in the previous paragraph. Consequently, in the case of the POO of an adversary trajectory is detected in an EZ, the friendly firing unit would be able to react promptly from the planned AMA/ARA and the Counterbattery battle drill would be executed immediately. Otherwise, the battle drill should be implemented in whole or in part according to the current situation, mainly based on the POO location.

In order to expedite Reactive Counterbattery fire, in case of:

a. the POO is detected in the EZ;

b. a firing unit was previously selected to react against that EZ;

c. an ACMREQ was accordingly developed and then included in the ACO,

It should be considered the opportunity to decentralize the execution of the Counterbattery fire granting the possibility to the WLR to transmit the FM.CFF directly to the designated firing unit. This arrangement would be particularly appropriate for those units able to conduct digital fire support. It should be noted that whilst this would shorten the sensor to shooter linkage, at the same time is important to set all necessary arrangements during the planning process.

In the event that an unexpected adversary indirect fire activity is detected (e.g. POO detected out of any EZ or ATRZ), the Counterbattery battle drill is a tool to optimize a proper reaction even though the timeliness of the reaction (friendly fire impact on target) may not meet the target decay time. In this case, to obtain the airspace clearance the JFSE/CF Cell must transmit to the ASM (via Chat, e-mail, voice, ACMREQ, or other means available) the following data (at minimum):

a. Target Location;

b. Firing unit location (friendly);

c. Max Ord (feet msl);

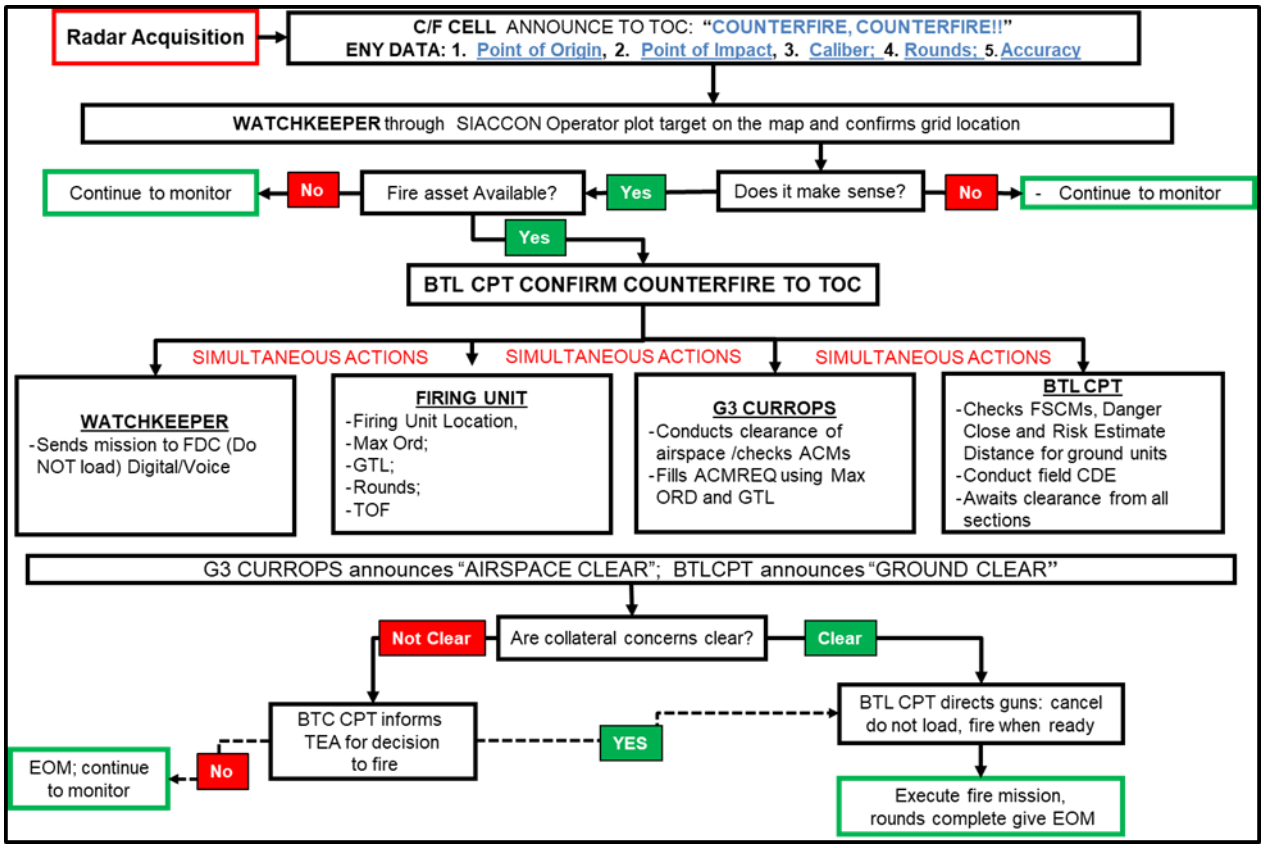
d. GTL (mils);

