ATP 3-21.18

FOOT MARCHES

JULY 2025

DISTRIBUTION RESTRICTION: Approved for public release: distribution is unlimited.
This publication supersedes ATP 3-21.18, dated 13 April 2022.

HEADQUARTERS, DEPARTMENT OF THE ARMY

This publication is available at the Army Publishing Directorate site (https://armypubs.army.mil) and the Central Army Registry Site (https://atiam.train.army.mil/catalog/dashboard).

Army Techniques Publication
No. 3-21.18

Headquarters
Department of the Army
Washington, DC, 24 July 2025

FOOT MARCHES

Contents

Page

Preface v
Introduction vii
CHAPTER 1 1
MOVEMENT FUNDAMENTALS 1
Section I–Troop Movement 1
Section II–Dismounted Movement (Foot Marches) 1
March Mission 1
Tactical Movement 2
Section III–General Consideration for the March 3
Visibility 3
Climate, Weather, and Terrain 3
March Discipline 4
Water Discipline 5
Acclimatization 6
Non-United States Military Participation 7
Morale 9
Individual Load 9
Risk Tolerance 10
Section IV–Planning for the March 11
Key Components of Planning 11
Environmental Conditions 12
March Distance, Rate, and Time 14
Section V–Preparations for the March 22
March Rehearsals 22
Precombat Checks and Precombat Inspections 22
Equipment Maintenance 23
Tier and Prioritize Resources and Assets 23

DISTRIBUTION RESTRICTION: Approved for public release: distribution is unlimited.
*This publication supersedes ATP 3-21.18, dated 13 April 2022.

CHAPTER 2 ..... **25**
MARCH EXECUTION **25**
Section I–Organization of Forces for the March **25**
Tactical Road March 25
Approach March 29
Forced March 32
Section II–Conduct of the March **32**
Limited Visibility March 32
Soldier and Leader Engagement 34
March Security 34
Communications 39
Scheme of Fires 40
Scheme of Engineer Operations 44
En Route Sustainment 44
Actions on Contact 46
Cognitive Load 51
Section III–Duties and Responsibilities for the March **52**
Battalion Commander and Staff 52
Company Commander and Subordinate Leaders 58
Company Habitual Attachments 61
Soldiers 62
CHAPTER 3 ..... **65**
SOLDIER LOAD **65**
Section I–Soldier Load Considerations **65**
Leader Responsibility 65
Echeloning Loads 66
Load Determination 69
Section II–Load Tailoring **76**
Commander's Guidance 76
Estimate of Situation 77
Decisions to Reduce or Offset Risk 77
Calculating Load Requirements 77
Unit Load (Packing List) 78
Section III–Movement of Supplies and Equipment **78**
Resupply Operations 78
Soldier Load Transfer 79
Contract, Host-Nation, and Local National Support 80
APPENDIX A **83**
MARCH PROCEDURES **83**

APPENDIX B **89**
MOVEMENT ORDER AND MOVEMENT TABLE **89**
APPENDIX C **95**
POSTURE AND BODY MECHANICS **95**
APPENDIX D **105**
TRAINING FOR THE MARCH **105**
APPENDIX E **117**
FOOT CARE **117**
APPENDIX F **129**
RELATED INJURY AND ILLNESS AWARENESS **129**
Glossary **143**
References **147**
Index **151**

Figures

Figure 1-1. Time and distance example 15
Figure 1-2. Strip map (dismounted movement), example 20
Figure 1-3. Overlay (dismounted movement), example 21
Figure 2-1. March organization, example 26
Figure 2-2. Initial axis of advance, example 30
Figure 2-3. Less vulnerable columns, example 31
Figure 2-4. Army aviation attack request call for fire format 42
Figure 3-1. Determine, review, and organize 69
Figure 3-2. Average dismounted rates of march 72
Figure 3-3. March velocity depletion based on load during cross-country movement 73
Figure 3-4. Maximum energy expenditure 74
Figure 3-5. Effects of terrain on energy cost 75
Figure 3-6. Load tailoring diagram, example 78
Figure B-1. Outline for movement order, example 90
Figure B-2. Format for movement table, example 93
Figure C-1. Body mechanics and load control 96
Figure C-2. Load placement inside pack 98
Figure C-3. Double pack method 101
Figure D-1. Tasks and physical components of movement lethality 108
Figure D-2. Types and percentages of fuel the body needs 113
Figure E-1. Trimming of toenails 118
Figure E-2. Friction hot spot 120
Figure E-3. Treatment of foot blisters 121
Figure E-4. Testing for a proper fit 125
Figure E-5. Fitting and sizing guidance for military boots 126
Figure F-1. Relationships between altitude, arterial oxygen partial pressure, and arterial oxygen saturation in acclimatized personnel 135

Tables

Table 1-1. Determine length of column 18
Table 2-1. Example counter-unmanned aircraft system detection report (SALUTE format) 38
Table 2-2. Artillery and mortar call for fire 41
Table 3-1. Fighting load-possible items carried 67
Table 3-2. Approach march load—possible items carried 68
Table 3-3. Personal protective equipment posture 71
Table 3-4. Kilocalories expended by a 180-pound Soldier moving 15 minutes per 1.6 kilometers with various loads on flat terrain 75
Table 3-5. Body weight percentages for combat loads 76
Table 3-6. Pack animal considerations 81
Table D-1. Carbohydrate and protein (macronutrient) intake by body type 114
Table E-1. Blister signs, symptoms, prevention, and treatment 121
Table E-2. Proper sizes of wool socks 127
Table F-1. Common heat injuries, signs, symptoms, and first aid 131
Table F-2. Common cold weather injuries, signs, symptoms, and first aid 132
Table F-3. Windchill effect 133
Table F-4. Estimated severity of mountain sickness in nonacclimatized personnel 136
Table F-5. Metatarsalgia signs, symptoms, prevention, and treatment 140
Table F-6. Knee pain signs, symptoms, prevention, and treatment 140
Table F-7. Meralgia paresthetica signs, symptoms, prevention, and treatment 141
Table F-8. Rucksack palsy signs, symptoms, prevention, and treatment 141
Table F-9. Low-back injury signs, symptoms, prevention, and treatment 141

Preface

ATP 3-21.18 provides the doctrinal framework and techniques for conducting dismounted movements, also called foot marches. It describes movement fundamentals and considerations; types of foot marches; foot march planning, preparations, execution, and assessment; duties and responsibilities; training for the march; and discipline, hygiene, and safety before, during, and after the march.

The principal audiences for ATP 3-21.18 are commanders, staffs, leaders, and Soldiers who are responsible for planning, preparing, executing, and assessing foot marches. The audience also includes the United States Army Training and Doctrine Command institutions and components, and the United States Army Special Operations Command. This publication serves as a doctrinal reference for personnel developing doctrine and training materiel and force structure, institutional and unit training, and standard operating procedures for foot marches.

To comprehend the doctrine contained in this publication, readers must first understand the tactics in FM 3-90 and FM 3-96. To comprehend how dismounted Infantry units organize and are doctrinally employed, the reader must understand the techniques in ATP 3-21.8, ATP 3-21.10, and ATP 3-21.20.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate in accordance with the law of war and the rules of engagement. (See FM 6-27.)

ATP 3-21.18 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. For definitions shown in the text, the term is italicized, and the number of the proponent publication follows the definition. This publication is not the proponent for any Army terms. The use of a trade or brand name does not constitute endorsement of any specific commercial product, commodity, service, or enterprise by the United States Army.

ATP 3-21.18 applies to the Active Army, Army National Guard/Army National Guard of the United States and United States Army Reserve unless otherwise stated.

The proponent for ATP 3-21.18 is the United States Army Maneuver Center of Excellence. The preparing agency is the United States Army Maneuver Center of Excellence, Directorate of Training and Doctrine, Doctrine and Collective Training Division. Send comments and recommendations on DA Form 2028 (*Recommended Changes to Publications and Blank Forms*) to Commander, Maneuver Center of Excellence, Directorate of Training and Doctrine, Doctrine and Collective Training Division, ATTN: ATZK-TDD, 1 Karker Street, Fort Benning, GA 31905-5410; by email to usarmy.benning.mcoe.mbx.doctrine@army.mil; or submit an electronic DA Form 2028.

This page intentionally left blank.

Introduction

ATP 3-21.18 encompasses techniques for foot marches and replaces ATP 3-21.18 published in April 2022. This publication provides doctrinal guidance; organizational roles and functions; capabilities; limitations; and responsibilities for planning, preparing, executing, and assessing foot marches. This publication addresses significant changes in Army doctrinal and training terminology, concepts, and 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–Movement Fundamentals—
  - Provides an overview of troop movement, specifically dismounted movement, also called foot marches.
  - Addresses the three methods of a tactical movements that units of all types can conduct: tactical road march, approach march, and forced march.
  - Addresses tactical considerations, planning, and preparation for foot marches.
  - Discusses how leaders must tier and prioritize the use of resources and assets during the march.
- Chapter 2–March Execution—
  - Describes conduct of the foot march and the organization of forces for the march.
  - Covers limited visibility marches and Soldier and leader engagement.
  - Discusses security, fire support, engineer operations, counter-unmanned aircraft system (UAS) en route sustainment measures, actions on contact, and cognitive loads for foot marches.
  - Defines cognitive load as the combination of the relevant, intrinsic, and extraneous information present during the execution of a Soldier's or leader's task.
  - Provides duties and responsibilities before, during, and after a foot march.
- Chapter 3–Soldier Load—
  - Discusses Soldier load considerations to include leader responsibility, echeloning loads, and load determination.
  - Describes load carriage-what needs to be carried and how a specific load is carried.
  - Covers energy use under load compared across environments.
  - Describes load tailoring, methods for reducing or offsetting risk, and calculating load requirements.
  - Addresses movement of supplies and equipment before, during, and after the march.

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

- Appendix A–March Procedures.
- Appendix B–Movement Order and Movement Table.
- Appendix C–Posture and Body Mechanics.
- Appendix D–Training for the March.
- Appendix E–Foot Care.
- Appendix F–Related Injury and Illness Awareness.

This page intentionally left blank.

Chapter 1

Movement Fundamentals

Movement is the positioning of combat power to establish the conditions for maneuver (ADP 3-90). This is inherent in all military operations. Successful movement places Soldiers and equipment at their destination at the proper time, ready for combat. This chapter provides an overview on troop movement and discusses in detail dismounted movement, commonly referred to as foot marches. It discusses integrated planning and preparation activities for foot marches. (See FM 3-90 for information on other methods of troop movement.)

SECTION I–TROOP MOVEMENT

1-1. *Troop movement* is the movement of Soldiers and units from one place to another by any available means (FM 3-90). The ability of commanders to posture friendly forces in the right starting location to conduct operations depends on their ability to move their forces. The essence of battlefield agility is the capability to conduct rapid and orderly troop movement to concentrate combat power at decisive points and times. Units can expect the enemy to attempt to deny freedom of movement throughout their assigned area. The two types of troop movement are nontactical and tactical movement.

1-2. *Nontactical* 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). Units only conduct nontactical movements in secure areas. Examples of nontactical movements include rail and highway movement in the continental United States. Once units deploy into a theater of operations, they do not normally conduct nontactical movements.

1-3. A *tactical movement* is a movement in which troops and vehicles are arranged to protect combat forces during movement when a threat of enemy interference is possible (FM 3-90). Units maintain security against enemy attacks from both the air and ground and prepare to take immediate action against enemy ambushes, although they do not expect contact with significant enemy ground forces. During movement, the moving force employs security measures, even when contact with enemy ground forces is not expected. During a tactical movement, units are always prepared to take immediate action. There are three methods of a tactical movements that units of all types can conduct: tactical road march, approach march, and forced march.

1-4. There are five methods of troop movements that units can execute. Generally, units can execute these methods in combination. For example, a unit can initially execute a mounted movement and then transition to a dismounted movement. Additionally, each method can be applied to nontactical or tactical movement. These methods are—

- Dismounted movement (foot marches).
- Mounted movement (road marches).
- Air movement.
- Rail movement.
- Water movement.

SECTION II–DISMOUNTED MOVEMENT (FOOT MARCHES)

1-5. A *dismounted movement* is a movement of troops and equipment mainly by foot, with limited support by vehicles (FM 3-90). It is also called a foot march. Foot marches are characterized by combat readiness, ease of control, adaptability to terrain, slow rate of movement, and increased Soldier fatigue. Foot marches do not depend on the existence of roads.

MARCH MISSION

1-6. A foot march is successful when Soldiers arrive at their destination at the prescribed time and are physically and mentally able to execute their mission immediately. Physical and mental conditioning are

normally done through unit conditioning programs and acclimatization of Soldiers to an area of operations (AO).

1-7. 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.

1-8. Commanders must determine the amount and type of equipment carried and rate of march–length and number of rests equates with Soldiers' physical endurance. Detailed planning and good leadership 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 receive notification of an impending move early enough to allow for planning.

1-9. When necessary, conducting a forced march can hurry foot marches. Forced marches require speed, exertion, and more hours marched per day. This is normally accomplished by increasing marching hours for each day rather than the rate of march. Forced marches are employed only when needed since they decrease unit effectiveness. (See chapter 2 for additional information.)

1-10. Shuttle marches alternate riding in vehicles and movement by foot during foot marches. This normally occurs due to an insufficient number of vehicles to carry the entire unit. Shuttling transports Soldiers, equipment, and supplies by a series of round trips with the same or different vehicles. Alternatively, shuttle marches may haul a load an entire distance then return for another or may carry successive elements of loads for short distances while remaining elements continue on foot.

TACTICAL MOVEMENT

1-11. Commanders use tactical road marches (see paragraph 2-2), approach marches (see paragraph 2-23), and forced marches (see paragraph 2-29) to relocate units rapidly within an AO to conduct combat operations. Tactical road marches are useful when contact with the enemy is possible. Approach marches are useful 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 forced march emphasize speed and security over tactical deployment. A tactical road march provides excellent speed, control, and flexibility, but sacrifices flank security. Forced marches require speed, exertion, and an increase in the number of hours marched each day beyond normal standards. Commands 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.

1-12. Units generally maintain integrity throughout tactical movements and plan for enemy interference either en route to or shortly after arrival at their destination. When units conduct tactical movement, they use movement formations and techniques consistent with the mission variables of METT-TC (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations. Units may conduct tactical movement, primarily the approach march, over unsecured routes, if there are no friendly forces between the forward elements of the moving force and enemy.

Note. METT-TC (I) represents the variables leaders use to analyze and understand a situation in relationship to the unit's mission. The first six variables are not new. However, the increased use of information (both military and civilian) to generate cognitive effects requires leaders to assess the informational aspects and impacts on operations continuously. Because of this, informational considerations, represented with (I) has been added to the familiar METT-TC mnemonic. Informational considerations are expressed as a parenthetical variable in that it is not an independent variable, but an important component of each variable of METT-TC that leaders pay particular attention to when developing understanding of a situation. (See FM 6-0 for additional information.)

1-13. When relocating in an AO, units may conduct tactical movement by dismounted or *mounted movement*—the movement of troops and equipment by combat and tactical vehicles (FM 3-90)–or in combination. This occurs prior to maneuver when speed is vital, and security requirements are minimal. Units

generally move by this type of tactical movement to an assembly area where units prepare to conduct combat operations.

1-14. During these types of 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 movement formations and movement techniques for assigned missions. When contact is made maneuver is executed. (See chapter 2 for additional information.)

SECTION III–GENERAL CONSIDERATION FOR THE MARCH

1-15. Visibility, climate, weather, and terrain characteristics to a degree determine actual arrangement and location of Soldiers, 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.

VISIBILITY

1-16. In the absence of enemy threats, marches during daylight hours are preferred as they permit faster movement and are 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 command and control (C2), reconnaissance, security, and a slow rate of march, but they do 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 stringent control measures, and thorough march training, signals, and communications 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 disciplines are strictly enforced. Units must enforce security to conceal operations from the enemy, preventing it from gaining information about the march. Navigational aids, C2 systems, thermal sights, and night-vision devices can prevent many C2 problems encountered during limited visibility movements.

1-19. Marches during limited visibility require careful planning. 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 and ATP 3-21.8 chapter 3 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 without the establishment of proper provisions.

CLIMATE AND WEATHER

1-21. Climatic 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 in normal conditions. Differences depend on physical limitations imposed by adverse conditions and the use of special equipment required to overcome them. (See appendix F for windchill chart information.)

1-22. Cold climates reduce efficiency of Soldiers. Bulky clothing limits movement in performing maintenance and operational duties. Hot, humid climates reduce energy and increase physical discomfort and the 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 the protecting of 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 the number of breakdowns due to overheating.

TERRAIN

1-24. Terrain evaluation is the study of how soils, vegetation, climate, and landforms help or hinder employment of military units and equipment. Movement planners evaluate terrain to determine the ability to move Soldiers, vehicles, and equipment without interruption and with minimal 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 informs the selection of 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 the 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 are 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 useful in describing the effects that inclines have on movement rates. It is the 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. (See ATP 3-34.80 for additional information.)

1-29. As the 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 the time needed due to the total amount of terrain traversed. Movement rates decrease whether units are moving uphill or downhill.

1-30. Slopes covered in talus-a 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 the use of cover and concealment. It must include specific controls and restrictions such as water, light, noise, and communications 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. Thorough training, supervision of operations by technically and tactically proficient, competent leaders, and attention to detail attain it. March discipline demands—

- Using qualified Soldiers and drivers who operate their equipment safely under a variety of conditions.
- Adhering to unit standard operating procedures (SOPs) specifying tactics, techniques, and procedures for movement, battle drills, and communications techniques.
- Strictly following traffic regulations.
- Meeting start point (SP), en route checkpoints (CPs), and release point (RP) 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 and regulations, speed limits, and time and distance gaps.

Note. The reference to drivers may imply Soldiers, U.S. Government contractors, or host-nation contractors.

WATER DISCIPLINE

1-34. All Soldiers must observe water discipline to maintain effectiveness and minimize fatigue while conducting operations. Water discipline mandates several rules:

- Consume water or electrolyte and carbohydrate fluids 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 carbohydrate fluids when not thirsty.
- Drink water or electrolyte and carbohydrate fluids slowly to prevent cramps or nausea.
- Refill canteens with water only or replenish electrolyte and carbohydrate fluids at every opportunity.

Note. Never pour electrolyte and carbohydrate fluids into water canteens or hydrating systems. Mold and mildew tend to grow within them, causing sickness or health issues. Use bleach to clean canteens or hydrating systems that appear to have mold and mildew. Never force hydrate with water alone. The body needs the proper amount of nutrients and electrolytes to operate efficiently. Force hydrating with water alone can flush electrolytes and nutrients out of the body 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 also 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 noticeable 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 is treatable with water purification tablets. (See TC 4-02.3 for additional information.)

1-39. When operating in a chemical, biological, radiological, and nuclear (CBRN) environment in an increased mission-oriented protective posture (MOPP) level, water consumption increases and forced hydration becomes necessary. Commanders and subordinate leaders at all levels can reduce heat injuries brought on by these conditions by adjusting march rates or loads. (See ATP 3-11.32 for additional information.)

ACCLIMATIZATION

1-40. Soldiers must be physically and mentally conditioned to participate in foot marches. Many types of terrain and climates 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 more quickly 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, subordinate leaders, and medical support Soldiers 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 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 that 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 in any environment is developed by strong leadership and progressive training. As Soldiers become stronger and learn and apply marching techniques, their self-confidence, morale, and pride increase. 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 unacclimatized Soldiers should be limited in intensity and time. About 2 weeks of progressive heat exposure and physical work is appropriate for heat acclimatization.

1-46. Heat acclimatization is necessary for all Soldiers; however, fit Soldiers may acclimatize to heat more quickly than less fit Soldiers. Full effects of heat acclimatization are relative to initial physical fitness levels and total heat stress encountered by Soldiers. Soldiers who perform light physical work achieve the 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. Furthermore, 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 a minimum exposure of 2 hours per day, which can be broken into 1-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 minimal requirements results in partial acclimatization. Soldiers must perform physical activity in heat to accomplish optimal acclimatization for work at the intensity level in given hot environments. (See TB MED 507 for additional information.)

NON-UNITED STATES MILITARY PARTICIPATION

1-49. March commanders are responsible for all non-U.S. military supporting assets associated with the march. These supporting elements can comprise multinational partners, U.S. civilian contractors, host country nationals and local national contractors, and host-nation force augmentation.

MULTINATIONAL PARTNERS

1-50. March commanders must practice diplomatic and cultural sensitivity, show respect for multinational forces, and treat them as partners. Their ROE may differ from U.S. ROE. Their equipment capabilities and limitations may also differ. Every effort must be made to ensure multinational 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 multinational forces during march missions.
- Define the chain of command clearly. It is important to determine and communicate who is in charge of the march during planning, preparation, and execution.
- Integrate multinational vehicles fully, if applicable, into the march and maintain organizational integrity.
- Plan for possible communications 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.
- Refer to the chaplain, staff judge advocate, contracting officer, civil affairs officer, and intelligence staff for additional information about cultural differences.

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 leaders 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 (PCCs), precombat inspections (PCIs), and battle drill rehearsals.

HOST-COUNTRY NATIONALS AND LOCAL NATIONAL CONTRACTORS

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

- Conduct thorough inspections of all host-country national equipment and personnel.
- Ensure host-country nationals are familiar with the unit's tactics, techniques, procedures, and SOPs. This increases the need for multiple rehearsals.
- Provide additional military escort vehicles and armed military assistant drivers as needed for marches with large numbers of host-country national drivers as an additional security consideration.

HOST-NATION FORCE AUGMENTATION

1-53. Host-nation forces have the advantage 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 more easily than U.S. personnel. Commanders 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 leaders' perspective to better operate alongside them. Key points for commanders to consider should include—

- Ensuring host-nation leaders participate in the planning stage of operations.
- Ensuring host-nation forces participate in rehearsals, PCCs, and PCIs.
- Attaching U.S. advisors to host-nation force leaders 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 disciplines as U.S. Forces and may not perform in the manner expected of U.S. Soldiers.
- Using liaison officers with necessary communications equipment and communications security to ensure host-nation forces can receive communications when utilizing secure communication protocols.
- Ensuring the attached host-nation force understands the expected reaction to enemy contact battle drills to avoid fratricide.
- Providing U.S. Forces for logistical support to host-nation forces when mission variables permit.
- Employing host-nation forces within their capabilities and understanding, for they often do not have the same capabilities as U.S. Soldiers and units.
- Intermingling host-nation forces, dependent on the situation, with own unit while conducting missions such as foot marches, understanding that host-nation personnel often look to U.S. Soldiers for actions and guidance.
- Establishing effective relationships with host-nation forces based on personnel rapport and trust built by key leaders.
- Using host-nation forces to help in foot march missions like clearing traffic and avoiding potential ambush sites.
- U.S. Forces may be restricted in 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 to—

- 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.
- Avoid delays during foot marches that keep Soldiers standing for extended periods.
  - Delays can increase fatigue causing legs to stiffen and making it difficult to resume the march.
  - Route reconnaissance before the march provides information on conditions that can cause delays.
  - Advance action can prevent conditions that can cause delays.
- Maintain a steady rate of march. Too rapid or too slow rate induces fatigue.
- Hold passing vehicles to reasonable speeds during marching 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, understanding that Soldiers quickly detect the presence or absence of their leaders in foot marches.
- Encourage unit leaders to walk their entire march formation, 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 timely and effective movement of the wounded, injured, or ill to and between medical treatment facilities on dedicated and properly marked medical platforms with en route care provided by medical personnel (ATP 4-02.2). *Casualty evacuation* is the movement of casualties aboard nonmedical vehicles or aircraft without en route medical care (ATP 4 02.13). Casualties are cared for at point of injury or under nearby cover and concealment and receive self or buddy aid, enhanced 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 (in coordination with unit CASEVAC procedures) outline procedures for MEDEVAC. Key MEDEVAC considerations include—

- Ensuring organic medical personnel accompany each march element.
- Coordinating air and ground MEDEVAC support.
- Rehearsing MEDEVAC operations with air ambulance flight crews.
- Rehearsing MEDEVAC operations with ground ambulance crews.
- Placing ground ambulances strategically in direct support of each march element.
- Identifying ambulance exchange points along march routes.

1-58. In situations in which MEDEVAC assets are either limited in number or unavailable, commanders must plan to conduct CASEVAC operations. These are usually accomplished through the use of organic vehicles. In situations in which 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 commander identifies the minimum of 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 the number of Soldiers 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 (see chapter 3 section II) 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 SOPs may be used to provide a standardized fighting load and approach march load (see chapter 3 for additional information) based on common mission requirements. The commander is responsible for ensuring the tailoring of fighting and approach march loads are based on specific mission requirements and obtaining means to carry additional gear (see load carriage in chapter 3 section I). This includes cross leveling Soldier loads across the unit to ensure no element or Soldier is overloaded to a point that hinders unit success.

1-61. During the conduct mission analysis, commanders and subordinate leaders consider individual loads and understand excessive loads affect physical readiness, combat performance, and have the potential for individual and unit mission failure. The framework gauge, evaluate, analyze, and reduce (also called GEAR) provides a tool to use as a memory aid in managing Soldier load throughout planning (specifically mission analysis) and preparation (specifically PCC and PCI), demonstrated in the following:

- Gauge mission requirements for the individual and unit by—
  - Assessing specific mission objectives.
  - Analyzing environmental factors influencing equipment needs.
  - Analyzing potential threats and challenges.
- Evaluate equipment selection by—
  - Identifying critical or essential equipment.
  - Prioritizing items based on mission essential and/or critical tasks (understanding ounces can add up to pounds and pounds impact performance).
  - Identifying threat and personal protective equipment posture (also called PPEP) and MOPP levels.
- Analyze future needs by—
  - Identifying (based on METT-TC [I]) the most efficient and effective way to carry mission essential loads.
  - Assessing and coordinating tactical movement and equipment transportation.
  - Coordinating equipment and resupply drops/caches if needed and feasible.
- Reduce risk (analyzing risk in carrying too much/carrying too little) by—
  - Identifying if required equipment exceeds soldiers' physiological capacity or causes time constraints to be failed.
  - Identifying how not carrying equipment could engage unforeseen enemy threats or risk to the mission.

1-62. When available and dependent upon mission variables of METT-TC (I). An Infantry rifle company or a smaller unit requires one truck and one trailer to carry additional gear. In cold weather or during other conditions in which personal gear requirements increase, this requirement increases.

1-63. The commander ensures the supply system provides the 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

1-64. Commanders must ensure a thorough understanding of the operation, including the senior commander's intent and risk tolerance. A commander receiving a mission will analyze it and assign subordinate missions and tasks, each with their own set of risk management considerations. 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.

1-65. In load planning, every decision requires risk management considerations by the commander. Excessive loads risk mission failure due to physical exhaustion or the inability to maintain the planned rate of march resulting in missed mission times. Conversely, decisions to leave mission-essential equipment in the tactical assembly area or patrol base without planning for timely resupply may also result in mission failure. The commander uses several factors to inform risk decisions, including:

- Higher commanders' guidance.
- Mission duration.
- Known physical state of the Soldiers.
- Likely weather and level of illumination during the mission.
- Type and nature of terrain to be traversed.
- Probable enemy threats (including enemy strength and the presence of obstacles, armor or CBRN capabilities).
- Appropriate PPEP and MOPP levels.
- Ability to conduct necessary resupply in a timely manner.
- Ability to link up with sustainment loads.

1-66. Determining the extent of a Soldier's load during the march requires careful consideration and analysis by leaders at all echelons in planning, preparation (to include precombat checks) and discipline in execution. The commander should clearly articulate risk-related decisions and expectations for execution during the operation order (OPORD) brief and inspect for compliance during precombat inspections. Risk management, the Army's process for helping organizations and individuals make informed decisions to reduce or offset risk, is further addressed in chapter 3.

SECTION IV–PLANNING FOR THE MARCH

1-67. Planning is the process by which march unit commanders translate their visualizations into specific courses of action for preparation, execution, and focus on expected results. Planning to determine relationships between the mission variables of METT-TC (I) begins with an analysis and assessment of the conditions in the 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 the higher commander's guidance, the march commanders' planning includes formulating one or more suitable courses of action to accomplish the mission. Planning continues (with assessment throughout the operations process) as needed during preparation and execution. March commanders rely on intuitive decision-making and direct contact with subordinate leaders to integrate processes and activities during the planning process.

Note. See ATP 3-21.20 for details on conducting the operations process (specifically the military decision-making process) within the battalion. See ATP 3-21.10 and ATP 3-21.8 for details on conducting the operations process (specifically troop leading procedures) within the company and platoon, respectively.

KEY COMPONENTS OF PLANNING

1-68. The march unit's mission statement, commander's intent, and concept of operations are key components of a plan and serve as the framework for an operation. Commanders and staffs ensure their mission and end state nest with those of their higher headquarters. While the 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. Additional components to the plan include the march unit's task organization, tasks for subordinate units, coordinating instructions, risk acceptance, and control measures.

1-69. 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 and staffs ensure the purpose of each task correlates with the accomplishment of another task, achievement of an objective, or direct attainment of an end state condition.

1-70. Commanders and staffs 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.

1-71. Commanders, staffs, and subordinate leaders use the mission variables of METT-TC (I) to focus on specific elements of an OE during mission analysis. Upon receipt of a warning order (WARNORD) or operation order (OPORD), commanders and staffs filter relevant information categorized by operational variables into categories of mission variables used during mission analysis. Commanders, staffs, and subordinate leaders use mission variables to refine their understanding of the situation. The tactical situation is defined through the mission variables of METT-TC (I). (See FM 3-96 and echelon and formation-specific Maneuver Center of Excellence Army techniques publication for additional information.)

ENVIRONMENTAL CONDITIONS

1-72. Environmental conditions must be considered when planning a foot march. Key environmental conditions to consider during movement planning are addressed in the following paragraphs.

MOUNTAINOUS AREAS

1-73. 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.

1-74. Units moving in a 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 in canalizing terrain. (See ATP 3-21.50 for additional information.)

WATER OBSTACLES

1-75. Evidence of ground water such as the presence of springs, pools, or plant growth, along planned cross country routes presents problems in the 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 the sizes and characteristics of obstacles through a map reconnaissance and information collection efforts through reconnaissance, surveillance, and intelligence operation aids 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

1-76. 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 1 to 2 feet.

1-77. 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

1-78. 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 reconnaissance and

information collection through reconnaissance, surveillance, and intelligence operations may supply all information necessary to planning personnel.

