

The Role of Artillery in Joint Fire Support

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Abstract

This article discusses the role of artillery in fire systems as a part of Joint Fire Support (JFS). The purpose of this article is to outline the functions, place and role of artillery as a component of JFS during operation and indicate important elements of JFS planning in the context of artillery. The article is mainly based on an analysis of the artillery of NATO and the USA. The author used theoretical research methods such as analysis and synthesis of information comprised in literature and source materials and the inference method to develop this article. The article described the main tasks and function of artillery in FS, the role and place of JFS in operation and selected elements of JFS planning. Artillery will executed fire support to create conditions that provide the supported commander freedom of action. Planning, coordinating and employment of all allocated JFS assets are essential parts of JFS. This is crucial to execute deconflict and avoid fratricide.

Keywords

artillery, defense, Joint Fire Support, Joint Fires

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1. Introduction

Contemporary military operations are characterized by high intensity. Joint Fire Support (JFS) plays a vital role in the modern battlefield. Conditions that provide the supported commander freedom of action are created by conducting JFS. Joint Fires (JF) that assist air, land, maritime, cyberspace, and special operations forces to move, maneuver, and control territory, populations, airspace, cyberspace, electromagnetic spectrum (EMS), and key waters are included in JFS. JFS may contain, but is not limited to, manned and unmanned fixed-wing, rotary-wing, and tiltrotor aircraft; naval surface fire support; artillery, mortars, rockets, and missiles; and other effects of some cyberspace attack, space control operations, electronic attack, and other capabilities to create nonlethal effects. Integration and synchronization of JF and JFS with the fire and maneuver of the supported force are essential (Joint Publication 3-0, p. 84). In the case of symmetrical confrontations, the role of artillery will probably be decisive.

The aim of the work is to present the role of field artillery in JFS and its main tasks and to indicate the most important elements during planning fire missions. Due to this article's nature and limited scope, the discussion is limited to the most crucial ideas and problems. The article is mainly based on an analysis of the artillery of NATO and the USA. Theoretical research methods such as analysis and synthesis of information comprised in literature and source materials and the inference method were used to develop the article. Due to the complexity of the problem, the author decided to limit the scope of the presentation to the most visible difficulties.

2. Main tasks of artillery

The main task of artillery weapon systems is indirect firing, thus keeping fire on targets kilometers away and beyond the line of sight (Silingier & Blaha, 2017, p. 332). Army surface-to-surface indirect fires include cannon, rocket, missile systems, and mortars organic to maneuver elements. Field Artillery (FA) is the equipment, supplies, ammunition, and personnel involved in the use of cannon, rocket, or surface-to-surface missile launchers. The main tasks of FA are to destroy, neutralize, or suppress the enemy by cannon, rocket, and missile fire and to integrate and synchronize all fire support assets into operations. Fire Support (FS) involves the use of fire that directly supports land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives (ADP 3-19, 2019, p. 21). Furthermore, some physical and functional effects of FS are indicated in Figure 1.

Harassment is defined as repeated, deliberate and intimidating activities intended to discourage, impede and disrupt. Those fires are delivered on an irregular timeframe and location with a reduced amount of delivery platforms. Suppression fires are fires on/about a weapon system to degrade its performance below the level needed to fulfill its mission objectives. The effect of suppressive fires usually lasts only as long as the fires are continued. Suppression is used to prevent effective fire on friendly forces. It is typically used to support a specified movement of forces. Neutralization fire is fire delivered to render the target tem-

porarily ineffective or unusable. Neutralization fire results in adversary personnel or materiel incapable of interfering with a particular operation or the accomplishment of a particular course of action (AARTYP-5, p. 87).



Figure 1. The Physical and functional effects of Fire Support (The author's own work based on AARTYP-5, 2015, p. 87).

