ATP 3-21.18 (FM 21-18)

Foot Marches

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Preface

Army Techniques Publication (ATP) 3-21.18 provides doctrinal framework and techniques for conducting foot marches. It describes foot march mission, characteristics, and types of foot marches; foot march planning, preparations, execution, and assessment; duties and responsibilities; discipline hygiene, and safety.

The principle audiences for ATP 3-21.18 are commanders, staffs, leaders, and Soldiers who are responsible for planning, preparing, executing, and assessing foot marches. ATP 3-21.18 serves as an authoritative reference for personnel developing doctrine materiel and force structure, institutional and unit training, and standard operating procedures for foot marches.

Commanders, staffs, and subordinates ensure their decisions and actions comply with United States, international, and in some cases, host-nation laws and regulations. Commanders at all levels ensure their Soldiers operate within the law of war and the rules of engagement. (Refer to FM 27-10 for additional information.)

This publication uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which ATP 3-21.18 is the proponent publication (the authority) are italicized in the text and are marked with an asterisk (*) in the glossary. Terms and definitions for which ATP 3-21.18 is the proponent publication are boldfaced in the text. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition

ATP 3-21.18 applies to Active Army, United States Army National Guard, Army National Guard of the United States and the United States Army Reserve unless otherwise stated. It is designed for squad, platoon, company, battalion, and brigade level chains of command, company and staff grade officers, senior and junior noncommissioned officers (NCOs), United States Army Training and Doctrine Command (TRADOC) institutions and components, and United States Army Special Operations Command.

The proponent agency is TRADOC and the preparing agency of ATP 3-21.18, is the United States Army Maneuver Center of Excellence (MCoE). Send comments and recommendations by any means—U.S. Mail, email, or telephone—using Department of the Army (DA) Form 2028, (*Recommended Changes to Publications and Blank Forms)* to:

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Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Introduction

ATP 3-21.18 encompasses techniques for foot marches and replaces FM 21-18 published in June 1990. This publication provides doctrinal guidance; organizational roles and functions; capabilities, limitations; and responsibilities for planning, preparation, execution, and accessing foot marches. This publication addresses significant changes in Army doctrinal terminology, concepts, constructs and proven tactics, techniques, and procedures developed during recent operations. The following is a brief introduction and summary of changes by chapter and appendix:

Chapter 1 – March Fundamentals—

- Provides an overview of troop movement, specifically dismounted marches, also called foot marches.
- Addresses tactical considerations, planning and preparation for foot marches.

Chapter 2 – March Execution—

- Describes conduct of the foot march and the organization of force for the march.
- Discusses security, fire support, and en route sustainment measures for foot marches.
- Provides duties and responsibilities before, during, and after a foot march.
- Covers limited visibility marches, actions against enemy attacks, and forced marches.

Chapter 3 – Soldier Load—

- Discusses Soldier load configuration.
- Covers energy use under load compared across environments.
- Describes methods for reducing or offsetting risk.
- Addresses movement of supplies and equipment before, during, and after the march.

Six appendixes complement the body of this publication addressing performance before, during and after foot marches:

- **Appendix A,** March Procedures. Describes unit standard operating procedures before, during and after a foot march.
- **Appendix B,** Movement Order and Movement Table. Provides clear and concise information and instructions to accomplish dismounted movement.
- **Appendix C,** Posture and Body Mechanics. Addresses proper mechanics for dismounted movement under load.
- **Appendix D,** Nutrition Considerations. Describes nutritional requirements before, during, and after the march to maintain combat effectiveness.
- **Appendix E,** Foot Care. Addresses preventive measures, foot injuries, and other measures for foot care.
- **Appendix F,** Related Injury and Illness Awareness. Provides information on common causes and prevention techniques for foot march related injuries and illnesses, including environmental factors and musculoskeletal injuries.

Chapter 1

March Fundamentals

Troop movement is the movement of troops from one place to another by any available means (ADRP 3-90). This is inherent in all military operations. Successful movement places troops and equipment at their destination at the proper time, ready for combat. Troop movements are made by different methods, such as dismounted and mounted marches, motor transport air, rail, and water means in various combinations. The method employed depends on the situation, size and composition of the moving unit, distance the unit must cover, urgency of execution, and condition of troops. It depends on availability, suitability, and capacity of different means of transportation. This chapter addresses dismounted marches, commonly referred to as foot marches. (Refer to FM 3-90-2 for information on other methods of troop movement).

SECTION I – DISMOUNTED MARCHES

1-1. *Dismounted marches* are movement of troops and equipment, mainly by foot, with limited support by vehicles. Also called foot march (FM 3-90-2). Foot marches are characterized by combat readiness, ease of control, adaptability to terrain, slow rate of movement, and increased personnel fatigue. Foot marches do not depend on existence of roads.

MARCH MISSION

1-2. A successful foot march is when Soldiers arrive at their destination at the prescribed time, and are physically and mentally able to immediately execute their mission. Physical and mental conditioning is normally done through unit conditioning programs and acclimatization of Soldiers to an area of operations (AO).

1-3. A foot march depends on control of units during movement. Such control is accomplished through the chain of command by proper supervision and organization of units. Movement of Soldiers over extended distances has extensive sustainment considerations.

1-4. Commanders must determine the amount and type of equipment carried, rate of march, length and number of rests equates with Soldiers' physical endurance. Detailed planning and leadership must move Soldiers and equipment to the right place at the right time ready for combat. Commanders ensure Soldiers arrive in good condition to accomplish their mission. March units should be notified of an impending move early enough to allow for planning.

1-5. When necessary, foot marches can be hurried by conducting a forced march. Forced marches require speed, exertion, and more hours marched per day. This is normally accomplished by increasing marching hours for each day rather than rate of march. Forced marches are employed when needed since they decrease unit effectiveness. (See chapter 2, this publication, for additional information).

1-6. Shuttle marches alternate riding in vehicles and movement by foot during foot marches. This is normally due to an insufficient number of vehicles to carry the entire unit. Shuttling requires transporting Soldiers, equipment, and supplies by a series of round trips with the same or different vehicles. It can be performed by hauling a load an entire distance then returning for another. It may be performed by carrying successive elements of loads for short distances while remaining elements continues on foot.

MARCH CLASSIFICATION

1-7. Troop movement can be administrative or tactical. The three types of troop movement are administrative movement, tactical road march, and approach march.

ADMINISTRATIVE MOVEMENT

1-8. *Administrative movement* is a movement in which troops and vehicles are arranged to expedite their movement and conserve time and energy when no enemy ground interference is anticipated (FM 3-90-2). An administrative movement, whether dismounted or mounted, is only conducted in secure areas. Normally once units deploy into a theater of war, administrative movement is not employed. (Refer to ATP 4-16 for additional information).

TACTICAL MOVEMENT

1-9. Commanders use tactical road marches and approach marches to rapidly relocate units within an AO to conduct combat operations. Tactical road marches are used when contact with the enemy is possible. Approach marches are used when contact is anticipated or intended. The approach march emphasizes tactical considerations such as security and de-emphasizes efficiency and ease of movement. Both the tactical road march and approach march emphasize speed and security over tactical deployment. The commander organizes the unit to conduct combat operations in tactical movements.

1-10. Units generally maintain integrity throughout tactical movements and plan for enemy interference either en route to or shortly after arrival at destination. When units conduct tactical road marches or an approach march it uses formations and techniques consistent with the mission variables of mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC). Tactical movement, primarily the approach march, may be conducted over unsecured routes, if no friendly forces between the forward elements of the moving force and enemy.

1-11. When relocating in an AO, units may conduct tactical movement by dismounted or *mounted march*—is the movement of troops and equipment by combat and tactical vehicles (FM 3-90-2)—or in combination. This occurs before hostilities begin or when a forward defense has been established. Speed is vital, and security requirements are minimal. Units move by tactical movement to an assembly area where units prepare to conduct combat operations.

1-12. During tactical movements, commanders must be prepared to maneuver against an enemy force. Once a unit is deployed in its assigned AO, it normally moves using proper techniques for assigned missions. When contact is made maneuver is executed. (See chapter 2, this publication, for additional information).

SECTION II – GENERAL CONSIDERATIONS FOR THE MARCH

1-13. Considerations which greatly influence the conduct of marches, in addition to enemy ground and air activities, is contact with the local populace. Contact with the local populace should always be expected, as should the consequences of not aligning actions, words, and images in support of the commander's intent. Visibility, climate, weather, and terrain characteristics to a degree determine actual arrangement and location of personnel, equipment, and vehicles within a given march formation. Additional considerations common to the conduct of marches include—march discipline, water discipline, acclimatization, non-U.S. military participation, morale, individual load, and risk tolerance.

CONTACT WITH THE LOCAL POPULACE

1-14. Marches create effects in the operational and information environments. While these effects may be intended for the enemy, they will likely also send a message to the local populace and, possibly, audiences external to the local populace. Therefore, they must be planned and executed so that these effects fully support the commander's intent.

1-15. Effectively supporting the commander's intent requires that Soldier actions during a foot march align with the unit's overall narrative: the sum of all it does, says, and conveys. A misspoken word, an uncontrolled action, an offensive image can ultimately work against the commander's objective.

VISIBILITY

1-16. In the absence of enemy threats, marches during daylight hours are preferred as it permits faster movement and is less tiring for Soldiers. Marches during daylight hours are characterized by dispersed formations, ease of control, extended lines of reconnaissance and security, and increased vulnerability to enemy observation and air attack.

1-17. Marches during limited visibility are characterized by closed formations, difficult mission command, reconnaissance, and security, and slow rate of march, but does enable concealment from observation. Marches during limited visibility exploit darkness or weather factors to gain surprise and help units avoid extreme heat common to marches during daylight hours. March control, especially during conditions of limited visibility, requires detailed planning and stringent control measures, and thorough march training, signals, and communication disciplines.

1-18. If concealment is required, movement before dark is restricted to small detachments. Marches should be completed by daybreak with Soldiers in concealed positions. When movement is near the enemy, security, noise and light discipline are strictly enforced. To conceal operations from the enemy, preventing it from gaining information about the march, security must be enforced. Navigational aids and mission command systems, thermal sights, and night vision devices, can prevent many mission command problems encountered during limited visibility movements.

1-19. Marches during limited visibility must be planned carefully. This includes reconnoitering routes and assembly areas. Special precautions ensure direction and contact within the column. Therefore, guides and file formations are needed. (See chapter 2, this publication, for additional information).

CLIMATE, WEATHER, AND TERRAIN

1-20. When conducting a foot march climate, weather, and terrain have the greatest impact on off road or cross country movement. Restrictions imposed by climate and weather extremes and terrain constitute major changes from operations in temperate areas. These restrictions can present major obstacles to operations unless proper provisions are established.

CLIMATE AND WEATHER

1-21. Climate conditions, produced by temperature, humidity, precipitation, wind, and light in an area over an extended period, influence long-range plans within an AO. Weather, the local, day-to-day condition of the atmosphere, impacts daily operations and is always a key planning consideration. Foot marches in adverse climatic and weather conditions follow the same principles as normal conditions. Differences depend on physical limitations imposed by adverse conditions and use of special equipment required to overcome them. (See appendix F, this publication, for wind chill chart information).

1-22. Cold climates reduce efficiency of personnel. Bulky clothing limits movement in performing maintenance and operational duties. Hot, humid climates reduce energy and increase physical discomfort and likelihood of disease. Over time, heat and high humidity reduce life expectancy of all equipment adding to maintenance, repair, and replacement problems. Rust and corrosion are accelerated. Mildew rapidly attacks unprotected clothing and leather products.

1-23. Climate and weather extremes affect the daily maintenance and operation of vehicles. Low temperatures require protecting cooling systems to prevent freezing, fuel additives to prevent frozen fuel lines, and protection to make starting easier. Tire life may be reduced; metals may become brittle and break. Batteries lose their efficiency and may freeze or crack. Severe freezing may require extensive road repairs after each thaw, particularly in early spring. Extremely high temperatures may increase number of breakdowns due to overheating.

TERRAIN

1-24. Terrain evaluation is the study of how soils, vegetation, climate, and land forms help or hinder employment of military units and equipment. Movement planners evaluate terrain to determine the ability to move Soldiers, vehicles, equipment without interruption with minimum exposure to observation and direct fire.

1-25. Terrain evaluation considers all factors of the operational environment (OE) in relation to capabilities and limitations of tasked equipment. Sources of information, techniques, and results of terrain evaluation vary with the OE. Terrain evaluation at unit level is made to select the most suitable route to accomplish the mission under prevailing circumstances.

1-26. Varying types of terrain over which Soldiers must march present different problems for commanders, depending on specific AO. Weather conditions combined with terrain affect mobility of marching Soldiers.

1-27. Movement must be calculated in terms of time and distance to determine the total amount of time Soldiers need to move from one place to another. This applies mainly in arctic, mountain, or jungle environments where trails are either limited or nonexistent and where cross country movement can be arduous and slow.

1-28. Rise and fall of the ground is known as slope or gradient (grade). Slopes of 7 percent or greater affect movement speed along routes and are considered an obstruction. Percentage of slope is used to describe effects inclines have on movement rates. It is ratio of change in elevation (vertical distance to horizontal ground distance) multiplied by 100.

Note. When planning routes, commanders should factor elevation gain and loss, as much as distance, into their movement timelines as effects of slope on dismounted movement is significant. (Refer to ATP 3-34.80 for additional information).

1-29. As percentage of slope increases, movement rates decrease due to increase in energy and physical demands needed for movement. Moving to the same exact location using an indirect route can help reduce the amount of strenuous energy needed but increases time needed due to total amount of terrain traversed. Movement rates are decreased whether units are moving uphill or downhill.

1-30. Slopes covered in talus, more stable slope formed by large rocks, often proves to be a relatively easy ascent route. On the other hand, climbing a scree slope, a slope formed by landslides consisting primarily of loose dirt and small rocks, can be extremely difficult, as small rocks tend to loosen easily and give way. This characteristic often makes scree fields excellent descent routes. Before attempting to descend scree slopes, commanders should carefully analyze the potential for creating dangerous rock falls and take necessary avoidance measures.

MARCH DISCIPLINE

1-31. March discipline includes observing and enforcing march instructions including formation, distances between elements, speed, and using cover and concealment. It must include specific controls, restrictions such as water, light, noise, and communication disciplines. March discipline is the culmination of training, which results in effective teamwork between all Soldiers of the unit.

1-32. Maintaining discipline is especially important. All commanders must ensure Soldiers understand and follow established rules of engagement (ROE). The principle of proportionality requires that the anticipated loss of life and damage to property incidental to attacks must not be excessive in relation to the concrete and direct military advantage to be gained. This principle, as well as the principle of unnecessary suffering, may restrict the use of certain weapons, munitions or techniques during operations.

1-33. March discipline is a command and individual responsibility stemming from organizational control and training. It is essential for march columns to prevent conflict with other movements in the area. It is attained by thorough training, supervision of operations by technically and tactically proficient, competent leaders, and attention to detail. March discipline demands—

- Using qualified Soldiers and drivers who operate their equipment safely under variety of conditions.
- Adhering to unit standard operating procedures specifying tactics, techniques and procedures for movement, battle drills, and communications techniques.
- Strictly following traffic regulations.
- Meeting start point, en route checkpoints, and release point times.
- Following prescribed routes at prescribed march rates.
- Halting at rest stops for the required amount of time.
- Using protective measures, including maintaining prescribed intervals, radio discipline, and blackout driving at night.
- Maintaining proper care of equipment.
- Maintaining correct weapon posture.
- Observing safety policies and regulations at all times.
- Ensuring Soldiers and drivers obey rules of the road, traffic laws or regulations, speed limits, time and distance gaps.

Note. When referring to drivers, Soldiers, U.S. Government contractors, or host-nation contractors may be implied.

WATER DISCIPLINE

1-34. Water discipline must be observed by all Soldiers to maintain effectiveness and minimize fatigue while conducting operations. Several rules must be followed—

- Water or electrolyte and carbohydrates fluids should be consumed before, during, and after foot marches. Do not overhydrate.
- Drink treated water or electrolyte and carbohydrate fluids from approved sources.
- Drink small quantities of water or electrolyte and carbohydrate fluids rather than gulping or rapid intake.
- Drink water or electrolyte and carbohydrates fluids when not thirsty.
- Drink water or electrolyte and carbohydrates fluids slowly to prevent cramps or nausea.
- Refill canteens with water only or replenish electrolyte and carbohydrates fluids at every opportunity.

Note. Electrolyte and carbohydrates fluids should never be poured into water canteens or hydrating systems. Mold and mildew tends to grow within causing sickness or health issues. Use bleach to clean canteens or hydrating systems which appear to have mold and mildew. Never force hydrate with water alone. Your body needs the proper amount of nutrients and electrolytes to operate efficiently. Force hydrating with water alone can flush electrolytes and nutrients causing over hydration and impairing performance.

1-35. The human body does not operate efficiently without adequate liquid intake. When Soldiers are engaged in strenuous activities, excessive amounts of water and electrolytes are lost through perspiration. Water is lost through normal body functions such as respiration and urination, which can create liquid imbalances in the body. As a result, dehydration could occur unless the loss is replaced immediately and Soldiers rest before continuing their activities. Insufficient liquid and salt intake during hot weather can result in heat injuries.

1-36. Danger of dehydration is as prevalent in cold regions as it is in hot, dry areas. The difference is in hot weather the Soldier's body loses liquids and salt through perspiration. In cold weather, when Soldiers are wearing many layers of clothing, they have difficulty realizing this condition exists since perspiration is absorbed rapidly by heavy clothing or evaporated by air.

1-37. Salt in food compensates for daily salt requirements. Additional salt intake should be under direct supervision of a physician or physician's assistant.

1-38. If pure water is not available, water in canteens can be treated by adding water purification tablets. (Refer to TC 4-02.3 for additional information).

1-39. If units are forced to traverse chemical, biological, radiological and nuclear (CBRN) contaminated area due to the tactical situation, water consumption increases and forced hydration becomes necessary. Commanders and subordinate leaders at all levels must prevent heat injuries brought on by physical activity in CBRN environments by adjusting march rates or loads.

ACCLIMATIZATION

1-40. Soldiers must be physically and mentally conditioned to participate in foot marches. Many types of terrain and climate throughout the world require different acclimatization for operations. Ideally, Soldiers should be trained to operate in all areas with minimal preparation; however, each area has specific preparation requirements. For example, Soldiers scheduled for operations in mountains normally participate in high altitude training for 10 to 14 days before engaging in full-scale mountain foot marches.

ALTITUDE ACCLIMATIZATION

1-41. Soldiers may be deployed to theaters of operation at altitudes in excess of 2,439 meters (8,002 feet) above sea level. Altitude acclimatization allows Soldiers to decrease their susceptibility to altitude illness and achieve optimal physical and cognitive performance for the altitude to which they are acclimatized. Altitude acclimatization has no negative side effects and does not harm health or physical performance upon return to low altitude. However, Soldiers with good aerobic endurance may acclimatize faster and perform better than those with low fitness levels.

1-42. High mountain environments are dangerous and unforgiving for those without adequate knowledge, training, equipment and acclimatization. Commanders and subordinate leaders and medical support personnel must understand interaction of environments, individuals and unit characteristics. Adequate planning and preparedness can reduce or prevent significant problems. Leadership is vital to safe operations in high altitude environments. (See chapter 3, this publication, for additional information).

COLD WEATHER ACCLIMATIZATION

1-43. Psychological adjustments eliminate preconceived notions and fears about specific cold weather locations and climates. Training conducted logically and realistically causes most Soldiers to lose previously held fears of cold or isolation. Adjustments are facilitated by educational and training programs which gradually introduce Soldiers to unfamiliar terrain features or cold climates. During these programs, Soldiers are encouraged to develop confidence until they can operate in cold weather environments with ease and assurance.

1-44. Self-confidence in each Soldier is a direct result of psychological adjustments. Self-confidence in foot marching under any environment is developed by strong leadership and progressive training. As Soldiers become stronger and marching techniques are learned and applied, Soldier's self-confidence, morale and pride increases. Commanders stimulate pride by building unit spirit and by instilling determination to succeed. A well-planned and conducted march is an excellent way to develop and demonstrate many attributes of good soldiering.

HEAT ACCLIMATIZATION

1-45. Physical work and training programs for un-acclimatized Soldiers should be limited in intensity and time. About two weeks of progressive heat exposure and physical work should be allowed for heat acclimatization.

1-46. Heat acclimatization is necessary for all Soldiers however; fit Soldiers may acclimatize to heat faster than less fit Soldiers. Full effects of heat acclimatization are relative to initial physical fitness level and total heat stress encountered by Soldiers. Soldiers who perform light physical work achieve level of

acclimatization needed to perform certain tasks relatively quickly. If Soldiers conduct strenuous work, they may need additional acclimatization.

1-47. Less fit Soldiers have reduced work capabilities in heat. For example, middle-aged Soldiers often have lower work capabilities than young adult Soldiers and female Soldiers often have lower physical capabilities than male Soldiers within the same categories either fit or less fit. However, if their physical fitness is sufficient and they are heat acclimatized, less fit Soldiers should have similar work capabilities.

1-48. When conditions allow, heat acclimatization requires minimum exposure of two hours per day, which can be broken into one-hour exposures with some activity requiring cardiovascular endurance. For example, marching can replace pushups and resistance training. Gradually increase activity intensity each day, working up to an appropriate conditioning schedule adapted to the present environment. Resting in heat with activity limited to minimum requirements results in partial acclimatization. Physical activity in heat must be performed to accomplish optimal acclimatization for work at the intensity level in given hot environments. (Refer to Technical Bulletin [TB] Medical [MED] 507 for additional information).

NON-U.S. MILITARY PARTICIPATION

1-49. March commanders are responsible for all non-U.S. Military supporting assets associated with the march. These supporting elements can be broken down into multinational partners, U.S. civilian contractors, third country national contractors, and local national contractors.

COALITION PARTICIPATION

1-50. March commanders must understand diplomatic or cultural sensitivity and show respect for coalition forces while treating them as partners. Their ROE may be different from U.S. ROE. Their equipment capabilities and limitations may be different. Every effort must be made to ensure coalition forces are an integral part of the team and accept an equitable share of risk. March commanders must—

- Ensure battle drills are articulated clearly, understood, and rehearsed.
- Ensure logistics support is provided to coalition forces during march missions.
- Clearly define chain of command. It is important to determine and communicate who is in charge of the march during planning and execution.
- Fully integrate coalition vehicles if applicable into the march and maintain organizational integrity.
- Plan for possible communication system incompatibility and develop alternate communications plans.
- Plan for communications problems due to differences in language and dialects. Determine if interpreters are required, and if so, how many.
- For additional information about cultural differences refer to the chaplain, Staff Judge Advocate, contracting officer, civil affairs, and the intelligence staff.

UNITED STATES CIVILIAN CONTRACTORS

1-51. The law of armed conflict imposes strict limitations on use of civilian personnel in combat environments. Department of Defense, Service, and commander guidance dictate policy, limitations, and restrictions for civilians supporting military forces. March commanders must be aware that contracted drivers will likely be unarmed. Civilian vehicles have different capabilities and terrain limitations than tactical vehicles. March commanders should—

- Disperse civilian vehicles throughout the march due to security and limited communications capabilities.
- Contact and coordinate with contractor points of contact and leadership before the mission.
- Develop habitual relationships with contractor personnel.
- Provide an internal communications plan to contractor personnel.
- Conduct risk evaluations for safety considerations such as licensing, vehicle condition, and load.

- Incorporate contractor personnel into precombat checks (PCC), precombat inspections (PCI) and battle drill rehearsals.

THIRD COUNTRY NATIONALS AND LOCAL NATIONAL CONTRACTORS

1-52. March commanders must take into consideration contractors who may not speak English and proportionally increase number of interpreters when necessary. March commanders should consider cultural and discipline differences between civilian drivers and possible implications on the march. This can impact vehicle crew mix. Depending on situations, the march commander should consider removing all third-country national communications capabilities to limit security breaches. March commanders should—

- Conduct thorough inspections of all third-country national equipment and personnel.
- Ensure third-country nationals are familiar with the unit's tactics, techniques, and procedures and standard operating procedures. This increases the need for multiple rehearsals.
- Marches with large numbers of third-country national drivers have additional security considerations. Additional military escort vehicles and armed military assistant drivers may be needed to provide security.

HOST-NATION FORCE AUGMENTATION

1-53. Host-nation forces have advantages of being in their homeland where they know more about the country, streets, routes, laws, situation, terrain, and culture than organic forces. They are a valuable resource for understanding terrain in particular areas and can help save time and energy while planning and conducting operations. Host-nation forces often have robust human intelligence capabilities since they know the terrain, local populace, and customs much better than U.S. Forces and can often spot something that does not look right easier than U.S. personnel. Commander's and subordinate leaders should understand host-nation force capabilities and limitations and use them to their advantage accordingly.

1-54. Commanders should consider combined operations from the augmenting force leader's perspective to better operate alongside them. Key points for commanders to consider should include—

- Include host-nation leadership personnel in the planning stage of operations.
- Include host-nation forces in rehearsals, PCC, and PCI.
- Attach U.S. advisors to host-nation force leadership and embedded trainers, if available, to ensure the augmenting force understands and is prepared for missions. Commanders should consider host-nation forces and personnel may not have the same standards or discipline as U.S. Forces and may not perform in the same exact manner as expected of U.S. Soldiers.
- Ensure attached host-nation force understands the expected reaction to enemy contact battle drills to avoid fratricide.
- Mission variables permitting, provide U.S. Forces for logistical support to host-nation forces.
- Employ host-nation forces within their capabilities. They often do not have the same capabilities as U.S. Soldiers and units.
- Intermingle host-nation forces with own unit while conducting missions such as foot marches. Host-nation personnel often look to U.S. Soldiers for actions and guidance.
- Establish effective relationships with host-nation forces based on personnel rapport and trust built by key leaders.
- Use host-nation forces to help in foot march missions like clearing traffic and avoiding potential ambush sites. U.S. Forces may be restricted on entering certain areas while host-nation forces can often enter these areas with fewer limitations and without incident.

MORALE

1-55. Morale can greatly affect Soldiers during foot marches. Low morale can be contagious and magnify any discomfort Soldiers might experience. Commanders and subordinate leaders improve morale by applying leadership and emphasizing proper foot march techniques, some of which are—

- Provide advance warning of an upcoming march so Soldiers can prepare adequately.

- Hold formations early enough to allow time for inspecting Soldiers and performing last-minute checks.
- During foot marches, avoid delays keeping Soldiers standing for extended periods. Delays can increase fatigue causing legs to stiffen, making it difficult to resume the march. Route reconnaissance before the march provides information on conditions which can cause delays. Advance action can prevent conditions which can cause delays.
- Maintain a steady rate of march. Too rapid or too slow rate induces fatigue.
- During marching, hold passing vehicles to reasonable speeds to promote safety and to prevent dust, rocks, or mud from being thrown on Soldiers. If dust conditions are severe, move Soldiers to the upwind side of the road.
- Do not allow trucks used to transport stragglers or foot march casualties to overtake columns unless it is unavoidable.
- Ensure Soldiers in rear formations receive full break times.
- Ensure leaders at all echelons march with their Soldiers throughout the entire foot march. Soldiers quickly detect presence or absence of their leaders in foot marches.
- Encourage unit leaderships to walk the entire march periodically spot checking Soldier performance, well-being, and to ensure command presence is observed.
- Ensure availability of adequate water at rest stops throughout the foot march.

1-56. Medical evacuation (MEDEVAC) and casualty evacuation (CASEVAC) have positive impacts on morale. *Medical evacuation*—is the process of moving any person who is wounded, injured, or ill to and/or between medical treatment facilities while providing en route medical care (FM 4-02). During c*asualty evacuation,* nonmedical units use this to refer to the movement of casualties aboard nonmedical vehicles or aircraft without en route medical care (FM 4-02). Casualties are cared for at point of injury or under nearby cover and concealment receiving self- or buddy-aid, advanced first aid from combat lifesaver (CLS), or emergency medical treatment from a trauma specialist or unit medic.

1-57. During planning, commanders and subordinate leaders outline procedures for MEDEVAC and CASEVAC. Key MEDEVAC considerations include—

- Organic medical personnel accompanying each march element.
- Coordinating for air and ground medical evacuation support
- Rehearsing MEDEVAC operations with air ambulance flight crews.
- Rehearsing MEDEVAC operations with ground ambulance crews.
- Strategically placing ground ambulances in direct support of each march element.
- Identifying ambulance exchange points along march routes.

1-58. In situations where MEDEVAC assets are either limited in number or unavailable commanders must plan to conduct CASEVAC operations. This is usually accomplished through the use of organic vehicle platforms. In situations where organic vehicles are not available it may be necessary to request vehicles from supporting units. Additional CASEVAC planning considerations may include:

- Rehearsing CASEVAC operations with designated CASEVAC platform crews.
- Identifying equipment to be carried by designated Soldiers in each march element includes:
  - Compact and lightweight casualty transport systems.
  - VS-17 panels or other marking equipment including night marking devices.
  - Mobility equipment such as rope and carabineers when applicable.

INDIVIDUAL LOAD

1-59. To prevent an individual load from hindering a marching Soldier's mobility and combat readiness, the commanders identifies the minimum mission-essential equipment to fight and survive in the immediate combat operation. The primary consideration is not how much Soldiers can carry, but rather how much they can carry without reduced combat effectiveness. A unit's combat strength cannot be based solely on number of Soldiers; it must be based on number of Soldiers who are willing and physically able to perform their

duties. Soldiers become exhausted quickly when under combat stress. Soldiers must have the capability to carry heavy loads and quickly adjust to a tailored fighting load that allows agile movement in combat.

1-60. Individual load must not be based on equipment and supplies needed to meet every possible contingency. The commander should not expect Soldiers to carry equipment for all possible combat situations. Instead, items contained in loads must be based on realistic expectations. Unit standard operating procedures (SOPs) may be used to provide a standardized fighting load and approach march load (see chapter 3, this publication, for additional information) based on common mission requirements. The commander is responsible for tailoring fighting and approach march loads based on specific mission requirements and obtaining means to carry additional gear. Usually a rifle company or smaller-size unit requires one truck and one trailer to carry additional gear. In cold weather or during other conditions where personal gear requirements increase, this requirement increases.

1-61. The commander ensures the supply system provides balance of essential supplies and equipment not carried by the unit. Soldiers must feel confident their mission-essential needs are being met. When operating under austere conditions, the commander sets proper standards regarding Soldier field-craft techniques in the use of caches and other field-expedient measures to sustain the force.

RISK TOLERANCE

1-62. Commanders must ensure a thorough understanding of the operation, including the senior commander's intent and the risk tolerance. A commander receiving a mission will analyze it and assign subordinate missions. The combined risks identified for these additional missions and tasks may modify the overall residual risk for the mission, possibly to a higher level than the risk tolerance. Risk management, the Army's process for helping organizations and individuals make informed decisions to reduce or offset risk is addressed in chapter 3.

SECTION III – PLANNING FOR THE MARCH

1-63. Planning is the process by which march commanders translate their visualization into specific courses of action (COA) for preparation and execution, focusing on expected results. Planning to determine relationships between mission variables of METT-TC begins with an analysis and assessment of conditions in OE, with particular emphasis on the enemy and terrain. Planning involves understanding and framing problems and envisioning sets of conditions representing desired end state. Based on higher commander's guidance, the march commanders' planning includes formulating one or more suitable COA to accomplish the mission. Planning continues as needed during preparation and execution. March commanders rely on intuitive decision-making and direct contact with subordinate leaders to integrate activities during the planning process.

PLANNING METHODOLOGY

1-64. Commanders employ three methodologies for planning: Army design methodology, military decision-making process (MDMP), and troop leading procedures (TLP). Commanders determine how much of each methodology to use based on scope of the problem, their familiarity with it, and time available.

DESIGN METHODOLOGY

1-65. *Army design methodology* applies critical and creative thinking to understand, visualize, and describe unfamiliar problems and approaches to solving them (ADRP 5-0). To produce executable plans, commanders integrate design methodology with detailed planning typically associated with MDMP. (Refer to ADRP 5-0 for additional information.)

MILITARY DECISION-MAKING PROCESS

1-66. *Military decision-making process* is an iterative planning methodology to understand the situation and mission, develop a course of action, and produce an operation plan or order (ADRP 5-0). The MDMP helps commanders apply thoroughness, clarity, sound judgment, logic, and professional knowledge to

understand situations, develop options to solve problems, and reach decisions. This process helps commanders, staffs, and others think critically and creatively while planning. (Refer to FM 6-0 for additional information.) The MDMP steps are—

- Step 1. Receive of mission.
- Step 2. Mission analysis.
- Step 3. Course of actions development.
- Step 4. Course of actions analysis (war game).
- Step 5. Course of actions comparison.
- Step 6. Course of actions approval.
- Step 7. Order production, dissemination, and transition.

TROOP-LEADING PROCEDURES

1-67. *Troop leading procedures* are dynamic processes used by small unit leaders to analyze missions, develop plans, and prepare for an operation (ADP 5-0). These procedures enable the company commander and subordinate leaders to maximize the available planning time while developing plans and preparing their units for an operation. TLP consist of eight steps. They are supported by risk management. TLP step sequences are not rigid. The company commander and subordinate leaders modify sequences to meet mission, situation, and available time. Some steps are done concurrently while others may go on continuously throughout the operation. (Refer to FM 6-0 for additional information) The TLP steps are—

- Step 1. Receive the mission.
- Step 2. Issue a warning order.
- Step 3. Make tentative plans.
- Step 4. Initiate movement.
- Step 5. Conduct reconnaissance.
- Step 6. Complete the plan.
- Step 7. Issue the order.
- Step 8. Supervise and refine.

PARALLEL PLANNING

1-68. Parallel planning occurs when two or more echelons plan the same operation at about the same time. Parallel planning is easiest when higher units continuously shares information on future operations with subordinate units. Rather than waiting until the higher commander finishes planning, march commanders start to develop their units' missions as information is received, and flesh out their missions as more information becomes available.

1-69. March commanders start by identifying their units' missions, stating commander’s intent, ensuring their intent reflects operational concepts of their higher and second higher command. March commanders choose tasks likely assigned to their units, developing mission statements based on information received. All commanders understand as their next higher commander's concept of operations continues to mature they continue parallel planning until execution. Figure 1-1 on page 1-12 shows the parallel planning sequences of the battalion, company, and platoon.

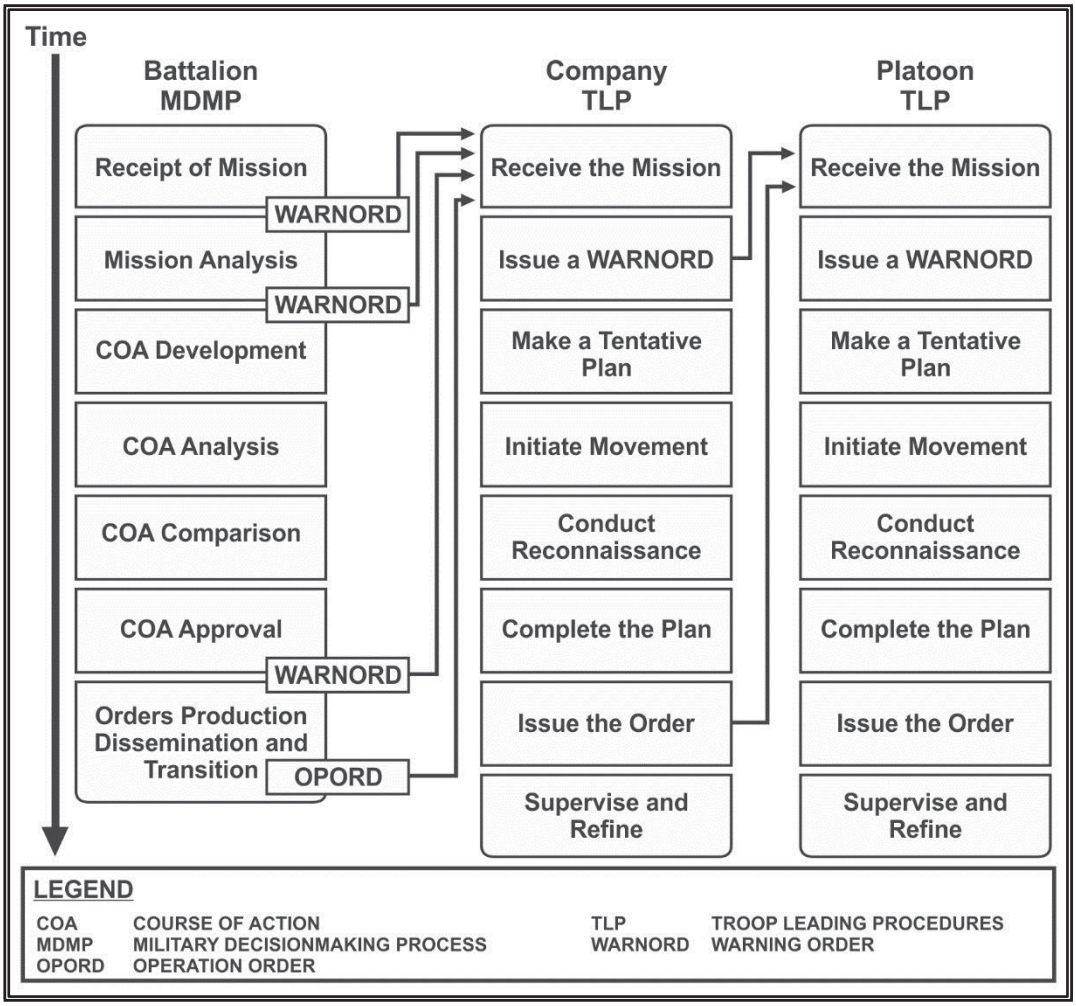


Figure 1-1. Parallel planning

KEY COMPONENTS OF PLANNING

1-70. March unit task organization, mission statement, commander's intent, concept of operations, tasks to subordinate units, coordinating instructions, and control measures are key components of planning. Commanders ensure their mission and end state nest with those of their higher headquarters. While commander's intent focuses on the end state, the concept of operations focuses on ways or sequences of action by which forces achieve the end state.

1-71. The concept of operations expands on the mission statement and commander's intent. Within the concept of operations, commanders may establish objectives as intermediate goals toward achieving the operation's end state. When developing tasks for subordinate units, commanders ensure the purpose of each task correlates with accomplishment of another task, achievement of an objective, or directly to attainment of an end state condition.

1-72. Commander and staff use operational variables to analyze and understand the OE. Operational variables describe military aspects of an OE and the population's influence on it. Planners analyze an OE in terms of eight interrelated operational variables—political, military, economic, social, information, infrastructure, physical environment, and time (PMESII-PT)

1-73. Commander and staff, and subordinate leaders use the mission variables of METT-TC to focus on specific elements of an OE during mission analysis. Upon receipt of a warning order (WARNORD) or operation order (OPORD), commander and staff filter relevant information categorized by operational

variables into categories of mission variables used during mission analysis. Commander and staff, and subordinate leaders use mission variables to refine their understanding of the situation. The tactical situation is defined through the mission variables of—mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC).

ENVIRONMENTAL FACTORS

1-74. Environmental factors must be taken into account when planning a foot march. Key environmental factors to consider during movement planning are address in the following paragraphs.

MOUNTAINOUS AREAS

1-75. Steep grades are common in mountainous areas. Proper selection of formations for an operation enables continued movement without halting. Soldiers must be extremely careful at all times in vicinity of sharp curves and dangerous grades. Uphill or downhill grades should be traversed carefully. When entering short, steep grades, Soldiers may build up momentum on the approach so the added momentum carries them over it. Use caution to ensure safety.

1-76. Units moving in column must guard against bunching on approaches to grades and curves. The slow movement of columns in mountainous areas makes Soldiers vulnerable to an enemy attack at natural obstacles or canalizing terrain. (Refer to ATTP 3-21.50 for additional information.)

WATER OBSTACLES

1-77. Evidence of ground water such as presence of springs, pools, or plant growth, along planned cross country route presents problems in movement of Soldiers. Water obstacles generally are associated with valleys or lowlands. However, side hill bogs and ridgeline swampy ground may appear where ground water emerges. For planning purposes, consider these barriers as seasonal, although seasonal conditions affect them as the water table rises or falls. Timely estimation of size and characteristics of obstacles through map study, reconnaissance, surveillance, and intelligence operation aid in determining—

- Amount and type of added equipment needed to facilitate passage of a column.
- Probable delays and adjustments in schedule to avoid congestion.
- Advisability of using an alternate route to bypass obstacles.

SWAMPS, BOGS, AND MUD

1-78. Swamps, bogs, and mud caused by water tables close to top of the ground should be avoided by all marches. Surface crust may appear dry and covered with vegetation, but breakthroughs may result in Soldiers becoming stuck. Depth of soft mud below the surface is extremely difficult to determine. Depth may vary in the same swamp from one to two feet.