1-79. When in doubt about the ease of crossing an obstacle, request 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 require control to avoid congestion. Canals, ravines, and rivers present serious obstacles to foot movement and require assistance for crossing.

1-80. Bridges and fords offer likely targets for the enemy to employ artillery, sniper, ambush, and explosives. Therefore, no movement should be made without provision for changes in plans dictated by current intelligence.

1-81. In general, canals, ravines, and river crossings 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.

Note. With proper training, a unit can emplace a rope bridge to cross a small water obstacle or other small gap (see TC 3-21.76).

DESERT AREAS

1-82. Movement planning for desert areas involves 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.

1-83. Foot movement in desert areas is difficult due to the terrain and tactical situation. Dispersion increases to achieve some degree of tactical security, which expands lengths of formations. Experience with time and space schedules developed for 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.

1-84. Column control normally is exercised from within the column by radio, C2 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. (See ATP 3-90.99 for additional information.)

JUNGLE OR HEAVILY FORESTED AREAS

1-85. 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.

1-86. 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. (See ATP 3-90.98 for additional information.)

ARCTIC AREAS AND NORTHERN TEMPERATE ZONE

1-87. 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 remain flexible to sudden weather changes.

1-88. 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.

1-89. 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 (see TC 4-02.3) and first aid.
- Issuing suitable cold weather clothing and equipment.
- Requesting engineer personnel and equipment when necessary for expediting movement.

1-90. 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. Despite 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. (See ATP 3-21.50 for additional information.)

URBAN AREAS

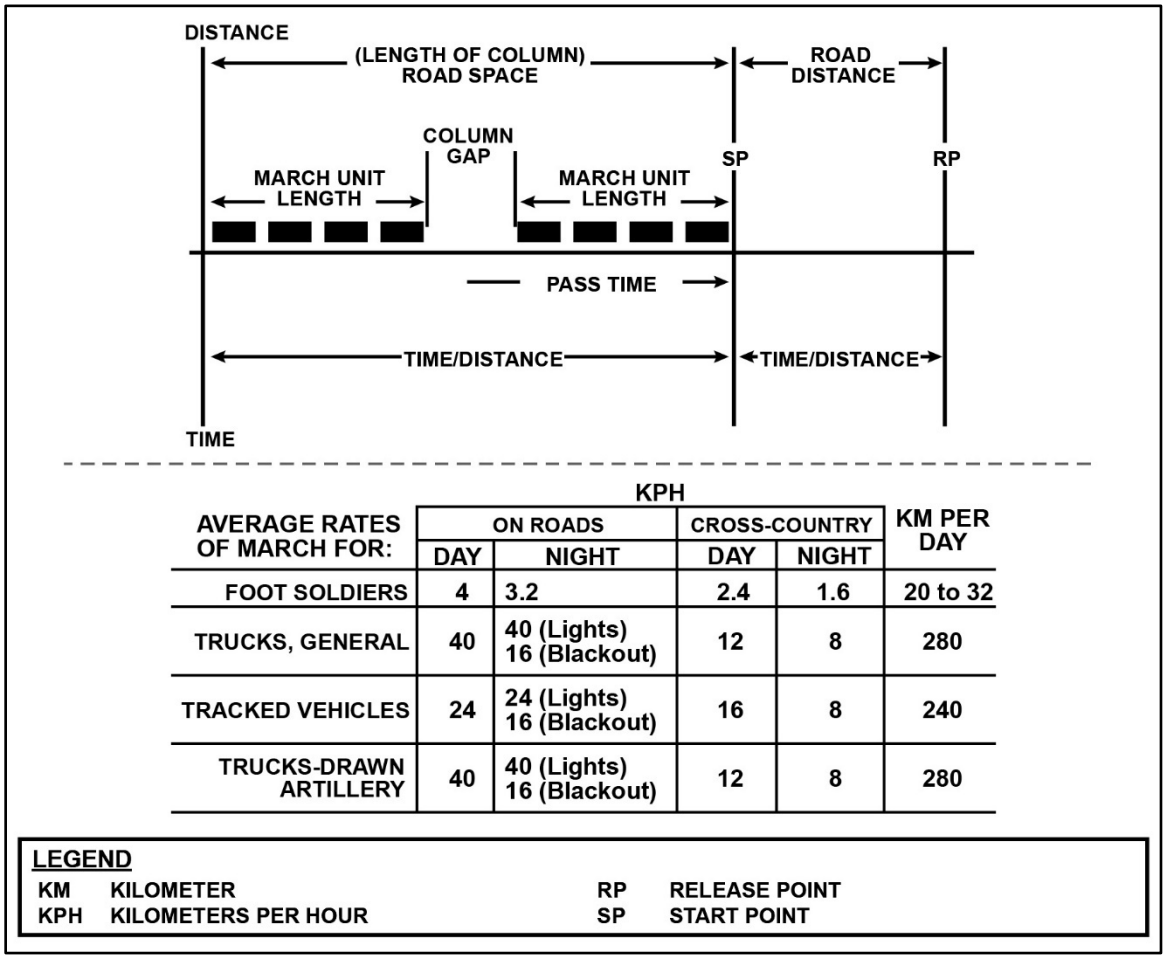
1-91. Urban areas all over the world share many general characteristics. These characteristics include dense city centers, compartmentalization, sectionalism, infrastructure, mass transportation lines, varied street patterns, and continual modernization. Central to these characteristics is population. 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. Commanders and staffs analyze civil considerations (see ATP 2-01.3) in terms of the categories of 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. (See ATP 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. (See ATP 3-21.51 for additional information.)

MARCH DISTANCE, RATE, AND TIME

1-92. 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. The march rate is the physical speed at which a march unit is moving at a given time and differs from the rate of march that is the average march rate over time to include rest. For example, a march unit conducting a dismounted movement on roads in daylight can reasonably expect to maintain a march rate of 106 steps per minute with a 30-inch stride with a 10-minute rest every hour. This results in a march rate of 4.8 kilometers per hour (kph) but an overall rate of march of 4 kph.

1-93. 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 (see figure 1-1).



KPH

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

LEGEND

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

Figure 1-1. Time and distance example

MARCH RATES UNDER DIVERSE CONDITIONS

1-94. Soldiers can only move as quickly 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 the conditions, the slower the pace should be. Moving too quickly, even under ideal conditions, can produce early fatigue, require frequent rest halts, and result in time loss.

1-95. 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. See ATP 3-21.50 for information on dismounted movement rates for mountain environments. See ATP 3-90.98 for information on dismounted movement rates for jungle environments.

MINIMIZING SOLDIER FATIGUE

1-96. To help minimize Soldier fatigue and ensure efficiency, the following should be considered during movement rate evaluation:

- When traveling at a moderate pace, the need for rest halts can decrease and the 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 so 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 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 are rapidly exhausting and requires longer recovery.

STRAGGLER CONTROL

1-97. Stragglers who cannot meet or maintain the pace set for the foot march are the responsibility of their immediate chain 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.

1-98. 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 SOPs.

DISTANCE FACTORS–DISMOUNTED OR MOUNTED MOVEMENTS

1-99. 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 2 to 5 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 the space between two consecutive vehicles or individuals of an organized element of a column.
- Column gap is the space between two organized elements following each other on the same exact route and can be calculated in units of length or time as measured from the rear of one element to the front of following elements.
- Traffic density of attached vehicles is the average number of vehicles occupying 1 mile or 1 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

1-100. Speed indicates the actual rate of speed of a dismounted movement or mounted movement column. It is gaged at a given moment by the relationship between time and distance for the dismounted column or as shown on the speedometer in kilometers per hour or miles per hour for the mounted column.

1-101. Pace is the regulated speed of a column or element that 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 a cadence of 106 steps per minute.

1-102. 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 SOPs usually state the rate for marches on roads and cross country, over normal terrain, and during 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 are usually prescribed for normal terrain.

1-103. Dismounted movement conducted in mountainous, jungle, desert, or arctic areas are characterized by—

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

TIME FACTOR

1-104. 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 RP.
- Pass time is the 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 and is calculated as 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, and it normally represents movement at the head of the column from SP to RP.
- Time gap is the time measured between the rear and front of successive elements moving past a given point.
  - It is a 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 CBRN threats and hazards.

MARCH COMPUTATIONS

1-105. 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

1-106. Time distance is determined by dividing distance being traveled by rate of march. Time distance does not include the 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 the 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 that could occur.

Pass Time

1-107. Length of column is used to determine pass time of a column and includes two parts: space occupied by the Soldier alone including distance between Soldiers and sum of distances between elements of the foot column or column gaps. Total length of column is the sum of two parts:

- Length of column is determined by multiplying the number of Soldiers by the appropriate factor selected from table 1-1, which does not include the distances between units.
- Total distance or column gaps 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

LENGTH OF COLUMN (IN METERS) =	(NUMBER OF SOLDIERS 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)

1-108. Based upon previous movements, march units accumulate past data to facilitate march planning. Accumulated data include approximate pass times for various elements. Units use these 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

1-109. Critical information used in movement formulas includes the SP and RP for the proposed march. The commander directing a march often uses a strip map or overlay to graphically depict critical information about the route to subordinates.

Start Point

1-110. A *start point* is a designated place on a route where elements fall under the control of a designated march commander (FM 3-90). SPs provide 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 its 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 in 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 the prescribed rate and intervals when reached. No elements of a march column or formation should be required to march to the rear of or through another unit to reach the SP.

Checkpoint

1-111. A *checkpoint* is a predetermined point on the ground used to control movement, tactical maneuver, and orientation (FM 3-90). The commander designates checkpoints along the route to assist marching units in complying with the timetable.

Linkup

1-112. A *linkup* is a type of enabling operation that involves the meeting of friendly ground forces, which occurs in a variety of circumstances (FM 3-90). A *linkup point* is a designated place where two forces are scheduled to meet (FM 3-90). It should be an easily identifiable point on the ground that offers cover and concealment. The commander may issue instructions concerning personnel or vehicles that do not march with the unit-for example, instructions on linkup after the march. (See ATP 3-21.20 and ATP 3-21.10 for additional information.)

Release Point

1-113. A *release point* is a designated place on a route where elements are released from centralized control (FM 3-90). RPs provide all units of the march column or formation with a common point for release or reverting 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 or 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 1-2) and overlays (see figure 1-3) 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 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 SP, CP, RP; country, province, or territorial boundaries or lines.
  - All halts (times must coincide with the movement order or OPORD).
- Sustainment support data: locations of all logistical support facilities and points for requesting or obtaining maintenance support and tactical combat casualty care, respectively.

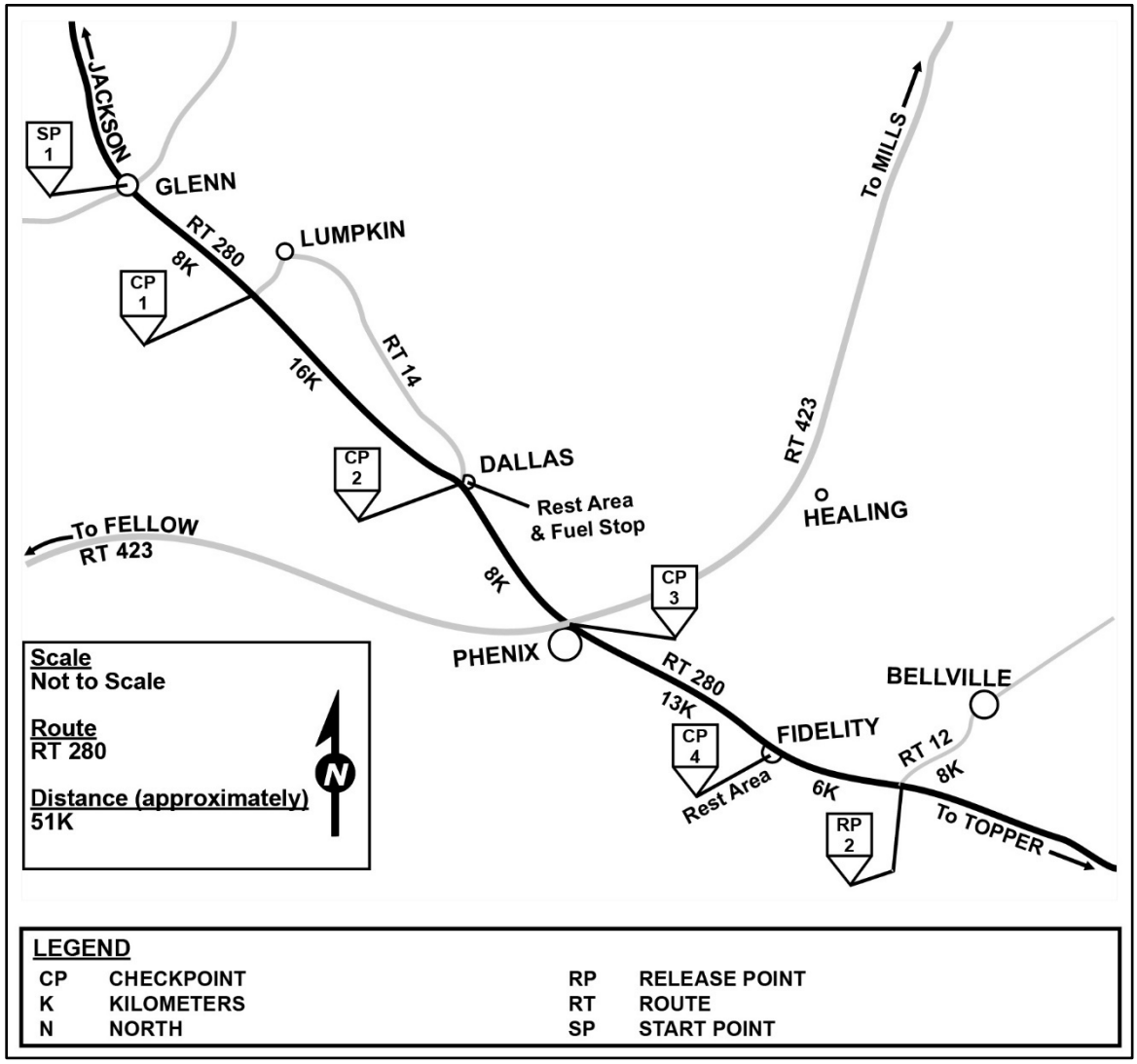


Figure 1-2. Strip map (dismounted movement), example

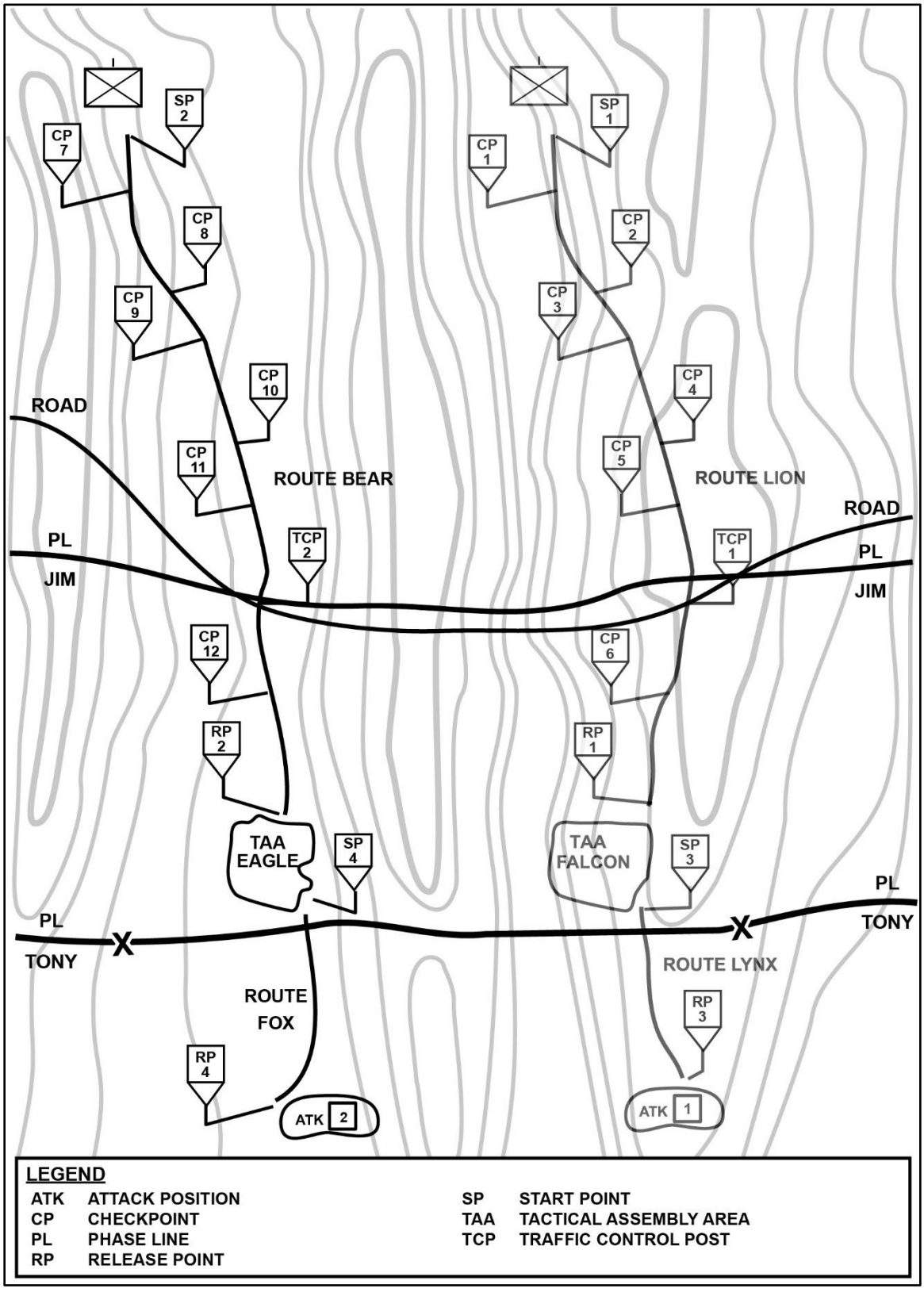


Figure 1-3. Overlay (dismounted movement), example

1-115. Additional information shown on a strip map or overlay generally includes the following:

- CPs on routes are points used for reference in providing instructions, or places where timing might be critical.
  - A route reconnaissance report or map study provides 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 CPs 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 since cities and towns indicate areas of heavy population concentrations and 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 V–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. (See ATP 3-21.20 and ATP 3-21.10 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 drill 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 execute the drill to standard. On-the-spot corrections are made during rehearsals and throughout preparation activities.

PRECOMBAT CHECKS AND PRECOMBAT INSPECTIONS

1-119. PCCs and PCIs are critical to the success of missions. These checks and inspections are leader tasks and cannot be delegated below the team-leader level. For example, at the platoon echelon, the platoon sergeant spot checks throughout the unit's preparation for combat. The platoon leader and platoon sergeant make a final inspection. For the squad echelon, team leaders spot check throughout preparation, and the squad leader makes a final inspection. They ensure the Soldier is prepared to execute the required individual and collective tasks supporting the mission.

1-120. 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.

1-121. 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 exact standards by first-line supervisors, with systematic spot checks made by unit leaders. An effective technique is conducting full PCCs and PCIs during the march recovery period to ensure individuals and unit equipment are immediately ready for the next mission. (See ATP 3-21.8 for additional information.)

Note. See chapter 3, section II for an example of a packing list checklist.

EQUIPMENT MAINTENANCE

1-122. Commanders and subordinate leaders plan for regular maintenance halts throughout extended marches. Weapons, night-vision devices and optical equipment, and vehicles require regular maintenance to perform consistently throughout operations. Weapons and other equipment, including vehicles, can become not mission capable due to direct or indirect enemy fire, mines, improvised explosive devices (IEDs), vehicle accidents, parts failures, and other unforeseen or unexpected events.

1-123. Commanders and subordinate leaders enforce regular preventive maintenance checks and services (PMCS) of all unit equipment. PMCS are 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*) or the manual DA Form 2404 (*Equipment Inspection and Maintenance Worksheet*) are used to record these deficiencies.

1-124. 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. (See ATP 3-21.8 for additional information.)

TIER AND PRIORITIZE RESOURCES AND ASSETS

1-125. Leaders must tier and prioritize the use of the resources and assets during the execution of the mission. Not all resources can support the dismounted unit during all portions of the march. When prioritizing available assets, leaders should consider three factors: responsiveness, accuracy, and method. To better determine which assets to use, leaders should ask themselves a series of questions for each factor. Some example questions determined by responsiveness, accuracy, and method include the following:

- Responsiveness—
  - How quickly can the asset deliver the necessary supplies or equipment?
  - In an emergency, what is the asset's response time?
  - If it is an asset not habitually aligned to the unit, how does that impact its delivery timeline?
- Accuracy—
  - How accurate do I need the delivery to be?
  - Can I risk it being off target?
  - Is there a high or consistent margin of error with the delivery?
  - Will an off-target delivery risk mission accomplishment?
- Method—
  - Will the delivery require me to deviate from my planned route and expend more effort?
  - Will the unit compromise its position or lose the element of surprise due to the delivery?

1-126. As the leader evaluates each load plan and its ability to manage the load, the leader continues to analyze the mission. The load management and analysis completed during the troops analysis portion of METT-TC (I) contributes to the leader's overall tentative plan and provides vital information for planning routes, logistics, rates of march, and many other aspects of the operation.

1-127. Managing the Soldier's load is a critical leader task. The Soldier's load is always METT TC (I) dependent and must be closely monitored. Soldiers cannot afford to carry unnecessary equipment into the battle. Not every contingency can be covered.

This page intentionally left blank.

Chapter 2
March Execution

In execution, commanders, staffs, and subordinate leaders focus their efforts on translating decisions into actions. Inherent in execution is deciding whether to execute planned actions (such as phases, branches, and sequels) or to modify the plan based on unforeseen opportunities or threats. Execution is enhanced by enabling and adapting plans to changing situations. This chapter addresses the organization of forces and conduct of the march. It concludes with a discussion of duties and responsibilities for the march.

SECTION I–ORGANIZATION OF FORCES FOR THE MARCH

2-1. Commanders use tactical road marches, approach marches, and forced marches to rapidly relocate units within an area of operations (AO) to conduct combat operations. Tactical road marches are used when contact with the enemy is not expected; while approach marches are used when contact is intended. Forced marches are longer or faster than usual or in adverse conditions. Organization of forces for the march must be flexible to changing conditions and responsive to the commander.

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

TACTICAL ROAD MARCH

2-2. A *tactical road march* is a rapid movement used to relocate units within an assigned area to prepare for combat operations (FM 3-90). Tactical road marches are organized into march columns. A *march column* consists of all march serials using the same route for a single movement under control of a single commander (FM 3-90). March execution depends upon a well-designed task organization to accomplish critical tasks and to provide the 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 subdivision of a march column organized under one commander (FM 3-90), who plans, regulates, and controls the serial. An example is a battalion serial formed from a brigade-size march column. A *march unit* is a subdivision of a march serial (FM 3-90). It moves and halts under the control of a single commander who uses voice and visual signals. An example of a march unit is a company from a battalion-size march serial.

2-4. During extended road marches, halts are necessary to rest personnel, adjust movement schedules, reorganize march elements, and service vehicles. The movement order or operation order (OPORD) or unit standard operating procedures (SOPs) 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 planned assembly area to prevent route congestion and to avoid being lucrative targets. March elements establish security and take other measures to protect (for example, establish local security) their forces. (See ATP 3-21.10 and ATP 3-21.20 for additional information on tactical road marches.)

MARCH COLUMN ORGANIZATION

2-5. March columns provide excellent speed, control, and flexibility, but sacrifice flank security. They provide 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 (see figure 2-1 on page 26).

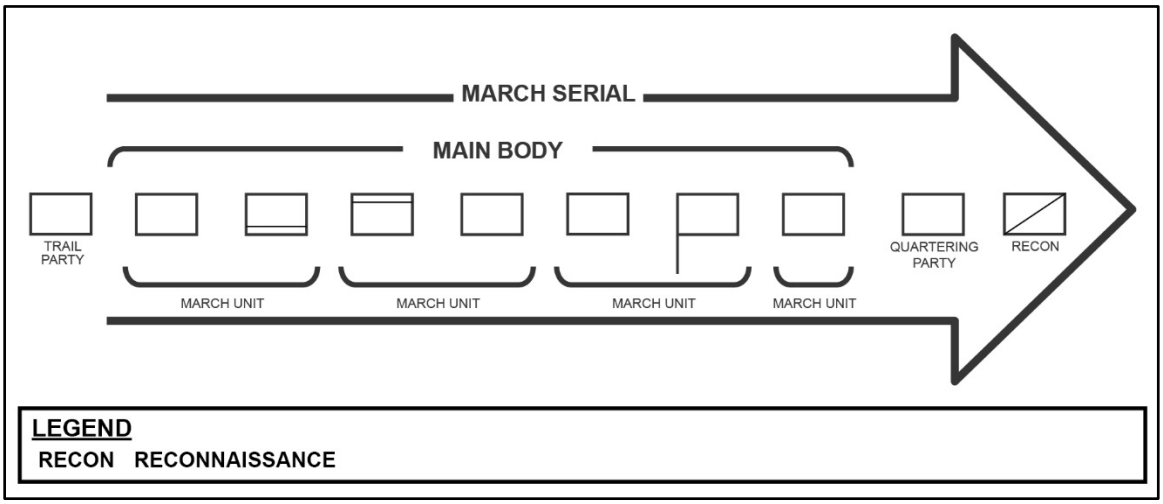


Figure 2-1. March organization, example

Note. March columns are organized to maintain unit integrity and task-organized as determined by the mission variables of METT-TC (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations.

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 includes reconnaissance forces and attached engineer support and traffic control elements. When the situation dictates, chemical, biological, radiological, and nuclear (CBRN) survey teams may be included in the reconnaissance element. Generally, the unit SOPs establish the reconnaissance element's base composition that can be modified to meet specific march requirements. The minimum of information required from the reconnaissance element includes—

- Available routes and conditions or trafficability of each route.
  - Routes may be specified by higher headquarters.
  - Trafficability should include factors such as slope, general route surface (for example, paved, cross-country, sand), and radius of turns that could hinder vehicular movement.
- Recommended rate of march with changes to the rate at different points along the route.
- Start point (SP) and release point (RP) selections and confirmation of their suitability.
- Confirmation of assembly area(s) and halt(s) locations.
- Checkpoint (CP) locations along route.
- Distance between CPs and total distance from SP to RP.
- Location of obstacles including estimations to repair and maintain routes.
- Recommendations to bypass obstacles.
- Number of guides (as necessary) required and their route locations.
- Locations of possible or likely danger areas, potential ambush sites, and chance enemy contacts.
- Locations of possible medical evacuation (MEDEVAC) points along the route.
- Heights and widths of underpasses and overpasses.
- Weight limits for and widths of roads and bridges.

Quartering Party

2-7. A *quartering party* is a group dispatched to a new assigned area in advance of the main body (FM 3-90). The dispatched group (generally made up of unit representatives) secures, reconnoiters, and organizes the

new assigned area before the main body's arrival and occupation. As an example, using a battalion-size unit, the composition and responsibilities of quartering parties may include—

- Quartering party commander; battalion logistics staff officer (S-4) and battalion CBRN representative; company representatives including—
  - Supply personnel.
  - Communications.
  - Security.
  - Unit guide (if available).
  - Medical personnel.
- Quartering party commander indicates the location of major subordinate units on the ground and selects exact locations for battalion command posts and support areas based on general locations selected by the battalion operations staff officer (S-3), in coordination with the S-4.
- Other considerations regarding locations 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.
- The quartering party commander also formulates plans to receive and guide units from the RP to their areas:
  - Plans are prepared to guide each unit over a designated route based on order of march.
  - This route begins at the RP and extends to the unit's new area.
  - Guides must understand and rehearse the plan.
  - These plans prevent congestion or delays near RPs.
  - Actual dispatch of the quartering party can follow the issuance of the movement order or OPORD.

Main Body

2-8. The main body of the march column consists of the remainder of the unit, including attachments and minus the trail party The *main body* is the principal part of a tactical command or formation. It does not include detached elements of the command, such as advance guards, flank guards, and covering forces (ADP 3-90). 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 or OPORD states the 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 or 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 or element. If the march unit is behind schedule, it uses the designated catchup rate of march. March units report crossing each control point as assigned by the movement order or 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 (FM 3-90). It normally consists of primarily maintenance elements in a mounted march. 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 consist 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 pick up and treat stragglers from various march units within the battalion serial. Once the trail party picks up stragglers, the battalion personnel staff officer (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. Marches are not complete until the unit establishes 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 the main body and trail party occur.

ORDER OF MARCH

2-14. During marches, the 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 enemy obstacles and explosive hazards along the march route.
- Antitank weapons can be arranged 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.

MARCH TECHNIQUES

2-15. Organized march columns employ three march techniques: open column, close column, and infiltration. Each of these techniques use scheduled halts to control and sustain the march. Mission variables of METT-TC (I) 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 or 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 their lead elements 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 the distance between dismounted Soldiers and vehicles when applicable for greater dispersion. Distance between dismounted Soldiers varies from 2 to 5 meters allowing dispersion and space for marching comfort. Distances exceeding 5 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 the 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 a reasonable degree of control. In an open column, a single Infantry company, with intervals between its platoons, occupies about 1 kilometer of road or trail. Vehicle density varies from 15 to 20 vehicles per kilometer.

Close Column

2-19. The dismounted movement equivalent to the close column is a limited visibility march (see paragraphs 2 30 to 2-40). Distance between Soldiers is reduced to 1 to 3 meters to help maintain contact and facilitate control. Limited visibility marches are characterized by close formations, reconnaissance, a 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. Infiltration requires more time to complete the movement, column control is more difficult and complex, 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.

Note. Infiltration as a march technique during troop movement differs from the infiltration discussion as a form of maneuver. (See ATP 3-21.10 chapter 2 for information on the forms of maneuver.)

APPROACH MARCH

2-23. An *approach march* is the advance of a combat unit when direct contact with the enemy is intended (FM 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 (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 the line of departure since the lead force provides those units a measure of security.

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 the mission variables of METT-TC (I), the commander assigns an AO or an axis of advance in combination with routes to units conducting an approach march (see figure 2-2). These routes, AOs, or axes facilitate the force's movement and maximize its use of concealment. Within the approach march, the commander may assign separate routes, AOs, or axes of advance for each element unless an individual subunit has the task of either follow-and-assume or follow-and-support.