e. Duration of the mission (Time of Flight or Time of Mission).

According to these data, the ASM will identify and resolve potential airspace conflicts or forward the request to the higher headquarters in order to obtain the airspace clearance. It should be noted that this process will take some time with the risk of not being able to meet the target decay time. For this reason, the more is accurately predicted, planned and arranged during the planning process, the more responsive will be the Counter Battery fire (both proactive and reactive).

Figure 8. Counterbattery Battle Drill – Example

Please note figure 8 is only an example, not the standard. ROE for Counterbattery engagements and target identification may vary between contributing nations and must be clearly understood so the target can be engaged in the most expedient manner possible. For example, one nation may require a nearest collateral concern check (field CDE) while others may not. Additionally, technical capabilities such as “do not load round” fire commands may not be recognized or possible to conduct by all participating nations. The figure below can be used and/or modified. Its terminology and content are not to be construed as the standard



6.3. Proactive Counterbattery Procedures

1. General. Reactive counterbattery can only be truly effective if proactive counterbattery has been conducted. Proactive counterbattery procedure provides two main outputs to include setting conditions for reactive counterbattery procedure and providing inputs to targeting. Proactive counterbattery procedure consists of two analytical steps that includes initial analysis and advance analysis.

6.3.1. Initial Counterbattery Analysis

1. Initial Counterbattery Analysis. The intelligence cell and CBO will work closely during counterbattery analysis. During IPOE they will define the enemy IFS ORBAT and enemy course of action (ECOA). Defining the enemy IFS will include all aspects of the holistic system to include sensors, shooters, logistics, command and control, and communications. Understanding the adversary's employment capabilities, limitations and restrictions will help anticipate the adversary's employment of IFS. The CBO is ultimately the subject matter expert on adversary IFS and friendly counterbattery procedures.

2. Critical Steps of initial counterbattery analysis.

a. Enemy ORBAT and ECOA – What is the adversary's IFS composition, disposition, employment, capability, limitations, and emplacement/ displacement criteria.

b. Adversary sensor to shooter methodology – How do they detect friendly forces and how do they deliver on friendly forces?

c. Adversary targeting priorities – How will the adversary commander target friendly forces?

6.3.2. Advance Counterbattery Analysis

1. Advance Counterbattery Analysis. The intent of advance analysis is to refine initial analysis and provide inputs to counterbattery planning for next 24, 48, and 72 hours. Both CBO and intelligence cell will continue to work closely to provide timely intelligence products. The means of how a unit will conduct analysis is based on the capabilities of the unit.

2. Pattern Analysis. Pattern analysis seeks to analyze previously acquired intelligence and data to identify patterns, including identifying where adversary indirect firing capabilities may be operating from, and predict adversary locations in time and space. Due to the immediate identification of this pattern, high payoff target(s) are classified as targets of opportunity and the clearance of fires process should immediately be conducted. Once cleared for engagement, targets of opportunity can be prosecuted with available joint or organic asset(s) as long as it meets the criteria specific to the Commander's guidance for fires and does not violate any laws or rule of engagement.

a. The acquisitions from WLS to include POO, POI, and multi- source intelligence reporting are plotted on a digital and/or analog common operating picture. Historical WLS acquisitions layered with Ground Moving Target Indicator (GMTI), Geospatial Intelligence, and Signal intelligence (SIGINT)[10]. The end state is answering "Is the adversary staying with anticipated COA and TTPs or have they changed their COA and TTPs".

3. WLR EMI. The CB cell will report interference or jamming of WLR to intelligence cell, JFSE, and direction/ control cell. Some NATO nations have the ability to gain a line of bearing (LOB) from direction of interference from possible EW or adversary WLR asset. Plotting and recording of interference will further refine sensor to shooter method and adversary's use of electromagnetic spectrum to deny or detect friendly WLR.

