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**FM 5-105**

# **Topographic Operations**

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DEPARTMENT OF THE ARMY  
Washington, DC, 9 September 1987

## topographic operations

Throughout history, the physical effects of terrain and weather have played a major role in the development of society. During wartime, the effects of terrain and weather assume a different, but no less important, role. Knowledge of the terrain on which a battle is to be fought is important during all phases and levels of military planning. Commanders can influence the outcome of battle by exploiting the limits and advantages of terrain as a combat multiplier. Commanders will enhance their chances to win in a battle by combining their knowledge of the terrain with weather effects, mission, enemy order of battle, friendly troop disposition, and all other factors which might affect the battle.

The unit commander is responsible for effectively making use of the terrain in the conduct of military operations. It is the staff engineer's responsibility to allow the commander to see as much of the terrain as possible. By obtaining and providing information on the configuration of the physical surface of the earth, the engineer ensures that the supported commander can better visualize the terrain.

Topographic operations consist of an interrelated flow of information and products through the various Department of Defense (DOD) agencies. The primary agency involved is the Defense Mapping Agency (DMA). Through agency intelligence and other engineer channels this flow of information is then passed on to the tactical units. These operations provide the commander with an effective means to—

- Evaluate the battlefield in terms of mobility, countermobility, and survivability.
- Visualize the terrain as fully as possible.
- Exploit all available topographic information on each unit's areas of operations and interest.

This manual provides the principal doctrine for topographic operations in support of the AirLand Battle. It describes the functions of topographic operations as they relate to an extended AirLand Battlefield in terms of depth, time, synchronization, and unity of effort. It is designed to be used by Army unit commanders and staffs, primarily at corps and division levels.

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**User Information**

The proponent for this publication is the US Army Engineer School. Submit changes for improving the publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms). Arrange comments in sequence by manuscript page, indicating exactly how a portion should be reworded with a brief reason for the change. Send comments to Commandant, US Army Engineer School, ATTN: ATZA-TD-P, Fort Belvoir, VA 22060-5291.

Unless otherwise stated, whenever the masculine or feminine gender is used, both men and women are included.

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# topographic operations to support the airland battle

## chapter 1

AirLand Battle doctrine in Field Manual (FM) 100-5 details how United States (US) Army forces fight in today's battle. The US forces must be prepared to fight in the full range of combat situations anywhere in the world. Threat forces may use nuclear arms, chemical weapons, and sophisticated technology, or they may use conventional weapons and tactics. Regardless of the conditions, US forces must maintain concentration of superior combat power at decisive times and places.

While there are no simple formulas for winning, certain key factors are critical to success on the AirLand Battlefield. One critical factor is the topographic support provided to the combined arms team.

The goal of topographic operations is to **ENSURE THAT TIMELY, ACCURATE, AND SUFFICIENT KNOWLEDGE OF THE BATTLEFIELD TERRAIN IS PROVIDED TO EACH COMMANDER THROUGHOUT ALL PHASES OF COMBAT OPERATIONS**. This is the overriding objective of all topographic support. Other endeavors in this area serve only to achieve it.

Topographic support most often is furnished in the form of information. Topographic information, most commonly, is presented graphically in the form of maps, charts, and overlays. It is also presented digitally in the form of tapes and disks of digital elevation and feature data; and textually in the form of gazetteers, trig lists, and terrain studies. In addition, topographic support includes services such as establishing geodetic survey control for precise positioning of artillery, command, control, communications, and intelligence systems.

All standard topographic products used in support of combat operations are provided by the DMA or by host nations through international agreements. Army topographic units supplement and enhance the DMA's efforts by providing the maneuver commander with specific tailored products reflecting the current state of the ground.

### MAJOR PARTICIPANTS

#### Tactical Commanders and Staff

Tactical commanders define military task requirements to support contingency plans (CONPLANS), operation plans (OPLANS), and operation orders (OPORDs). Based on a commander's concept of operation, the topographic engineer assists the G2 (intelligence staff) and other staff officers in preparing the annex for each CONPLAN/OPLAN/OPORD. The commander outlines the specific support requirements needed for the command. Details for preparing a topographic annex are found in Appendix C.