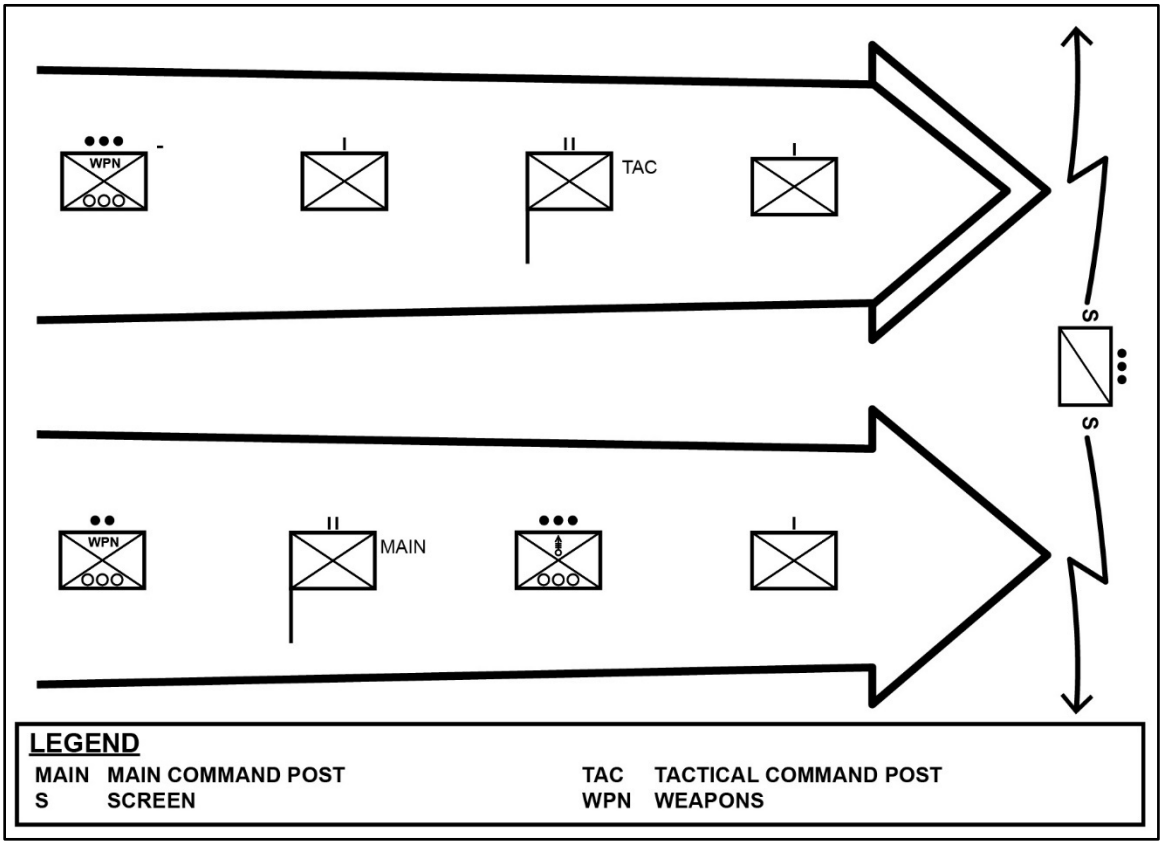


Figure 2-2. Initial axis of advance, example

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 multiple routes or cross country while continuing to employ security elements (see figure 2-3). The commander may employ reconnaissance and/or security forces forward and to the flanks to increase the distance traveled before the main body must transition 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.

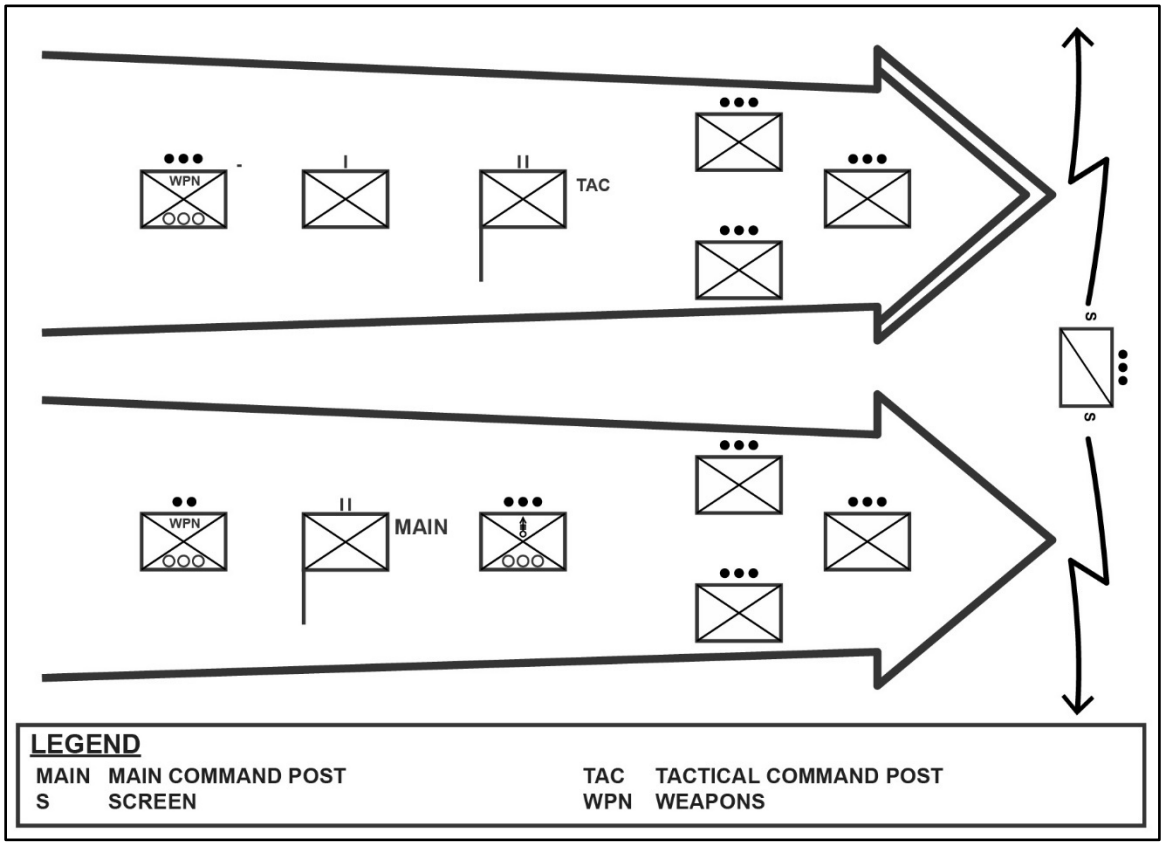


Figure 2-3. Less vulnerable columns, example

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 govern the march formation during tactical movement. Tactical movement differences between approach marches and tactical road marches include the following:

- Approach marches employ larger security forces because of their 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 typically 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 likelihood 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 movement formations described in ATP 3-21.8 in conjunction with three movement techniques: traveling, traveling overwatch, and bounding overwatch. (See ATP 3-21.10 and ATP 3-21.20 for additional information on the approach march.)

FORCED MARCH

2-29. When necessary, a unit can accelerate its forced march, so it arrives at its destination quickly. This is normally accomplished by increasing marching hours for each day rather than rate of march (speed of units conducting the 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 dependent on the mission variables of METT-TC (I). The march organization, order, and techniques for the forced march are the same as for the tactical road march (see paragraphs 2-2 to 2-22).

2-30. A normal foot march day, under ideal conditions, is 8 hours, for 32 kilometers at a rate of 4 kilometers per hour (kph). Under ideal conditions, maximum distances recommended for forced marches are—

- 56 kilometers in 24 hours (14 hours of marching in 24 hours).
- 96 kilometers in 48 hours (12 hours of marching each 24-hour period).
- 128 kilometers in 72 hours (12 hours of marching in the first two 24-hour periods, 8 hours in the last 24-hour period).

2-31. 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 the 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.

SECTION II–CONDUCT OF THE MARCH

2-32. The conduct of the march must be flexible to changing conditions and responsive to the commander. This section addresses the conditions surrounding the foot march, Soldier and leader engagement, march security, supporting enablers, and contingencies for reaction to enemy contact. It concludes with a discussion of cognitive load, the combination of the relevant, intrinsic, and extraneous information present during the execution of a Soldier's or leader's task.

LIMITED VISIBILITY MARCH

2-33. Tactical conditions surrounding a foot march may require a limited visibility march. Limited visibility marches are characterized by close formations, difficult control and reconnaissance, and 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. 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.

TACTICAL MOVEMENT

2-34. Prior to tactical movement, commanders and staffs gather intelligence on the proposed march route. Commanders and staffs conduct mission analysis to determine the control, navigation, and security measures required to conduct the movement under limited visibility conditions.

Control

2-35. 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 the intervals between Soldiers and units.
- Leaders conduct headcounts often.
- Units increase the number of guides and CPs to ensure units remain on the correct route.

Navigation

2-36. 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

2-37. As with any operation, leaders consider which security measures to employ and when to employ them to mitigate risk, such as—

- Using forward and flank security elements to provide early warning for the main body.
- Enforcing strict noise and light disciplines.
- Using radio silence when possible.
- Using camouflage.
- Using terrain to avoid detection by enemy surveillance or night-vision devices.
- Making frequent listening halts; conducting stop, look, listen, and smell.
- Masking sounds of movement by taking advantage of rain, wind, and nearby flowing water when possible.

Disadvantages

2-38. Disadvantages during a march under limited visibility may include—

- Difficulty in navigation.
- Slower rate of march.
- Difficulty in recognizing CPs.
- Difficulty in controlling subordinate units.
- Difficulty in maintaining the proper interval between units.
- Reduced support by aviation.
- Difficulty in reacting to enemy contact.
- Difficulty with MEDEVAC and casualty evacuation (CASEVAC).
- Ineffective unmanned aircraft system (UAS) coverage.

Advantages

2-39. Advantages during a march under limited visibility may include—

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

INCREASED CONTROL MEASURES

2-40. Unit SOPs 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 the intervals between elements of the column.
- Increasing the use of connecting files between march units in the serial.
- Monitoring radios closely.
- Increasing radio traffic during limited visibility to ensure shared understanding across echelons.

2-41. 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 (I). Consistent with light discipline, visual communication means such as flashlights, lanterns, luminous markers, lasers, and pyrotechnics are used.

RISK REDUCTION MEASURES

2-42. Depending on the mission variables of METT-TC (I) or unit SOPs, limited visibility marches may require risk reduction measures to reduce the level of risk. Risk reduction measures may include—

- Using friendly force identification marking SOPs to prevent fratricide.
- Using trails or routes not used by vehicles.
- Placing 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.
- Marking moving or static traffic guards and other key personnel, if the tactical situation permits, with reflective or luminescent materials such as reflective fabric or tape, vests, caps, mittens, helmet bands, and traffic ensembles.
- Warning vehicle operators of the presence of Soldiers on or near the roadway and limit speeds, as needed.
- Ensuring vehicles use limited visibility lights if mission requirements allow.
- Dictating ammunition ball-to-tracer ratio for aid in target acquisition during contact as per unit SOPs or mission requirements.
- Providing the exclusive use of selected routes by foot Soldiers. Enforcing safety measures when Soldiers are assigned exclusive use of routes that are negotiable by wheeled or tracked vehicles.

SOLDIER AND LEADER ENGAGEMENT

2-43. 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.

2-44. Soldier and leader engagements require clear guidance in the form of SOPs 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. (See FM 3-53 for additional information.)

MARCH SECURITY

2-45. During the march, units maintain security through observation, orientation, dispersion, concealment, electromagnetic signature/emission control, noise, and light discipline, 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. (See ATP 3-21.8 chapter 3 for additional information.)

AIR AND MISSILE DEFENSE

2-46. March, as well as movement, air and missile defense planning considerations continue to apply to units during foot marches, like in any other operation. Air and missile defense sensors and command and control (C2) elements external to the unit provide early warning against aerial and missile attack and populate the unit's common operational picture. Soldiers train in aircraft recognition and rules of engagement (ROE) due to multiple factions using the same or similar aircraft, to include international and private organizations employing their own or charter civilian aircraft and Group 1 and 2 UASs. (See ATP 3 01.8 for additional information on air and missile defense and ATP 3-01.81 for additional information on counter-UAS measures.)

Note. See ATP 3-01.15 for information on the tactics, techniques, and procedures for an integrated air defense system. See ATP 3-01.50 for information on the operations of the air defense and airspace management cell within the brigade combat team fire support cell. (See FM 3-96 for additional information.)

2-47. Counter-rocket and artillery batteries, and counter-mortar firing elements may be located in or near the unit's AO to support its operations. Battery sensors detect incoming rockets, artillery, and mortar shells and may be used to detect Group 1 and 2 UASs. The battery's fire control system predicts the flight path of incoming rockets and shells, prioritizes targets, and activates the supported AO's warning system according to the established ROE. Exposed elements within the AO can then take cover and provide cueing data that allow the battery's weapon system to defeat the target before the target impacts the area. The commander clearly defines command and support relationships between counter-rocket, artillery, and mortar elements and the unit during planning. (See ATP 3-01.60 for additional information on counter-rocket, artillery, and mortar fires and ATP 3-01.81 for additional information on counter-UAS measures.)

2-48. Commanders and subordinate leaders ensure all passive and active air defense measures are well planned and implemented, to include scanning for any hostile small-unmanned aircraft systems. (See Battle Drill-React to Aircraft While Dismounted-Platoon [07-PLT-D8015].). Passive measures include use of concealed routes and assembly areas, movement on secure routes, marches at night, increased intervals between elements of the columns, dispersion between Soldiers, using terrain to mask movement, and slowing or stopping movement to eliminate dust signature. Air guard duties assigned to specific Soldiers during dismounted (or mounted) movements and marches give each a specific search area. For movements and marches, seeing the enemy first gives the unit time to react. Leaders understand that scanning for long periods decreases the Soldier's ability to identify enemy aircraft. During extended or long marches and movements, Soldiers are assigned air guard duties in shifts. Units take passive measures unless or until threat aircraft are within range of assigned or attached weapons, at which time when threatened they take active measures. Active measures primarily involve engaging threat aircraft with a high volume of fires with the appropriate lead applied. Active measures include use of organic and attached weapons according to the operation order and unit SOP. (See ATP 3-21.8, ATP 3-21.10, and ATP 3-21.20 for additional information on movements.) Additional passive air defense measures include—

- Use of cover and concealment for stationary vehicles.
- Use of camouflage to conceal reflective surfaces.
- Use of cover and concealment during temporary stops and extended halts.
- Nonengagement of passing aircraft unless it assumes an attack profile.
- Establishment of air warning system.
- Establishment of immediate action drills.

COUNTERING UNMANNED AIRCRAFT SYSTEM THREATS

2-49. Companies and below take the concept of protection developed at battalion and implement it. Their main focus during troop leading procedures is reacting to air contact battle drills. Leaders at company and below conduct rehearsals and examine their unit's active and passive measures. Rehearsals check things such as air guard locations, assigned sectors, UAS reporting procedures, communication plans, air defense warning status, weapons control status (WCS), engagement criteria, and threat UAS identification.

Note. The company commander and its subordinate leaders should assume the company is being observed by the enemy through reconnaissance forces, surveillance assets, and targeting systems, and not assume they are under a protective umbrella of friendly air and missile defense units. UASs (both military and civilian off the shelf) are everywhere and accessible to any one individual or organization. While not all hostile air threats require engagement using air defense measures from air and missile defense units, there is still a requirement to detect, identify and be prepared to counter and defeat all classes of UASs. (See ATP 3-01.81 for classifications and additional information on counter-UASs.)

2-50. Understanding that planning is the first step toward effectively countering UAS threats. Neutralizing the UAS threat requires a combined arms approach that employs capabilities from all the warfighting functions. Effective planning synchronizes activities across echelons and warfighting functions to ensure complementary and redundant capabilities. Planning considerations are part of a coherent planning structure that includes—

- Layered approach.
- ROE.
- Airspace control.
- Air defense warning condition.
- WCS.
- Early warning network.
- Prioritized protection list.
- Warnings.

Layered Approach

2-51. A layered defense provides multiple engagement opportunities, ideally beginning at the maximum range from friendly forces and areas, and before any attacking UAS can release its weapons. A layered defense normally includes support by necessary space, surface, and airborne early warning, detection and tracking assets.

Rules of Engagement

2-52. Commanders have the responsibility to take whatever action is necessary to protect their forces and equipment against attack and ensure their Soldiers operate in accordance with established ROE. A unit can push engagement authority of threat system UAS lower, but they balance the risks of a quicker response with the potential for fratricide.

Airspace Control

2-53. Divisions and brigades distribute the airspace coordination order, the unit airspace plan, and the current air picture via C2 systems that subordinate units have access to. This includes systems such as the CP computing environment or the joint battle command-platform. Not all brigades and battalions have access to the tactical airspace integration system which is the C2 system that manages the air picture, forward area air defense C2, or air and missile defense early warning systems. Subordinate units without air defense and air management cells or access to these systems, are not capable of maintaining awareness of the current friendly air picture and rely on those echelons with those systems to share and create products they can use.

Air Defense Warning Conditions

2-54. Air defense warning condition is an air defense warning given in the form of a color code corresponding to the degree of air threat probability. Warning conditions are a procedural control used to prepare units based on the assessed threat. Different conditions can be provided for different air threats. Commanders may issue higher, but not lower, conditions for their assigned area. Leaders ensure that every Soldier knows the current air defense warnings.

Weapons Control Status

2-55. WCS is a control measure that establishes the conditions under which air defense weapons (including small arms and crew served weapons) are permitted to engage threats. WCSs can apply to weapon systems, volumes of airspace, or types of air platforms. The tactical situation normally determines the degree or extent of control necessary over weapon systems. The brigade air and missile defense cell either establishes separate WCSs for various air threats, including fixed and rotary-wing aircraft, and UASs or an overall control status for any threat air engagement. The three WCSs for counter-UASs are—

- Weapons free.
  - Engage any UAS that is not positively identified in accordance with ROE as friendly.
  - This is the least restrictive weapon control status.
- Weapons tight—UASs are engaged only when identified as hostile in accordance with ROE.
- Weapons hold.
  - Units may fire only in self-defense or when ordered by proper higher authority.
  - This is the most restrictive weapon control status.

Early Warning Network

2-56. As part of their counterreconnaissance efforts, all units establish an air threat early warning network. This network is usually over frequency modulation (FM) and is a means of sharing air threat situational understanding for units without dedicated air defense C2 systems. These networks alert everyone. Units practice relaying information using this network to reduce the time required to notify everyone.

Prioritized Protection List

2-57. Normally, the company receives a prioritized protection list (developed at brigade and battalion echelons) to help prioritize the use of assigned or allocated protection capabilities. The prioritized protection list provides focus on defending critical assets such as C2 nodes or logistics areas as part of the overall protection plan. Critical assets can be people, property, equipment, activities, operations, information, facilities, or materials.

Warnings

2-58. Once an air threat is detected, all friendly forces need to be quickly warned. This can happen by two methods-a top-down approach, or a bottom-up approach. Small UAVs are typically detected by forward units first, so rehearsing the use of the unit early warning net and rehearsals from the bottom-up are critical. No matter which approach is used, the information is passed using the size, activities, location, unit, time, and equipment (SALUTE) report format. Receipt of this report should trigger additional follow-on actions for all units. These follow-on actions could be for units to freeze in place or engage with lethal or non-lethal means. When possible, units detecting air threats alert adjacent units. Table 2-1 on page 38 shows some additional information to collect on unknown UAS and to include in a SALUTE report. (See ATP 3-01.81 for additional information.)

Table 2-1. Example counter-unmanned aircraft system detection report (SALUTE format)

Line	*Information*	*Example*
1	Size	Report the number of unmanned aircraft systems (UASs), or size of the formation.
2	Activity	Report a detailed account of actions: • What is the UAS's direction of movement? • Was there any hostile action? • Is the threat UAS loitering in one spot? • Is it flying straight? • Was the threat UAS approach observed or was it spotted overhead?
3	Location	Report where the activity was seen. Include 6- to 8-digit grid coordinate of reporting element and either grid or distance and direction from reporting element location (known point).
4	Unit (Description of UAS)	Include details such as— • Fixed-wing or rotor/multi-rotor. • If fixed wing, include— ▪ Estimated length of wingspan. ▪ Tail configuration. • If rotor/multi-rotor, include— ▪ Number of rotors. ▪ Height. ▪ Payload, sensors, and weapons. ▪ Any lights. ▪ Other distinguishable markings.
5	Time	Report the time the activity was observed.
6	Equipment	If possible, report all equipment associated with the UAS, such as payload or weapons.

HALTS

2-59. During extended marches, halts are necessary to rest personnel, adjust movement schedules, reorganize march elements, and if applicable service vehicles. The movement order or OPORD or unit SOPs regulate(s) 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

2-60. 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.

2-61. Extended marches during daylight hours should end early enough to provide Soldiers with rest and time to prepare for the 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 or OPORD or unit SOPs. Leaders inspect Soldiers and equipment

during halts, and medics or combat lifesavers (CLSs) administer medical treatment to those who need it. Regardless of what happens, all-around security must be maintained.

2-62. 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. 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 loosening gear and sitting or lying with their feet elevated.

Unscheduled Halts

2-63. Unscheduled halts may be caused by unforeseen actions or developments such as obstacles, traffic congestion, or equipment failure. During short halts, the march column's initial priority is to establish local security. Short halts typically take 1 or 2 minutes. Soldiers seek immediate cover and concealment and take a knee. Long halts typically take more than 2 minutes. Soldiers should 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

2-64. If possible, obstacles reported by reconnaissance, or another 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

2-65. Overwatch positions are identified during mission planning. Key terrain identified to provide overwatch, often located at higher elevations, enables security through areas of possible enemy contact. To compensate for the 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 should be varied to increase security, to include the return movement of the overwatch element.

Camouflage, Noise, and Light Discipline and Emission Control

2-66. The march is visible to enemy forces and target acquisition capabilities on every spectrum, including visible light, sound, and across the electromagnetic spectrum. The march commander and subordinate leaders must take steps to eliminate or minimize all these signatures to prevent targeting. Natural or artificial materials may be used as camouflage to confuse, mislead, or evade the enemy. Leaders ensure all elements abide by strict execution of noise (this includes carried equipment) and light discipline and emissions control (for example, thermal and electronic). Infrared lights can provide additional illumination when necessary; however, peer threat forces can easily detect it. Radios and other C2 systems all emit detectable signatures and must be used carefully; for instance, minimizing transmissions, reduced power settings, masking signals with terrain, and so forth, can help reduce the likelihood of detection. Cell phones must not be used under any circumstances. (See ATP 3-21.8 for a detailed discussion.)

COMMUNICATIONS

2-67. 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 or serial, each march element may utilize its own control net. Commanders and subordinate leaders ensure Soldiers follow the movement order or OPORD and unit SOPs.

Communications techniques, such as voice and signal, must be established and rehearsed. (See ATP 6-02.53 for additional information.)

2-68. C2 systems are the primary means of communication during marches, but messengers and visual signals 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 or OPORD and unit SOPs contain(s) instructions for their use in specific situations.

2-69. When radio silence is in effect, 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 the completion of halts or to warn Soldiers of an enemy air attack or CBRN hazards. Sound signals normally are standardized and can be included in unit SOPs. If units are operating in a communication degraded environment, they may become necessary.

2-70. In an environment where every transmission is potentially targeted, the primary, alternate, contingency, and emergency (also called PACE) plan enables both mission success and survivability. To be effective, the PACE plan must be understood and rehearsed by every participant. The PACE plan is a communication plan that exists for a specific mission or task, not a specific unit, as the plan considers both intra- and inter unit sharing of information. The march commander's ability to exercise C2 during a movement can suffer due to communication systems not working properly or otherwise unavailable.

SCHEME OF FIRES

2-71. *Scheme of fires* is the detailed, logical sequence of targets and fire support events to find and engage targets to support the commander's objectives (JP 3-09). The march commander and staffs integrate and synchronize indirect fires, Army aviation attack and reconnaissance units (manned and unmanned) and/or organic or tasked echelon-specific UAS firing platforms, and close air support (CAS) 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

2-72. Indirect fire targets along the route are planned on probable locations of enemy attempts to attack the movement. *Call for fire* is a standardized request for fire containing data necessary for obtaining the required fire on a target (FM 3-09). Table 2-2 contains the 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. (See FM 3-09 for additional information.) Unique challenges include—

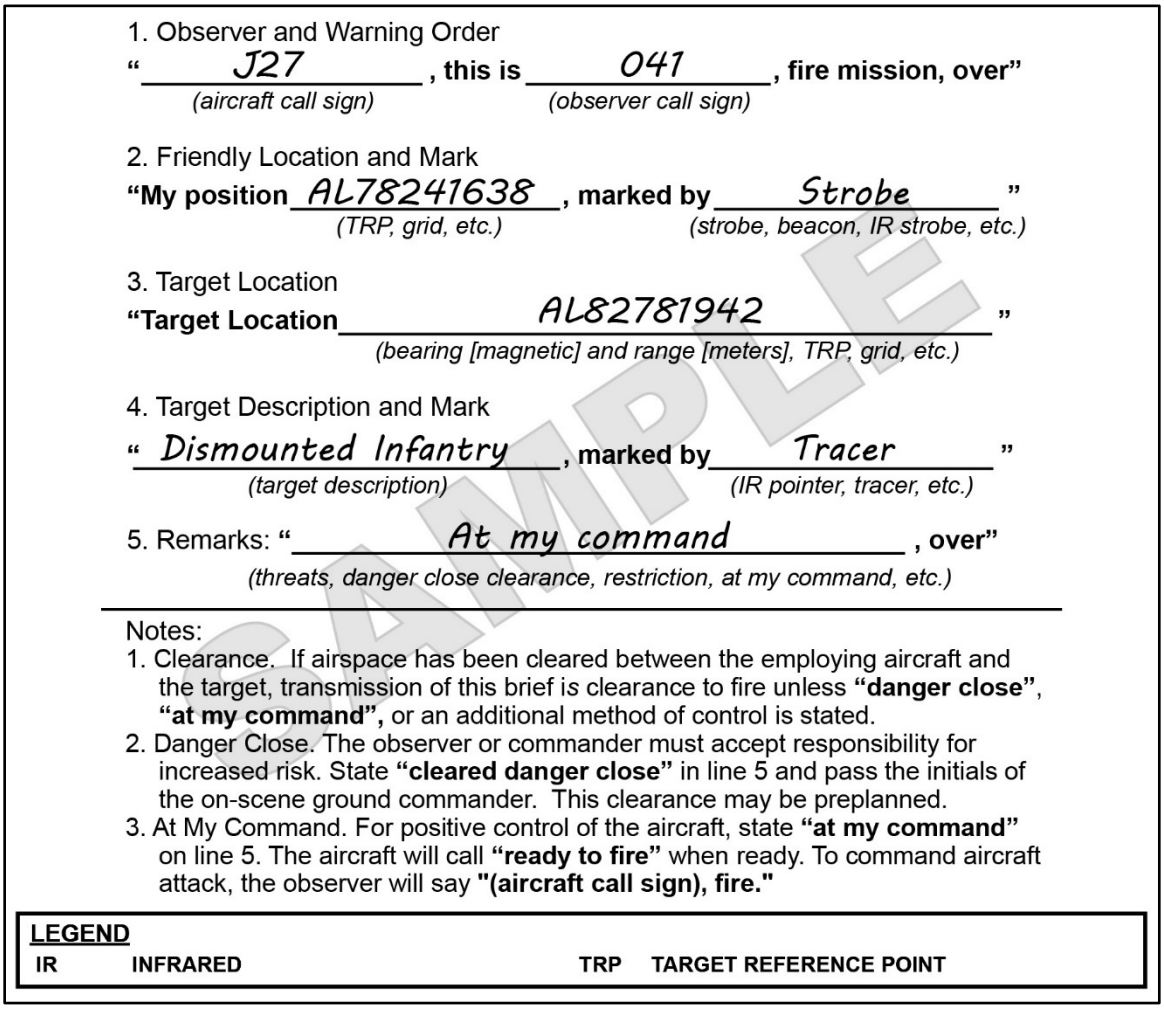
- Unpredictable weather conditions affecting accuracy of rounds.
- Targets located on peaks and steep terrain, making adjustments difficult.
- Intervening crests requiring placement of observers on dominating heights for overwatch.
- Limited terrain suitable for firing positions to cover a particular 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.
- Marches typically take place in rear areas or in AO assigned to units other than the march unit.
- When marches are held in rear areas or other AOs, march units must be aware of extra steps and adjacent unit coordination's required to execute clearance of fires drills.

Table 2-2. 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 AVIATION

2-73. Army aviation attack targets are planned on probable locations of enemy attack along the march route. Army aviation call for fire is a coordinated attack by Army attack aircraft against enemy forces in close proximity to march units. Army aviation call for fire (see figure 2-4 on page 42) is not synonymous with CAS 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 aviation attack units 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. (See ATP 3-04.1 for additional information.)


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 , over"
(threats, danger close clearance, restriction, at my command, etc.)

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"**, **"at my command",** or an additional method of control is stated.
2. Danger Close. 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. To command aircraft attack, the observer will say **"(aircraft call sign), fire."**

LEGEND
IR INFRARED TRP TARGET REFERENCE POINT

SAMPLE

Figure 2-4. Army aviation attack request call for fire format

2-74. 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 enemy and friendly locations, flight leads formulate an attack plan and brief the supported commander and their other attack team members.

Limitations

2-75. 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.

Marking and Identifying Locations and Targets

2-76. 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 the day, vision systems of the AH 64 allow accurate identification of targets.

2-77. 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

2-78. 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

2-79. 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.

UNMANNED AIRCRAFT SYSTEM EMPLOYMENT

2-80. When feasible, echelon-specific 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 UAS 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 and fires (echelon-specific UAS [to include firing] platform).
- To disrupt enemy radio communications.
- To deceive or divert the enemy.

2-81. 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 employment of echelon specific UAS platforms (for example, organic or tasked to the Infantry rifle company) depends on the situation. Employment advantages and disadvantages at each echelon, as with any capability, determine the system's employment

2-82. Conditions affecting 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 ensure aircrews are alerted to airspace restrictions as they arise for UAS use.

2-83. In mountainous terrain, where weather conditions can vary abruptly and easily crash UASs, commanders may decide the 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. (See ATP 3-04.1 for additional information.)

