**TOPIC 3/1**

**Engineer support aim and tasks in the FORCES‘SUPPORT system**

**MILITARY ENGINEERING (MILENG)**

**Military Engineering (MILENG)** shapes the physical operating environment regardless of component or service. Yet tactical MILENG assets are used for the accomplishment of military tasks, they are in increasing demand by civil authorities. The balance of effort between the two varies with the type and phase of operation and also the different levels of operation, Strategic, Operational and Tactical. Engineer forces invariably have utility in both areas.

**Scope of tactical military engineering**

Regardless of component or service, military engineering remains focused on shaping the physical operating environment. While shaping the operating environment, engineers also affect the living conditions of the populace, improving mobility, support removing explosive threats or developing and restoring critical urban infrastructure. While tactical engineering assets should primarily be used for the accomplishment of military tasks, they are in increasing demand by civil authorities. So Military success increasingly depends on civil support and an ability to balance between military focus and enabling operations.

Independent of national caveats or service particularities, military engineering comprises a wide spectrum of tasks, varying from combat to construction. The balance between Force support tasks and Combat support operations will depend on the campaign theme, the nature and the phase of the operation. More information can be found as to the nature of tactical operations in ATP-3.2.1. In any case, at the tactical level, there are rarely sufficient engineer resources to meet all demands. Therefore, prioritization and engineer commander advice is critical to the optimal use of these assets. Very often, tactical tasks exceed organic engineer capabilities and a centralized engineer effort is required, often complemented by civil agencies and an increasing proportion of contracted services. Co-ordinating the available assets in support of the main effort will be a key role for the JFEngr supported by engineer commanders at other levels.

**Military Engineer Roles, Tasks and Functions**

Tactical engineer activity is particular in that its impacts are rarely limited to a mission. Constructions works and utilities are executed at the tactical level but are almost always utilized by a whole joint force and often by the local populace. In the framework of military tactical operations conducted by NATO, relations between Alliance MILENG forces and civilian authorities, populations, organizations and agencies are complex. This is due to the nature of military operations, often taking place in underdeveloped or failed states, where civil engineering capabilities are dysfunctional or ineffective. Because of this complexity of relations and operating environment, military success increasingly depends on civil support and an ability to balance between military focus and enabling operations.

The full range of MILENG skills covers field engineering, construction, environmental protection, geomatics, protective works, military search, support removing and management of the explosive threat (including but not limited to countering improvised explosive devices (C-IED) and explosive ordnance disposal (EOD1)). Independent of national caveats or service particularities, MILENG comprises a wide spectrum of tasks, varying from combat to construction and specialist support. The proportion of engineer effort will largely depend on the commander’s intent and concept of operations as well as changes in the operating environment. More information can be found as to the nature of tactical operations in ATP-3.2.1, since land tactical doctrine is applicable to most tactical manoeuvres.

**Tactical Tasks and Combat Functions**

Traditional Roles of Military Engineers in terms of mobility, counter mobility, survivability and general engineer support which categorize engineer activities, remains valid. Since Joint doctrine establishes that “although tactical-level MILENG is most intimately concerned with shaping the terrain, the benefits do not accrue solely to the land component”, Joint Functions can also be used as a frame of reference. The next paragraphs attempt to use traditional description of MILENG activities and situate them with Joint functions. All tasks, capabilities and techniques described in this publication play either a leading or a supporting role to one of the functions. The figure below expands in more detail on the MILENG Task Framework. It is important to note that this framework is used solely to support conceptual understanding and is by no means restrictive. As the nature of military operations evolve, it is common to consider tasks traditionally nested in a specific combat function for a completely different one. A rigid application of the categorization proposed here could defeat the purpose of explaining the versatility and reach of engineer tasks. For example, managing explosive threats could be perceived as both under force protection or manoeuver, depending on the purpose of the task. What is important to understand is what these tasks are and how they relate to Joint Functions by shaping the terrain. As depicted in the framework below, engineer tasks support all Joint Functions but generally emphasize more on three functions; **Manoeuver and Fires**, **Force Protection** and **Sustainability**. This is due to the nature of MILENG, applied to shape the physical aspects of the battlefield, which affects more directly these three functions.

**Engineer Roles**

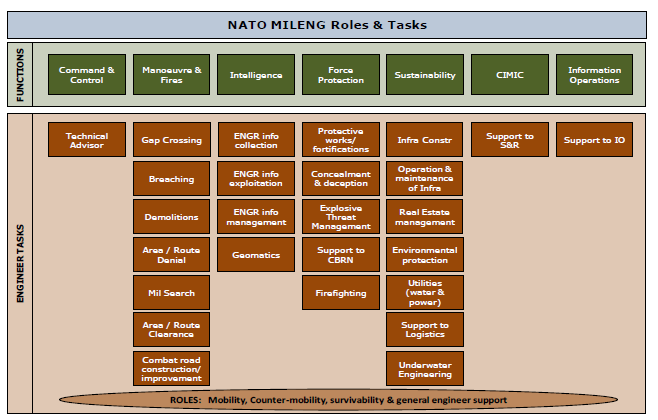
As mentioned above, the traditional roles of the military engineer have focused upon the advice and provision of:

* Mobility Support.
* Counter-mobility Support.
* Survivability Support.
* General Engineer Support.

This paradigm of MILENG capabilities is still valid to this day as the physics of military operations remain. However, the implications of each element of engineer these capabilities were based on Combat operations, and less so for security, peace support and PME, as these functions have significantly changed the functions of MILENG within the old role of General Engineer support needed to be redefined to be more inclusive of existing campaign themes such as Force support and Combat support functions as such it becomes very difficult at times to categorize MILENG tasks. What was easily identifiable as mobility or a survivability task in the past can now fit in others as well. An example of the management of explosive threat, MILENG support to as the clearance and disposal of explosive ordnance (both manufactured and improvised).

These tasks can be accomplished as a mobility task if it involves Freedom Of Movement (FOM), as a survivability task if confined to friendly forces’ lodgments, or general engineer support if it concerns DDR3 tasks or support to logistics storage of ammunition. This reality also affects the military structure of different nations in the Alliance where classification of roles and capabilities may differ according to specialties and components. Despite the complexity of MLENG tasks in the contemporary operational environment, using this paradigm of capabilities remains useful as a central point of reference and in understanding and developing MILENG concepts, capabilities and doctrine. Therefore, the descriptions of each roles and associated tasks below should not be considered restrictive and exclusive.

This description of broad engineer activities remains enduring and will now be considered in greater detail. The priority previously accorded to intimate organic engineer support to fighting echelons (Close Support) has been reassessed by many NATO nations, taking into account the changed operating environment already described, resulting in an enhanced General Engineer Support capability for some. It is an area which may involve a greater degree of cross-component support and the engineer tasks will usually be more enduring, relying more on purpose designed and built solutions. It is likely to fulfill a longer-term, operational requirement which encapsulates the diversity and scope of tasks undertaken in support of all three services, not just the Land component.

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**Figure 1 : Framework of MILENG Roles and Tasks**

**MILITARY ENGINEER SUPPORT TO JOINT FUNCTIONS**

Independent of component or service, tactical units often conduct their missions and tasks in a land-based environment. As such, this chapter adapts a large portion of the content of AJP-3.2 Allied Joint Doctrine for the Conduct of rations, and its subset; ATP-3.2.1 Allied Land Tactics, in an attempt to harmonize with the parameters set in AJP-3.12. Due to the nature of MILENG - often remaining “joint” in scope even at the tactical level – tactical operations are addressed here with the aim of being as general and inclusive as possible and as detailed as necessary. The purpose therefore is to describe in general terms the tasks assigned to the Military engineers within the Joint functions. It is not intended to be prescriptive or detailed but rather act as a guide to help correlate the traditional roles with the now established joint tasks. Nor are the tasks listed under the respective functions intended to be a hierarchal list as with all engineer tasks they are conducted across the entire spectrum of operations and functions dependent upon the environment and tactical plan.

**Command and Control**

Effective C2 is key to the success of MILENG components in support of operations. Although invariably in support of combined arms operations, specialty imperatives demand a certain degree of technical authority. This reality does not suggest that the Engr technical network is in fact another command authority; there is only one chain of command. However, the credibility and capability of Engrs rests largely on their expertise in often highly specialized fields. Sometimes, technical requirements will impact on the Commander’s plan and Engr advisors have to develop the art of balancing specialty expertise with the higher commander’s intent. The nature of MILENG makes them more effective when their effort can be prioritized, their command and planning centralized and their execution de-centralized.

**Technical Advisor**

In addition to his responsibilities to the tactical commander, every engineer commander is linked to an engineer technical authority or “technical network”. It is not a chain of command, but is a channel of engineer coordination and technical expertise. It exists to ensure the most economical employment of engineers and engineer resources. It enables the Engr advisor to coordinate engineer support across all components. It is thus essential that engineer units and sub-units supporting joint and combined formations retain the ability to communicate with the appropriate engineer commanders.

Elements of the plan for the employment of engineers will interact with many other aspects of the operational plan. It is essential that the engineer commander ensures that all such aspects are fully coordinated with other arms/branches. The TFEngr/Chief Engr provides advice to the commander the staff, and to the commanders of subordinate units, to include EOD, CBRN, and infrastructure on all MILENG related subjects, including:

* Integration of engineer plans into combined arms/branches operations plans.
* Planning of engineer employment within the formation.
* Coordination of all engineer work within formation boundaries.

**Manoeuvre and Fires**

Manoeuvre and Fires is the employment of forces on the battlefield through movement in combination with fire or fire potential to achieve a position of advantage in respect to the enemy in order to accomplish a mission. Within the MILENG context this provides the force the means to move live and fight on the battle field through the application of engineer resources to enable kinetic forces to achieve the advantage over their adversaries.

The main purpose of Manoeuvre and Fires is as an offensive activity in most cases to defeat an adversant by imposing will through the threat and the use of violence. Subsidiary purposes are: pre-emption to gain the initiative disruption of adversant offensive action; deception or diversion from the main effort; seizing ground; and fixing the adversant as an economy of force operation. The attacker seeks to create the conditions for freedom of movement and manoeuvre, shatter the adversant’s cohesion, and defeats his forces selectively, thus creating and sustaining momentum.