### **Defense Mapping Agency**

The DMA provides mapping, charting, and geodesy (MC&G) support for all US armed forces (see Appendix A). This agency plays an important role in Army topographic operations by providing all of the standard topographic and aeronautical products used in support of combat operations. Standard products commonly used include 1:50,000- and 1:250,000-scale maps, aeronautical charts, nautical charts, and terrain analysis data bases. Other commonly used products are trig lists, gazetteers, flight information publications (FLIPs), and digital data. Appendix B describes some of these products in more detail. In addition, the agency provides theater-level storage and bulk supply to the theater of its products for Army use. Depending upon the product, DMA support may be channeled through a topographic unit or directly to the tactical user.

### **Intelligence Staffs**

From the Assistant Chief of Staff for Intelligence (ACSI) at Headquarters, Department of the Army (HQDA), down through the division G2, the intelligence officer has general staff responsibility for topography. This means that the intelligence officer is responsible for topographic policy, solicitation and validation of requirements, and establishment of priorities for topographic support within the command. This support always includes high priority, continuing terrain analysis support of the Intelligence Preparation of the Battlefield (IPB) process. The corps G2 tasks the tactical operations center (TOC) support element of the corps terrain team and coordinates other topographic support requirements and priorities with the corps engineer. Battalion and brigade S2s compile and submit topographic requirements and priorities for their commands to their division G2. The G2 consolidates these requirements with division staff requirements, establishes priorities, coordinates topographic support with the division engineer, and tasks the division terrain team.

### **Engineer Staffs**

From the Assistant Chief of Engineers (ACE) at HQDA, down through the division engineer, the engineer officer has special staff responsibility for topography. This means that the engineer officer is recognized as the terrain utilization expert responsible for topographic program execution, training, resourcing, and coordination of technical topographic requirements with the staff and subordinate commands. Battalion task force and brigade engineers are also terrain experts at their organizational levels. All engineers regularly assist in terrain data collection (river, soils, route and bridge classification for example) to fill data voids and/or verify data in analysis data bases. All engineers also exploit terrain data and analyses in order to focus reconnaissance efforts and otherwise assist in site selection, planning and estimating for performance of mobility, countermobility, survivability, and general engineering missions.

### Engineer Units

Topographic units located at division and corps levels and echelons above corps (EAC) supplement the DMA's effort by compiling data from various sources into special-purpose topographic products. After compilation, the data is then tailored to meet the supported commander's needs. These units belong to the topographic battalion in support of the theater of operations. Their rapid response and nonstandard support aids the commander in—

- Visualizing the extended battlefield.
- Understanding the effect of terrain and weather/environment on the battle.
- Navigating on the battlefield.
- Ensuring precise positioning of weapons, command and control, communications, and intelligence systems.

Special-purpose products include maps, map overprints, overlays, terrain studies, photomaps, and other graphic and nongraphic portrayals of the terrain, and geodetic survey support for precise positioning of weapons, and command and control, and communications systems.

All topographic units are focused to support the forward areas and are specifically tailored to the requirements of the particular theater. Their primary interest is in *direct* and *rapid* response to support command needs. Since these units no longer have an original mapping mission, they will only perform expedient map missions. The units will not duplicate any support if originally provided by the DMA.

## TOPOGRAPHIC FUNCTIONS

### Basic Functions

Topographic operations encompass three major functions: terrain analysis, production, and map storage and distribution.

"Terrain and weather affect combat more significantly than any other physical factors. Most battles have been won or lost by the way in which combatants used the terrain to protect their own forces and to destroy those of the enemy." FM 100-5.

**Terrain analysis.** Terrain analysis is the process of interpreting natural and man-made features of a geographic area, and the influence of weather and climate on these features to predict their effect on military operations. The products of terrain analysis may include, but are not limited to, those listed in Table 1-1, page 1-4. These products provide the commander with terrain information upon which to base decisions.