CLOSE AIR SUPPORT

2-84. *Close air support* is air action by 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 3-09.3). Units with a reasonable expectation of conducting terminal attack control need to have certified joint terminal attack controllers (JTACs) available. In rare circumstances, the ground movement commander might require CAS when a JTAC or forward air controller (airborne) 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/forward air controller (airborne). In these circumstances, the CAS aircrew assists the ground movement commander to the greatest extent possible to bring fires to bear. (See ATP 3-21.10 for additional information.)

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

SCHEME OF ENGINEER OPERATIONS

2-85. Engineers review the movement order or OPORD to assist in conveying the scheme of engineer operations required to support the march. Assignment of engineering tasks prior to the march effectively addresses 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. (See FM 3-34 for additional information.)

2-86. Geospatial engineering is focused on improving the march commanders understanding of the terrain the route covers. 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.

2-87. Engineer reconnaissance includes tactical and technical engineer support to the march. Engineer reconnaissance, like CBRN and other technical applications, is the focused application of unique capabilities supporting reconnaissance operations and is applicable to the march. Engineer reconnaissance generated from and organized by engineer lines of efforts provides a range of technical reconnaissance capabilities. Each line supports varying degrees of technical expertise and efforts to the march. (See ATP 3-34.81 for additional information.)

EN ROUTE SUSTAINMENT

2-88. Based on the march method and route used, the commander may have to pre-position 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 more closely 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

2-89. While on the 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 battlefield kitchens or MREs. According to unit SOPs, units may establish transient field feeding sites along the march

route. Units must maintain local security and be prepared to react to contact when establishing field feeding sites in the event of an enemy attack.

DISPOSING OF HUMAN WASTE

2-90. During short halts, Soldiers use a brief relief bag or cathole latrine. The cathole latrine is dug about 1 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 are usually 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. The number of latrines is based on one commode or urinal per 25 male Soldiers and one commode per 17 female Soldiers.

2-91. Human waste disposal facilities are required when discussing proper disposal of human waste during movements. The two categories of human waste disposal facilities are 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 a 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. (See ATP 4-25.12 for additional information.)

MAINTENANCE EN ROUTE

2-92. 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 a 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 off 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.
- Recovery crew limits vehicle recovery operations to those situations where tow bars may not work (use tow bars when possible).
- Recovery crew does not obstruct roads during recovery operations.
- Recovery crew does not destroy equipment unless directed to do so through command channels or as a last resort to prevent enemy capture.

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

REFUELING EN ROUTE

2-93. Requirements for refueling are based on the normal operating range of march vehicles. The operating range is the normal distance vehicles can travel on a full tank of fuel. The operating range varies according to terrain, vehicle, and load. Heavily loaded vehicles operating on poor roads in hilly terrain get less fuel mileage than lightly loaded vehicles operating on ideal roads in fairly level terrain. Use vehicles with the worst fuel operating range to determine when to refuel. This practice prevents vehicles with the worst fuel operating range in the march from running out of fuel.

2-94. Drivers and vehicle commanders always should know 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 SOPs might dictate otherwise. If vehicles are used during the march, refueling is a vital area covered in the movement order or OPORD.

MEDICAL SUPPORT EN ROUTE

2-95. The march commander must consider medical support based on the mission, distance of the march, and likelihood of enemy contact. Medical support can be provided by organic medical personnel assisted by trained CLSs or by attachment of medical teams to march units by higher headquarters. Normally, MEDEVAC frequencies are established in the movement order or OPORD.

2-96. 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 following MEDEVAC precedence criteria and available resources. (See ATP 4-02.2 for additional information.)

ACTIONS ON CONTACT

2-97. *Actions on contact* a process to help leaders understand what is happening and to take action (FM 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 that include 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—

- React.
- Develop the situation.
- Choose an action.
- Execute and report.

Note. Contacts occur when a unit encounters any situation during the march that requires an active or passive response to a threat or potential threat. The nine forms of contact are: direct, indirect, nonhostile, obstacle, CBRN, aerial, visual, electromagnetic, and influence. (Electromagnetic contact includes contact in cyberspace.) Units may experience all forms of contact simultaneously. Leaders always assume that they are in contact with peer threats, particularly electromagnetic contact.

2-98. Leaders should use all available information and intelligence to enhance march operations and 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 intelligence products to determine where and when an enemy ambush is likely to occur to avoid surprise engagements and to gain an offensive advantage.

2-99. 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 increases 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. Additional planning considerations and coordination will need to be made prior to the execution of a march when a unit is transiting an AO that is assigned or controlled by a higher echelon or different unit. Depending on the circumstances, coordination with host-nation fire support teams may decrease the response time for fires. (See ATP 3-21.8 for additional information.)

NONHOSTILE CONTACT

2-100. Marches create effects in the operational and informational 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.

2-101. 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. In some situations, a misspoken word, an uncontrolled action, or an offensive image can ultimately work against the commander's objective.

ENEMY AMBUSH

2-102. 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 that 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.

2-103. The best counterambush 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 counteractions. Soldiers should be constantly alert for the enemy and any signs of enemy activity such as wires, recently disturbed earth, and movement. If reconnaissance elements identify an enemy ambush site prior to initiation, leaders can plan and call for fires to destroy the enemy 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, to monitor enemy activities along the march route.
- Using alternate return routes when possible.
- Avoiding routines or setting patterns.
- Using noise and light disciplines.

Note. Enemy forces may avoid decisive engagements when there is overt CAS.

2-104. While dismounted, counterambush techniques usually consist of actions based on battle drills followed by specific actions quickly planned and executed. Leaders plan and rehearse counterambush 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 Soldiers 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.

2-105. When a portion of the march force is mounted, unit actions may be more restricted. Leaders should consider when ambushed, the best course of action 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 aviation attack, or CAS to attack the enemy as vehicles move out of contact, when possible.

ENEMY INDIRECT FIRE

2-106. Enemy indirect fires may range from mortars to large-caliber artillery, and enemy target acquisition assets may range from hidden observers to small UASs. Enemy forces will use indirect fires to create long range standoff to quickly engage friendly forces and then quickly displace before becoming decisively engaged by friendly direct and indirect fires.

2-107. The enemy may intend to use the same firing positions repeatedly which is both an advantage and a disadvantage. An enemy without adequate indirect fire control can fire accurately from previously used

positions. By using the same positions, the enemy can become accustomed to setting up quickly and directly aiming its fires. A disadvantage for the enemy is friendly forces targeting these areas with quick counterfire. As these positions 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.

2-108. Leaders plan and rehearse actions to counter enemy indirect fires prior to any movement to include using radar zones on likely enemy artillery locations/azimuths, limiting communication windows and electromagnetic signatures, and keeping large formations dispersed along routes to limit exposure to enemy indirect fires. For example, when the situation allows, the march elements in contact immediately counter 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 counterfire mortar/artillery, or break contact. (See ATP 3-01.60 for additional information.)

ENEMY SNIPER

2-109. 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 and then maneuvers the portion of the element not in contact to kill the sniper or to break contact. March units develop, practice, and enforce use of countersniper immediate action drills, blending both active and passive countermeasures.

Active Countermeasures

2-110. 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 improvised explosive device (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.
  - 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.
- Clearing and occupying all buildings around CPs and if possible, directly along the route to eliminate potential enemy sniper positions.
- Supplementing ground observation with available manned and unmanned aircraft.
- Maintaining active patrols, especially in areas covering dead space along the route.
- Patrols watching for armed personnel and evidence of personnel moving into and from possible firing positions.

2-111. Active countersniper operations include—

- Engaging enemy sniper.
- Forcing the enemy sniper, once spotted, to displace, surrender, or be killed.
- Using organic or supporting fires to kill, suppress, and obscure the enemy sniper.
- Using smoke or riot control agents to obscure and suppress hostile sniper fires.
- Using organic fires (for example, mortar fires) to overmatch, outrange, or preempt hostile sniper fires.

Passive Countermeasures

2-112. 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 ROE. Passive countermeasures employed by the commander include—

- Limiting exposure.
  - Not establishing 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.
  - Not saluting, removing rank insignia, camouflaging, and operating during limited visibility conditions are other helpful actions.
- Wearing protective equipment and wearing it properly, for body armor and advanced combat helmets do not work unless they are worn properly.
- Using armored vehicles when applicable.
- Erecting screens and shields, prior to and after movement, or during extended halts, when applicable.
  - Construct barriers and shields around CPs 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 an 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 EXPLOSIVE DEVICE THREATS

2-113. Explosive hazards can be a major threat to the march. March commanders should brief personnel on the latest explosive ordnance threat types, usage, and locations along similar routes. Explosive threats can include munitions such as cluster munitions, unexploded ordnance, deliberately placed mines, and IEDs. All Soldiers maintain situational awareness by looking for explosive threats and potential hiding places along the march route. Units should expect to encounter explosive hazards at any time during the march and expect an ambush immediately after the detonation of an explosive. (See ATP 3-34.20 and TM 3-34.82 for more information.)

Planning

2-114. Leaders develop plans to counter explosive hazards. Plans should include pattern analysis of explosive hazards (both friendly and enemy), and allocate enablers to—

- Coordinate with the intelligence officer concerning enemy employment of explosive hazards (to include dud rates).
- Coordinate with the fires officer concerning friendly use of explosives (to include dud rates) and planning for clearing.
- Maintain common operation picture (specifically route status) depicting known and suspected explosive hazards (friendly and enemy).
- Enable engineer planning for clearing explosive hazards.
- Deconflict support requirements and available explosive hazard sweeps.
- Coordinate counter-explosive hazards and route-clearing activities for movement.
- Enable explosive ordnance planning for rendering safe explosive hazards.
- Coordinate the plan with the staff to include the intelligence, operations, protection, sustainment, and electromagnetic warfare sections.
- Recommend movement formations and movement techniques, including preplanned battle drills to react to explosive hazards.
- Identify suspicious or possible explosive hazard employment sites.
- Recognize that identifying explosive hazards will be challenging during darkness and periods of reduced visibility.

Categorization

2-115. Leaders categorize levels of suspicion to determine appropriate responses and resources needed in accordance with the following levels:

- Level 1 (Low)—explosive hazards are unlikely.
- Level 2 (Medium)—explosive hazards are possible, but no evidence exists.
- Level 3 High)—evidence of explosive hazards exists, and unit contact is highly likely.
- Level 4 (Imminent)—explosive hazards have been reported or employed in the AO and contact is expected to be imminent.

Protection and Reporting Explosive Hazards

2-116. Consider enemy positions, areas where friendly fires have been employed and choke points as high-risk areas for explosive hazards. Mark the explosive hazard and establish an exclusion area to protect the force. Submit a 9-line report to request EOD support to render safe the explosive hazard (see FM 6-99).

Counter Improvised Explosive Devise Operations

2-117. Recognition and identification of suspicious activities and objects are critical planning consideration during counter IED operations. Paragraphs 2-117 and 2-118 address key recognition, identification, and protection considerations during the conduct of the march.

Suspicious Activities and Objects

2-118. Suspicious activities and objects that may indicate the presence of an IED include—

- 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 guardrails.
- Fresh concrete or asphalt work or repair patches on or around route surfaces.
- Suspicious packages, containers, or other foreign objects on or near the route.
- Markings warning locals of IEDs (for example, a blue X painted on a rock).
- Third-party personnel or vehicles attempting to pass or enter the march formation.

Identification

2-119. Leaders identify explosive threats or IEDs and possible emplacement locations by the following characteristics:

- March techniques.
  - Varying routes and times, entering overpasses on one side of the road and exiting out the other.
  - Training weapons on overpasses as the march passes under.
  - Avoiding chokepoints to reduce risk.
- Visibility—early mornings and periods of reduced visibility are especially dangerous since the enemy has better opportunities to emplace explosive devices without being detected.
- Construction methods.
  - Explosive threats may be 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 MRE bags.
- 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 cords to connect detonators to explosives.
- Delivery.
  - Dropped from a UAS.
  - Dropped from or attached to underside of overpasses.

  - Soldiers should watch for suspicious activity on overpasses and never stop under one.
- Hiding places.
  - Potholes, abandoned vehicles, dead animal carcasses, or secured to telephone poles and guardrails.
  - 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.

Note. Obtain the latest IED update/indicators during the pre-march brief.

ENEMY AIR ATTACK

2-120. When the march makes visual contact first with a hostile aircraft, march elements immediately attempt to conceal themselves from the aircraft. If 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 positions, assumes a defensive posture, and prepares to support the element in contact. (See ATP 3 21.8 for additional information.)

CHEMICAL HAZARDS

2-121. When a chemical attack hazard is identified, Soldiers conducting the march immediately perform the following actions:

- Don their protective mask.
- Sound the vocal or nonvocal alarm.
- Conduct immediate decontamination of any exposed contaminated skin with the skin decontamination kit and eyes by flushing with water.
- Assume mission-oriented protective posture (MOPP) four.

2-122. Individuals, buddies, crews and unit then conduct—

- Personal wipe down of individual mission essential equipment with the M295 individual equipment decontamination kit.
- Check of their gear for contamination and conduct operator wipe down with a joint service equipment wipe or a sorbent decontamination system of contaminated surfaces that must be touched.
- Identification of the chemical agent using M8 chemical detector paper and M256 detector kit.
- Reporting of the chemical hazard to higher headquarters using the CBRN 1 report.
- Request (if necessary) of operational decontamination support for contaminated equipment.
- Exchange of contaminated mission oriented protective posture gear when a second set of gear and other supplies are available.
- Marking of the contaminated area if contamination is present.
- Request for guidance from higher headquarters.

Note. See ATP 3-21.10 and ATP 3-21.8 for additional information on CBRN hazards and protection.

COGNITIVE LOAD

2-123. Cognitive load is the combination of the relevant, intrinsic, and extraneous information present during the execution of a Soldier's/leader's task. It is the mental factors that affect the performance of a leader to make sound judgements during an operation. Leaders receive multiple cognitive inputs during the course of a mission, such as the environment, radio traffic, digital inputs, personal interactions, and other stressors that all produce a cumulative cognitive load on leaders. This requires leaders to receive, balance, and filter these inputs.

2-124. Much like the physical load a Soldier/leader carries, the cognitive load a Soldier/leader can handle at any given time varies. The cognitive load capacity cannot be easily measured as opposed to the physical

aspect. Many leaders fail to consider its cumulative effects on their Soldiers. (See FM 7-22 for additional information.)

COGNITIVE OVERLOAD

2-125. With the ever-growing presence of technology on the battlefield increasing situational awareness, leaders must be more conscious of the impact those information inputs have on performance. The ability to communicate via multiple voice and data devices is a combat multiplier to a certain point; however, every leader reaches a point where the ability to manage and process incoming and outgoing information begins to impair the leader's ability to conduct the operation effectively. The number, type, and timing of information flowing to and from the leader should not detract from the leader's performance on the battlefield.

2-126. Implementing brevity codes, communications windows, and practicing battle drills and SOPs are methods to reduce cognitive load on Soldiers and leaders to enable them to focus more on the mission. It is important to understand the unit's ability to engage the enemy with maximum effects, while understanding that decision-making, situational awareness, and communications will continue to degrade as fatigue during long movements and/or carrying heavier physical loads affect the unit.

IMPACTS OF COGNITIVE LOAD ON THE MISSION

2-127. Impacts of cognitive load on the mission can be excessive cognitive inputs that cause Soldiers and leaders to miss critical information required to accomplish the mission. A decrease in cognitive performance can have dire impacts on the integration and synchronization of critical activities and events. Decreased cognitive performance can increase the risk level of a mission. Maintaining awareness of the Soldier's cognitive load is critical to ensuring the unit can efficiently and effectively accomplish its mission. While the ability to perform under extreme conditions with reduced rest and rations is admirable, leaders should always consider the physical and cognitive status of the unit when planning and conducting missions under combat conditions to optimize performance on the battlefield. Leaders combine physical and mental aspects that encompass load factors of the unit to accomplish the mission.

SECTION III–DUTIES AND RESPONSIBILITIES FOR THE MARCH

2-128. Regardless of the mission, every subordinate leader and staff officer have unique broad areas of expertise within the operations process determining how the commander divides duties and responsibilities. Grouping related activities allow an effective span of control and unity of effort. Areas of expertise may vary slightly, depending on the echelon of command and the mission. This section addresses the duties and responsibilities for the march at battalion and company echelon.

BATTALION COMMANDER AND STAFF

2-129. The battalion commander and staffs have important duties and responsibilities within the activities of planning and preparation that drive march execution. By developing understanding, the commander and staffs 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, exercises C2 throughout the conduct of operations. Duties and responsibilities within the battalion for the march are addressed in the following paragraphs. (See ATP 3-21.20 for additional information.)

BATTALION COMMANDER

2-130. 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 combat operations 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 the flexibility to execute a variety of plans to meet ever-changing conditions.

2-131. The commander guides the staff's development of the movement order or 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 commanders, 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

2-132. The battalion executive officer (XO) is the commander's principal assistant and directs staff tasks, manages, and oversees staff coordination, and special staff officers. The XO provides oversight of movement planning for the battalion commander. As the key staff integrator, the XO frees the commander from routine details of staff operations and the management of the headquarters and ensures efficient and prompt staff actions. The XO is responsible for directing the activities of each staff section and subordinate unit to capture and disseminate organizational knowledge. The XO exercises the duties and responsibilities of the second in command.

BATTALION COMMAND SERGEANT MAJOR

2-133. The battalion command sergeant major provides advice and makes recommendations to the commander and staffs in matters about the dismounted movement, that include (though not inclusive) Soldier load and SOPs for the march. During movement, the battalion commander employs the command sergeant major throughout the battalion's AO to extend command influence, assess the morale of the force, and assist during critical events.

BATTALION STAFF

2-134. The battalion staff supports the commander, assists 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 XO 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. (See ATP 3-21.20 for additional information.)

Coordinating Staff Officers

2-135. 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 (S-6).

Personnel Staff Officer

2-136. 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 of Paragraph 4 to the movement order. Additional duties and responsibilities for the march include—

- Maintaining an accurate personnel accountability for all march units.

- Keeping the battalion commander informed of missing in action, killed in action, prisoners of war, wounded in action, and evacuated Soldiers.
- Maintaining an accurate casualty report during the march.

Intelligence Staff Officer

2-137. The battalion intelligence staff officer (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, civil considerations, and informational considerations in each of the factors regarding the route for the commander and participates, with the staff, in performing intelligence preparation of the operational environment. The S-2 focuses intelligence collection operations to collect and analyze information about threats along the route. The S-2 provides the commander and the S-3 with the initial information collection plan, which facilitates reconnaissance, surveillance, and intelligence operations integration and synchronization. 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 to the movement order. Additional duties and responsibilities for the march include—

- Analyzing enemy trends, indicators and warnings, and pattern analysis mission analysis and the targeting process along primary and alternate routes and identified danger areas.
- Presenting information obtained from recent patrol debriefings on selected primary and alternate routes.
- Addressing route information, which should comprise—
  - The current enemy situation.
  - Road conditions.
  - Traffic congestion.
  - Civilian centers.
  - Religious locations or other protected sites.
  - Locations of friendly safe havens.
  - Observed changes to landmarks.
- Providing patrol briefings with photos to help Soldiers identify key personalities and potential threats along routes.
- Contacting units adjacent to the routes and at destination locations for situational updates.
- Developing and continually updating route strip maps or overlays showing locations of—
  - Landmarks.
  - Previous ambush sites.
  - Known and suspected locations of enemy explosive hazards.
  - Safe havens such as maneuver unit outposts, and other information of importance to Soldiers.
- Debriefing reconnaissance and surveillance elements returning from patrols along the proposed route(s).
- Providing daily intelligence summaries to higher headquarters and designate named areas of interest based on observations from patrolling along the route(s).

Operations Staff Officer

2-138. 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—

- Recommending march configuration and sequence of march.
- Deconflicting the routes and times with march unit representatives, and routes contemplated must reflect march availability versus—
  - Required delivery times.

  - Route movement conditions.
  - Traffic congestion.
  - Enemy positions.
  - Friendly actions.
  - The explosive hazard clearance schedule.
  - Civilian activities.
- Ensuring battalion methods for recovering isolated, missing, detained, or captured personnel are synchronized with higher headquarters' personnel recovery plan.
- Documenting locations of friendly maneuver units along the routes, their radio frequencies, and their call signs.
- Contacting friendly units and providing expected transit time windows and march routes moving through their AOs.
- Coordinating plans for manned and unmanned aircraft to perform reconnaissance and surveillance and/or attacks during the march.
- Identifying march unit reports (for example, departures, SPs, halts, CPs, and RPs).
- Tracking march units along the movement route(s).
- Identifying march unit priorities of work for follow-on actions, intelligence debriefing, maintenance, refueling, and messing.

Logistics Staff Officer

2-139. 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. (See ATP 4-10 for additional information on operational contract support.) Duties and responsibilities for the march include—

- Leading a sustainment synchronization meeting to deconflict support requirements and transportation assets available.
- Driving the schedule (in coordination with the S-3) for marches based on—
  - Delivery time windows.
  - Road conditions.
  - Explosive hazard sweeps.
  - Other tactical operations.
  - Civilian activities.
- Compiling battalion logistics status reports and providing the support operations officer with lists of items and quantities needed by each supported unit.
- Identifying priorities for resupply of supported units, by unit and commodity.
  - Such priorities 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 officer (NCO) to ensure units and Soldiers have sufficient ammunition for all assigned weapons.

Signal Staff Officer

2-140. The battalion S-6 is the principal staff officer for all matters concerning signal network operations during the march. The S-6 provides network transport, information services, and information management; conducts network operations to facilitate communication and defend the network infrastructure; enables knowledge management; manages communication assets in the battalion's AO; and performs spectrum management operations. The S-6 prepares Annex H (Signal) and participates in the 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—

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

Personal Staff Officers

2-141. 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 2-117), the battalion surgeon, and the battalion chaplain.

Battalion Surgeon

2-142. The battalion surgeon is responsible for establishing Army Health System principles within the command. The surgeon provides health service support mission planning to sustain the battalion's march. The surgeon provides and oversees medical care to Soldiers, civilians, and enemy prisoners of war. 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

2-143. The chaplain advises the commander on all religious, moral, ethical, and morale issues with potential impact on operations. The chaplain and a religious affairs specialist, known together as the unit ministry team, provide religious support to all assigned or attached Service members and authorized civilians. (See FM 3-83.) The unit ministry team prepares a portion of Annex F (Sustainment) to the OPORD or a portion of Paragraph 4 to the movement order.

Special Staff Officers

2-144. Special staff officers, within the Infantry battalion, provide specific areas of expertise to assist the exercise of C2 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 NCO, common to the battalion, include the fire support officer (FSO) (assigned or attached), the engineer NCO, the air liaison officer, the CBRN officer, the electromagnetic warfare NCO, and the liaison officer(s).

Fire Support Officer

2-145. The FSO serves as the special staff officer for fires and integrates fires into the scheme of maneuver for the march. The FSO leads the targeting process and fire support planning for the delivery of fires during the march. The FSO 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 FSO also coordinates with the electromagnetic warfare officer and the air liaison officer. The battalion S-3 coordinates this position. Additional duties and responsibilities for the march include—

- Planning for responsive fires on key known, suspected, or potential enemy positions along the route for each phase of the movement.
- Positioning observers, including manned and unmanned aircraft, forward and along the supported unit's flanks, when required, to detect enemy threats.
- Ensuring fire support assets are positioned to support the battalion at points of vulnerability such as—
  - Obstacles.
  - Canalizing terrain.
  - Obscuration operations.
  - Bridge or gap crossings.

Engineer Noncommissioned Officer

2-146. 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 Liaison Officer

2-147. The air liaison officer is the senior Air Force officer (or NCO) in the tactical air control party. The air liaison officer plans and executes CAS per the battalion commander's guidance and intent for the movement. The air liaison officer assists the fires support cell in coordinating joint air component assets and operations for the march, such as CAS 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

2-148. The CBRN officer is responsible for CBRN operations and coordinating CBRN unit support for the movement when required. 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.

Electromagnetic Warfare Noncommissioned Officer

2-149. The electromagnetic warfare NCO serves as the designated staff officer for the planning, integration, synchronization, and assessment of electromagnetic warfare, to include cyber electromagnetic activities. The electromagnetic warfare NCO coordinates through other staff members to integrate electromagnetic warfare and/or cyber electromagnetic activities into the commander's concept of operations for the movement. The electromagnetic 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.

Liaison Officer

2-150. Liaison officers are the commander's representatives 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 requisite coordination, synchronization, and cooperation between the battalion and higher headquarters, and interagency, multinational, host-nation, adjacent, and subordinate organizations as required. When embedded as subject matter experts, liaison officers provide face-to-face coordination.

Augmentation

2-151. The battalion staff can receive augmentation teams by specialty to assist the exercise of C2. 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

2-152. 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. (See ATP 3-21.10 and ATP 3-21.8 for additional information.)

COMPANY COMMANDER

2-153. 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.

2-154. The company commander issues the warning order (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 and surveillance per higher headquarters' order.

2-155. 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 movement order or OPORD to subordinates.

2-156. 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, messengers, C2 systems, and arm and hand signals means.

2-157. 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 resume the march immediately, the cigar-shaped perimeter expands with elements establishing observation posts 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 occur throughout the company.

2-158. The commander ensures the 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

2-159. The company 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—

- Ensuring accurate, timely march and sustainment reports are sent to higher.
- Assisting in the preparation of the movement order or OPORD.
- Coordinating with higher, adjacent, and supporting units.
- Assisting the commander in preparations activities, including rehearsal site preparation.

- Managing the company timeline and facilitating the integration of attachments.
- Serving as movement control officer, if required.
- Supervising company road guards and guides, if required.
- Leading the quartering party for the tactical road march, if required.

COMPANY FIRST SERGEANT

2-160. The company first sergeant assists the commander as assigned, ensures unit NCOs perform all unit tasks according to unit SOPs, and supervises precombat checks (PCCs) and precombat inspections (PCIs). 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 disciplines. 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—

- Supervising, inspecting, and observing all march matters designated by the commander.
- Assisting and coordinating with the XO in all critical aspects of the march.
- Serving as quartering party noncommissioned officer-in-charge, if required.
- Assisting the commander with maintaining accountability.

SUPPLY SERGEANT

2-161. 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, with the company trains, or as positioned to conduct movement with a march unit within the main body. Additional duties and responsibilities for the march include—

- Monitoring activities and the tactical situation.
- Anticipating and reporting logistical requirements.
- Coordinating and monitoring sustainment requests.
- Coordinating and supervising logistics packages (route, contingent, and urgent resupply).

SIGNAL SUPPORT NONCOMMISSIONED OFFICER

2-162. 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—

- Sending and receiving routine traffic and making required communications checks.
- Performing limited maintenance to organic communications equipment.
- Providing linkage to battalion-level communications maintenance.
- Supervising communications security equipment.
- Assisting communications planning and employment.
- Assisting command post operations.

MORTAR SECTION LEADER

2-163. 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 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

2-164. 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 movement order or OPORD and unit SOPs is followed and accomplished.

2-165. The platoon leader rapidly briefs the platoon on the information contained in the movement order or OPORD 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 PCCs and PCIs go as dictated in the order.

2-166. 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.

2-167. 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.

2-168. 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 SOPs, and medical assistance is available as needed.

PLATOON SERGEANT

2-169. The platoon sergeant assists the platoon leader in the conduct of the march as assigned and supervises the inspection of Soldiers before, during, and after the march. The platoon sergeant controls stragglers and dropouts by examining march casualties with the 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 duties according to the movement order or OPORD and/or unit SOPs.

SQUAD LEADERS

2-170. The squad leader's duties and responsibilities are similar to those of the platoon leader and platoon sergeant. Upon receipt of a 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 CLSs 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.

2-171. The squad leader marches at a location within the formation for best control of 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.

2-172. The squad leader follows unit SOPs and ensures Soldiers accomplish 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 for additional information on Soldier load.)

2-173. 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.

2-174. As the squad approaches the RP, the squad leader prepares for follow-on actions. For example, the squad may move to an assembly area, establish security, and occupy available covered and concealed positions. 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 conduct foot inspections of Soldiers and report their physical condition to the platoon leader or platoon sergeant. The squad leader coordinates with the platoon sergeant for resupplies and medical attention. The squad leader continues to supervise team leaders and monitors the radio, waiting for further instruction for upcoming missions.

TEAM LEADERS

2-175. Team leaders accomplish the same duties and responsibilities as the squad leader before, during, and after the march, except focusing on their team. They ensure their teams follow directions given by the squad leader and ensure movement order or OPORD and unit SOPs guidelines and instructions are followed.

COMPANY HABITUAL ATTACHMENTS

2-176. 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

2-177. Fire support team headquarters personnel authorized for the company include an FSO, a staff sergeant as the fire support sergeant, a fire support specialist, and a radiotelephone operator. The fire support team also includes three two-person teams, a forward observer (FO) and a radiotelephone 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

2-178. 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 principal advisor. Based on 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—

- Advising the commander on all fire support matters.
- Requesting, adjusting, and directing all fire support.
- Serving as the commander's primary advisor on the enemy's indirect fire capabilities.
- Assisting the commander with developing the movement order or OPORD to ensure full integration of fires.
- Recommending targets and fire control measures.
- Determining methods of engagement and responsibility for firing the targets.
- Developing an observation plan with limited visibility contingencies.
- Allocating FOs and other observers to maintain surveillance of target along the route.
- Monitoring the locations of friendly units and assisting the commander with clearing fires.
- Requesting counterfire support in response to enemy artillery and mortar attacks.
- Assisting control of CAS in the absence of a qualified JTAC.
- Handing off responsibility for planned targets as the unit advances.

Forward Observer

2-179. 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 combat information. As directed by the platoon leader, the FO executes planned fires and requests and adjusts fires for the supported platoons during the march.

COMBAT MEDICS

2-180. 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—

- Overseeing and evaluating ill, injured, or wounded friendly and enemy personnel for priority of treatment.
- Requesting and coordinating the evacuation of sick, injured, or wounded personnel under the direction of the company first sergeant.
- Monitoring the tactical situation, as necessary.
- Anticipating and coordinating health service support requirements and Class VIII resupply.
- Advising the company commander and first sergeant on unit field sanitation issues.
- Keeping the first sergeant informed on the status of casualties and coordinating for additional sustainment requirements.

2-181. At every halt, medics assess and treat those who require medical attention. Medics advise the chain of command when a Soldier requires MEDEVAC. In situations where MEDEVAC assets are limited, medics can advise leaders on which Soldiers they believe can be safely transported using designated CASEVAC 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 as 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 chapter 8 for a detailed discussion on the TCCC phases-care under fire, tactical field care, and tactical evacuation care.)