A range of engineer activities will be required to support Manoeuvre. Mobility is vital to achieving success in offensive operations and therefore engineer support will be central in maintaining the speed and momentum of an attack. In this way, the joint force commander can seize the initiative and achieve surprise by his selection of the timing and direction of attack. Counter-mobility tasks, particularly flank protection, the fixing of adversant counter-attacks forces and the closure of adversant withdrawal routes, are also important. Engineers will be required to support attacking forces by any or all of the following actions:

* Breaching, marking or opening our own, as well as adversant minefields.
* Providing the means of crossing rivers or other obstacles.
* Securing the flanks by means of minefields, demolitions and other obstacles. These also help to shape and structure the battlefield and may allow commanders to use economy of force measures for force protection.
* Preparing and maintaining routes for follow-up echelons.
* Supporting the consolidation on the objective by digging, laying minefields and creating obstacles.

**GAP CROSSING**

Any obstacle can be overcome given sufficient resources and time. However, in an attack, the combined arms/branches commander must attempt to force his way to the other side of the obstacle before the adversant can fully organize defensive preparations. At first, leading elements will determine the extent of the obstacle and seek a bypass. If there is no bypass, the tactical commander will attempt a hasty crossing of the obstacle, without loss of momentum, using the resources immediately available to him. He should have assault bridging and breaching resources grouped with the force in anticipation of the minor obstacles, which he can expect to encounter during his advance.

If an obstacle cannot be overcome with the integral resources available to the force in place, a deliberate crossing operation will have to be carried out which requires new orders, bringing up additional breaching and/or crossing resources, and the employment of specific breaching and/or crossing procedures. Water crossing procedures for example are contained in STANAG 2395 – Deliberate Water Crossing procedures.

Crossing operations may be carried out in three overlapping phases:

* Assault, to gain a lodgement on the far side of the obstacle. This phase is not required for an unopposed crossing.
* Build-up, to extend the lodgement into a bridgehead.
* Consolidation, to establish a firm base within the bridgehead from which to break out and continue the overall operation.

**Short Gap Crossing.** Preparation for the crossing of short gaps must be preceded by map and terrain analysis as well as air and ground reconnaissance to determine gap locations, widths and the grouping of engineer resources to support manoeuvre units. Short gaps are normally crossed from the march by combat units employing organic engineer support or using expedient means. Armored engineers employing fascines, vehicle-launched bridges and armored engineer vehicles will be the likely means of crossing short gaps. Vehiclelaunched bridges will normally remain in place to be crossed by follow-on elements and some logistics, and eventually be replaced by support bridging. In addition to the preparation of crossing sites, engineers will also mark the immediate approaches and exits in accordance with STANAG 2036.

**Deliberate Water Crossing Procedures.** Water crossing operations will be conducted in accordance with STANAG 2395. In short, when a water obstacle cannot be crossed from the march, using existing bridges, fording, swimming or on-hand bridging resources, and the assaulting force is in contact with the adversant, a deliberate crossing operation will have to be carried out. The crossing may be conducted in three overlapping phases: assault, buildup and consolidation. Two main forces may be involved: a bridgehead force and a break-out force. The critical functions of a water crossing are: security, movement control, terrain control and crossing support.

**BREACHING**

Breaching may be conducted as a hasty or deliberate operation, by hand, mechanical or explosive means, or using a combination of means. Once lanes are established they are marked in accordance with STANAG 2036.

* **Hasty Breach**. An attacking force will attempt to breach from the march using breaching resources within the force. Very little reorganisation of the assault echelon is required and SOPs may be developed for breaching to commence with little or no additional orders being given. Engineer support will come from resources on hand. The scope of engineer support can include reconnaissance, provision of advice, and the breaching, proving, marking and maintenance of lanes.
* **Deliberate Breach.** If a breach cannot be conducted from the march or if the obstacle is too complex to be crossed using the resources on hand, deliberate breaching will be attempted. The resultant loss of momentum has to be accepted, as more time is required for reconnaissance, planning and the build-up of necessary resources. Engineer support to the deliberate breach is extensive. Timely and accurate intelligence is required to determine the extent and composition of the Explosive threat , and hence the structure of the breaching force. This force normally consists of infantry, armour, engineers, indirect fire support and close air support (CAS). Engineer support to a deliberate breach is likely to include the following:
* Detailed reconnaissance of the minefield to determine locations of mine rows and types of mines.
* Provision of engineer advice to commanders.
* Provision of special engineer equipment and personnel to assist in the conduct of the breach.
* Proving, marking and maintenance of lanes.

**Minefield Breaching.** Minefield breaching will invariably be part of a combined arms/branches operation. In many instances, the minefield will be merely one of a series of obstacles to be breached; the overall obstacle, in this instance, is described as “complex”, thereby posing a considerable challenge to engineers. Increasingly such breaching may take place in an urban setting, reflecting the realities of the contemporary operating environment.

* **Reconnaissance.** The task of determining the boundaries of a minefield is an all arms/branches responsibility. The physical reconnaissance within a minefield is an engineer responsibility.
* **Locating Minefields.** Modern reconnaissance and surveillance techniques as well as information obtained from maps, terrain analysis and/or other sources enable a commander to determine likely mined areas. The use of all arms/branches reconnaissance, supplemented by engineer reconnaissance well forward, will provide timely advice on minefield locations thus allowing a commander to adjust the deployment of his force and position breaching equipment so that it can be used quickly. It is essential that planning and preparations commence before the obstacle is reached.
* **Minefield Composition.** It may not always be necessary to determine the exact composition of a minefield, particularly if a combination of explosive breaching and other methods is used. However, if a deliberate operation is to be conducted, it is advantageous to determine the composition of a minefield prior to breaching. As a minimum, the width, depth and details of adversant weapons covering the minefield are essential.

**DEMOLITIONS**

Demolition is defined as the destruction of structures, facilities, or materiel by the use of fire, water, explosives, mechanical or other destructive means. Explosive demolitions are used for both destructive and constructive purposes, including:

* Clearing obstacles or obstructions and destroying fortifications;
* Impeding the opposing force movement by destroying bridges, cratering roads and airfields, and creating other obstacles such as blowdown in defiles or rubbling of structures in built-up areas
* Battlefield munitions and UXO disposal/clearance;
* Denying areas, facilities, equipment and supplies to the opposing force;
* Preparing sites for general construction work; and
* Quarry operations.

**Control of Demolitions.** It is the responsibility of the all arms/branches commander to control what is to be fired and when for preliminary or tactical targets. However for operational or strategic targets the JF Commander retains control. For this purpose, a system for the control of demolitions is essential; this is set out in STANAG 2017. For obstacles of particular importance, the tactical commander/JF Comd may impose the requirement for guards e.g. for reserved demolitions or other obstacles, or impose restrictions concerning the firing of demolitions and the employment of scatterable mines.

**Responsibilities.** Simple demolition tasks are those that all arms soldiers (understanding that not all NATO forces are the same) in general shall be capable of completing are;

* using the Bangalore torpedo;
* using explosives to assist digging in;
* destroying vehicles and equipment; and
* destroying user blinds and misfired ammunition.

Engineers are responsible for executing the more technical demolition tasks requiring special skills, training and equipment; these tasks are usually authorized (preliminary) and controlled (reserve) at the formation level and support the formation. Preliminary demolition tasks are part of the counter mobility plan. Whereas Reserve Demolition tasks are part of the counter attack plan and although both are prepared and executed by engineers these types of demolition tasks are controlled at the highest levels.

**AREA / ROUTE DENIAL**

As NATO has a requirement to continue to denying adversary personnel and vehicles access to areas and routes this task remains valid. With the introduction of the Ottawa Treaty in 199712, denying area and route access through the use of anti-personnel mines is no longer viable. Many countries have also reduced the use of anti-tank mines to impose control and or use through denial methods, which further exacerbates into a current capability gap. A controllable, mine-free barrier system that fully meets NATO’s capability and legacy requirements is still in development, however in the interim a means to satisfy the capability gap still exists. While it is still necessary to develop an Area and route denial system that delivers lethal and non-lethal effects to personnel and vehicles (including armoured vehicles), the use of sensors, effectors, humanin-the-loop command and control weapon systems along with non lethal obstacle and denial systems satisfy the requirement. These systems and measures will be employed by engineers throughout the full spectrum of operations to provide; Force Protection Support, Counter-Mobility support for both Area and Route Denial operations.

Three main engineer responsibilities for denial operations (Block,Fix,Turn and/or disrupt) are:

* **Force Protection Support**: employment of systems to protect a fixed location (base camp, key infrastructure, entry control point).
* **Area Denial**: employment of systems to support the scheme of manoeuvre by shaping or hampering the movement of the adversant and enhance the effectiveness of direct and indirect fires (area, point).
* **Route Denial**: employment of systems to support local security, and prevent adversant obstacle emplacement and their use of linear avenues of approach (border, tunnel, route).

**MILITARY SEARCH**

Military Search operations are imperative to uncovering and neutralising concealed adversaries. Friendly forces seize the initiative through offensive Military Search operations locating people, information, and material resources employed by the adversant and then acting to interdict the adversant’s ability to conduct operations. Friendly forces protect themselves and friendly populations against attack, in part, through defensive Military Search operations.

Principles of military search. As a means of both carrying the fight to the adversant and of defending friendly forces, effective Military Search operations are vital to coalition success. Therefore, the planning, coordination, and execution of effective Military Search operations are of the utmost importance to all multinational force partners. There are three levels of search which are;

* **Basic Search.** All military personnel should be prepared to conduct Basic Search incidental to performing their assigned missions and duties on a continuing basis. Basic Search does not involve a pre-planned search operation and no specific adversary threats or environmental hazards have been identified. Basic Search is inherent to force protection. All military personnel should be able and ready to conduct Basic Search.
* **Intermediate Search.** Intermediate Search is appropriate for deliberate, preplanned offensive Military Search operations when there is no specific intelligence indicating the presence of functioning explosive / hazardous devices, there is no indication of environmental hazards and a high assurance level is not required. Intermediate Search is the first level at which units form teams to conduct Military Search operations.
* **Advanced Search.** Advanced Search is appropriate for deliberate, pre-planned Military Search operations when there is specific intelligence indicating the presence of a functioning explosive / hazardous devices, there are indications of environmental hazards or a high assurance level is required.

Military Engineer participation in a specific Search operation will be dependent on the level of Search as well as the Risk Assessment and the resources available. In particular, Military Engineers will be involved in Advanced Search operations when specific explosive or environmental hazards are likely. Military Engineer assets may also be held on standby when lower level Search operations are ongoing.

**AREA CLEARANCE**

Area clearance is a mobility task, under the MILENG Support to Joint Functions manoeuvre and fires; of which some components fall under force protection. In land operations, area clearance is the detection, confirmation, identification, marking, neutralization, destruction, and removal of EO and nonexplosive obstacles in a defined area to allow a military operation to continue with reduced risk.