4. Further questions that are answered during advance analysis:

a. How is the adversary employing fires with regards to terrain?

b. What is the typical stand-off distance from friendly and/ or adversary forward line of troops (FLOT)?

c. What type of firing order is the adversary using? i.e. ammunition type and volleys

d. What is the adversary's emplacement and displacement criteria or times?

e. Did the adversary use certain triggers to engage friendly forces?

f. How is the adversary using sensor to shooter method?

g. What is the adversary targeting?

h. How is the adversary using EW to detect or deny friendly WLS?

i. What is the adversary's engagement criteria and response time?

j. How is the adversary using their WLS?

[10] Based on nations capabilities or Article 5

5. Predictive Battle Damage Assessment (BDA). Predictive BDA is a process to estimate the effects on adversary IFS with reactive counterbattery procedure. The predictive BDA process is conducted when there is a lack of other ISTAR means to collect actual BDA. Predictive BDA provides the commander and staff with an estimate of adversary IFS and further refine counterbattery planning. CB cell must have proper recording status of reactive counterbattery process to enable predictive BDA. Predictive BDA should be followed up with actual BDA to confirm or refine unit's efficiency of process. The process requires multiple variables to efficiently predict BDA.

a. Predictive BDA Variables includes:

(1) Friendly use of munition type, volley, and sheaf to achieve desired effect

(2) Friendly fire impact on target within target decay time

(3) Alignment of adversary IFS employment size (Section, Platoon, Battery, and Battalion)

(4) Number of acquisitions received from targeted area after friendly attack

6.3.3. Proactive Counterbattery Analytical Products

1. Proactive Counterbattery Analytical Products. It is imperative that an organization has a standard for analytical products that help describe the adversary IFS and the "so what of analysis". The analytical products must be easily understood within the organization and also disseminated upon completion to its supporting and supported units.

2. Recommended proactive counterbattery analytical products: (Some products are limited due to nation capabilities)

a. Heat map: a product displayed on a map with concentration of POOs and POIs that can include type of weapon system (mortars, cannon artillery, and rockets).

b. Time/event product: a product that displays times of WLS acquisitions and is aligned with friendly and adversary events. This product can highlight if or when the adversary is choosing to engage friendly forces.

c. Adversary IFS BDA chart: a product that incorporates both predictive and actual BDA of adversary IFS. The intent is to highlight remaining percentage of adversary systems.

d. Proposed and/or anticipated adversary IFS locations in time and space to include adversary AMAs, radar positions, observation positions, C2 nodes and logistics hubs.

6.3.4. Proactive Counterbattery Procedure Outputs

1. Proactive Counterbattery Procedure Outputs. The outputs of proactive counterbattery procedures provide critical information for inputs to targeting, manoeuvre and fires planning, and for the commander to make decisions. Ultimately the procedure outputs are necessary for planning and refinement of counterbattery planning. The timeliness of the procedure outputs is crucial in order to make operational sense for next 24 to 72 hours. The entirety of the process is recognized as initiation of proactive counterbattery.

2. Critical proactive counterbattery inputs for planning and refinement:

a. Targeting process: Identify opportunities to coordinate and synchronize organic and joint assets based on refinement to Enemy IFS ORBAT, COA, and SITEMP

for next 24 to 72 hours. Outputs of proactive counterbattery will develop or refine NAIs, TAIs and WLR zones.

b. Measurement of performance (MOP) and measurement of effectiveness (MOE) of organizations counterbattery operations: MOPs addresses whether the organization's process is or is not meeting the target decay time. This allows the organization to understand issues within process and mitigate for future execution. MOEs addresses if the organization is achieving desired effect based on target description and munition effectiveness (type of munition, number of volleys, and standard sheaf size). MOEs provide refinement to fires support planners to make adjustments to attack guidance's.

c. Scheme of manoeuvre plan: Proactive counterbattery input can drive and/or change friendly scheme of manoeuvre based on effectiveness of counterbattery operations. For instance, the commander's intent is to reduce or attrite adversary IFS to enable tactical advantage of subordinate manoeuvre units. If intent is not met than a possible decision point for the commander may exist to change or alter scheme of manoeuvre.

d. Fires plan: Proactive counterbattery will provide essential inputs for fires plan and refinement by anticipating adversary IFS locations in time and space. This will adjust friendly AMAs, radar positions, FSCMs, ACMs, ammunition, and refinement of processes.

e. Counterbattery plan: Planning and refinement of employment of WLSs to include changes to cueing, zones, and positioning.