SOLDIERS

2-182. To ensure success during the march, Soldiers master a diverse set of battle and crew drills and specialized skills. Soldiers should be keenly aware of 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 those of CLSs and pacesetters.

BATTLE AND CREW DRILLS

2-183. Soldiers execute battle and crew drills, which are standardized collective actions made in response to common occurrences and designed for rapid reaction situations without the application of 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. (See ATP 3-21.8 for additional information.)

OBSERVATIONS AND EXPERIENCE

2-184. Observations and experiences of Soldiers provide depth and context to information gathered during information collection 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 Soldiers operate. All Soldiers should look for anything out of place or inconsistent with what they normally encounter and report their observations immediately. For example, an alert Soldier may detect changes or disturbances in terrain from previous missions that could indicate a possible buried explosive hazard (see paragraphs 2-102 to 2-104). Soldiers remain vigilant and attentive to details about local personnel that indicate possible enemy activity.

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

COMBAT LIFESAVER

2-185. 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 CASEVAC/MEDEVAC. 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's combat load remains as light as possible.

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

PACESETTER

2-186. 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 (I). 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 of average height to take average strides can be taken. Overstriding or understriding 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.

This page intentionally left blank.

Chapter 3

Soldier Load

The ability of Soldiers to march and fight is directly influenced by their combat loads. Soldier load 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 managed 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 from excessive loads and Soldier exhaustion and injury. Soldier load is limited to mission-essential equipment to sustain continuous operations. Commanders and leaders accept risks to reduce Soldier load based on a thorough mission analysis.

LEADER RESPONSIBILITY

3-2. Soldier load is a leader responsibility regardless of the operational environment (OE). The fighting capability of a Soldier relates directly to the load the Soldier carries. A maximum individual load limit is established and not exceeded if a Soldier is to accomplish an assigned combat mission. Commanders and subordinate leaders consider the following points during Soldier load planning:

- A Soldier's load is based on the weight of the Soldier, the climate, the terrain, and the stress the Soldier has faced or is currently facing.
- Heavy loads, mountain terrain, high altitude, and extremely hot or cold weather will decrease a Soldier's capability to carry a load.
- Prior to initiating the march, the leader considers the environment, weather, mission, duration, and Soldier requirements.
- Each mission requires an analysis of the essential items for combat operations and survival.
- Commanders determine the combat load (see paragraph 3-4) through the risk management process (see paragraph 3-39) to improve the likelihood of mission accomplishment.
  - Items such as the amount of food and water taken as well as the configuration of body armor are examples of decisions that commanders should make.
  - Understanding the operation, including the senior commander's intent and risk tolerance, and the residual risk for the mission helps leaders make informed decisions to reduce or offset risk.
- While assault packs vary by role or function within the unit, leaders determine their exact contents during mission analysis.
- To assist in managing Soldier load leaders do the following:
  - Conduct precombat checks (PCCs) and precombat inspections (PCIs).
  - Consider using the memory aid DROP, in which D refers to decide mobility level, R stands for reduce unnecessary gear, O stands for organize resupply methods, and P stands for police the ranks (inspect).
- For a properly conditioned Soldier—
  - The fighting load (see paragraph 3-5) should average between 60 to 80 pounds (ideally about 30 percent of a Soldier's body weight).
  - The approach march load (see paragraph 3-6) should average between 80 to 100 pounds (ideally about 45 percent of a Soldier's body weight) including all clothing and equipment, either worn or carried.

  - The emergency approach march load (see paragraph 3-7) should average between 100 to 125 pounds.
- Overloading Soldiers can expose them to extreme risk and unit standard operating procedures (SOPs) should limit what Soldiers carry on combat operations and enforce those limits.
- No amount of training can change the body's reaction to carrying excessive loads.
- The leader's involvement in analyzing the situation and the level of risk involved is the key to determining what is mission essential for Soldier loads.
- Mountainous terrain is usually rocky, making it very easy to twist an ankle or otherwise have a minor to moderate lower-body injury with heavy loads.
- Injuries tend to increase in the winter due to the water, snow, and ice.
- Vehicles will not always be available to carry ammunition, food, and equipment but should still be considered for use whenever practical.
- Even in the most benevolent terrain, fatigue can become an issue:
  - With rough terrain and bad weather, the effects of fatigue multiply exponentially.
  - Without proper rest, fatigue can greatly reduce the effectiveness of an otherwise highly trained unit.
- While season, climate, and weather conditions impact on items carried, Soldiers should be equipped for sudden weather changes.
- Leaders plan contingencies for additional resupply (see ATP 3-21.10 and ATP 3-21.20 for more information on contingency resupply at the company and battalion level, respectively).
- When required, resupply contingencies can include a means for purifying spring or stream water.
- Inexperienced or new Soldiers may attempt to pack and carry more equipment than needed increasing the physical strain on their body and exhausting them more quickly.
- Carrying more equipment than needed not only affects individual performance but unit performance as well.

ECHELONING LOADS

3-3. Maximum effort should be placed on echeloning loads. Commanders should resist the mindset to carry everything to be prepared for every eventuality. Leaders at all 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. Units can separate loads of supplies and equipment into three echelons: combat load, sustainment load, and contingency load.

COMBAT LOAD

3-4. 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 3-8) and contingency loads (see paragraph 3-9). Soldiers carry 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.

Fighting Load

3-5. The 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 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 is essential to balance out the loads carried within the unit. For example, selected Infantry rifle platoon members may carry a mortar round (usually addressed in the unit SOPs) to drop at the mortar-firing position once the march unit reaches its area of operations (AO) to reduce loads within the mortar section.

Table 3-1. Fighting load-possible items carried

Fighting Load	*Pounds*
Uniform complete (OCP, T-shirt, socks, boots, belt, patrol cap)	7.8
Advanced combat helmet	4.2
Tactical Assault Panel (TAPs)	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 with scabbard	1.3
Individual first-aid kit	1.0
Total	68.9
Legend: ATPIAL—advanced target pointer illuminator aiming light, CCO—close combat optic, LWTS—light weapon thermal sight, MNVD—monocular night-vision device, MRE—meal, ready to eat, OCP—operational camouflage pattern, SAPI—small arms protective inserts, SBI—side ballistic insert	

Note. When the improved outer tactical vest is substituted for the Soldier Plate Carrier System, a medium-size improved outer tactical vest 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-size improved outer tactical vest weighing about 35 pounds.

Approach March Load

3-6. An approach march load includes the fighting load plus additional essential equipment. The approach march load may include an assault pack or rucksack, and all the other items not needed in the fighting load but now required. Approach march loads, for when direct contact with the enemy is intended, are dropped in an assault position, in an 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 on page 68 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
Meal, 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, meal, ready to eat (MRE), and ammunition.

Emergency Approach March Load

3-7. Operations requiring an emergency approach march load should only be used when 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 (see paragraph 2-111). 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

3-8. 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

3-9. Contingency loads include all other items not necessary for ongoing operations such as extra clothing and personal items or Javelin-Close Combat Missile Systems (or M3 Multi-role, Antiarmor, Antipersonnel Weapon System [also called MAAWS]) 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 are critical decisions for the commander. (See ATP 3-21.8 for a detailed discussion on considerations when replacing the javelin with the MAAWS.)

3-10. 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 in a division or corps rear area.

3-11. Instructions are issued to Soldiers before deployment, listing individual and organizational equipment not part of initial deployment. Contingency equipment could remain in the continental United States, be stored at base areas in unit packs, or be reserve equipment issued by a higher headquarters when necessary.

3-12. 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

3-13. Load determination is managed at company and platoon levels; however, standards are established at battalion level (in coordination with company leaders) during planning to ensure Soldiers are properly equipped and physically ready for the conduct of operations. During this process, commanders and subordinate leaders determine the factors affecting Soldier load, and the capabilities and limitations of the unit. Load determination factors are addressed in the following paragraphs.

LOAD CARRIAGE

3-14. Load carriage describes what needs to be carried and how that specific load is to be carried. Planning considerations for load carriage are vital to mission success. Commanders determine Soldier load based on component weights and sustaining factors. These factors assist commanders during the planning process to determine how much should be carried, how far, how it is configured on the Soldier, how it is distributed throughout the unit, and how the unit is to be sustained. Commanders balance the risk to their Soldiers from the enemy, the environment, and their equipment. To assist with load planning, commanders and subordinate leaders incorporate mission analysis planning tools to address the factors of Soldier load and to mitigate the load's impact on Soldier performance for the duration of the mission. Mission analysis planning tools, examples addressed in paragraphs 3-15 and 3-19, help commanders and subordinate leaders plan, prepare, execute, and assess successful missions.

Determine, Review, and Organize Load Carriage

3-15. One mission analysis planning tool is embedded within the mission variables of METT-TC (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations, specifically during the troops and support available analysis. This planning tool provides the commander with a process to determine, review, and organize load carriage during mission analysis. (See figure 3-1.)

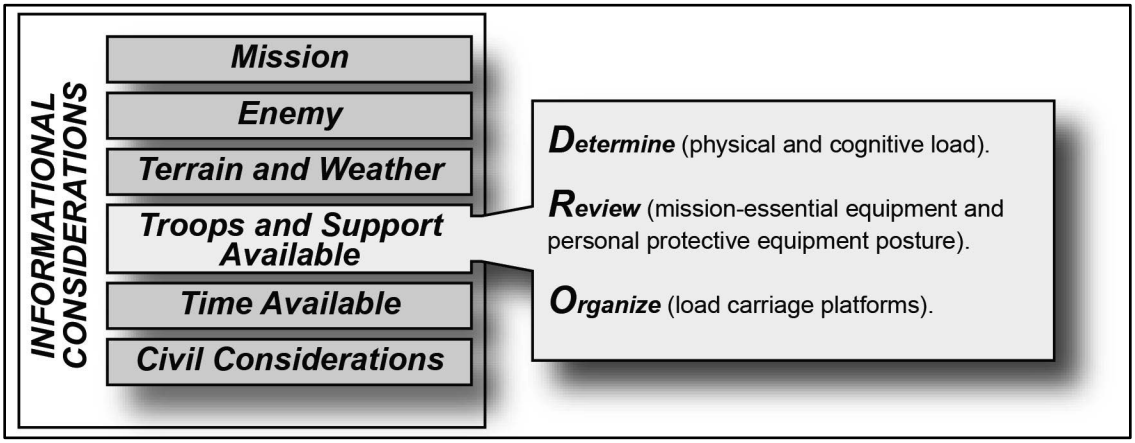


Figure 3-1. Determine, review, and organize

Determine (Physical and Cognitive Load)

3-16. When determining Soldier load, commanders first identify the physical and physiological impact and the aggregate component weight of equipment during the execution of a Soldier's task. When analyzing cognitive load, the commander evaluates the relevant, intrinsic, and extraneous information present during the execution of a Soldier's task.

Review (Mission-essential Equipment and Personal Protective Equipment Posture)

3-17. Understanding that ounces can add up to pounds and pounds impact performance, commanders ensure the equipment Soldiers carry during the mission is essential and must be carried. When evaluating the required personal protective equipment posture (PPEP) the commander identifies the type of threat and level of personal protective equipment required (see paragraphs 3-19 to 3-21).

Organize (Load Carriage Platforms)

3-18. Once Soldier loads are determined and reviewed during mission analysis, commanders identify the most efficient way to carry the load required for the mission, specifically conducted during course of action development. The type of platform is METT-TC (I) dependent, type of platform may be individual, vehicle (manned), aircraft (manned), aircraft (dropped), autonomous (air), and autonomous (ground). Commanders analyze carriage platforms utilizing the factors of responsiveness, accuracy, and method and asking the following questions of each:

- Responsiveness—
  - How quickly can the asset deliver supplies?
  - If it is a platform that is not habitually aligned to the unit, how does that affect delivery?
  - If immediate resupply (also known as emergency or urgent resupply) is required, is available during the mission?
- Accuracy:
  - How accurate is the delivery required to be?
  - Is the margin of error high or moderate for the delivery platform?
- Method:
  - Will the delivery platform require the unit to deviate from the planned route?
  - Will the delivery platform compromise the unit's position or lose it the element of surprise?

Personal Protective Equipment Posture

3-19. A second mission-analysis planning tool is PPEP. Similar to the protection requirements reflected in the mission-oriented protective posture (MOPP) level (see ATP 3-21.8 for additional information on MOPP levels), PPEP provides a threat-based framework for commanders and subordinate leaders to reference regarding the level of body armor and personal protective equipment Soldiers need to wear while conducting an operation. The PPEP levels range from PPEP 0 to PPEP 3 and act as a common language to standardize protection levels and suggested protection level based on the possible threats on the battlefield.

3-20. The ability to designate a desired level of a Soldier's personal protection relies heavily on the fielding of modular and scalable body armor, which allows leaders to assess the level of enemy threat and designate an appropriate protection level. PPEP provides a common language for all Soldiers to quickly understand the required body armor protection level and configure their equipment appropriately (see table 3-3). As directed by the commander, Soldiers should use helmets, side plates, ballistic eye, extremity, neck, and hearing protection at PPEP levels 0 to 3.

3-21. Because what the Soldier wears and carries has the most impact on battlefield performance, it is important for leaders to take time to review and question the necessity of those items. As stated earlier, when considering how much to carry, commanders and subordinate leaders should remember, ounces can add up to pounds and pounds impact performance.

Table 3-3. Personal protective equipment posture

PPEP Level	*Ballistic Threat Protection*	*Example*	*Notes*
0 All Carried	No ballistic protection.	Protection level: None.	Load carriage only. All soft armor and hard armor plates readily available and transported to the Soldier when needed
1 Soft Armor	9 millimeter and fragmentation protection.	Protection level: Broad-spectrum fragmentary, handgun, submachine gun protection.	Intended for threat levels not including rifle threat (for example, vehicle crews and patrol base activities).
2 Hard Armor Plates Only (Minimum–Front and Back Plates Only)	Low-threat rifle (7.62 x 39 AP) protection.	Protection level: Hardened steel core.	Protection from small arms while reducing overall weight. Intended for dismounted troops who may encounter small arms fire.
3 Soft Armor and Hard Armor (Minimum–Front and Back Plates Only)	High-threat rifle (7.62 x 54 AP) protection.	Protection level: Broad-spectrum fragmentary, handgun, submachine gun protection. Hardened steel core, sniper threat.	Protection from sniper caliber small arms with increased protection provided by soft armor. Increased protection while dismounted. Intended for dismounted troops who will likely encounter small arms fire with a sniper threat.

Legend: AP—armor-piercing, PPEP—personal protective equipment posture

LOAD CONFIGURATIONS

3-22. 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, commanders consider what ammunition, supplies, and equipment are mission essential. Effective load configuration requires the battalion commander, staff, and subordinate commander(s) to manage risk in a logical and controlled manner based on a detailed mission analysis. Commanders tailor 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.

3-23. The commander's situational understanding, personal experience, and knowledge of the capabilities and limitations at each echelon of the march unit enable the determination of load configuration. The commander adapts to circumstances and situations encountered, makes decisions for when to drop equipment, and cross-loads equipment to ensure success during the march. The commander maintains enough firepower and protection to defeat the enemy, when required, without burdening the unit with excessive loads.

LOAD IMPACT

3-24. The load a Soldier carries is a major concern to the commander and subordinate leaders planning a dismounted movement. How much is carried, how far, and under what configuration are important mission considerations, requiring command emphasis at multiple echelons (specifically battalion and company). A Soldier's ability to fight is directly related to the loads the Soldier carries. Commanders attempt to minimize Soldier load to improve stealth, speed, and survivability.

3-25. Excessive loads reduce energy and agility. Soldiers carrying excessive loads 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 and ability to accomplish the mission.

WEIGHT CATEGORIES

3-26. 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, regulates breathing due to constriction of the torso. Depending on the mission variables of METT-TC (I), commanders may discuss adjusting the level of body armor protection balancing an increased risk to individual Soldiers to improve the likelihood of mission accomplishment.

3-27. Ammunition, supplies, and equipment carried by the Soldier are 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 (or MAAWS). 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 electromagnetic countermeasure equipment. Planning and preparation processes include detailed load planning and calculation to assist commanders 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.

ENERGY EXPENDITURES

3-28. The average sustainable dismounted rate of march in daylight on roads or improved surfaces is 4 kilometers per hour (kph) and 2.4 kph cross-country shown in figure 3-2 with a load of 40 pounds or less. Given a load of 100 pounds, the rate of march cross-country is 2.4 kph in easy terrain based upon figure 3-3. As shown in figure 3-4 on page 74, this rate of march is generally consistent with a sustainable rate of march expending 300 kilocalories 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 to 32

LEGEND
KM KILOMETER KPH KILOMETERS PER HOUR

Figure 3-2. Average dismounted rates of march

3-29. 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, Soldiers' speed can cause rates of energy expenditure of more than 300 kilocalories 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. For every 10 pounds carried over 40 pounds, the average distance marched by Soldiers decreases by approximately 2 kilometers every 6 hours. Figure 3-3 shows sustainable average velocities with given loads, which results in an energy expenditure of 300 kilocalories per hour. Loads can be carried in places other than the torso, but they often result in higher energy expenditures. (See appendix C for additional information.)

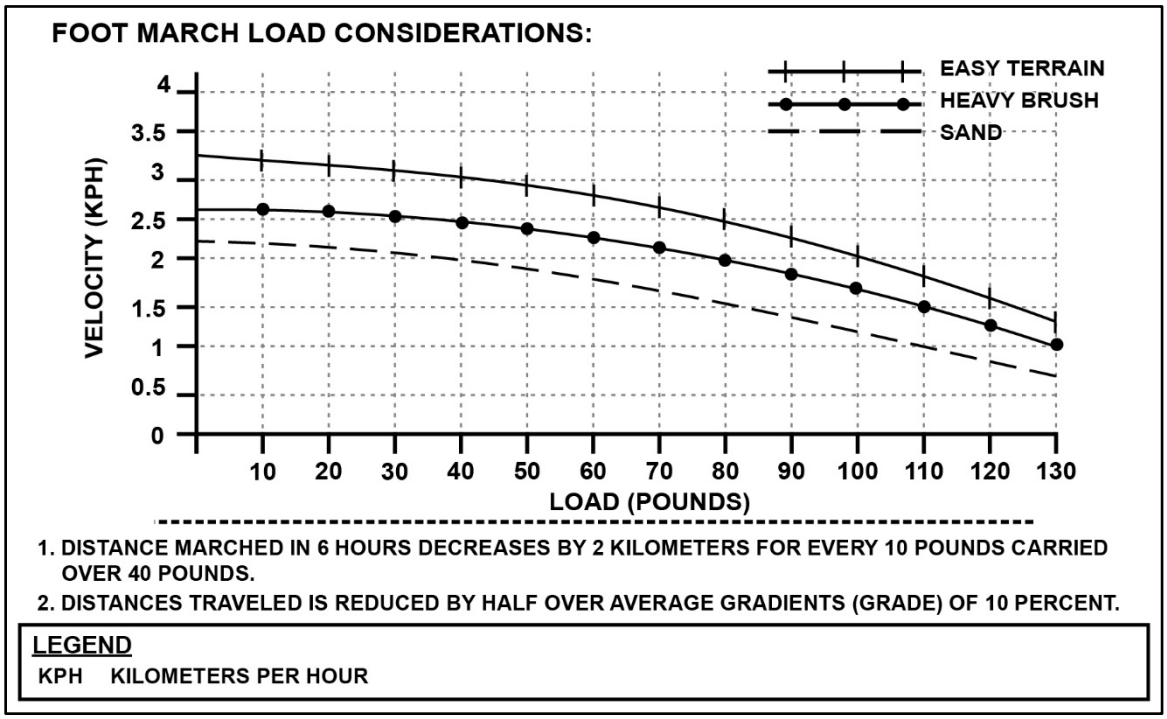


Figure 3-3. March velocity depletion based on load during cross-country movement

3-30. When the march unit conducts a 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 3-4 on page 74, leaders must assess when a unit's energy expenditure culminates and provide the unit time to recover.

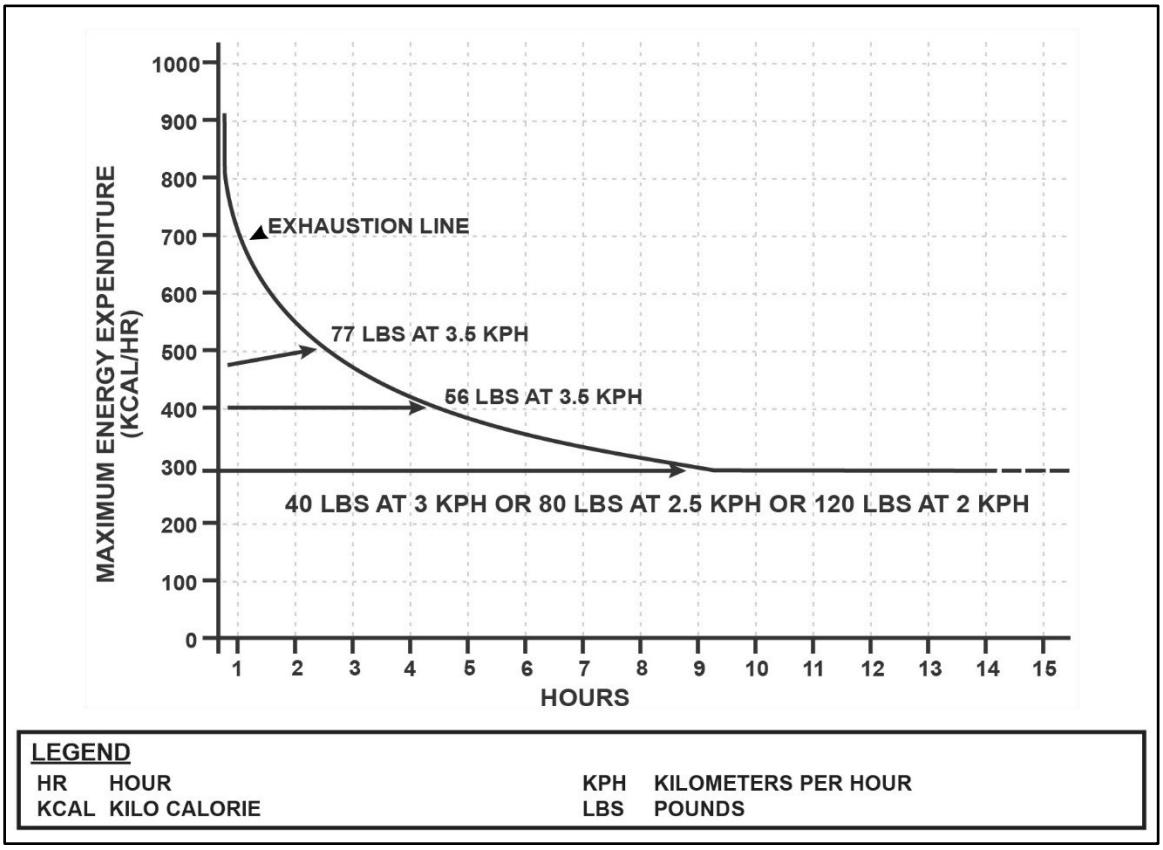


Figure 3-4. Maximum energy expenditure

3-31. 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 kilocalories). If a unit is unable to provide ideal recovery time, leaders should focus on replenishment of kilocalories 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 is often 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.

Impacts of the Physical Load on Mission Performance

3-32. A critical aspect of achieving overmatch is the Soldier's ability to physically perform at optimum levels upon making enemy contact. The physical load the Soldier carries decreases the ability to maneuver and perform under combat conditions. Leaders must understand that physical load can negatively affect performance to a point where mission accomplishment may be at risk. Table 3-4 shows the kilocalorie expenditure under various conditions. Energy cost increases with increase in body mass, load mass, and grade. During heavier movements, Soldiers should increase intake to accommodate the caloric needs of the activity.

Table 3-4. Kilocalories expended by a 180-pound Soldier moving 15 minutes per 1.6 kilometers with various loads on flat terrain

	35-lb Ruck	*50-lb Ruck*	*70-lb Ruck*
6 kilometers	680 kcal	735 kcal	820 kcal
12.8 kilometers	1,360 kcal	1,475 kcal	1,635 kcal
19.3 kilometers	2,040 kcal	2,210 kcal	2,455 kcal
Legend: kcal—kilocalorie; lb—pound			

3-33. Figure 3-5 describes the effect that flat and other common types of terrain have on energy cost. It is important to know exactly how different terrain will affect Soldiers mission performance and allow the leaders to plan for future engagements once the foot march has been conducted.

Note. Figure 3-5 shows volume oxygen max, which is the maximum rate of oxygen consumption measured during incremental exercise; that is, exercise of increasing intensity. The name is derived from three abbreviations: V for volume, O2 for oxygen, and max for maximum.

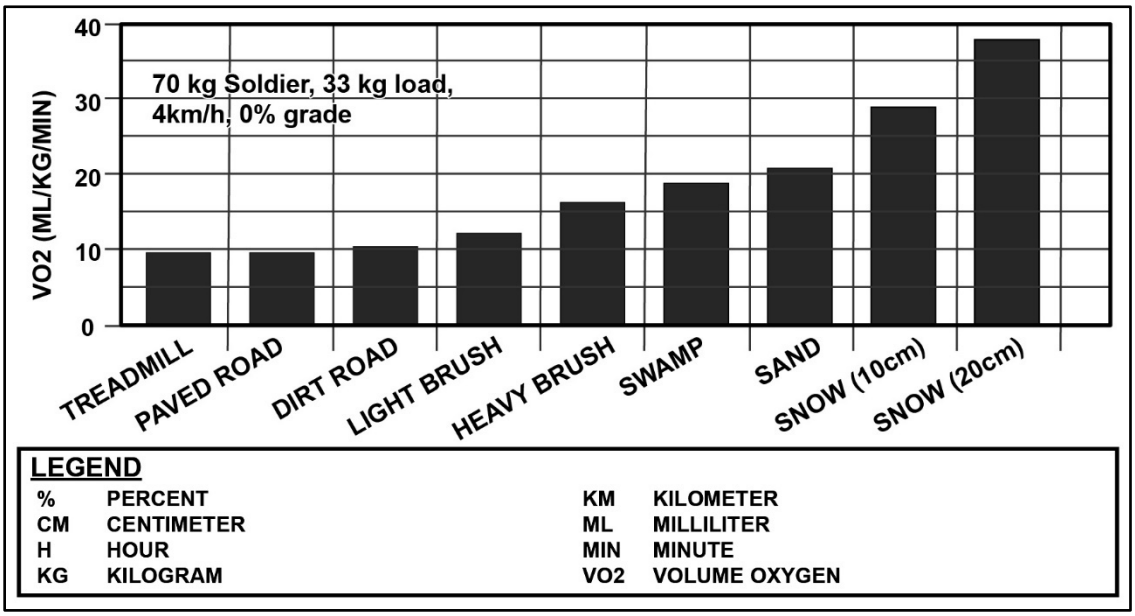


Figure 3-5. Effects of terrain on energy cost

OPTIMIZATION OF SOLDIER LOAD

3-34. Excessive weights on the backs of fit Soldiers, coupled with harsh environments, reduce Soldiers' 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 (see table 3-5 on page 76)–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 3-5. Body weight percentages for combat loads

Individual 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

Legend: %—percent, BW—body weight

3-35. Major components of Soldier loads are body armor, weapons, ammunition, and water. Unlike an 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. Commanders 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.

SECTION II–LOAD TAILORING

3-36. The purpose of load tailoring is two-fold. First, it lets the commander and staffs 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 staffs consider the following areas in load tailoring for subordinates to maintain combat power and to ensure accomplishment of the mission.

COMMANDER'S GUIDANCE

3-37. 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

3-38. During planning, commander and staffs' 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 uploaded on vehicles or packaged in the unit trains.

DECISIONS TO REDUCE OR OFFSET RISK

3-39. 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 force's 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. (See ATP 5-19 for a detailed discussion on the analysis of risk.)

CALCULATING LOAD REQUIREMENTS

3-40. Calculating loads includes 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 3-6 on page 78.) 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 following unit SOPs.
- Organize nonessential equipment into the sustainment and contingency loads, if possible.
- Determine how to best move nonessential supplies and equipment later in the operation once combat loads are established, dictated by commander and staff's recommendations.

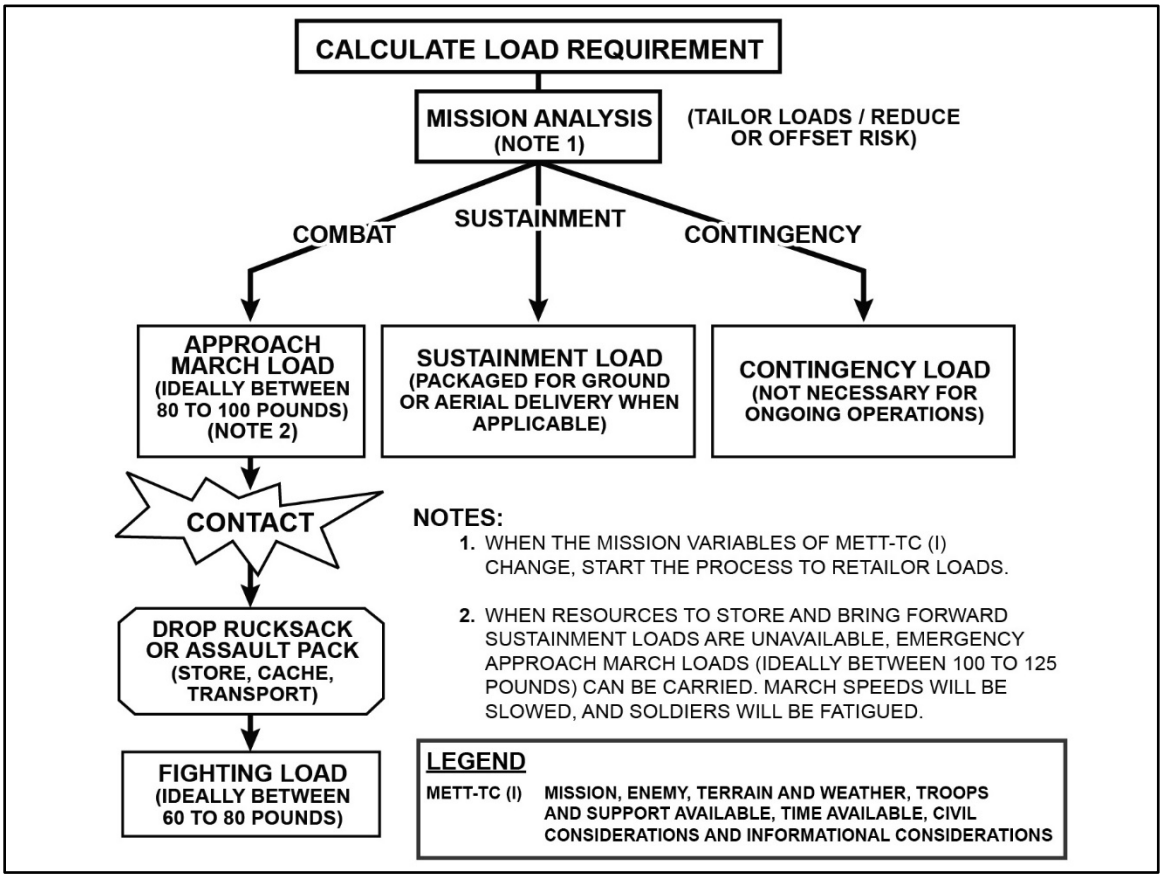


Figure 3-6. Load tailoring diagram, example

UNIT LOAD (PACKING LIST)

3-41. 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 compositions of combat and sustainment loads are driven by the mission and commander's intent.