Area clearance is not normally conducted under fire or in adverse weather and is normally conducted during hours of daylight. Leaders and planners must strive to limit the areas requiring clearance to only those areas necessary to support military operations. When possible, areas not required for military operations and not an immediate threat to friendly forces are permanently marked and avoided. It is also not normally oriented to counter risks posed by natural disaster, such as clearance after an earthquake. Some situations where area clearance could be required, in support of operations, include;

* Airfield clearance.
* Equipment retrieval operations.
* Runway construction.
* Logistics facility construction.
* Air and seaport recovery.
* Forward air refuelling point (FARP) operations.
* Support and relief operations.

Area clearance normally focuses on EO and non-explosive obstacles clearance in a defined area to ensure the safe usage of the area by/for military units. To ensure continuity of effort, a controlling headquarters for the area clearance effort is designated and responsible for;

* Specifying the area to be cleared and the depth of clearance in tasking orders.
* Specifying the standards and guidelines for the clearance mission.
* Accrediting a unit ability to conduct clearance operations.
* Maintaining a database of cleared and uncleared areas and showing the clearance status for each area.
* Establishing and maintaining a system to monitor current clearance activities and posting clearance inspections of cleared areas.

Planning includes the requirement for the support by other military units including medical, logistics and maneuever forces for security, as well as, coordinating the support of host nation agencies, local security forces, etc. Planning for area clearance involves the risk management process and effectively guide commanders, staff and military engineers to select the preferred methods of clearance. The degree of risk influences the methods and thus the clearance rate at which areas may be cleared, with every task having its own set of complications and nuances.

Area clearance operations consist of the following three phases:

* Technical survey, including;
* Information gathering (detailed technical and topographical information of known or suspected hazardous areas).
* Reconnaissance (visual or aerial, including the use of imagery).
* Survey (defines the area in terms of size, described through measurements and azimuths).
* Clearing, including;
* Planning
* Site layout.
* Detection.
* Clearance.
* Proofing.
* Final marking.
* Report and Handover.

In the clearance phase, all obstacles and hazards from a specified area to a specified depth are removed or destroyed. However, clearance operations have residual risk after the implemented procedures. This requires management systems and clearance procedures that are appropriate, effective, efficient, and safe. These procedures need to have an internal audit mechanism to ensure that the end product is safe.

**Site layout.** A safe clearing operation includes the proper design and layout of a clearance worksite by fencing and marking hazardous areas, controlling the movement of personnel, enforcing safety distances, and providing effective medical support.

**Methods.** The clearance phase is the direct application of an asset to remove a specific threat. Based on the recognition of threat locations, leaders match the best clearance method and equipment available to counter the threat. The safe execution, highest possible effectiveness, and impacts on future operations need to be considered. Clearance procedures vary depending on the type of clearance equipment available.

**Area Clearance Elements**. Area clearance is typically a combined-arms operation executed by security and support element, command and control (C2) element, clearance element, and reinstatement elements.

* **Security and Support Element**: The mission of the security and support force is to provide security and protection of all elements and to facilitate area clearance.
* **Command and Control Element**: The C2 element integrates the activities of all the elements. It maintains communications with higher headquarters as well as reporting.
* **Clearance Element**: The clearance element has detection, identification and neutralization capabilities.
* **Reinstatement Element**: Improves the area upon completion of clearance operations in order to facilitate the use of the cleared area.

**General Considerations and Limitations**

* Area clearance utilizes similar procedures as Route Clearance and Military Search.
* Risk management measures should be continuously reviewed by the military engineer troop commander with the involvement of the tactical commander. There is always residual risk following a clearance operation; there is no 100% guarantee.
* The nature of the task site (terrain, vegetation, metallic debris) and the operating environment (threat/hazard level) influence progress.
* Handover-takeover should be supported by documentation recording all the details of the clearance and reinstatement.

**ROUTE CLEARANCE**

RC is an enabling task that can be conducted in conjunction with and in support to other mobility tasks to achieve and maintain freedom of movement. Unlike breaching, RC is not normally conducted under threat of direct or indirect fire. However, planning must take into account the threat of possible adversary surveillance and / or adversary attack. Units should conduct and coordinate RC to ensure that friendly forces retain the ability to move as the Commander dictates. Timely and accurate reporting of the effect achieved by RC operations is fundamental.

Route Clearance is defined as: the detection and if found, the confirmation, the identification, marking and neutralization, destruction or removal of explosive ordnance (EO) and non-explosive obstacles threatening a defined route to allow a military operation to continue with reduced risk.

**ROAD CONSTRUCTION / IMPROVEMENT**

Road construction and improvement is conducted as required in support of mobility operations (Manouvre) to enhance existing routes and roads or to allow access by military units to areas not serviced by the existing road network. This is conducted normally as a support activity however in operations that are humanitarian in nature, it can also be a force support task as well the engineers can augment civil agencies with the use of equipment or resources to assist those activities.

**Routes for Tactical Movement.** Despite the improved mobility of modern combat and logistic vehicles, engineer support will still be required to construct, repair, open and maintain multiple routes for tactical movement. While keeping routes clear of obstacles, is a particularly important task for land forces engineers to ensure tactical mobility and sustainment of the force therefore the need for route construction and maintenance teams will be required. Routes can be subsequently upgraded if they are to be used more extensively. As such routes and lanes must also be properly marked for friendly forces in accordance with STANAG 2036.The following are basic consideration in determining route and construction requirements;

* **Route Reconnaissance.** Reconnaissance is required to determine the availability and trafficability of routes. Existing route networks must be checked and limitations or shortfalls identified. The reconnaissance must then determine what additional routes must be provided, taking account of the resources available.
* **Routes for Combat Vehicles**. Routes primarily for use by combat vehicles are normally designed and constructed to carry limited traffic for relatively short periods. Requirements for construction will vary based on local conditions.
* **Routes for Logistic and Other Wheeled Traffic**. Routes for wheeled traffic in the forward areas are usually built to support a moderate volume of traffic. The construction effort is likely to be more extensive than for tracked combat vehicles but similar techniques will be used.

**Intelligence**

MILENG intelligence within NATO and national elements are activities that historically focused primarily on actual or potential adversaries within a specific country or region. However, the ability for NATO to act effectively with a comprehensive approach requires information and knowledge regarding the capabilities, interaction and influences of all key actors across a broad operational environment. As a result a KD approach which utilizes subject matter experts to analyze the different actors and systems in all the relevant (PMESII) domains, as well as the specific aspects of the region and operational environment, now develops a much broader and more comprehensive understanding of the engagement space. With regards to engineer specific information (intelligence gathering) the focus remains terrain based due to the nature of MILENG. The aim of this is to provide guidance on the process, from a MILENG perspective, while remaining as general as possible. For detailed information on the process, refer to the JFCBS directive, as necessary.

**ENGINEER INFO COLLECTION**

**Engineer information** is unprocessed data, which may be used in the production of intelligence and knowledge. It may come from many sources including maps, satellite imagery, reconnaissance, POWs as well as military and civilian sources. The MILENG advisor must identify information requirements to the HQ staff for inclusion in the intelligence collection plan.

Types of Engineer Information. Examples of the type of information engineers should be interested in:

* Commander’s plan (CCIRs);
* Terrain features;
* Organic engineer assets and resources;
* Adversary engineer capabilities and techniques;
* Other engineer assets available;
* Civilian engineer assets available;
* Critical infrastructure requirements;
* Local population infrastructure requirements;
* Local contracting capabilities;
* Local engineer resources.

**ENGINEER INFO EXPLOITATION**

Engineer intelligence was previously defined as the product resulting from the processing of information concerning adversant engineer operations and resources, environmental conditions, military geographic information and terrain required by a commander in the planning of combat operations.

In the current Operating Environment, Engineer Information supports both the traditional Intelligence process and the wider Knowledge Development process. It has a fundamental role in the successful planning of military operations. Engineer information may be collected and reported by all arms/branches, by intelligence gathering services as well as by dedicated engineer reconnaissance. Once reported, engineer information is collated and managed by engineer staff elements. Many items of engineer information are of interest to other arms/branches, intelligence services and agencies and the ability to exchange information within, and between, headquarters is required.

A structured sequence or process is needed to identify the information and intelligence requirements, gather the relevant information, process them into a product and disseminate them to those who need it. This need for a structured approach is satisfied by a four-stage-sequence consisting of Direction, Collection, Processing and Dissemination. The so called ”Intelligence- Cycle” is the foundation for all intelligence activity. These phases are discrete operations and they culminate in the dissemination of the required intelligence product. The integration of engineer staffs and information into this Intelligence Cycle is critical.

**ENGINEER INFO MANAGEMENT**

Engineer info management supports Knowledge Development and is very wideranging in its scope. It may encompass the operational capabilities of friendly and adversant forces, the terrain, the weather, geographic information as well as information on infrastructure, utilities and resources needed to conduct operations. It can be considered as both a product and a process that supports the following functions:

* **Force Generation.** Engineer support to Knowledge Development informs the force generation process by allowing the engineer commander to advise on and plan the optimal engineer force structures for particular operations paying regard to terrain, tasks and adversant.
* **Intelligence Preparation of the Battlefield (IPB).** The purpose of IPB is to help commanders to refine their intelligence requirements, identify decision points and to inform the Operational Planning Process. Within this process the engineer focuses on the terrain aspects of Battlefield Area Evaluation (BAE). One of the products of this analysis classifies the terrain as “GO”, “NO GO” or “SLOW GO” manoeuvre areas by assessing trafficability. Movement template times may also be developed.
* **Situational Understanding.** Engineer information adds to the overall situational understanding with particular emphasis on terrain and the capability of adversant engineers. Modern technology offers considerable benefits in ensuring engineer situational understanding information is rapidly and accurately reflected in a complete all arms/branches or joint picture.
* **Joint Targeting Process.** Engineers can contribute to the joint targeting process by input to the selection of targets, aiming points, and Battle Damage Assessment (BDA). Destroying infrastructure targets may limit the military options for an adversant or faction in the short term, but may create significant limitations for NATO in the longer term. Consequently, engineers may assist in achieving a desired effect based by denying rather than destroying targets. Engineers may also help to identify alternative targets and aiming points that create similar effects without the consequent damage and other limitations such as cost.
* **Force Protection.** Engineers can add considerably to force protection planning and implementation by examining how the adversant could exploit the terrain and what actions our own forces could take to reduce or negate potential adversant action.

**GEOMATICS**

Geospatial is the term used to describe those scientific and engineering activities involved in the capture, storage, analysis, processing, presentation, dissemination and management of geospatial information. Geomatics is the physical products produced as a result of those activities.