1-79. When it is necessary to cross such barriers, make provisions to bridge surfaces by suitable reinforcement means such as mats, brush, or special flotation materials. By increasing flotation and avoiding concentrated loads, Soldiers may cross otherwise impassable barriers without undue loss or delay. If support of tactical operations requires movement over large marshes or swamps, assistance from engineer personnel and equipment may be available.

DITCHES AND STREAMS

1-80. Drainage ditches and canals, gullies and ravines, and streams and rivers present obstacles to foot movement especially if obstacles are large and movement is open to enemy action. Map study, reconnaissance, surveillance, and intelligence operations may supply all information necessary to planning personnel.

1-81. When doubt about ease of crossing an obstacle, request an engineer reconnaissance. Engineers can determine what must be done to make the crossing. Small ditches, gullies, and streams do not cause serious delays, and approach and passage at reduced speeds requires control to avoid congestion. Canals, ravines, and rivers present serious obstacles to foot movement and require assistance for crossing.

1-82. Bridges and fords offer likely targets for enemy artillery, sniper, ambush, and improvised explosive device (IED) activities. Therefore, no movement should be made without provision for changes in plans dictated by current intelligence.

1-83. In general, canals, ravines, and rivers crossing of selected routes require added preparation by planners. Planners do this to—

- Avoid congestion in critical areas.
- Arrange for construction at crossing sites.
- Give adequate instructions to personnel to ensure proper conduct of missions.

DESERT AREAS

1-84. Movement planning for desert areas involve examining influences of climate and terrain on movement. Planners at all levels must be familiar with capabilities and limitations of soldiers and equipment. Make necessary changes to organization, training, and equipment as early as possible. When utilized, select vehicles suitable for local climate and terrain. This ensures maximum mobility and lessens excessive supply and evacuation requirements of vehicles themselves.

1-85. Foot movement in desert areas is difficult due to terrain and tactical situation. Dispersion increases to achieve some degree of tactical security, which expands length of formations. Experience with time and space schedules developed in other types of terrain may not be helpful. Routes must be general rather than specific. Point-to-point distances may be increased by unexpected obstacles.

1-86. Column control normally is exercised from within the column by radio, mission command system or visual signals. Supply and evacuation movements in deserts usually involve greater distances. Because of force dispersion due to terrain, greater volumes of supplies and support may be required in desert operations. (Refer to FM 90-3 for additional information.)

JUNGLE OR HEAVILY FORESTED AREAS

1-87. Planning for movements in jungles or heavily forested areas requires early consideration of climate and terrain. Anticipate needing additional personnel and equipment to give timely support to movements. Distances involved may be comparatively short and foot speeds usually are reduced. Allowances must be made for route construction and clearance.

1-88. Supply and evacuation in jungle operations should be coordinated closely. Making maximum use of terrain to reduce traffic is a key factor. Tropical conditions require increased protection for supplies against effects of rain, high humidity, and solar heat. (Refer to FM 90-5 for additional information.)

ARCTIC AREAS AND NORTHERN TEMPERATE ZONE

1-89. Planning for movements in arctic areas and northern temperate zones is based on thorough familiarity with local weather and terrain. Movement plans must account for maximum severity of seasonal weather and be flexible to allow for sudden weather changes.

1-90. Sudden rise in temperature accompanied by warm rain turns trafficable snow into mud and slush. Cold temperatures, even though above freezing, cause great discomfort to personnel. Midwinter thaws are often followed by subzero temperatures, creating deep frozen ruts and ice.

1-91. If vehicles are attached, snow and ice accumulation may bind moving parts and wheels and lead to accidents. Sudden changes in weather often have detrimental effects on vehicle transport operations. Advance planning and preparation must include—

- Winterizing vehicles to meet severe weather conditions when applicable.
- Instructing personnel in winter hygiene and first aid.
- Issuing suitable cold weather clothing and equipment.
- Requesting engineer personnel and equipment when necessary expediting movement.

1-92. Route selection should be based on data resulting from route and area reconnaissance. Alternate routes should be used to take advantage of changes in trafficability due to weather. In spite of reduced pace,

column formations normally are open due to intervals required for increased distances. During periods of low visibility, columns close up to maintain control. Schedule frequent halts to allow Soldiers to rest and adjust their loads.

URBAN AREAS

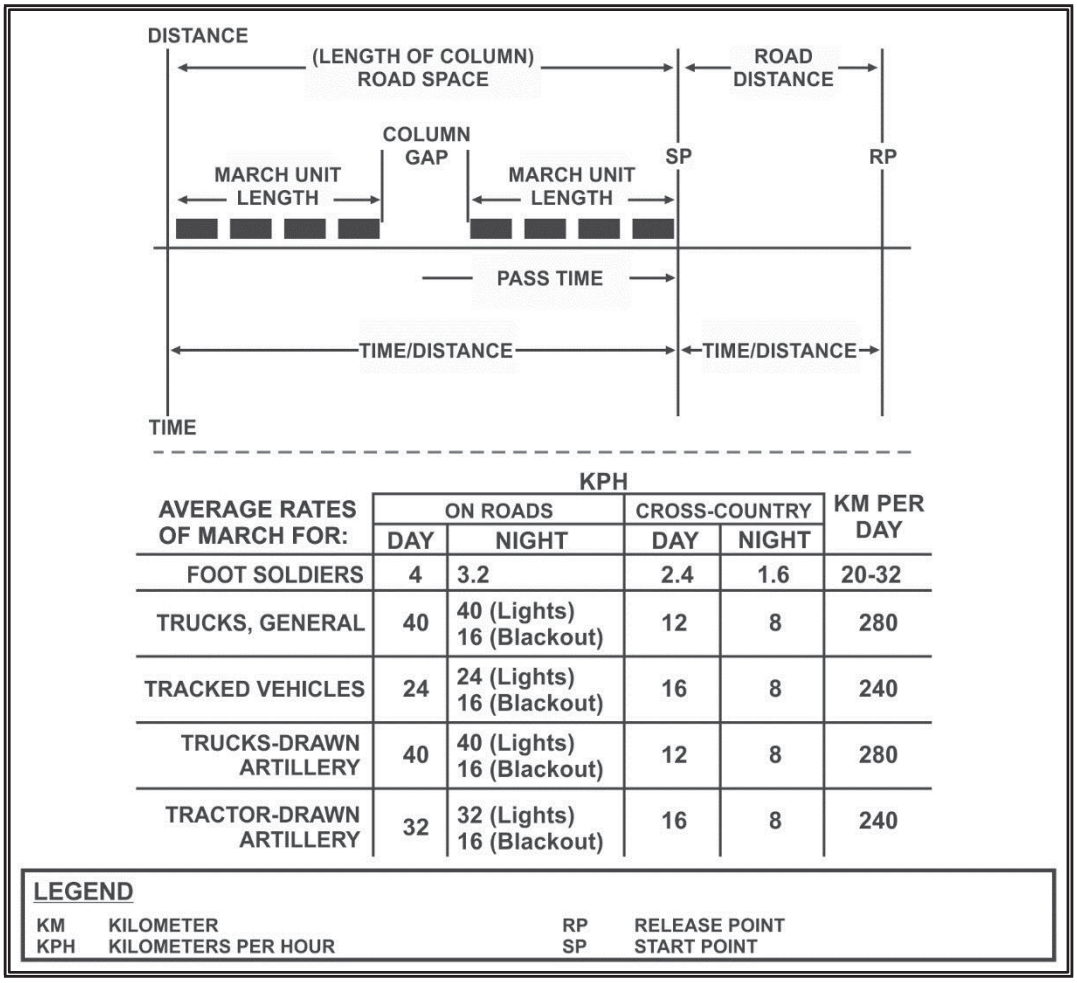
1-93. Urban areas all over the world share many general characteristics. These characteristics include dense city centers, compartmentalization, sectionalism, infrastructure, mass transportation lines, varied street patterns, and continual modernization. Central to these characteristics is population. Large urban areas are often composed of more than one municipality, and large municipalities often have subordinate political units. Units should identify and consider the boundaries of these political units during planning on a case-by-case basis. Commander and staff analyze civil considerations (see ATP 2-01.3) in terms of the categories expressed in the memory aid ASCOPE (areas, structures, capabilities, organizations, people, and events). These characteristics easily align with an urban area's three main components of terrain, society, and infrastructure; and, like them, they are overlapped and interdependent. (Refer to ATTP 3-06.11 for additional information.)

Note. Subsurface areas (also known as subterranean) include underground garages, passages, subway lines, utility tunnels, sewers, and storm drains. Although these areas allow for tactical movement, a commander will generally not conduct a foot march in these areas.

MARCH DISTANCE, RATE, AND TIME

1-94. Basic factors of march distance, rate and time transform into movement formulas. Formulas are then applied to known data to obtain information needed to prepare a time schedule. The time schedule is used to regulate departures and arrivals of march elements.

1-95. Relationships between time and distance are the basis for march planning. Planners determine how far columns should travel (distance) and how long it takes to make the move (time). They must know the space (length of column) columns occupy on the route. They include in their computation safety factors of distance (road gap) or time (time gap) separating march columns and their elements. Each term used for distance has its corresponding term for time. The length of a column in kilometers has an equivalent travel time in minutes; road distance in kilometers or miles has a corresponding time distance (figure 1-2, page 1-16).



AVERAGE RATES OF MARCH FOR:	KPH ON ROADS DAY	KPH ON ROADS NIGHT	KPH CROSS-COUNTRY DAY	KPH CROSS-COUNTRY NIGHT	KM PER DAY
FOOT SOLDIERS	4	3.2	2.4	1.6	20-32
TRUCKS, GENERAL	40	40 (Lights) 16 (Blackout)	12	8	280
TRACKED VEHICLES	24	24 (Lights) 16 (Blackout)	16	8	240
TRUCKS-DRAWN ARTILLERY	40	40 (Lights) 16 (Blackout)	12	8	280
TRACTOR-DRAWN ARTILLERY	32	32 (Lights) 16 (Blackout)	16	8	240

LEGEND

KM	KILOMETER	RP	RELEASE POINT
KPH	KILOMETERS PER HOUR	SP	START POINT

Figure 1-2. Time-distance relationship

MARCH RATES UNDER DIVERSE CONDITIONS

1-96. Soldiers can only move as fast as their lungs and legs allow. A trained, conditioned, and acclimatized Soldier often has endurance and moves efficiently. Rest, good nutrition and hydration, conditioning, acclimatization, proper training, and will are vital. Terrain, weather, and light conditions affect movement rates. Movement rates should be relative to conditions. The more adverse conditions, the slower the pace should be. Moving too fast, even under ideal conditions, can produce early fatigue, require frequent rest halts, and result in time loss.

1-97. Movement rates, coupled with proper Soldier spacing, should be adjusted to prevent an accordion effect during movement in adverse terrain. Spacing between Soldiers largely depends on the terrain, weather, and visibility. In adverse terrain, a slow, steady pace is preferred to rapid movement with frequent halts.

Note. Refer to ATTP 3-21.50 for information on dismounted movement rates for mountain environments. Refer to FM 90-5 for information on dismounted movement rates for jungle environments.

MINIMIZING SOLDIER FATIGUE

1-98. To help minimize Soldier fatigue and ensure efficiency, the following should be considered during movement rate evaluation:

- When traveling at moderate pace, the need for rest halts can decrease and chances of personnel overheating are less than traveling at a high rate. Minimization of halts enables units to cover given distances in minimal time.
- An adjustment halt should be taken during the first half-hour of movement. Soldiers can loosen or tighten bootlaces as needed, adjust packs, and add or remove layers of clothing as appropriate.
- Short rest halts may be taken every 1 to 1.5 hours. If possible, Soldiers should lean against a tree, rock, or hillside to relieve their shoulders of pack weight, breathe deeply, hydrate, and snack on trail food. Halts should be short to avoid muscles stiffening. Take rests on level ground, if possible, and avoid steep inclines.
- Longer rest halts may be taken later in the march if necessary due to fatigue or mission requirements. At these halts, Soldiers may need to put on additional clothing to avoid becoming chilled. It is much easier to keep a warm body warm, than to warm up a cold body.
- After a climb, Soldiers need a good rest to revive tired muscles. Use rest stops for steep slopes, snowfields, and higher elevations. Rest stops help control the pace and limits fatigue by giving lungs and legs a moment to recuperate between stops. Maintain a slow and rhythmic pace.
- Soldiers should employ proper walking techniques and pause briefly after each step forward, relaxing muscles of the forward leg while resting their entire body weight on the rear leg. The rear leg should be kept straight with the knee locked so the bone, not muscle, supports the weight. After relaxing the forward leg, Soldiers should scan their surroundings and ensure they focus on maintaining alertness and not just traversing terrain.
- Soldiers should synchronize their breathing with each rest step. The number of breaths per step changes depending upon the difficulty of the climb. Steeper slopes or higher elevations may require several breaths per step. It is especially important to breathe deeply when air thins at higher altitude, using the "pressure breathing" technique. Soldiers should exhale strongly, enabling an easier, deeper inhale. This slow, steady, halting rest step is more efficient than spurts of speed, which is rapidly exhausting and requires longer recovery.

STRAGGLER CONTROL

1-99. Stragglers who cannot meet or maintain pace set for the foot march are the responsibility of their immediate chains of command. Fire team leaders, squad leaders, and ultimately the platoon sergeant must ensure Soldiers are linked up with the straggler control party at the rear of the march column.

1-100. Information concerning the number of Soldiers who fall out, their standard name lines, and medical disposition must be relayed through the chain of command to maintain accountability of personnel and equipment at all times.

Note. Soldiers who fall out and are carrying mission essential equipment must transfer equipment to other Soldiers in the unit continuing the march according to unit SOP.

DISTANCE FACTORS – DISMOUNTED OR MOUNTED MARCHES

1-101. Battalions normally are organized into company-size march units to facilitate control and maintain unit integrity. Normal march formation is a column of twos. Normal distance is two to five meters between Soldiers (1 to 3 meters at night), 50 meters between platoons (25 meters at night), and 100 meters between companies (50 meters at night).

- Vehicle or individual distance is space between two consecutive vehicles or individuals of an organized element of a column.
- Column gap is space between two organized elements following each other on the same exact route. It can be calculated in units of length or time as measured from rear of one element to the front of following elements.
- Traffic density of attached vehicles is the average number of vehicles occupying one mile or one kilometer of road space, expressed in vehicles per mile or vehicles per kilometer.

- The length of a column is the length of roadway occupied by a column to include gaps in the column measured from front to rear.
- Road gap is the distance between two march elements. It is the length aspect of column gap. Since it is a more significant factor when columns are moving than when they are halted, road gap becomes factors of time rather than distance.

RATE FACTOR

1-102. Speed indicates the actual rate of speed of a dismounted march or mounted march column at a given moment as shown on the speedometer in kilometers per hour (kph) or miles per hour (mph).

1-103. Pace is the regulated speed of a column or element which is established by a Soldier or a lead vehicle in the lead element to maintain the prescribed average speed. For foot marches, the normal pace is 30 inches at cadence of 106 steps per minute.

1-104. Commanders consider all factors affecting marches and select a rate placing their units at their destinations in the shortest time and in combat ready condition. Unit SOP usually state the rate for marches on roads and cross country, over normal terrain, and day or night. Column commanders modify the rate to suit their needs, which varies greatly in mountain, jungle, desert, or arctic areas. Rates of march usually are prescribed for normal terrain.

1-105. Dismounted marches conducted in mountainous, jungle, desert, or arctic areas are characterized by—

- Increased physical effort of individual Soldier.
- Decreased Soldier's load.
- Increased potential for injury.

TIME FACTOR

1-106. Time measurement includes the total time needed for units to complete marching or to pass designated points along designated routes. Time usually is measured in minutes or hours.

- Arrival time is when the head column arrives at a designated point or line.
- Clearance time is when the trail of a column passes a designated point or line.
- Completion time is when the trail of a column passes the release point.
- Pass time is actual time between the moment the first element passes a given point and the moment the last element passes the same point.
- Road clearance time is the total time required for a column to travel over and clear a section of road. Road clearance time equals time distance plus column pass time.
- Time distance is the time required to move from one point to another at a given rate of march. It normally represents movement of the head of the column from start point to release point.
- Time gap is the time measured between rear and front of successive elements as moving past a given point. It is time aspect of column gap or conversion of road gap to time. There are no prescribed time gaps. Gaps depend on the size of serials and march units, time available for movement, and tactics required for protection against air attack and chemical, biological, radiological, and nuclear threats and hazards.

MARCH COMPUTATIONS

1-107. Before issuing the movement order or OPORD, commanders must compute the required time and space measurements to prepare a road movement table (see appendix B) or schedule. Distance, rate, and time are factors for march computations. During computation, if two factors are known, the third can be determined easily by dividing or multiplying one known factor by the other.

- Distance is determined by multiplying rate by time.
- Rate is determined by dividing distance by time.
- Time is determined by dividing distance by rate.

Note. March planners must determine time distance, pass time, arrival time, and completion time.

Time Distance

1-108. Time distance is determined by dividing distance being traveled by rate of march. Time distance does not include time for long delays or extended scheduled halts. Time distance table is a valuable source for march planners. It provides a list of factors used to calculate time required to travel certain distances at specified speeds, either by foot or on vehicle. Travel rates are expressed in foot or vehicle speeds and corresponding rates of march. Travel factors are derived from the rate of march, which includes time for short periodic halts and other minor delays which could occur.

Pass Time

1-109. Length of column is used to determine pass time of a column and consists of two parts: space occupied by the Soldier alone including distance between Soldiers and sum of distances between elements of the foot column or column gap. Total length of column is the sum of two parts:

- Length of a column is determined by multiplying number of Soldiers by appropriate factor selected from table 1-1. This does not include the distances between units.
- Total distance or column gap between units is obtained by—
  - Determining the number of serial distances. (Total serials minus one).
  - Determining the number of march unit distances. (Total march units minus one, minus the number of serial distances).
  - Multiplying the number of distances obtained by length in meters between the respective units.
- Add the results.

Table 1-1. Determine length of column

SOLDIERS LENGTH OF COLUMN IN METERS =	(NUMBER OF SOLDIER'S X FACTOR) + COLUMN GAPS (BETWEEN UNITS)	
FACTOR TABLE		
FORMATION	2 meters between soldiers	5 meters between soldiers
SINGLE FILE	2.4 (Factor)	5.4 (Factor)
COLUMN OF TWOS	1.2 (Factor)	2.7 (Factor)

1-110. Based upon previous movements, march units accumulate past data to facilitate march planning. Accumulated data includes approximate pass times for various elements. Units use this data rather than computing the data each time a march is scheduled. Data tables reduce time required to complete the computation phase of march planning. Appropriate information is integrated into the unit's SOP.

CRITICAL INFORMATION

1-111. Critical information used in movement formulas include the start point and release point for the proposed tactical march. The commander directing a tactical march often uses a strip map or overlay to graphically depict critical information about the route to subordinates.

Start Point

1-112. Start points (SPs) provides all units of the march column or formation with a common point for starting their movement. When units use more than one route, each route has their own SP. The SP is a place along the route of march easily recognizable on the map and ground such as a road intersection. SPs should

not be a defile, on a hill, or on a sharp curve. SPs should be far enough away from assembly areas to allow units to organize and move at prescribed rate and intervals when reached. No elements of a march column or formation should be required to march to the rear or through another unit to reach the SP.

Release Point

1-113. Release points (RP) provides all units of the march column or formation with a common point for release or reverting back to control of their parent units. RPs should be on the route of march and be easily recognizable on the map and ground. Units do not stay at the RP. Guides meet units arriving at the RP and lead them to new areas according to the movement order/OPORD or units release to continue follow-on operations. Multiple routes and cross country movement enable units to disperse rapidly. When selecting a RP, units should avoid hills, defiles, and sharp curves along the route. Units must not countermarch or pass through other units to reach their new positions.

Strip Maps and Overlays

1-114. Strip maps (see figure 1-3) and overlays (see figure 1-4 on page 1-22) depict critical information about the route. They are detailed but not cluttered with unreadable and unnecessary information. Both show the route over which the march travels. A strip map is not drawn to scale and should indicate this on the face of the map. Examples of information shown include:

- Route data—route numbers, major intersections, and distance between points. Whenever possible, insets or separate strip maps should be made to show routes through metropolitan areas or entrances into rest halts and refueling (as required) sites. Control measures, generally specific to an overlay, may include boundaries, phase lines, and assembly areas.
- Movement control data—arrival and departure times at the start point, checkpoints, release point; country, province, or territorial boundaries or lines; and all halts. Times must coincide with the movement order/OPORD.
- Logistical support data—locations of all logistical support facilities and points for requesting or obtaining medical and maintenance support.

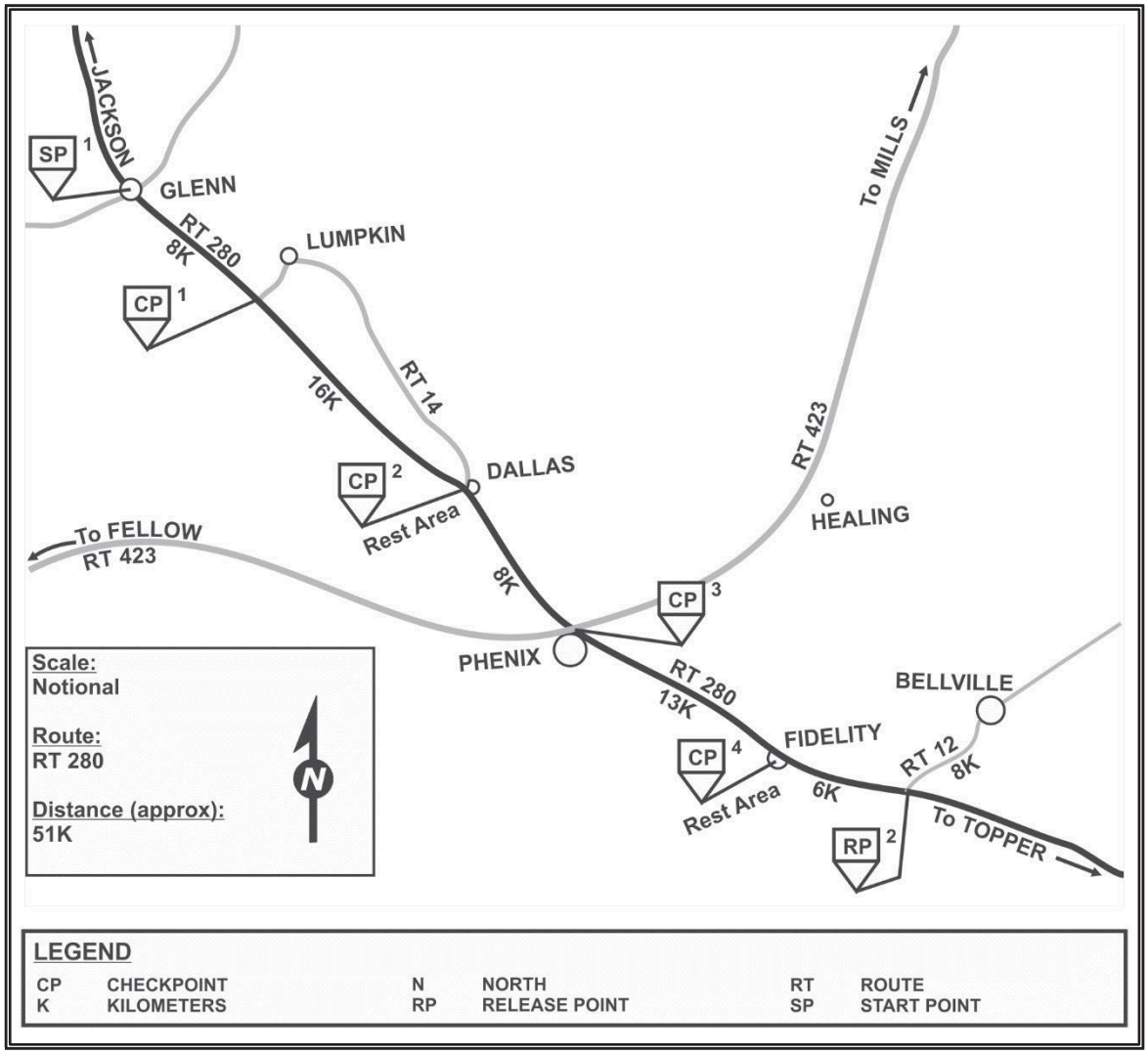


Figure 1-3. Example of a strip map (dismounted march)

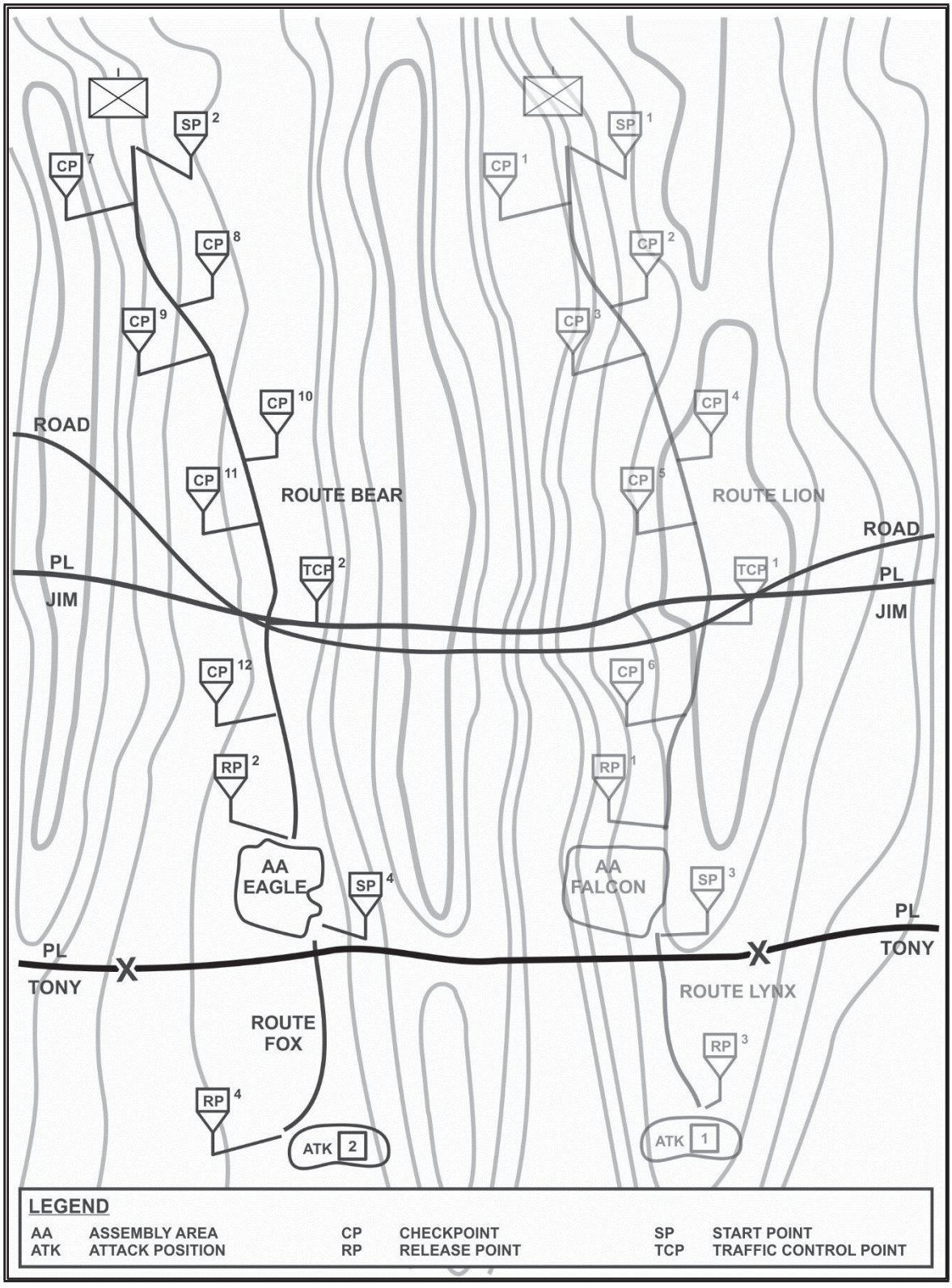


Figure 1-4. Example of an overlay (dismounted march)

1-115. Additional information shown on a strip map or overlay generally include:—

- Checkpoints (CPs)—on routes are points used for reference in providing instructions, or places where timing might be critical. Route reconnaissance report or map study provide march planners with information to designate CPs along routes of march and distances from one CP to another. CPs are always identified and numbered consecutively. Once identified, guides and signs usually are sufficient. Leaders may be present at passing points.
- Distance between checkpoints—are determined and listed on the strip map. In most parts of the world, distances are measured in kilometers.
- Rest areas—provide rest, messing, refueling, inspection and maintenance, and schedule adjustment while allowing other traffic to pass. Elements halt for 15 minutes during the first hour and 10 minutes every 50 minutes thereafter. Long halts are identified for dining, refueling, and assembly area activities. Every effort should be made to ensure messing, refueling, and maintenance halts coincide. Halt areas must be clearly identified.
- Major cities and towns—serve as valuable reference points, cities and towns indicate areas of heavy population concentrations. If possible, cities and towns should be bypassed to avoid congestion or choke points.
- North orientation— (commonly referred to as the North-seeking arrow) is clearly depicted on the strip map, generally near the legend box. The northern orientation is a critical feature of the strip map and must align with any standard map.

SECTION IV – PREPARATIONS FOR THE MARCH

1-116. Preparation is essential to effective execution of any movement plan. Preparing before actual events gives commanders, subordinate leaders, and Soldiers clear ideas of what to expect. Applicable unit SOPs enable execution. This section addresses key preparation activities for the march. (Refer to FM 3-21.20 for additional information on preparation activities.)

MARCH REHEARSALS

1-117. Well-planned rehearsals are critical aspects of preparation for march operations. With limited time, rehearsals must concentrate on battle drill reactions to likely enemy threats. Rehearsals ensure everyone in the march understands and demonstrates the ability to execute the plan and essential drills. Rehearsals instill confidence in all march participants and ensure they are fully prepared.

1-118. Good rehearsals happen if they are planned and prepared carefully. Subordinate leaders supervise individual and crew drills rehearsals. Rehearsals are scheduled early in the preparation cycle, linking individual and crew rehearsals with PCCs and PCIs. Drills are practiced until individuals, teams, and crews can executed the movement to standard. On-the-spot corrections are made during rehearsals and throughout preparation activities.

PRECOMBAT CHECKS AND PRECOMBAT INSPECTIONS

1-119. PCCs determine if equipment required for the march is available and serviceable. PCCs are effective if they are organized and conducted using an up-to-date checklist. Unit SOPs tailor these lists to specific missions. Follow-through is essential, missing or unserviceable equipment must be reported, repaired or exchanged immediately. These checks should be conducted soon after the WARNORD is issued.

1-120. PCIs are a series of inspections scheduled early in the preparation sequence to ensure all PCCs have been performed properly and all weapons, communications, vehicles (when required), and special and individual equipment are available and functioning. PCIs are effective when organized and conducted to exacting standards by first-line supervisors, with systematic spot checks made by subordinate leaders. An effective technique is conducting full PCC and PCI during the march recovery period to ensure individuals and unit equipment are immediately ready for the next mission. (Refer to ATP 3-21.8 for addition information.)

Note. See chapter 3, section II, this publication for an example-packing list checklist.

EQUIPMENT MAINTENANCE

1-121. Commander and subordinate leaders plan for regular maintenance halts throughout extended marches. Weapon, night vision devices and optical equipment, and vehicles require regular maintenance to perform consistently throughout operations. Weapons and other equipment including vehicles can become non-mission capable due to direct or indirect enemy fire, mines, IED, vehicle accidents, parts failures, and other unforeseen or unexpected events.

1-122. Commander and subordinate leaders enforce regular preventive maintenance checks and services (PMCS) of all unit equipment. PMCS is operator-level maintenance conducted before, during, and after operations. Comprehensive PMCS identifies actual and potential problems and ensures repairs are made promptly to minimize equipment downtime. DA Form 5988-E, (*Equipment Maintenance and Inspection Worksheet (EGA)*) or the manual DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) is used to record these deficiencies.

1-123. Early detection and correction of these deficiencies can decrease the possibility of combat equipment breaking down during marches and prevent minor deficiencies from becoming major faults. Every individual is responsible to conduct PMCS. Subordinate leaders are responsible to ensure PMCS is conducted regularly and to standard before, during, and after the operations. (Refer to ATP 3-21.8 for addition information.)

Chapter 2

March Execution

The execution phase of foot marches is a continuation of the planning and preparation phases. The MDMP and TLP provide a framework for feedback to unit commanders or leaders. Proper planning and preparation ensures smooth transitions by setting up task organization, control and security measures, and mission command. Execution is enhanced by enabling and adapting plans to changing situations.

SECTION I – ORGANIZATION OF FORCES FOR THE MARCH

2-1. Commanders use tactical road marches and approach marches to rapidly relocate units within an AO to conduct combat operations. Tactical road marches are used when contact with the enemy is not expected; and approach marches are used when contact is intended. Organization of force for the march must be flexible to changing conditions and responsive to the commander.

Note. For discussion purposes the unit organization used in this section is a battalion-size element.

ORGANIZATION FOR A TACTICAL ROAD MARCH

2-2. A *tactical road march* is a rapid movement used to relocate units within an AO to prepare for combat operations (ADRP 3-90). Tactical road marches are organized into march columns. *March columns* consist of all elements using the same route for a single movement under control of a single commander (FM 3-90-2). March execution depends upon task organization to accomplish critical tasks and flexibility to adjust to changing conditions.

2-3. To facilitate control and scheduling within a march column, units are organized into serials and march units, and are given an order of march. A *march serial* is a major subdivision of a march column organized under one commander who plans, regulates, and controls the serial (FM 3-90-2). An example is a battalion serial formed from a brigade-sized march column. A *march unit* is a subdivision of a march serial. It moves and halts under the control of a single commander who uses voice and visual signals (FM 3-90-2). An example of a march unit is a company from a battalion-sized march serial.

2-4. During extended road marches, halts are necessary to rest personnel, adjust movement schedules, reorganize march elements, and if applicable service vehicles. The movement order/OPORD or unit SOP regulates when to take halts, and addresses actions for various types of halts, such as security, scheduled, unscheduled, rest, and maintenance halts. During halts, march elements normally clear the march route and move to a previously selected assembly area to prevent route congestion and to avoid being lucrative targets. March elements establish security and take other measures to protect their forces.

MARCH COLUMN ORGANIZATION

2-5. March columns provide excellent speed, control, and flexibility, but sacrifices flank security. It provides the ability to deploy forces to the front of the column. The commander uses a march column when speed is essential and enemy contact is unlikely. The commander organizes a march column into four elements: reconnaissance, quartering party, main body, and trail party (figure 2-1, page 2-2).

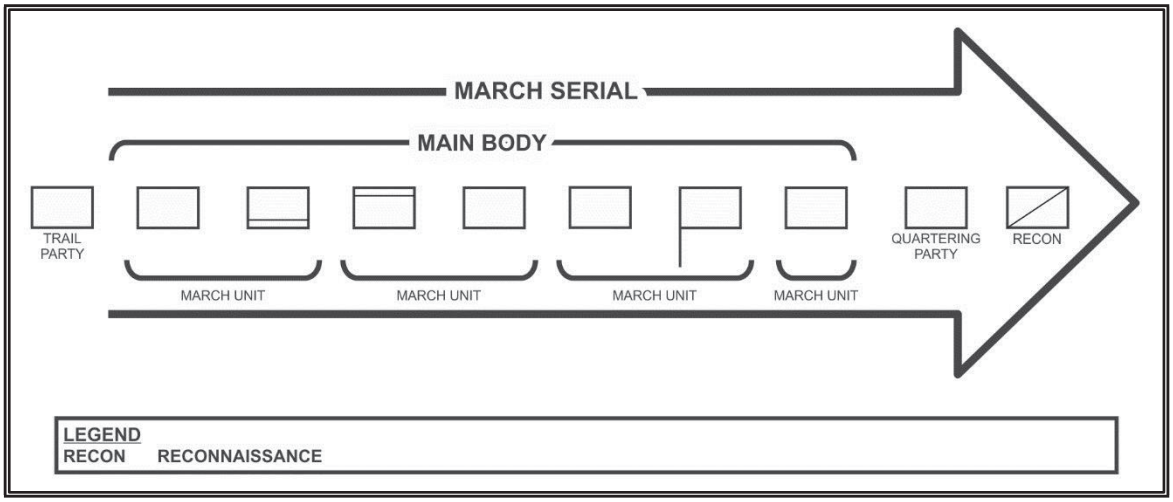


Figure 2-1. Example of march organization

Note. March columns are organized to maintain unit integrity and task organized as determined by the mission variables of METT-TC.

Reconnaissance

2-6. The march plan is based on thorough ground reconnaissance if time permits. Map and aerial reconnaissance help formulate plans but are not substitutes for ground reconnaissance. A reconnaissance element performs route reconnaissance and usually consists of reconnaissance forces, and attached engineer support and traffic control elements. When the situation dictates, CBRN survey teams may be included in the reconnaissance element. Generally, unit SOP establishes the reconnaissance element's base composition which can be modified to meet specific march requirements. Minimum information required from the reconnaissance element includes—

- Available routes and conditions/trafficability of each route. (Routes may be specified by higher headquarters).
- Recommended rate of march, includes changes to the rate at different points along the route.
- Start point and release point selections and confirmation of their suitability.
- Confirmation of assembly area(s) and halt(s) locations.
- Checkpoint locations along route.
- Distance between checkpoints and total distance from start point to release point.
- Location of obstacles, includes estimations to repair and maintain routes.
- Recommendations to bypass obstacles.
- Number of guides (as necessary) required and their route locations.
- Location of possible/likely danger areas, potential ambush sites, and chance enemy contacts.
- Possible medical evacuation points along the route.
- Height and width of underpasses and overpasses.
- Weight limit and width of roads and bridges.

Quartering Party

2-7. A *quartering party* is a group of unit representatives dispatched to a probable new site of operations in advance of the main body to secure, reconnoiter, and organize an area before the main body's arrival and occupation (FM 3-90-2). As an example using a battalion-size unit, composition and responsibilities of quartering parties include—

- Quartering party commander; an S-4 (battalion logistics staff officer) representative; company representatives including supply and CBRN personnel; and communication, security, and medical personnel.
- Quartering party commander indicates the location of major subordinate units on the ground, formulates plans to receive and guide units from the release point to their areas, and selects exact locations for battalion command posts and support areas based on general locations selected by the S-3 (battalion operations staff officer), in coordination with the S-4. Other considerations include—
  - Company representatives select locations for company headquarters, platoons, messing, and latrines.
  - Communications personnel install equipment ensuring immediate control of units as units arrive in their assigned areas.
  - Medical personnel advise other quartering party personnel on sanitation measures and select a site for the battalion aid station.
  - Based on order of march, plans are prepared to guide each unit over a designated route. This route begins at the release point and extends to the unit's new area. Guides must understand and rehearse the plan. This prevents congestion or delays near release point(s). Actual dispatch of the quartering party can follow issuance of the movement order/OPORD.

Main Body

2-8. Before starting the march, each march unit of a serial reconnoiters its route to the SP and determines the exact time for reaching it. The movement order/OPORD states time the serial must arrive and clear its SP. Serial commanders determine and announce times for march units of their serials. Arrival time at the SP is critical. Each march unit must arrive at and clear the SP on time; otherwise movement of other elements may be delayed. Each leader reconnoiters routes from their position to the SP to help decide when their unit must move to meet its SP time.

2-9. During movement, march units move at the constant rate of march designated in the movement order/OPORD while maintaining proper interval and column gap. Erratic increases and decreases in rate of march, particularly on hills, create an accordion or whipping effect. This can force tail elements to move at increased and unsafe rates of march to keep up with the lead column/element. If the march unit is behind schedule, it uses the designated catch-up rate of march. March units report crossing each control point as assigned by the movement order/OPORD. During movement, air and ground security must be maintained.

Trail Party

2-10. The *trail party* is the last march unit in a march column and normally consists of primarily maintenance elements in a mounted march (FM 3-90-2). As an example using a battalion-size unit, the trail party is usually led by the assistant march commander or the battalion maintenance officer when vehicles are included in the march and may consists of elements of the maintenance and medical sections. The trail party recovers disabled vehicles and stragglers. If disabled vehicles cannot be repaired or towed, vehicles and crew members are moved off the road into a secure area. Drivers and crew members are left with the vehicle, along with food and water. When vehicles are left behind, the trail party calls in its location and tells the battalion S-4 why it was left.

2-11. Medical personnel attached to the trail party comprise the personnel evacuation section. This section is responsible for recovering stragglers from the march column who require medical care. Company medics try to maintain march unit discipline by treating casualties within their ability and not allowing stragglers to delay them or the progress of the foot march. Trail party personnel evacuation section must have troop-carrying assets to pickup and treat stragglers from various march units within the battalion serial. Once the trail party picks up stragglers, the S-1 should be notified to maintain accountability.