SECTION III–MOVEMENT OF SUPPLIES AND EQUIPMENT

3-42. 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

3-43. During dismounted movement, resupply operations often involve Class I (water specifically) and possibly Class V (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 is planned to occur on a regular basis per the movement order or operation order (OPORD) and when possible, schedule during limited visibility.

3-44. Without hampering safety and hydration of dismounted Soldiers, means or methods must be developed to permit off-loading of water from Soldiers' backs. 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.

3-45. 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. Unit leaders 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.

3-46. 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. (See ATP 3-21.20 for additional information on resupply operation.)

3-47. When ground delivery is unavailable or limited, march units must be prepared to receive resupply through aerial delivery and manned aircraft. 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. (See FM 3-99 and ATP 4-48 for additional information on aerial delivery.) The use of manned aircraft as a delivery platform is extremely common on today's battlefields. Rugged terrain and limited ground access points push units to use manned aircraft to carry supplies or equipment internally or externally to the unit in need. For most dismounted units, the use of manned aircraft (primarily rotary-wing) must be coordinated before the mission, unless designated for an emergency resupply mission by a higher headquarters. If the aircraft is tasked to support the ground unit, the responsiveness of the aircraft can be quite rapid; however, weather conditions and higher priority missions can often divert manned aircraft to other missions. The accuracy of a manned aircraft is extremely high. A well-coordinated landing zone (either preplanned or hasty) can allow an aircraft to deliver supplies and equipment to the exact point of need. While manned aircraft, like helicopters, can be responsive and accurate, their audio and visual signatures often draw attention and can compromise a unit's ability to limit enemy or civilian detection.

SOLDIER LOAD TRANSFER

3-48. 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. At the start of any operation, Soldiers should identify the types of platforms and equipment they have available to them or begin to plan the most efficient and effective way to carry the load required for success. The type of platform a leader designates to carry the load should be based on the amount and type of supplies or equipment to be carried; its importance to the mission; and the platform's capabilities with respect to responsiveness, accuracy, and method and other aspects of METT-TC (I). Leaders tier and prioritize platforms and plan movements for their use during mission execution.

LOAD CARRIAGE USING WHEELED CARTS

3-49. 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.

3-50. Combat load carts appropriate for military operations should have a low center of gravity, wide wheelbase, 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

3-51. Besides carts, removing much of the load burden from Soldiers requires use of a wide variety of motor vehicles. Systems that 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 1,213 pound-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

3-52. 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. (See ATP 4-10 for additional information.)

CONTRACT SUPPORT

3-53. Though contracting support involves many risks, units may use contractors to bridge gaps between required capabilities and available forces in their AO. Contractors may be employed, subject to METT-TC (I), throughout the AO and under virtually all conditions. Protecting contractors on the battlefield is the unit's responsibility. When contractors are expected to perform in potentially hostile areas, supported military forces must ensure protection of their operations and personnel.

3-54. Units 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. The Defense Logistics Agency provides bulk fuel, water, and food to contractor personnel either through prepositioned stocks or host-nation contracts.

HOST-NATION SUPPORT

3-55. Host-nation support may be provided to the march force located in or transiting through host-nation territory and includes 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 U.S. 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)

3-56. 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.

3-57. 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 3-6 lists advantages and disadvantages to consider before using pack animals. Several planning elements to consider before deciding to use pack animals include the following:

- 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 3-6. Pack animal considerations

Advantages	*Disadvantages*
May save energy and wear on Soldiers. May save time. Can carry larger loads than Soldiers. May (payment for animals) 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. May 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 operations security issues during coordination for use and planning.

This page intentionally left blank.

Appendix A
March Procedures

This appendix provides examples and common practices that enable units to conduct dismounted movement or "foot marches" effectively. Procedures described in this appendix apply unless other actions are prescribed by unit leaders in particular cases. Thus, the flexibility necessary for special situations is retained.

UNIT-LEVEL STANDARD OPERATING PROCEDURES

A-1. Unit-level standard operating procedures (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 movement include common planning considerations which are 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 leaders of the unit are 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 movement. The examples in the following paragraphs illustrate dismounted movement procedures for a foot march and tactical road march. The examples discussed in the following paragraphs are intended to be used as a guide. They are not to be considered prescriptive.

FOOT MARCH PROCEDURES

A-4. Unit movement SOPs for the foot march provide standard task organization (units will not normally organize into march units at the company level and below) 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 SOPs and applied to the foot march may include—

- Numbers, types of weapons, and minimum quantities of ammunition, needed by each Soldier on the march.
- Cross-loading and leveling of essential Soldiers and leaders, load carriage (what needs to be carried and how that specific load is to be carried), and equipment within the unit.
- Number of radios, command and control (C2) systems required, and appropriate nets to monitor.
- Number of counter-radio electromagnetic warfare and counter-improvised explosive device (IED) systems available.
- Medical capabilities needed.
- Required training level of gunners, radio operators, combat lifesavers (CLSs), and dismounted security teams; and stipulate what each Soldier in the march must know about the mission.
- Configuration of gun vehicles desired in the march when required.
- 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 electromagnetic warfare systems.
- Battle drills during the march.
- Pyrotechnics for signals, obscuration, and illumination.

- SOPs for use of lasers and marking devices.
- Content required for 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. When a battalion or larger unit conducts a tactical roach march, the conduct of the march requires at a minimum, reconnaissance, main body, trail party or rear security, and when required a quartering party. Considerations for inclusion in unit SOPs and applied to the tactical road march may include paragraphs A-6 to A-10.

Reconnaissance

A-6. Reconnaissance provides the eyes for the march. The unit SOPs 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 SOPs 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 the 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 SOPs 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. Per the SOP, these personnel may be located in the trail party, unless otherwise stated in the movement order or operation order (OPORD).

Note. Many of the march procedures addressed in this 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. (See chapter 2 of this 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.

TRAFFIC CONTROL

A-13. The headquarters controlling the march may post road guides and traffic signs at designated traffic control posts. A *traffic control post* is a manned post that is used to preclude the interruption of traffic flow or movement along a designated route (FM 3-39). At critical points, guides assist in creating a smooth flow of traffic along the march route. Attached MPs (if available) or designated elements from the quartering party may serve as guides. They should have equipment or markers that will allow march elements to identify them in darkness or other limited visibility conditions.

HALTS

A-14. During halts, all personnel have certain responsibilities. Officers and noncommissioned officers (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 per environmental requirements.

COMMUNICATIONS

A-15. 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.
- C2 systems.

ESCORT AND SECURITY ELEMENTS

A-16. MP units may provide march security to specific units or on an area basis. However, availability of MP support depends on threat in the area of operations (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-17. 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 SOPs address the following areas:

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

SPECIAL TEAMS

A-18. Special teams have specific duties, tasks, and responsibilities during dismounted movement. Each team must understand their role and rehearse before execution of the foot march. Unit SOPs must clearly state what is expected when their expertise is needed. Leaders, if mission variables permit, keep unit integrity while creating special teams. Special teams may include field sanitation, enemy prisoner and detainee handling, and road guard teams.

Field Sanitation Team

A-19. A field sanitation team provides the unit 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. (See ATP 4-25.12 for additional information.)

Detainee Processing Teams

A-20. The detainee processing team provides the expertise in processing detainees at the point of capture. Unit SOPs provide at a minimum, humane treatment of detainees afforded by the Geneva Conventions if captured during a march. A detainee should be searched, segregated, silenced, sped to the detainee collection point, safeguarded, and tagged with DD Form 2745 (*Enemy Prisoner of War [EPW] Capture Tag*). As a matter of policy, all detainees are treated as enemy prisoners of war until the appropriate legal status in determined and granted by competent authority. (See FM 3-63 for additional information.)

Road Guard Teams

A-21. The use of road guard teams is dependent on the mission variables of METT-TC (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations. 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 the variation of conditions or speed limit of the route in urban areas.

A-22. 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-23. Road guards must always remain vigilant. They must carry enough combat power to stop an oncoming vehicle which might have the 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.

This page intentionally left blank.

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 the 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 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 operation order (OPORD) or as a separate OPORD. Prepared in a 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 OPORD, the movement table is prepared as an attachment to the movement order. (See FM 6-0 for additional information.)

MOVEMENT ORDER

B-1. The movement order (see figure B-1 on pages 90 and 91) 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 (RPs), scheduled maintenance halts, logistics sites and services, communications, and location of the commander. Information and procedures contained in the unit's movement standing operating procedure (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 command and control (C2) 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 (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations. 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 (MP), and engineers-are critical for a successful tactical movement. The staff develops the detailed movement order per established priorities and commander's guidance.

B-4. The movement order and unit SOPs address the appropriate unit-level responses to all possible forms of contact. 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 an attack, the commander has a casualty evacuation (CASEVAC) plan. This plan considers SOP items, such as using combat lifesavers (CLSs) and dispersing medical evacuation (MEDEVAC) 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 percent and so forth)

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 Force/Quick Response Force/Quick Reaction Force
   - Military Police Escort
   - Explosive Ordnance Disposal
   - Special Operations Forces
   - Fire Support Elements
   - Element Locations
   - Attachments (External)

II. MISSION:

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

III. EXECUTION:

a. Commander's Intent
b. Concept of Operations:
c. March Executions and Tasks of Elements, Teams, and Individuals at the Objective or Mission Complete (Broad General Description from Beginning to End)
d. Tasks to Subordinate Units: (Includes Attached or Operational Control Elements)
e. Coordinating Instructions: (Instructions for ALL Units)
   1) Safety:
      - Overall Risk to Force: (Low, Medium, High, Extremely High)
      - Overall Risk to Mission Accomplishment: (Low, Medium, High, Extremely High)
      - Fratricide Reduction Measures
   2) Order of March (Spacing of Units/Location of Support Elements)
   3) Routes (Ensure Strip Map is Attached)
   4) Additional Movement Issues (Speed, Intervals, Stragglers, Lane, Reaction Units, and Accidents)

SAMPLE

Figure B-1. Outline for movement order, example

f. March Execution:
1) Timeline:
- Vehicle/Personnel Gear Preparation (Precombat Checks/Precombat Inspections Completed)
- Briefing
- Put on Equipment
- Load Vehicles (If Applicable)
- Rehearsals/Immediate Action Drills/Test Fires
- Brief Back/Confirmation Brief from Key Leaders
- Start Point/Departure/Checkpoints/Release Points Times
- Return to Base (When Applicable)
- Debrief
- Recovery: Maintain Vehicles/Personnel Gear

2) Sectors-of-Fire: (Cover Assigned Sectors While Mounted/Dismounted; Cover Up/Down Bridges, Rooftops, Balconies, and Storefronts, Multi-Story Structures, and Cross Streets)
3) 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)

4) Unit Speed. Minimum/Maximum.
- Speed is 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.

5) 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, civil considerations, and informational considerations (METT-TC[I]).

6) Headlight Status (If Applicable) On/Off, Blackout. Use of Night Observation Devices.
7) Reaction to Ground Enemy Contact/Enemy Aircraft (Battle Drills)
8) Rules of Engagement for March Operations (Theater Specific)

IV: SUSTAINMENT:
a. Individual Equipment (Precombat Inspections in Accordance With Standard Operating Procedures)
b. Vehicles (If Applicable) Preventive Maintenance Checks and Services
c. Recovery/Wrecker Support (When Applicable)
d. Class I thru 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. Command and Control (Positioning in March Formation)
b. Units Frequency: Call Sign:
c. Areas of Operations/Medical Evacuation (MEDEVAC) and Casualty Evacuation (CASEVAC) Plans
d. Unit Primary/Alternate/Contingency/Emergency Communications (PACE) plan
e. Counter Radio/Improvised Explosive Device Frequency Review, Communications (Extra Batteries)
f. Unit Internal (Back to:)
g. Arm and Hand/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/Quick Reaction Force. Call Sign.
- Close Air Support: Frequency. Call Sign.
- MEDEVAC/CASEVAC: Frequency. Call Sign.
- Indirect Fire Support: Frequency. Call Sign.

k. Crew Commands/Pro-Words/Brevity Codes
l. Pyrotechnics
m. Special Instructions
n. Reports (Individual and Higher Headquarters)
o. Give Time Hack and Ask for Questions

SAMPLE

Figure B-1. Outline for movement order, example (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 not complicating the movement or OPORD or in creating an unusually long order.

Note. Depending on mission and unit SOPs, a movement table may not always be used.

B-6. The movement table (see figure B-2) has two parts:

- One part provides data paragraphs reflecting general information common to two or more columns or elements of a column.
- The second part lists columns or elements of a column together with all other necessary information arranged in tabular form.

B-7. The movement table includes—

- 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 movement graph and, of importance to march planners, times at which serials or march units arrive at and clear critical points.
- Other information on movement tables includes 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-8. 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-9. 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.

(SECURITY CLASSIFICATION)

Movement Table to Operations Order for Movement No. : March Serial 1 **Map:** FM897649

General Data:

Copy No. : 4 of 10 **Issuing HQ:** 1-66 Infantry Regiment **Place of Issue:** Fort Benning, Georgia

Date-Time Group of: 151000 April

Signature: Bn Operations Officer

Message Reference No. : 19_XXX7

1. Average Speed: - 4kph
2. Traffic Density: - Between Soldiers 5 meters, between platoons 50 meters, between companies 100 meters
3. Halts: - Per units standard operating procedures
4. Routes (for example: between Start and Release Points): - MOYE Road; BUENA VISTA Road: SCHATULGA Road
5. Route Classification Restrictions: - None
6. Critical Points:
(a) Start Points: - MOYE Road and 2d ARMORED DIVISION Road (FM 988882)
(b) Release Points: - SCHATULGA Road and WARM SPRINGS Road (FM 998035)
(c) Other Critical Points: - MOYE Road and ST MARYS Road (FM 987696) (CP 1)
- MOYE Road and STEAM MILL Road (FM 998908) (CP 2)
- MOYE Road and BUENA VISTA Road (FM 998940) (CP 3)
- BUENA VISTA Road and SCHATULGA Road (GM 001942) (CP 4)
- SCHATULGA Road and FORREST Road (GM 001963) (CP 5)
- SCHATULGA Road and MACON Road (GM 000002) (CP 6)
7. Main Routes to Start Points: - MOYE Road
8. Main Routes from Release Points: - Unnamed trail (as designated by guides)
9. March Units: (See chart below):

March Unit 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/CP	Arrival (Hrs)	Clear (Hrs)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
March Unit 1 / 16 April	Co A	N/A	112/0	SP	RP	B	See No. 7 above	SP CP 1 CP 2 CP 3 CP 4 CP 5 CP 6 RP	160700 April 0711 0733 0836 0838 0910 1010 1050	160707 April 0718 0740 0843 0845 0917 1017 1057	See No. 8 above	
March Unit 2 / 16 April	Co B Bn Tactical Command Post	N/A	129/0	SP	RP	B	See No. 7 above	SP CP 1 CP 2 CP 3 CP 4 CP 5 CP 6 RP	0748 0759 0821 0924 0926 0958 1058 1138	0755 0806 0828 0931 0933 1005 1105 1145	See No. 8 above	
March Unit 3 / 16 April	Co C	N/A	109/0	SP	RP	B	See No. 7 above	SP CP 1 CP 2 CP 3 CP 4 CP 5 CP 6 RP	0812 0823 0845 0948 0950 1022 1122 1202	0819 0830 0852 0955 0957 1029 1129 1209	See No. 8 above	

SAMPLE

Acknowledge:

Distribution: - A

Authentication: - Official
SELLERA
Bn Operations Officer

(SECURITY CLASSIFICATION)

LEGEND

Bn	BATTALION	KPH	KILOMETERS PER HOUR
Co	COMPANY	N/A	NON APPLICABLE
CP	CHECKPOINT	No.	NUMBER
HHC	HEADQUARTER AND HEADQUARTERS COMPANY	Ref	REFERENCE
		RP	RELEASE POINT
HQ	HEADQUARTERS	SP	START POINT
Hrs	HOURS		

Figure B-2. Format for movement table, example

This page intentionally left blank.

Appendix C
Posture and Body Mechanics

Soldier posture and body mechanics are critical factors for performance during load carriage. Proper posture and body mechanics allow Soldiers to move efficiently, 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 important while conducting dismounted movement.

BODY MECHANICS (POSTURE IN MOTION)

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. The primary goals of all 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.

MANAGEMENT OF THE LOAD TO CONSERVE ENERGY

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 plus 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 load, 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.

BODY ALIGNMENT AND MOVEMENT

C-3. When body segments are aligned properly, movement is efficient, and injury risk is minimized. When body segments are 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 the 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 (CPs) 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. The feet remain directed generally forward, but Soldiers should not strain to keep feet directed forward, since variations in skeletal alignment prevent some Soldiers from assuming a feet-forward position.

BODY ADJUSTMENTS TO LOAD

C-6. Foot marching with a load on the back will require body adjustments to load, specifically some forward lean of the trunk. Typical body adjustments to load include trunk lean, gait changes, and increased stress on lower extremities. However, Soldiers must not allow their trunk and shoulders to round forward.

Trunk Lean

C-7. The most visible response to adding pack-borne load is that the Soldier leans forward while walking (see figure C-1). This happens with pack loads as light as 15 to 20 pounds. Mechanically, this forward lean response serves to center load as closely over 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.

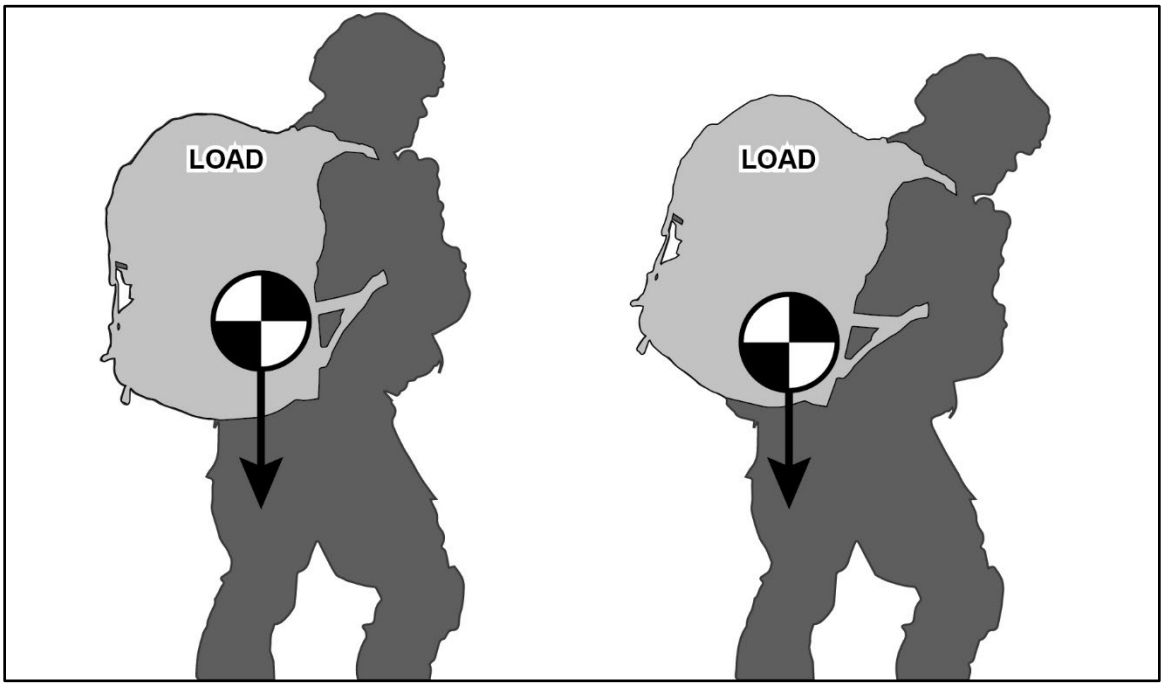


Figure C-1. Body mechanics and load control

C-8. 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 increases 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-9. 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-10. 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 that 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, Soldiers should take shorter, faster strides to maximize efficiency. 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.

ENERGY EXPENDITURE

C-11. 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-12. Energy expenditure of load carriage increases in a systematic manner as the load carried increases, and with increases in walking velocity, grade, terrain, and weather or a combination of these conditions. For example, 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 four to six times.

C-13. 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 Soldier's bodyweight, energy expenditure remains constant; however, when Soldier's load increases above 30 percent of bodyweight the rate of energy expenditure increases throughout the march.

C-14. 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 (see figure C-2 on page 98).

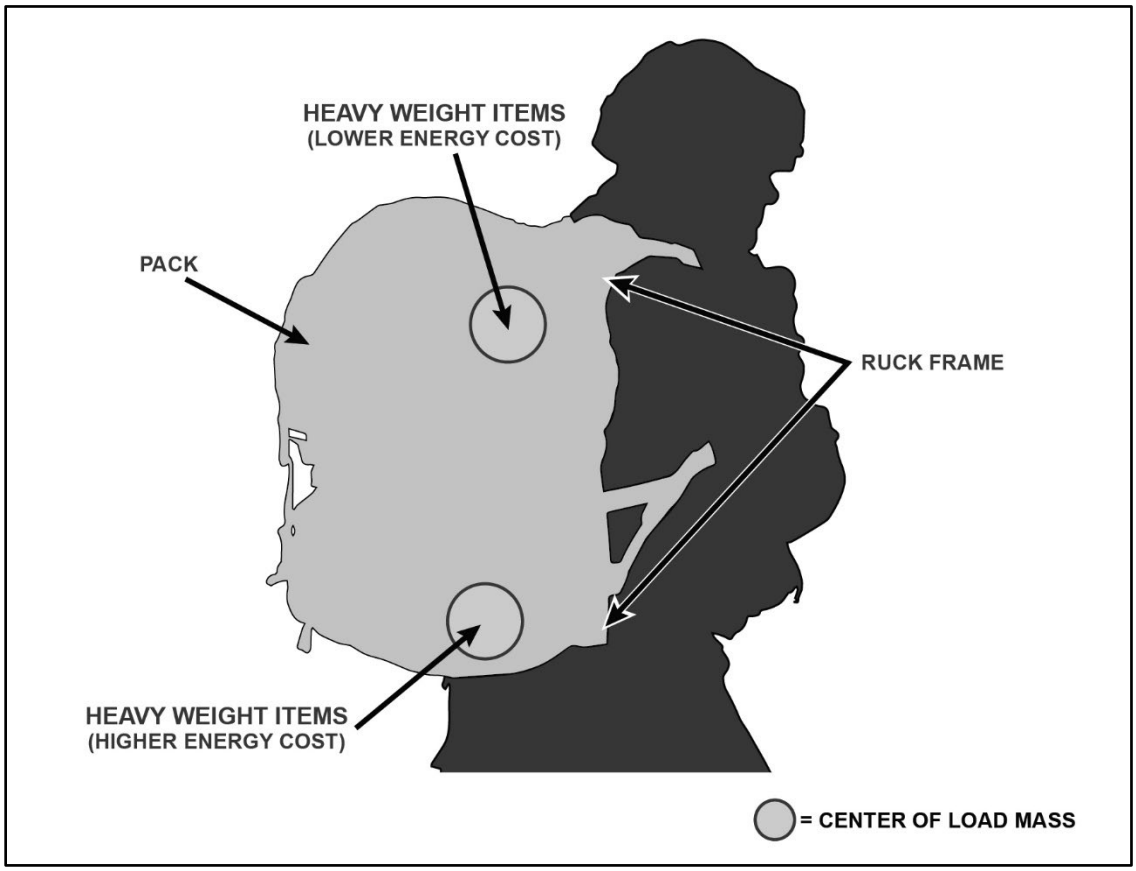


Figure C-2. Load placement inside pack

Note. For reduced energy expenditure, heavy items should be packed high and close to the body area of the pack rather than low and away from the body.

PHYSIOLOGICAL DIFFERENCES

C-15. Compared to males, females walk with shorter stride length and greater stride frequency. As loads increase, a female's stride length decreases, whereas a male's stride length does not show significant change. With increasing loads, females show a more pronounced linear increase in time when both feet are on the ground than males. To bring center of load mass over the feet, females tend to hyperextend their necks and bring their shoulders farther forward than do males, possibly to compensate for less upper body strength. Many of these differences between males and females persist even when differences in body size and composition are considered.

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

PREPARE AND PACK THE LOAD

C-16. Everything a Soldier wears or carries during an operation should be relevant to accomplishing the mission. While there are numerous items a Soldier could carry during a mission, it is up to leaders to decide what they should carry. By thoroughly reviewing the packing list, assessing the value of every item, and weighing the threat the enemy presents against the need for mobility and survivability, leaders can ensure their Soldiers carry the necessary equipment during the operation while maintaining a protective posture capable of preserving combat power and saving lives.

C-17. Leaders can establish the correct procedures to pack a rucksack based on the Soldier's duty position. A correctly packed ruck will allow Soldiers to sustain themselves for extended periods. Equipment should be optimally configured to allow for easy access to critical items, stowing lesser-used items near the bottom of the rucksack, and ensuring the load is balanced and comfortable when carried.

PACKING THE RUCK

C-18. Ultimately, it is up to the commander to dictate what goes into the ruck for the mission. Whether the item is accessible, balanced, compressed, and streamlined may assist in determining pack procedures and should be used as guidelines.

C-19. Accessible mission-critical items should be readily retrievable at any given time in a mission. The location of these items should be standard across the unit. Keep similar items together.

Balanced

C-20. A lopsided pack is a miserable experience. Ounces make pounds. Subordinate leaders supervise Soldiers in packing to reduce nonessential and redundant equipment. Strive to use multifunction equipment as much as possible. Note that waterproofing is necessary. A drenching rain can more than double the weight of a rucksack. Measures to maintain balance include—

- Placing heavy items close to the body and midway up the back.
- Evenly distributing mid-weight items side to side.

Compressed

C-21. Certain items like mission equipment, food, and/or sleeping gear make up the bulk of the load. Other items, like clothes, make perfect buffers to squeeze into the cracks of bulky items. Continue this process of layering, keeping in mind the access need for each item. Continue to push down and compress each layer. A tightly packed ruck carries much easier and provides more room to pack. Utilize the compression straps to keep the internal load from shifting around. This keeps the load closer to the body. Once the ruck is fully compressed, there should be no flexing if pressing down on the top.

Streamlined

C-22. Hanging equipment on the outside of the pack is an extremely poor practice. Heavier items can be felt swinging with each step. Heavy items, such as hydration bladders and assault packs, will act like a pendulum the further away they get from the body, increasing the felt weight. Place these items directly on top or inside, close to the body. Items will snag on brush, make excessive noise, and may be broken or lost in a tumble. When climbing rocky terrain, they can catch on vegetation and in cracks and cause a loss of balance or a fall. Try to keep all items inside the pack until needed.

ADDITIONAL TECHNIQUES

C-23. Some additional techniques that align with accessible, balanced, compressed, and streamlined are as follows:

- Accessible—
  - Confirming the top zone is used for essential, immediate-use items Soldiers will require on the mission.
  - Confirming the accessory pockets for urgent essentials.
- Balanced—
  - Waterproofing of all items.
  - Determining the three zones and peripheral storage for Soldiers' rucksacks.
  - Confirming rows, not columns, are used when packing rucks.
  - Confirming Soldiers fill nooks and crannies until they have a solid, stable, and equally balanced load on both sides of the pack.
  - Confirming the bottom zone is used for the Soldiers' bulky gear and items not needed until later in the mission.
  - Confirming the core zone is used for the Soldiers' denser, heavier items.
  - Breaking down rations; do not carry unnecessary food items.

  - Working at lightening the load by working as a team-not everyone needs to carry cooking equipment, cleaning kits, sleeping bags, and so forth.
- Compressed—
  - Evaluating rucksacks when they are fully loaded to ensure efficiency and balance.
  - Verifying Soldiers wrap soft items around bulky gear to prevent shifting.
- Streamlined—
  - Placing all items in medium-sized dry bags, allowing for quick retrieval.
  - Removing sleeping bags only when it is tactically sound to do so; consider putting it in the bottom of the pack.

C-24. Packing bulky, soft, light weight, or less-essential gear at the bottom of the ruck offers an additional advantage. It creates an internal shock-absorption system for the Soldiers' back and the ruck. Roll items as small and tight as possible. Packing heavy items in the core zone creates a stable center of gravity and directs the load downward rather than backward.

C-25. A good rule of thumb is to pack least-used items in the bottom of the ruck, place more frequently used items in the top of the ruck, and fill nooks with soft items. Rucks differ in that they provide front pockets, side pockets, and so forth. The pockets may be perfect for a compass, Global Positioning System, maps, or other frequently used items.

FORMS OF LOAD CARRIAGE

C-26. Where loads are carried on the body affects energy expenditure and gait mechanics. While it is not the most efficient method (from an energy expenditure perspective) to carry heavy loads on the back, the requirement to do so while navigating complex terrain and keeping the load from protruding excessively beyond a Soldier's frame necessitates carrying in less efficient locations such as on the back.

RUCKSACKS AND DOUBLE PACKS

C-27. A practical choice in load carriage is to carry loads as close as possible to center mass of the body. For this reason, rucksacks and double pack methods use less energy than other forms of load carriage. (See figure C-3.) Even so, rucksacks 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-28. 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-29. 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. Alternatively, increasing the load when using a regular backpack lengthens the stride, with potentially harmful effects.

C-30. 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-31. 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-32. 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-33. When a pack frame and hip belt are used for loads between 31 and 90 pounds, the proportion of the load is 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-34. 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 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.