Geomatic/Geospatial support is essential to the conduct of modern military operations. Every weapon system, combat unit, aircraft and ship requires some form of geospatial support to deploy, navigate, manoeuvre and fight. Geospatial support includes a responsibility for updating, revising and maintaining geospatial databases, including paper maps, providing limited production capabilities, distributing geographic data including mapping and softcopy data, and other geospatial products conducting terrain analyses, providing terrain analysis teams to formations and conducting field surveys. Co-operation with the intelligence staff, engineer and reconnaissance units is necessary to both obtain and confirm data. Liaison with the appropriate staff concerning the provision of geospatial information from a host nation is also essential.

**Database management .**Geomatic/Geospatial elements provide field support to users of map background displays both in hard and soft copies. It is necessary to ensure that geospatial information is readily available, up-to-date and distributed throughout the theatre. There is a requirement for close liaison with EOD and Engineer Intelligence staff as the maintenance of mines, UXO and general engineer information related databases may also be done by the geospatial staff.

**Production.** Geospatial elements have a limited capability for the provision of graphic support to staff and production of geomatic products, including mapping. However high speed, high volume reproduction capabilities may not be available in the field, in which case they must be provided by national base-plant resources.

**Geographic information dissemination.** Geospatial elements are tasked to establish formation map supply points tied into higher formation, theatre or national networks. Responsibilities include shipping, receiving, inventory control and sourcing of geomatic data in both hard and soft copy. It does not include delivery to field units which remains a service support function.

**Terrain analysis.** The process undertaken to address specific concerns of the commander about the terrain and how it will affect the implementation of the plan. Terrain analysis consists of applying classic workflows and initiative to produce terrain analysis products using terrain databases in conjunction with other sources. It does not include information collection. The terrain analysis information provided is used by all staffs in planning operations.

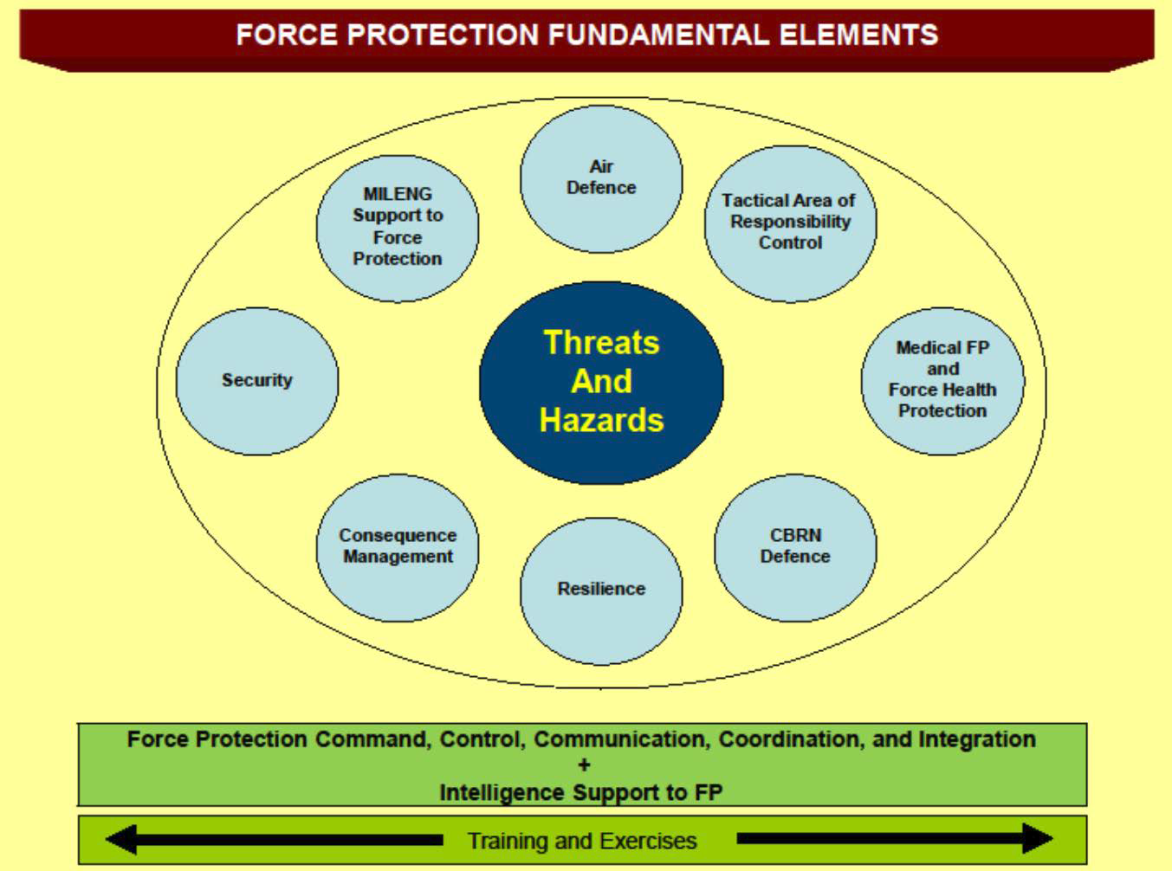
**Field survey.** Geospatial elements provide theatre level survey support to various weapon systems. They also carry out global positioning system (GPS) or terrestrial survey as required and can collect data for production of mission specific mapping either from the ground or from imagery. Other tasks can include natural obstacle locating and advice on navigation.

**Geographic imagery provision.** Although the majority of imagery is supplied from and for G2, Geospatial staffs also have access to imagery that can be used for production of image maps and graphics for the G3 element. This requires close liaison with G2 to ensure the correct prioritization/classification, as the imagery sources will often be the same.

**FORCE PROTECTION**

**Force Protection.** Measures and means to minimize the vulnerability of personnel, facilities, equipment, materiel, operations and activities from threats and hazards in order to preserve freedom of action and operational effectiveness thereby ontributing to mission success.”

**Force Protection Capabilities.** FP comprises a number of inter-related capabilities and elements, measures and disciplines, which may contribute to the overall FP function to achieve the desired objective. The contribution of these capabilities will be determined by the operational environment and the level of threat, scale of the operation, climate, civil environment, composition of the NATO led forces, availability of HN Support and the presence of International Organizations.

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**Figure 2 : NATO Force Protection Capabilities**

FP is a combination of activities of a large number of specialist areas, each with their own plan and priorities that requires an integrated and synchronized plan. MILENG Support to FP is one of these eight fundamental elements with Military Engineers that support proactively all other capabilities. MILENG has to coordinate and support various engineer efforts in order to integrate these capabilities in to a cohesive and effective set of activities and performances to FP. In AJP 3.14 MILENG Support to FP is divided into 7 sub categories:

* Protective Infrastructure,
* Fire Protection,
* Support to EOD,
* Support to C-IED activities,
* Camouflage, Concealment and Deception,
* Military Search,
* Route and Area Clearance.

Effective protection does not rely on a single technique or action but comes from a balanced combination of active and passive measures into a coherent, flexible system. This systematic approach to integrated survivability seeks first to prevent an attack. Should an attack take place, its effect should be reduced if not, nullified. If an effect is felt, the protected asset should have the robustness to maintain operational capability. Moreover flexible plans are to set up in advanced in order provide rapidly restoration of destroyed capabilities and ensure the survivability of the attacked base. It is essential that this systematic approach is applied from outside the asset and works towards it.

For the scope of this Publication, land centric, tasks described below reflect main Joint tasks accomplished by Military Engineering in support to Force Protection that require high qualifications and technical skills.

**PROTECTIVE WORKS AND (FIELD) FORTIFICATIONS / FORCE PROTECTION**

**ENGINEERING**

Generally called Protective infrastructure in the joint environment, this includes all the infrastructure, materiel, tasks and activities that contribute to FP. It encompasses professional and technical expertise for planning, designing, coordination, construction and maintenance of appropriate infrastructure, hardening facilities, perimeter security systems, bases’ surveillance system, determining stand-off distances and field fortifications that in the land environment are carried out by Engineer Branch/Task Force Engineers under FP Engineering. On this regards, national FP caveats may certainly have to be taken into consideration while designing protective works and fortifications. NATO strives to standardize expeditionary infrastructure, however it is understood that national directives may prescribe different standards.

**Flexibility.** Within any particular Operation or deployment, the level of threat faced will most probably fluctuate throughout the progress of the Operation. The protective measures employed may therefore vary considerably across the battle space as a whole and will most likely change with time. However, the construction of physical protective measures may take some time and can be costly. Therefore, they must offer flexibility and allow for subsequent changes in threat by either built-in redundancy or the ability to upgrade simply. The threat picture upon which they are based will always remain fluid and subject to a rapid change.

**Presentational factors.** The physical protective measures employed by a Force must also take into account the political and presentational impact they may have. The loss of a military capability or critical infrastructure may often have more significance impact to the overall mission in this context, than if measured purely in terms of physical value to the force.

* **Force Posture.** The protective measures adopted by a Force give a clear indication of how vulnerable it feels itself to be. Any Force Protection work must be in harmony with the Force posture the commander wishes to present. Indeed, it is likely that the Commander may wish to use the physical protective measures adopted by the Force, as a principal means by which its posture is expressed. It is therefore important to plan for both the removal and not just the installation of those measures.
* **Duration factors.** Any such construction work also gives a visible indication as to how long the Force believes it may take to create a stable and secure environment.
* **Morale.** Operational experience has repeatedly shown that Force Protection preserves both the physical and moral components of fighting power. Our Forces must have confidence in the structures and systems provided for their own protection.

**Force Protection Engineering (FPE)** is defined as “the aggregate of those engineering activities whose intended effect is the minimization of the risks to a force’s assets posed by operational threats, occupational and environmental hazards that require technical and engineering skills”. The Military Engineers, as technical experts, develop and maintain FP Engineering SOP and best practices, enabling pre-incident vulnerability analysis, post incident response and restoration capabilities.

Effective protection does not rely on a single technique or action but comes from a balanced combination of active and passive measures into a coherent, flexible system. This systematic approach to integrated survivability seeks first to prevent an attack. Should an attack take place, its effect should be reduced if not, nullified. If an effect is felt, the protected asset should have the robustness to maintain operational capability. Moreover flexible plans are to set up in advanced in order provide rapidly restoration of destroyed capabilities and ensure the survivability of the attacked base. It is essential that this systematic approach is applied from outside the asset and works towards it.