2-12. When the trail party completes the march, the battalion's first priority is to recover vehicles left behind and return stragglers to their parent units. Tactical marches are not complete until a 100 percent accountability of all march units, vehicles, equipment, and personnel.

2-13. When the trail party is responsible for rear security of the march, the party is attached with a small security force. The security force ensures no one surprises the march from the rear. The trail party maintains constant communication with the main body and march commander to ensure no wide separations between main body and trail party occur.

ORDER OF MARCH

2-14. During tactical marches, order of march depends on the mission, terrain, probable order of commitment into action, and mobility of units. March units and serials are placed in the desired order of march by scheduling the arrival of march units at the SP. When different types of units are included in the march, the following is an example how units might be broken down:

- Tanks and Infantry units included in marches are interspersed throughout the column to facilitate integrated entry into combat.
- Artillery and mortars are placed forward and throughout the column to ensure support of forward elements and the initial action of the main body.
- Air defense weapons are deployed throughout the column or are moved by bounds to protect passage of critical points.
- Engineer units are located well forward to facilitate movement of units through obstacles or possible improvised explosive devices along the march route.
- Antitank weapons can be disposed to provide protection throughout the column. Some antitank weapons may be employed to overwatch forward elements.

Note. Integration of different units may have an adverse impact on rate of march; but increases combat power and protection level.

TACTICAL MARCH TECHNIQUES

2-15. Units conducting tactical road marches employ three tactical march techniques: open column, close column, and infiltration. Each of these techniques uses scheduled halts to control and sustain the march. Mission variables of METT-TC require adjustments in standard distances between dismounted Soldiers and if used, vehicles.

2-16. During movement, elements in a column may encounter many different types of routes and obstacles simultaneously. Consequently, parts of the column may be moving at different speeds, which can produce an undesirable accordion effect. The movement order/OPORD establishes order of march, rate of march, interval or time gaps between units, column gap, and maximum catch-up rate of march. Unless the commander directs them not to do so for security reasons, march units report when they have crossed each control point. Throughout the march, movement elements maintain air and ground security.

Open Column

2-17. In an open column, the commander increases distance between dismounted Soldiers and vehicles when applicable for greater dispersion. Distance between dismounted Soldiers varies from two to five meters allowing dispersion and space for marching comfort. Distances exceeding five meters between dismounted Soldiers increase column length and hinder control. Vehicle distance varies from 50 to 100 meters, and may be greater if required. The open column technique normally is used during day movements. It may be used at night with passive night-vision equipment, infrared lights, or blackout lights.

2-18. Using an open column roughly doubles the column's length and time it takes to clear a point when compared to a close column moving at the same speed. Open column is the preferred movement technique because it offers security while still providing the commander reasonable degree of control. In an open column, a single Infantry company, with intervals between its platoons, occupies about one kilometer of road or trail. Vehicle density varies from 15 to 20 vehicles per kilometer.

Close Column

2-19. The dismounted march equivalent to the close column is a limited visibility march (see paragraphs 2-30 to 2-40). Distance between Soldiers is reduced to one to three meters to help maintain contact and facilitate control. Limited visibility marches are characterized by close formations, reconnaissance, slow rate of march, and good concealment from enemy ground and air observation.

2-20. In a close column, commanders space vehicles about 20 to 25 meters apart. At night, vehicles are spaced so each driver can see two lights in the blackout marker of the vehicle ahead. Commanders normally employ close columns for marches during darkness under blackout driving conditions or for marches in restricted terrain. This method takes maximum advantage of traffic capacity of a route but provides little dispersion. Normally, vehicle density is from 40 to 50 vehicles per kilometer along the route in a close column.

Infiltration

2-21. Infiltration provides the best possible passive defense against enemy observation and attack. It is suited when time, space, security, deception, and dispersion are necessary. During infiltration, dismounted units are dispatched in small groups, or at irregular intervals, at rates keeping march density down and prevents undue massing of units and Soldiers during movement.

2-22. Disadvantages of an infiltration are more time required to complete the move, column control is nearly impossible, and recovery of stragglers and broken-down vehicles by the trail party is protracted when compared to recovery in close and open columns. Additionally, unit integrity is not restored until the last vehicle arrives at its destination, complicating the unit's onward movement or employment.

ORGANIZATION FOR AN APPROACH MARCH

2-23. An *approach march* is the advance of a combat unit when direct contact with the enemy is intended (ADRP 3-90). Commanders employ an approach march when the enemy's approximate location is known, emphasizing speed over tactical deployment, and less physical security or dispersion. An approach march terminates in a march objective, such as an attack position, assembly area, or assault position, or it can be used to transition to an attack. Follow-and-assume and reserve forces may conduct an approach march forward of a line of departure.

MARCH ORGANIZATION

2-24. Commanders task-organize units conducting an approach march before the march begins to allow them to transition to an on-order or be-prepared mission without making major organizational adjustments. Based on mission variables of METT-TC the commander assigns an AO or an axis of advance in combination with routes to units conducting an approach march (figure 2-2, page 2-6). These routes, AO, or axes facilitate the forces movement and maximize its use of concealment. Within the approach march, the commander assigns forces conducting decisive operation or main effort and forces conducting each shaping operation or supporting effort, respectively, separate routes, AO, or axes of advance unless an individual subunit has the task of either follow-and-assume or follow-and-support.

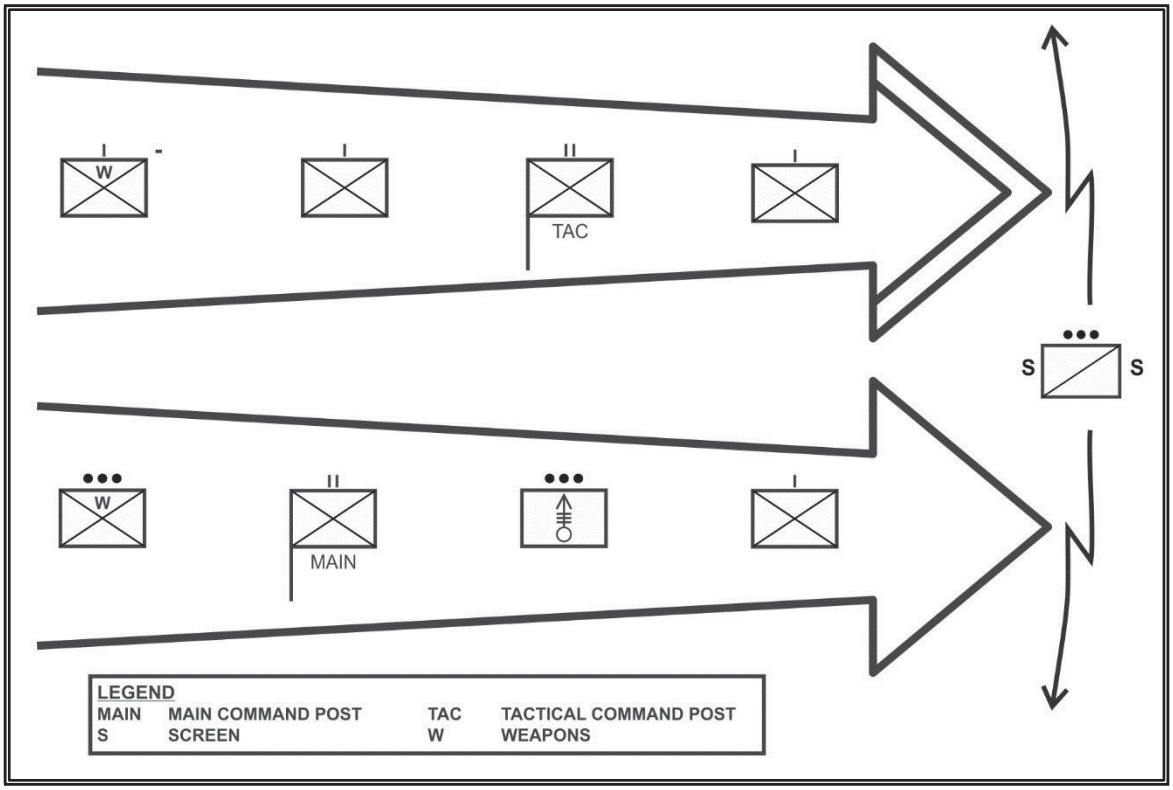


Figure 2-2. Example of an initial axis of advance

ORDER OF MARCH

2-25. As the approach march nears areas of likely enemy interference, the commander divides the unit's main body into smaller, less vulnerable columns that move on additional multiple routes or cross-country while continuing to employ security elements (figure 2-3). The commander employs reconnaissance and security forces forward and to the flanks increasing the distance traveled before the main body transitions to a tactical formation. The advance and flank guards remain within supporting distance of the main body, which stays in these smaller columns to facilitate rapid movement.

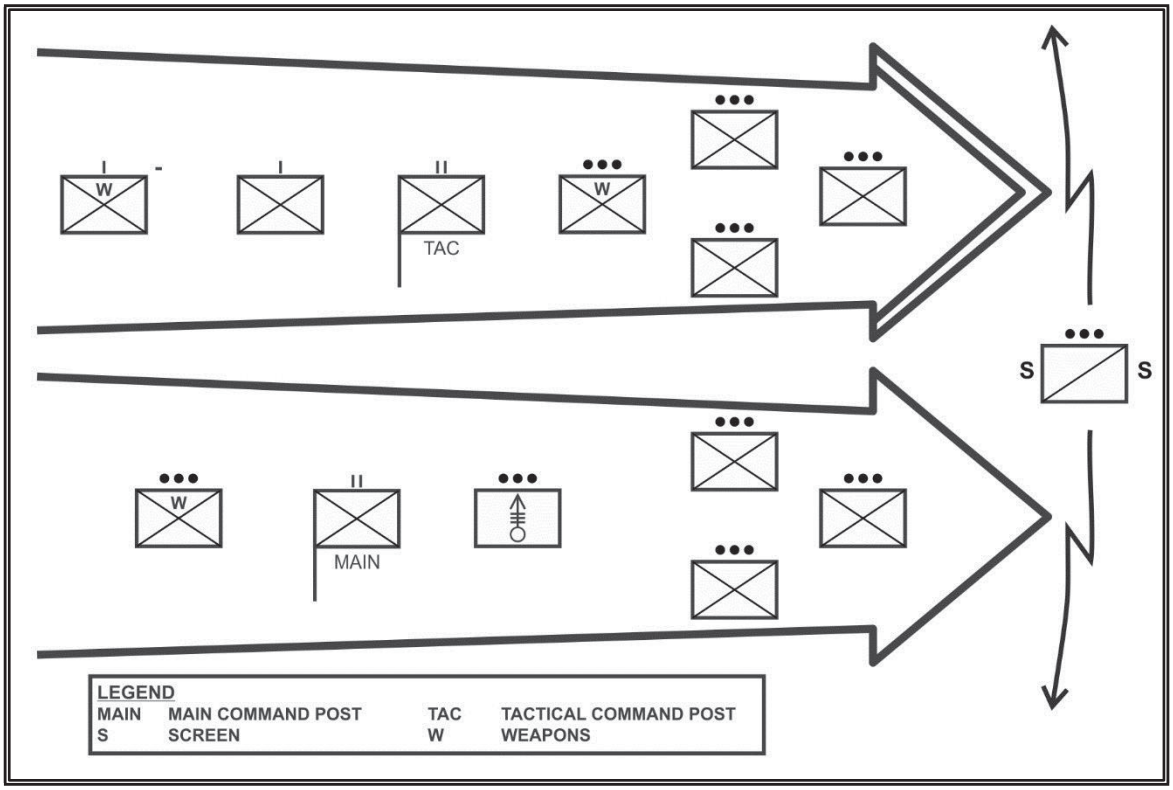


Figure 2-3. Example of less vulnerable columns

2-26. The tactical situation and order in which the commander wants subordinate units to arrive at their attack position, assembly area, or assault position, or at the transition to an attack primarily governs the march formation during tactical movement. Tactical movement differences between approach marches and tactical road marches include—

- Approach marches employ larger security forces because of its greater exposure to enemy attack.
- Approach marches are arranged into combined arms organizations.
- Approach marches allow the commander to disperse the task-organized force into a tactical formation without being constrained to roads and trails.
- Tactical road marches can organize their columns for administrative convenience; by similar type, speed, and cross-country capabilities.
- Units conducting an approach march establish appropriate tactical intervals between elements, and if applicable vehicles; they do not normally employ close columns.
- Units conducting an approach march use more routes than units conducting a tactical road march.

MOVEMENT TECHNIQUES

2-27. Movement techniques limit unit exposure to enemy fire and position it to react to enemy contact. The commander selects the appropriate movement technique based on the chance of enemy contact. While moving, individual Soldiers and if applicable vehicles use terrain to protect themselves when enemy contact is possible or expected. They use natural cover and concealment to avoid enemy fires.

2-28. The commander conducts tactical movement using combat formations described in ATP 3-21.8 in conjunction with three movement techniques: traveling, traveling overwatch, and bounding overwatch. (Refer to FM 3-21.20 for additional information).

SECTION II – CONDUCT OF THE MARCH

2-29. The conduct of the march must be flexible to changing conditions and responsive to the commander. Successful tactical movement depends upon the conditions surrounding the foot march, march security, supporting enablers, and contingencies for reaction to enemy contact.

LIMITED VISIBILITY MARCH AND FORCED MARCH

2-30. In cases of tactical necessity, conditions surrounding a foot march may require a limited visibility march or forced march. Though the same general techniques addressed above for tactical road marches and approach marches apply, the following paragraphs address conditions and activities unique to these marches.

LIMITED VISIBILITY MARCHES

2-31. Limited visibility marches are characterized by close formations, difficult control and reconnaissance, nd a slower rate of march. Units routinely operate during limited visibility and must be prepared to maneuver against an enemy under all conditions. During limited visibility, increases in control and risk reduction measures enable the march.

Tactical Movement

2-32. Prior to tactical movement, the commander gathers intelligence on the proposed march route. The commander conducts mission analysis to determine the control, navigation, and security measures required to conduct the movement under limited visibility conditions.

Control

2-33. When visibility is poor, several methods aid in control during movement:

- Leaders move closer to the front.
- Units reduce speed.
- Units use luminescent tape on personnel and equipment.
- Leaders reduce intervals between Soldiers and units.
- Leaders conduct headcounts often.

Navigation

2-34. While navigating during limited visibility, units use the same techniques as during daylight, but leaders exercise more care to keep the unit oriented. Leaders must be able to control and navigate the unit to maintain security and movement during limited visibility.

Security

2-35. As with any operation, leaders consider which security measures to employ and when to employ them to mitigate risk, such as —

- Enforce strict noise and light discipline.
- Use radio silence when possible.
- Use camouflage.
- Use terrain to avoid detection by enemy surveillance or night vision devices.
- Make frequent listening halts; conduct stop, look, listen and smell.
- Mask sounds of movement when possible. (Rain, wind, and flowing water mask sounds of movement.)

Disadvantages

2-36. Disadvantages during a march under limited visibility may include—

- Difficulty in navigation.

- Slower rate of march.
- Difficulty in recognizing checkpoints.
- Difficulty in controlling subordinate units.
- Difficulty in maintaining proper interval between units.
- Aviation support may be reduced.
- Difficulty in reacting to enemy contact.
- Difficulty with medical and casualty evacuation.
- Ineffective unmanned aircraft system coverage.

Advantages

2-37. Advantages during a march under limited visibility may include—

- Increased security.
- Tighter formations.
- Less traffic at night.
- Use of surprise and stealth.
- Better concealment.
- Reduced rate of march.
- Cooler during hot and humid conditions.

Increased Control Measures

2-38. Unit SOP should reflect increased control measures when movement is conducted during limited visibility. Items may include—

- Assigning colors to march units, may be used on flashlights, strobe lights or other lighting means for recognition.
- Closing intervals between elements of the column.
- Increasing use of connecting files between march units in the serial.
- Monitoring radios closely.
- Increased radio traffic occurs during limited visibility.

2-39. Control is increased by reducing distances between Soldiers and units. The number of guides can be increased, depending on suitability of roads, trails or METT-TC. Consistent with light discipline, visual communication means such as flashlights, lanterns, luminous markers, lasers and pyrotechnics are used.

Risk Reduction Measures

2-40. Depending on mission variables of METT-TC or unit SOP, limited visibility marches may require risk reduction measures to reduce the level of risk. Risk deduction measures may include—

- Use trails or routes not used by vehicles.
- Place guards to the front and rear of columns and on flanks when vehicles could approach from those directions. Ensure road guards are equipped, marked, and informed of the enemy situation.
- If the tactical situation permits, mark moving or static traffic guards and other key personnel with reflective or luminescent materials such as reflective fabric or tape, vests, caps, mittens, helmet bands, and traffic ensembles.
- Warn vehicle operators of the presence of Soldiers on or near the roadway and limit speeds, as needed.
- If mission requirements allow, ensure vehicles use limited visibility lights.
- Unit standard operating procedures or mission requirements dictate ammunition-to-tracer ratio.
- Provide exclusive use of selected routes by foot Soldiers. Enforce safety measures when Soldiers are assigned exclusive use of routes that are negotiable by wheeled or tracked vehicles.

FORCED MARCHES

2-41. When necessary, a unit can accelerate its rate of movement by conducting a forced march so that it arrives at its destination quickly. Forced marches require speed, exertion, and an increase in the number of hours marched each day beyond normal standards. This is normally accomplished by increasing marching hours for each day rather than rate of march. However, sometimes the rate of march must be increased to adjust to the situation. The commander must understand that immediately following a long and fast march, Soldiers experience a temporary deterioration in their physical condition. The combat effectiveness and cohesion of the unit also temporarily decreases.

Note. March rates are always depend on the mission variables of METT-TC.

2-42. A normal foot march day, under ideal conditions, is eight hours, for a distance of 32 kilometers at a rate of 4 kilometers per hour. Under ideal conditions, maximum distances recommended for forced marches are:

- 56 kilometers in 24 hours.
- 96 kilometers in 48 hours.
- 128 kilometers in 72 hours.

2-43. Although forced marches may impair fighting effectiveness of units, urgent conditions on the battlefield could require them. Rest periods should be scheduled to avoid marching at the hottest time of day to ensure arrival of the unit in combat-ready condition. Full advantage should be taken of periods when Soldiers are rested to increase rate of march, if necessary.

SOLDIER AND LEADER ENGAGEMENT

2-44. Foot marches occur under conditions and in environments in which people live, increasing the likelihood of interactions with indigenous populations. Soldier and leader engagement is an information-related capability at every unit's disposal that seeks to ensure these interactions shape the current situation favorably and support the commander's intent. More specifically, these interactions—

- Enable Soldiers to obtain combat information of immediate value.
- Build rapport, trust and understanding with the populace.
- Increase understanding and situational awareness of the immediate surroundings.

2-45. Soldier and leader engagements require clear guidance in the form of standard operating procedures on ways to effectively interact with the local populace, as well as thorough planning and preparation. For example, an important element of planning is determining whether an interpreter is required for the foot march. Preparation involves rehearsing Soldier and leader engagements using realistic and probable scenarios that the foot march may encounter. (Refer to FM 3-53 for additional information.)

MARCH SECURITY

2-46. During the march, units maintain security through observation, orientation, dispersion, concealment, and camouflage. Leaders assign sectors of observation and orientation to Soldiers to create 360 degrees of coverage. Throughout the movement, elements are oriented on specific sectors. Lead elements of a march unit cover the front, following elements cover alternate flanks, and the last elements cover the rear.

AIR DEFENSE

2-47. The commander ensures all passive and active air defense measures are well-planned and implemented. Passive measures include use of concealed routes and assembly areas, movement on secure routes, marches at night, increased intervals between elements of the columns, and dispersion. Active measures include use of organic and attached weapons according to the movement order/OPORD and unit SOP.

2-48. Air guard duties are assigned to specific Soldiers during the march with leaders giving each a specific search area. For both dismounted and mounted marches, seeing the enemy first gives the march unit time to

react. Leaders understand that scanning for long periods decreases the Soldier's ability to rapidly identify enemy aircraft. During extended or long marches, Soldiers are assigned air guard duties in shifts.

HALTS

2-49. During extended marches, halts are necessary to rest personnel, adjust movement schedules, reorganize march elements, and if applicable service vehicles. The movement order/OPORD or unit SOP regulates when to take halts, and addresses actions for various types of scheduled and unscheduled halts for security, rest, and maintenance. During halts, march elements normally clear the march route and move to a previously selected assembly area to prevent route congestion and to avoid being a lucrative target. March elements establish local security and take additional measures, as required, to protect the force.

Scheduled Halts

2-50. The commander schedules halts generally with all units in the column halted at the same time. Preplanned halts along march routes are scheduled for maintenance and rest, or to follow higher headquarters movement order. A scheduled halt is located on concealed and defensible terrain. During scheduled halts, Soldiers move off to the sides of the road while maintaining march dispersion. Local security, including at least one observation post for each platoon, is established immediately. Observation posts should not be established outside small arms range and should be readily retrievable so the unit is ready to move at a moment's notice.

2-51. Extended marches during daylight hours should end early enough to provide Soldiers with rest and time to prepare for next day's activities. Midday heat or enemy action can require units to make long day halts or night marches. At long halts, each unit moves to a planned location near the march route and follows guidelines given in the movement order/OPORD or unit SOP. Leaders inspect Soldiers and equipment during halts, and medics or CLS administer medical treatment to those who need it. Regardless of what happens, all-around security must be maintained.

2-52. Under normal conditions, a 15-minute halt provides an opportunity for Soldiers to adjust loads after the first 45 minutes of marching. Depending on the situation, following the first halt, a 10-minute halt may be enforced for every 50 minutes of marching. Commanders in conjunction with higher headquarters determine when halts are required based on terrain, enemy contact, and combat effectiveness due to fatigue. Variations of time schedules are required if a halt occurs when passing through built-up areas, or when cover and concealment are required but not available. Though, variations in the time schedules should be kept to a minimum if possible.

Note. Depending on the situation, at the halfway point through an extended march, a 15-minute stop may be taken in which all Soldiers alternate changing socks and powdering feet. Soldiers may also alternate removing or loosing gear and sitting or lying down with their feet elevated.

Unscheduled Halts

2-53. Unscheduled halts may be caused by unforeseen actions or developments such as obstacles, traffic congestion, or equipment failure. If the halt is for a limit timeframe the march column's initial priority is to establish local security. Short halts typically takes one or two minutes. Soldiers seek immediate cover and concealment and take a knee. Long halts typically takes more than two minutes. Soldiers assume prone positions behind cover and concealment. Leaders ensure Soldiers have clear fields of fire, and assign sectors of fire. When an extended halt is anticipated, the march column establishes a hasty perimeter defense.

OBSTACLES

2-54. If possible, obstacles reported by reconnaissance or other forward element are bypassed. If an obstacle cannot be bypassed, the lead march unit assumes a hasty defense to provide overwatch while the obstacle is reduced. Follow-on march units move slower or move off the road establishing a hasty perimeter with 360-degree security, then closely monitors the command net for further orders.

OVERWATCH

2-55. Overwatch positions are identified during the intelligence preparation of the battlefield. Key terrain identified to provide overwatch, often located at higher elevation, enable security through areas of possible enemy contact. To compensate for increased vulnerability of compressed formations, units make maximum use of multiple routes coupled with the security provided by an overwatching element. Overwatch elements provide security from potential ambushes along routes whenever possible and when danger to the march is imminent. Return march routes, when utilized, are varied when possible to increase security, this includes the movement of the overwatch element.

COMMUNICATIONS

2-56. The ability to communicate during the march is essential. Radio nets must be established to link the march commander with higher headquarters, fire support, reconnaissance, quartering party, main body march units, and trail party. Within the march column and/or serial, each march element may utilized its own control net. Commanders and subordinate leaders ensure Soldiers follow the movement order/OPORD and unit SOP. Communications techniques such as voice and signal must be established and rehearsed. (Refer to ATP 6-2.53 for additional information.)

2-57. Mission command systems are the primary means of communication during tactical marches, but messengers and visual signal may be used. Messengers pass information from one march unit to another. Visual communication means include flashlights, lasers, luminous markers, panel sets, flags, pyrotechnics, smoke, and arm and hand signals. The use and meaning of visual signals are standardized to avoid misunderstandings. The movement order/OPORD and unit SOP contains instructions for their use in specific situations.

2-58. When radio silence is in effect, road guides are needed to control rate of march, units and their intervals. When used, road guides should be given enough information to control movement. Sound communications used by road guides and other leaders include voice, whistles, and horns, which can be used to assemble Soldiers upon completion of halts or warn Soldiers of an enemy air or CBRN attack. Sound signals normally are standardized and can be included in unit SOP if their use is routine.

SCHEME OF FIRES

2-59. *Scheme of fires* is the detailed, logical sequence of targets and fire support events to find and engage targets to accomplish the supported commander's intent (FM 3-09). The march commander and staff integrate and synchronize indirect fires, Army attack aviation, and close air support to support the march. The march commander ensures targets and fire support events are planned for each march unit to counter likely enemy obstacles and ambushes and support planned engagement areas. Depending on what other mission is being supported, the march column or serial may not have priority of fires during movement. Internal fire support means are always planned for regardless of external fire support. The scheme of fires is rehearsed to ensure coverage throughout movement.

INDIRECT FIRE

2-60. Indirect fire targets along the route are planned on probable locations of enemy attempts to attack the movement. Call for fire (see table 2-1) is the request for fire containing data necessary for obtaining the required artillery and mortar fire on a target. The ability for artillery and mortars to engage targets on reverse-slopes and areas of defilade is a tremendous advantage, especially during marches in adverse terrain. As with other operations, employing indirect fires in adverse terrain and climate does have its challenges. (Refer to FM 3-09 for additional information) Unique challenges include—

- Unpredictable weather conditions affecting accuracy of rounds.
- Targets located on peaks and steep terrain making adjustments difficult.
- Intervening crests requiring placement of observers on dominating heights for overwatch.
- Limited terrain suitable for firing positions to cover a particular movement.

- Artillery and mortar locations ideal for range and coverage unsuitable due to intervening adverse terrain features.
- Locations tactically positioned but in an area with difficult or limited access.
- Shifting artillery mortar assets to alternate locations requiring significant time and engineering and logistical efforts.

Table 2-1. Artillery and mortar call for fire

1st Transmission	*3rd Transmission*
1. OBSERVERS IDENTIFICATION (Call signs) 2. WARNING ORDER • Adjust fire • Fire for effect • Suppress • Immediate suppression/immediate smoke	4. TARGET DESCRIPTION • Type • Activity • Number • Degree of protection • Size and shape (length/width or radius) 5. METHOD OF ENGAGEMENT • Type of adjustment • Danger close • Mark • Ammunition • Distribution 6. METHOD OF FIRE AND CONTROL • Method of fire • Method of control
2nd Transmission	
3.TARGET LOCATION • Grid coordinate • Shift from a known point • Polar plot	

ARMY ATTACK AVIATION

2-61. Army attack aviation targets are planned on probable locations of enemy attack along the march route. Army attack aviation call for fire is a coordinated attack by Army attack aircraft against enemy forces in close proximity to march units. Army attack aviation call for fire (see table 2-2, page 2-14) is not synonymous with close air support flown by Joint and multinational aircraft. Terminal control from ground units or controllers is not required due to aircraft capabilities and enhanced situational understanding of the aircrew. Depending on the enemy situation, Army attack aviation can be on station during times when contact is most likely to occur. Air-ground integration ensures frequencies are known and markings are standardized to prevent fratricide. (Refer to ATP 3-04.1 for additional information.)

Table 2-2. Army attack aviation call for fire format

1. Observer and Warning Order
"J27 (aircraft call sign), this is 041 (observer call sign), fire mission, over"

2. Friendly Location and Mark
"My position AL78241638 (TRP, grid, etc.), marked by Strobe (strobe, beacon, IR strobe, etc.)"

3. Target Location
"Target Location AL82781942 (bearing [magnetic] and range [meters], TRP, grid, etc.)"

4. Target Description and Mark
"Dismounted Infantry (target description), marked by Tracer (IR pointer, tracer, etc.)"

5. Remarks: "At my command (threats, danger close clearance, restriction, at my command, etc.), over"

Notes:
1. Clearance: If airspace has been cleared between the employing aircraft and the target, transmission of this brief *is* clearance to fire unless **"danger close"** or **"at my command"** is stated.
2. Danger Close: For danger close fire, the observer or commander must accept responsibility for increased risk. State **"cleared danger close"** in line 5 and pass the initials of the on-scene ground commander. This clearance may be preplanned.
3. At My Command: For positive control of the aircraft, state **"at my command"** on line 5. The aircraft will call **"ready to fire"** when ready.

LEGEND
IR INFRARED TRP TARGET REFERENCE POINT

2-62. During call for fire, the flight lead must have direct communication with the on-scene ground commander to provide direct fire support. After receiving the call for fire brief from ground forces, pilots must be able to positively identify friendly location before engagement. Once the crew has identified both enemy and friendly locations, flight leads formulate an attack plan and brief the supported commander and their other attack team members.

Note. Attack aviation may be used as a show of force to discourage enemy forces from performing offensive actions. Coordination can be made with aircraft conducting nearby operations to simply fly over or near a planned unit movement to deter aggressive actions by the enemy.

Limitations

2-63. Major limitations for use of attack aircraft include—

- Number of aircraft available. Sorties are often limited and in high demand in combat operations.
- Time needed to get aircraft on station. Available aircraft may be too far away or have to take a lengthy indirect route to be effective.
- Weather conditions. Current or pending adverse weather conditions may ground aircraft.

- Elevation restrictions. High mountain ridges may be at an elevation restricting movement of rotary-wing aircraft across them. Simply getting aircraft to target areas may be restricted if available aircraft are on the other side of mountains with ridges above certain altitudes.
- Rearming and refueling. Travel time to locations may be lengthy and use substantial amounts of fuel. This reduces time on station for the aircraft and requires refueling. Locations for rearming and refueling may be some distance away.

Mar4king and Identifying Locations and Targets

2-64. Ground units must ensure aircraft have positive identification of friendly unit locations and enemy targets. There are various ways to mark locations or targets. The effectiveness of vision systems on helicopters compared to those found on ground vehicles may differ. During day, vision systems of the AH-64 allow accurate identification of targets.

2-65. During periods of limited visibility, resolution is greatly degraded, requiring additional methods of verification. This situation requires extra efforts from both ground units and aviation elements. Thermal, optical, and radar acquisition devices enable positive identification. Both aviation and ground forces might become overloaded with tasks in battle. Simple, positive identification must be established and known to all.

Marking of Friendly Forces

2-66. A method of target identification is direction and distance from friendly forces. Friendly forces can mark their own positions with infrared strobes, infrared tape, night vision goggle lights, smoke, signal panels, body position, meal, ready to eat (MRE) heaters, chemical lights, and mirrors. Marking friendly positions is the least desirable method of target location information because it can reveal friendly positions to the enemy.

Marking of Enemy Forces

2-67. Target marking aids aircrews in locating targets the unit in contact desires to attack. The ground commander provides target marking whenever possible. Methods for marking targets include, but are not limited to: laser handover, tracer fire, marking rounds (flares or mortars), or laser target marker. To be effective, marking must be timely, accurate, and easily identifiable. Target markings might be confused with other fires on the battlefield, suppression rounds, detonations, and marks on other targets. Although marking is not mandatory, it improves aircrew accuracy, enhances situational awareness, and reduces risk of fratricide.

CLOSE AIR SUPPORT

2-68. *Close air support* (CAS) is air action by fixed- and rotary-wing aircraft against hostile targets in close ximity to friendly forces and requires detailed integration of each air mission with the fire and movement of those forces (JP 3-0). Units having a reasonable expectation of conducting terminal attack control need to have certified joint terminal attack controllers (JTAC) available. In rare circumstances, the ground movement commander might require CAS when a JTAC or forward air controller airborne (FAC [A]) is not available, but detailed integration with friendly forces fire and movement is still required. Aircrew executing CAS under these circumstances bear increased responsibility for the detailed integration required to minimize fratricide normally done by a JTAC/FAC (A). In these circumstances, the CAS aircrew assist the ground movement commander to the greatest extent possible to bring fires to bear.

Note. Although Army aviation does not consider its aircraft a CAS system, they can conduct attacks employing CAS joint tactics, techniques, and procedures when operating in support of non-U.S. Army forces.

2-69. The flow and prosecution of CAS targets normally begins with a check-in briefing, a situation update briefing followed by a CAS 9-Line and ending with a battle damage assessment report. A game plan is a concise and situational awareness enhancing tool to inform all players of the flow of the following attack (table 2-3, page 2-16). At a minimum, the game plan will contain the type of control and method of attack. The method of attack and type of terminal attack control are separate and independent constructs. Method of attack conveys the JTAC's/FAC (A)'s intent for the aircraft prosecution of the target; either the aircraft will

be required to acquire the target (bomb on target) or not (bomb on coordinate). The method of attack is broken down into two categories, bomb on target and bomb on coordinate. These two categories define how the aircraft will acquire the target or mark the target. Any type of control can be utilized with either method of attack and no type of control is attached to one particular method of attack.

Table 2-3. Game plan and 9-line close air support brief

Do not transmit the numbers. Units of measure are standard unless briefed. Lines 4, 6 and any restrictions are mandatory readbacks.The joint terminal attack controller (JTAC) may request an additional readback.

JTAC: "J27 , **advise when ready for game plan."** JTAC **"Type (1,2,3) control (method of attack, effects desired or ordnance, interval). Advise when ready for 9-line."**

1. Initial Point / Battle Position " AL78241638 "
2. Heading: " 280 DEGREES "
   (degrees magnetic, initial point or battle position-to-target) Offset: " LEFT ."
   (left or right, when requested)
3. Distance: " 4000 METERS "
   (initial point-to-target in nautical miles, battle position-to-target in meters)
4. Target elevation: " 794 FEET "
   (in feet, mean sea level)
5. Target description " DISMOUNTED INFANTRY "
6. Target location: " AL82781942 "
   (latitude and longitude or grid coordinates, or offsets or visual)
7. Type mark / terminal guidance: " VIPER 27, CODE 888 "
   (description of the mark, if laser handoff, call sign of lasing platform and code)
8. Location of friendlies: " 4000 METERS EAST OF TARGET "
   (from target, cardinal direction and distance in meters) Position marked by: "SMOKE"
9. **" Egress** SOUTHWEST **"**

Remarks / *Restriction:
- Laser to target line (LTL) / pointer target line (PTL).
- Desired type and number of ordnance or weapons effects (if not previously coordinated).
- Surface-to-air threat, location, and type of suppression of enemy air defense (SEAD).
- Additional remarks (e.g., gun-to-target line, weather. hazards, friendly marks).
- Additional calls requested.
- *Final attack headings or attack direction.
- *Airspace coordination areas (ACAs).
- *Danger close and initials (if applicable).
- *Time on target (TOT) / time to target (TTT).
- *Post launch abort restriction (if applicable).

- NOTE: For off-axis weapons, the weapons final attack heading may differ from the aircraft heading at the time of release. The aircrew should inform JTAC when this occurs and ensure weapon final attack headings comply with given restrictions.

2-70. In accordance with JP 3-09.3, terminal attack control is the authority to control the maneuver of and grant weapons release clearance to attacking aircraft. A certified and qualified JTAC or FAC (A) is recognized across the Department of Defense as capable and authorized to perform terminal attack control. There are three types of terminal attack control: Type 1, 2, and 3. The commander considers the situation and issues guidance to the JTAC/FAC (A) based on recommendations from the staff and associated risks identified in the tactical risk assessment. The intent is to offer the lowest-level supported commander, within the constraints established during risk assessment, the latitude to determine which type of terminal attack control best accomplishes the mission. (Refer to ATP 3-04.1 for additional information.) The three types of control are not ordnance specific, but are based on the following factors:

- Type 1 control is used when the JTAC/FAC (A) requires control of individual attacks and the situation requires the JTAC/FAC (A) to visually acquire the attacking aircraft and visually acquire the target for each attack.

- Type 2 control is used when the JTAC/FAC (A) requires control of individual attacks and is unable to visually acquire the attacking aircraft
- Type 3 control is used when the JTAC/ FAC (A) requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions, and any or all of the following conditions exist: JTAC is unable to visually acquire the attacking aircraft at weapons release; JTAC is unable to visually acquire the target; and/or the attacking aircraft is unable to acquire the mark/target prior to weapons release. The JTAC/FAC (A) requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions.

UNMANNED AIRCRAFT SYSTEM EMPLOYMENT

2-71. When feasible, unmanned aircraft system (UAS) employment provides an information collection (specifically reconnaissance and surveillance) capability prior to the march. UAS employment enables situational awareness during the march and can monitor and track movement in areas of key interest. Commanders use a UASs prior to and during the march—

- To gain knowledge on known or suspected enemy locations.
- To reconnoiter an area, route, or zone.
- To observe or monitor otherwise unobservable areas (such as defilade, cracks, crevices and other concealed areas).
- To provide security.
- To disrupt enemy radio communications.
- To deceive or divert the enemy.

2-72. UAS capabilities from higher echelons may be available for battalion level and below operations, though, coordination is generally required well in advance. Often these systems are used for preplanned operations rather than opportunity type missions and require 72 to 96-hour pre-coordination. The RAVEN UAS, organic to the Infantry company, employment is dependent on the situation. Employment advantages and disadvantages at each echelon, as with any capability, warrant the system's employment.

2-73. Conditions effecting UAS employment include rain, fog, snow, wind, and other weather-related situations. Systems are easily detected and are prone to interference from enemy jamming. When other aviation assets are operating in the area, ground forces must alert aerial platforms controllers to the current location and altitude of tactically operated UASs. Coordination and communication with higher headquarters ensures aircrews are alerted to airspace restrictions as they arise for UAS use.

2-74. In mountainous terrain, where weather conditions can vary abruptly and easily crash a UAS, commanders may decide risk of loss is too great to warrant their employment. Depending on mission requirements, downed systems may have to be recovered. The recovery of a downed UAS in adverse terrain can be slow and arduous and expose recovery teams to enemy actions. (Refer to ATP 3-04.1 and ATP 3-4.64 for additional information.)

SCHEME OF ENGINEER OPERATIONS

2-75. Engineers review the movement order/OPORD to assist in conveying the scheme of engineer operations required to support the march. Engineering task prior to the march effectively address classification of the route and provides information useful in the engineer estimate. Similarly the engineer estimate effectively addresses efforts to provide information useful in classification of the route. (Refer to FM 3-34 for additional information.)

2-76. Geospatial engineering is focused on improving the march commanders understanding of the terrain the route is over. Geospatial engineering is the foundation that supports the combat and general engineering and the lines of engineer support for the march. Geospatial engineering teams can provide information on soil conditions, vegetative concealment, and terrain masking along march routes to facilitate movement and the survivability of the force.

2-77. Engineer reconnaissance includes both tactical and technical engineer support to the march. Engineer reconnaissance, like CBRN and other technical applications, is the focused application of special/unique capabilities supporting reconnaissance operations and is applicable over/pertinent to the march. Engineer reconnaissance generated from and organized by engineer lines of efforts provide a range of technical reconnaissance capabilities. Each line supports varying degrees of technical expertise and efforts to the march. (Refer to ATP 3-34.81 for additional information.)

EN ROUTE SUSTAINMENT

2-78. Based on the march method and route used, the commander may have to preposition sustainment assets to conduct rapid and efficient resupply and maintenance. Generally, a column formation is the easiest march technique to support. Any other formation requires increased sustainment planning. Movements during limited visibility require special preparations to include marking units and Soldiers, and equipment for easy identification by friendly forces and positioning units and Soldiers closer together. The march commander can relieve sustainment shortfalls by using aerial resupply or ordering external forces to establish support areas along the route when feasible. The following paragraphs address specific en route sustainment considerations for the march.

MESSING EN ROUTE

2-79. While on march, Soldiers can be fed by their organizational field feeding capabilities or by transient messes. For organizational mess, the march commander uses organic capabilities to feed, such as mobile kitchen trailers or MREs. According to unit SOP, units may establish transient field feeding sites along the march route. When setting up feeding sites which present an opportunity for enemy attack units maintain local security. Units must have detailed plans and SOPs to react to an enemy attack.

DISPOSING OF HUMAN WASTE

2-80. During short halts, Soldiers use a brief relief bag or cat hole latrine. The cat hole latrine is dug about one foot (30 centimeters) deep and wide, and it is completely covered and packed down after use. In temporary assembly areas (1 to 3 days), the straddle trench latrine is used unless permanent facilities are provided. When setting up a temporary camp or operating base, a deep pit latrine and urine soakage pits usually are constructed. Alternate devices, which may be used to dispose of human waste on marches, are burnout, mound, bored-hole, or pail latrines. The burnout latrine is the preferred method for improvised devices. If possible, urinals should be provided in these facilities to prevent soiling toilet seats. Numbers of latrines are based on one commode or urinal per 25 male Soldiers and one commode per 17 female Soldiers.