Destruction fire physically renders an adversary force combat-ineffective unless it is reconstituted, or so damaged that it cannot function as intended nor be restored to a usable condition without being entirely rebuilt. Terrain effects in the context of FS means that artillery units can deliver area and precision effects by employing a wide variety of munitions. Psychological effects expressed through that all delivered fires and even the presence of FS assets positively affect an army's own troops besides the classical effects generated on the adversary power. Even if FS assets fire non-lethal ammunition, friendly forces show their resolve and the readiness to use lethal ammunition if necessary. Psychological effects encompass deter, demoralize, discourage, etc. Operational effects are known as e.g. delay, disrupt, defeat, divert, deter, degrade, dislocate, deny, deceive, dissuade, limit, interdict, canalize, isolate, block, area control, separate, fix, contain, compel, obscure, illuminate, coerce, hinder, hamper, contain, turn, neutralize, demonstrate, eliminate, prevent, retaliate, etc. (AARTYP-5, p. 87).

In summary, it can be indicated that the main functions of artillery in FS are:

- supporting forces in contact,
- supporting the concept of operations,
- synchronizing and converging FS (lethal and nonlethal) across all domains,
- sustaining and protecting the FS system (FM 3-09, p. 20).

The four functions of artillery are the basic requirements of the FS system must fulfill to complete the main tasks (destroy, neutralize, or suppress the enemy). Comprehension functions and tasks of FA is indispensable for planning, rehearsals, and assessment of the overall conduct of the FS system. The basic FS functions describe what FS must do. They are used as screening criteria during FS planning, rehearsals, and assessment of the overall conduct of the FS system.

Artillery as land-based Indirect Fire System (IFS) units are always subordinated in the Land Component Command. They are characterized by a very flexible organization in order to be able to deploy and operate in a highly centralized or decentralized manner. As a result of this flexible structure, land-based FS units are able to perform efficiently in a complex operational environment. The main characteristics are its 24/7,¹ all-weather capability to acquire ground targets and achieve effects over a wide area and in-depth. It should be able to deliver guided or unguided munitions in order to strike point or area targets (AARTYP-5, p. 25). All these factors make FA an important component of JFS. Appropriate use of artillery will help to create conditions that provide the supported commander freedom of action.

3. The role and place of Joint Fire Support in operation

In NATO nomenclature, Joint Fire Support (JFS) is defined as the coordinated and integrated employment of land-, air- and naval fire support platforms delivering 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. Depending on national doctrine, the Joint Fire Support Element (JFSE) could either encompass influence elements as, e.g. PSY-OPS, CIMIC, EW, or be incorporated in a wider cell dealing with overall influence activities (AARTYP-5, p. 22). In US nomenclature, JFS is explained as joint fires that assist air, land, maritime, space, cyberspace, and special operations forces to move, maneuver, and control territory, airspace, space, cyberspace, the electromagnetic spectrum (EMS), and key waters and to influence populations. Providing the supported commander freedom of action is an essential task ensured by JFS. Coordinated interaction of all of the elements of the fire support system, thorough and continuous planning, aggressive coordination, and vigorous execution are required to provide JFS. The joint force commander (JFC) is responsible for all aspects of JFS planning, prioritization, coordination, execution, and assessment. With the assistance of their staff, the JFC and component commanders integrate and synchronize JFS in time, space, and purpose to increase the effectiveness of the joint force (Joint Publication 3-09, p. 9). JFS is the coordinated and integrated employment of all weapon platforms delivering 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, including field artillery fire and effects, to influence the adversary forces, installations, or warfighting functions (Rubaj, 2011, p. 165).

Joint operations are military actions conducted by joint forces and those Service forces employed in specified command relationships with each other, which of themselves do not establish joint forces. A joint force is one composed of significant elements, assigned or attached, of two or more Military Departments operating under a single JFC (Joint Publication 3-0, p. 11). In the planning of joint operations, the aim is to obtain a multifaceted and multifactorial military advantage, including, in particular, technological and information

¹ Ability to function 24 hours a day and 7 days a week without interruption.

advantage. Combined operations are conducted in five dimensions, i.e. on land, in water, in the air, in space and cyberspace (*DD-3.30*, p. 9). By Analyzing the country as a system, all strategic entities can be broken down into five component parts. The most crucial element of the system, the innermost ring, is leadership. The importance of subsequent elements (organic essentials, infrastructure, population, and fielded forces) decreases with the distance from the center of the diagram. Within each ring exists a center of gravity (COG) or collection of COGs that represents “the hub of all power and movement” for that particular ring. If destroyed or neutralized, the ring’s effective functioning ceases, which will impact the entire system in more or less important ways, depending upon whether it is an inner or outer ring (Fadok et al., 1995 pp. 31-32). Dimensions of combat and their impact on the functional elements of the state are presented in Figure 2.