**The FPE Spectrum.** FPE manifests as a series of engineering measures undertaken in all 3 environments present in the Continuum of Operations. The engineering structures and systems themselves may be primarily intended for one specific part of the spectrum but may be of wider use.

**The FPE Model.** The FPE model is a logical process carried out and managed by Chief Engineer through the FP Engineering Cell/Officer (FPEO) in the Engineer Branch to identify, design and realize the necessary and more appropriate protective measures and related infrastructures. In relation to FP model responsibilities and inputs from MILENG are related to:

* Hazard & threat identification to minimize the vulnerabilities defined/identified;
* Risk assessment and FP task analysis to tailor the FPE intervention to the tasks identified.

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**Figure 3 : Engineer Force Protection Model**

**Force Protection Engineering Phases.** The Force Protection Engineering Model comprises the following phases with actions:

* FP Guidelines and Requirements;
* Initial FPE planning;
* FPE Planning approval;
* Recces and technical evaluation;
* Preparation of the FPE intervention;
* Execution of the FPE intervention.

**Protective works**. Engineers may augment existing structures or facilities with enhancements or protective materials to increase the protective properties or resistance to damage or attack. Although not as extensive as in the field fortifications in the defense, protective emplacements are used primarily for personnel infrastructure, unit locations and logistic concentrations. Commanders may require hardening of key command and control facilities, especially those with a detectable electronic signature. Engineers provide protective works mainly in the form of constructed barriers and screens such as:

* Chicanes or route access control points;
* Fences, screens, or bunkers surrounding a facility or vehicle, equipment or troop concentration;
* Preparation of sites for tactical air and aviation units;
* Advice/assistance with the construction of protective barriers;
* Perimeter protection systems;
* Support to CBRN Collective Protection (COLPRO).

**Field Fortifications.** The preparation of (field) fortifications is an all arms/branches responsibility. When time is short or the nature of the terrain requires special techniques, such as the use of earthmoving equipment or explosives, engineers may provide support in accordance with the commander’s priorities. Possible engineer tasks include:

* SME’s advice on the construction of field fortifications;
* Construction of command posts;
* Construction of artillery gun positions, tank scrapes and weapon pits;
* Preparation of alternate positions;
* Preparation of sites for tactical air and aviation units;
* Strengthening field fortifications and building reinforcement.

**Critical Infrastructure Protection.** Critical infrastructure should be protected against spectrum of threats. The types of protection built will depend upon the terrain and soil type as well as on the availability of existing buildings and natural cover and Host nation Support. Engineer advises the commander on the selection of the most suitable measures to protect both military and host nation critical infrastructure.

**CONCEALMENT, DECEPTION AND CAMOUFLAGE**

Although camouflage and concealment is and all arms task one of the main engineer survivability tasks associated with force protection is “Assistance with camouflage, concealment and deception.” This includes the MILENG Expertise in planning, designing, construction and maintenance of concealment and deception in support to tactical Commanders Measures taken by engineers might include the construction of fighting positions, the installation of dummy equipment and the emplacement of phoney minefields to support formation and unit deception plans.

**Camouflage and Concealment.** In general, all units are responsible for their own concealment and local camouflage. Major positions, facilities, and operational sites, may, however, require special camouflage stores and measures. The tactical commander may then require engineers to undertake such tasks, as advised by his engineer commander. Efforts must be made to mitigate the distinctive signatures that engineer work in preparing battle positions can create. Apart from the use of camouflage nets and natural camouflage material, special camouflage measures often require the employment of engineer equipment and devices. This is especially true for large scale camouflage requirements.

**Deception.** Deception is designed deliberately to give the adversant a false and misleading picture of the true tactical and operational situation thus conferring potential benefit to own forces. Deception measures often include camouflage, although construction work should expend as little time and materiel as possible. It is an engineer responsibility to provide advice on deception to the all arms/branches commander.

* Deception must always be coordinated at the highest practical level and with all the units involved.
* Special engineer deception measures can include construction of dummy positions, phoney obstacles, including minefields, decoys and the simulated employment of construction equipment. For the construction of dummy positions and decoys, camouflage and deception material will be used and engineer equipment may be employed to excavate soil. Damaged or captured materiel can also be used to create deception. Dummy positions and decoys must be carefully planned and coordinated within the framework of the tactical plan and genuine positions.

**EXPLOSIVE THREAT MANAGEMENT**

Explosive Threat Management is the MILENG task dealing with Explosive Threats. It manages the three MILENG tasks involved in and supporting countering explosive threats: Military Search, Explosive Ordnance Disposal and Support to Intelligence. Explosive Threat Management is a force protection task that is not exclusively for Engineers. Not only because some countries consider EOD not as an engineering task, but also because it involves other branches like Technical Exploitation or C-IED.

**Threats**

* Improvised Explosive Devices (IEDs),
* Unexploded Explosive Ordnance (UXOs, including mines),
* Abandoned Explosive Devices (AXOs),
* CBRN Explosive Ordnance (CBRN EO, including Toxic Industrial Materials (TIM) and Petrol/Oil/Lubricants (POL))

**IEDs** are devices placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals and designed to destroy, incapacitate, harass or distract. IEDs may incorporate military stores, but are normally devised from non-military components.

**UXOs** are all munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. Mines are explosive munitions designed to be placed under, on or near the ground or other surface area and to be actuated by the presence, proximity or contact of a person, land vehicle, aircraft or boat, including landing craft. Mines are considered military stores and come in two types: anti-vehicle and anti-personnel. Although anti-personnel mines are prohibited by the OTTAWA treaty which is signed by many countries, they still are a common threat all over the world.

**AXOs** are abandoned ammunitions, ammunition that has not seen a weapon system and is abandoned in the terrain or in storage.

**CBRN EO** is an explosive device containing a CBRN element. Although a CBRN element is normally not explosive by itself, it can be so due to an external threat, such as fire or a detonation, and then even may cause a disaster.

Military Engineers are responsible for the provision of awareness training to all personnel on mines and other explosive threats.

**Explosive Threat Manager:** This is normally the role for the principal EOD Staff Officer of the Joint Force. The Explosive Threat Manager is the Subject Matter Expert and coordinates all tasks related to the Explosive Threat. He operates the Multi National EOD Coordination Cell (MNEODCC). He reports directly to the Joint Force Engineer and to the (MN/CJ)EODC(C) of the higher command. The JF Engineer is the principal MILENG advisor of the JF Commander and has the coordinating and technical authority over the employment of all MILENG assets throughout the Joint Force. As there are rarely sufficient MILENG recourses to meet all demands, coordinating and task-organizing available MILENG assets in support of Explosive Threat Management is an essential role for the JF Engineer, in which the Explosive Threat Manager is his principal advisor and SME.

**Military Search** is executed by military engineers and/or EOD units and is used to find explosive threats when executing Breaching and/or Area/Route Clearance tasks.

**Explosive Ordnance Disposal (EOD)** is the final detection, identification, on site evaluation, render safe and final disposal of an Unexploded Explosive Ordnance. EOD teams can be tasked for the following:

* **Explosive Ordnance Reconnaissance (EOR).** EOR is the investigation, detection, location, marking, initial identification, confirmation and reporting of suspected unexploded explosive ordnance in order to determine further action. EOR can also be executed by specially trained Engineers and SOF demspec operators.
* **Explosive Ordnance Clearance (EOC)** EOC concerns all measures and procedures to be executed to clear an actual Explosive Ordnance. EOC includes assistance to an airplane or helicopter crash or recovery. EOC is divided in three sub-categories:
* *Conventional Munitions Disposal (CMD).* CMD is the approach, identification, securing and disposal of conventional explosive threats. A conventional explosive is a complete device charged with explosives, propellants, pyrotechnics, initiating composition but without chemical, biological, radiological or nuclear material, for use in military operations, including demolitions. Conventional munitions who have failed to explode (UXOs) or obsolete stored munitions (AXOs) pose a major danger potential for the allied forces and public safety, also because they can easily be used in IEDs.
* *IED Disposal (IEDD)*. IEDD concerns specific methods, tools and procedures in order to render safe, recover or final disposal of an IED.
* *Chemical, Biological, Radiological and Nuclear Explosive Ordnance Disposal (CBRN EOD)*. CBRN EOD is no different from CMD or IEDD, only the involvement of CBRN elements makes it a bigger threat, in which CBRN expertise will be needed in order to mitigate the risks and recover the actual CBRN element after the device is rendered safe. Especially when final disposal is needed, those CBRN expertise is essential to avoid a disaster.

**Support to Intelligence** builds understanding of all aspects concerning the physical operational environment. Explosive Threats are a fundamental risk for the JF in that physical operating environment. The MILENG Support to Intelligence task directs the information requirements, collects all information, processes it to be used in planning processes and procedures, and disseminates it to all relevant users. Support to Intelligence builds the Explosive Threat database and is operated in the environment cell of the Joint Force.

**Explosive Ordnance Disposal**

Those are tasks related to minimizing the threat posed by all kinds of explosive devices, both manufactured and improvised, to friendly forces. This includes all actions from providing advice and engineer intelligence to deliberate actions such as disposal, search and explosive ordnance clearance. Note that this task is not exclusively executed as a force protection task or a survivability task exclusively; it is often conducted as a mobility task when the explosive ordnance threat hinders FOM of friendly forces.

EOD involves the detection, identification, on site evaluation, rendering safe, recovery and final disposal of UXO. It may also include explosives which become hazardous by damage or deterioration. Military Engineers are responsible for the provision of awareness training to all personnel on mines and other explosives hazards. Pending on different organizations within NATO nations, EOD forces/military engineers are responsible to dispose UXO/EO that threaten friendly forces, be able to contribute to protection of personnel and materiel.

A military capability is required to dispose of unexploded ordnance whether aerially or ground delivered or placed by hand. This includes the requirement to clear booby traps and improvised explosive devices (IEDs) and also the capability to deal with Chemical, Biological, Radiological and Nuclear CBRN) threats in a CBRN environment.

It should be noted that EOD is not exclusively the responsibility of engineers and the assignment of responsibilities for dealing with an EO threat will depend on many factors such as: the type of operation; operational imperatives and directives; terrain; EOD or other asset availability; risk and EOD policy/ROE. The forces available to counter any EO threat will consist of specially trained EOD personnel augmented by, amongst others, military engineers, ammunition technical personnel and divers. Former belligerents, host nation agencies, other nations, international organisations and Non- Governmental Organisations (NGO) may also conduct EOD operations within the AO.

**Explosive Ordnance Reconnaissance (EOR)** is the focused collection of information on the EO situation in a limited area. Some nations train non-EOD personnel in the EOR role. These personnel can then execute EOR tasks assigned by the Multi National EOD Coordination Center (MNEODCC) as required. Disposal of the EO is not included in EOR.