2-81. Human waste disposal facilities are requirements when discussing proper disposal of human waste during movements. The two categories of human waste disposal facilities: latrines and urinals. The type of human waste disposal facility selected for use depends upon how long the unit remains in one place. The primary human waste disposal type is chemical toilet. When chemical toilets are not available, improvised facilities are used. Usually the longer the stay, the more sophisticated the facility. However, other considerations such as the tactical situation, weather, ground conditions, and local environmental laws apply. (Refer to ATP 4-25.12 for additional information.)

MAINTENANCE EN ROUTE

2-82. En route maintenance for vehicles (when required) is performed by the driver and by mechanics in the trail party during a tactical road march. When repairs are beyond the driver's capability maintenance elements in the trail party or within the main body are available for assistance. Drivers always perform normal preventive maintenance at halts. Maintenance personnel in trail party elements are used to carry out all unit level repairs on vehicles during the march. If vehicles can be repaired quickly, then repairs should be attempted. If they cannot be repaired quickly vehicles are towed or recovered. Vehicles undergoing repairs or those being abandoned or destroyed are moved off the road. When vehicles are disabled during a march—

- Driver pulls the disabled vehicle of the road and signals other vehicles to pass.
- Assistant driver and passengers dismount and take up defensive positions.

- Driver tries to repair vehicle.
- Trail party officer notifies the march commander of disabled vehicles and recovers or destroys them depending on the tactical situation.
- Limit vehicle recovery operations to those situations where tow bars may not work. Use tow bars when possible.
- Do not obstruct roads during recovery operations.
- Do not destroy equipment unless directed through command channels or as a last resort to prevent enemy capture.

Note. All sensitive items and equipment must be recovered before destruction of vehicle.

REFUELING EN ROUTE

2-83. Requirements for refueling are based on normal operating range of march vehicles. The operating range is the normal distance vehicles can travel on a full tank of fuel. Operating range varies according to terrain, vehicle, and load. Heavily loaded vehicles operating on poor roads in hilly terrain gets less fuel mileage than a lightly loaded vehicle operating on ideal roads in fairly level terrain. Use vehicles with the worst fuel operating range to determine when to refuel. This prevents vehicles with the worst fuel operating range in the march from running out of fuel.

2-84. Drivers and vehicle commanders always should be aware of their vehicle fuel level and consumption. If their vehicle loads permit, extra full gas cans should be carried on vehicles. As a general rule every vehicle in the march should have at least one full 5-gallon gas can as part of its load. Unit SOP might dictate otherwise. If vehicles are used during the march, refueling is a vital area covered in the movement order/OPORD.

MEDICAL SUPPORT EN ROUTE

2-85. The march commander must consider medical support based on mission, distance of the march, and likelihood of enemy contact. Medical support can be provided by organic medical personnel assisted by trained combat life savers or by attachment of medical teams to march units by higher headquarters. Normally, MEDEVAC frequencies are established in the movement order/OPORD.

2-86. Always transport casualties to the nearest medical treatment facility, casualty collection point, or other site where medical personnel are located. Over evacuation occurs routinely unless controls are implemented to manage casualties by patient category. Responsive evacuation is extremely important but must be executed in accordance with medical evacuation precedence criteria and available resources. (Refer to ATP 4-02.2 for addition information.)

ACTIONS ON CONTACT

2-87. *Actions on contact* are a series of combat actions, often conducted simultaneously, taken on contact with the enemy to develop the situation (ADRP 3-90). Leaders plan and prepare for actions Soldiers take after any form of contact. Restrictive terrain often causes deviations from actions normally taken on ideal terrain where maneuverability is easier and options are greater. March units plan for actions on contact which includes options for maneuver based on restrictive or severely restrictive terrain along the route. During marches in restrictive or severely restrictive terrain, protection from unexpected contact can be enhanced through employment of an overwatch element when possible and conditions allow. Actions on contact are:

- Deploy and report.
- Evaluate and develop the situation.
- Choose a course of action.
- Execute selected course of action.
- Recommend a course of action to the higher commander.

Note. During the march, contacts occur when a unit encounters any situation that requires an active or passive response to a threat or potential threat. The eight forms of contact are visual; direct; indirect; non-hostile; obstacles; aircraft; chemical, biological, radiological, and nuclear; and electronic warfare.

2-88. Leaders should use all available information and intelligence to enhance march operations and aid in unit protection. By planning for actions on contact and changing unit march or movement techniques when necessary, leaders increase their units' protection and chances for success. For example, leaders use terrain analysis and other intelligence to determine where and when an enemy ambush is likely to occur to avoid surprise engagements and to gain an offensive advantage.

2-89. When contact is made, leaders need to quickly analyze each situation to determine immediate follow-on actions. Battle drills should be well planned and practiced in advance to reduce the amount of time needed for deciding follow-on actions. Delays in taking appropriate actions unnecessarily increase risk to Soldiers. Because it is extremely important to maintain momentum during the movement, the enemy may attempt to slow or stop friendly unit movement and maneuver by employing ambushes, obstacles, and fires. By developing and refining specific battle drills and tactical SOPs, units can respond quickly and decisively to contact in any terrain. (Refer to ATP 3-21.8 for additional information.)

ENEMY AMBUSH

2-90. Restrictive or severely restrictive terrain is well-suited for enemy ambushes. Enemy ambush sites often include low lying areas with easily defended entry and exit locations. When planning for the march, leaders need to pay particular attention to terrain which canalizes forces into potential enemy ambush sites. Narrow passes and valleys are often the only routes to travel between locations without using long, indirect routes. An indigenous enemy is particularly aware of these areas and may use them to its advantage. The enemy may observe unit movements on routes used during particular missions and emplace an ambush on the same route if the unit returns.

2-91. The best counter-ambush technique is to destroy the enemy before friendly forces are exposed in the kill zone. This requires leaders to anticipate possible ambush positions and plan counter actions. Soldiers should be constantly alert for the enemy and any signs of enemy activity such as wires, recently disturbed earth, and movement. If an ambush site is identified, leaders can plan and call for fires to destroy the enemy and/or establish support by fire positions to maneuver against the enemy. Considerations for avoiding an enemy ambush include—

- Having an overwatch unit observe friendly movement.
- Using available reconnaissance and surveillance assets, including manned and unmanned aircraft systems, to monitor enemy activities along the march route.
- Using alternate return routes when possible.
- Avoid routines or setting patterns.
- Using noise and light discipline.

Note. The enemy seldom emerges or fights when friendly air assets are on orbit or station.

2-92. While dismounted, counter-ambush techniques usually consist of actions based on battle drills followed by specific actions which are quickly planned and executed. Leaders plan and rehearse counter-ambush actions before the operation. During movement leaders constantly anticipate enemy contact and visualize their units' actions on contact. While properly executed battle drills have Soldiers seek cover, return direct fire, and maneuver against the enemy, battle drills usually are not sufficient to destroy a well-prepared enemy. In these cases, initial actions by the Soldier allow leaders time to develop and execute specific plans to destroy the enemy in detail when necessary. In anticipating reaction to an ambush, leaders should understand—

- Maneuver space may be limited.
- Attempting to break contact may further expose personnel.

- Terrain may restrict follow-on actions.

2-93. When a portion of the march force is mounted, unit actions may be more restricted. Leaders should consider when ambushed, the best COA may be to return direct fire and break contact. The time it takes to dismount and transition combat power to maneuvering dismounted Soldiers is often more detrimental than breaking contact. Engaging the enemy may expose additional dismounted Soldiers in the kill zone. Ambushes often are initiated from distances or higher elevations. Dismounting and maneuvering on foot to engage enemy forces over steep difficult terrain takes time; gives the enemy chances to escape; and may increase risk to soldiers. Leaders should consider using indirect fire, Army attack aviation, or CAS to attack the enemy as vehicles move out of contact when possible.

ENEMY INDIRECT FIRE

2-94. Enemy indirect fires may range from mortars to large caliber artillery. Using mortars, and sometimes light rocket-propelled grenades, allow the enemy long-range stand-off distance from which it can engage friendly forces and then quickly disengage before friendly forces maneuver or return effective direct fire.

2-95. To the advantage of friendly forces, enemy indirect fires may be less accurate and less effective than friendly force indirect fires due to indirect fire missions being shot in direct lay. Many enemy forces do not have advantages of precise grid locations, fire direction centers, meteorological data, registration data, or ability to stay in one place long enough to accurately adjust fires. When Army attack aviation or CAS is on station, enemy mortar fires often shut down quickly.

2-96. The enemy may intend to use the same firing positions repeatedly which is both an advantage and disadvantage. An enemy without adequate indirect fire control can fire accurately from previously used position. By using the same positions, the enemy can become accustomed to quickly setting up and directly aiming its fires. A disadvantage for the enemy is friendly forces targeting these areas with quick counterfire. As these position are identified, they should be recorded, templated, and reported as potential enemy firing positions. Leaders can attach mortar sections or squads to units, which makes immediately responsive fires available to leaders on the ground.

2-97. Leaders plan and rehearse actions to counter enemy indirect fires prior to any movement. For example when the situation allows, the march elements in contact immediately counters enemy indirect fires by taking cover and returning direct fire to suppress the firing position when visible. As quickly as possible, the march commander then determines whether to maneuver to attack by assault, attack with air assets or counter-fire mortar/artillery, or break contact.

ENEMY SNIPER

2-98. Based on a sound knowledge of enemy sniper operations and a detailed mission analysis, march units develop sniper countermeasures along the march route. Reaction to enemy sniper fire generally follows the same steps and performance measures for react to direct fire contact (see ATP 3-21.8). The element in contact seeks cover, locates the enemy and places well-aimed fire on the known enemy sniper position. The element leader assesses the situation then maneuvers the portion of element not in contact to kill the sniper or to break contact. March units develop, practice, and enforce use of counter-sniper immediate action drills, blending both active and passive countermeasures.

Active Countermeasures

2-99. Active countermeasures are those actions march units can initiate to defeat, disrupt, or destroy an enemy sniper. Active countermeasures are largely the same type of operations involved in counter-IED measures with additional techniques added as needed. Some include (when possible)—

- Establishing and maintaining observation posts to overwatch the route. To be effective, snipers move into a firing position without detection. Establishing these observation posts prior to movement and briefing observers to watch for anyone with weapons; pointing out obvious sniper positions; and making sure each observation post is equipped with binoculars, night-vision devices and thermal sights reduces chances of an enemy sniper moving into a position along the route.

- Clear and occupy all buildings around checkpoints and if possible directly along the route to eliminate potential enemy sniper positions.
- Supplement ground observation with available manned and unmanned aircraft systems.
- Maintain active patrols, especially in areas covering dead space along the route. Patrols watch for armed personnel and evidence of personnel moving into and from possible firing positions.

2-100. Active counter-sniper operations include—

- Engage enemy sniper. Once spotted, the enemy sniper must be forced to surrender or be killed.
- Use smoke or riot control agents to obscure and suppress hostile sniper fires.
- Use organic fires to overmatch, outrange, or preempt hostile sniper fires.

Passive Countermeasures

2-101. Passive countermeasures protect against an enemy sniper, though the rule when engaging an enemy sniper is to use maximum force against the sniper. Passive countermeasures are used when the engaged force must balance the use of force against collateral damage or rules of engagement. Passive countermeasures employed by the commander include—

- Limiting exposure. Do not establish obvious routines such as issuing equipment or rations in manners causing Soldiers to line up for extended periods or grouping large portions of the chain of command in one area. Other helpful actions include not saluting, removing rank insignia, camouflaging, and operating during limited visibility conditions.
- Wearing protective equipment. Body armor and advanced combat helmets do not work unless they are worn properly.
- Using armored vehicles when applicable.
- Erecting screens and shields when applicable. Construct barriers and shields around checkpoints and observation posts to protect Soldiers. Shields and screens can be used in cantonment areas to block a sniper's vision to scan for information and targets.
- Denying enemy sniper use of key terrain.
- Using obscuration employed to screen (blankets, hazes and curtains) whenever possible.
- Avoiding public displays of leadership functions such as saluting, staff huddles, or having important personnel groups in open areas whenever possible.

Enemy Improvised Explosive Device

2-102. An enemy improvised explosive device (IED) attack is a major threat to the march. March commanders should brief personnel on the latest IED threat types, usage, and previous emplacements along similar routes. All Soldiers maintain situational awareness by looking for IEDs and IED hiding places. March units vary routes and times, enter overpasses on one side of the road and exit out the other, train weapons on overpasses as the march passes under, and avoids chokepoints to reduce risk. Units should expect an IED attack at any time during the march and expect an ambush immediately after an IED detonation. Early mornings and periods of reduced visibility are especially dangerous since the enemy has better opportunities to emplace IEDs without being detected.

Categorization

2-103. Leaders categorize levels of suspicion to determine appropriate response and resources needed—

- **Level 1.** Large amount of debris on roads having a history of recent IED attacks.
- **Level 2.** Evidence of on-going emplacement such as prepared holes (no device visible), removed curb stone, suspicious activity or absence of activity when there would be otherwise. Report immediately.
- **Level 3.** Suspicious objects, activity, or conditions on road. Rucksacks, mailbags, dead animals; meal bags; roadside mounds; and rock piles could conceal improvised explosive devices. No obvious improvised explosive device indicators such as wires, detonation cord or antennae. Report according to unit SOP immediately because it requires engineer or explosive ordnance disposal (EOD) response.

- **Level 4.** Clear indicators of imminent improvised explosive device activity such as protruding wires or an individual with a command-detonating device. These are verifiable and easily identified. Report immediately as it requires direct action or explosive ordnance disposal response.

Identification

2-104. Leaders identify IEDs and possible emplacement locations by the following characteristics:

- **Construction Methods.** Constructed using mortar shells, artillery projectiles, antitank mines, diesel fuel, rockets, black powder, fertilizer, and chemical explosives. Construction is limited by the enemy's imagination.
- **Camouflage.** Disguised as loose trash or debris, trash bags, soda cans, milk cans, buckets, burlap bags, and meals ready to eat bags. (See figure 2-4.)

Figure 2-4. Possible improvised explosive device configurations

- **Detonation**. Command-detonated, victim-activated, or timed. Car alarms, battery powered remote doorbell devices, remote controlled light switches, and cordless and cellular telephones are common means of detonation.

- **Communications**. Insulated wire or detonation cord to connect detonator to explosive.
- **Delivery**. Dropped from or attached to underside of overpasses. Soldiers should watch for suspicious activity on overpasses and never stop under one.
- **Hiding Places**. Hidden in potholes, abandoned vehicles, dead animal carcasses, or secured to telephone poles and guardrails. Emplaced along sides of roads, shoulders, median strips, or in numerous other areas. Enemy hide positions usually have line of sight to the kill zone and an easy escape route. (See figure 2-5.)

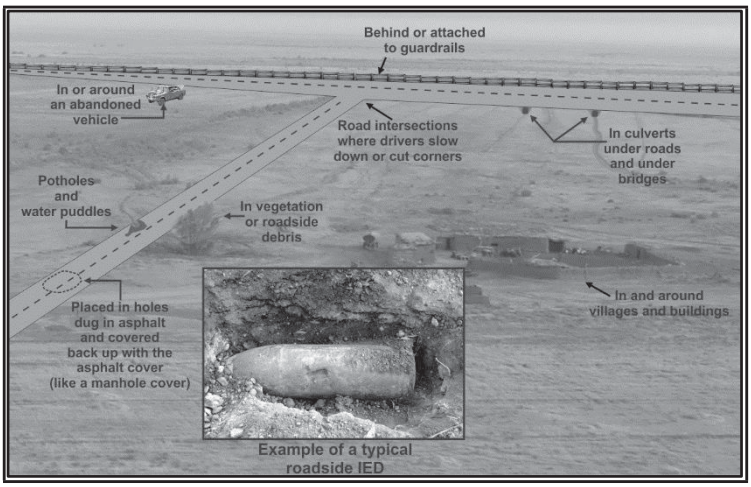


Figure 2-5. Potential improvised explosive device locations

Suspicious Activities and Objects

2-105. Suspicious activities and objects that may indicate the presence of an IED include—

- An abandoned or disabled vehicle parked on or near the route.
- Animal-drawn carts or wagons moving on or near the route.
- Signs of tampering, exposed wires, or objects fastened to the back of a guardrails.
- Fresh concrete or asphalt work or repair patch on or around route surfaces.
- Suspicious packages, containers, or other foreign objects on or near the route.
- Markings warning locals of improvised explosive devices (for example, a blue "X" painted on a rock).
- Third-party personnel or vehicle attempting to pass or enter the march formation.

Note. Obtain the latest improvised explosive device update/indicators during the pre-march brief.

Vehicle-Borne Improvised Explosive Device

2-106. Vehicle-borne IEDs, also known as car bombs, are explosive-laden vehicles detonated by electronic command wire, wireless remote control, or timed devices. A driver is optional. Anything from small sedans to large cargo trucks or cement trucks can be used (figure 2-6). Device functions vary. Possible signs of a vehicle-borne IED include—

- Low-riding vehicles, especially if empty. Those carrying explosives in the trunk will ride lower in the back. Those with explosives in the side panels may ride fairly level.
- Large boxes, satchels, bags, or any other type of container in plain view such as on, under, or near the front seat of vehicle.
- Wires or rope-like material running from the front of a vehicle to the rear passenger or trunk area.
- A timer or switch in the front of a vehicle. The main charge is usually out of sight, often in the rear of vehicle.

- Unusual or strong chemical or petroleum-like odors.
- Moving vehicle with no driver.
- Vehicle with suspiciously behaving driver.

VBIED Capabilities	Vehicle Description	Maximum Explosives Capacity	Lethal Air Blast Range	Minimum Evacuation Distance	Falling Glass Hazard
	Compact Sedan	500 Pounds 227 Kilos (in trunk)	100 Feet 30 Meters	1,500 Feet 457 Meters	1,250 Feet 383 Meters
	Full Size Sedan	1,000 Pounds 455 Kilos (in trunk)	125 Feet 38 Meters	1,750 Feet 534 Meters	1,750 Feet 534 Meters
	Passenger Van or Cargo Van	4,000 Pounds 1,818 Kilos	200 Feet 61 Meters	2,750 Feet 838 Meters	2,750 Feet 838 Meters
	Small Box Van (14 Foot box)	10,000 Pounds 4,545 Kilos	300 Feet 91 Meters	3,750 Feet 1,143 Meters	3,750 Feet 1,143 Meters
	Box Van or Water/Fuel Truck	30,000 Pounds 13,636 Kilos	450 Feet 137 Meters	6,500 Feet 1,982 Meters	6,500 Feet 1,982 Meters
	Semi-Trailer	60,000 Pounds 27,273 Kilos	600 Feet 183 Meters	7,000 Feet 2,134 Meters	7,000 Feet 2,134 Meters

LEGEND
VBIED VEHICLE-BORNE IMPROVISED EXPLOSIVE DEVICE

Figure 2-6. Vehicle-borne improvised explosive device capabilities

Impending Improvised Explosive Device Ambush Indicators

2-107. Possible indicators of an impending IED ambush include—

- Unusual absence of women and children.
- Dramatic changes in population from one block to the next.
- Unusual lack of activity.
- Sudden activity within crowds as the march approaches.

Note. Small improvised explosive devices can be thrown.

- Dispersion of third-party personnel as the march approaches.
- Sudden reduction or absence of civilian traffic.
- Flares fired or lights turned on as the march approaches.
- Suspicious movement in upper floor windows or roof of building(s).

Reaction to a Suspected Improvised Explosive Device

2-108. When the march encounters a suspected IED, the Soldier identifying the IED reports the sighting to the remainder of the march element by using the 3-Ds (distance, direction, and description).

- **Distance.** The distance from the Soldier(s) that initially found the possible IED.

- **Direction.** The direction to which the possible IED is located from the Soldier(s) who initially found it.
- **Description.** The initial description of the possible IED. Soldiers should not move closer to the possible IED to retrieve a better description.

2-109. When the march encounters an IED and is under enemy direct fire, march elements seek the nearest covered position, suppress enemy direct fire, establish security, evacuate casualties, and submits an explosive hazards spot report. The march unit exits the area, if necessary, to move to a more advantageous position to initiate follow-on actions.

2-110. When the march encounters an IED and is not under enemy direct fire, march elements performs the 5-Cs (check, confirm, clear, cordon, and control).

- **Check.** March personnel should check their immediate area for secondary/tertiary devices by conducting 5/25/200 meter checks from their positions. If Soldiers suspect an IED while performing the 5/25/200 meter checks, they should assume it could detonate at any moment, even if the suspected IED turns out to be a false alarm.
- **Confirm.** March unit must confirm the existence of a suspected IED from a safe distance using any available standoff means (robot, Buffalo, optics, or other means). Once confirmed, the unit calls in an EOD 9-line explosive hazard spot report (see table 2-4).

Table 2-4. Explosive ordinance disposal 9-line explosive hazard spot report

Line	*Item*	*Input*
Line 1	Date-Time Group	The date and time the item was discovered.
Line 2	Reporting Activity and Location	The unit and the 8-digit grid location of the explosive hazard.
Line 3	Contact Method	Radio frequency, call sign, point of contact, and telephone number.
Line 4	Type of Ordnance	Document whether it was dropped, projected, placed, or thrown; or whether it was a possible improvised explosive device. Give the number of items, if more than one. Include as detailed of a description as possible of the item in question, to include the size, shape, and physical condition.
Line 5	CBRN Contaminations	Be as specific as possible.
Line 6	Resources Threatened	Document equipment, facilities, or other assets that were threatened.
Line 7	Impact on Mission	Provide a short description of the current tactical situation and how the explosive hazard affected the status of the mission.
Line 8	Protective Measures	Document any measures taken to protect personnel and equipment.
Line 9	Recommended Priority	Indicate whether it was immediate, indirect, minor, or no threat: - Immediate. Stops the unit maneuver and mission capability, or threatens critical assets vital to the mission. - Indirect. Stops the unit maneuver and mission capability, or threatens critical assets important to the mission. - Minor. Reduces the unit maneuver and mission capability, or threatens noncritical assets. - No threat. Little or no effect on the capabilities or assets of the unit.

- **Clear.** March unit clears the area around the device of all personnel, working from the device outwards. If an IED has been confirmed, the unit must clear the area. The safe distance is determined by several factors: the tactical situation, avoiding predictability, and moving several hundred meters away from the IED.

Note. The march element varies the minimum safe distance (though no closer than 300 meters when exposed) when moving away from the IED to avoid establishing predictability because of possible secondary/tertiary IEDs. Unit avoids using any communication or electronic equipment (other than crew devices) within the secured exclusion area.

- **Cordon.** March unit establish a security cordon around the danger area by setting up blocking positions to prevent foot and vehicle traffic from approaching the IED. An effective cordon will deny the enemy observation of the danger area, along with denying the enemy IED effectiveness. To reduce IED effectiveness and exposure of personnel, the march leader optimizes the number of soldiers used in performing the 25-meter search and throughout the check for secondary/tertiary IEDs.
- **Control.** The march unit controls the area inside the cordon to ensure authorized access. Since the distance of all personnel from the IED directly affects their safety, Soldiers should control the site to prevent someone from straying dangerously close until the threat has been neutralized.

2-111. In the event the march is to continue, elements deemed nonessential for the purpose of cordoning the area can use an alternate route to continue the march. Elements deemed nonessential for the cordon may conduct movement to an assembly area to consolidate and reorganize for the march as necessary. (Refer to ATP 3-21.8 for additional information.

ENEMY AIR ATTACK

2-112. When attacked by hostile aircraft, the march unit in contact quickly assumes a defensive posture, mainly dependent upon the terrain, and immediately engages attacking aircraft with all available weapons. Any portion of the march not in contact occupies covered and concealed positons, assumes a defensive posture and prepares to support the element in contact. When the march makes visual contact first with a hostile aircraft, march elements immediately attempt to conceal themselves from the aircraft. (Refer to ATP 3-21.8 for additional information.)

ENEMY CHEMICAL ATTACK

2-113. During a chemical attack, Soldiers conducting the march don their protective mask, sound the vocal or non-vocal alarm, decontaminate any exposed contaminated skin, and assume mission-orientated protective posture, MOPP 4. The march unit identifies the chemical agent using M8 chemical detector paper and M256 detector kit. The march commander reports the chemical attack to higher headquarters using the CBRN 1 report. The march commander determines if decontamination is required and requests support, if necessary. March elements mark the contaminated area if contamination is present and the march commander requests guidance from higher headquarters. (Refer to ATP 3-21.8 for additional information.)

SECTION III – DUTIES AND RESPONSIBILITIES FOR THE MARCH

2-114. Regardless of mission, every subordinate leader and staff officer has common broad areas of expertise within the operations process determining how the commander divides duties and responsibilities. Grouping related activities allows an effective span of control and unity of effort. Areas of expertise may vary slightly, depending on echelon of command and the mission. This section addresses duties and responsibilities for the march at battalion and company echelon.

BATTALION COMMANDER AND STAFF

2-115. The battalion commander and staff have important duties and responsibilities within the activities of planning and preparation that drive march execution. By developing understanding, commander and staff prepare effective plans and assess operations accurately. To function effectively and have the greatest chance for mission accomplishment, the battalion commander, supported by the staff, exercise mission command throughout the conduct of operations. Duties and responsibilities within the battalion for the march are addressed in the following paragraphs. (Refer to FM 3-21.20 for additional information.)

BATTALION COMMANDER

2-116. The battalion commander leads the operations process to ensure organized and uninterrupted movement of subordinate units within the battalion's AO. The ability of the commander to position forces to prepare for the conduct of decisive action depends on the movement of forces. The objective for unit movement is to arrive at a destination on time and in condition suitable to its probable employment. The goal of all movement planning is to retain flexibility to execute a variety of plans to meet ever-changing conditions.

2-117. The commander guides the staff's development of the movement order/OPORD to conduct rapid and orderly movement to concentrate combat power at decisive points and times. The commander ensures unit movement tactical SOPs within the battalion contain specifics, guiding leaders and Soldiers in their duties and responsibilities. The commander oversees rehearsals to ensure subordinate leaders and Soldiers understand their duties and responsibilities for the march.

Note. March commanders position themselves where they can best command without losing the ability to respond to changing situations.

BATTALION EXECUTIVE OFFICER

2-118. The battalion executive officer is the commander's principal assistant and directs staff tasks, manages and oversees staff coordination, and special staff officers. The executive officer provides oversight of movement planning for the battalion commander. As the key staff integrator, the executive officer frees the commander from routine details of staff operations and the management of the headquarters and ensures efficient and prompt staff actions. The executive officer is responsible for directing the activities of each staff section and subordinate unit to capture and disseminate organizational knowledge. The executive officer exercises the duties and responsibilities of the second in command.

BATTALION COMMAND SERGEANT MAJOR

2-119. The battalion command sergeant major provides advice and initiates recommendations to the commander and staff in matters pertaining to the dismounted march, that included (though not inclusive) Soldier load and standard operating procedures for the march. During movement, the battalion commander employs the command sergeant major throughout the battalion's area of operations to extend command influence, assess the morale of the force, and assist during critical events.

BATTALION STAFF

2-120. The battalion staff supports the commander, assist subordinate units, and informs units and organizations outside the headquarters. The staff supports the commander's understanding, making and implementing decisions, controlling and assessing the progress of the march. The staff establishes and maintains a high degree of coordination and cooperation with staffs of higher, supporting, supported, and adjacent units. The battalion staff does this by actively collaborating and communicating with commanders and staffs of other units to solve problems. The staff keeps civilian organizations informed with relevant information according to their security classification as well as their need to know. The staff structure for the battalion includes the executive officer and a grouping of staff members by area of expertise under a coordinating, personal, or special staff officer.

Note. The basis for staff organization depends on the mission and the activities to accomplish. These activities determine how the commander organizes, tailors, or adapts individual staffs to accomplish the mission. The mission also determines the size, composition, and location of a staff, including the establishment of integrating and functional cells, elements, and staff augmentation.

Coordinating Staff Officers

2-121. Coordinating staff officers are the battalion commander's principal assistants who advise, plan, and coordinate actions within their area of expertise or warfighting function. Coordinating staff officers may also exercise planning and supervisory authority over designated special staff officers. Coordinating staff officers within the battalion are the personnel staff officer, intelligence staff officer, operations staff officer, logistics staff officer, and signal staff officer.

Personnel Staff Officer, S-1

2-122. The battalion S-1 is the principal staff officer for all matters concerning human resources support. Specific responsibilities include manning, personnel services, personnel support, legal support, and headquarters management. The S-1 prepares a portion of Annex F (Sustainment) to the OPORD or a portion Paragraph 4 (Sustainment) to the movement order. Additional duties and responsibilities for the march include:

- Maintain an accurate personnel accountability for all march units.
- Keep the battalion commander informed of missing in action, killed in action, prisoners of war, wounded in action, and evacuated Soldiers.
- Maintain an accurate casualty report during the march.

Intelligence Staff Officer, S-2

2-123. The battalion S-2 is the principal staff officer responsible for providing intelligence to support current operations and plans. The S-2 gathers and analyzes information on enemy, terrain, weather, and civil considerations regarding the route for the commander and participates, with the staff, in performing intelligence preparation of the battlefield. Focuses intelligence operations, undertaken by military intelligence units and Soldiers, on collecting and analyzing information about threats along the route. The S-2, together with the S-3, helps the commander coordinate, integrate, and supervise information collection planning and operations, and targeting. The S-2 gives the commander and the S-3 the initial intelligence synchronization plan, which facilitates reconnaissance and surveillance integration. The S-2 assists the S-3 to develop the initial reconnaissance and surveillance plan. The S-2 is responsible for the preparation of Annex B (Intelligence) and assists the S-3 in the preparation of Annex L (Information Collection) to the OPORD or a portion of Paragraph 1 (Situation) to the movement order. Additional duties and responsibilities for the march include:

- Analyze enemy trends, indicators and warnings, and pattern analysis mission analysis and the targeting process along primary and alternate routes and identified danger areas.
- Present information obtained from recent patrol debriefings on selected primary and alternate routes. Route information should address the current enemy situation, road conditions, traffic congestion, civilian centers, religious locations or other protected sites, location of friendly safe havens, and observed changes to landmarks.
- Provide patrol briefings with photos to help Soldiers identify key personalities and potential threats along route.
- Contact units adjacent to the route and at destination locations for situational updates.
- Develop and continually update route strip maps or overlays showing locations of landmarks, previous ambush sites, suspected improvised explosive device locations, safe havens such as maneuver unit outposts, and other information of importance to Soldiers.
- Debrief reconnaissance and surveillance elements returning from patrols along the proposed route(s).
- Provide daily intelligence summaries to higher headquarters and designate named areas of interest based on observations from patrolling along the route(s).

Operations Staff Officer, S-3

2-124. The battalion S-3 is the principal staff officer for integrating and synchronizing the march as a whole for the commander. The S-3 integrates reconnaissance and surveillance during planning and preparation for the march. The S-3, together with the S-2, helps the commander coordinate, integrate, and supervise information collection planning and operations, and targeting. The S-3 synchronizes reconnaissance and surveillance with the overall operation throughout the operations process. The S-3 develops orders, and determines potential branches and sequels. The S-3 prepares Annex A (Task Organization), Annex C (Operations), Annex L (Information Collection), and Annex M (Assessment) to the OPORD or Paragraph 3 to the movement order. Additional duties and responsibilities for the march include:

- Recommend march configuration and sequence of march.
- Deconflict of routes and times with march unit representatives. Routes contemplated must reflect march availability versus required delivery times, route movement conditions, traffic congestion, enemy positions, friendly actions, improvised explosive device clearance schedule, and civilian activities.
- Ensure battalion methods for recovering isolated, missing, detained, or captured personnel are synchronized with higher headquarters personnel recovery plan.
- Document locations of friendly maneuver units along the route, their radio frequencies, and their call signs. Contact these units and provide expected transit time windows and march routes moving through their area of operations.
- Coordinate plan for manned and unmanned aircraft systems to perform reconnaissance and surveillance and/or attacks during the march.

- Identifies march unit reports, for example, departures, start points, halts, checkpoints, and release points.
- Track march units along movement route(s).
- Identify march unit priorities of work for follow-on actions, intelligence debriefing, maintenance, refueling, and messing.

Logistics Staff Officer, S-4

2-125. The battalion S-4 is the principal staff officer for sustainment planning and operations, supply, maintenance, transportation, services, field services, distribution, and operational contract support. The S-4 develops the battalion's concept of support and prepares Annex F (Sustainment), Annex P (Host-Nation Support) and Annex W (Operational Contract Support) to the OPORD or Paragraph 4 to the movement order. Additional duties and responsibilities for the march include:

- Lead sustainment synchronization meeting to deconflict support requirements and transportation assets available. Drive the schedule (in coordination with the S-3) for tactical marches based on, delivery time windows, road conditions, improvised explosive device sweeps, other tactical operations, and civilian activities.
- Compile battalion logistics status reports and provide the support operations officer with lists of items and quantities needed by each supported unit.
- Identify priorities for resupply of supported units, by unit and commodity to allow unit commanders to adjust delivery plans when encountering delays along routes. After the battalion commander defines the ammunition requirement for the march, the battalion S-4 works with unit supply and ammunition noncommissioned officers to ensure units and Soldiers have sufficient ammunition for all assigned weapons.

Signal Staff Officer, S-6

2-126. The battalion S-6 is the principal staff officer for all matters concerning network operations during the march. The signal staff officer provides network transport, information services, and information management, conducts network operations to operate and defend the network, enables knowledge management, manages communication assets in the battalion's area of operation, and performs spectrum management operations. The S-6 prepares Annex H (Signal) and participates in preparation of Appendix 12 (Cyberspace Electromagnetic Activities) to Annex C (Operations) with input from the S-2 and in coordination with the S-3, to the OPORD or a portion of Paragraphs 3 and 5 to the movement order. Additional duties and responsibilities for the march include:

- Identify radio blackout areas along the route.
- Designates retransmission sites, as required, to ensure continuous communications.
- Identify and correct march unit communication issues before, during, and after the march.

Personal Staff Officers

2-127. Personal staff officers work under the immediate control of, and have direct access to, the battalion commander. They advise the commander, provide input to orders and interface and coordinate with entities external to the battalion headquarters. Personal staff officers to the battalion commander include the command sergeant major (see paragraph 2-118), the battalion surgeon, and the battalion chaplain.

Battalion Surgeon

2-128. The battalion surgeon is responsible for coordinating health service support and operations within the command. The surgeon provides force health protection mission planning to support the battalion's march. The surgeon provides and oversees medical care to Soldiers, civilians, and enemy prisoners of war. (See ATP 4-02.3.) The surgeon prepares a portion of Annex E (Protection) and Annex F (Sustainment) of the OPORD or a portion of Paragraph 4 to the movement order.

Battalion Chaplain

2-129. The chaplain is responsible for religious support operations; advises the commander and staff on religion, morale, moral, and ethical issues, within both the command and area of operation. The chaplain prepares a Portion of Annex F (Sustainment) to the OPORD or a portion of Paragraph 4 to the movement order.

Special Staff Officers

2-130. Special staff officers, within the Infantry battalion, provide specific areas of expertise to assist the exercise of mission command during the march. These areas of expertise vary with authorizations, mission requirements, and the desires of the commander. When a special staff officer is not assigned or attached, the officer with coordinating staff responsibility for the area of expertise assumes those functional responsibilities. Special staff officers or noncommissioned officers, common to the battalion, include the fire support officer (assigned or attached), the engineer noncommissioned officer (NCO), the air liaison officer, the chemical, biological, radiological, and nuclear (CBRN) officer, the electronic warfare NCO, and the liaison officer(s).

Fire Support Officer

2-131. The fire support officer serves as the special staff officer for fires and integrates fires into the scheme of maneuver for the march. The fire support officer leads the targeting process and fire support planning for the delivery of fires during the march. The fire support officer leads the fire support cell (when established) and prepares Annex D (Fires) of the OPORD or a portion of Paragraph 3 to the movement order. The fire support officer also coordinates with the electronic warfare officer and the air liaison officer. The battalion S-3 coordinates this position. Additional duties and responsibilities for the march include:

- Plan for responsive fires on key known, suspected, or potential enemy position along the route for each phase of the movement.
- Position observers, including manned and unmanned aircraft, forward and along the supported unit's flanks, when required, to detect enemy threats.
- Ensure fire support assets are positioned to support the battalion at points of vulnerability, such as obstacles, canalizing terrain, and bridge or gap crossings.

Engineer Noncommissioned Officer

2-132. The engineer NCO is the engineer on staff responsible for coordinating engineer support during the march. The engineer (in coordination with the battalion S-3) integrates specified and implied engineer tasks into the movement plan. The engineer ensures that mission planning, preparation, execution, and assessment activities integrate supporting engineer units. The engineer prepares Annex G (Engineer) to the OPORD or a portion of Paragraph 3 to the movement order.

Air Liason Officer

2-133. The air liaison officer is the senior Air Force officer (or noncommissioned officer) in the tactical air control party. The air liaison officer plans and executes close air support in accordance with the battalion commander's guidance and intent for the movement. The air liaison officer is responsible for coordinating aerospace assets and operations for the march, such as close air support and air reconnaissance. The air liaison officer supports the fire support cell (when established) and assists in preparing Annex D (Fires) of the OPORD or a portion of Paragraph 3 to the movement order.

Chemical, Biological, Radiological, and Nuclear Officer

2-134. The CBRN officer is responsible for CBRN operations, obscuration operations, and CBRN asset used for the movement. When established, the CBRN officer leads the CBRN working group. The CBRN officer prepares a portion of Annex E (Protection) and a portion of Annex C (Operations) of the OPORD or a portion of Paragraph 3 to the movement order.

Electronic Warfare Noncommissioned Officer

2-135. The electronic warfare NCO serves as the designated staff officer for the planning, integration, synchronization, and assessment of electronic warfare, to include cyber electromagnetic activities. The electronic warfare NCO coordinates through other staff members to integrate electronic warfare and/or cyber electromagnetic activities into the commander's concept of operations for the movement. The electronic warfare NCO prepares Appendix 12 (Cyber Electromagnetic Activities) to Annex C (Operations) to the OPORD and contributes to any section that has a cyber electromagnetic activities subparagraph in the OPORD or a portion of Paragraph 3 to the movement order.

Liason Officer

2-136. Liaison officer(s) are the commander's representative at the headquarters or agency to which they are sent. Liaison activities augment the commander's ability to synchronize and focus the march. Liaison activities promote coordination, synchronization, and cooperation between the battalion and higher headquarters, interagency, multinational, host-nation, adjacent, and subordinate organizations as required. When embedded as subject matter experts, liaison officers provide face-to-face coordination.

Augmentation

2-137. The battalion staff can receive augmentation teams by specialty to assist the exercise of mission command. For example, teams may be air and missile defense planners, liaison officers from joint or multinational support agencies, or additional augmentation to the fires cell, which may include a naval surface fire support team, air force weather team, and/or a space support team. When received the commander integrates these elements into the planning process as early as possible.

COMPANY COMMANDER AND SUBORDINATE LEADERS

2-138. The company commander and subordinate leaders within the company must understand their duties and responsibilities and know what to do when unexpected circumstances occur. Duties and responsibilities within the company for the march are discussed in the following paragraphs. (Refer to FM 3-21.10 for additional information.)

COMPANY COMMANDER

2-139. Duties and responsibilities of the commander within the company include leadership, training, and employment. The commander must understand the strengths and capabilities of the Soldiers within the company to employ them correctly. Upon receipt of the order, the commander performs an initial assessment of the situation (mission analysis) and allocates the time available for planning and preparing for the march.

2-140. The company commander issues the WARNORD in time to allow subordinate leaders and their Soldiers to prepare for the march. Reconnaissance of the march route precedes unit movement. Reconnaissance includes movement to the SP to determine the length of time it takes the company to arrive from its position prior to the march to the SP. When the company marches independently, the company commander selects the route for the march and directs reconnaissance in accordance with the higher headquarters order.

2-141. The commander refines the plan, coordinates with adjacent units, and supervises and assesses preparations. To ensure the company is ready for the march, the commander monitors subordinate unit rehearsals and inspections. The commander issues instructions concerning company personnel who do not march with the unit, for example instructions on linkup after the march. The commander completes the plan and issues the OPORD/movement order to subordinates.

2-142. The commander usually marches in front of the company to the SP, and then moves to a point in the column to best supervise the march. The commander monitors and controls rate of march, movement technique (including formation spacing and uniformity), and Soldier load. Periodically, the commander adjusts the march rate and distances between Soldiers and units to reduce accordion effects and the number of stragglers. The commander maintains control by using voice, messenger, mission command systems and arm-and-hand signals means.