6.3.5. ASM Procedures for Proactive Counterbattery

1. ASM procedures in Proactive Counterbattery. As specified in Chapter 2, during the planning process the staff is expected to develop all ACMREQs necessary to expedite fire against the adversary fire support capabilities. These ACMREQs will be then submitted to the ASM (Airspace Manager /Management Cell) for inclusion in the unit airspace plan. In this context, according to the adversary predicted locations and the locations of those friendly howitzer expected to fire on, the staff will develop and recommend ACMREQ to link these locations, which should be validated during the rehearsal. As stated before, the adversary locations are predicted in time and space during the Advance Counterbattery Analysis conducted by CBO and Intelligence Cell. To develop such ACMREQs the following steps may be followed:

a. Predict adversary fire support capabilities location in space and time;

b. Establish proper Radar Zones for example EZ and ATRZ to expedite and prioritize Counterbattery fire. These zones are also used to plan, assign and synchronize detection activities carried out by ISTAR assets (ISTAR Collection Plan);

c. Identify AMA/ARA from where friendly firing units are able to range those Radar Zones;

d. Calculate trajectory of the rounds (maximum altitude) and GTL;

e. In conjunction with the FSO, refine the choice of AMA/ARA considering the maximum altitude of the trajectories and the GTL with respect to active ACMs

and/or other airspace user's operational requirements (e.g. CL/CA, planned Slow Aviation Flight Routes (SAAFR), presence of FARP, etc.);

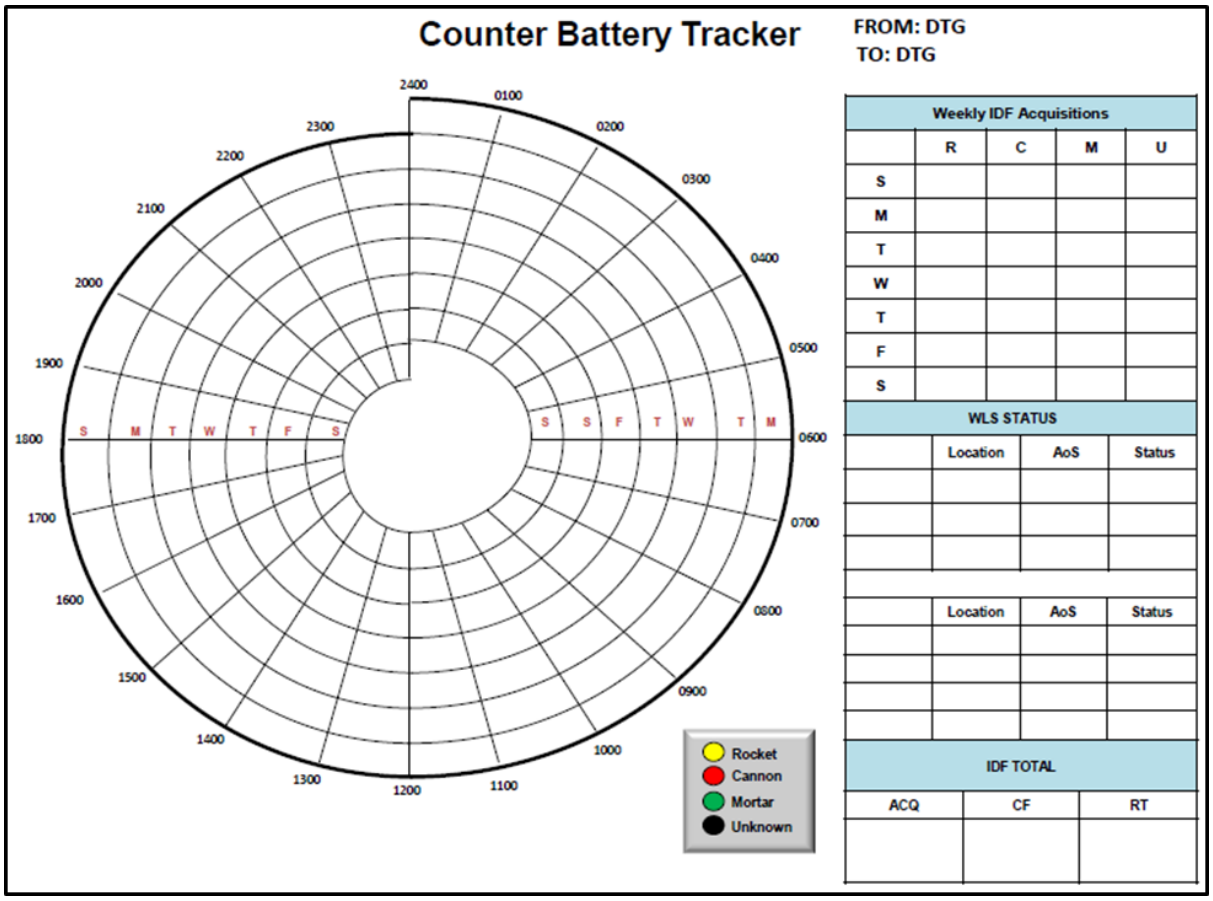
f. Develop ACMREQs according to the ROZ(s) requirements (wall, goalpost, etc.);