**Explosive Ordnance Clearance** serves the purpose of reducing or eliminating the hazard posed by EO, including their disposal.

The execution of EOC missions varies considerably from nation to nation. Some assign the mission exclusively to EOD forces; whereas, others assign the mission to units with varying levels of EO knowledge and expertise. Therefore, nations must clearly state and identify their EOC capability for each specific operational scenario. This includes clear definition of the division of responsibilities between EOD forces and other force elements.

Improvised Explosive Device Disposal (IEDD) includes the location, identification, rendering safe and final disposal of IEDs.

he likelihood of facing a significant and sophisticated IED threat requires that an effective IEDD capability be embedded within the assigned EOD forces provided for each operation. IEDD should be linked to technical intelligence collection organisations.

The disposal of an IED requires specific training and equipment. National policies require compliance with special procedural and safety regulations. The coordination of operations and standby duties is of particular importance for these forces.

Disposal of Chemical, Biological, Radiological and Nuclear EO (CBRN EO) is an EOD task that requires special training according to STANAG 2143. CBRN EO may be conventionally manufactured or improvised. Once the absence of explosives has been determined the CBRN item must be dealt with by appropriately qualified CBRN-trained personnel.

CBRN EO disposal tasks require compliance with special procedural and safety regulations, necessitating coordination with other specialized forces like NBC or decontamination units, in accordance with STANAG 2609. Due to the political sensitivity of this issue, it is unlikely that EOD operators will carry this out in isolation. Support may be required from a number of diverse agencies.

**Support Missions**

* **Stockpile Disposal.** At certain stages of an operation, EOD personnel may be required to carry out or assist in the removal of ammunition and explosives from a stockpile. If the ammunition is to be recovered for future use, stockpile disposal may or may not require the use of render-safe or destruction procedures.
* **Training of Military and Civilian Personnel.** EOD forces may conduct or support Mine and UXO Awareness Training (MAT), Mine and UXO Risk Education (MRE), and community awareness training regarding EO hazards. The training may address the recognition, marking and reporting of EO, and the correct response in the case of EO detection and bomb threats.
* **Mortuary Services.** Immediate recovery and clearance of deceased persons is a priority of the Services. EOD forces may be required to assist in the recovery of remains where the presence of EO is suspected. In addition, support may be required for the exhumation of mass graves.

**Other Tasks.** EOD forces may be required to support other tasks, including:

* Mechanical mine clearing activities (e.g. “flailing systems”).
* Protection of VIPs.
* Security of events.
* Accident response (Medevac, aircraft crash recovery, mine strikes etc.) that may include removal of EO hazards, investigation and forensic evidence gathering.
* Technical support during the investigation of EO incidents.
* Support in Implementing Amnesty Programs: EOD forces assist in the collection and disposal of hazardous munitions and components as part of the CJTF commander’s force protection program, to ensure the continued safety of Military personnel.

**COUNTERING - IMPROVISED EXPLOSIVE DEVICE:**

C-IED is defined as: “The collective efforts at all levels to defeat the improvised explosive device system through attack the networks, defeat the device and prepare the force. An IED is defined as “a device placed or fabricated in an improvised manner, incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals, and designed to destroy, incapacitate, harass or distract. It may incorporate military stores, but is normally derived from nonmilitary components”. Note: Networks describe interconnected people or things, and can be identified, isolated and attacked.”

C-IED is a Commander’s responsibility at all levels and requires the coordinated effort of all staff branches. AJP-3.15(A) divides the C-IED approach into 4 pillars and underlying Areas of Activity. These are:

* Understanding and Intelligence.
* Understand.
* Attack the Networks.
* Pursue.
* Prevent.
* Defeat the Device.
* Protect.
* Prepare the Force.
* Prepare.

**SUPPORT TO CBRN**

Engineers must implement the general rules for defense against the CBRN threat which are common to all arms/branches. National engineers may have specific CBRN responsibilities allocated to them; these vary from nation to nation and are not considered further in this publication. Whatever special responsibilities are allocated to them nationally, engineers are very likely to be involved in the following tasks because of their generic capabilities and organization:

* Assistance with Survivability. With construction capabilities, engineers are well placed to advise and assist other arms/branches in the provision of field fortifications and other shelters against CBRN attack including improvised collective protection (COLPRO) against chemical attack; these measures are termed “Survive to Operate”.
* Mobility through or Around Areas Affected by CBRN Strikes. As part of their normal task of route opening and maintenance, engineers are likely to be tasked to clear routes blocked by the effects of CBRN strikes, or to open routes to by-pass.
* Decontamination. Engineers may be called upon to construct traffic circuits and facilities in a decontamination point. In some armies, they may operate the point or provide water for it. Area decontamination may also be an engineer task.
* Release Other Than Attack (ROTA) and Toxic Industrial Materials (TIM). In built up or urban areas, there is considerable potential for engineers to have to deal with the effects of ROTA and TIMH. Industrial areas, power stations and even hospitals offer a range of options for potential enemies to exploit.

**FIREFIGHTING**

**Fire Protection.** Fire Protection includes the design and construction of fire prevention and suppression systems within infrastructure. It includes the development, implementation and monitoring of a fire safety program within a camp, including training, exercises and the evaluation of the Fire protection plans adopted by the military units/bases.

**Fire Prevention.** Fire Protection Services are a key safety-related component which must be an integral part of every deployment. Within NATO this responsibility falls under different elements within various Troop contributing Nations (TCNs). However regardless of who is responsible the requirement to establish fire protection support needs to be identified within the deployed NATO force. Employment of fire fighters in a theatre of operations is outlined as essential for force protection but can easily be translated into any fire support service from a TCN. Fire can have many causes ranging from poor housekeeping discipline, inadequately designed electrical services, improper handling of fuel or as a result of an attack by adversant forces. Unless fires are quickly contained, controlled and extinguished, the resultant effects can hamper the Commander’s ability to project combat power and achieve his mission. It is the FEngr’s responsibility to advise the Commander on the proper level of fire protection and prevention services within the theatre of operations. The scope of the advice will include incorporation of fire protection requirements within the Force, selection of camp location, design of the accommodation and facilities, and even mundane TF daily routine to prevent the risk of fires due to poor housekeeping and practices.

**Sustainability**

Sustainability is the process of all activities to support or sustain the force, sometimes referred as life services but like Force protection it affects all facets or can involve all MILENG support simultaneously. To describe each facet is not deemed necessary but needs to be recognized in the planning process for sustainment activities.

**INFRASTRUCTURE**

Infrastructure requirements are normally under the national codes and standards however some important considerations for engineer planners include;

* Coordinating for a field maintenance team to support each engineer unit to ensure quick turnaround of maintenance problems.
* Coordinating closely with the logistics staff to assist in management of required construction materials. The engineer staff helps the logistics staff identifies and forecast requirements to ensure a quality control process is in place for receipt of the materials. The management of Class IV supplies for survivability and counter mobility is most efficient when there is a shared interest between the manoeuvre and engineer logisticians.
* Using expeditionary support packages or pre-prepared stocks of barrier materials.
* Coordinating closely with the theater support command or sustainment commands (expeditionary) support operations officer, the G-4, the supporting contract support brigade, and the associated LOGCAP planner to ensure that engineer requirements are properly integrated and captured in the contracting support plan and/or specifically addressed in the engineer support plan.

**Deployed Force Infrastructure**

Deployed Force Infrastructure (DFI) comprises buildings, facilities and installations required to support military forces when deployed. The DFI publication (ATP-3.12.1.4) is intended as guidance for the planning of national, coalition or multinational operations and recognizes the existence of various national standards. It includes recommended scales and standards for accommodation and essential services for expeditionary forces. DFI scales and standards are intended to mitigate the effects of climate and environment in order to preserve the health, welfare and overall operational effectiveness of an expeditionary force. It does not cover the technical specifications for standard infrastructure or designs. However, it facilitates the transfer of DFI between nations by identifying basic common standards to be used when designing and constructing camps. It should be read in concert with references DFI Publication (ATP 3.12.1.4).

**Contractor supplied services :** There are times when engineering services to deployed operations are more effectively carried out by contractors than by uniformed personnel. If the decision is made to use contractor-supplied engineering services the JFEngr would retain responsibility for the overall engineer effort, though the actual work would be done by contractors. The potential scope of contracted engineering support is large and the organisations that provide the services could include locally hired staff or contractors, NATO agencies such as NATO Support Agency (NSPA), MILENG-based contractors on SOA, or large multi-national engineering firms. The efficiency and effectiveness of the contract options need to be considered early in the planning process and a decision made as to the most cost-effective means of getting the job done. A cost-benefit analysis of different options would have to be done to compare the methods and determine the most effective approach — operationally and economically. This section will discuss some of the options and the procedures to obtain contractor-supplied engineering services.

**Scope of Work:** There are a number of areas that lend themselves to the use of contractor supplied services on deployed operations. The provision of water, sewage services, and waste collection and disposal as well as power supply and distribution are obvious. Construction and maintenance of the whole gamut of infrastructure including roads and grounds and accommodation in longer-term deployments also makes sense. At the present time there are a host of firms that would offer “cradle to grave” engineering support to deployed operations. Those services could be bundled with a complete logistics support package.

**Civilian Contract Support:** Civilian contract support includes all contract support not included as part of HNS agreements. It may be obtained from MILENG sources, other nations or in the theatre of operations. The contract support which will be required may include specialist engineer consulting services, technical translation, material and equipment procurement, and supply of engineer related services.

On deployed operations there will usually be local governments, private companies or qualified individuals available which are able to provide contracted engineering services to the TF. Their capabilities and competency of the organisations, companies or individuals will need to be critically assessed before they are hired, but they usually provide an economic approach to providing support. The contracting process will naturally involve a co-ordinated effort by the JFEngr, J4 Log, J8 Fin and Contracting, J9 CIMIC and Legal staffs. As with any contract the TF Legal Officer must review and approve before signing. There will be a cell in the TFHQ that will co-ordinate all contracts. The JFEngr, as the engineer adviser, will have to ensure that the engineering services being provided meet the needs of the TF and are being done in a competent, professional way.

Equipment support, communications information systems (support), infrastructure facilities management/ professional services and enabler support for NATO HQ (in support of the framework nation) can be provided by contractors at readiness. The best way of achieving a credible, effective contingent contractor capability, whilst minimizing cost, is to use preselected/qualified contractor(s), with high readiness capability and well trained. Regional contractors should be prioritized in order to best match with local requirements and needs. In any case HN, contractors and military effects must be synchronized and aligned.