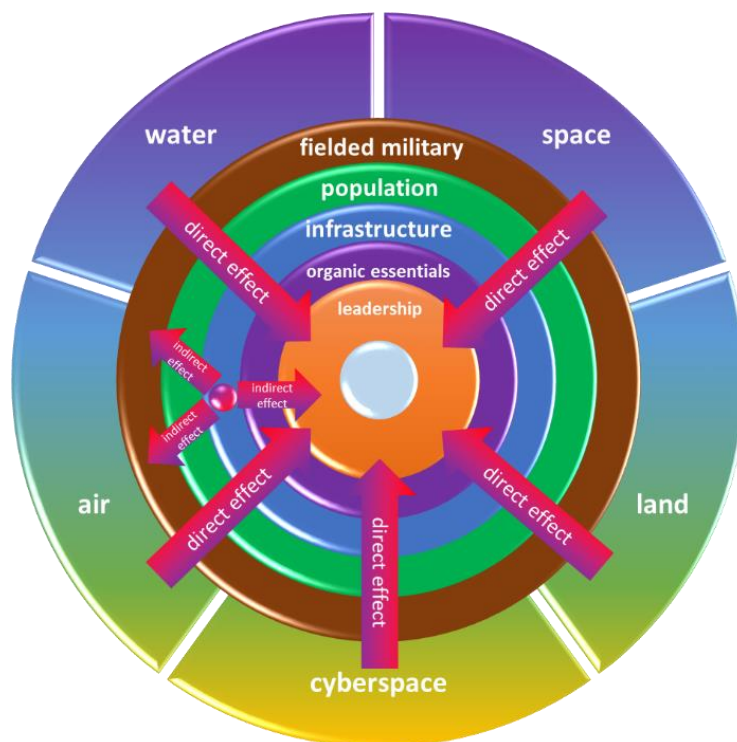


Figure 2. The model of the five dimensions of combat and their impact on the functional elements of the state (Own work, based on Warden III J.A. (1995), pp. 46-49 and *DD-3.30* (2017), p. 9).

Every state and every military organization will have a specific set of COG or vulnerabilities. However, the five dimensions model is a good starting point. Detailed questions to ask and suggestions for a priority for operations are indicated with the help of the model.

Activities that are related capabilities and activities grouped together to help JFCs integrate, synchronize, and direct joint operations are called joint functions. Functions common to joint operations at all levels of warfare fall within seven basic groups:

- command and control (C2),
- information,
- intelligence,
- fires,
- movement and maneuver,
- protection,
- sustainment (Joint Publication 3-0, p. 53).

Some functions, such as C2, information, and intelligence, are conducted in all operations. Others, such as fires, apply as the JFC's mission requires. A number of subordinate tasks, missions, and related capabilities help state each function, and some could apply to more than one joint function.

Artillery is mainly used to provide fires. To employ fires is to use available weapons and other systems to create a specific effect on a target. JF are those delivered during the employment of forces from two or more components in coordinated action to produce desired results in support of a common objective (Joint Publication 3-0, p. 83). JF planning is based on the Operations Planning Process (OPP), an analytical planning process applying the "top down principle". It is oriented towards the intended conduct of operations of JFC. With regard to target selection, the process implies the assignment of appropriate effects based on operative and possibly strategic requirements and capabilities, as well as judicial and political restrictions (AARTYP-5, p. 22). Fires typically produce destructive effects, but various other tools and methods can be employed with little or no associated physical destruction. This function encompasses the fires associated with a number of tasks, missions, and processes, including:

- Conduct Joint Targeting. This is the process of selecting and prioritizing targets and matching the appropriate response to them, taking account of command objectives, operational requirements, and capabilities.
- Provide Joint Fire Support. This task includes JF that assist joint forces to move, maneuver, and control territory, populations, space, cyberspace, airspace, and key waters.
- Countering Air and Missile Threats. This task integrates offensive and defensive operations and capabilities to achieve and maintain the desired degree of air superiority and force protection. These operations are planned to destroy or negate enemy manned and unmanned aircraft and missiles, both before and after launch.
- Interdict Enemy Capabilities. Interdiction diverts, disrupts, delays, or destroys the enemy's military surface capabilities before they can be used effectively against friendly forces or to otherwise achieve their objectives.
- Conduct Strategic Attack. This task includes offensive action against targets—whether military, political, economic, or others specifically selected to achieve national or military strategic objectives.
- Assess the Results of Employing Fires. This task includes assessing the effectiveness and performance of fires and their contribution to the larger operation or objective (Joint Publication 3-0, pp. 82-83).

The relations of FS and JFS according to the NATO standards are shown in Figure 3.

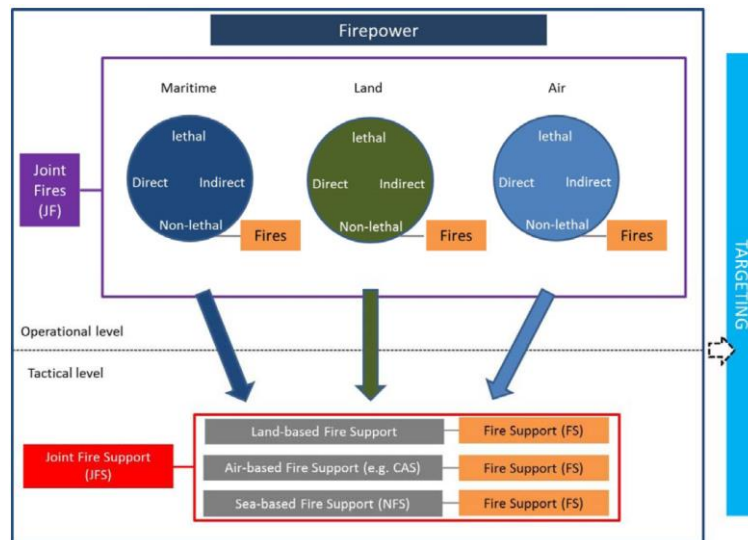


Figure 3. Firepower (AARTYP-5, 2015, p. 23).

In the context of the model of the five dimensions of combat (Figure 2), kinetic effects will be executed in four dimensions: on land, in water, in the air and in space (e.g. destroy ballistic rockets, satellites). JF is used for lethal and nonlethal purposes in a direct or indirect way. JF is provided by the maritime, air and land component. JFS is used as an overarching term to indicate the use of indirect systems for lethal or nonlethal purposes and applied by the maritime, air and land component. FS is defined as the use of indirect systems for lethal or non-lethal purposes and applied by one single component. Effectively combining firepower with movement and maneuver gives a synergic effect which is crucial for the result of operations.

4. Role and place of FA in JFS

The role of artillery as a unit of land-based IFS is to support the ground maneuver forces with indirect fires and its effects as a part of JFS. The leader of the Joint Fire Support Element (JFSE) at all levels, usually led by artillery personnel, is the Fire Support adviser of the maneuver commander and the expert to support maneuver forces with all types of fires. JFSE is the element² responsible at all levels (company, battalion, brigade, division, corps) for the overall planning, coordinating and employment of all allocated 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 (AARTYP-1, 2015, p. 19). This is crucial to execute deconflict and avoid fratricide.³ With increasingly congested airspace, risk analysis for artillery fires colliding with aircraft in a given airspace is becoming an ever-growing source of concern for mission planners, decision-makers, and commanders (Holzmann & Cochran, 2012, p. 42). The required JFS capabilities are integrated at the respective levels in the coordination elements/fire support elements. Substantial tasks of all JFSE are JFS planning, coordination and implementation, and provision of

² Due of the experience of the artillery personnel, in the most cases it is artillery led.

³ In this context, the term "fratricide" indicates the unintended killing of friendly military elements.

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 the level of force and reinforced by all necessary liaison cells as required (AARTYP-1, 2015, p. 19).