C-35. 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 the 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-36. 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-37. 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-38. 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-39. 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 that can further improve Soldier mobility and comfort.

Note. Pull shoulder straps forward while walking uphill, this shifts the center of mass of the load higher on the back which reduces trunk lean, reduces energy cost, and assists hip mechanics. Loosen shoulder straps while walking down hill, this makes the load more stable.

RIFLE CARRIAGE

C-40. 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 a small, but significant, effects on human gait. The rifle carriage increases forces produced at heel strike (ground impact forces, about

5 percent), results in forces to decelerate the body (maximum breaking forces, about 1 percent), and increases side-to-side forces (mediolateral impulse, about 12 percent). Many of these changes are less because of the mass of the rifle and due to restrictions of arm movement, which increases movement of the body center of mass.

BODY ARMOR CARRIAGE

C-41. 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. (See paragraph 3-19 for more information.)

This page intentionally left blank.

Appendix D

Training for the March

This appendix provides a brief overview of the Army's holistic health and fitness (H2F) system that formalizes the way the Army trains, develops, and cares for Soldiers. It discusses physical and mental conditioning for foot marches and the nutrition and hydration requirements before, during, and after the march.

HOLISTIC HEALTH AND FITNESS SYSTEM

D-1. The Army's H2F system establishes the doctrine (see FM 7-22) for the readiness training of Soldiers and is the foundation of unit readiness. The system presents individualized training and testing that builds peak performance in all Soldiers. The five domains of the H2F program build the Army's readiness goals and are based on the principles of optimization, individualization, and immersion. The goal is to improve each Soldier's physical lethality and mental toughness through the linking of the five domains-physical readiness, nutritional readiness, mental readiness, spiritual readiness, and sleep readiness. (See ATP 7-22.01 for H2F testing and ATP 7-22.02 for H2F drills and exercises.)

D-2. Performance readiness experts of the H2F system can assess each Soldier's physical and mental status and design programs to sustain or improve that Soldier's ability to meet the demands of the military occupational specialties, duty assignments, and combat-specific tasks. This individualized approach is sustained across the Soldier's Army career. It represents a cultural shift from the industrial scale approaches of the past where massed formations received the same training in a one-size-fits-all approach-often with no equipment or expertise required to lead the training.

D-3. H2F directs leaders and Soldiers to use unit-level experts, facilities, and equipment to develop the physical and nonphysical components of Soldier readiness. This doctrine has evolved from the lessons learned, Soldier feedback, and Soldier testing throughout a prolonged period of ground combat. Lessons learned in that period are combined with the best performance and medical science to prepare Soldiers for a wide range of threats in complex operational environments (OEs). The H2F system is an immersive, comprehensive approach to readiness centered on brigade-owned H2F facilities and personnel.

PHYSICAL AND MENTAL CONDITIONING FOR FOOT MARCHES

D-4. Military leaders have always recognized the effectiveness of Soldiers depends largely on their physical condition. Combat operations place a premium on Soldiers' strength, stamina, agility, mobility, resiliency, coordination, and survivability. Victory and the Soldier's life often depend upon these factors. Superb physical conditioning is required to march long distances under loads (for example, fighting or approach march loads [see chapter 3]) through rugged terrain and to fight effectively upon arriving at the area of combat.

D-5. Competence in individual Soldier performance in all training activities instills confidence in the ability to perform. It gives Soldiers the confidence that all Soldiers in the unit have similar physical capabilities and the mental and physical discipline needed to adapt to changing situations and physical conditions. Commanders at every echelon integrate training events in their training plans to develop and train adaptive leaders and units. Commanders must understand the fundamental doctrinal training principles described in ADP 7-0 and FM 7-0 and apply them accurately to ensure Soldiers are physically prepared to accomplish the unit's mission.

PHYSICAL READINESS

D-6. Physical readiness is a critical component of Soldier and unit readiness. Physical readiness training is a daily opportunity to build valuable Soldiering skills of strength, power, flexibility, speed, mobility, and agility to help Soldiers meet physical and mental challenges during the conduct of combat operations.

Providing emphasis on varieties of physical tasks enables commanders to ensure the full physical readiness of the unit regardless of the threat environment and mission. This emphasis allows an opportunity for Soldiers to take pride in their skills. Soldiers excelling in different skills can boost unit and individual morale, inspiring Soldiers to take ownership of their own physical fitness.

D-7. The basic form of Soldiering physical success means having abilities to move, to acquire, and to engage the enemy. Soldiers must have endurance to travel by foot to the objective. In some environments, this involves several hours of uphill walking with a pack at altitude, strength to defeat, move and climb over obstacles in their path; mobility to maneuver on the objective skillfully and after extreme physical exertion, stamina to control their breathing well enough to accurately fire weapons at an enemy. See FM 7-22, ATP 7-22.01, and ATP 7-22.02 for a detail discussion on the physical readiness activities that enhance the military skills needed during combat operations and duty performance.

Note. Commanders and staff establish physical training programs consistent with AR 350-1 and FM 7-22 and in consultation with their H2F teams and master fitness trainers. Training that addresses both the physical and nonphysical aspects of Soldier readiness develops an H2F training program benefiting subordinates for combat missions.

Principles of Physical Readiness Training

D-8. All physical readiness training follows the principles of precision, progression, and integration. These principles ensure Soldiers perform all physical readiness training sessions, activities, drills, and exercises correctly with an appropriate intensity and duration for optimal conditioning and injury control. (See FM 7-22 for a detailed discussion of each principle.)

Precision

D-9. Precision is the strict adherence to optimal execution standards for physical readiness training activities. Precise movement depends on having the structural capabilities, proper flexibility, tolerance of extra weight, body composition, and the connection of the brain to muscles-motor patterns-that allow Soldiers to learn the standard and perceive the difference between correct and incorrect techniques. The quality of the movement is as important as the weight lifted, repetitions performed, or speed of the movement. Movement skill develops through the repeated execution and deliberate practice of foundational drills and exercises.

Progression

D-10. Progression refers to the proper frequency, intensity, duration, and type of exercise required to overload the body without causing overtraining, plateauing, or reversal of fitness. The goal is to develop physical capacity to support the mastery of occupational and combat-specific tasks. Task analysis includes the physiological demands of the task and potential performance, and injury issues the Soldier might have.

Integration

D-11. The integration principle focuses on the tasks and drills, and multiple training events to achieve balance and appropriate recovery between activities in the unit-driven and unit-run physical readiness training program. Physical readiness training requires the integration of a variety of components, for example, muscular endurance, muscular strength, balance, flexibility, and agility.

Movement Lethality

D-12. The overarching physical readiness training goal is movement lethality-the ability to physically engage with and destroy the enemy. Movement lethality is the ability to apply and sustain the right amount of strength, endurance, and speed to meet the demands of training and combat physical tasks. This physical goal is supported by optimal mental function. The goal and the function are inseparable, linked together. The ability to tolerate physical duress is a function of mental toughness.

D-13. Movement lethality has to be taught and learned with meticulous attention to the precise replication of the movements required in occupational tasks and combat. Movement skill must be deliberately and

purposely progressed until it becomes a natural part of Soldier performance in training and in contact with the enemy.

D-14. Because foot marches require a blend of strength, endurance, and speed, commanders and subordinate leaders design physical readiness training activities to challenge all three characteristics of movement in an integrated manner. Precision regarding all three components is based on the premise quality, movement, or form is just as important as weight lifted, repetitions performed, or the speed of the run or march. Proper progression of physical training activities allows the body to positively adapt to the stresses of training.

Strength

D-15. Strength is the ability to overcome resistance. Strength runs a continuum between two subcomponents: absolute muscular strength (the capacity of a muscle/muscle group to exert a force against a maximal resistance) and muscular endurance (the capacity of a muscle/muscle group to exert a force repeatedly or to hold a fixed or static contraction over a period time). Soldiers need strength to foot march under load; enter and clear a building or trench line; repeatedly load heavy rounds; lift equipment; transport a wounded Soldier to the casualty collection point; and most of all, to be able to withstand the rigors of continuous operations while under load. A well-designed, strength-training program improves performance and appearance and controls injuries.

Endurance

D-16. Endurance is the ability to sustain activity. The component of endurance, like strength, also runs a continuum between the ability to sustain high-intensity activity of short duration (anaerobic), and low intensity activity of long duration (aerobic). A properly planned and executed endurance training program balances anaerobic and aerobic training. Examples of anaerobic training are speed running, individual movement techniques, and negotiation of obstacles. Examples of aerobic training are foot marching, sustained running, cycling, and swimming.

Speed

D-17. Speed improves with the proper development of aerobic and anaerobic energy systems along with muscular strength and endurance. Drills and exercises are the means to cultivate this improved end state. When Soldiers use moderate to heavy loads (65 to 85 percent of one repetition maximum), a greater number of repetitions and a variety of speeds, they are building muscle mass. Muscular endurance, in combination with aerobic and anaerobic endurance, is required to tolerate carrying progressively heavier loads over greater distances on uneven and steeper terrain and at faster speeds. Hill repeats are an effective means of developing explosive leg strength, anaerobic endurance, and speed.

Prerequisites for Movement Lethality

D-18. Figure D-1 on page 108 illustrates the prerequisites for movement lethality. Components of fitness, energy systems, occupational skills, and physical skills required for movement lethality must be carefully combined over time with a Soldier's structural capabilities.

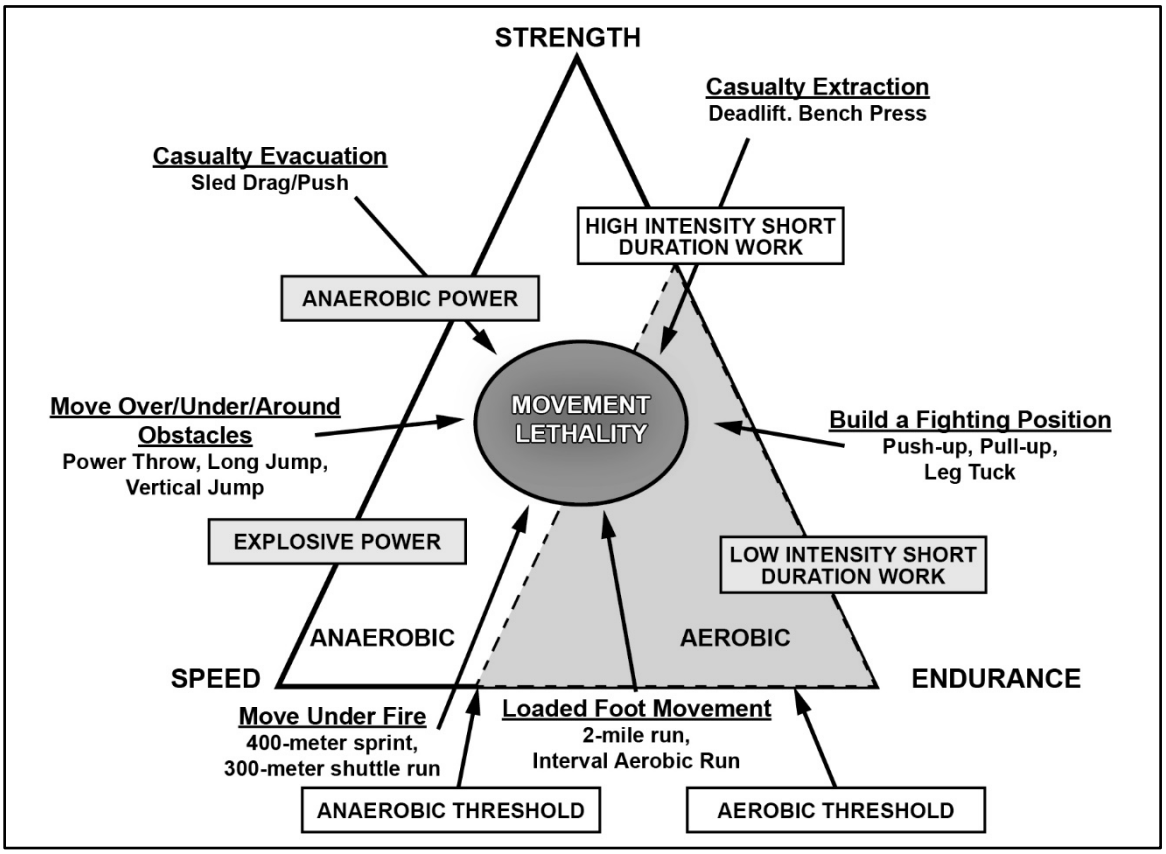


Figure D-1. Tasks and physical components of movement lethality

Mobility

D-19. Mobility is the ability to move at varying speed and range of motions across multiple planes of motion. Mobility is the functional application of strength and endurance. It is movement proficiency. Strength with mobility allows a Soldier to squat and lift an injured Soldier. Without sufficient mobility, a strong Soldier may have difficulty executing the same casualty transport technique. Endurance without mobility may be acceptable to a distance runner, but for Soldiers performing a foot march or individual movement techniques, both components are essential for optimal performance.

Mental Readiness

D-20. Mental readiness is an individual's or unit's ability to think, feel, and act in a manner that optimizes performance in a demanding environment or with occupational and combat-specific tasks. Just as physical readiness requires the integration of a variety of components, optimizing mental readiness requires the integration of a variety of capabilities. Mental readiness includes the ability to integrate three interrelated capabilities-cognitive, emotional, and interpersonal capabilities.

D-21. Mental readiness, like physical readiness can be improved and requires intentional training to achieve peak levels of performance. Optimizing Soldier readiness requires maximizing the mental and physical readiness of the Soldier and unit. Leaders play an active role in creating and sustaining a climate that encourages Soldier mental readiness in accordance with unit needs.

D-22. Unlike physical, sleep, and nutritional readiness, mental readiness is difficult to standardize and measure. Conceptual notions of what makes a mentally ready Soldier often differ with empirical findings. Moreover, reconciling stable personality traits with fluid Army roles and assignments is a daunting task. For example, what might appear to be the perfect mental readiness profile for success in maneuver units within

the brigade combat team might not be appropriate for nonmaneuver forces or a specific military occupational specialty in the brigade combat team.

D-23. Soldiers must possess exceptional mental flexibility and endurance, morals and ethics, self-initiative, and an ability to operate within the commander's intent. Mental readiness is a foundational consideration in the H2F system. It includes the integration of cognitive, emotional, and interpersonal capabilities. Leaders must incorporate individual and unit mental readiness training into the unit's battle rhythm.

D-24. Within the H2F system, teams are staffed and resourced to support leaders and Soldiers in the training of mental readiness. Leaders should seek their assistance to enable them to focus time and energy on primary functions while mental readiness improvement can be trained by experts in an appropriate, effective, and efficient manner.

D-25. Optimal mental readiness is required for optimal Soldier or unit cohesion. Mentally ready Soldiers can leverage protective factors against physical and environmental stressors typically encountered in complex military environments.

D-26. FM 7-22, chapter 9, provides tools, techniques, and resources for leaders to maximize Soldier and unit performance through the development, sustainment, or restoration of mental readiness. The chapter discusses the purpose, impact, and the components of mental readiness as well as strategies for mental readiness development.

Common Training Considerations for Foot Marches

D-27. Training in foot marches develops a unit's ability to march to its destination conditioned to accomplish its mission. Whether forces are mounted or dismounted, success in combat depends upon Soldiers who can move dismounted cross country, covering great distances quickly. Achieving this goal requires unit discipline, outstanding leadership, excellent teamwork, high morale, mental and physical endurance, and mental and physical stamina.

D-28. Restoring adequate glycogen in the muscles and enhancing muscle recovery through proper nutrition before, during, and after the march allows the body to refuel and recuperate. This ensures positive adaptations to stress, enhances Soldier resiliency, and optimizes gains in strength, endurance, and speed while controlling injuries.

D-29. Ensuring that Soldiers are properly hydrated during all march activities is a good way to prevent the onset of injuries. Water is the preferred hydration fluid before, during, and after physical activities. Soldiers must consume enough water to replace water lost due to sweat. Sweating rates greater than 1 quart per hour are not uncommon when training for the conduct of long-distance marches under loads through rugged terrain.

Proper Physical and Mental Conditioning

D-30. An essential element of training foot Soldiers is proper physical and mental conditioning, which develops stamina and endurance to perform required tasks. Best results are obtained from cross-country marches, although physical training and negotiating obstacle courses are useful. Initially loads should be light and distances short, then increased as the rigor of distance and weight under load increases. Training must replicate, to the degree possible, the rigorous conditions Soldiers will encounter during combat operations. Considerations to apply during exercise and conditioning drills and training activities, though not all inclusive, include—

- Progression.
- Regularity.
- Overload.
- Variety.
- Balance.
- Recovery.

Progression

D-31. Progression is the systematic increase in the intensity, duration, volume, and difficulty of physical training activities. A variety of physical activities with precise standards of execution ensures that bones, muscles, and connective tissues gradually toughen, rather than break. Toughening activities develop essential skills associated with critical Soldier tasks such as jumping, landing, climbing, lunging, bending, reaching, and lifting. The proper progression of a variety of physical activities allows the body to adapt positively to the stresses of foot march training. When progression is violated by too rapid an increase in intensity, duration, volume, or difficulty the Soldier is unable to adapt to the demands of training. The Soldier is then unable to recover, which can lead to overtraining, overreaching, and overuse (see FM 7-22 for a detailed discussion) or the possibility of injury (see appendix F). A Soldier's proper progression during foot marches under loads, allows the Soldier to gradually become proficient at managing heavier loads while conserving energy.

Regularity

D-32. When regularly performed with precision, foot marches and the enabling drills, exercises, and activities within FM 7-22 and ATP 7-22.02 enhance posture and improve body mechanics. As many factors may influence regular participation in these events, the most common factors include a unit's operating tempo and related mission requirements. Commanders and subordinate leaders must anticipate and plan for these and must make these events as important as any other programmed training or mission requirement. Adhering to a regular schedule, and the scheduled intensity and duration prevent Soldiers from progressing too fast and to avoid cumulative effects regarding injuries. How fast Soldiers progress depends on how regularly they perform challenging activities and how much rest and recovery time they get. Every regularly performed session will develop strength, endurance, and mobility.

D-33. Foot marching as a movement component of the movement and maneuver warfighting function is a critical Soldier physical requirement. Regular foot marching helps to avoid the cumulative effects of lower extremity injury trauma and prepares Soldiers to successfully move under load. To enhance optimal posture and mechanics, Soldiers need to regularly stretch the chest muscles that are prone to tightness and strengthen the upper back muscles that promote proper carriage of the shoulder girdle (the set of bones in the shoulder area that connects to the arms on each side). More importantly, they need greater awareness of the way they carry the shoulder girdle while performing everyday tasks. Rounding of the shoulders is a common postural problem with many Soldiers, perhaps from emphasizing pushing exercises at the expense of pulling motions.

Note. Per AR 350-1, Soldiers are required to participate in collective or individual H2F activities at least three times per week. Optimal participation in H2F may be achieved through conducting training sessions anytime during the duty day, not necessarily only in the early morning. Leaders must understand this and make it known. Soldiers should only be excused from regular unit H2F when they have performed exhaustive duties with little or no rest or have a temporary or permanent physical profile according to AR 40-501. All Soldiers must understand that it is their personal responsibility to achieve and sustain a high level of physical readiness. Many Soldiers are assigned to duty positions that restrict participation in collective unit H2F programs. Commanders must therefore develop leadership environments that encourage and motivate Soldiers to accept individual responsibility for their own physical readiness. Leaders and individual Soldiers need to use the H2F system outlined in FM 7-22 to help achieve and sustain high levels of physical readiness.

Overload

D-34. Commanders train Soldiers to adapt to the rigorous conditions they will encounter during combat operations through intensified training experiences and varied training conditions. Activities, such as foot marches, must impose physical and metabolic demands on the Soldier. To prepare the foot Soldier to meet the physical demands of the profession, a system of training must focus on the development of strength, endurance, and mobility, plus the enhancement of the body's metabolic pathways.

D-35. To achieve muscle development, it is necessary to exceed normal demands on the body, not exercising to muscle failure. Muscle failure implies using the muscle until it no longer works and relying on other structures such as ligaments, tendons, and cartilage to complete the exercise. These structures then may be injured, requiring medical treatment. Muscle fatigue is more appropriate term and condition. Once muscles fatigue, Soldiers can no longer maintain proper form, then they must modify the exercise to protect other structures. For example, after performing multiple push-ups, Soldiers must move to their knees to continue with proper form.

D-36. Developing the ability of Soldiers to meet the changing physical demands and varied conditions that are placed upon them during a foot march under load, without undue fatigue or risk of injury, is woven into the standards for conducting this training event. Standards are achieved through precise control of the following:

- Prescribe appropriate intensity and duration to which Soldiers perform.
- Properly distribute external loads across the major joints of the body.
- Integrate and balance the components of strength, endurance, and mobility.
- Provide adequate rest, recovery, and nutrition.

Variety

D-37. Commanders use a variety of H2F activities (specifically the drills, exercises, and activities listed in FM 7-22 and ATP 7-22.02) to improve the strength, endurance, and mobility of Soldiers for the successful performance of foot marching over varying terrain. Varying progression and types of exercises to include muscular strength, muscular endurance, aerobic endurance, anaerobic endurance, flexibility, and mobility help to avoid injuries while providing challenging training. This systematic progression and variety readies and conditions the body for a variety of body management competencies required during the march. The foot march itself improves the muscular and aerobic endurance needed for foot marching. Varying rates of march, distances, and speeds, along with hill repeats and terrain runs improve the Soldier's ability to move quickly with agility over varying terrain with or without a load. Recovery (see paragraph D-39) safely returns Soldiers to a pre-exercise/activity state while improving mobility thus enhancing the military skills needed for effective combat and duty performance.

Balance

D-38. Commanders obtain effective training when they create a realistic and challenging training environment. Commanders and subordinate leaders select exercise and conditioning drills and other training activities within a balanced conditioning and training program that can be conducted safely within the constraints of the training environment. A balanced program requires the integration of multiple drills and activities to achieve the correct blend of strength, endurance, and mobility while controlling injuries. Foot marches require a blend of strength, endurance, and mobility, preconditioning drills and activities that are designed to challenge all three components in an integrated manner with appropriate recovery between activities. Within this program, example drills and activities could include—

- Conditioning drills and climbing drills to develop the strength, mobility, and physical skills needed to negotiate obstacles and conduct movements under loads.
- Military movement drills and foot marches to improve posture and body mechanics during movement.
- Guerrilla drills to develop the strength and skill associated with dismounted movement characterized by high altitudes, rapidly changing climatic conditions, and rugged terrain.

Recovery

D-39. Recovery is the most violated consideration for training, though essential to minimize overuse injuries. Recovery gradually and safely tapers off activities to bring the body back to its pre-exercise or training activity state. The consideration for recovery carries over until the next activity is performed. Restoring adequate hydration and energy balance through proper nutrition and ensuring adequate sleep allows the body to refuel and rest. Proper recovery results in a positive adaptation to the stress of training, improves Soldier resiliency, and optimizes gains in strength, endurance, and mobility while controlling injuries. Examples could include stretching after a foot march or walking after running activities and the performance of recovery

drills at the end of an exercise session. Two familiar ways to recover from hard workouts might be to follow a hard workout with an easy day or to exercise different body regions or perform different type of activities the day after a hard workout such as agility followed by endurance training.

NUTRITION AND HYDRATION

D-40. Soldiers must understand what to eat daily and what to eat and drink around each training activity or tactical event. For example, prior to and during execution, and to adequately recover from one training activity or tactical event to another, Soldiers must restore energy and hydration through proper nutrition and fluid intake. This intake of nutrition and fluids by Soldiers is essential to unit readiness and the ability to enable and sustain continuous operations.

Note. Nutritional readiness is the attainment of an individual nutritional strategy that supports optimal physical and cognitive function as well as lifelong disease and injury prevention. Nutritional readiness is a critical component of holistic health and contributes greatly to mission success. The development of a comprehensive performance nutrition program, tailored to organizational requirements, can improve individual Soldier performance, overall unit readiness, and mission success. FM 7-22 chapter 8 describes basic nutrition concepts and integrates them into performance nutrition plans and practical nutrition recommendations for the Soldier.

NUTRITION CONSIDERATIONS FOR PERFORMANCE

D-41. The macronutrients (proteins, carbohydrates, and fats) are important to building a nutritional foundation to conduct foot marches. Figure D-2 illustrates the general guidelines for Soldiers about macronutrient intake and the role of these macronutrients.

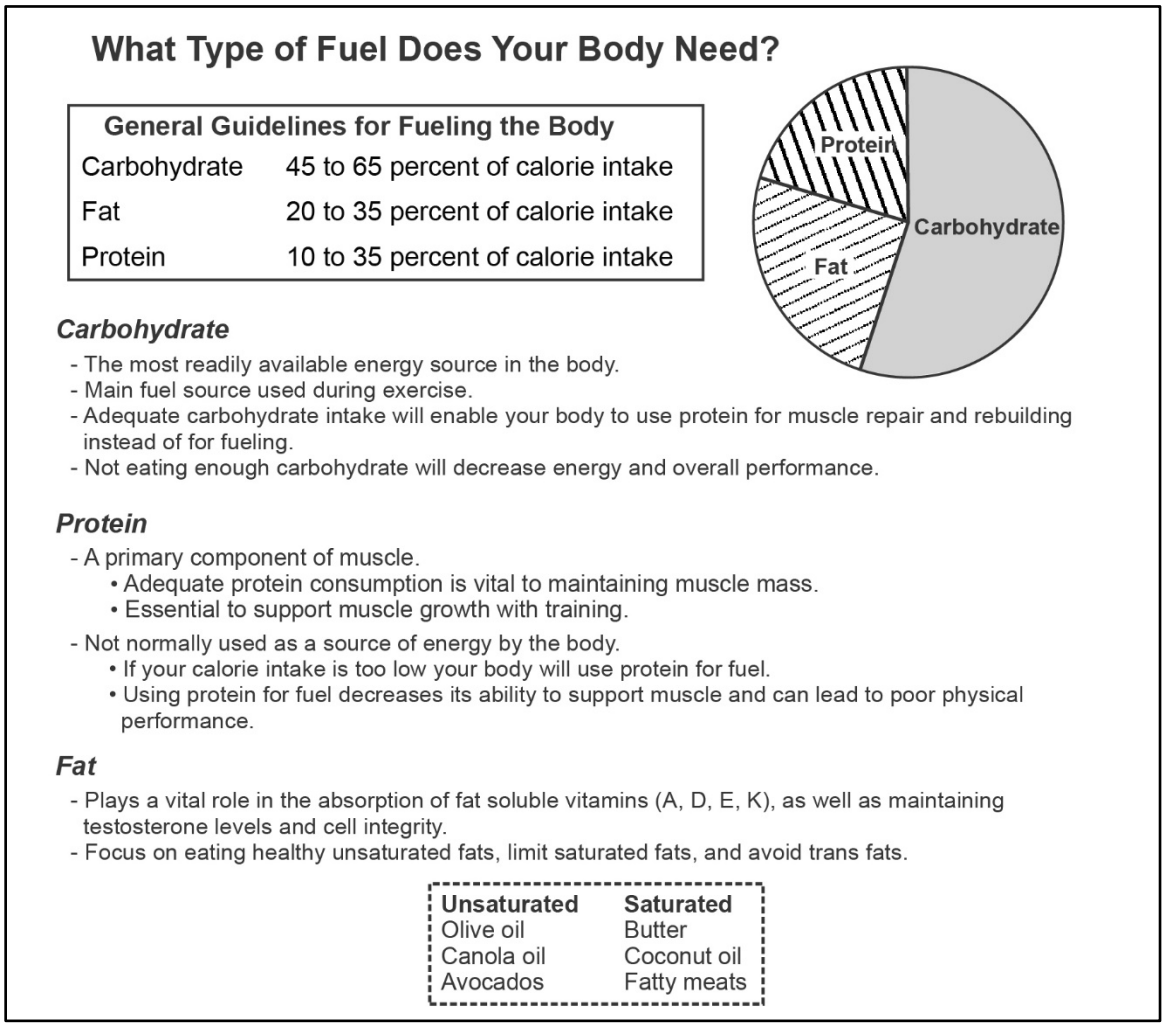


Figure D-2. Types and percentages of fuel the body needs

D-42. 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-43. Kilocalories from carbohydrates, protein, and fat digest, absorb, and metabolize at different rates in the 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 recovery 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-44. Muscles require energy to perform work and use carbohydrates as the primary fuel for intense muscular activity. Soldiers should consume at least 1 gram 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-45. 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 four equal parts over an hour. For example, consume the crackers or bread and the beef jerky items from a meal, ready to eat (MRE) or first strike ration at rest points and/or halts during the foot march.

After the March

D-46. 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 decrease 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 (greater than 90 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 the Appropriate Electrolyte Balance

D-47. 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. General guidelines for hydration and maintaining an appropriate electrolyte balance include the following:

- Drink 16 ounces of water 2 hours before the march.
- Drink 8 to 16 ounces of water 15 minutes 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 that 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.

This page intentionally left blank.

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 feet is vital to mission accomplishment. Leaders and Soldiers should—

- Bring several pairs of proper fitting socks.
- Have an extra pair 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 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 the mission variables of METT-TC (I), which stands for mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations.

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 the towel back under the arch.

PREVENTATIVE MEASURES

E-4. Foot care preventive measures enable continuous operations. Commanders and subordinate leaders implement preventive measures before, during, and after the march to avoid painful foot problems.

E-5. Before the march, trim toenails on a regular basis. Cut toenails short and square, and straight across. (See figure E-1 on page 118.) 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 liners can reduce friction and add protection.