g. Submit ACMREQs to the ASM for inclusion in the unit airspace plan;

h. Verify the inclusion of the requested ACMs in the Airspace Control Order (ACO) issued by ACC.

Figure 9. Counterbattery Analysis Wheel – Example

Please note figure 9 is only an example, not a standard. The figure below is an example that can be used and/or modified to conduct basic counterbattery analysis. The analysis wheel depicting adversary acquisitions by day and time. Its terminology and content are not to be construed as the standard.



ANNEX A. NATO RADAR DEPLOYMENT ORDER

RADAR DEPLOYMENT ORDER								Effective Date:
WLS				Mission	Task:			
HIGHER HQs					Purpose:			
Location	Primary RRA			Alternate RRA				
Friendly AMA/ ARA								
Locating Zone (LZ)								
Primary LZ	Left Edge		Right Edge		Minimum Range		Maximum Range	
360/ 90/ Other		mils		mils		meters		meters
Inhibit Zone								
Alternate LZ	Left Edge		Right Edge		Minimum Range		Maximum Range	
360/ 90/ Other		mils		mils		meters		meters
Inhibit Zone								
EW THREAT ASSESSMENT								
EW Threat Yes No	Type of Threat:				EMI Reporting:			
Survivabiltiy Criteria:								
CUEING AGENTS (CALL SIGN AND DESIGNATION) IN PRIORITY								
1		3			5			
2		4			6			
Cueing Guidance (Demand/ Situational):								
Communications								
Primary:				Alternate:				
P:	C:			P:	C:			
A:	E:			A:	E:			
Zone Data								
Type/Number	Command Priority/ Purpose/ Execution	Grid Coordinates of Zone Corner Points or Center Grid with Radius						
Additonal Information								
Attached Security:				**Engineer Support:**				
Remarks:								

WLS
List the radar section number and type of radar involved
Higher HQs
List the WLS higher HQ

Mission
List the task and purpose of the WLS mission. Ensure inclusion of counterbattery control and support relationship.
Location
List primary and alternate radar reserved areas (RRA) for the section; for example, **Primary RRA 1 and Alternate RRA 3.** It is the responsibility of the CBO to create a naming convention for the RRAs and ensure they are distributed in the operations order. The radar section chief selects the actual site and reports the location to the supporting unit.
Friendly AMA/ARA
Provide any planned AMA/ARA currently known in vicinity of RRAs. This block provides situational awareness of friendly indirect firing systems.
Locating Zone
Describe the locating zone. Select a primary and alternate azimuth and then determine the left and right sector edges. Range search limits can be specified with minimum and maximum ranges; for example,
EW Threat Assessment:
Indicate and describe electronic warfare threat. Specify whether an electronic warfare threat exists, if it is affecting friendly assets. If there is an EW threat, you may use the survivability flow chart in conjunction with the commander's risk assessment and mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC) to determine emission limits.
Type of Threat
Example, List an enemy system within enemy ORBAT; ground or air threat
Electromagnetic Interference (EMI) Reporting
List reporting agents of EMI event
Survivability Criteria
List events that will constant survivability move. See paragraph 3 of 3.2.3.
Cueing Agents
List in priority by call sign, agents that can cue the WLR
Communications
List the communications nets (primary, alternate, contingency, and emergency) on which the radar is to operate. Include call sign for each
Zone Data
List the type of zone and zone number as well as coordinates of the zones to include priority.
Attached Security
Describe any security element attached to the radar section
Engineer Support
Describe any engineer support given to the radar section

GLOSSARY

A

Airspace Coordination Area (ACA)
A three-dimensional block of airspace in a target area, established by the appropriate ground commander, in which friendly aircraft are reasonably safe from friendly surface fires. The airspace coordination area may be formal or informal

Artillery Manoeuvre Area (AMA)
An area within which artillery is authorized to deploy but which is not reserved for its exclusive use.