Security concerns will always need to be considered when engaging host nation employees or contractors. The early involvement of the TF security staff and J9 CIMIC to vet the employees and the firms for which they work is necessary.

**OPERATION AND MAINTENANCE OF INFRASTRUCTURE**

Operation and maintenance of infrastructure is normally conducted by the nations emplacing the initial camps and facilities using integral resources. These processes are based on assets available, technical skills and capabilities along with nation standards and regulations. However as the mission continues the magnitude of the support now exceeds the capabilities of the integral force alone. Contracted services provided the means to provide this service.

**Contractor Augmentation:** Various national contractors are developed as a service support capability for deployed operations. The programs are managed by their respective MoDs/HQ/ADM (Mat) and HQs which retains funding and employment authority for those specific contracts who are intended to be employed in a sustaining role in an established theatre. It should be viewed as a “tool in the engineer toolbox”; and can provide contracted engineer services, not merely civilian employees working under military supervision. The decisions to employ these contractors are a national decision of the TCNs and are made at the strategic level, within those nations. However coordination with NSPA can assist providing advice on delivery of engineering functions to avoid duplication of effort and expense.

**Normal Contracted Engineering Functions:**

* Construction engineering — common tasks;
* Fire services;
* Environmental management;
* Roads and grounds;
* Facilities operations and management;
* Waste management;
* Water supply and distribution, and
* Power supply and distribution.

**Normal MILENG Functions**

* Construction engineering — inspections and quality assurance common tasks;
* Environmental inspection and reports
* Maintenance and operations standards – inspections of services.

**REAL ESTATE MANAGEMENT**

Real estate management is a complex business and is fraught with many potential legal problems. It must be treated in a serious manner; the real estate arrangements and contracts related to that are entered into on behalf of NATO or contributing nations and therefore have continuing legal obligations that must be fully understood. Experienced and knowledgeable real estate expertise and advice must be sought. The TF Engr is the TFC’s adviser on real estate asset management. To provide guidance for the TF Engr and HQ staffs in property management during deployed operations it must be understood that the property management and leasing of infrastructure/accommodation or services are subject to the laws, forms and protocols of the HN in which the mission is deployed. ALP-4.2, Land Forces Logistics Doctrine, provides a detailed guidance On real estate management (functions, NATO and national responsibilities, property conditions, procedures, organisation) in its chapter 10 “MILENG support to Logistics”. The following guidelines are provided to assist in reaching the best possible deal for NATO. The drafting of a lease or contractual agreement must be done in concert with the TFHQ staffs as previously mentioned.

**Leasing of Property:** The leasing of real estate and contracting of engineer- /utility services on deployed operations is a negotiated, legally binding arrangement between NATO and another legal entity. Negotiation of such agreements is a shared responsibility between the TF Engr, J4 Log, J4 Fin, J9 CIMIC and Legal staffs on behalf of the contributing nations. To meet the operational requirements of the TFC, a co-ordinated effort by these staffs is required to ensure the right services are acquired at the best available price. The TF Legal Officer must review and approve all TF contracts. No other TF representative has the legal right to enter into such a contract agreement; this prohibition extends to the TFC. Consequently, any activity conducted by the TF that would require a property owner’s agreement must be undertaken with the full involvement of the TF Legal officer.

**ENVIRONMENTAL PROTECTION**

Engineers must consider the environmental impacts of their actions. They must weigh the implications of holding out for logistical support against environmental collateral damage that they will cause. They must ensure that a proper environmental risk assessment is done before beginning any action.

**Environmental Protection definition:** “The prevention or mitigation of adverse environmental impacts”45. Essentially, EP is the protection of the environment from the actions of NATO forces. Protecting our forces from natural environment is part of Force Protection and not EP.

During operations, in addition to its forces, NATO brings international values which it hopes will benefit all communities. One of these values is respect for the environment and for the people who live in it. Environmental protection (EP) is NATO’s term for the application and integration of all aspects of environmental considerations as they apply to the conduct of military operations. Environmental considerations include the entire spectrum of environmental media, resources, or programs that may affect, or be affected by, the planning and execution of military operations. Factors that NATO takes into account in its planning include HAZMAT Regulations, environmental compliance, pollution prevention, waste management, due diligence, sustainability, conservation, heritage protection (natural and man-made), and protection of flora and fauna. Environmental damage may be an inevitable consequence of operations, but environmental planning can minimize these effects without compromising either operational or training requirements. With an understanding of applicable environmental legislation and regulations, NATO forces will be able to plan efficiently and act accordingly. By taking proper steps to assess, plan, train and execute the deployment and the mission, NATO can more effectively protect human health and essential environmental resources, reduce the occurrence of environmental accidents and mitigate any damage that may be caused to the environment. This will limit NATO’s potential long-term liability.

**MILENG tasks and responsibilities.** MC 469/1 NATO Military Principles and Policies for Environmental Protection is the key NATO EP policy document. It is applicable to all NATO nations and others involved in NATO-led operations and exercises. It defines the responsibilities of Commanders, NATO units, Non-NATO units from Contributing Nations and Host Nation. The objective of MC 469/1 is to integrate EP into NATO-led military activities, consistent with operational imperatives, in order to minimise the risk, prevent environmental degradation, and restore/remediate any environmental degradation. Although Environmental Protection is a Military Engineer responsibility and the JFENGR provides the EP appx to Annes EE, specific EP tasks are carried out by different personnel / branches within the various NATO nations.

* Emergency Response. EP incidents will occur and need to be reported and remediated during the operation.
* Remediation. Nations do not have to leave a clean environment, but they are liable for any incremental damage their troops cause. Prior to closing out camps or its AOO, nations should complete Close out Environmental Baseline Studies and remediate environmental damage not recorded in their Baseline Studies.
* Documentation. Accurate theatre record keeping and reporting is essential. NATO and SN Theatre Environment Record Keeping should include: Environmental Baseline Studies, ENGSITREPs, Environmental Damage Reports including Remediation, Camp Handover documentation, etc. Nations (including NATO where it’s a lead nation) perform Environmental Baseline Studies (EBS) for Camps and AOO as appropriate. See STANAG 6500 (AJEPP-6), Environmental File for Military Compounds in NATO Operations, for more information and templates.
* Training. NATO and SNs must provide appropriate EP training for their key personnel in order to allow them to act in an EP friendly manner and supervise the execution of their required tasks.
* Many EP tasks can also be carried out through the use of non-military resources or through Host Nation support. Regardless of the resources used engineer/commander.

**UTILITIES (WATER AND POWER)**

The provision of water (sewage treatment) and power are all normally conducted in accordance with national standards. However within NATO the means to provide a standardized approach to these resources required that certain guidelines and procedures are followed within the alliance to ensure interoperability.

**Water** must be sourced, treated, stored, distributed, issued and disposed. Water quality standards must be appropriate for a range of uses including drinking, cooking, washing, laundering, medical, firefighting and water-borne sewerage systems. Water services include bulk storage with distribution being achieved through bulk deliveries, packaging and/or pipelines. A key reference for water quality standards are STANAG 2136, Minimum Standards of Water Potability during Field Operations and STANAG 2885, Emergency Supply of Water in Operation.

**Power.** The requirements for power differ from mission to mission and the optimum power production solution differs according to the localisation, climatic conditions, local resources, size, function, Force structure, concept of operations, and the phase of the operation. Planners must ensure that appropriate requirements for energy efficiency (power generation and consumption) are met during the infrastructure planning phase. To achieve energy efficiency, three key principles should be taken into account: modularity, interoperability and sustainability. Some factors to consider when determining power generation and its sustainability are:

* Coordination of power requirements, comprising all levels from individual and tactical combat systems up to power generation for a large NATO camp, should be considered as key elements to contribute to increasing the effectiveness of existing energy systems and reducing liquid fuel demand. Method of specifying electrical power supplies: standard types of electrical power STANAG 4133 and field electrical power supply technical aspects for interoperability AEP-25 provide guidance.
* The use of multi-energy as well as multi-size systems, from the early stages of an operation, to ensure efficient and secure power. However, autonomous power generation and supply must be continuously available for operational functions and critical services in case of failure of a traditional centralized grid.
* Operational commanders are responsible for the use of resources under their command, including energy. The senior military engineer (in accordance with MC 560/1 the JFENGR at the operational level and the Chief Engineer at the tactical level) advises the commander on operational energy concerns such as prioritizing, energy conservation programs, awareness plans and training objectives.

**SUPPORT TO LOGISTICS**

As defined in MC 0319/3, NATO Principles and Policies for Logistics, “particular areas of expertise in Support to Logistics, which used to be called ‘Infrastructure Engineering for Logistics’, are MILENG (...). MILENG is a multifaceted force multiplier and an essential physical enabler, throughout all stages of the operation and particularly when conducting tasks associated with Reception, Staging, Onward Movement and Integration (RSOM(I)) and sustaining the Allied Forces”. Support to logistics is a significant MILENG missions in operations, infrastructure in-theatre being critical for both operational and logistic purposes. Once the concept of operations (CONOPS) has been agreed for an operation a concept of support (CONSUP) is then developed to ensure the mission will be resourced. From the CONSUP the requirements for infrastructure for logistics purposes can be derived and compared with the existing infrastructure. This comparison will identify any shortfalls. In some scenarios the existing infrastructure will be good and little effort will be required but in other scenarios significant work will be required to bring the infrastructure up to the minimum military requirement. This work may be done by HNS, contractors and/or military engineer support. JFEng staff will implement the planning, maintenance and disposal of the infrastructure works required to support the logistic mission and the Joint Force as a whole. For example, as a part of an analysis of infrastructure requirements, it is critical to take into consideration any munitions safety requirements.

**Joint Logistic Support Group (JLSG).** “The Joint Force Engineer and staff are the focal point for the planning and execution of all aspects of MILENG within the JOA. The Senior Joint Engineers of the subordinated commands (including the JLSG) are responsible for the prioritisation and coordination of the MILENG support within their areas of responsibility” (MC 0319/3). If a multinational JLSG is formed, a military engineering and infrastructure branch49 (MEIB) will be established in the JLSG to plan and coordinate the provision of MILENG support within the supported JFC’s AOR. MEIB specific responsibilities include also supporting the planning and synchronisation of logistic aspects of the OPLAN, developing environmental baseline studies (EBS) for camps and major installations as a basis for environmental protection planning, the identification of the requirement for the development and maintenance of infrastructure, and conducting C2 of JLSG subordinate MILENG units within respective line of expertise and in accordance with delegated authorities.