The JFSE at the Company Joint Fire Support Element (Coy-JFSE) level include:

- Coy Fire Support Officer (Coy-FSO),⁴
- Forward Observer (FO) Team,
- Forward Air Controller (FAC),⁵
- Other personnel tailored to the mission, e.g. spotter.

The JFSE at the Battalion/Battle Group Joint Fire Support Element (Bn- BG-JFSE) level include:

- Bn Fire Support Officer (Bn-FSO)
- Other personnel tailored to the mission, e.g. personnel to coordinate and/or deconflict airspace.

The JFSE at Brigade (to Corps) Joint Fire Support Element (Bde-, Div- or Corps JFSE) level are:

- Direction/Control cell,
- Artillery Cell,
- Army Aviation Cell (AHs) (if required),
- Air Forces Cell (if required),
- Navy Forces Cell (if required),
- Airspace Control and/or Coordination Cell,
- Other cells tailored to the mission, e.g. Air Defense cell or UAV cell (AARTYP-5, 2015, p. 31).

The leader of JFSE is responsible for the integration, synchronization and coordination of fire support delivered by air, maritime and land effectors, in time, space and purpose, in support of the common land operational objective. It only accentuates the fact that synchronization of JFS with the supported forces is fundamental. JFS may thus provide lethal or non-lethal effects in such a way as to have synergistic effects on land operations. Nevertheless, fire support systems provide close and deep fire support and counter battery fire. It also contributes to the suppression of enemy air defenses (SEAD). The tasks of artillery as a part of land-based IFS are based on the concept of operations and intent of the maneuver commander. These are the basis of the combat organization:

- allocation of available Fire Support assets (effectors and sensors),
- taking part in the intelligence cycle and Surveillance, Target Acquisition (STA),
- contributing to the Targeting Process,
- fire support and effects integration for planning and delivery of fires,
- Command and Control (C2) of all allocated fire support systems,
- coordinating the Joint Fire Support effects,
- liaison and cooperation with other services, branches and combined forces,
- execution of combat service support,
- force protection (AARTYP-5, 2015, pp. 25-26).

Land-based FS uses a diversity of weapon systems and munitions (guided and unguided) in order to cover the entire battlefield with indirect fire delivering a variety of effects, as determined by the maneuver commander. There are three principal types of ground-based indirect fire weapon systems. These include:

⁴ In some nations, this function is executed by the forward observer.

⁵ The function is similar to Joint Terminal Attack Controller (JTAC).

- Mortars use self-propelled, towed and man-portable equipment. In general, it is integrated into the Indirect Fire System and uses guided as well as unguided munitions.
- Tube artillery uses self-propelled and towed gun equipment and is characterized by high responsiveness, accuracy, and the capability to deliver sustained fire. An extensive selection of munitions, in combination with sophisticated target acquisition assets, permit the engagement of both point and area targets and a target effect adjusted to the tactical requirements.
- Rocket/Missile artillery uses guided or unguided munitions to strike point and area targets. Long-range munitions enable the engagement of high payoff targets throughout the depth of the battlefield. Furthermore, it can deliver a very heavy weight of fire for a short period (AARTYP-5, 2015, pp. 32-33).

Armies from different countries use various munitions for target engagement. Comparable munitions can have an effect varying from lethal to non-lethal. Ballistic data, the propelling charge system used and the performance data are of particular importance. The indirect fires munitions are divided into two different categories:

- Unguided Munitions
- (Precision) Guided Munitions ((P)GM).

Unguided Munitions follows the ballistic trajectory. Their accuracy is directly attributed to the delivery platform (e.g. Topographical, Meteorological and Ballistic data). The ability to guarantee first-round fire for effect depends on the accuracy. The accuracy of the system can be improved through registration fires, calibration or/and adjustment (AARTYP-5, 2015, p. 34). Presently, many types of (P)GM are under development or even already in production. (P)GM provide a significant increase in the range and accuracy for they have the ability to seek, find and engage (land) targets with a high degree of autonomy. (P)GM is to be divided into the following types:

- Laser Guided Projectiles (LGP),
- Terminally Homing Projectiles (THP),
- Trajectory Correctable Munitions (TCM), including Course Correcting Fuzes (CCF),
- Sensor Fuzed (Sub) Munitions (SFM),
- Loitering munitions (LM),
- Video link lock on munitions (AARTYP-1, 2015, p. 131).