2-143. Halts during the march range from brief to extended periods of time depending on the situation. For short halts, the commander may use a cigar-shaped perimeter intended to protect the force while maintaining the ability to continue movement. When the commander decides not to immediately resume the march, the cigar-shaped perimeter expands with elements establishing observation post forward of the 360 degree perimeter. A perimeter defense is established for long halts or delays in the march. The commander ensures foot care and load adjustments take place throughout the company.

2-144. The commander ensures movement of subordinate elements into their respective assembly areas or positions at the conclusion of the march is rapid and without delay. The commander supervises subordinate leaders in the execution of their duties after the march. The commander ensures security measures are established and 100 percent accountability of personnel and equipment is accomplished. The commander continues planning and preparations for follow-on actions.

COMPANY EXECUTIVE OFFICER

2-145. The company executive officer (XO) is the company's second-in-command and primary sustainment planner and coordinator before, during, and after the march, in conjunction with the company first sergeant. The XO may establish an alternate command post for the company with radio and digital communications. Additional duties and responsibilities for the march include:

- Ensure accurate, timely march and sustainment reports are sent to higher.
- Assist in the preparation of the OPORD/movement order.
- Coordinate with higher, adjacent, and supporting units.
- Assist the commander in preparations activities, including rehearsal site preparation.
- Manage the company timeline and facilitates the integration of attachments.
- Serve as movement control officer, if required.
- Supervise company traffic guards and guides, if required.
- Lead the quartering party for the tactical road march, if required.

COMPANY FIRST SERGEANT

2-146. The company first sergeant assists the commander as assigned, ensures unit NCOs perform all unit tasks according to unit SOP and supervises PCC and PCI. The first sergeant helps establish and maintain march unit formation and discipline to include pace, intervals between Soldiers, noise and light discipline, and water, rest, and hygiene discipline. The first sergeant forwards casualty information to the battalion S-1 and ensures DA Form 1156 (*Casualty Feeder Card*) is accurately and completely filled-out on each casualty. Additional duties and responsibilities for the march include:

- Supervise, inspect, and observe all march matters designated by the commander.
- Assist and coordinate with the executive officer in all critical aspects of the march.
- Serve as quartering party noncommissioned officer-in-charge, if required.
- Assist the commander with maintaining accountability.

SUPPLY SERGEANT

2-147. The supply sergeant requests, receives, issues, stores, maintains, and turns in supplies and equipment for the company. The supply sergeant coordinates all supply requirements and actions with the company XO and/or the first sergeant and the battalion S-4 section. Usually, the supply sergeant's duty location is with the battalion field or combat trains, company trains, or positioned to conduct movement with a march unit within the main body. Additional duties and responsibilities for the march include:

- Monitor activities and/or the tactical situation.
- Anticipate and report logistical requirements.
- Coordinate and monitor sustainment requests.
- Coordinate and supervise logistics packages (route, contingent, and urgent resupply).

SIGNAL SUPPORT NONCOMMISSIONED OFFICER

2-148. The signal support NCO supervises the operation, maintenance, and installation of organic digital, wire, and frequency modulation communications. The signal support NCO usually travels, during the march, within the trail party or with a march unit within the main body. Additional duties and responsibilities for the march include:

- Send and receive routine traffic and make required communications checks.
- Perform limited maintenance to organic communications equipment.
- Provide linkage to battalion level communications maintenance.
- Supervise communications security equipment.
- Assist communications planning and employment.
- Assist command post operations.

MORTAR SECTION LEADER

2-149. The mortar section leader is responsible for employing the mortar section and ensuring effective support to the company during movement. The section leader coordinates with the company fire support officer (FSO) to receive the fire support plan, the fire support execution matrix, the company target list worksheet, and any fire support coordination measures. The section leader assists the commander and FSO in the integration of mortar fires throughout the march route and follow-on actions.

PLATOON LEADER

2-150. The platoon leader has a variety of duties and responsibilities before, during, and after the march, to include, understanding the strengths of the Soldiers and the capabilities of subordinate units within the platoon to employ them effectively. The Platoon leader works closely with the platoon sergeant to ensure everything in the OPORD/movement order and unit SOP are followed and accomplished.

2-151. The platoon leader rapidly briefs the platoon on the information contained in the OPORD/movement order to ensure adequate and timely preparations. The platoon leader, in coordination with the platoon sergeant, inspects the wear and adjustment of uniforms and equipment for the march. The platoon leader supervises subordinate leaders, working closely with the platoon sergeant, to ensure assigned duties and PCC and PCI go as dictated in the order.

2-152. As the platoon marches to the SP, the platoon leader ensures prescribed distances within platoons are accomplished according to the order. The platoon leader checks compliance with announced restrictions such as water and march disciplines. After leading the platoon across the SP, the platoon leader moves to a point in the column to best control the movement. As the column approaches the RP, the platoon leader moves to the head of the platoon to better control movement to follow-on actions.

2-153. During halts, the platoon leader directs Soldiers to move off the route while ensuring security is maintained. The platoon leader directs subordinate leaders to ensure Soldiers make equipment adjustments when needed and physically check the condition of their Soldiers. The platoon leader monitors the situation to be ready to reinitiate the march.

2-154. Upon crossing the RP, the platoon leader ensures the platoon moves promptly to its assigned area. When occupying an assembly area, the platoon leader disperses the platoon in covered and concealed areas and positions key weapon systems. The platoon leader, in coordination with the platoon sergeant, supervises squad leaders in their duties to ensure priorities of work are accomplished according to the order, ensures food, water, shelter, and rest are applied according to unit SOP, and medical assistance is available as needed.

PLATOON SERGEANT

2-155. The platoon sergeant assists the platoon leader in the conduct of the march as assigned and supervises inspection of Soldiers before, during and after the march. The platoon sergeant controls stragglers and dropouts by examining march casualties with platoon medic before recommending to the platoon leader for their evacuation. The platoon sergeant coordinates with the first sergeant or company supply representative for resupply of water, rations, and medical supplies before, during and after the march. The

platoon sergeant ensures and supervises squad leaders to do their jobs according to the OPORD/movement order and/or unit SOP.

SQUAD LEADERS

2-156. The squad leader's duties and responsibilities are similar to those of the platoon leader and platoon sergeant. Upon receipt of WARNORD, the squad leader provides detailed instructions and individual attention to every Soldier in the squad. Inspects boots for serviceability, proper fit, comfort and anything else hindering the march. The squad leader inspects each Soldier's clothing for cleanliness and serviceability. Ensures Soldiers carry extra clothing including socks for use during and after the march and ensures all squad CLS carry extra foot powder, gauze, adhesive tape, and other appropriate items needed during the march. The squad leader inspects Soldiers for proper equipment, adjustment of equipment, and full canteens.

2-157. The squad leader marches at a location within the formation to best control the squad. While maintaining the prescribed distance from the squad ahead and periodically checking Soldiers for proper distance and rate of march. The squad leader assists the platoon leader and platoon sergeant in enforcing march discipline, other march control measures, and accountability of all personnel and equipment.

2-158. The squad leader follows unit's SOP and ensures Soldiers accomplish and execute what is asked of them. The squad leader monitors the squad and supervises team leaders throughout the march and manages cross loading of equipment to ensure all loads are carried and balanced within the squad. Loss of Soldiers because of equipment exhaustion is unacceptable, it puts the squad at risk and reduces combat power. (See chapter 3, this publication, for additional information on soldier load).

2-159. During halts, the squad leader directs Soldiers to move off the route while ensuring security is maintained. The squad leader directs team leaders to check Soldiers, checks include clothing (for example, change socks if needed), adjusting and refitting loads, switching crew-served weapons and other heavy loads from tired Soldiers to those who are less tired, and the physical condition of Soldiers. Soldiers must be encouraged to drink water or electrolyte and carbohydrate fluids at every halt and during movement to maintain proper levels of hydration and nutrients.

2-160. As the squad approaches the RP the squad leader makes preparations for follow-on actions. For example, the squad may move to an assembly area, establish security, and occupy available covered and concealed positons. The squad leader ensures all Soldiers and equipment are accounted for and reports this to the platoon sergeant or platoon leader. The Squad and team leaders conducts foot inspections of Soldiers and reports their physical condition to the platoon leader or platoon sergeant. The squad leader coordinates with the platoon sergeant for resupplies and medical attention if needed. The squad leader continues to supervise team leaders and monitors the radio waiting for further instruction for upcoming missions.

TEAM LEADERS

2-161. Team leaders accomplish the same duties and responsibilities as the squad leader before, during and after the march, except focuses on their team. They ensure teams follows directions given by the squad leader and ensure OPORD/movement order and unit SOP guidelines and instructions are followed.

COMPANY HABITUAL ATTACHMENTS

Habitual attachments to the company include the fire support team and combat medics. These habitual attachments are normally attached whenever the company deploys.

FIRE SUPPORT TEAM

Fire support team (FIST) headquarters personnel authorized for the company include a FSO, a staff sergeant as the fire support sergeant, a fire support specialist, and a radiotelephone operator. The FIST also includes three two-man teams, a forward observer (FO) and a ratio telephone operator. Each FO team may be assigned to a rifle platoon or be designated to observe a specific area along the march.

Fire Support Officer

2-162. While the company commander is ultimately responsible for integrating fires in support of the scheme of maneuver; the company FSO serves as the commander's principle advisor. On the basis of the commander's guidance, the company FSO synchronizes fire support within the movement plan and presents the fire support plan to the commander for approval. During planning, the FSO develops and refines a fire support plan based on the commander's concept and guidance. Additional duties and responsibilities for the march include:

- Advise the commander on all fire support matters.
- Request, adjust, and direct all fire support.
- Serve as the commander's primary advisor on the enemy's indirect fire capabilities.
- Assist the commander with developing the OPORD/movement order to ensure full integration of fires.
- Recommend targets and fire control measures.
- Determine methods of engagement and responsibility for firing the targets.
- Develop an observation plan with limited visibility contingencies.
- Allocate forward observers and other observers to maintain surveillance of target along the route.
- Monitor the location of friendly units and assist the commander with clearing fires.
- Request counterfire support in response to enemy artillery and/or mortar attacks.
- Assist control of close air support in the absence of a qualified Air Force joint terminal attack controller.

Forward Observer

2-163. The FO is the primary fire support observer in the platoon and generally collocates with the platoon leader. The FO provides target refinement, submits key targets to the company fire plan, and advises the platoon leader on all fire support matters. The FO prepares, maintains, and uses situation maps; designates targets for smart munitions; and reports battlefield intelligence. As directed by the platoon leader, the FO executes planned fires and requests/adjusts fires for their supported platoons during the march.

COMBAT MEDICS

2-164. The basis of allocation for company level medical support is one senior combat medic per company and one combat medic per maneuver platoon. The company's senior combat medic and platoon medics generally collocate (respectively) with the company headquarters element and the platoon headquarters element. This basis of allocation is designed to place medical treatment assets as close to the point of injury as possible. Additional duties and responsibilities for the march include:

- Oversee and evaluate ill, injured, or wounded friendly and enemy personnel for priority of treatment.
- Request and coordinate the evacuation of sick, injured, or wounded personnel under the direction of the company first sergeant.
- Monitor the tactical situation, as necessary
- Anticipate and coordinate health service support requirements and Class VIII resupply.
- Advise company commander and first sergeant on unit field sanitation issues.
- Keep the first sergeant informed on the status of casualties and coordinate for additional sustainment requirements.

2-165. At every halt medics assess and treat those who require medical attention. Medics advise the chain of command when a Soldier requires medical evacuation. In situations where medical evacuation assets are limited, medics can advise leadership on which Soldiers they believe can be safely transported using designated casualty evacuation platforms. All casualties being evacuated should have a DD Form 1380 (*Tactical Combat Casualty Care (TCCC) Card*) filled out and attached to their uniform before being evacuated. Medics must be careful and ensure that they do not become casualties themselves.

Medics need to coordinate with the assigned unit for cross loading or transporting medical equipment needed for the march.

Note. It is absolutely vital every Soldier in the unit be trained to be a first responder. First responders are the first individuals to reach a casualty and provide first aid, enhanced first aid, or emergency medical treatment. (See ATP 3-21.8.)

SOLDIERS

2-166. To ensure success during the march, Soldiers master a diverse set of battle and crew drills and specialized skills. Soldiers should be keenly aware and astute to anomalies, changes, and other clues to identify dangers or threats in the environment and populace. Specialized skills required for the march include combat lifesavers (CLSs) and pacesetter.

BATTLE AND CREW DRILLS

2-167. Soldiers execute battle and crew drills, standardized collective actions made in response to common occurrences, designed for rapid reaction situations without the application of a deliberate decision-making. Battle and crew drills are initiated on a cue, such as an enemy action or the leader's order, and are a trained response to that stimulus. These drills require minimal leader orders to accomplish, and are vital to success and critical to preserving life. (Refer to ATP 3-21.8 for additional information.)

OBSERVATIONS AND EXPERIENCES

2-168. Observations and experiences of Soldiers provide depth and context to information gathered through reconnaissance, surveillance, and intelligence operations. Soldiers often work in and are familiar with the local populace and can read, sense, or detect abnormalities, inconsistencies, or irregularities in their behavior or actions during the march. The same can be said about environments in which Solders operate. All Soldiers should look for anything seeming out of place or inconsistent with what is normally encountered and report their observations immediately. For example, an alert Soldier may detect changes or disturbance in terrain from previous missions which could indicate a possible buried IED (see paragraphs 2-101 to 2-10). Soldiers remain vigilant and attentive to details about local personnel indicating possible enemy activity.

Note. Leaders need to ensure subordinates remain vigilant and not become complacent during dismounted marches and understand that this is most likely to occur during longer movements.

COMBAT LIFESAVER

2-169. The CLS is a tremendous asset to the company and unit medical personnel and is likely the first responder to medical issues during the march. The CLS's advanced first aid skills are called upon in the field until casualties can be evacuated. The CLS knows the procedures for establishing (as required) a casualty collection point and is trained in medical evacuation. The CLS ensures the squad CLS bag with litters and other medical equipment is packed properly, identifies Class VIII shortages to the platoon medic, and oversees casualty treatment and carries. It is imperative the CLS combat load remains as light as possible.

Note. CLSs ensure every Soldier in their unit carries their improved first aid kit.

PACESETTER

2-170. The pacesetter (when used) is an experienced Soldier, carrying the same load as the majority of the unit's Soldiers, marching from 4 to 10 meters at the head of the column, depending on METT-TC. The pacesetter's primary duty is to maintain the rate of march ordered by the commander or subordinate leader. The pacesetter does this by establishing pace (length of step) and cadence (number of steps per minute) to obtain the prescribed rate of march. The pacesetter should be average height so average strides can be taken. Over-striding or under-striding tends to tire leg muscles quickly and affects efficiency of marching Soldiers.

The leader marching with the unit responsible for setting the pace supervises the pacesetter to ensure the pacesetter takes average strides and maintains a uniform cadence.

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Chapter 3

Soldier Load

The ability of Soldiers to march and fight is directly influenced by their combat load. Soldier loads should be limited to mission essential equipment. Excessive loads significantly reduce the Soldier's ability to accomplish the mission. Identifying the optimum combat load for the Soldier is crucial to maintaining combat power and ensuring efficient mission accomplishment. Commanders tailor loads based on mission requirements and manage risk throughout all phases of the mission. This chapter addresses considerations specific to soldier load, the tailoring of loads, and the movement of supplies and equipment. .

SECTION I – SOLDIER LOAD CONSIDERATIONS

3-1. Soldier load is an area of concern for Army commanders and subordinate leaders. How much is carried, how far, and in what configuration are critical mission considerations. Commanders and leaders balance the risk to their Soldiers from the enemy against the risk to mission accomplishment due to excessive loads and Soldier exhaustion and injury. Soldier load is limited to mission essential equipment to sustain continuous operations. Commanders and leaders accept prudent risks to reduce Soldier load based on a through mission analysis.

ECHELONING LOADS

3-2. Maximum effort should be placed on echeloning loads. Commanders resist the mindset to carry everything to be prepared for every eventuality. Subordinate leaders at the lowest levels enforce load discipline to ensure that Soldiers do not voluntarily carry excess weight. Commanders and subordinate leaders plan for the delivery of nonessential equipment forward for subsequent operations. Echeloning loads to be secured or transported, breaks down supplies and equipment into three echelons: combat load, sustainment load, and contingency load.

COMBAT LOAD

3-3. Combat load is the minimum mission essential equipment required for a Soldier to operate (fight if required) and survive during the immediate operation. Supplies and equipment not carried in a combat load are secured and transported in sustainment loads (see paragraph 3-7) and contingency loads (see paragraph 3-8). Soldier's carrier loads in one of three type combat loads depending on the situation. The three types of combat loads are: fighting load, approach march load, and emergency approach march load de.

Fighting Load

3-4. Fighting load is the essential items a Soldier needs to maneuver on, close with and destroy enemy forces in direct fire contact. Fighting load is the sum of everything worn or carried by the Soldier (see table 3-1, page 3-2 for a listing of possible items carried depending on the current situation and mission). For missions requiring mobility, speed, and/or stealth, carrying heavy loads is a disadvantage. Cross-loading machine gun ammunition, mortar rounds, shoulder fired munitions, water, and radio operator's equipment across the march unit may be necessary to balance out the loads being carried within the unit. For example, selected rifle platoon members may carry a mortar round (usually address in unit SOP) to drop at the mortar firing position once the march unit reaches its area of operation to reduce loads within the mortar section.

Table 3-1. Fighting load – possible items carried

Fighting Load	*Pounds*
Uniform complete (ACU, T-shirt, socks, boots, belt, patrol cap)	7.8
Advance combat helmet	4.2
Field load carrier (FLC)	5.8
Knee pads	0.5
M4 (no magazine)	6.4
5.56 unit basic load (UBL; 210 rounds and 7 magazines)	7.0
AN/PEQ-15 (ATPIAL)	0.5
M68 (CCO)	0.9
AN/PAS-13(V)1 (LWTS)	1.9
AN/PVS-14 (MNVD) Includes helmet mount	1.2
Soldier Plate Carrier System (SPCS)	5.9
SAPI (front and back), SBI (sides)	16.0
1 quart canteens (2 each, with water)	4.6
MRE (1 each, stripped)	1.4
M67 fragmentary grenades (2 each)	2.0
Compass	0.5
Bayonet w/scabbard	1.3
Individual first aid kit	1.0
Total	**68.9**

Legend
ATPIAL – advanced target pointer illuminator aiming light
ACU – Army combat uniform
CCO – close combat optic
LWTS – light weapon thermal sight
MRE – meals, ready to eat
MNVD – monocular night vision device
SAPI – small arms protective inserts
SBI – side ballistic insert

Note. When the improved outer tactical vest (IOTV) is substituted for the SPCS, a medium size IOTV complete with all components (soft armor panel inserts, four ballistic plate inserts (front and back plates and two side plates), collar, and groin protectors) weighs 30 pounds, with a Large IOTV weighing about 35 pounds.

Approach March Load

3-5. An approach march load consists of the fighting load plus additional essential equipment. The approach march load may include an assault pack or rucksack and all other items not needed in the fighting load and now required. Approach march loads, where direct contact with the enemy is intended, are dropped in an

assault position, objective rally point, or when receiving effective enemy fires prior to an assault. (The key word is "effective" enemy fires, not contact, dropping carried loads will always delay the operation during recovery of dropped gear/equipment.) Execution of this technique must be planned for and rehearsed, and may require transportation assets, when available, to retrieve equipment later in the operation. An approach march load allows Soldiers to fight and sustain themselves until resupplied, though, approach march loads should not exceed 100 pounds. Table 3-2 lists possible items carried in an approach march load.

Table 3-2. Approach march load – possible items carried

Approach March Load	*Pounds*
Assault pack	3.1
T-Shirt	0.2
Socks (2 pair)	0.4
Wet weather top and bottom	3.0
Poncho	1.0
Poncho liner	1.5
Weapons cleaning kit	1.0
Entrenching tool with carrier	3.5
2-quart canteens (2 each)	10.0
Meals, ready to eat (3 each, stripped)	4.2
Subtotal	**27.9**
Add Fighting Load	68.9
Total	**96.8**

Note. Depending on the mission and environmental conditions, items carried normally in an approach march load may be carried as a fighting load. For example, wet weather gear top and/or bottom, and additional water, MREs, and ammunition.

Emergency Approach March Load

3-6. Operations requiring an emergency approach march load should only be used when absolutely necessary to accomplish a specific mission. For example, Soldiers may be required to carry heavier loads through terrain impassable by vehicles or when ground and air transportation resources are unavailable. Excessive weights associated with these loads significantly impact the unit's ability to move to the final destination without physically exhausting Soldiers. Physical exhaustion significantly limits the cognitive ability and mental focus of leaders and Soldiers, and inhibits their combat effectiveness. When carrying an emergency approach march load, commanders should seek to limit march distances and provide Soldiers time to recover before executing follow-on activities.

SUSTAINMENT LOAD

3-7. Sustainment loads consist of equipment required to sustain operations. Sustainment loads are generally positioned within the battalion or company support area and brought forward when needed. (See section III of this chapter.) Sustainment loads may include rucksacks, duffel bags, and sleeping bags. Depending on the situation, personal protection items can be stored in preconfigured unit sustainment loads. Coordination is made to ensure sustainment load items are available when required.

CONTINGENCY LOAD

3-8. Contingency loads includes all other items not necessary for ongoing operations, such as extra clothing and personal items, or Javelin Close Combat Missile System in threat environments where the enemy lacks an armored capability. Contingency loads might be stored in duffel bags or palletized. Determining what goes in these loads and who is responsible for their storage and delivery is a critical decision for the commander.

3-9. B-bags should be palletized in unit loads and a contingency table of organizational equipment should be centralized in battalion packs. Contingency loads are generally not flown into deployment areas as part of the initial deployment. When contingency loads arrive in theater, plans should be made at or above brigade level to store unit contingency supplies and equipment. Items then can be returned to units if require by the situation. For example, if units are deployed into an area where items of contingency load are needed or if units are staged in assembly areas.

3-10. Instructions are issued to Soldiers before deployment, listing individual and organizational equipment not part of initial deployment. Contingency equipment could remain in continental United States, be stored at base areas in unit packs, or be reserve equipment issued by a higher headquarters when necessary.

3-11. Upon arrival in theater, provisions must be made for some items of equipment to be back loaded from the company, battalion, or brigade to division control. This allows units to deploy heavy for maximum flexibility. As the situation becomes clearer units can back load items not immediately needed to higher headquarters control as contingency loads for use at a later time.

LOAD DETERMINATION

3-12. Load determination is managed at company and platoon levels; however, standards are established at battalion level during planning to ensure Soldiers are properly equipped and physically ready for the conduct of operations. During this process, the commander and subordinate leaders determine the factors affecting Soldier load, and the capabilities and limitations of the unit. Load determination factors are address in the following paragraphs.

LOAD CONFIGURATIONS

3-13. As addressed earlier, loads are configured in three echelons: combat load (one of three configurations—fighting load, approach march, or emergency approach march), sustainment load, and contingency load. When configuring combat loads, the commander considers what ammunition, supplies, and equipment are mission essential. Effective load configuration requires the commander and staff to manage risk in a logical and control manner based on a detailed mission analysis. The commander tailors the combat load (see section II of this chapter) to be carried with the march unit based on this analysis and arranges for sustainment and contingency loads to be transported at a later time.

3-14. The commander's situational understanding, personal experience, and knowledge of the capabilities and limitation of the march unit enables the determination of load configuration. The commander adapts to circumstances and situations encountered, makes decisions when to drop equipment, and cross loads equipment to ensure success during the march. The commander maintains enough fire power and protection to defeat the enemy, when required, without burdening the unit with excessive loads. See table 3-3 for an example METT-TC analysis.

Table 3-3. Example of METT-TC analysis

Mission	*Enemy*	*Time*	*Troops*	*Terrain*	*Civil Considerations*	*Load Analysis*
Platoon (as a part of a company) conducts a movement to contact transitioning to attack to defeat enemy forces in the AO.	Dismounted Infantry platoon with small arms.	Expected duration is 24 to 48 hours.	3 squads plus weapons squad.	Severely restricted terrain, rolling hills, dense vegetation, high humidity, high temperature.	None.	Approach march load without body armor, only light antitank (AT)/ BDM weapons, 2x stripped MRE.
Platoon (as a part of a company) raids an objective to capture or kill enemy elements.	Dismounted Infantry reinforced squad.	Expected duration is less than 24 hours.	3 squads plus weapons squad.	Severely restricted urban terrain, limited visibility, moderately high temperatures.	Noncombatants present in vicinity of the target objective.	Fighting load, body armor with front/back/ side plates.
Platoon (as a part of a company) attacks to seize an enemy objective.	Dismounted Infantry platoon with small arms and light AT weapons in a prepared defense.	Expected duration is 24 to 48 hours.	3 squads plus weapons squad.	Severely restricted terrain, rolling steep hills, dense vegetation, freezing temperatures/ snow fall.	None	Approach march load, cold weather uniforms, extra silks, fleece, socks, and body armor with front/back plats, only light AT/BDM weapons, 2x stripped MRE.
Stryker platoon (as a part of a company) attacks to seize an enemy objective.	Mechanized Infantry defending in vicinity a small village, BMP 1-BTR mix.	Expected duration is less than 24 hours.	3 squads plus weapons squad.	Restricted terrain, moderate vegetation, moderate temperatures.	Noncombatants present in vicinity of the target objective.	Fighting load, body armor with front/back plates, Javelin CCMS with 2x additional rounds.
Legend: AO– Area of operations AT – Antitank; BDM – Bunker defeat munitions; BMP 1- BDR – Boyevaya Mashina Pekhoty 1, BTR– CCMS – Close combat missile system MRE – meals, ready to eat						

LOAD IMPACT

3-15. The load a Soldier carries is a major concern to the commander and subordinate leaders planning a dismounted march. How much is carried, how far, and under what configuration are important mission considerations, requiring command emphasis. A Soldiers' ability to fight is directly related to the loads they carry. The commander attempts to minimize Soldier load to improve stealth, speed and survivability.

3-16. Excessive Soldier loads reduce energy and agility. Soldiers carrying an excessive load are at a disadvantage when reacting to enemy contact and during the conduct of follow-on actions at the conclusion of the march. Conversely, if the load is reduced, leaders may make decisions to leave behind mission essential or crucial equipment. Sometimes Soldiers must carry more than the recommended weights for a combat load. However, leaders must realize how this impacts the unit's overall combat power to accomplish the mission.

WEIGHT CATEGORIES

3-17. Personal protective equipment, specifically Soldier body armor, constitutes the largest weight category of Soldier load. Body armor limits the Soldier's ability to maintain body core temperature and, to varying degrees, regulate breathing due to constriction of the torso. Depending on the mission variables of METT-TC, the commander may adjust the level of body armor protection balancing an increased risk to individual Soldiers to improve the likelihood of mission accomplishment.

3-18. Ammunition, supplies, and equipment carried by the Soldier is tailored to the requirements of the mission. For example, if the enemy threat does not include armor formations, a Soldier's combat load may not include the Javelin. In certain circumstances, it may be appropriate for units to carry additional ammunition due to sustainment constraints. In other circumstances, based on the enemy threat and historical analysis it may be necessary to carry mine detectors but not electronic countermeasure equipment. Planning and preparation processes include detailed load planning and calculation to assist the commander and subordinate leaders in organizing tactical loads to manage energy expenditure and combat effectiveness.

Note. When exact equipment weights are required, refer to the appropriate technical manual for the item's weight.

TIME AVAILABLE AND TERRAIN

3-19. The burden of load reduces the Soldier's ability to react to the enemy. Loads cause fatigue and lack of agility, placing Soldiers at disadvantages when rapid reaction to the enemy is required. Commanders consider the variables of METT-TC when determining loads. Two variables, time available and terrain, have the greatest effect on loads. Leaders must assess and balance the risk of the assigned mission against the risk to the units' ability to execute the mission given their physical condition.

3-20. Time available to move the unit, under a given load, may constrain the march unit's ability to arrive in the most efficient manner with maximum available energy to accomplish assigned tasks. Time constraints may force the commander to reduce Soldier loads. When loads are not reduced, Soldier physical exertion increases requiring the commander and subordinate leaders to assess the condition of their units more often.

3-21. Difficult terrain naturally slows movement due to vegetation (thick brush compared to pine forest), grade (generally flat compared to steep hills or mountain), and composition (hard packed ground or roads compared to sand, snow/ice, or scree). Heavy march loads over difficult terrain quickly exhaust Soldiers and significantly reduce their physical effectiveness and cognitive capacity to accomplish assigned tasks.

ENERGY EXPENDITURES

3-22. The average dismounted rate of march in daylight on roads or improved surfaces is 4 kph and 2.4 kph cross-country shown in figure 3-1. Given a load of 100 pounds, the rate of march cross-country is 2.4 kph in easy terrain based upon figure 3-2. As shown in figure 3-3, page 3-8, this rate of march is generally consistent with a sustainable rate of march expending 300 kilo calorie (kcal) per hour and should provide an available energy reserve in event of enemy contact.

AVERAGE RATES OF MARCH FOR:	KPH				KM PER DAY
	ON ROADS		CROSS-COUNTRY		
	DAY	NIGHT	DAY	NIGHT	
FOOT SOLDIERS	4	3.2	2.4	1.6	20 - 32

LEGEND
KM KILOMETER KPH KILOMETERS PER HOUR

Figure 3-1. Average dismounted rates of march

3-23. Commander and subordinate leaders plan an appropriate rate of march, or pace, to provide flexibility for their units if enemy contact or subsequent tasks are assigned during the mission. When carrying loads during approach marches, Soldier's speed can cause rates of energy expenditure of more than 300 calories per hour and can erode reserves of energy needed upon enemy contact. March speeds must be reduced when loads are heavier to stay within reasonable energy expenditure rates. Carrying awkward loads and heavy handheld items causes increased degradation to march speed and agility. Distance marched in six hours decreases by about two kilometers for every 10 pounds carried over 40 pounds. Figure 3-2 shows sustainable average velocities with given loads, which results in an energy expenditure of 300 calories per hour. Loads can be carried in places other than the torso, but they often result in higher energy expenditures. See appendix C, this publication, for additional information.

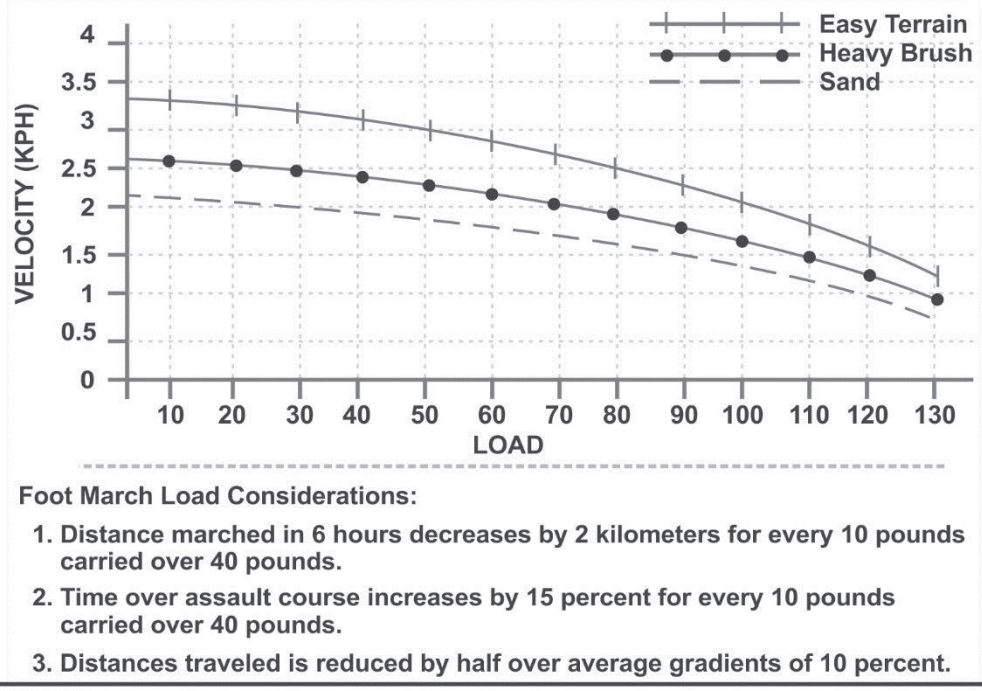

Figure 3-2. March velocity depletion based on load during cross-country movement

3-24. When the march unit conducts forced march, the commander increases the number of kilometers travelled per day to sustain unit effectiveness without significant recovery. If necessary, the commander may increase the rate of march but must mitigate the energy expenditure by varying rates of march, periodic halts to readjust loads, hydration, and calorie replenishment—primarily carbohydrates consisting of simple sugars. Leaders must continually assess the condition of their unit to determine the frequency and duration of halts

if they are not directed. If conducting a march at rates beyond the exhaustion line in figure 3-3, leaders must assess when a unit's energy expenditure culminate and provide the unit time to recover.

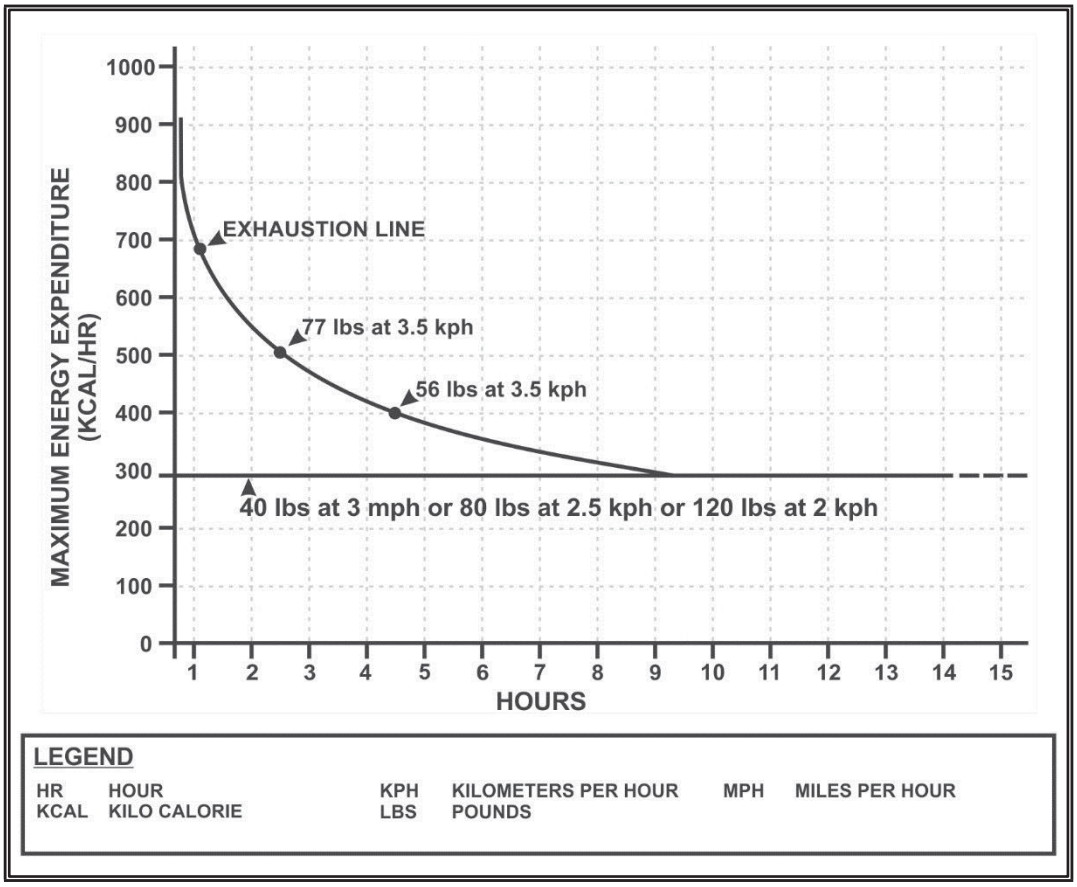

Figure 3-3. Maximum energy expenditure

3-25. A march unit in ideal circumstances requires about 24 hours recovery after movements under load that exhausts Soldiers, defined as any movement rate or load beyond the exhaustion line to prevent injury and replenish calories. If a unit is unable to provide ideal recovery time, leaders should focus on replenishment of calories and maximizing available rest. Unit effectiveness continues to degrade based on energy expenditure and lack of adequate recovery time.

Note. Battlefield stress decreases Soldiers' abilities to carry their loads. Fear burns up glycogen in muscles required to perform physical tasks. This wartime factor often is overlooked in peacetime, and leaders must consider it when establishing loads for Soldiers. However, applying strong leadership to produce well-trained, highly motivated Soldiers can lessen some effects of stress.

OPTIMIZATION OF SOLDIER LOAD

3-26. Excessive weights on backs of fit Soldiers, coupled with harsh environments, reduce Soldier performance. Despite the commander and subordinate leaders going to great lengths to minimize Soldier loads while still ensuring they can accomplish their assigned tasks, a Soldier's combat load will generally exceed the upper limits of what the soldier should carry in proportion to body weight. The following total loads (table 3-4)—the combination of fighting load and approach march load—should be adhered to as closely as possible for mission accomplishment and minimal energy expenditure—

- Average fighting load: 60 to 80 pounds (about 30 percent body weight is ideal).

- Average total approach march load: 80 to 100 pounds (about 45 percent body weight is ideal).
- Average total emergency approach march load: 100 to 125 pounds.

Table 3-4. Body weight percentages for combat loads

Individual Body Weight (BW) in Pounds	*Fighting Load (30% of BW)*	*Approach March Load (45% of BW)*	*Emergency Approach March Load (46 to 70% of BW)*
120	36.00	54.00	84.00
125	37.50	56.25	87.50
130	39.00	58.50	91.00
135	40.50	60.75	94.50
140	42.00	63.00	98.00
145	43.50	65.25	101.50
150	45.00	67.50	105.00
155	46.50	69.75	108.50
160	48.00	72.00	112.00
165	49.50	74.25	115.50
170	51.00	76.50	119.00
175	52.50	78.75	122.50
180	54.00	81.00	126.00
185	55.50	83.25	129.50
190	57.00	85.50	133.00
195	58.50	87.75	136.50
200	60.00	90.00	140.00
205	61.50	92.25	143.50
210	63.00	94.50	147.00
215	64.50	96.75	150.50
220	66.00	99.00	154.00
225	67.50	101.25	157.50
230	69.00	103.50	161.00

3-27. Major components of Soldier loads are body armor, weapons, ammunition, and water. Unlike assault pack or rucksack, which can be dropped off in assault positions or upon contact during some tactical operations, body armor to some level of protection is generally always worn. Weight and bulk of body armor wears down the Soldier, exhausting, abrading, and overheating them. Commander and subordinate leaders still attempt to reduce the weight of combat loads borne by Soldiers by cross leveling loads within march units. Using alternate means of transporting nonessential equipment and offloading equipment not immediately needed reduces combat loads.

SOLDIER ABILITY TO CARRY PRESCRIBED LOAD

3-28. The load Soldiers can carry is based on their weight, climate, terrain, and prior or current stress. Physical conditioning and progressive preparation is essential to the Soldier's ability to carry a prescribed load. Heavy loads, mountain terrain, high altitude, and extremely hot or cold weather combine to diminish a Soldier's strength.

3-29. Even in the least physically demanding terrain, fatigue can become an issue. With rough terrain and bad weather, effects of fatigue multiply exponentially. Without proper rest, fatigue can greatly reduce effectiveness of an otherwise highly trained unit. While season, climate, and weather conditions impact items carried in operations, Soldiers should be equipped for sudden changes in weather.

3-30. A Soldier's fighting capability is related directly to their load. The following observations demonstrate how important it is for commanders to understand their responsibilities for load planning and discipline—

- Each mission requires an analysis of essential items necessary for survival and operations. The unit must consider environment, weather, mission, and Soldier requirements before determining what equipment is mission essential.
- No amount of training can change the body's reaction to carrying excessive loads. The commander's involvement in analyzing situation and level of risk involved is vital to determining what supplies and equipment are mission essential.
- Vehicles may not always be available for Soldiers to carry their essential loads of ammunition, food, and equipment. Vehicles should be used whenever practical.
- Overloading Soldiers can get them killed. Develop unit standard operating procedures strictly limiting what is carried on operations and exercises and enforce those limits.
- Fatigue is part of the Soldier's life in field environments. With rough terrain and bad weather, effects of fatigue multiply exponentially.
- Soldiers carrying extremely heavy loads in any weather or terrain, slow movement and increase fatigue.
- Mountain terrain is usually rocky, making it easy to twist an ankle or otherwise have minor to moderate lower body injury.
- Soldiers carrying heavy loads are at greater risk for injuries. Injuries tend to increase in winter due to water, snow, and ice.