Terrain analysis is the focus of Army topographic operations. The terrain analyst uses DMA-produced data bases as the chief analytical tool consisting of a series of terrain factor overlays at 1:50,000 and 1:250,000 scales. The analyst modifies and updates the data bases using data collected from the field. The data collected includes information supported through host nations as well as

Table 1-1. Terrain analysis support

Military Aspects of Terrain (OCOKA)	Elements of Terrain Information	Examples of Terrain Analysis Products
Observation/ fields of fire	<ul style="list-style-type: none"> <li>● Vegetation (summer and winter).</li> <li>● Surface configuration.</li> <li>● Battlefield environmental effects on the terrain.</li> <li>● Urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>● Horizontal line-of-sight for direct-fire weapons and radar.</li> <li>● Emplacement suitability and performance ratings for ground surveillance.</li> </ul>
Cover and concealment	<ul style="list-style-type: none"> <li>● Vegetation (summer and winter).</li> <li>● Surface configuration.</li> <li>● Obstacles (micro relief).</li> <li>● Battlefield environmental effects on terrain.</li> <li>● Urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>● Cover potential from direct and indirect fire (good/fair/poor).</li> <li>● Concealment potential from horizontal and vertical observations (good/fair/poor).</li> </ul>
Obstacles	<ul style="list-style-type: none"> <li>● Vegetation (summer and winter).</li> <li>● Surface configuration.</li> <li>● Drainage characteristics.</li> <li>● Natural and man-made.</li> <li>● Micro relief.</li> <li>● Surface materials (wet and dry).</li> <li>● Urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>● Location of existing natural and man-made obstacles.</li> <li>● Mobility potential on the battlefield expressed in GO, SLOW-GO, and NO-GO for track and wheeled vehicles.</li> </ul>
Key terrain	<ul style="list-style-type: none"> <li>● Urban areas.</li> <li>● Lines of communication.</li> <li>● Surface configuration.</li> <li>● Drainage characteristics.</li> </ul>	<ul style="list-style-type: none"> <li>● Location of key terrain features, both natural and man-made. Examples are landslide areas, bridges, choke points, high ground, and key military installations.</li> </ul>
Avenues of approach	<ul style="list-style-type: none"> <li>● Vegetation (summer and winter).</li> <li>● Urban areas.</li> <li>● Surface configuration.</li> <li>● Surface materials (wet and dry).</li> <li>● Drainage characteristics.</li> <li>● Lines of communication.</li> </ul>	<ul style="list-style-type: none"> <li>● Identification of areas where movement of friendly and enemy forces may occur.</li> <li>● Speed prediction.</li> <li>● Drop zones.</li> <li>● Landing zones.</li> <li>● Landing beaches.</li> <li>● NOE navigation.</li> </ul>

current and all-source intelligence. All of this together allows the analyst to supply an up-to-date picture of the battlefield terrain.

The standard DMA factor overlays used in studying the terrain are—

- Vegetation.
- Surface configuration (slope).
- Surface drainage.
- Surface materials (soils).
- Obstacles.
- Transportation.
- Water resources (1:250,000 scale only).

The analyst combines information from two or more of these overlays and, using weather data and operational parameters for tactical equipment, provides the commander with an analysis of the expected effects of terrain and weather on future operations.

Terrain teams prepare their findings in several forms: oral, graphic, tabular, or textual, depending on the immediacy of the commander's need. Resulting products include cross-country movement (CCM) (wet/dry weather), lines-of-communication, river-crossing, and cover-and-concealment items of information. Terrain analysis products are normally provided in limited quantities for staff use. Copies are kept in local data bases as are site recommendations for combat support and combat service support facilities. Table 1-1, page 1-4, correlates the military aspects of terrain through observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA)—as they relate to a few of the more common terrain analysis products.