The precision of Laser Guided Projectiles (LGP) is obtained by illuminating (or “painting”) the target by a laser target designator, on the ground or on an aircraft. The laser target designator sends its beam in a series of encrypted pulses so that the projectile cannot be confused by other means. By using Terminally Homing Projectiles (THP), it is possible to guide the projectile actively to the target. The THP may use a seeker to lock onto the target and guides the projectile towards the target. Some THP operate in an autonomous -seeking mode that can recognize targets and discriminate targets among decoys and burning targets/devices. Trajectory Correctable Munitions (TCM), including Course Correcting Fuzes (CCF), is in the near future to be considered as a modular 155mm projectile that can carry different kinds of payload. The precision of these projectiles is gained by the combination of a guidance system based on GPS and an Inertial Navigation System (INS) and the use of canards and/or thrusters to make corrections during the flight possible. The location of the target is set to the GPS. The guidance system is mounted into the projectile. A new development is the Course Correcting Fuze (CCF). The guidance and steering mechanism is built into the fuze. By adding this kind of fuze onto a “dumb” projectile, it is possible to create a TCM. Sensor Fuzed (Sub) Munitions (SFM) provide cannon artillery with the capability to effectively deliver effects to threats ranging from light armored targets up to main battle tanks. SFSM consists of a thin wall carrier shell (cargo shell), a base, a submunition expul-

sion charge and the sensor fuzed submunitions. Precision is gained through the submunitions. The systematic search of the target area and the intelligent evaluation of sensor signals, in combination with a high penetration performance of the Explosively Forged Penetrator (EFP) make it possible to detect and destroy (effect) individual (pinpoint) targets in the target area. It is important to know that the SFSM carrier shell is still a “dumb” one at this stage. For having the desired effect on the target, it is still necessary to bring the SFSM carrier shell as close and precise as possible above the target. For this reason, developments are going on to carry the submunitions into a TCM cargo shell. Loitering Munition (LM) is able to stay in position over a target and to be reassigned a target in flight. During the attack phase, the target can be aborted with the munition returning to the loitering mode. These munitions can be delivered by a wide range of platforms, e.g. rocket launcher, plane or ship. Video link lock on munitions are a glide or self-propelled non-line-of-sight precision strike munition using video for targeting or feature/object recognition and locked on target by operator control. The operator, on receiving the video data, arms the air vehicle to engage the target, which delivers its onboard explosive payload with precision onto the target, causing minimal collateral damage. It is possible to abort a mission if the situation changes after launch or safely destroy it without inflicting casualties or collateral damage to property (AARTYP-1, 2015, pp. 131-132).

The coordination, integration and synchronization employment of land-, air- and naval fire support platforms are crucial to conducting operations. Different platforms are naturally designated to conduct miscellaneous tasks or operations. JFS requires an appropriate employ all of the support platforms (maritime, land and air). The possibility of maintaining support in 24/7 and in all-weather capability is a great advantage of artillery as a component of JFS. FA is able to acquire ground targets and achieve effects over a wide area and in-depth. Moreover, the wide range of munitions enables artillery to conduct lethal and non-lethal tasks.

5. Selected elements of JFS planning

Commanders at all levels have to understand battlespace management and how the doctrine applies to them and at levels above and below them to employ JFS effectively. Clarity and honesty are paramount in applying fire-support coordination measures as with command relationships (Alsworth & Tidmarsh, 2018, p. 53).