SECTION II – LOAD TAILORING

3-31. The purpose of load tailoring is two-fold. First, it lets the commander and staff use their understanding of the current situation to determine what supplies and equipment are essential to the mission. Second, it accounts for potential impact on Soldier loads, emphasizing the need to carry what is necessary. The commander and staff consider the following areas in load tailoring for subordinates to maintain combat power and to ensure accomplishment of the mission.

COMMANDER'S GUIDANCE

3-32. When confronted with unacceptable loads Soldiers must carry, commanders may establish firm guidance on the weight of loads carried by Soldiers. However, when realistically applying such guidelines, Soldier loads may not be optimized for the mission. Load tailoring normally falls directly to the commander, who decides what is transported or stored in sustainment loads or packages based on the mission. The commander's guidance sets the conditions for the staff's mission analysis in determining what is transported or stored to support the march.

ESTIMATE OF SITUATION

3-33. During planning, commander and staff estimates are continually updated. Updated estimates are based on a complete analysis and understanding of the unit's mission at the end of the march, enemy situation, terrain being marched on or through, expected weather, and the physical condition of the unit's personnel conducting the march. Through understanding the commander decides what items to include in the Soldier combat load and what items to leave with the sustainment load, either upload on vehicles or packaged in the unit trains.

DECISIONS TO REDUCE OR OFFSET RISK

3-34. Risk management is the Army's process for helping organizations and individuals make informed decisions to reduce or offset risk. Using this process increases the march forces operational effectiveness and the probability of mission accomplishment. This systematic approach identifies hazards, assesses them, and manages associated risks. Risk management outlines a disciplined approach to express a risk level in terms readily understood at all echelons. For example, the commander may adjust the level of body armor protection balancing an increased risk level to individual Soldiers to improve the likelihood of mission accomplishment. (Refer to ATP 5-19 for a detailed discussion on the analysis of risk.)

CALCULATING LOAD REQUIREMENTS

3-35. Calculating loads consists of three components: common essential items carried regardless of threat, environment, or mission; duty position load, consisting of assigned weapons or components of the weapon systems plus ammunition; and variables, consisting of all other items carried or transported, based on the commander's understanding of the situation. (See figure 3-4.) When calculating load requirements—

- Modify combat loads into fighting, approach march, or emergency approach march loads, when applicable.
- Modify assault pack and/or rucksack loads per the mission and/or in accordance with unit standard operating procedures.
- Organize nonessential equipment into the sustainment and contingency loads, if possible.
- Once combat loads are established, the commander and staff determine how best to move nonessential supplies and equipment later in the operation.

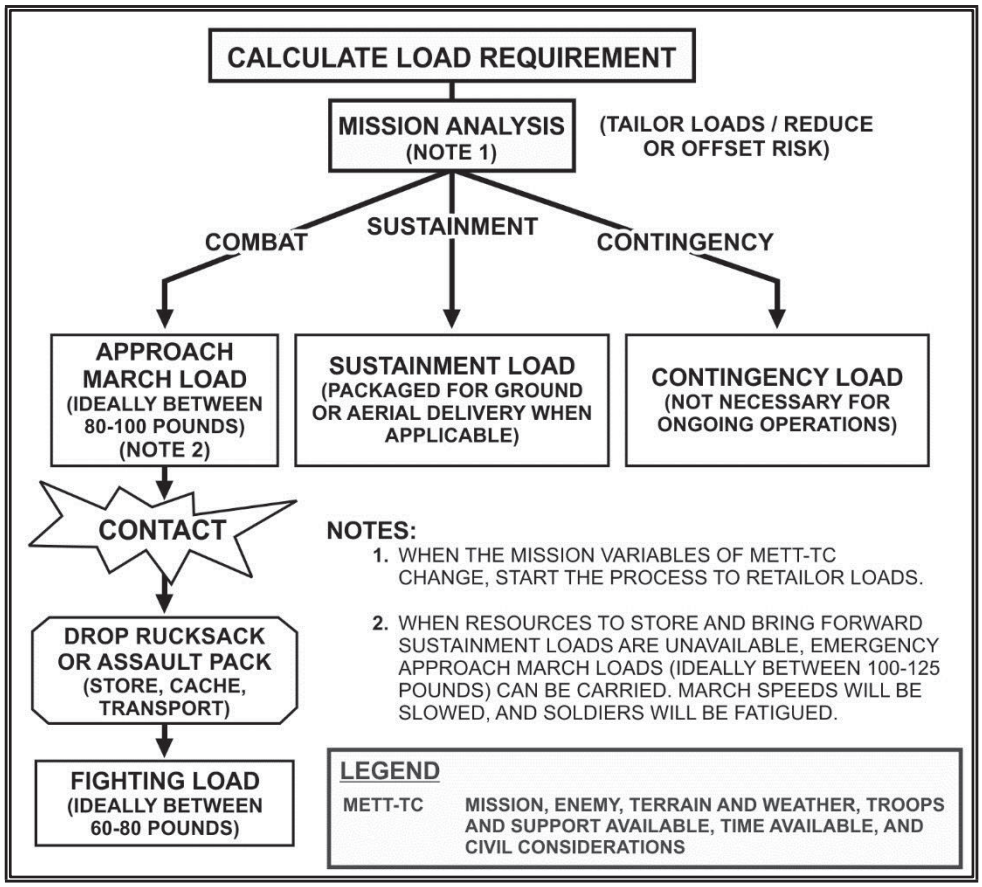

Figure 3-4. Example of a load tailoring diagram

UNIT LOAD (PACKING LIST)

3-36. Units should develop packing lists in their unit SOPs to include specific deployment options, based on guidance from the chain of command. Once deployed, commanders may send items back to support areas for inclusion in contingency loads. The composition of combat and sustainment loads are driven by the mission and commander's intent.

3-37. All Soldiers, regardless of the threat environment and mission, always carry certain items. These items are the minimum load configuration along with the Soldier's assigned weapon system and minimum amount of ammunition. Additions or deletions to minimum loads is based on the unit commander's visualization of the situation.

SECTION III – MOVEMENT OF SUPPLIES AND EQUIPMENT

3-38. The movement of supplies and equipment by dismounted units requires careful planning and execution. For example, the Infantry battalion forward support company has limited organic transportation for the movement of supplies and equipment, often resulting in trade-offs. The battalion commander must ensure assets are being employed correctly to accomplish the mission. Time is critical and the battalion must reduce on station time so all movement requirements can be met. The commander must be creative in maximizing usage of available transportation assets to lighten Soldier loads.

RESUPPLY OPERATIONS

3-39. During dismounted marches, resupply operations often involve class I (water specifically) and possibly III (ammunition) when reinitiating the march after contact. Resupply operations under these conditions may require immediate resupply (also known as emergency or urgent resupply). Routine resupply through logistics package operations are planned to occur on a regular basis per the OPORD/movement order and when possible schedule during limited visibility.

3-40. Without hampering safety and hydration of dismounted Soldiers, means or methods must be developed to permit off-loading of water from the Soldier's back. Soldiers should never have to carry more than one 100-ounce hydration bag. Water resupply packages may be staged for resupply to units by ground or aerial delivery.

3-41. Prepositioning of supplies or cache sites along the route must be carefully planned and executed at every level. All leaders must know the exact locations of prepositioned or cache sites, which they verify during reconnaissance. The commander take measures to ensure the survivability of these sites. Measures may include digging in prepositioned or cache supplies and selecting covered and concealed positions. The commander must also have a plan to remove or destroy these resupply sites if required. Security risk always exists when returning to a resupply site. Site should be observed for signs of enemy presence and secured before being used; it may have been booby trapped and may be under enemy observation.

3-42. Within an acceptable level of risk established by the commander, Soldier combat loads may be significantly reduced by redesigning resupply practices. Rethinking frequency of their unit's resupply operations and deciding how to maintain immediate or contingency resupply packages by ground or aerial delivery goes a long way toward reducing combat loads. Such changes to logistics practices are essential in maintaining combat power throughout the march. (Refer to FM 3-96 for additional information on resupply operation.)

3-43. When ground delivery is unavailable or limited, march units must be prepared to receive resupply through aerial delivery. An understanding of pickup zone and landing zone selection, sling loading, bundle drops, and allowable cargo loads can be critical to sustain a unit during the march. (Refer to FM 3-99 and ATP 4-48 for additional information on aerial delivery.)

SOLDIER LOAD TRANSFER

3-44. Loads transferred from the Soldier to combat load handling equipment reduces the Soldier's fighting load. This reorganization of the Soldier's load entails resourcing combat load handling equipment and

sustainment load handling equipment. Provision of combat load handling equipment at company level and sustainment load handling equipment at battalion level is the responsibility of the command having control of transportation resources for ongoing operations.

LOAD CARRIAGE USING WHEELED CARTS

3-45. Load carriage using wheeled carts is often an option to the commander to transport loads in certain situations. Generally durable; they are able to carry or exceed their rated loads (91 kilograms or 201 pounds to 181 kilograms or 399 pounds); and can be used effectively on flat terrain, in barrier construction, and in resupply. On the negative side, carts create problems on rugged terrain. They are noisy in brush or rocky areas, thus reducing tactical surprise; and equipment can get caught in the wheels of some carts.

3-46. Combat load carts appropriate for military operations should have low center of gravity, wide wheel base, and large wheel size. Compared with body carriage, energy expenditure is reduced by 88 percent when 50 kilograms or 110 pound load is pushed in a cart on smooth surfaces. Pulled carts, rather than pushed, seem to be easier to control on uneven terrain and result in considerable energy expenditure-savings.

LOAD CARRIAGE USING MOTOR VEHICLES

3-47. Besides carts, removing much of the load burden from Soldiers requires use of a wide variety of motor vehicles. Systems which have carried Soldier equipment in rugged areas in Afghanistan have included a two-seat, six-wheeled squad vehicle that carries up to 550 kilograms or 1213 pounds load and runs on aviation turbine fuel. Units also used a four-wheel, all-terrain vehicle that carries one Soldier and loads up to 204 kilograms or 450 pounds. Of course, there still may be terrain unsuitable for carts or motor vehicles of any type, where Soldiers must personally bear the load.

CONTRACT, HOST NATION, AND LOCAL NATIONAL SUPPORT

3-48. Contract, host-nation, and local nationals play an increasing role in sustaining deployed U.S. Forces. Depending on the situation, march units may have these assets to assist in the movement of nonessential supplies and equipment. (Refer to ATP 4-10 for additional information.)

CONTRACT SUPPORT

3-49. Though contracting support involves many risks, the commander may use contractors to bridge gaps between required and available force structure in the battalion's AO. Contractors may be employed, subject to METT-TC, throughout the AO and under virtually all conditions. Protecting contractors on the battlefield is the commander's responsibility. When contractors are expected to perform in potentially hostile areas, supported military forces must ensure protection of their operations and personnel.

3-50. The commander must understand contractors are subject to the same threat as Soldiers and plan accordingly. Contractor personnel must not perform protection functions and cannot take an active role in hostilities, retaining the inherent right to self-defense. Defense Logistics Agency provides bulk fuel, water, and food to contractor personnel either through prepositioned stocks or host-nation contracts.

HOST NATION SUPPORT

3-51. Host-nation support is provided to the march force located in or transiting through host-nation territory and includes both civil and military assistance. Support may include assistance in almost every aspect required to sustain the march. Planners must consider host-nation support meets local, not necessarily United States standards. Host-nation support can be a significant resource to the march force provided it is available and appropriate agreements are in place.

LOCAL NATIONAL SUPPORT (PACK ANIMAL TRANSPORT)

3-52. Local national pack animal support, such as donkeys, mules, horses, llamas, and alpacas, are commonly found in mountainous areas with indigenous populations who control them. Local nationals

understand these animals' abilities, limitations, and; most of all, how to control them. Local nationals understand how to load these animals and properly secure loads.

3-53. Local nationals are skilled at providing proper motivation to make animals perform required tasks. Although these animals may be able to carry significant amounts of equipment, they do have limitations. Their carrying capacity decreases with higher elevations. Table 3-5 lists advantages and disadvantages to consider before using pack animals. Several planning elements to consider before deciding to use pack animals are—

- Is terrain conducive to pack animal operations?
- Does extreme altitude prohibit or restrict pack animal operations?
- Does seasonal bad weather prohibit or restrict pack animal operations?
- Do units have experience with these animals in day and night conditions?
- Do units have enough experience to execute pack animal operations?

Table 3-5. Pack animal considerations

Advantages	*Disadvantages*
May save energy and wear on Soldiers. May save time. Can carry larger loads than Soldiers. Payment for animals may stimulate local economy in a counterinsurgency. Are readily available, yet are replaceable if lost due to injury or combat action. Can carry crew-served and heavy weapons. May offer leaders additional options in planning and execution.	May have terrain limitations, especially on narrow trails where wide loads limit mobility. May have difficulty seeing during limited visibility. Require care and feeding (feed, grain, roughage, water, grooming, preventive such as hoof care) to sustain performance. May be difficult to secure from or be specifically targeted by the enemy. May be difficult to control and may require local nation keepers. Must have frequent access to water, especially during sustained operations. May create operational security issues during coordination for use and planning

Appendix A

March Procedures

Army techniques publications cover features of operations, in this case dismounted march (also called foot march), which lends it to definite or standardized procedures without loss of effectiveness. Procedures apply unless other actions are prescribed for particular cases. Thus, the flexibility necessary for special situations is retained. This appendix covers unit level procedures for dismounted marches.

UNIT LEVEL STANDARD OPERATING PROCEDURES

A-1. Unit level SOPs prescribe the routine procedures to follow in military operations. To provide for quick and efficient movement, individual and unit training in preparation for and the conduct of all forms of movement is desirable. Unit operations should include those standard procedures that each march unit could be expected to employ. Unit level SOPs for dismounted marches include common planning considerations; unique to each unit based on mission sets; and are guided by desires to make the unit efficient and combat ready.

A-2. One advantage to a well-written, easily understood SOP is it saves time in planning, briefing, and rehearsing. The leadership of the unit is responsible for ensuring SOP guidelines are followed by all Soldiers of the unit and updated as appropriate.

EXAMPLE PROCEDURES

A-3. Unit level tactical SOPs, established to standardize march procedures, may include a task organization and guidance for dismounted marches. The examples below illustrate dismounted march procedures for a foot march and tactical road march. The examples discussed below are intended to be used as a guide. They are not to be considered prescriptive.

FOOT MARCH PROCEDURES

A-4. For the purpose of this example the company conducts a semi-independent foot march. Unit movement SOPs for the foot march provide standard task organization (normally will not organize into march units at this echelon and in this situation) to simplify planning, provide flexibility, and allow greater responsiveness. The SOP allows for smoother cooperation between habitual relationships established by unit subordinate elements and outside supporting elements. Considerations for inclusion in unit SOP and applied to the foot march may include—

- Numbers, types of weapons, and minimum quantities of ammunition, needed by each Soldier on the march.
- Number of radios, mission command systems required and appropriate nets to monitor.
- Number of counter-radio electronic warfare and counterimprovised explosive device systems available.
- Medical capabilities needed.
- Required training level of gunners, radio operators, combat lifesavers, dismounted security teams and stipulate what each Soldier in the march must know about the mission.
- When required, desired configuration of gun vehicles in the march.
- Composition of the march to include front and rear security for the unit, and when required a forward reconnaissance element.
- Breakdown of units, communications assets, and counter-radio electronic warfare systems.

- Required planning software to help position counter-radio electronic warfare devices and minimize their effect on communications.
- Battle drills, including use of pyrotechnics such as signal, obscuration, illumination, lasers, and marking devices.
- Required content of march briefings.
- No later than time for adding Soldiers, and as required, vehicles to the march.
- March mission abort criteria.

TACTICAL ROAD MARCH (DISMOUNTED) PROCEDURES

A-5. For the purpose of this example the battalion conducts a tactical road march. As a minimum the conduct of the march requires reconnaissance, main body, trail party or rear security, and when required a quartering party. Considerations for inclusion in unit SOP and applied to the tactical road march may include—

Reconnaissance

A-6. Reconnaissance provides the eyes for the march. The unit SOP may designate what units, systems and techniques, in addition to the scout platoon, may be used for the reconnaissance mission. Listed requirements for reconnaissance may include:

- Security and early warning.
- Determination of completion time based route reconnaissance.
- Capacity of underpasses, overpasses and roads.
- Identification and classification of route obstacles, bridges, and fords.
- Locations of possible enemy contact and ambush locations.

Quartering Party

A-7. A quartering, when required, coordinates unit arrival at destination. The unit SOP may designate support missions for the quartering party to coordinate with the receiving unit for staging for on load or off load military equipment and security. When units relocate, the quartering party prepares for arrival of the unit's main body. The quartering party may travel with the column during early stages of the move; however, it must arrive at destination sufficiently ahead of the column to perform its mission.

A-8. From a unit control perspective, major functions of the quartering party ensure the column is able to move quickly off route and into marshaling or assembly areas. The party positions march units within marshaling or assembly areas to prevent congestion on the route and enhance security by not allowing units to line up along a route waiting to enter the marshaling or assembly area. The SOP for the quartering party designates personnel by task to be accomplished and requirements to secure and sweep the area for contamination or enemy activity if the area is not secured.

Main Body

A-9. The unit SOP may designate locations of key leaders and proposed layout for movement of march units. The SOP can state the organization of the road march by column for administrative convenience, for example, open column and close column, and infiltration for deception and greater security.

Trail Party

A-10. The SOP may identify the assistant march commander, unit maintenance officer, recovery vehicles, aid and litter teams, landing zone teams, medical personnel, straggler control, rear security element and other personnel as required. In accordance with the SOP these personnel may be located in the trail party, unless otherwise stated in the OPORD/movement order.

Note. Many of the march procedures for the addressed in the appendix can also apply to an approach march, though there are several differences between an approach march and a tactical road march. A force conducting an approach march employs larger security forces because of its greater exposure to enemy attack. Commanders arrange units conducting approach marches into combined arms organizations. An approach march allows the commander to disperse the task-organized force into a tactical formation without being constrained to existing roads and trails. (Refer to chapter 2 of the publication for additional information on an approach march.)

ADDITIONAL OPERATING PROCEDURES

A-11. Operating procedure within a unit march SOP apply across a broad range of activities in carrying out the march. Operating procedures are essential for units to achieve the desired result easily and repeatedly. Operating procedures for the unit march can include the following additional activities and measures:

GUIDES

A-12. Guides are used to ensure units follow prescribed routes. Guides become important when operating in an area where road signs are poor or nonexistent. On controlled routes, the area commander may furnish guides to direct units or vehicles moving over these routes. Highway regulation authorities use movement regulation teams and military police (MP) to assist moving units. Although these teams normally do not escort units, guides assist march commanders in locating supported units, preventing conflict with other units, and providing other information on the route. On routes not controlled, the moving unit usually is responsible for providing its own guides.

HALTS

A-13. During halts, all personnel have certain responsibilities. Officers and NCOs check the welfare of their Soldiers, security of loads, and en route maintenance. Control personnel inspect equipment and loads, giving instructions to ensure columns get started with minimal confusion. Dining, medical, and maintenance personnel perform their special duties as purpose and duration of the halt permit. When vehicles are part of the march, drivers inspect their vehicles loads and perform en route maintenance. Soldiers wanting to relieve themselves must apply proper sanitation measures according to their unit procedures in accordance with environmental requirements.

COMMUNICATIONS

A-14. Communication during march operations is essential. Radio nets must be established to link the commander with higher headquarters, fire support, march units, reconnaissance, medics, quartering party, and trail party. Within columns, each march element may have its own control net with the march element commander and head and trail party. Other communications techniques, such as signals, must be established and rehearsed. Means of communication for the march include—

- Visual signals.
- Audio signals.
- Radios and tactical satellite radios.
- Mission command systems.

ESCORT AND SECURITY ELEMENTS

A-15. MP units may provide march security to specific units or on an area basis. Route security is an MP mission. However, availability of MP support depends of threat in the AO, sensitivity of the cargo, and other missions the MPs must support. If available, escort and security elements are used to secure and protect the unit from enemy activity. Unit escort and security elements usually are responsibility of the moving unit. However, MPs may provide them on a mission basis contingent upon the threat and importance of the mission. March commanders must request MP support through command or movement control channels.

A-16. If MP support is approved, march commanders must closely coordinate with the MP unit assigned to provide support. Presence of MPs or other escorts does not relieve march commanders from responsibility for security of their units. March commanders must plan and coordinate through their chain of command all matters regarding unit security. Unit SOP addresses the following areas—

- Noise, litter, and light discipline.
- Front, flank, and rear security.
- Security during halts.
- Air cover.
- Direct and indirect fires.
- Communications security.
- Deception.

SPECIAL TEAMS

A-17. Special teams have specific duties, tasks and responsibilities during dismounted marches. Each team must understand their role and rehearse before execution of the foot march. Unit SOP must clearly state what is expected when their expertise is needed. Leaders if mission variables permit, keep unit integrity while creating special teams. Teams may include:

Field Sanitation Team

A-18. The field sanitation teams provide units with expertise in basic sanitation protection. Teams ensure before, during and after the march that proper field latrines are constructed to standard and human waste is disposed of according to local, state, federal or host-nation laws. Field sanitation teams ensure no violations of environmental regulations occur. (Refer to ATP 4-25.12 for additional information).

Enemy Prisoner of War Search Teams

A-19. If prisoners or detainees are captured during a march, they will be treated humanely at all times and in accordance with the Geneva Convention. The unit SOP provides at a minimum, enemy prisoner of war (EPW) should be searched segregated, silenced, sped to the prisoner collection point, safeguarded and tagged with DD Form 2745 (*Enemy Prisoner of War [EPW]Capture Tag*).

Road Guards

A-20. Road guards are METT-TC dependent. Road guards are condition-oriented. If conditions require them, they are placed about 50 meters to the front and rear of columns to slow or stop oncoming or passing traffic. Distance may be increased due to variation of conditions or speed limit of the route in urban areas.

A-21. If they are used, road guards are a safety precaution. The column commander places guards at road intersections or other critical points to stop traffic while the column crosses. At these times, road guards act as guides. When possible during night marches, road guards use night vision devices, flashlights, strobes, chemical lights and similar devices to control or slow down traffic.

A-22. Road guards must remain vigilant at all times. They must carry enough combat power to stop an oncoming vehicle which might have intent to harm or kill.

Note. A good technique is for all road guards to carry shoulder-launched munitions or at a minimum, be assigned as grenadier.

Appendix B

Movement Order and Movement Table

The movement order and movement table provide clear and concise information and instructions to subordinates to accomplish movement within the framework of the commander's intent. The movement order clearly states all required information for units to perform their assigned tasks. Tasks must be understood for a movement order since it may be preceded by a tactical operation or follow after an operation or mission. The movement table, as an attachment to the movement order, is a convenient means of transmitting time schedules and other essential march details to subordinate units.

Note. The movement order is prepared as Tab C - Transportation to Appendix 1 - Logistics, of Annex F - Sustainment to an operations order or as a separate operations order. Prepared in five-paragraph format, Tab C provides critical information needed by a unit to plan and execute movement. The movement table (also referred to as a road movement table) supports the movement order. When the movement order is prepared as Tab C the movement table is prepared as an exhibit to Tab C. When the movement order is prepared as a separate operations order the movement table is prepared as an attachment to the movement order. (Refer to FM 6-0 for additional information.)

MOVEMENT ORDER

B-1. The movement order (figure B-1, page B-2) establishes the destination, route(s), order of march, rate of march, interval or time gaps between units, column gap, and maximum catch-up speed. The order includes arrival and clearing times for starting and release points, scheduled maintenance halts, logistics sites and services, communications, and location of the commander. Information and procedures contained in the unit's movement SOP are not included. The movement order should include a strip map or overlay. Information and procedures contained in the unit's movement SOP are not included.

B-2. The movement order discusses procedures for succession of command to include subordinate march unit, march serial, and march column, if those procedures vary from the unit's established SOP. The order addresses the procedures for disseminating succession information throughout the organization. It also addresses how changes in command location are communicated, including the activation of alternate mission command nodes. It addresses alternate means of communications within and external to each march unit, such as hand and arm signals and pyrotechnics where they vary from established SOPs. It also addresses who has the authority to activate alternative routes.

B-3. The commander bases the movement order on the best available information on the mission variables of METT-TC. This plan establishes how the unit will move from its current location to the desired location. The integration of and support from maneuver and functional and multifunctional support—such as artillery, intelligence, military police, and engineers—are critical for a successful tactical movement. The commander's operations staff develops the detailed movement order, with the assistance of the commander's sustainment staff, in accordance with established priorities.

B-4. The movement order and unit SOP address the possibility of ambushes, indirect fires, and air attacks. A small-unit SOP includes drills for reacting to these circumstances. Passive measures mitigating an air attack include route selection, vehicle intervals, and movement during limited visibility. In case of attack, the commander has a casualty evacuation plan. This plan takes into account SOP items, such as using combat lifesavers and dispersing medical evacuation assets throughout the convoy.

ADMINISTRATIVE REMARKS (PERSONNEL ROLL CALL/INSTRUCTIONS):

1. March Commander:
2. Assistant March Commander:
3. Navigator/Pacesetter:
4. Vehicle Commanders (If Applicable):
5. Drivers (If Applicable, Primary/Alternate):
6. Key Weapon System Operators:
7. Escort/Security Element Leader:
8. Snipers/Designated Marksmen:
9. Medics/Corpsman/Combat Lifesavers:
10. Guides/Interpreter:
11. Higher Headquarters Representatives:
12. Aid and Litter Team:
13. Prisoner of War/Search Teams:
14. Landing/Pick-up Zone Teams:
15. Recovery Team (If Applicable):
16. Designated Close Air Support Control Personnel:
17. Others not Mentioned:

I. SITUATION:

a. Enemy Forces: (Discuss Enemy).
- Identification of Enemy (If Known).
- Composition/Capabilities/Strength/Equipment.
- Location (Danger Areas Highlighted on Map).
- Most Likely/Most Dangerous Course of Action (Defend, Reinforce, Attack, Withdraw, and Delay).

b. Weather: General Forecast.
c. Light Data: (Beginning Morning/Early Evening Nautical Twilight, Illumination).
d. Friendly Forces:
- Task Organization (Internal Organization of Unit).
- Adjacent Units or Other Units along the Route.
- Operational Support Provided by Higher Headquarters.
- Aviation Support:
  - Air Support Operations Center.
  - Direct Air Support Center.
  - Joint Surveillance Target Attack Radar System.
- Security Forces/Quick Response Forces.
- Military Police Escort.
- Explosive Ordnance Disposal (EOD).
- Special Operation Forces.
- Fire Support Elements.
- Element Locations.
- Attachments: (External).

II. MISSION:

a. Who?
b. What?
c. When?
d. Where?
e. Why?

III. EXECUTION:

a. Concept of Operations:
- March Execution and Tasks of Elements, Teams, and Individuals at the Objective or Mission Complete (Broad General Description from Beginning to End).

b. Tasks to Subordinate Units: (Includes Attached or Operational Control Elements).
c. Coordinating Instructions: (Instructions for ALL Units.).
d. Safety:
- Overall Risk to Force: (Low, Medium, High, Extremely High).
- Overall Risk to Mission Accomplishment: (Low, Medium, High, Extremely High.
- Fratricide Reduction Measures.

1) Order of March (Spacing of Units/Location of Support Elements).
2) Routes (Ensure Strip Map or Overlay is Attached).
3) Additional Movement Issues (Speed, Intervals, Stragglers, Lane, Reaction Drills, and Accidents).
4) March Execution.

Figure B-1. Example of a format for movement order

5) Timeline:
   - Vehicle/Personal Gear Preparation (Precombat Checks/Inspections Completed).
   - Briefing.
   - Put on Equipment.
   - Load Vehicles (If Applicable).
   - Rehearsals/Immediate Action Drills/Test Fires.
   - Confirmation Brief and/or Backbrief from Key Leaders.
   - Start Point/Departure/Checkpoints/Release Points Times.
   - Return to Base (When Applicable).
   - Debrief.
   - Recovery: Maintain Vehicles/Personal Gear.
6) Sectors-of-Fire: (Cover Assigned Sectors While Mounted/Dismounted; Cover Up/Down Bridges, Rooftops, Balconies, and Storefronts, Multistory, Structures, and Cross Streets).
7) Scanning: (Scan Crowds, Vehicles, and Roadsides for Attack Indicators.
   Note. Communicate Indicators Throughout the Unit).
   - Beware of Motorcycles, Vans with Side Doors, and Dump Trucks.
   - Beware of Objects on the Road (Cars, Potholes, Objects, Fresh Asphalt/Concrete and Trash).
8) Unit Speed: Minimum/Maximum:
   - Speed Dictated by Either the Rear Unit's Ability to Keep Up or Placing Slower Individuals in the Lead.
   - Highways/Open Roads.
   - Urban/Canalized Areas: As Fast as Traffic Will Allow. For vehicles Brief Evasive Maneuvers, Bumping and Blocking Technique, and use of Ramming Techniques (When Applicable) to Allow for Continuous Movement of Unit.)
9) Units/Individuals Interval:
   - Highways/Open Roads.
   - Urban/Canalized Areas: Close Interval, but Must Have Visual of Unit in Front of You. March on Wrong Side as Needed according to mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC).
10) Headlight Status (If Applicable) On/Off, Blackout, Use of Night Observation Devices.
11) Reaction to Enemy Contact (Battle Drills).
12) Rules of Engagement for March Operations (Theater Specific.)

IV. SUSTAINMENT:

a. Individual Equipment (Precombat Inspections According to Unit Standing Operating Procedures).
b. Vehicles (If Applicable) Preventive Maintenance Checks and Services.
c. Recovery/Wrecker Support (When Applicable).
d. Class I through Class IX Support (When Applicable).
e. En route Support.
f. Medical Support (Combat lifesavers/Medics/Corpsmen/Aid and Litter Teams).
g. Handling of Enemy Prisoner of War (Search, Segregate, Silence, Speed and Safeguard).

V. COMMAND AND SIGNAL:

a. Mission Command (Positioning in March Formation).
b. Units Frequency: Call Sign:
c. Area of Operations Communications/Medical/Casualty Evacuation Plan.
d. Unit Primary/Alternate/Contingency/Emergency.
e. Counter-radio/Improvised Explosive Device Frequency Review, Communications (Extra Batteries).
f. Unit Internal (Back to :).
g. Hand and Arm/Visual Signals.
h. Unit to Unit:
   - Radio: Primary/Alternate:

i. March Unit to Higher Headquarters
   - Radio: Primary/Alternate:

j. Other Support (External to March Unit):
   - Security Force/Quick Response Force: Frequency: Call Sign:
   - Close Air Support: Frequency: Call Sign:
   - Medical/Casualty Evacuation: Frequency: Call Sign:
   - Indirect Fire Support: Frequency: Call Sign:

k. Crew Commands/Pro-Words/Brevity Codes.
l. Mission Command System Serial Number (If Applicable).
m. Pyrotechnics.
n. Special Instructions.
o. Reports (Individual and Higher Headquarters).
p. Give Time Hack and Ask for Questions

Figure B-1. Example of a format for movement order (continued)

MOVEMENT TABLE

B-5. Usually attached to a movement order, the movement table transmits time schedules and other essential march details to subordinate units. The movement table is particularly useful in preventing complicating the movement or operation order or in creating an unusually long order.

Note. Depending on mission and unit SOP a movement tables may not always be used.

B-6. The movement table (figure B-2) has two parts: one giving data paragraphs reflecting general information common to two or more columns or elements of a column and the other listing, columns or elements of a column together with all other necessary information arranged in tabular form. The movement table consists of—

- Data paragraphs including general information common to two or more march elements; and lists of serials or march units along with all other required information, arranged in tabular form.
- Data transferred from the road movement graph. Of particular importance to march planners are times at which serials or march units arrive at and clear critical points.
- Other information on road movement tables include serial or march unit number, date of the move, units involved, number of vehicles when applicable, load class of the heaviest vehicles, routes being used, and a remarks section for details not explained elsewhere.

B-7. The movement table provides convenient transmission modes of schedules and other essential detail about the movement to subordinates. This is particularly helpful when inclusion of such detail in the body of the movement order complicates it or makes it too long.

B-8. A movement table frequently requires wider distribution than the base order so copies can be issued to movement control personnel, traffic posts, and other pertinent groups and individuals as required. Security classification is based on content and need not necessarily be the same as the base order for the movement.

B-10.

(SECURITY CLASSIFICATION)

Movement Table to Operations Order for Movement No: Map:

General Data:

Copy No.: Issuing HQ: Place of Issue:

Date-Time Group of:

Signature:

Message Reference No.:

1. Average Speed
2. Traffic Density
3. Halts
4. Routes (i.e. between Start and Release Points)
5. Critical Points:
   (a) Start Points
   (b) Release Points
   (c) Check Points
   (d) Other Critical Points
6. Main Routes to Start Points
7. Main Routes from Release Points

March or Movement Number	Date	Unit and Formation Type	Number of Units/Types of Vehicles (if applicable)	Total Number of Soldiers/ Vehicles	From	To	Route	Route to Start Point	Critical Points			Route from Release Point	Remarks
									Ref	Arrival (Hrs)	Clear (Hrs)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD			TBD	TBD

Acknowledge:

Distribution:

Authentication:

(SECURITY CLASSIFICATION)

LEGEND

HQ	HEADQUARTERS	No.	NUMBER	TBD	TO BE DETERMINED
Hrs	HOURS	Ref	REFERENCE		

Figure B-2. Example of a format for movement table

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Appendix C

Posture and Body Mechanics

Posture and body mechanics are critical factors for Soldiers performance during load carriage, allowing Soldiers to move efficiently with an ability to create great force and absorb heavy resistance. Posture is the position in which the body resides. Though posture often is thought of as a stationary position, control of moving postures is perhaps more important in foot marching

BODY MECHANICS AND LOAD CONTROL

C-1. Body mechanics (posture in motion) can be defined as the ability to control body movement. Many discussions of posture are limited to static positions such as sitting and standing. Good posture during walking and other movements is imperative for efficiency and injury control.

C-2. Walking can be described as a series of falls, as can be observed from by the rise and fall of the hips whether someone is walking with or without a load. When the foot strikes the ground, muscles activate eccentrically to control and stabilize the load as the body accepts the weight of the gear and moves forward. Later in the same step the muscles act concentrically to propel the body forward and prepare for the next step. The ultimate objectives of biomechanical changes observed during load carriage are to manage the load and to conserve energy. The load is managed by maintaining the load + body center of mass over the base of support (feet), and energy cost is optimized by minimizing the vertical excursion of the pack center of mass (walking as smoothly as possible). When the Soldier dons a loaded backpack, the addition of the pack shifts the center of mass of the Soldier-pack system higher on the back and away from the body relative to the center of mass of the Soldier without the load. This weight shift becomes more pronounced as the load gets heavier. The primary goals of all of the biomechanical responses to the addition of a load are to control the load as best as possible and minimize the energy cost of carrying the load.

C-3. When body segments are aligned properly, movement is efficient, and injury risk is minimized. When body segments not aligned properly, movement is less efficient and risk of injury increases. Consider Soldiers attempting to lift heavy loads from the ground with their legs straight and trunk twisted. Not only does the load seem heavier than if their knees are bent and the back is straight, but the risk of injury increases. Back injuries occurring during an improper lift are an obvious example of relationship between posture, body mechanics, performance, and health. Less obvious but just as damaging is the cumulative toll on the body when faulty

C-4. It is important to walk as smoothly as possible to reduce the high impacts and accelerations the body is subjected to by heavy loads, especially at the feet and legs. If possible, it is important to distribute the load on the body as evenly as possible while still meeting mission requirements; this allows the Soldier to walk using more natural mechanics, and reduces the energy requirements to walk with a given load.

C-5. Head and trunk checkpoints for standing apply to marching. Allow arms to swing naturally, though crossing midline of the body is excessive. Allow hips to naturally rotate forward with each stride. Do not allow knees to lock at any point in the walking cycle. Stride naturally, landing on the heel and pushing off with most of weight toward the big toe. Feet remain directed forward.

C-6. Do not strain to keep feet directed forward, since variations in skeletal alignment prevent some Soldiers from assuming feet forward position. Foot marching with a load on the back requires some forward lean of the trunk. However, do not allow the trunk and shoulders to round forward.

BODY ADJUSTMENTS TO LOAD

C-7. Typical body adjustments to load include trunk lean, gait changes, and increased stress on lower extremities.

Trunk Lean

C-8. The most visible response to adding pack-borne load is that the Soldier leans forward while walking and carrying a load (figure C-1), which happens with pack loads as light as 15 to 20 pounds. Mechanically, this forward lean response serves to center load as close to the base of support (feet) as possible, and serves to stabilize the load. Physically, this forward, or trunk lean serves to counterbalance the torque that the load causes at the pelvis and hips. When walking, excessive forward lean places undue stress on the lower back and abdominal musculature

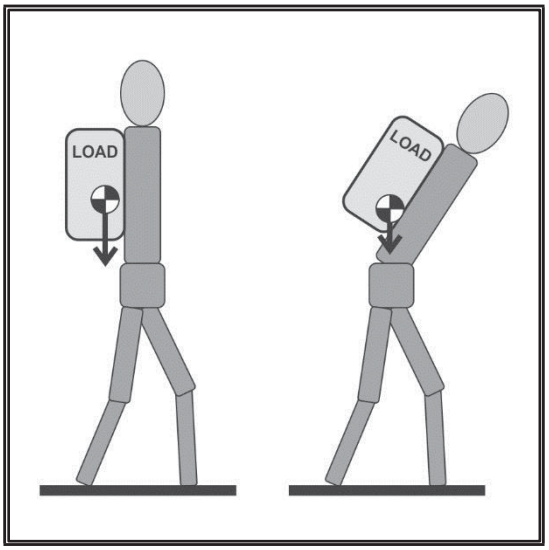

Figure C-1. Body mechanics and load control

C-9. When the pack loads are heavier, the Soldier also involves the neck and head to act as an additional counterweight. This can result in increased muscular activity, head accelerations and force transmission at the head as load increased which could lead to risk for injury. Increased movement at the head can have a negative effect on body mechanics and decrease situational awareness while marching.

Gait Changes

C-10. The gait cycle (walking, marching) can be divided into two primary phases: the stance phase, during which the foot is on the ground and propelling the body forward, and the swing phase, during which the foot is off the ground and moving forward to take the next step. As loads get heavier, Soldiers walk slower and keep their feet on the ground longer to stabilize the load and conserve energy. When walking speed is held constant individuals respond to heavier loads (typically greater than 66 pounds) by taking shorter, faster steps.

Increased Stress on Lower Extremities

C-11. An increase in loads on the back translates to an increase in loads on the muscles at the hip, knee and ankle. The stress on all lower extremity joints increases as load gets heavier; however, the knee is the primary joint which controls the lowering of the load immediately after the foot contacts the ground, especially at lighter loads. Care should be taken to ensure adequate rest and recovery between bouts of heavy load carriage whenever possible.

Note. Under heavy weights, you should take shorter, faster strides to maximize efficiency.

ENERGY EXPENDITURE

C-12. Most recommendations on safe loads to carry are based on energy expenditure or the metabolic cost associated with carrying a load. The Soldier needs to carry the appropriate supplies to complete the movement

and execute the mission. Several factors increase the energy expenditure associated with load carriage. These factors include load distribution, terrain, weather, gait/posture, and fitness level.

C-13. Research on the energy expenditure of loads carriage shows that energy cost increases in a systematic manner as the load carried increases, and with increases in walking velocity, grade or a combination of these factors. Terrain effects load carriage: one compilation of studies has shown that for the same load weight, walking through swamp or on sand essentially doubles the energy cost of walking on a paved road, and walking in snow without snowshoes can increase this cost by 4 to 6 times.

C-14. Increasing load weight can substantially increase Soldier energy expenditure during typical foot march conditions. When carrying loads less than or equal to 30 percent of Soldiers bodyweight, energy expenditure remains constant; however, when Soldiers load increases above 30 percent of bodyweight the rate of energy expenditure increases throughout the march.

C-15. The addition of an external load increases energy cost. The distribution of the heavier items within the load within a pack can affect the energy expenditure during load carriage, as well as the body mechanics of how the load is carried. Concentrating the heavier items higher in the pack and closer to the body can reduce energy cost of marching by as much as 25 percent as compared to a load that is placed low in the pack and away from the body (figure C-2).

Figure C-2. Load placement inside pack

GENDER DIFFERENCES

C-16. Compared to men, women walk with shorter stride length and greater stride frequency. As loads increase, women's stride length decreases, whereas men's stride length does not show significant change. With increasing loads, women show a more pronounced linear increase in time both feet are on the ground than men. To bring center of load mass over the feet, women tend to hyperextend their necks and bring their shoulders farther forward than do men, possibly to compensate for less upper body strength. Many of these

differences between men and women persist even when differences in body size and composition are taken into account.

Note. Female Soldiers should avoid foot march posture that involves hyper extending the neck forward.