**Infrastructure development and management.** MILENG Support to Logistics covers the construction, restoration, acquisition, repair, maintenance and disposal of those infrastructure facilities required to mount, deploy, accommodate, sustain and re-deploy military forces. This also includes construction, restoration and maintenance of lines of communication (LOC), and facilitation of environmental protection50. To enable NATO commanders to maximize the effectiveness of their assigned MILENG capabilities and resources, the availability of senior engineer expertise is necessary at all HQ levels. To ensure that consideration of MILENG capabilities and forces is adequately addressed in the NDPP, defence planners and MILENG experts at the SC level must work closely with both NATO HQ staff and senior engineers in national HQ. A detailed planning and a thorough reconnaissance, involving all functional specialists, are essential to identify resources and shortfalls for the construction, maintenance and operation of facilities. Priority is given to facilities to install POD, Staging Areas, Assembly Areas and their connecting routes.

**Contingency planning** is vital as the infrastructure picture can change very rapidly. At the operational level the infrastructure function is mostly concerned with the provision, operation and maintenance of the infrastructure needed for the upcoming and/or ongoing operation. In order to prevent the contributing nations from competing for limited facilities and to ensure efficient use of critical resources, co-ordination between Engineers and Logistics is crucial in assigning or scheduling the use of limited facilities and resources. As the primary responsible engineer adviser to the JFC, the JFEngr will have coordinating and technical authority, on behalf of the JFC, over the allocation of engineer resources to Components. Within that framework, the JFC may shift the main effort of MILENG support entirely to logistics, and may allocate capabilities normally seen supporting the manoeuvre to infrastructure development and sustainment, enhancement of freedom of movement or the provision of real life support. At LCC level, the Chief Engineer (CEngr) will be the responsible for the construction and maintenance of Theater infrastructure, environmental protection and supporting MEIB in managing Real Estate that has been designated for LCC.

**UNDERWATER ENGINEERING**

Military engineer diving is an extension of military engineering into the water. Military engineer divers provide the armed forces with the capability of performing military engineer tasks underwater. Military engineer divers do the majority of their work inland waterways. This can include lakes, river deltas, inshore waterways, harbors, urban environment (e.g. confined spaces, sewage systems, and drainage systems) and other areas as tasked. Military engineer divers assist the freedom of manoeuvre and movement by supporting the movement of troops and equipment. Supporting assets range from a small team to multiple larger teams with a diverse range of capabilities. Military engineer diving must be conducted following national diving safety regulations and require a high degree of planning to achieve the maximum amount of underwater performance with the maximum degree of safety for the diver(s). To meet the operational and safety requirements the following aspects always have to be taken into account:

* Mission.
* Location and depth of water.
* Time scale.
* Environmental factors.
* Resources (personnel and equipment).

**The characteristics of a military engineer dive teams are:**

* Flexibility. Military engineer dive teams can apply a wide range and support nearly all underwater missions on the battlefield. Military engineer diving teams are relatively small, specialized organizations. Each team has specific duties and responsibilities but are flexible enough to support the commander in most situations.
* Mobility. Military engineer dive teams have limited mobility while conducting their tasks. They must enter the water relatively close to the task site and they cannot cross large bodies of water without boats. Based on a field section, the diving team has the same ground mobility like the rest of the engineer unit.
* eliance on Equipment. Military engineer dive teams rely heavily on their equipment and breathing apparatus. Even surface swim operations will require the use of bulky personal issued equipment.
* **Vulnerability.** Environmental and operational conditions have a major influence on the selection of divers, diving technique and the equipment to be used. Military engineer dive teams are vulnerable to unique environmental and operational hazards. These include:
* Underwater visibility,
* Water temperature, depth,
* Currents,
* Tides, Sea state, and waves,
* Arctic and tropic conditions,
* Confined spaces,
* Polluted / Contaminated water,
* Underwater Obstacles,
* Electrical Shock,
* Explosions.

**Principles of Employment:** Military engineer diving expertise is required throughout the AO. Since there are only a limited number of divers, military engineer commanders may choose to allocate diving assets only to the most critical mission sites. Early integration of divers into the planning process is critical to successful diving missions. The principles for employing military engineer divers are the same as for other military engineer assets. These include:

* ntegration with Other Combat Functions. Combat power is used to find, fix, and strike the enemy. All activities on the battlefield support the integrated combat power. Military engineer divers should conduct tasks in accordance with the commander's plan. When military engineer divers support and conduct joint / combined operations, the diving supervisor coordinates the dive tasks and advises the local commander on dive related issues.
* Centralized Coordination. Military engineer diving assets are a limited resource. They need to be centrally coordinated at the highest practical level.
* Decentralized Execution. Military engineer diving assets, once tasked, are controlled at the lowest level necessary for the execution of the task.
* Allocation of Priorities. All effort on the battlefield must be focused on the commander's priorities. Military engineer divers should not be held in reserve. Therefore dive tasks must be considered with the other priorities.
* Continuity. The military engineer dive team, most familiar with the area of operations and situational awareness, should conduct the task. Once committed to a task, it may be tactically and logistically difficult to change that commitment.
* Early Warning and Reconnaissance. Foresight and anticipation of tasks are important and a reconnaissance is essential. When a new dive task is planned, time is needed to assemble a dive team and their equipment in order to conduct dive site reconnaissance and preparations. For diving medical reasons, divers may also need to rest before starting a new task.

**The Role and Tasks of Military Engineer Divers:** Military engineer divers conduct tasks as part of the combined / joint force in the full spectrum of operations. If required, they have the ability to execute tasks independently.



**Table1: Engineer Diving Tasks**

**CIMIC**

NATO CIMIC55 is the link to the civil environment and the military facilitator in a comprehensive approach. This enables the military to reach the desired end state by coordinating, synchronizing and de-conflicting military activities with civil actors, thus linking military operations with the civil sector. The aim of CIMIC is to establish and maintain the full cooperation of the civilian population and entities in order to create conditions that offer the commander the greatest possible moral, material, environmental and tactical advantages. (AJP- 01)

**Engineer support to CIMIC.** Engineer resources may be committed to support CIMIC programs in the framework of the objective assigned to the operation. It could include, among others, the delivery of clean drinking water, assisting construction projects or demining activities. Sufficient engineer resources will be essential to deliver such support. Cooperation, co-ordination and specific arrangements, including funding, need to be established between the different actors to have the best employment of Military Engineer Support to CIMIC programmes and to minimize potential negative impacts like the creation of a dependency culture. Co-ordination and co-operation between engineer's and CIMIC staff regarding such activities is vital. The support of CIMIC activities must be clearly defined in order to support the commander's intent and to avoid the dilution of engineer effort in tasks not essential to the implementation of the mission.

**SUPPORT TO CIVIL AUTHORITIES**

Support to Civil Authorities (SCA): Although SCA is primarily a civilian responsibility, NATO cannot ignore areas where it can contribute to restore essential services. When initiated at the tactical level, SCA tasks can have adverse effects on the campaign if their intended effects are not coordinated with higher Engr and local authorities. Since operators are in direct contact with the population, they can overcommit MILENG assets and resources to SCA tasks. Such situations can be detrimental to the campaign but also inhibit the execution of SCA responsibilities by local civilian agencies, creating unproductive reliance on military.

Disaster Relief: At the tactical level, response to these kinds of emergencies should be set under the parameters of area damage control and civil protection specified by higher operational commanders for specific AOs. Any response exceeding those parameters would normally be prescribed by higher command.

**Military Engineering Support to Civil Authorities.** MILENG is a multifaceted activity and a force multiplier across the full range of Alliance operations, but particularly NA5CRO. It uses both military and civil engineering capabilities and typically includes infrastructure repair; reconstruction and development; liaison with national authorities, IOs, and NGOs; and support to displaced persons and refugees. MILENG capabilities are well suited to all HA tasks and engineer units are well equipped to be used in consequence management and disaster relief such as flooding, earth quakes etc.

* Efficient use of scarce engineer resources is essential to provide effective support to HA. Other contributing factors include early involvement of engineers in the overall planning process, centralised coordination, and decentralised execution.
* The level of assistance can vary from small, highly specialized teams to complete engineer units. Small teams may be used to conduct damage assessment or estimate engineering repairs, and can assist in specialized support such as power supply and distribution, utilities repair work, well drilling activities, and water purification. In large HA and IDRO, NATO engineer units can provide technical expertise and will usually support the planning and design of infrastructure including facility construction, structural repair, debris clearance, emergency repairs to restore utilities, and camp construction for both deployed forces and IDPs and refugees. Explosive ordnance disposal (EOD) could also be provided.
* MILENG support to infrastructure includes the construction, restoration, acquisition, repair, maintenance and disposal of infrastructure facilities, including the construction, restoration and maintenance of lines of communication. The Joint Force Engineer (JFEng) and his staff may support and coordinate the project management and execution of all infrastructures, including civilian reconstruction efforts.
* NATO common funding will only be available for this purpose where it serves the core minimum military requirement in direct support of the NATO mission.

**SUPPORT TO INTERNATIONAL ORGANIZATONS**

NATO forces might intervene in crises, for example, to strengthen, uphold or restore peace and security, to re-establish governance and authority, or to provide humanitarian assistance. NATO forces will usually be but one contributor; and while different participants’ respective goals may be broadly aligned, each is nevertheless shaped by different perspectives, priorities, motivations, mandates, timeframes, cultures and processes. This complex of actors may include, in addition to multinational military forces, the indigenous population, media, diplomats, International Organisations such as the United Nations (UN), Non-Governmental Organisations (NGOs), private military and security companies, multinational companies and opportunists. As such the engineering aspects and interactions with these Civilian organizations need to be understood and planned for with a theatre of operations.

**Information Operations**

Info Ops is an analysing, planning, integrating and assessing function focused on the information environment rather than a capability in its own right. Whilst the inter-related activity areas can make use of all or any capability or activity that can achieve an influence, affect understanding, or have a counter command effect; the extent is only limited by imagination, availability, policy and legal constraints. However, there are several capabilities, and techniques that form the basis of most Info Ops activity. The capabilities and techniques used in support of Information Effects are varied but have to follow a protracted and directed plan in support of the commanders intent.

In addition to the tasks of liaison, reconnaissance, provision of an advisory service and coordinating the management of infrastructure projects military Engineers are also involved in direct relief operations which can support the IO plan. The engineers involved in the actual engineering support tasks need to establish relationships with a variety of civilian authorities and agencies and thereby establish a valuable source of information to assist in the planning of information activities. However, due care must be taken to avoid overt use of these activities being perceived as intelligence gathering.