Graphics, data tables, and textual evaluations and descriptions are characteristic of prebattle and postbattle responses. The majority of responses during battle, particularly at division level, may be verbal. Responsiveness within the time frame established by the commander is very important. Emphasis is placed on the informational content and not on appearance. Rapid-response products are provided to meet tight time requirements. If the terrain analysis team cannot respond to a commander's need, and time allows, the requirement is forwarded to the next higher topographic unit for completion.

The terrain analysts are responsible for analyzing the effects of the weather on the terrain and the resulting operational systems effects that can be depicted on computer- or map-based graphics. Some examples are—

- The effects of weather on mobility (equipment, personnel).
- The effects of weather and terrain on intervisibility.
- The effects of weather on nap-of-the-earth (NOE) flying.
- The effects of weather on stream hydrology (swimming, river crossing).

**Production.** The production function includes the cartographic production of map-based graphics, reproduction of these graphics, and the production of topographic survey data. Cartography is the art and science of graphically portraying physical and man-made features of the earth, usually as a map or chart.

Topographic units use cartographic techniques in the production of map-based graphics. These techniques are used when time is not critical. This usually occurs when a neat draft is desired, color-coded overprints are needed, or multiple copies are required for a wide-area distribution. In certain instances, however, rapid-response products may be produced in multiple copies.

Production capabilities are used to make—

- Operations and intelligence overlays and overprints.
- Map substitutes (photomaps).
- Expedient revisions to standard maps.
- Draft manuscripts of terrain analysis overlays and graphics.
- Precise survey and geodetic positions.

Reproduction equipment and facsimile machines of topographic units include single-color lithographic presses and diazo reproduction equipment. Lithographic presses are used for high-volume and/or multicolor printing of standard sheet-sized products (22½ by 29½ inches). For each color desired in the product, a separate run through the press must be made. Although the time to actually print a product may be relatively short, the time required to clean and ready the press for the next color is significant. Therefore, multiple-color products are *not*

practical when time is critical. The DMA holds the charter for bulk printing and distribution of standard map products. Since their printing methods can produce four maps at a time, overprinting of these standard products by topographic units is not recommended.

When only a few copies of a single-color product are required, such as with rapid-response terrain analysis products, topographic units use a diazo reproduction machine. The operation is similar to a *blueprint* machine employing light-sensitive materials which are developed by a dry chemical process. Maximum width is 42 inches by whatever length is desired. Products can be reproduced on film (acetate) or on various types of paper.

Facsimile machines provide for transmission of graphic materials such as maps, photographs, or printed text by electrical means. Facsimile copies are usually single-color and are currently limited to 8½ by 11 inches in size.

Topographic survey provides the necessary positioning and elevation data required by artillery, missile fire control, and communications systems. Surveyors recover existing ground control and extend it by third-order conventional survey or satellite methods to within 5 kilometers of Pershing missile units. For Lance missile units, it is extended to within 1,500 meters of the unit.

Topographic surveyors establish a minimum of two third- or higher-order control points in the division rear area. In addition to making precise point determination, they provide azimuths for missile systems and the orientation of communications equipment. Experienced surveyors also provide, within minutes, positions in friendly or enemy territory, using the Analytical Photogrammetric Positioning System (APPS) and point positioning data bases (PPDB) for the area of concern.

**Map storage and distribution.** The map storage and distribution function encompasses the storage, maintenance, and distribution of standard and nonstandard MC&G products. However, neither DMA nor Army topographic units possess organic transportation assets to move maps. Movement of maps between the continental United States (CONUS) and theater depots, as well as movement of maps from in-theater depots to the requesting unit, is based on priorities set by tactical commanders. Distribution in-theater is made on a supply point basis; units must go to the supporting map distribution point to pick up maps. Figure 1-1, page 1-8, shows a typical map storage and distribution scheme.