C-17. Because pack systems have been designed primarily based on anthropometry of men, data suggest pack systems designed considering the anthropometry of women can lessen the time gap between men and women. Studies with the modular lightweight load-carrying equipment, MOLLE pack, suggest well-padded hip belts allow better transfer of the load to the hips so women can use stronger leg muscles to carry the load. This might assist in improving female load-carriage performance.

RUCKSACKS AND DOUBLE PACKS

C-18. Where loads are carried on the body affects both energy expenditure and gait mechanics. Loads can be transported with the lowest energy expenditure when they are carried on the head. However, this method is impractical for military operations because it requires lengthy training to learn how to use effectively, is useful on unobstructed horizontal terrain, and produces a high profile.

C-19. A practical choice is to carry loads as close as possible to center mass of the body. For this reason, backpack and double pack methods use less energy than other forms of load carriage. (See figure C-3.) Even so, backpacks place most of the load on the back, pushing the trunk and head forward relative to the load.

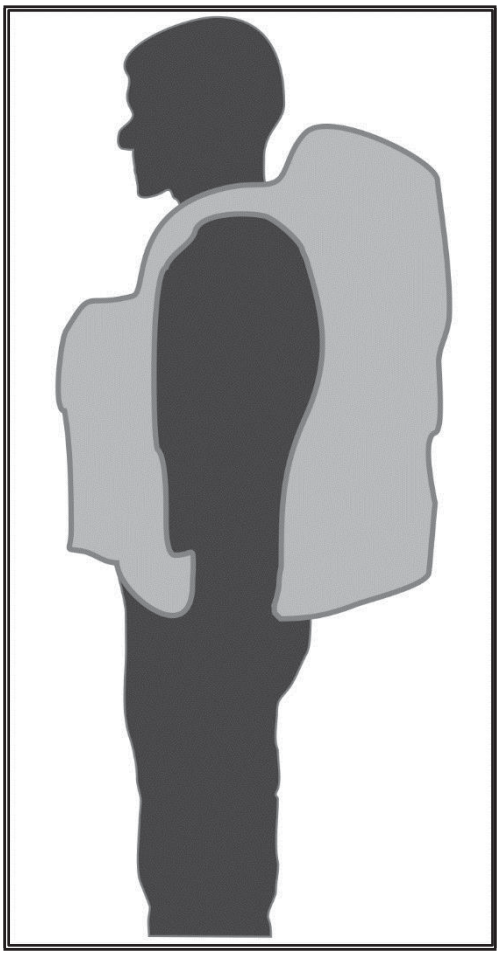

Figure C-3. Double pack method

C-20. Although this forward lean keeps the weight over the feet (base of support), the downside is that it causes repetitive contractions and stress to low back muscles. Even just standing still with a backpack on increases postural sway (anterior-posterior, medial-lateral center of pressure excursions) in a linear manner as the load increases.

C-21. On the other hand, a double pack produces fewer deviations from normal walking than does a backpack, including less forward lean. Also, increasing the load reduces stride length and increases stride frequency. This is desirable, because it can reduce stress on the bones of the foot.

C-22. Alternatively, increasing the load when using a regular backpack lengthens the stride, with potentially harmful effects.

C-23. Double packs can be especially useful in some military situations, for example, they allow medics to carry aid bags on the fronts of their bodies. However, backpacks generally provide more versatility in military situations, because double packs can inhibit movement and limit field of vision. Double packs are hard to get on and off, and that can be a problem--Soldiers need to be able to drop their stuff in a hurry when sudden enemy contact occurs. The double pack can induce ventilator impairments and greater heat stress symptoms, compared with the backpack. The double pack can restrict tasks, such as firing weapons and donning protective masks.

C-24. Soldiers can take advantage of what has been learned from the double pack by distributing loads evenly over the torso. Although it is difficult to make the load equal on the front and back of the body, modular systems allow part of the load to be moved forward onto the load-carrying vest. Doing this might be expected to reduce energy expenditure, improve body posture, and reduce injuries.

PACK FRAMES AND HIP BELTS

C-25. Pack frames and hip belts reduce shoulder stress. Shoulder straps exert pressure on the skin, which can be measured with transducers under the straps. Shoulder pressure is considerably lower with a pack frame incorporating a properly fitting hip belt, compared with a pack frame without a hip belt. Packs with frame and hip belt produce less stress in the trapezius muscle and in the shoulder area.

C-26. When a pack frame and hip belt are used for loads between 31 pounds and 90 pounds, proportion of the load supported on the hips and lower back is 30 percent and the load on the shoulders is 70 percent regardless of load mass. A consistent anterior force exerted on the lower back increases stress in this area. Suggestions indicate that experienced Soldiers adjust their walking posture to reduce forces and force fluctuations in the shoulder straps. Rigid rods attached to both sides of the pack and extending into the hip belt transfer about 14 percent of the vertical load from the upper torso to the pelvis.

C-27. Internal frame packs have supporting structures inside the fabric of the pack and keep the pack closer to center of mass of the body. External frame (figure C-4, page C-6) packs have supporting structure on the outside of the pack, and the pack is usually farther away from center of mass of the body. Conflicting information is ambiguous regarding whether the internal frame pack has lower energy expenditure than the external frame pack. There is no difference in the perceived exertion between external and internal frame packs when walking on level, even terrain. However, perceived exertion over rough terrain is lower with the internal frame pack.

Figure C-4. Soldier wearing modular lightweight load-carrying equipment

C-28. For backpacks with or without frames, majority of discomfort appears to be in the neck and shoulder region, although foot discomfort can be substantial, presumably because of development of hot spots and blisters. For backpacks with hip belts, discomfort is localized to the mid-trunk and upper legs. Overall, when portions of the load are carried on the waist through use of a hip belt, less subjective discomfort occurs than with shoulder load carriage. When walking uphill, Soldiers give higher ratings for balance and ease of gait for packs with hip belts which pivot in the sagittal plane.

STRAP ADJUSTMENTS

C-29. It is reasonable to assume shifting loads from one part of the body to another during marches can improve Soldier comfort and allow loads to be carried for longer periods. Load shifting is accomplished with some pack systems using various strap adjustments. Strap adjustments can redistribute the load to other muscles or other portions of previously loaded muscles. Portions of the body subjected to high-load pressures for long periods of time can suffer discomfort, circulatory occlusion, and paresthesia.

C-30. Some rucksacks have sternum straps attached horizontally across both shoulder straps at mid-chest level. When the sternum strap is tightened, it pulls shoulder straps toward the midline of the body so pressure is shifted medially. When the sternum strap is loosened, shoulder straps move laterally, and the load is shifted laterally.

C-31. Most pack systems with hip belts and shoulder straps have adjustments presumably allowing more of the load to be placed on the hips or shoulders. When shoulder strap tension is reduced, more of the load is placed on the hips. With shoulder straps tighter, more of the load is placed on the shoulders.

C-32. Some pack systems have load-lifter straps attaching top of the shoulder straps to the pack frame. When the strap is tightened, the top of the load is pulled anterior over the base of support; however, when the strap is loosened, the top of the load drops posterior. Other strap adjustments shift load pressures, center the pack and improve lumbar support can further improve Soldier mobility and comfort.

RIFLE CARRIAGE

C-33. Rifles almost are always carried in dismounted military operations. Rifle carriage restricts arm swing, adds weight, and moves center of mass anteriorly. During rapid walking a rifle has minimal, but significant, effects on human gait. The increases in forces produced at heel strike (ground impact forces, about 5 percent), forces to decelerate the body (maximum breaking forces, about 1 percent), and side-to-side forces (mediolateral impulse, about 12 percent). Many of these changes are less because of mass of the rifle and due to restrictions of arm movement, which increases movement of the body center of mass.

BODY ARMOR CARRIAGE

C-34. Wearing body armor as part of the total Soldier load increases exertion due to increased heat retention and chest wall restriction. These factors are considerations when determining personal protective equipment requirements during foot march planning.

Notes. During a prolonged foot march, halt briefly after the first mile to retie boots and adjust equipment. This is important--it increases blood flow to the feet and calves, and decreases pressure around the lower leg. This method helps to alleviate shin splints due to pressure build up.

Pull shoulder straps forward while walking uphill, this shifts the center of mass of the load higher on the back which reduces trunk lean, reduce energy cost, and assist hip mechanics.

Loosen shoulder straps while walking down hill, this makes the load more stable.

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Appendix D

Nutritional Considerations

Restoring adequate glycogen in the muscles and enhancing muscle recovery through proper nutrition allows the body to refuel and recuperate. This ensures positive adaptations to stress, enhances Soldier resiliency, and optimizes gains in strength, endurance, and mobility while controlling injuries.

BASICS OF NUTRITION FOR PERFORMANCE

D-1. Soldiers must understand what to eat on a daily basis and what to eat and drink around each and every tactical event. The macronutrients (proteins, carbohydrates, and fats) are important to building a nutritional oundation to conduct foot marches. Figure D-1 illustrates the general guidelines for Soldiers about macronutrient intake and the role of these macronutrients.

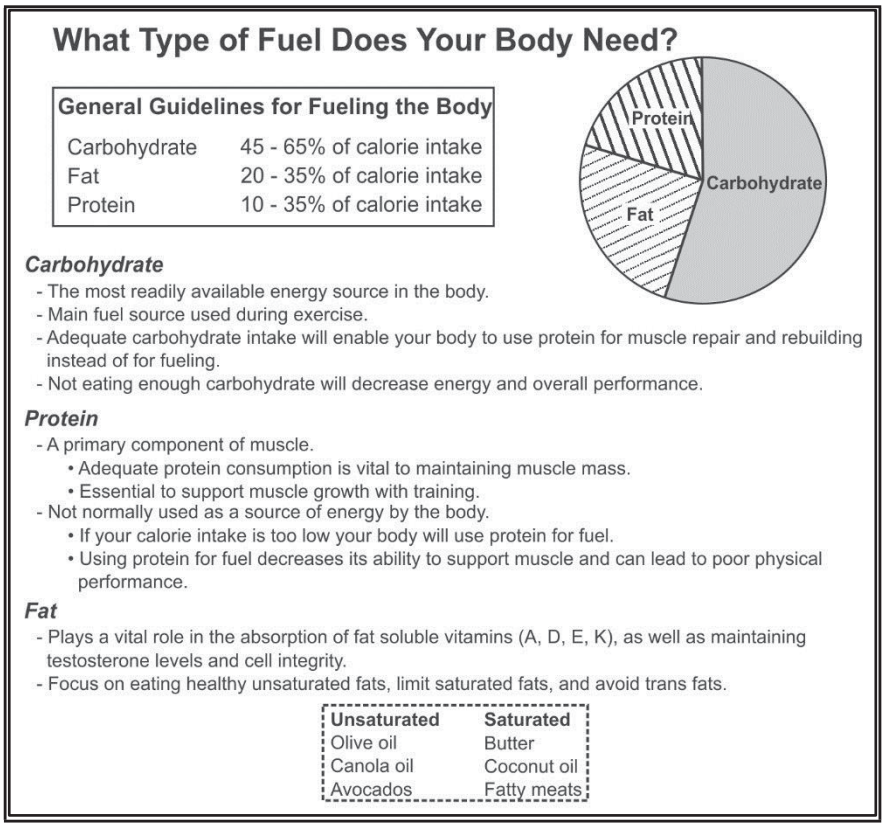

Figure D-1. Types and percentages of fuel the body needs

D-2. Problems with an unbalanced diet include—

- Increased inflammation.
- Compromised immune system.
- Degraded recall and learning.
- Reduced ability to focus.
- Reduced speed and agility.
- Degraded body composition.

- Increased fatigue.
- Increased muscle breakdown.
- Increased risk of infections and muscle strain.
- Reduced blood flow to tissues

NUTRIENT TIMING

D-3. Calories from carbohydrate, protein, and fat digest, absorb and metabolize at different rates in our body. This is important to understand to take advantage of nutrient timing around intense physical activities and to maximize Soldier performance and recovery. Nutrient timing is essential for Soldiers that have little recover time between operations or during long distant foot marches. Since foot marching is a high energy expenditure event, fueling before, during, and after is a critical factor in foot march performance.

Note. Soldiers should use extreme caution when starting fad diets or taking over-the-counter herbal supplements. Medical records have revealed deaths and severe injuries occurring in Soldiers using dietary or herbal supplements without medical supervision.

BEFORE THE MARCH

D-4. Muscles require energy to perform work and use carbohydrate as the primary fuel for intense muscular activity. Soldiers should consume at least 1gram of carbohydrates 1 to 2 hours before foot marching. This is to not allow the body to use muscle protein for energy during long foot marches. Having adequate carbohydrates preserve skeletal muscle protein from being used as fuel. Choose foods low in fat and fiber to prevent digestive upset. Examples of fast absorbing carbohydrates for this time are: energy bars, jam or jelly on bread, granola bars, bananas, and so forth. Consuming protein 1 to 2 hours before foot marching enhances carbohydrate absorption and helps prevent muscle breakdown during and after foot marching. Start with 0.3 grams of high-quality protein, for example, lean beef, chicken, turkey, fish, egg whites, and so forth.

DURING THE MARCH

D-5. Soldiers should consume small amounts of fast-absorbing carbohydrates and protein during foot marching to prevent performance decline, excessive muscle breakdown and enhance recovery time following foot marching. The optimal range for carbohydrate intake during foot marches is about 25 to 75 grams per hour, divided into 4 equal parts over an hour. For example, consume the crackers or bread and the beef jerky items from a meal, ready to eat or first strike ration at rest points and/or halts during the foot march.

AFTER THE MARCH

D-6. The hour immediately following the march is a crucial window of time for nutrient timing and is important for success in follow-on operations. This is an important time to replenish glycogen (carbohydrate) stores in muscles and the liver to prevent the breakdown of muscle and optimize recovery. Consuming carbohydrates and protein in this window decreases muscle protein breakdown and enhances net protein balance, essentially optimizing recovery. In addition, post activity immune function depression is most pronounced when activity is continuous, prolonged (>90 mins [minutes]), and/or moderate to high intensity. Consuming carbohydrates during the time immediately following the march has a positive effect on the immune system. The optimal way to quick start the recovery process is by consuming fast-absorbing carbohydrates and protein and limited amounts of fat within this 1 hour window immediately following the foot march. Guidelines for macronutrient intake are given in table D-1.

Table D-1. Carbohydrate and protein (macronutrient) intake by body type

Body Weight (pounds)	*Carbohydrates (grams)*	*Protein (grams)*
120	54	16
140	63	19
160	72	22
180	81	25
200	90	27
220	100	30
240	110	33

HYDRATION AND ELECTROLYTES

D-7. Ensuring adequate, but not excessive, hydration and maintaining an appropriate electrolyte balance can further optimize performance. Performance deficits can begin with as little as 2 to 3 percent loss of body weight due to sweat. On hot, humid days, Soldiers might sweat 1 to 2 liters per hour with some Soldiers sweating as much as 2 to 3 liters per hour. Additionally, sodium lost through sweat can range from 575 to 1,725 milligrams per liter. Including sodium sources aids in reducing electrolyte imbalances and prevents hyponatremia. Figure D-2 shows general guidelines for hydration and maintaining an appropriate electrolyte balance.

- Drink 16 ounces of water 2 hours before the march.
- Drink 8 to 16 ounces of water 1/4 hour before the march.
- Drink 6 to 12 ounces of water every 15 to 20 minutes during the march.
- Monitor urine during the march, should be pale yellow.
- Water does not replace lost electrolytes. When available, consume beverages containing electrolytes (sodium, potassium, chloride) to replace losses during the march. This is especially important in environments which increase sweat rate such as extreme heat and humidity.
- Do not restrict salt in the diet.
- Sodium intake of 1 gram per hour is recommended during prolonged marches where heavy sweat loss is expected.
- In extreme dry heat, water and sodium needs can be as high as 10 liters and 20 grams, respectively.

Figure D-2. Guidelines for maintaining hydration and electrolyte levels

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Appendix E

Foot Care

Foot care is extremely important since feet are enclosed in some type of footwear and are constantly in action. Foot care measures include foot hygiene, care of minor foot ailments, foot care preventive measures and injury treatment, and proper fitting and care of footwear.

BEFORE, DURING, AND AFTER A MARCH

E-1. Foot care is an important ingredient in Soldier morale. Soldiers whose feet are dirty and unkempt do not function as well as Soldiers who have had an opportunity to bathe and put on clean, dry socks. During combat, unit leaders must stress the importance of foot care before, during, and after a march.

FOOT PROTECTION

E-2. In all types of footgear, feet sweat more and are generally less ventilated than other body parts. Moisture accumulates in socks, decreasing their insulating quality. Feet are susceptible to cold injury and in most cases are observed less frequently than the rest of the body. Protecting your feet is vital to mission accomplishment. Leaders and Soldiers should—

- Bring several pairs of proper fitting socks.
- Have an extra pairs of boots available, when possible, to change when wet or worn down.
- Keep socks clean and dry.
- Change wet or damp socks, as soon as possible.
- Apply foot powder on feet and inside of boots when changing socks.
- Wash your feet daily, if possible.
- Avoid tight socks and boots and completely lace boots up as loosely as possible.
- Wear overshoes when appropriate and dependent on METT-TC.

FOOT CONDITIONING

E-3. Conditioning is accomplished by progressively increasing distance marched from day to day. Marching is an excellent way to strengthen feet and legs. The arch, ankle, and calf can be conditioned by performing simple exercises such as—

- Rising high on toes.
- Placing feet on towels and using toes to roll towel back under the arch.

PREVENTIVE MEASURES

E-4. Foot care preventive measures enable continuous operations. Measures implemented before, during and after the march to avoid painful foot problems are addressed below.

E-5. Before the march, trim toenails on a regular basis. Cut toenails short and square, and straight across. (See figure E-1.) Keep feet clean and dry, and use foot powder. Wear clean, dry, proper fitting socks (preferably cushion soled) with seams and knots outside free from holes or other obvious signs of wear. Nylon or polypropylene sock liner can reduce friction and add protection.

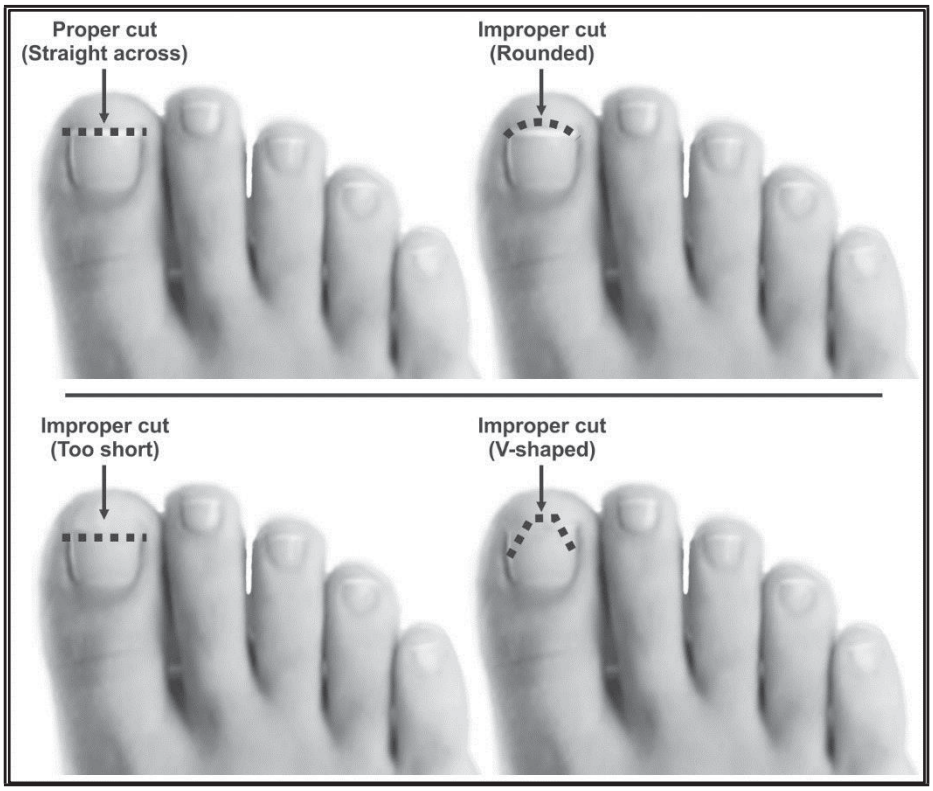

Figure E-1. Trimming of toenails

Note. Carefully fit new boots. When getting used to new pairs of boots, alternate with another pair and tape known hot spots before wearing the new pair.

E-6. During halts when conditions permit, soldiers remove only one boot at a time to massage feet, apply foot powder, change socks, and medicate blisters. Soldiers cover open blisters, cuts, or abrasions with absorbent adhesive bandages. Unit medics or CLS can provide assistance. Obtain relief from swelling feet by slightly loosening bootlaces where laces cross the arch of the foot.

E-7. After the march when conditions permit, repeat feet care methods, wash and dry socks, and dry boots. Medicate blisters, abrasions, corns, and calluses. Inspect painful feet for sprains and improper fitting of socks and boots. Red, swollen, tender skin, which could become blisters, can develop along sides of the feet from prolonged marching. If possible, give feet a daily foot cleaning. In field environments, cool water seems to reduce sensation of heat and irritation. After washing, dry feet well.

Note. Unit medics and CLS have proper equipment and training to accommodate Soldiers with foot problems before, during, and after foot marches.

FOOT INJURIES AND TREATMENT

E-8. Care of minor foot ailments should be given the utmost attention. Many major conditions requiring hospitalization and disability have resulted from neglected or maltreated minor conditions. Injuries that can occur from foot marches include—

- Blisters and abrasions.

- Foot perspiration.
- Athlete's foot.
- Foot frostbite.
- Trench foot.
- Immersion foot.
- Stress fractures.

BLISTERS AND ABRASIONS

E-9. Foot blisters and abrasions are the most common Soldier load-related injury. Blisters result from friction between socks and skin. Blisters can cause extreme discomfort, may prevent Soldiers from completing planned actions, and can lead to many days of limited activity. Blisters may progress to serious problems like an infection. Common causes of blisters and abrasions are improperly conditioned feet, heavy Soldier load, ill-fitting footwear and socks, improperly maintained footwear, heat, and moisture. Blisters normally are caused by friction, pressure and impact.

E-10. Heavy loads increase blister incidence, possibly by increasing pressure on the skin and causing movement of the foot inside the boot through higher propulsive and breaking forces. When loads are heavy (61 kilograms/134 pounds or more), the double pack method of load carriage has been shown to demonstrate lower blister incidence than the backpack method, suggesting better load distribution can reduce blisters.

E-11. Gel shoe insoles have been shown to reduce foot blister incidence, possibly because they absorb frictional forces in anteroposterior and mediolateral directions. Regular conditioning with load carriage induces skin adaptations reducing the probability of blisters. Thus, blisters can be less of an issue in units marching regularly; however, sudden increases in march intensity or distance probably make blisters likely, regardless of conditioning regularity.

E-12. Moist skin increases frictional forces and probably increases blister incidence. Acrylic socks decrease the number and size of blisters, possibly by conducting sweat away from the foot. Nylon socks worn inside wool socks reduce incidences of blisters for Soldiers who are foot marching. Polyester socks alone, or thin polyester sock worn inside thicker socks either wool-polypropylene or cotton-wool, reduce foot blister incidence as well. Antiperspirants reduce foot sweating and blisters.

E-13. Soldiers typically experience areas of friction known as hot spots. Subjective experience is a localized warm or burning sensation. This presumably pre-blister stage is characterized as a local red (erythema) and tender area. (See figure E-2.) When hot spots are detected, blisters may be avoided by shielding the affected areas with low-friction skin covering. Various skin coverings have been examined for their coefficients of friction, and lower values may be effective in reducing blister incidence.

Figure E-2. Friction hot spot

Note. Soldiers may use moleskin to prevent blisters before movement or foot marching. Soldiers should consult with their unit medic for proper usage and placement of moleskin.

E-14. To clean blisters, wash gently around it with soap and water, being careful not to break the skin. (See figure E-3.) If unbroken, use a sterilized needle or knifepoint to prick lower edge of blister to remove fluid. (To sterilize a needle or knifepoint, hold it in a flame or immerse and wipe with alcohol). Do not remove the skin; cover blister with an absorbent adhesive bandage or similar dressing, extending beyond edges of the blister. After applying bandage, dust outside of bandage and entire foot with foot powder.

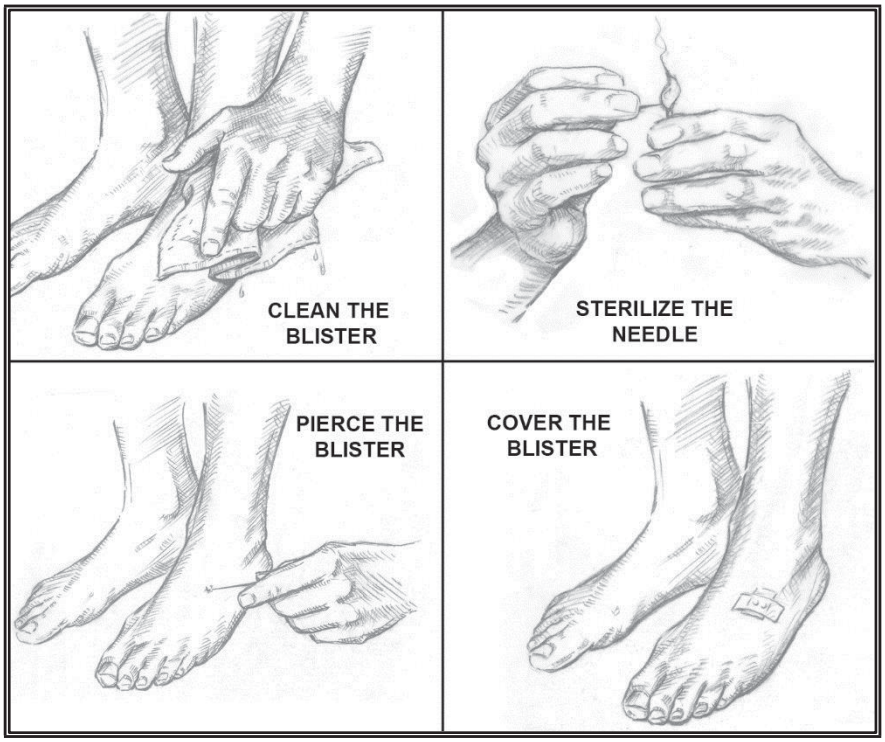

Figure E-3. Treatment of foot blisters

E-15. Use just enough foot powder since it can harden and become irritating. Foot powder lessens friction on the skin and prevents raw edges of bandage adhesive plaster from adhering to socks. Bandage adhesive plaster should be smooth so it can serve as a second skin. Check blister periodically for proper drying.

E-16. After blister has dried, remove the bandage adhesive plaster. Carefully inspect the foot for other problem areas which are red and tender needing protection of bandages adhesive plaster. Cover abrasions and cuts on foot with absorbent adhesive bandages for rapid healing. In an emergency, medical personnel can attend to your injury and provide assistance in applying first aid. See table E-1 on page E-6 for signs and symptoms, prevention and treatment of blisters.

Table E-1. Blister signs and symptoms; prevention and treatment

Signs and Symptoms	*Prevention*	*Treatment*
Elevated area, lighter in color than surrounding skin, and filled with fluid; pain, burning, warmth, and erythema.	1. Use acrylic, nylon, or polyester inner sock; use thick, snug, dense-weave outer sock with inner sock. 2. Use feet insoles. 3. Use antiperspirants. 4. Make sure load distribution is evenly around body center of mass. 5. Reduce load mass. 6. Precondition feet. 7. Improve aerobic fitness. 8. Cease smoking or tobacco use. 9. Cover skin when hot spots appear.	1. Intact blister: drain, leave top in place, and use light pressure dressing. 2. Torn blister: remove top, use antibiotic ointment, and put on surgical bandage. 3. Use hydrogel or hydrocolloid dressings; also polyurethane films.

Note. When mission variables permit, allow medics or CLS to drain blisters.

FOOT PERSPIRATION

E-17. When feet perspire, secretion decomposes and causes a foul odor. Skin between toes usually becomes white and soft, rubs off easily, and is prone to abrasions. Treatment comprises washing feet with soap and water, thoroughly drying feet, applying foot powder lightly and changing socks.

ATHLETE'S FOOT

E-18. Athlete's foot usually occurs between toes, on soles of feet, and at points of contact between skin and footwear. Mild chronic cases of fungal infection may respond to daily foot powder applications. If fungicidal ointment is available, it can be used along with foot powder. Fungicidal ointment should be used as directed and while feet are at rest. If foot powder and fungicidal ointment do not heal the infection, consult with your unit medic or physician.

FROSTBITE

E-19. Frostbite is freezing of the foot or feet due to exposure to below freezing temperatures and it is classified as either superficial or deep. Frostbite is a constant hazard in operations performed at freezing temperatures, mainly when accompanied with strong winds. Normally, cold sensation occurs, followed by numbness and tingling, stinging, aching, or cramping pain. Skin first turns red and yellowish, pale gray or waxy white.

Second SubPara

E-20. Prevention of frostbite or stopping it in its early stages is easier than thawing and caring for frozen flesh. Proper-fitting clothing, foot gear and properly worn equipment avoid interference with blood circulation, which could reduce amount of heat delivered to extremities. To prevent severe frostbite—

- Proper clothing must be worn for protection against cold and wind. The face must be protected during high winds and during exposure to aircraft propeller blast.
- Clothing, body and extremities must be kept dry. To avoid sweating when performing heavy work in cold environments, Soldiers should remove their outer layers of clothing and replace them when work is finished. Socks should be changed when feet become moist.

- Cold metal should not be touched with bare skin in extremely low temperatures. Doing so could mean loss of skin.
- Remove constricting clothing or jewelry.
- Adequate clothing, equipment and shelter must be provided during periods of inactivity.
- Face, fingers, toes, and ears should be exercised or massaged to keep them warm and to detect numb or hard areas.
- The buddy system or team work always should be used. Soldiers should find buddies and observe each other for signs of frostbite and for mutual aid if frostbite occurs. Small frozen spots should be thawed immediately, using bare hands or other sources of body heat.

Note. Always consult unit medics and leaders with issues about any kind of frostbite.

Treatment

E-21. There are two levels of frostbite:

Superficial Frostbite

E-22. Some cases of frostbite may be superficial, which involves skin. If freezing extends below the skin, it demands involved treatment to avoid or lessen loss of the body part such as fingers, toes, hands, or feet. Often no pain occurs, so Soldiers must observe each other for signs. Since it is difficult to distinguish between superficial and deep frostbite, Soldiers should assume injuries are deep and serious. If numbness occurs for a short time, frostbite is probably superficial. For treatment of superficial frostbite, the following measures should be taken—

- Cover cheeks with warm hands until pain returns.
- Place uncovered frostbitten fingers under opposing armpits, inside clothing next to skin.
- Place bare frostbitten feet under clothing and against chest or belly area of a buddy.
- Do not rewarm area by such measures as cold water soaks, or rubbing with snow.
- Be prepared for pain when thawing occurs.

Deep Frostbite

E-23. Deep frostbite is a serious injury and requires immediate first aid and subsequent medical treatment to avoid or minimize amputation. For treatment of deep frostbite (freezing injury), the following measures should be taken—

- If freezing is considered deep, do not attempt to treat injury in field environments. This causes increased pain and invites infection, greater damage, and gangrene. Quickly evacuate the injured frostbite victim to nearest medical facility.
- Protect frozen body parts from further injury, and do not try to thaw them by rubbing, bending, or massaging.
- Do not rub body parts with snow or place in cold or warm water. Do not expose to hot air or open fires; and do not use ointments.
- Do not walk on feet after they have thawed. Though it is safer to walk on frozen feet, thawing may occur during transportation to a medical facility. This cannot be avoided since a Soldier's entire body must be kept warm.

Note. Leaders and medics should be aware of and monitor all Soldiers having previous cold weather injuries. Soldiers having sustained past cold weather injuries are more susceptible for reoccurrence.

TRENCH FOOT

E-24. Trench foot is thermal injury caused by exposure to severe cold weather conditions or in damp or wet environments in temperatures between 32 and 50 degrees Fahrenheit. Causes include immobility of limbs

due to sitting or standing, insufficient clothing, and constriction of body parts due to boots, socks, and other garments.

E-25. Trench foot is similar to gradual frostbite since the primary causes are the same—only difference is degree of cold. In early stages of trench foot, feet and toes are pale, and feel cold, numb, and stiff. Walking becomes labored. If preventive action is not taken at this stage, feet may swell and become painful. In extreme cases of trench foot, flesh dies and amputation of the foot or leg may be needed. Since early stages of trench foot are not painful; Soldiers must be alert to prevent and treat trench foot.

Prevention

E-26. Socks and boots should be cleaned and dried daily, and feet should be dried soon after being wet. If Soldiers must wear wet boots and socks, their feet should be exercised by wiggling toes and bending ankles, and should be warmed with hands. Foot powder should be applied and dry, clean socks should be put on as often as possible.

Treatment

E-27. When treating trench foot, feet should be handled gently. Feet should not be rubbed or massaged. If needed, feet can be cleaned carefully with plain soap and water, dried, elevated, and left exposed. While it is best to warm the patient, feet always should be at room temperature. The patient should be carried and not allowed to walk on injured feet.

IMMERSION FOOT

E-28. Immersion foot is an injury following prolonged immersion of feet in water not cold enough to cause freezing or frostbite. It can occur after exposure in subtropical waters. Clinically and pathologically, immersion foot is like trench foot since its cause is the same lowering temperature of the body part involved. It is associated with dependency marked by legs and feet down as in sitting or standing and immobility of lower extremities, and with constriction of limbs by clothing or shoes. Other important factors are—

- Body cooling due to wind.
- Total immersion.
- Inadequate protective clothing.
- Illness.
- Starvation.

Note. Prevention and treatment for immersion foot is the same as for trench foot.

STRESS FRACTURES

E-29. Lower extremity stress fractures are common in Soldiers. Stress fractures are attributable to repetitive overloading of bones during activities, such as foot marching. Most common areas of involvement are lower extremities, especially the tibia, tarsals, and metatarsals. Once stress fractures occur, allow them time to heal. Affected areas must rest for several weeks physician dependent; until pain is gone, followed by a slow return to activity to avoid a recurring injury. Personnel who have had previous injuries are susceptible for injury reoccurrence.

PROPER FIT AND CARE OF FOOTWEAR

E-30. Poor–fitting boots can cause blisters, abrasions, calluses, and corns. Pressure is caused by boots being oo small; friction is caused by boots being too large. If tops of toes are involved, the cap is too low or too stiff. If ends of the toes are affected, the boot is too short or too loosely laced. If sides of the big and little toes become irritated, the boot is too narrow. Heel irritation is caused by boots being too long, too loosely laced, or too wide a heel space. This section address the proper fit and care of footwear.

PROPERLY FITTED BOOTS

E-31. Two important factors in fitting boots are that first, the space between the end of the big toe and the toe of the boot should be the width of the thumb. Second, in the unlaced boot, you should have enough space under the lower edge of the boot tongue to insert an index finger.

Note. This technique may not work for everyone. Do what is comfortable for you. Different manufactured boots may not always fit the same.

E-32. Figure E-4 illustrates how to test for a proper fit.

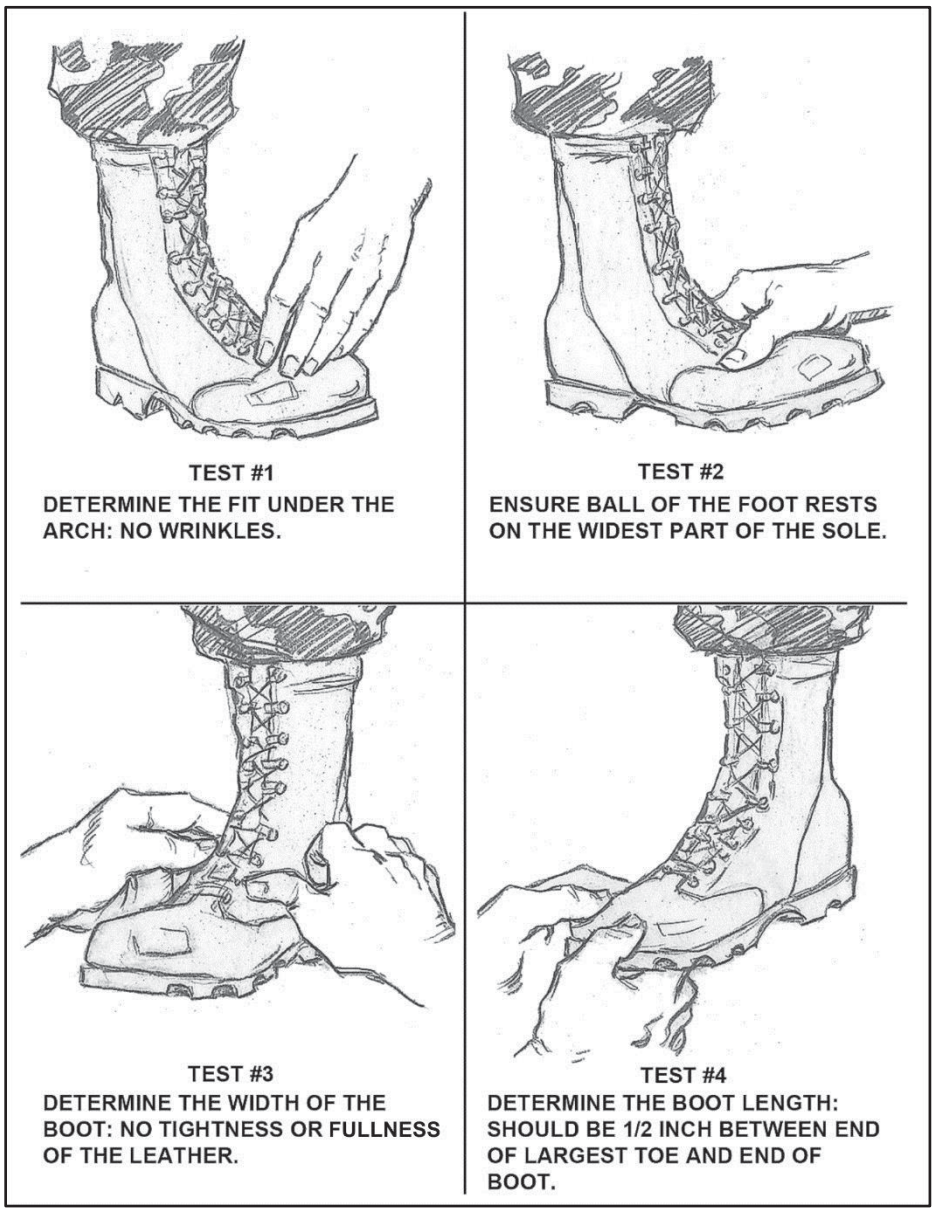

Figure E-4. Testing for a proper fit

E-33. Figure E-5 illustrates fitting and sizing guidance for military boots.

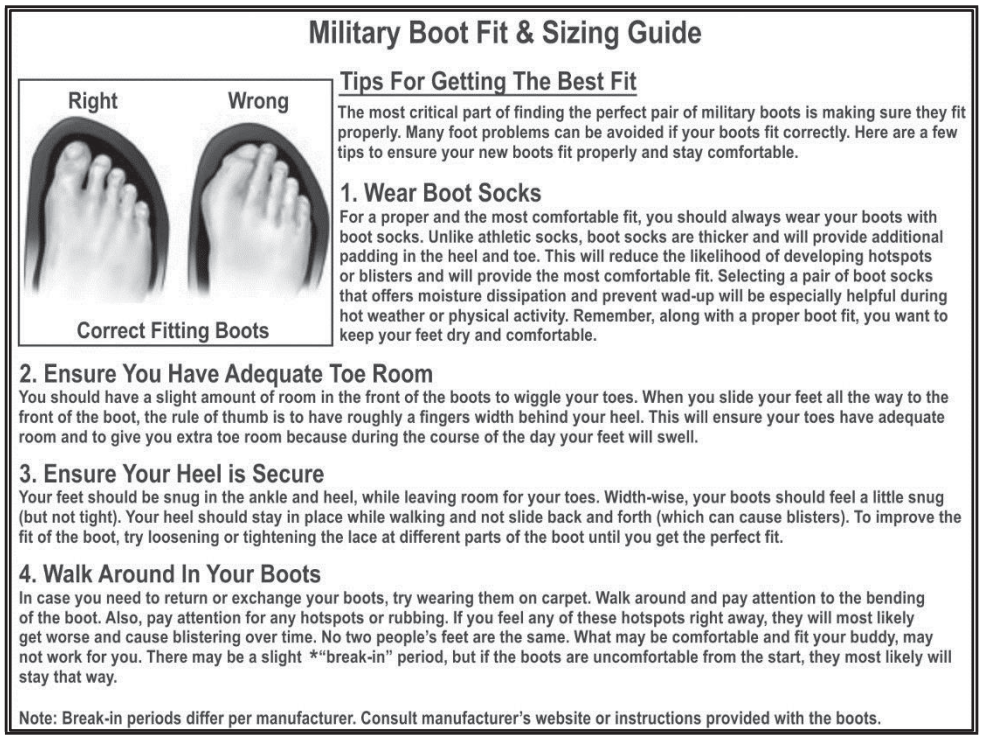

Figure E-5. Fitting and sizing guidance for military boots

Note. Boots must be dried after use to avoid losing proper fit and to prevent hardening of the material. To prevent moist material from freezing during winter, boots should be placed inside sleeping bags or somewhere warm to allow drying naturally to maintain proper fit.