The Land Component Command (LCC) provides operations planning based on instructions/orders from the Joint Forces Command as directed by the chief of mission LCC. The result of this planning process is implemented in the Concept of Operations (CONOPS), the Operation Plan (OPLAN) or Operations Order (OPORD) in coordination with other Component Commands, including required coordinating instructions. For the future JFS planning process, it is essential that initial outlines, particularly for the decision-making authorities, are already included, i.e. which level may decide on delivery systems employment dependent on the situation, mission, intensity, available delivery systems, and Collateral Damage Estimate (CDE) Level. A meaningful contribution to the maneuver commander's combat power is represented by JFS. It is important to have a concept of JFS that is synchronized with and supports the maneuver commander's concept of operations. The JFS planning, coordination, and synchronization are paramount to optimize the use of all JFS assets delivering lethal or non-lethal effects. Although the concept shall be drafted by the JFS staff, the commander is ultimately responsible for ensuring that the application of JFS is synchronized with the other elements of his force. The JFS planning, coordination, and synchronization

ensure that all available FS assets are employed in accordance with the commander's CONOPS. The JFSE chief at all appropriate levels is the primary staff officer responsible for the development, integration and synchronization of all FS assets into the concept of FS (AARTYP-5, 2015, pp. 35-36). The commander's intent and priorities for the FS are described in CONOPS. The JFS plan should guide this concept of FS. The intent for JFS is the maneuver commander's declaration of what the FS assets must accomplish. JFS Priorities are the commander's guidance prioritizes the targeting effort, and clarifies the expected availability of FS assets. The commander frequently delegates authority for drafting the concept of FS and the planning and execution of FS for the operation to the JFSE (AARTYP-5, 2015, p. 36).

After CONOPS has been formalized by G3/J3 in cooperation with G2/J2, the JFSE will then finalize the Concept of Joint Fire Support. In order to plan effective employment of FS assets, the Fire Support Officer (FSO) will rely on the following principles:

- early involvement of all liaison and command elements deployed within the scope of the JFSE (e.g. TACP Air Liaison Officer [ALO]) in order to guarantee integrated and effective planning of non-land organic FS assets,
- early and continuous planning (in order to effectively integrate FS with the scheme of maneuver),
- the exploitation of all target acquisition assets (from own, higher and adjacent echelon),
- effective employment of FS assets and capabilities (lethal/non-lethal, lowest suitable assets capable of achieving required effects [economy of forces], integration of all restraints),
- air, naval and land coordination in order to minimize the risk of fratricide/collateral damage by deconflicting the use of the three-dimensional battlespace,
- rapid and proactive coordination in order to support the battle effectively,
- establishing coordinating measures as Fire Support Coordination Measures (FSCM) or requesting other measures as Airspace Control Means (ACM) in order to speed up the target engagement process while safeguarding friendly forces,
- flexibility in order to facilitate future operations, e.g. contingency, sequel, branch, on order plan (AARTYP-5, 2015, p. 36).

Drafting has to be initiated as soon as possible, and it may be necessary to issue incomplete orders to start time-critical actions quickly. Most often, this will be to move FS assets and redistribute ammunition.

6. Summary

This work has tried to outline the role and place of artillery in JFS. FA is one of the platforms employed to conduct JFS. The main functions of artillery in FS include support forces in contacting, supporting the concept of operations, synchronizing and converging FS (lethal and nonlethal) across all domains, sustaining and protecting the FS system. The four functions of artillery are the basic requirements the FS system must fulfill to complete the main tasks (destroy, neutralize, or suppress the enemy). Understanding the functions and tasks of FA is essential for planning, rehearsals, and assessment of the overall conduct of the FS system. Artillery is characterized by a flexible organization in order to be able to deploy and operate in a highly centralized or decentralized manner. FA units are able to perform efficiently in a complex operational environment. The main characteristics are its 24/7, all-weather capability to acquire ground targets and achieve in-depth effects over a wide area. Artillery units are able to perform efficiently in a complex operational environment. FS exe-

cuted by artillery will help to create conditions that provide the supported commander freedom of action. Artillery is employed to achieve joint functions, primarily fires. During JFS, the essential parts are planning, coordinating and employment of all allocated JFS assets. This is crucial to execute deconflict and avoid fratricide. Commanders at all levels must understand battlespace management and how the doctrine applies to them, and at levels above and below to effectively employ JFS. JSF planning as a crucial element has to be adaptable to integrate lethal and non-lethal capabilities from the outset properly. It will be helpful to focus globally disaggregated forces operating across multiple domains in the right place.

Declaration of interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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