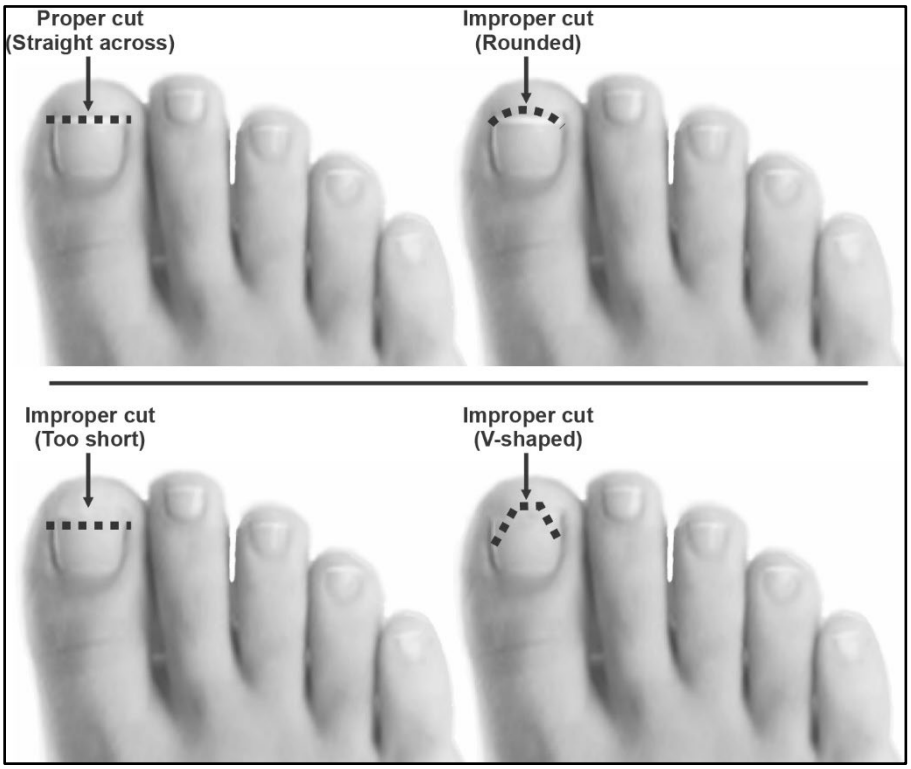


Figure E-1. Trimming of toenails

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 combat lifesavers (CLSs) can help. 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 foot 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 the sensation of heat and irritation. After washing, dry feet well.

Note. Unit medics and CLSs have proper equipment and training to care for 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. Conditions 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 are normally 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 probability 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 on page 120.) When hot spots are detected, blisters may be avoided by shielding the affected areas with low-friction skin coverings. 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 the bandage, dust outside of the bandage and the entire foot with foot powder.

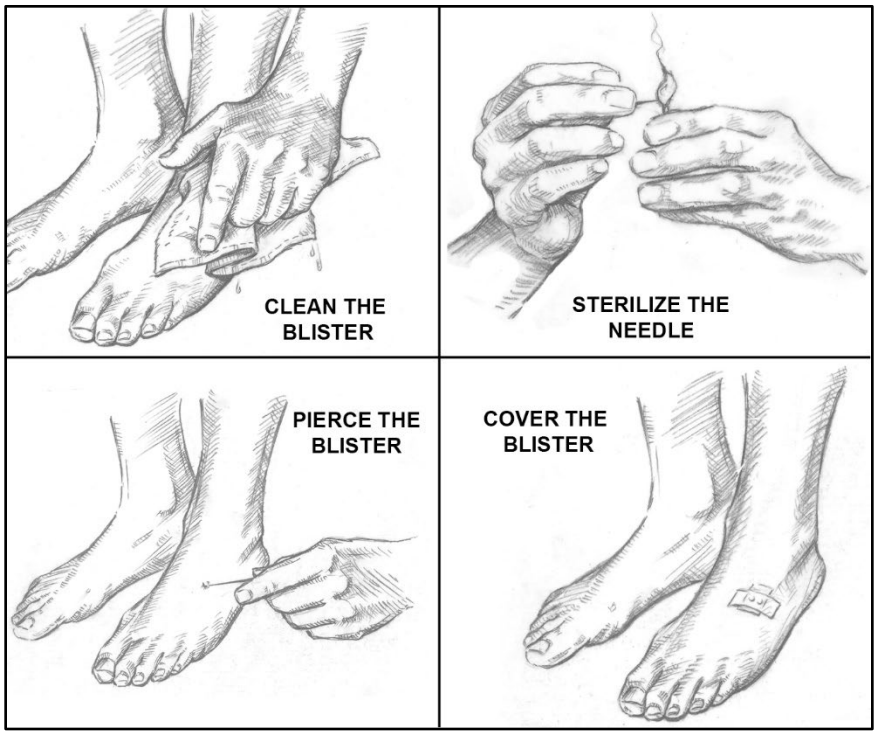


Figure E-3. Treatment of foot blisters

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 that 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 the injury and aid in applying first aid. See table E-1 for signs, symptoms, prevention, and treatment of blisters.

Table E-1. Blister signs, 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 shoe insoles. 3. Use antiperspirants. 4. Make sure load is distributed 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 CLSs 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 of 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 the 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.

Prevention

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, because doing so could mean loss of skin.
- Constricting clothing or jewelry should be removed.
- 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 teamwork 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.

Levels

E-21. The two levels of frostbite are superficial and deep. Superficial frostbite involves the skin. Deep frostbite is a serious injury and requires immediate first aid and subsequent medical treatment to avoid or minimize amputation. 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.

Treatment

E-22. 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.

E-23. For treatment of deep frostbite (freezing injury), the following measures should be taken:

- Do not attempt to treat injury in field environments if freezing is considered deep.
  - 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 body parts 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 know 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 like 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. 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. The most common areas that stress fractures occur are the lower extremities, especially the tibia, tarsals, and metatarsals. Once stress fractures occur, Soldiers must allow them time to heal. The affected areas of a stress fracture must rest for several weeks 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 too 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 of a heel space. This section addresses the proper fit and care of footwear.

PROPERLY FITTED BOOTS

E-31. There are two important factors in fitting boots. 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, Soldiers 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. Soldiers should do what is comfortable for them. Different manufactured boots may not always fit the same.

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

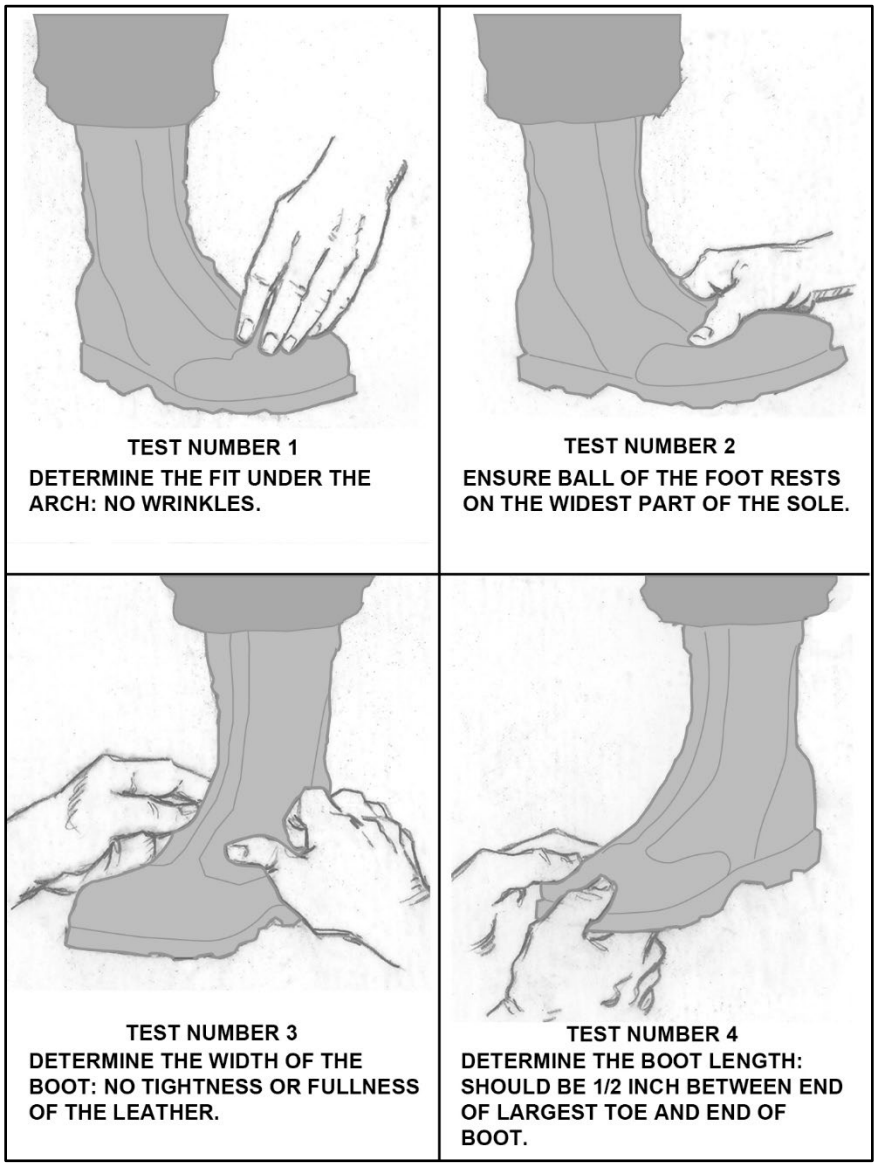
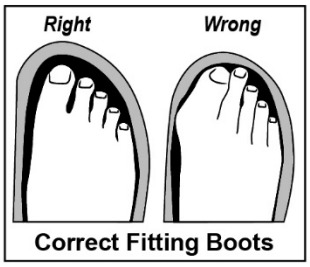


Figure E-4. Testing for a proper fit

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



BEST BOOT FITTING

Proper boot fit is essential for foot health and comfort. Following are some ideas to consider comfort and proper fit.

1. Boot Socks

Wearers should choose appropriate boot socks, rather than athletic socks. The thicker construction of boot socks offers extra cushioning around the heel and toes. This extra cushioning helps prevent blisters and discomfort. Moisture-wicking boot socks are particularly beneficial in warm conditions or during exercise, keeping feet dry and comfortable.

2. Sufficient Toe Room

There should be enough room in the front of the boot for the wearer to wiggle their toes. When putting on the boot, the wearer slides the foot forward until the toes touch the front of the boot. Generally, there should be room to insert one finger between the heel and the back of the boot. This allows enough toe room as the foot swells during the day.

3. Secure Heel

The boot should be snug (not tight) across the width of the foot, around the forefoot, ankle, and heel, with room left for the toes. The heel should remain in place while marching. If the foot slides back and forth inside the boot, blisters will form. Tightening or loosening the laces at different places from the vamp to the collar will allow for a better fit.

4. Trying Out The Boot

While testing the boot, the wearer walks while paying attention to how the boot bends. If any hotspots or rubbing are felt, these will likely become worse and over time cause blistering. There will likely be a break-in period with new boots. However, if the boots are uncomfortable from the beginning, they will likely remain that way.

Note: Break-in periods differ per manufacturer. Consult manufacturer's website or instructions provided with the 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 a 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 the fitting of socks, Soldiers should stand with their weight evenly distributed on both feet. If socks fit correctly, no tightness or fullness should exist (see table E-2). A 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 is 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 that are too large will wrinkle inside boots, increase friction inside the boot leads to blisters and abrasions. Socks that are too small will wear quickly and may reduce blood flow in the foot. When wearing two pairs of socks, Soldiers should wear an outer pair at least a 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.

This page intentionally left blank.

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 skeletal conditions that relate to injury risk, and injuries most common to foot marches under loads.

INJURY RISK FACTORS

F-1. Leaders screen Soldiers for 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 a 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 heatstroke (most severe form of heat illness and possibly fatal). See 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 heatstroke.

Heat Cramps

F-5. Excessive sweating caused by an imbalance of electrolytes in the body leads to cramping. 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, and 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 or feet.
- Confusion.

Heatstroke

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. The 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. Heatstroke 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 that may require performance of necessary basic lifesaving measures. Table F-1 shows common heat injuries along with signs, symptoms, and first aid to apply when heat injuries occur.

Table F-1. Common heat injuries, signs, 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 132 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, 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 to 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 the possibilities of such complications as rewarming, shock, and disturbances in the 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.

WINDCHILL

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

Table F-3. Windchill effect

ESTIMATED WIND SPEED (IN MPH)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°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

°	DEGREES	F	FAHRENHEIT
-	MINUS	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 factors 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. The only warning is a bright, sunburn-like eye damage. 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 that 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. Although oxygen makes up about 21 percent of the atmosphere at all altitudes, a progressive decrease in partial pressure of oxygen means there is less actual oxygen at higher altitudes compared to sea level.

F-19. The relationship of decreased oxygen availability to altitude illness and performance decrease 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.

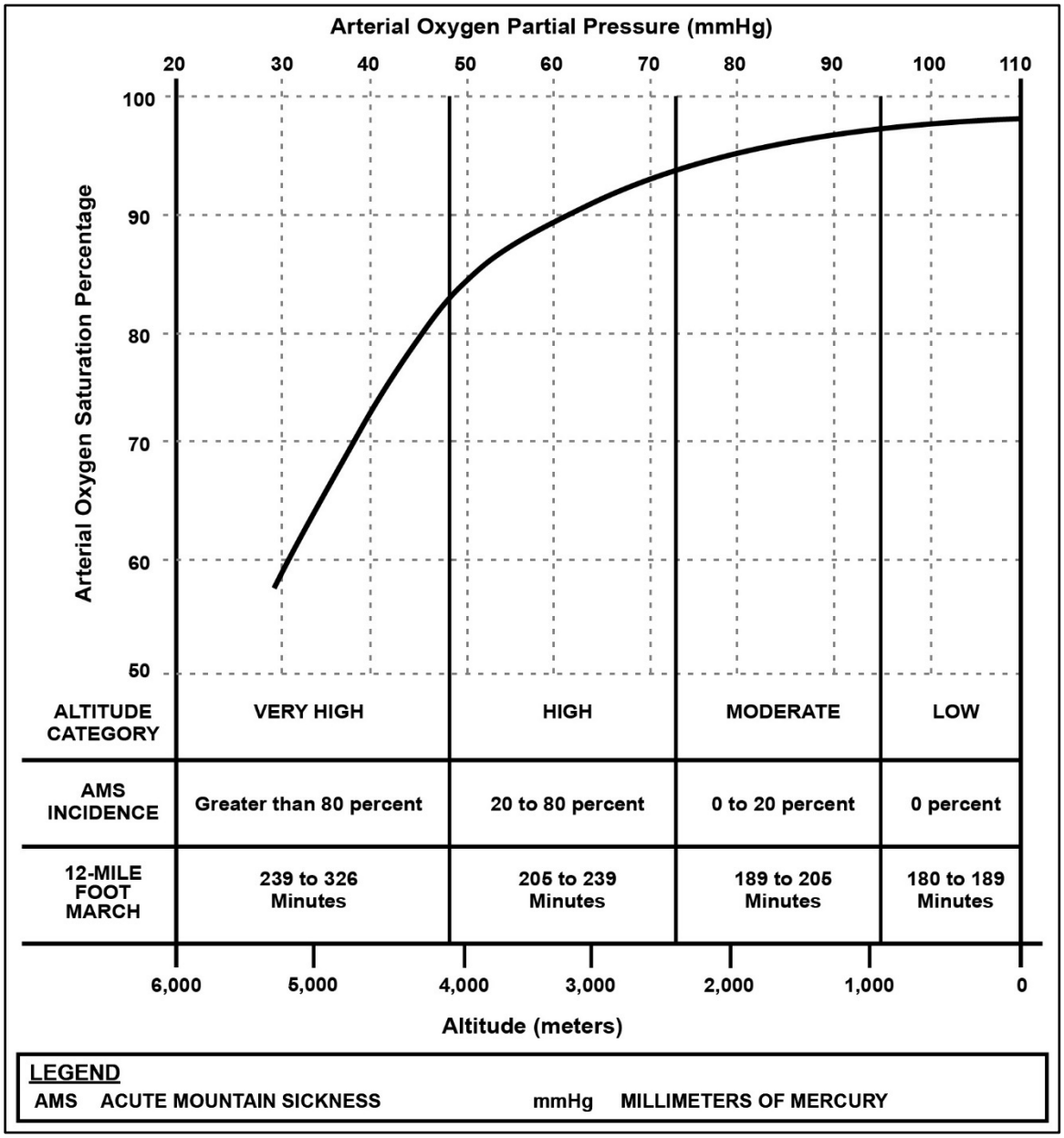


Figure F-1. Relationships between altitude, arterial oxygen partial pressure, and arterial oxygen saturation in acclimatized personnel

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 a 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, like an alcoholic hangover, normally lasting from 2 to 7 days. AMS symptoms include headache, nausea, fatigue, and lightheadedness. AMS develops within 6 to 24 hours of altitude exposure, and its incidence and severity increase in direct proportion to ascent rate and altitude. (See table F-4 on page 136.)

Table F-4. Estimated severity of mountain sickness in nonacclimatized 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%
Legend: >—greater than			

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 135 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. The 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 micrograms of 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 micrograms per day) for rapid ascents to altitudes below 4,000 meters (13,123 feet).

PULMONARY EDEMA

F-28. HAPE is potentially fatal, although an uncommon illness, occurring in usually less than 10 percent of individuals ascending above 3,660 meters (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 a vasodilator such as nifedipine (20 micrograms sustained release every 8 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 an uncommon illness, occurring in usually less than 2 percent of individuals ascending above 3,660 meters (12,008 feet). HACE is an exacerbation of unresolved, severe AMS often occurring 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.
  - Can be impaired, for 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 the risk of developing cold injuries.

Poor Nutrition

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 the amounts of carbon monoxide in close spaces. Irritant effects 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 if 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 4 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 1 or 2 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. Carbohydrates are the most efficient fuel for optimizing physical performance at altitude. Recent research has indicated 6 to 12 percent glucose or maltodextrin solution in liquid form (such as, 56 grams in 560 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 the 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 (to aid in performance) 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 improves 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 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, poor nutrition, 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 140.) 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, 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, and elevate. 2. Take anti-inflammatory medication. 3. Seek medical care to rule out stress fracture.

SHIN SPLINTS

F-49. Shin splints are a common term that may include many diagnoses or causes and is not an actual injury or diagnosis. 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 including:

- Repeated marches on hard surfaces.
- Feet with unusually high or low arches.
- Worn-out boots.
- Poor mobility at the ankle.

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 (see 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, 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, and 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 signs, symptoms, prevention, and treatment.

Table F-7. Meralgia paresthetica signs, 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 the shoulder straps of backpacks. It can cause a traction or 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 signs, symptoms, prevention, and treatment of rucksack palsy.

Table F-8. Rucksack palsy signs, 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 the 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 signs, symptoms, prevention, and treatment of low-back injuries.

Table F-9. Low-back injury signs, 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 the 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 the rucksack straps that 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

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. ATP 3-21.18 is not the proponent publication (the authority) for any operational term or definition. The proponent publication for other terms is listed in parentheses after the definition.

SECTION I–ACRONYMS AND ABBREVIATIONS

ADP	Army doctrine publication
AFTTP	Air Force tactics, techniques, and procedures
AMS	acute mountain sickness
AO	area of operations
AR	Army regulation
ATP	Army techniques publication
C2	command and control
CAS	close air support
CASEVAC	casualty evacuation
CBRN	chemical, biological, radiological, and nuclear
CLS	combat lifesaver
CP	checkpoint
DA	Department of the Army
DD	Department of Defense
FM	field manual/frequency modulation
FO	forward observer
FSO	fire support officer
HACE	high altitude cerebral edema
HAPE	high altitude pulmonary edema
H2F	holistic health and fitness
IED	improvised explosive device
JP	joint publication
JTAC	joint terminal attack controller
kph	kilometers per hour
MAAWS	Multi-role Antiarmor, Antipersonnel Weapon System
MCRP	Marine Corps reference publication
MED	medical
MEDEVAC	medical evacuation
METT-TC (I)	mission, enemy, terrain and weather, troops and support available, time available, civil considerations, and informational considerations
MOPP	mission-oriented protective posture
MP	military police

MRE	meal, ready to eat
NCO	noncommissioned officer
NTTP	Navy tactics, techniques, and procedures
OE	operational environment
OPORD	operation order
PACE	primary, alternate, contingency, and emergency
PCC	precombat check
PCI	precombat inspection
PLT	platoon
PMCS	preventative maintenance checks and services
PPEP	personal protective equipment posture
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
SALUTE	Size, activities, location, unit, time, and equipment
SOP	standard operating procedure
SP	start point
TB	technical bulletin
TC	training circular
UAS	unmanned aircraft system
U.S.	United States
WARNORD	warning order
WCS	weapons control status
XO	executive officer

SECTION II–TERMS

actions on contact

A process to help leaders understand what is happening and to take action. (FM 3-90)

approach march

The advance of a combat unit when direct contact with the enemy is intended. (FM 3-90)

call for fire

A standardized request for fire containing data necessary for obtaining the required fire on a target. (FM 3-09)

casualty evacuation

(Army) The movement of casualties aboard nonmedical vehicles or aircraft without en route medical care. (ATP 4-02.13)

checkpoint

A predetermined point on the ground used to control movement, tactical maneuver, and orientation. (FM 3-90)

close air support

Air action by 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 09.3)

dismounted movement

A movement of troops and equipment mainly by foot, with limited support by vehicles. (FM 3-90)

linkup

A type of enabling operation that involves the meeting of friendly ground forces, which occurs in a variety of circumstances. (FM 3-90)

linkup point

A designated place where two forces are scheduled to meet. (FM 3-90)

main body

The principal part of a tactical command or formation. It does not include detached elements of the command, such as advance guards, flank guards, and covering forces. (ADP 3-90)

march column

All march serials using the same route for a single movement under control of a single commander. (FM 3-90)

march serial

A subdivision of a march column organized under one commander. (FM 3-90)

march unit

A subdivision of a march serial. (FM 3-90)

medical evacuation

The timely and effective movement of the wounded, injured, or ill to and between medical treatment facilities on dedicated and properly marked medical platforms with en route care provided by medical personnel. (ATP 4-02.2)

mounted movement

The movement of troops and equipment by combat and tactical vehicles. (FM 3-90)

movement

The positioning of combat power to establish the conditions for maneuver. (ADP 3-90)

nontactical movement

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)

quartering party

A group dispatched to a new assigned area in advance of the main body. (FM 3 90)

release point

A designated place on a route where elements are released from centralized control. (FM 3-90)

scheme of fires

(DOD) The detailed, logical sequence of targets and fire support events to find and engage targets to support the commander’s objectives. (JP 3-09)

start point

A designated place on a route where elements fall under the control of a designated march commander. (FM 3-90)

tactical movement

A movement in which troops and vehicles are arranged to protect combat forces during movement when a threat of enemy interference is possible. (FM 3-90)

tactical road march

A rapid movement used to relocate units within an assigned area to prepare for combat operations. (FM 3-90)

traffic control post

A manned post that is used to preclude the interruption of traffic flow or movement along a designated route. (FM 3-39)

trail party

The last march unit in a march column. (FM 3-90)

troop movement

The movement of Soldiers and units from one place to another by any available means. (FM 3-90)

References

Websites accessed on 14 July 2025.

REQUIRED PUBLICATIONS

These documents must be available to intended users of this publication.

DOD Dictionary of Military and Associated Terms. 15 May 2025.

FM 1-02.1. *Operational Terms*. 28 February 2024.

FM 1-02.2. *Military Symbols*. 23 January 2025.

RELATED PUBLICATIONS

These documents are cited in this publication.

JOINT AND DEPARTMENT OF DEFENSE PUBLICATIONS

Most joint publications are available online at https://www.jcs.mil/Doctrine.

JP 3-09. *Joint Fire Support*. 10 April 2019.

JP 3-09.3. *Joint Close Air Support*. 10 June 2019.

ARMY PUBLICATIONS

Most Army publications are available online at https://armypubs.army.mil.

Battle drills are available online: https://rdl.train.army.mil.

ADP 3-90. *Offense and Defense*. 31 July 2019.

ADP 7-0. *Training*. 29 April 2024.

AR 40-501. *Standards of Medical Fitness*. 27 June 2019.

AR 350-1. *Army Training and Leader Development*. 1 June 2025.

ATP 2-01.3. *Intelligence Preparation of the Operational Environment*. 1 March 2019.

ATP 3-01.15/MCTP 10-10B/NTTP 3-01.8/AFTTP 3-2.31 *Multi-service Tactics, Techniques, and Procedures for Air and Missile Defense*. 7 April 2023.

ATP 3-01.50. *Air Defense and Airspace Management (ADAM) Cell Operation*. 5 April 2013.

ATP 3-01.60. *Counter-Rocket, Artillery, and Mortar Operations*. 10 May 2013.

ATP 3-01.81. *Counter-Unmanned Aircraft System (C-UAS) Operations*. 23 May 2025.

ATP 3-04.1. *Aviation Tactical Employment*. 7 May 2020.

ATP 3-06.11. *Brigade Combat Team Urban Operations.* 27 September 2024.

ATP 3-11.32/MCRP 10-10E.11/NTTP 3-11.27/AFTTP 3-2.46. *Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Protection*. 24 January 2024.

ATP 3-21.8. *Infantry Rifle Platoon and Squad*. 11 January 2024.

ATP 3-21.10. *Infantry Rifle Company*. 14 May 2018.

ATP 3-21.20. *Infantry Battalion*. 28 December 2017.

ATP 3-21.50. *Infantry Small-Unit Mountain and Cold Weather Operations*. 27 August 2020.

ATP 3-21.51. *Subterranean Operations*. 1 November 2019.

ATP 3-34.20/MCRP 10-10.1. *Countering Explosive Hazards*. 21 January 2016.

ATP 3-34.80. *Geospatial Engineering*. 26 March 2024.

ATP 3-34.81/MCWP 3-17.4. *Engineer Reconnaissance*. 1 March 2016.

ATP 3-90.98/MCTP 12-10C. *Jungle Operations*. 24 September 2020.

ATP 3-90.99/MCTP 12-10D. *Desert Operations*. 7 April 2021.

ATP 4-02.2. *Medical Evacuation*.12 July 2019.

ATP 4-02.13. *Casualty Evacuation*. 30 June 2021.

ATP 4-10/MCRP 3-40B.6(MCRP 4-11H)/NTTP 4-09.1/AFTTP 3-2.41. *Multi-Service Tactics, Techniques, and Procedures for Operational Contract Support*. 16 December 2021.

ATP 4-25.12. *Unit Field Sanitation Teams*. 30 April 2014.

ATP 4-48. *Aerial Delivery*. 28 August 2023.

ATP 5-19. *Risk Management*. 9 November 2021.

ATP 6-02.53. *Techniques for Tactical Radio Operations*. 13 February 2020.

ATP 7-22.01. *Holistic Health and Fitness Testing*. 1 October 2020.

ATP 7-22.02. *Holistic Health and Fitness Drills and Exercises*. 1 October 2020.

Battle Drill (Drill Task) 07-PLT-D8015. *React to Unmanned Aircraft While Dismounted–Platoon*. 14 April 2025.

FM 3-09. *Fire Support and Field Artillery Operations*. 12 August 2024.

FM 3-34. *Engineer Operations*. 18 December 2020.

FM 3-39. *Military Police Operations*. 21 April 2025.

FM 3-53. *Military Information Support Operations*. 4 January 2013.

FM 3-63. *Detainee Operations*. 02 January 2020.

FM 3-83. *Religious Affairs*. 11 April 2025.

FM 3-90. *Tactics*. 1 May 2023.

FM 3-96. *Brigade Combat Team*. 19 January 2021.

FM 3-99. *Airborne and Air Assault Operations*. 6 March 2015.

FM 6-0. *Commander and Staff Organization and Operations*. 16 May 2022.

FM 6-27/MCTP 11-10C. *The Commander's Handbook on the Law of Land Warfare*. 7 August 2019.

FM 6-99. *U.S. Army Report and Message Formats*. 17 May 2021.

FM 7-0. *Training*. 14 June 2021.

FM 7-22. *Holistic Health and Fitness*. 1 October 2020.

TB MED 507. *Heat Stress Control and Heat Casualty Management*. 12 April 2022.

TC 3-21.76. *Ranger Handbook*. 26 April 2017.

TC 4-02.1. *First Aid*. 21 January 2016.

TC 4-02.3. *Field Hygiene and Sanitation*. 6 May 2015.

TM 3-34.82/MCRP 3-34.2. *Explosives and Demolitions*. 7 March 2016.

OTHER PUBLICATIONS

GENEVA CONVENTIONS

Geneva Convention (III) Relative to the Treatment of Prisoners of War. https://www.loc.gov/rr/frd/Military_Law/pdf/GC_1949-III.pdf.

Geneva Convention (IV) Relative to the Protection of Civilian Persons in Time of War. https://www.loc.gov/rr/frd/Military_Law/pdf/GC_1949-IV.pdf

PRESCRIBED FORMS

This section contains no entries.

REFERENCED FORMS

Unless otherwise indicated, DA forms are available online: https://armypubs.army.mil.

DD forms are available online: https://www.esd.whs.mil/Directives/forms.

DA Form 1156. *Casualty Feeder Card*.

DA Form 2028. *Recommended Changes to Publications and Blank Forms*.

DA Form 2404. *Equipment Inspection and Maintenance Worksheet*.

DA Form 5988-E. *Equipment Maintenance and Inspection Worksheet*. (Available from Unit Level Logistics System.)

DD Form 1380. *Tactical Combat Casualty Care (TCCC) Card*. (Available through normal publications supply channels.)

DD Form 2745. *Enemy Prisoner of War (EPW) Capture Tag*. (Available through normal publications supply channels.)

This page intentionally left blank.

Index

Entries are by paragraph number.

A

acclimatization
  altitude. 1-41
  cold weather. 1-43
  heat. 1-45
actions on contact. 2-97
approach march. 2-23

B

body mechanics. C-1
boots
  proper fit. E-31
  proper lacing. E-34

C

call for fire. 2-72
carbohydrates. F-43
casualty evacuation. 1-56
combat load. 3-4
conduct of the march. 2-32
contingency load. 3-9

D

dismounted movement. 1-5

E

effects on the human body. F-30

F

fighting load. 3-5

L

linkup. 1-112
load determination. 3-13

M

march discipline. 1-31
march security. 2-45
march serial. 2-3
march unit. 2-3
medical evacuation. 1-56
mounted movement. 1-13
movement order. B-1
movement table. B-5

P

physical readiness. D-6

Q

quartering party. 2-7

R

resupply operations. 3-43

S

scheme of fires. 2-71
special teams. A-18
sustainment load. 3-8

T

tactical road march. 2-2
traffic control post. A-13
trail party. 2-10
troop movement. 1-1

W

water discipline. 1-34

This page intentionally left blank.

ATP 3-21.18

24 July 2025

By Order of the Secretary of the Army:

RANDY A. GEORGE
General, United States Army
Chief of Staff

Official:



MATTHEW L. SANNITO
Acting Administrative Assistant to the
Secretary of the Army
2519904

DISTRIBUTION:
Active Army, Army National Guard, and United States Army Reserve. Distributed in electronic media only(EMO).

This page intentionally left blank.

This page intentionally left blank.

This page intentionally left blank.

PIN: 201558-000