PROPERLY LACED BOOTS

E-34. Proper lacing of boots prevents blisters and prevents improper blood flow in the foot. Laces can assume a seesaw action, which can produce blister across the instep. To prevent blistering, lacing over the instep can be avoided. If possible, broad laces should be used and an extra pair should be carried.

PROPERLY WORN SOCKS

E-35. To check fitting of socks, Soldiers should stand with their weight evenly distributed on both feet. If socks fit correctly, no tightness or fullness should exist (table E-2). Wool cushion sole sock is best, as it offers good foot protection.

Table E-2. Proper sizes of wool socks

Boot Size		Sock Size
From	*To*	
5	5.5	10
6	6.5	10.5
7	8	11
8.5	9	11.5
9.5	10.5	12
11	11.5	12.5
12	13	13
13.5	14	13.5
14.5	15	14

Note. This technique might not work for everyone. Different manufacturers may cause different fit and feel. Apply what's best and works. When Soldiers are allergic to wool, using other alternative material like nylon, acrylic, or polypropylene may be beneficial.

E-36. Soldiers should allow 3/8 inch for shrinkage of new socks. Socks, which are too large wrinkle inside boots, rub feet causing blisters and abrasions. Socks, which are too small, wear quickly and reduce blood flow in the foot. When wearing two pairs of socks, Soldiers should wear an outer pair at least half size larger than usual. Socks must be changed daily. Dirty socks are conductors of heat and allow warmth to escape. Socks should be washed in lukewarm water to preserve the fibers, since hot water can cause the socks to shrink.

E-37. When socks become damp, they can be dried by placing them inside a shirt next to the body or tied to the outside of the rucksack. Socks should be completely dry before wearing. If it is not possible to wash them, socks should be changed. Dirty socks should be dried and kneaded by hands to remove dirt and hardness.

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Appendix F

Related Injury and Illness Awareness

Foot march related injury and illness awareness is essential to unit readiness and the ability to enable and sustain continuous operations. The following information focuses on injury and illnesses, including musculature and skeleton conditions as it relates injury risk, most common to foot marches under loads.

INJURY RISK FACTORS

F-1. Leaders screen Soldiers with regards strength, endurance, and mobility to identify high injury risk Soldiers and provide corrective interventions to address the identified deficiencies. Post screening, leaders conduct reassessment to determine if identified Soldiers are physically prepared to conduct foot march under load.

HOT WEATHER INJURIES

F-2. Soldiers participating in foot marches often encounter hot weather environments impacting mission accomplishment. Continued exposure to hot environments degrades physical performance capabilities, significantly impacts morale, and eventually causes hot weather injuries. Hot weather conditions impair many aspects of normal military functioning in field environments, which in turn can influence Soldier health and performance.

DEHYDRATION

F-3. Dehydration occurs when the body loses too much fluid. Certain amount of body fluid is lost through normal activity. Normal daily intake of liquids replaces this loss. When individuals are engaged in strenuous activities, fluid is lost through sweating and loss creates an imbalance of fluids in the body. If this loss is not matched by rehydration, it can contribute to dehydration.

HEAT ILLNESS

F-4. While there is a range of adverse effects that can result from the body overheating, the two major kinds of heat illnesses (also called heat injuries) are—heat exhaustion (can be mild or more severe) and heat stroke (most severe form of heat illness and possibly fatal). Refer to ATP 4-25.12 and TC 4-02.1 for additional information on heat illness and first aid. Exertional heat illness refers to a spectrum of disorders resulting from total body heat stress that includes—heat cramps, heat exhaustion, and heat stroke.

Heat Cramps

F-5. Cramping is caused by an imbalance of chemicals, called electrolytes, in the body as results of excessive sweating. This condition causes the casualty to exhibit—

- Cramping in extremities including arms and legs
- Abdominal or stomach cramps
- Excessive sweating

Heat Exhaustion

F-6. Heat exhaustion is caused by loss of body fluids (dehydration) through sweating without adequate fluid replacement. It can occur in an otherwise fit Soldier who is involved in physical exertion in hot environments especially if the Soldier is not acclimatized. These signs and symptoms are—

- Excessive sweating with pale, moist, cool skin
- Headache
- Weakness
- Dizziness
- Loss of appetite
- Cramping
- Nausea with or without vomiting
- Urge to defecate
- Chills or gooseflesh
- Rapid breathing
- Tingling of hands and/or feet
- Confusion

Heat Stroke

F-7. Soldiers can suffer from heatstroke due to being exposed to high temperatures (such as direct sunlight), dressed in protective over garments, or perhaps has worn body armor extensively, which causes body temperature to rise. Heatstroke occurs rapidly in Soldiers who engage in work or other physical activity in high heat environments. Heatstroke is caused by failure of the body's cooling mechanism which includes decrease in the body's ability to produce sweat. The casualty's skin is red or flushed, hot, and dry. Casualty may experience—

- Weakness.
- Dizziness.
- Confusion.
- Headaches.
- Seizures.
- Nausea.
- Stomach pains or cramps.
- Respiration and pulse may be rapid and weak.
- Unconsciousness and collapse may occur suddenly.

Note. Heat stroke is a medical emergency and can be fatal if not immediately addressed. The casualty must be evacuated to the nearest medical treatment facility as soon as possible.

FIRST AID

F-8. Heat casualties should be monitored continually for development of conditions which may require performance of necessary basic lifesaving measures. Table F-1 shows common heat injuries along with signs and symptoms and first aid to apply when heat injuries occur.

Table F-1. Common heat injuries, signs and symptoms, and first aid

INJURY	*SIGNS AND SYMPTOMS*	*FIRST AID*
HEAT CRAMPS	Casualty experiences muscle cramps in arms, legs and/or stomach, may also have wet skin and extreme thirst.	1. Move the casualty to a shaded area and loosen clothing. 2. Allow casualty to drink one quart of cool water slowly per hour. 3. Monitor casualty and provide water as needed. 4. Seek medical attention if cramps persist.
HEAT EXHAUSTION	Casualty experiences loss of appetite, headache, excessive sweating, weakness or faintness, diszzness, nausea, muscle cramps. The skin is moist, pale, and clammy.	1. Move the casualty to a cool, shaded area and loosen clothing. 2. Pour water on casualty and fan to increase cooling effect of evaporation. 3. Provide at least one quart of water to replace lost fluids. 4. Elevate legs. 5. Seek medical if symptoms continue.
HEAT STROKE	Casualty stops sweating (hot, dry skin), may experience headache, dizziness, nausea, vomiting, rapid pulse and respiration, seizures, mental confusion. Casualty may suddenly collapse and lose consciousness.	1. Move casualty to a cool, shaded area, loosen clothing, and remove outer clothing if the situation permits. 2. Immerse in cool water. If cool bath is not available, massage arms and legs with cool water. Fan casualty to increase the cooling effect of evaporation. 3. If conscious, slowly consume one quart of water.

Note. Do not use salt solutions in first aid for heat injuries.

COLD WEATHER INJURIES

F-9. Soldiers participating in military training or deployments often encounter cold stress impacting mission accomplishment. Continued exposure to cold environments degrades physical performance capabilities, significantly impacts morale, and eventually causes cold weather injuries. Cold environments include exposure to extremely low temperatures in arctic regions, and cold wet exposures such as rain or water immersion in warmer ambient temperatures. Cold weather conditions impair many aspects of normal military functioning in field environments, which in turn can influence Soldier health and performance.

SIGNS, SYMPTOMS, AND FIRST AID

F-10. Cold weather injuries can occur anytime while foot marching under load. Table F-2 on page F-4 shows common cold weather injuries Soldiers may encounter and the signs, symptoms, and first aid remedies for these types of injuries.

Table F-2. Common cold weather injuries, signs and symptoms, and first aid

INJURY	SIGNS AND SYMPTOMS	FIRST AID
CHILBLAIN	Red, swollen, hot, tender, itchy skin. Continued exposure may lead to infected (bleeding, ulcerated) skin lesions.	1. Area usually responds to locally applied warming (body heat). 2. DO NOT rub or massage area. 3. Seek medical treatment.
IMMERSION (TRENCH) FOOT	Affected parts are cold and numb. As body parts warm, they may become hot, with burning and shooting pains. *Advanced stage:* Skin is pale with bluish cast, pulse decreases; blistering and swelling occur, swelling, heat hemorrhages, and gangrene may follow.	1. Gradual warming by exposure to warm air. 2. DO NOT massage or moisten skin. 3. Protect affected parts from trauma. 4. Dry feet thoroughly; avoid walking. 5. Seek medical treatment.
FROSTBITE	*Superficial:* Redness, blisters in 24 to 36 hours followed by peeling skin. *Deep:* Preceded by superficial frostbite; skin is painless, pale-yellowish, waxy, “”wooden or solid to touch, blisters form in 12-36 hours.	*Superficial:* 1. Keep casualty warm; gently warm affected parts. 2. Decrease constricting clothing, increase exercise and insulation. *Deep:* 1. Protect the part from additional injury. 2. Seek medical treatment as fast as possible.
SNOW BLINDNESS	Red scratchy, or watery eyes; headache; increased pain in eyes with exposure to light.	1. Cover the eyes with a dark cloth. 2. Seek medical treatment.
DEHYDRATION	Similar to heat exhaustion.	1. Keep warm, loosen clothes. 2. Replace lost fluids, rest, and additional medical treatment.
HYPOTHERMIA	Casualty is cold, shivers uncontrollably until shivering stops. A core (rectal) temp below 95 fahrenheit can affect consciousness. Uncoordinated movements, shock, and coma may occur as body temperature drops.	*Mild Hypothermia:* 1. Warm body evenly and without delay. (Heat source must be provided.) 2. Keep dry, protect from elements. 3. Warm liquids may be given to conscious casualty only. 4. Be prepared to start cardiopulmonary resuscitation (CPR). 5. Seek medical treatment immediately. *Severe Hypothermia:* 1. Quickly stabilize body temperature. 2. Attempt to prevent further heat loss. 3. Handle the casualty gently. 4. Evacuate to nearest medical treatment facility as soon as possible.

Note. Rewarming a severely hypothermic casualty is extremely dangerous in field environments due to possibilities of such complications as re-warming, shock and disturbances in rhythm of the heartbeat. These conditions require treatment by medical personnel.

DEHYDRATION

F-11. Dehydration is as prevalent in cold regions as it is in hot regions. In hot weather, Soldiers are aware of their bodies losing fluids through sweat. In cold weather, however, it is extremely difficult to realize this condition exists since sweating is not as apparent as in hot environments. In cold climates, sweat evaporates so rapidly or is absorbed so thoroughly by layers of heavy clothing it is rarely visible on the skin. Dehydration

occurs during cold weather operations because drinking is inconvenient. Dehydration weakens or incapacitates for several hours, or sometimes several days. Rest is an important part of recovery, and casualties must limit movement during their recuperative period to decrease risks of becoming a cold injury casualty.

WIND CHILL

F-12. Table F-3 shows how wind speeds increase the sensation of cold, known as wind chill. Frequent winds in mountain areas cause extremely low wind chills. Command emphasis should include countermeasures based on wind chill, not on thermometer reading, specifically nutrition, ample fluid intake, and multiple, loose clothing layers.

Table F-3. Wind chill effect

ESTIMATED WIND SPEED (IN MPH)	ACTUAL TEMPERATURE READING (^{0}F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (^{0}F)											
CALM	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(WIND SPEEDS GREATER THAN 40 MPH HAVE LITTLE ADDITIONAL EFFECT.)	**LITTLE DANGER** IN LESS THAN ONE HOUR WITH DRY SKIN. MAXIMUM DANGER OF FALSE SENSE OF SECURITY.						**INCREASING DANGER** DANGER FROM FREEZING OF EXPOSED FLESH WITHIN ONE MINUTE.		**GREAT DANGER** FLESH MAY FREEZE WITHIN 30 SECONDS.			
	. TRENCH FOOT AND IMMERSION FOOT MAY OCCUR AT ANY POINT ON THIS CHART.											

LEGEND

F FAHRENHEIT MPH MILES PER HOUR

INJURIES CAUSED BY SUNLIGHT

F-13. Solar radiation injuries caused by sunlight are likely at altitude due to increased ultraviolet radiation and reflection from snow and rock surfaces. Solar radiation injuries can be severe and occur with much shorter exposure at higher altitudes. Injuries caused by sunlight include sunburn and snow blindness.

SUNBURN

F-14. Sunburn may be likely to occur on partly cloudy or overcast days when Soldiers may be unaware of the threat and do not take appropriate precautions. Use sun block with at least 30 sun protection factor to help prevent sunburns.

SNOW BLINDNESS

F-15. Snow blindness occurs when ultraviolet light is absorbed by external parts of the eyes, such as eyelids and cornea. No warning, aside from brightness, sunburn-like eye damage is occurring. Damage can occur in just several hours. Sunglasses or goggles with ultraviolet protection prevent snow blindness. Sunglasses with side protectors are recommended.

HIGH ALTITUDE ILLNESS AND EFFECTS

F-16. Decreased availability of oxygen in atmospheric air is an environmental stress unique to high altitudes. It lowers oxygen supply to body tissues which can cause illness at high altitudes and a decline in physical and mental performance.

Note. One meter equals 3.28084 feet, so to calculate the exact altitude in feet, multiply the number of meters times 3.28084.

HYPOBARIC HYPOXIA

F-17. Hypobaric hypoxia can interact with other factors in the environment to increase the likelihood of environment-related injuries, or it can exacerbate preexisting medical conditions. Given its widespread effects, basic understanding of hypobaric hypoxia is essential for medical personnel supporting military units operating in high mountain regions.

F-18. A curvilinear reduction occurs in ambient barometric pressure with increasing altitude. Physiologic significance of decreased barometric pressure is related to concomitant reduction in partial pressure of oxygen (hypobaric hypoxia). Although oxygen makes up about 21 percent of the atmosphere at all altitudes, a progressive decrease in partial pressure of oxygen means less actual oxygen at higher altitudes compared to sea level.

F-19. Relationship of decreased oxygen availability to altitude illness and performance decreases provides classification of altitude exposure based on arterial oxygen content and its physiologic effects. Information presented in figure F-1 is for acclimatized low altitude individuals having ascended rapidly from low altitudes.

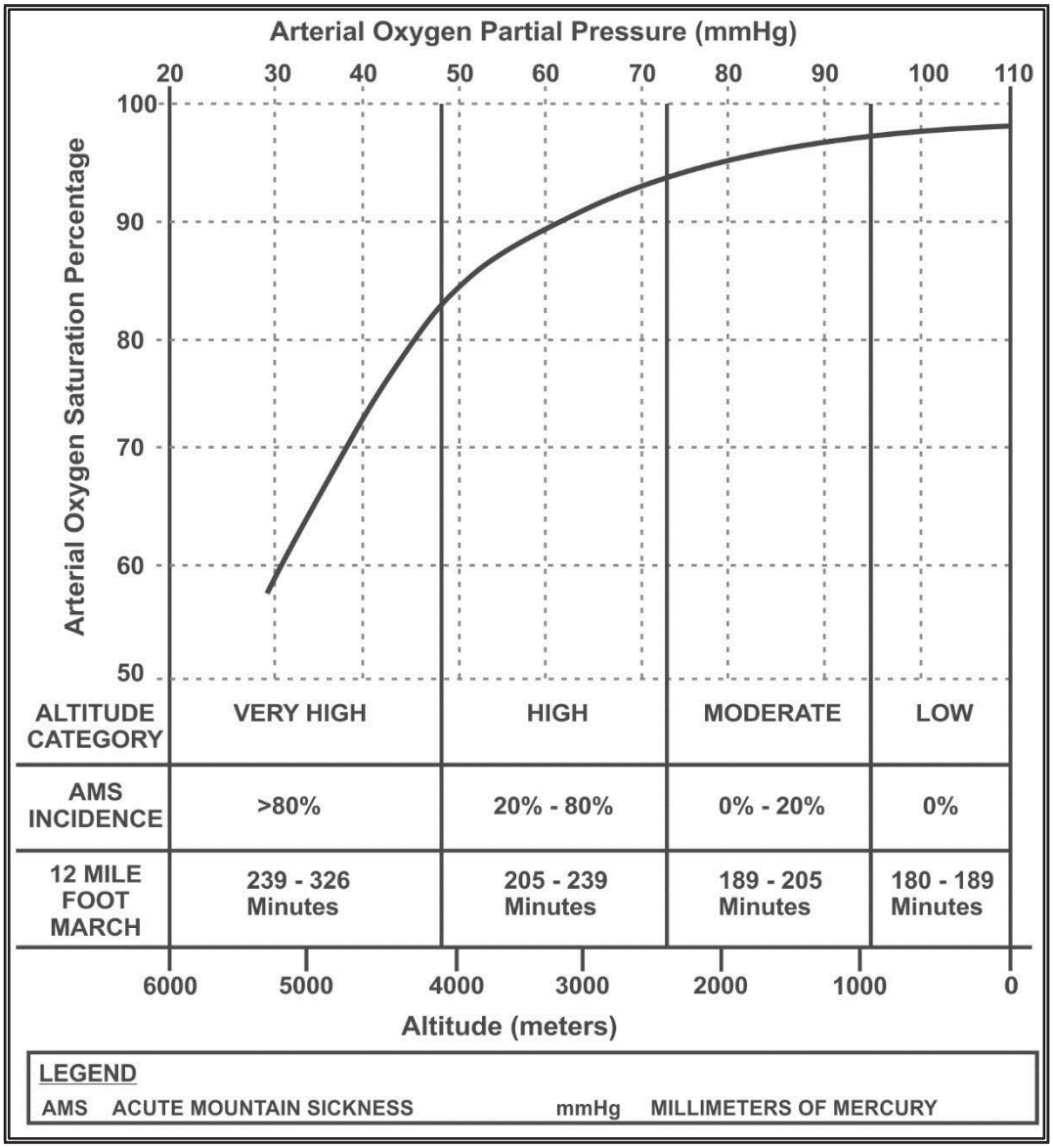

Figure F-1. Relationships between altitude, arterial oxygen partial pressure, and arterial oxygen saturation in acclimatized personnel

Note. Rapid ascent to altitudes above 2,439 meters (8,002 feet) increases individual susceptibility to altitude illness. Primary altitude illnesses are acute mountain sickness (AMS), high altitude pulmonary edema (HAPE), and high altitude cerebral edema (HACE). Additionally, many individuals develop sore throat and bronchitis, producing disabling and severe coughing spasms.

ACUTE MOUNTAIN SICKNESS

F-20. AMS is the most common form of altitude illness. AMS is a short-lived illness similar to an alcoholic hangover normally lasts from two to seven days. AMS symptoms include headache, nausea, fatigue, and lightheadedness. AMS develops within 6 to 24 hours of altitude exposure, and its incidence and severity increases in direct proportion to ascent rate and altitude. (See table F-4 on page F-8.)

Table F-4. Estimated severity of mountain sickness in non-acclimatized personnel

Altitude	*Incidence Percent (%)*		
	Mild	*Moderate*	*Severe*
2,130 meters (6,988 feet)	20% to 40%	0% to 10%	0%
3,050 meters (10,007 feet)	20% to 30%	10% to 20%	0% to 10%
3,660 meters (12,008 feet)	10% to 40%	30% to 40%	10% to 20%
4,270 meters (14,009 feet)	10% to 30%	30% to 60%	20% to 30%
5,500 meters (17,880 feet)	0%	10% to 20%	>70%

F-21. Individual AMS susceptibility is currently not predictable from measurements made at low altitudes. However, prior history of AMS is the best predictor of future susceptibility to AMS under similar ascent conditions. For all individuals, sustained physical exertion early in altitude exposure greatly increases AMS incidence and severity.

F-22. Figure F-1 (on page F-7) shows with ascent to increasing altitudes, risk of developing altitude illness, AMS and experiencing an aerobic work performance decrement is inversely proportional to resting arterial oxygen saturation. In relationship between arterial partial pressure of oxygen and hemoglobin, significant decreases in resting oxygen saturation do not emerge until altitude exceeds 2,400 meters (7,874 feet).

F-23. Although resting oxygen saturation is well-preserved up to 2,400 meters (7,874 feet) drop in arterial partial pressure of oxygen decreases diffusion of oxygen from the lungs to the blood and from the blood to the cells. This decrease in oxygen diffusion rate becomes apparent during physical activities as an arterial oxygen desaturation at altitudes as low as 1,000 meters (3,281 feet). Thus, physical work performance is decreased at altitudes slightly higher than 1,000 meters (3,281 feet), though resting oxygen saturation is near sea level values.

F-24. Best methods for reducing AMS susceptibility are altitude acclimatization and minimizing physical exertion at high altitudes. If altitude acclimatization is not possible, pharmacologic prophylaxis, which creates 75 percent reduction in symptom severity, is available with acetazolamide, a carbonic anhydrase inhibitor.

Note. Before taking medication consult a doctor.

F-25. Acetazolamide induces mild metabolic acidosis via bicarbonate diuresis, which stimulates breathing and increases arterial oxygen content to ameliorate hypoxemia. Additional benefits include mild diuresis reducing development of edemas, which is the likely basis for all altitude illnesses.

F-26. Adverse side effects of acetazolamide include paresthesia or tingling sensation, potential dehydration, and decreased aerobic endurance performance. Several studies have demonstrated 1,000 mg acetazolamide per day produces about a 25 percent decrease in endurance performance at low and high altitudes.

F-27. Thus, prophylaxis with high doses of acetazolamide impairs prolonged physical performance at all altitudes. Current guidance recommends limiting acetazolamide to individuals with known susceptibility to AMS, or using lower doses (250 to 500 mg per day) for rapid ascents to altitudes below 4,000 meters (13,123°feet).

PULMONARY EDEMA

F-28. HAPE is potentially fatal, although uncommon illness, occurring in usually less than 10 percent of individuals ascending above 3,660 meters or 12,008 feet. Individuals making repeated ascents and descents above 3,660 meters (12,008 feet) may have an increased susceptibility to HAPE. Prevention of HAPE is

similar to AMS. However, instead of acetazolamide, individuals with prior history of HAPE may take vasodilator such as Nifedipine (20 mg sustained release every eight hours). Sildenafil, Tadalafil, and inhaled Beta Agonists, such as Salmeterol, are additional options for the prevention of HAPE.

CEREBRAL EDEMA

F-29. HACE is potentially fatal, although uncommon illness occurring in usually less than two percent of individuals ascending above 3,660 meters (12,008 feet). HACE is an exacerbation of unresolved, severe AMS often occurs in people who have AMS symptoms and continue to ascend. If left untreated, HACE can progress to coma and death in 12 hours or less. Prevention of HACE is the same for AMS.

EFFECTS ON THE HUMAN BODY

F-30. When operating in mountainous terrain, military and civilian personnel often experience a decline in physical and mental performance. Common effects of altitude exposure on the human body include—

- Reduced physical performance.
- Psychological effects.
- Sleep disturbances.
- Dehydration
- Poor nutrition.

Reduced Physical Performance

F-31. Soldiers cannot maintain the same physical performance at altitude as they can at sea level, regardless of their fitness levels. Countermeasures include ensuring acclimatization, adjusting activity rates and load carriage, planning frequent rests during activities, and planning and performing physical conditioning programs at altitude.

Psychological Effects

F-32. Altitude exposure may result in changes in senses such as vision and taste, mood, and personality. These effects are related directly to altitude and are common at above 3,048 meters (10,000 feet). Some effects occur early and are temporary while others may persist after acclimatization or for extended periods after descent—

- Vision is generally the sense most affected by altitude exposure. Dark adaptation is reduced significantly, affecting Soldiers at altitudes as low as 2,438 meters (7,999 feet) and can potentially affect military operations at altitude.
- Mental effects most noticeable at extreme altitudes include decreased perception, memory, judgment, and attention span.
- Changes in mood and personality traits are common during altitude exposures.

Sleep Disturbances

F-33. Altitude exposure may have significant effects on sleep. Most prominent effects are frequent periods of apnea, which is a temporary pause in breathing and fragmented sleep. Reports of being unable to sleep and nighttime restlessness are common and may contribute to mood changes and daytime drowsiness. These effects have been reported at elevations as low as 1,524 meters (5,000 feet) and are common at higher altitudes.

Dehydration

F-34. Dehydration is common in Soldiers at high altitudes. Causes include perspiration, vomiting, increased breathing, and diminished thirst sensation. Dehydration decreases physical performance, increases symptoms of altitude illness, and may increase risk of developing cold injuries.

Poor Nutrition a

F-35. Poor nutrition can severely impact military operations and contribute to illness or injury, decreased performance and poor morale. At high elevations dulled taste sensations make food undesirable, and nausea or lack of energy can decrease motivation to prepare or eat meals. Poor eating habits may lead to constipation, aggravation of hemorrhoids, and undesired weight loss.

PRODUCTS TO AVOID

F-36. Products to avoid at high altitudes include: tobacco, alcohol, and caffeine. Tobacco smoke interferes with oxygen delivery in the body and increases amounts of carbon monoxide in close spaces. Irritant effect of tobacco smoke can narrow airways and interfere with breathing. Alcohol impairs judgment and perception, depresses respiration, causes dehydration, and increases susceptibility to cold injury. Caffeine from coffee and other sources may not improve physical and mental performance. Caffeine causes dehydration and should be consumed in moderation.

ACCLIMATIZATION

F-37. Altitude acclimatization eliminates altitude illness and allows Soldiers to achieve maximum physical work performance possible. Once acquired, acclimatization is maintained as long as the Soldier remains at altitude. It is lost over several days after returning to lower elevations. Exposure to higher altitudes requires additional acclimatization.

F-38. For most Soldiers at high to very high altitudes, 70 to 80 percent of respiratory component of acclimatization occurs in 7 to 10 days; 80 to 90 percent of overall acclimatization generally occurs in 14 to 30 days; and maximum acclimatization may take months or years. Two methods Soldiers can use to achieve high altitude acclimatization are staged ascent and graded ascent.

Staged Ascent

F-39. Soldiers ascend to moderate altitudes and remain for four days or more to acclimatize before ascending higher. When possible, Soldiers should stop at several altitudes to allow a greater degree of acclimatization.

Graded Ascent

F-40. Slow ascents allow partial acclimatization. To reduce risk of altitude illness, have Soldiers spend one or two nights at moderate altitude (1,200 meters (3,937 feet) to 2,400 meters (7,874 feet). At altitudes above 2,400 meters (7,874 feet), Soldiers should not sleep higher than 300 meters (984 feet) above the previous night's sleeping altitude.

Note. Combination of staged and graded ascents is the safest and most effective way to prevent altitude illnesses.

FUELING THE BODY

F-41. In addition to ways described for inducing altitude acclimatization, maintaining adequate hydration levels and primarily consuming carbohydrates can improve physical performance. Fueling the body also decreases altitude illness susceptibility.

Hydration

F-42. Dehydration significantly impairs physical performance and may increase susceptibility to AMS. Physical performance decreases produced by dehydration are likely in addition to impairments produced by hypoxia. Dehydration increases severity of hypoxic symptoms, such as lightheadedness and dizziness. Water requirements may be increased at high altitudes due to increased loss of water through breathing and diuresis produced by hypoxia and acetazolamide.

Carbohydrates

F-43. Carbohydrate is the most efficient fuel for optimizing physical performance at altitude. Recent research has indicated 6 percent to 12 percent glucose or maltodextran solution in liquid form (such as, 56 grams in 560 ml (milliliters) of water) ingested just before and periodically during moderate to intense physical activity improved endurance performance by 10 to 25 percent at 4,300 meters (14,108 feet).

F-44. Carbohydrate supplementation maintains blood glucose levels and reduces perception of effort. Moreover, consuming it after completing an activity speeds recovery and replenishes muscle glycogen stores. In addition to providing energy to power prolonged and intense activity, consuming carbohydrates in liquid form assures better hydration status by replacing much of fluid volume lost due to sweating and increased ventilation.

F-45. High carbohydrate diets are recommended at altitude as an intervention to alleviate symptoms of AMS. Diets high in carbohydrates at altitude stimulates ventilation and improves blood oxygenation. Since severity of AMS is linked closely to low blood oxygen levels, increasing blood oxygen content through enhanced carbohydrate metabolism should lessen symptoms of AMS. High carbohydrate diets compared to high fat or protein diets at altitude is typically better palatable, digestible, and acceptable by all individuals.

Note. Certain nutritional supplements are not effective in preventing altitude illness or enhancing physical performance. Ingestion of high doses of antioxidant vitamins or Ginkgo biloba does not effectively reduce AMS susceptibility. Furthermore, creatine supplementation during short, high altitude exposures does not improve physical performance.

MUSCULOSKELETAL

F-46. Soldiers need strength to be able to withstand the rigors of continuous operations while under load. The goal is to attain the muscular strength required to perform functional movements against resistance. A well-designed strength and conditioning program improve performance and appearance and controls injuries. Injuries are defined as any intentional or unintentional damage to the body resulting from acute or chronic exposure to mechanical, thermal, electrical, or chemical energy, and from the absence of such essentials as heat or oxygen. The following paragraphs focus specifically on musculoskeletal (orthopedic-involving both musculature and skeleton) conditions as it relates to the type of injury risk most common to foot marches under loads.

BONE STRESS INJURIES

F-47. Lower extremity stress fractures are common in foot marching. Normally affected areas are the foot, shin, knee and hip. Stress fractures occur when the rate of stress on the skeletal system exceed the rate of repair and recovery. In addition to overuse, additional risk factors for stress fractures include, older age, taller body stature and prior physical inactivity or low physical fitness.

METATARSALGIA

F-48. Metatarsalgia is a descriptive term for a nonspecific painful overuse foot injury. Walking with heavy loads may be a predisposing factor for metatarsalgia. This may cause the foot to rotate from front to rear for more prolonged periods resulting in mechanical stress in this area. Treatment is conservative and includes rest, use of ice packs, elevation of the foot, and anti-inflammatory medications. (See table F-5 on page F-12.) Metatarsal pads can be used. If symptoms persist, further evaluation for more serious problems such as fractures or tumors is warranted.

Table F-5. Metatarsalgia signs and symptoms, prevention, and treatment

Injury	*Signs and Symptoms*	*Prevention*	*Treatment*
Metatarsalgia	Pain, swelling on sole of foot.	1. Precondition feet through physical training and road march practice. 2. Reduce load mass.	1. Rest, ice, compress, elevate. 2. Take anti-inflammatory medication. 3. Seek medical care to rule of stress fracture.

SHIN SPLINTS

F-49. Shin splints is a common term that may include many diagnoses or causes, and is not an actual injury or diagnosis in itself. One of the most common causes is inflammation of the shin bone. Traction forces from the muscles of the lower leg pull on the shin bone causing pain and inflammation. Overuse is the most likely cause; however, many factors can increase the likelihood of this occurring—

- Hard surfaces.
- Flat feet or a rigid foot (high) arches.
- Wear worn out boots.
- Poor mobility at the ankle can cause increased stress on the soft tissues, muscles and tendons of the lower leg when foot marching.

KNEE PAIN

F-50. Knee pain is another condition associated with Soldier load. It may result from overuse, improper training, prior injury or hereditary. Knee pain can be difficult to diagnose. Various disorders include patellofemoral pain syndrome, patellar tendonitis, bursitis, and ligamentous sprain. These conditions can arise from an abrupt increase in road marching mileage or intensity (load) or duration or from climbing hills if Soldiers have not been conditioned for this activity. Treatment includes rest, use of ice packs, and anti-inflammatory medications (table F-6). Core, quadriceps, and hamstring strengthening and stretching exercises, along with calf stretching, may be important to prevent recurrence.

Table F-6. Knee pain signs and symptoms, prevention and treatment

Injury	*Signs and Symptoms*	*Prevention*	*Treatment*
Knee pain	Pain, swelling, crepitus, and instability.	1. Perform lower extremity strengthening. 2. Perform lower extremity stretching.	1. Rest, ice, compress, elevate. 2. Take anti-inflammatory medication. 3. Seek medical care.

MERALGIA PARESTHETICA

F-51. Meralgia paresthetica (tingling thigh syndrome) is an abnormal condition characterized by pain, numbness and tingling sensation in the outer thigh. It is caused by compression of the nerve. For instance, when Soldiers wearing body armor are seated for long periods, the lower edge of the body armor may compress the groin region, resulting in compression of the lateral femoral cutaneous nerve. Symptoms generally subside with removal of the chronic compression. See table F-7 for symptoms, prevention and treatment.

Table F-7. Meralgia paresthetica signs and symptoms, prevention and treatment

Injury	*Signs and Symptoms*	*Prevention*	*Treatment*
Meralgia paresthetica	Pain, paresthesia, and weakness in the front thigh.	1. Use properly fitted body armor. 2. Avoid compressing thighs with lower edge of body armor. 3. Avoid tight fitting straps.	1. Reduce body armor wear. 2. Take anti-inflammatory medication. 3. Change flexed posture frequently, maintain hip flexor flexibility. 4. Seek medical care.

RUCKSACK PALSY

F-52. Rucksack palsy is believed to be caused by shoulder straps of backpacks. It can cause a traction/tension injury of the nerve roots of the neck. Symptoms include numbness, weakness, cramping, shoulder blade winging, and minor pain in the shoulder, elbow and wrist. Possible risk factors for rucksack palsy include heavy loads, improper load distribution, and longer distances under load. See table F-8 for symptoms, prevention and treatment of rucksack palsy.

Table F-8. Rucksack palsy signs and symptoms, prevention and treatment

Injury	*Signs and Symptoms*	*Prevention*	*Treatment*
Rucksack palsy	Upper extremity numbness, weakness, and cramping; shoulder blade winging.	1. Use framed rucksack. 2. Use hip and sternum belt on rucksack. 3. Shift load by adjusting straps.	1. Rest, ice, and take anti-inflammatory medication as needed. 2. Seek medical care.

LOW BACK INJURIES

F-53. Low back injuries can pose significant problems during Soldier load and foot marches. Low back injuries are difficult to define. Pain may result from trauma to spinal discs, ligaments connecting vertebral bodies, nerves or supporting musculature.

F-54. Heavy loads may be risk factors for back injuries. Heavier loads could lead to changes in trunk angle stressing back muscles, discs, and ligaments. The research suggested that new technologies that put weight higher on the shoulders may help reduce back problems. This results in optimal posture and eliminates prolonged bending of the back.

F-55. The double pack method can help reduce incidence of back problems because it results in optimal posture and eliminates prolonged bending of the back. Thus, better load distribution (front and back) could reduce back injuries. A balanced strengthening and conditioning program involving the core, upper and lower body can assist in performance enhancement and injury prevention. See table F-9 for symptoms, prevention and treatment of low back injuries.

Table F-9. Low back injury symptoms, prevention, and treatment

Injury	*Signs and Symptoms*	*Prevention*	*Treatment*
Low-back pain	Pain, muscle spasm, and nerve-related symptoms (numbness, burning, tingling, and muscle weakness).	1. Distribute load evenly around body's center of mass. 2. Reduce load mass. 3. Strengthen trunk and abdomen.	1. Rest, ice, and take anti-inflammatory medication as needed. 2. Seek medical care.

LOCAL DISCOMFORT AND FATIGUE

F-56. Another important aspect of Soldier load, from the individual's perspective is discomfort. In Soldiers carrying backpack loads over long distances, local pain and discomfort is often reported in feet, shoulder and back areas. Foot pain could be due to blisters and abrasions and pressure on the feet. Shoulder discomfort could be caused by rucksack straps which place pressure on the shoulders.

F-57. Discomfort varies depending on the pack system design. For backpacks with or without frames, majority of discomfort appears in the neck and shoulder regions. For backpacks with hip belts, which remove pressure from the shoulders, discomfort is localized to mid trunk and upper legs. Overall, when loads are carried primarily on the waist they create less subjective discomfort compared to shoulder discomfort.

F-58. Local fatigue while carrying loads is common. Muscle groups having the greatest decrements in strength are lower back muscles, hip extensors and knee flexors. This is often caused by lack of experience carrying loads or lack of training carrying loads. Proper fitting of equipment is important when carrying loads. Leaders should always check their subordinates to ensure equipment is being worn properly. This can create less fatigue during and after missions.

Glossary

SECTION I – ACRONYMS AND ABBREVIATIONS

ADP	Army doctrine publication
ADRP	Army doctrine reference publiction
AMS	acute mountain sickness
AO	area of operations
ATTP	Army tactics, techniques, and procedures
ATP	Army techniques publication
CAS	close air support
CASEVAC	casualty evacuation
CBRN	chemical, biological, radiological, and nuclear
CLS	combat lifesaver
COA	course of action
CP	checkpoint
DA	Department of the Army
DD	Department of Defense form
EOD	explosive ordnance disposal
EPW	enemy prisoner of war
FAC(A)	forward air controller airborne
FIST	fire support team
FM	field manual
FO	forward observer
FSO	fire support officer
HACE	high altitude cerebral edema
HAPE	high altitude pulmonary edema
IED	improvised explosive device
IOTV	improved outer tactical vest
JTAC	joint terminal attack controller
kcal	kilo calorie
kph	kilometers per hour
MED	medical
MDMP	military decisionmaking process
MEDEVAC	medical evacuation
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, and civil considerations
MOLLE	modular lightweight load-carrying equipment
MOPP	mission-oriented protective posture
mph	miles per hour
MP	military police
MRE	meal, ready to eat

NCO	noncommissioned officer
OE	operational environment
OPORD	operation order
PCC	precombat checks
PCI	precombat inspections
PMCS	preventive maintenance, checks, and services
ROE	rules of engagement
RP	release point
S-1	battalion or brigade personnel staff officer
S-2	battalion or brigade intelligence staff officer
S-3	battalion or brigade operations staff officer
S-4	battalion or brigade logistics staff officer
S-6	battalion or brigade signal staff officer
SOP	standard operating procedure
SP	start point
TB	technical bulletin
TLP	troop leading procedure
TRADOC	United States Army Training and Doctrine Command
UAS	unmanned aircraft system
U.S.	United States
WARNORD	warning order
XO	executive officer

SECTION II – TERMS

actions on contact

A series of combat actions, often conducted simultaneously, taken on contact with the enemy to develop the situation. (ADRP 3-90)

administrative movement

Movement in which troops and vehicles are arranged to expedite their movement and conserve time and energy when no enemy ground interference is anticipated. (FM 3-90-2)

approach march

The advance of a combat unit when direct contact with the enemy is intended. (ADRP 3-90)

Army design methodology

Applies critical and creative thinking to understand, visualize, and describe unfamiliar problems and approaches to solving them. (ADRP 5-0)

casualty evacuation

Nonmedical units use this to refer to the movement of casualties aboard nonmedical vehicles or aircraft without en route medical care. (FM 4-02)

close air support

Air action by fixed and rotary wing aircraft against hostile targets that are in close proximity to friendly forces and that require detailed integration of each air mission with the fire and movement of those forces. (JP 3-0)

dismounted march

Movements of troops and equipment, mainly by foot, with limited support by vehicles. Also called foot march. (FM 3-90-2)

march column

Consists of all elements using the same route for a single movement under control of a single commander. (FM 3-90-2)

march serial

A major subdivision of a march column organized under one commander who plans, regulates, and controls the serial. (FM 3-90-2)

march unit

A subdivision of a march serial. It moves and halts under control of a single commander who uses voice and visual signals. (FM 3-90-2)

medical evacuation

The process of moving any person who is wounded, injured, or ill to and/or between medical treatment facilities while providing en route medical care. (FM 4-02)

military decisionmaking process

An iterative planning methodology to understand the situation and mission, develop a course of action, and produce an operation plan or order. (ADRP 5-0)

mounted march

The movement of troops and equipment by combat and tactical vehicles. (FM 3-90-2)

quartering party

A group of unit representatives dispatched to a probable new site of operations in advance of the main body to secure, reconnoiter, and organize an area before the main body's arrival and occupation. (FM 3-90-2)

scheme of fires

The detailed, logical sequence of targets and fire support events to find and engage targets to accomplish the supported commander's intent. (FM 3-09)

tactical road march

A rapid movement used to relocate units within an AO to prepare for combat operations. (ADRP 3-90)

trail party

The last march unit in a march column and normally consists of primarily maintenance elements in a mounted march. (FM 3-90-2)

troop leading procedure

Dynamic processes used by small unit leaders to analyze missions, develop plans, and prepare for an operation. (ADP 5-0)

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