Artillery Reserved Area (ARA)
An area reserved exclusively for the positioning of artillery assets.

C

Counterbattery fire is fire intended to destroy, neutralize, or suppress adversary integrated fire support capabilities. Adversary integrated fire support capabilities include, but are not limited to, fire support platforms, command and control nodes, weapons locating systems, and logistics.

F

Fire Support Coordination Measures (FSCM)
Measures employed by land or amphibious commanders to facilitate the rapid engagement of targets and to provide safeguards for friendly forces.

Force Fire Support Headquarters (Force FS HQ). Force Fire Support Headquarters is a role designated by the Commander at the Division, Corps, or Land Component Command Level for the Senior Field Artillery HQ organic, attached, or placed under the OPCON of that command. The supported commander specifies the responsibilities of the Force FS HQ and, if necessary, the duration of those responsibilities.

I

Indirect Fire System (IFS)
A system of systems, the main characteristics of which are its 24/7, all weather capability to acquire targets and achieve effects over a wide area and in depth. It should be able to deliver area and precision munitions.

J

Joint Fires (JF)
Fires applied during the employment of forces from two or more components in coordinated action toward a common objective.

Joint Fire Support (JFS)
Joint Fire support is the coordinated and integrated employment of all weapon platforms delivering fires (It includes land, air and naval delivered indirect fires) to achieve the required effects on ground targets to support land operations in the full spectrum of conflict. It encompasses the integration of indirect fires and effects in order to influence the adversary forces, installations or functions.

Q

Quick-fire
The quick-fire channel establishes a direct link between the sensor and the shooter, or it may have one or more intervening control elements that evaluate and relay traffic.

R

Radar Reserved Area (RRA)
An area reserved exclusively for the positioning of WLR assets.

S

Slow Aviation Assets Flight Routes (SAAFR)
SAAFRs are established to route land component aviation assets in the forward area in direct support of ground operations.

T

Target
A target is an area, structure, object, person and group of people against which lethal or non-lethal capability can be employed to create specific psychological or physical effects.

Target Acquisition (TA)
The detection, identification, and location of a target in sufficient detail to permit the effective employment of weapons.

Target Engagement
Target engagement is the process of applying a weapon system, capability, action, or function against a target to achieve a desired lethal or nonlethal effect in support of the commander’s objectives.

U

Unit airspace plan
Planned Airspace Control Means Requests (ACMREQs) procedures to integrate and nominate planned airspace coordinating means to higher headquarters as part of a future airspace control order.

LIST OF ACRONYMS AND ABBREVIATIONS

A

AArtyP	Allied Artillery Publication
ACA	Airspace Coordination Area
ACM	Airspace Control Means
AMA	Artillery Manoeuvre Area
ASCA	Artillery Systems Cooperation Activities
ATRZ	Acquisition Target Report Zone
AWL	Acoustic Weapon Locating System

C

CDE	Collateral Damage Estimation
COA	Course Of Action

E

ECOA	Enemy Course Of Action
EMI	Electromagnetic Interference
EW	Electronic Warfare

F

Force FS HQ	Force Fire Support Headquarters
FSCM	Fire Support Coordination Measures

G

GMTI	Ground Moving Target Indicator

H

HPT	High Pay-off Target
HPTL	High Pay-off Target List
HQ	Headquarters
HVTL	High Value Target List

I

IFS	Indirect Fire Systems
IPOE	Intelligence Preparation of the Operational Environment
ISTAR	Intelligence, Surveillance, Target Acquisition, Reconnaissance

J

JF	Joint Fires
JFS	Joint Fire Support

L

LCC	Land Component Command(er)
LO	Liaison Officer
LZ	Locating Zone

O

ORBAT	Order of Battle

P

POI	Point Of Impact
POO	Point Of Origin

R

RRA	Radar Reserved Area
RoE	Rules of Engagement

S

SAAFR	Slow Aviation Assets Flight Routes

T

TTP	Tactics, techniques, and procedures

U

UAS	Unmanned Aircraft System

W

WLR	Weapons Locating Radar
WLS	Weapons Locating Systems

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