Various organizations provide map storage and distribute bulk quantities from theater to division levels. At theater level, the theater area commander (TACOM) is supported by the DMA as requested through the planning and control (P&C)

team. The TACOM provides map inventory control, and also handles storage and supply-point distribution of war reserve and operational stocks. The topographic battalion provides supply-point distribution to units operating at EAC; the supporting topographic company does the same at corps level. At division level, the division support command (DISCOM) provides supply-point distribution for standard MC&G products. Stockage levels and capabilities decrease progressively from theater to division, although war reserve stockage may be kept at levels that match expected prebattle contingencies.

In accordance with command policy, the unit's basic loads of standard MC&G products may be stored at any level. The maintenance of map stock and the replacement of obsolete products with new editions are done at the level where the stock is held. The types and quantities of products held as well as the geographical coverage are determined by the operations that are required. This is outlined in each command's CONPLANS/OPLANS/and OPORDs.

Special-purpose products distribution is dependent upon the theater of operation. When small quantities are produced for a specific purpose, they are normally distributed directly from the producing unit to the user. For example, a terrain analysis of a specific avenue of approach would be provided directly to the user. When general multipurpose special products are produced in large quantities, however, they are moved through the normal map distribution channels. For instance, a map depicting military installations in a country or region would be distributed through the standard procedural channels.

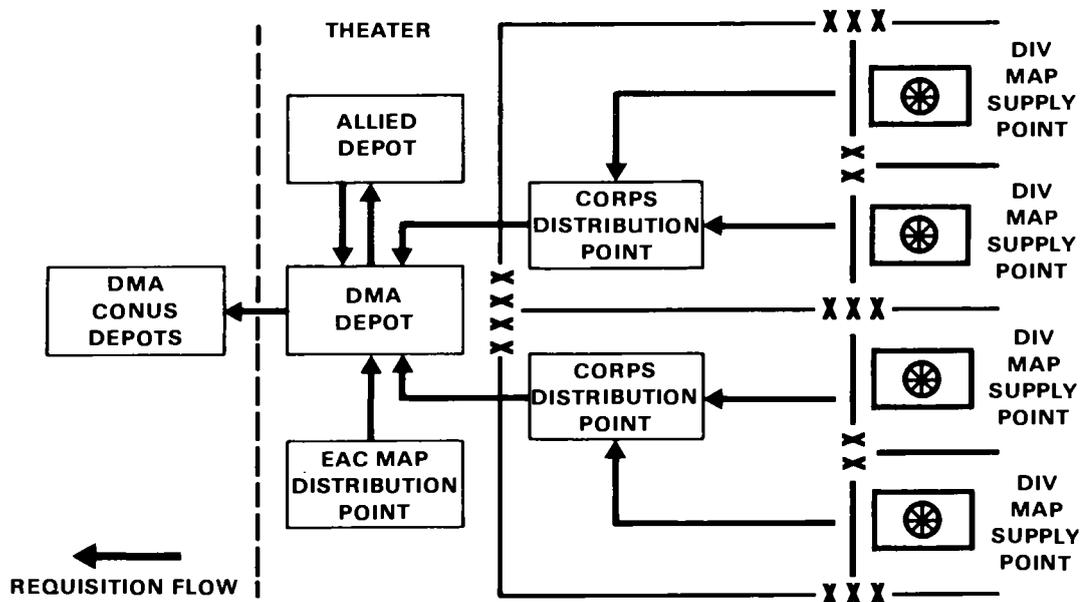


Figure 1-1. Map storage and distribution scheme

Currently, map storage/distribution is a major function for the engineer. In the near future, however, the quartermaster corps will assume this function fully. At that time, total responsibility for map storage and distribution activities will pass to the quartermaster corps.

### Preparing the Battlefield

All aspects of military operations—close, deep, or rear—require topographic support. Missions associated with these operations may be preplanned in peacetime or they may evolve from battlefield situations. Essentially the same functions are performed regardless of the type of military operation. Each response is variable and tailored to the tactical situation and the geographic area of operations. Figure 1-2 shows examples of operations groups that need tailored topographic support for preparation of the battlefield. Some of the major

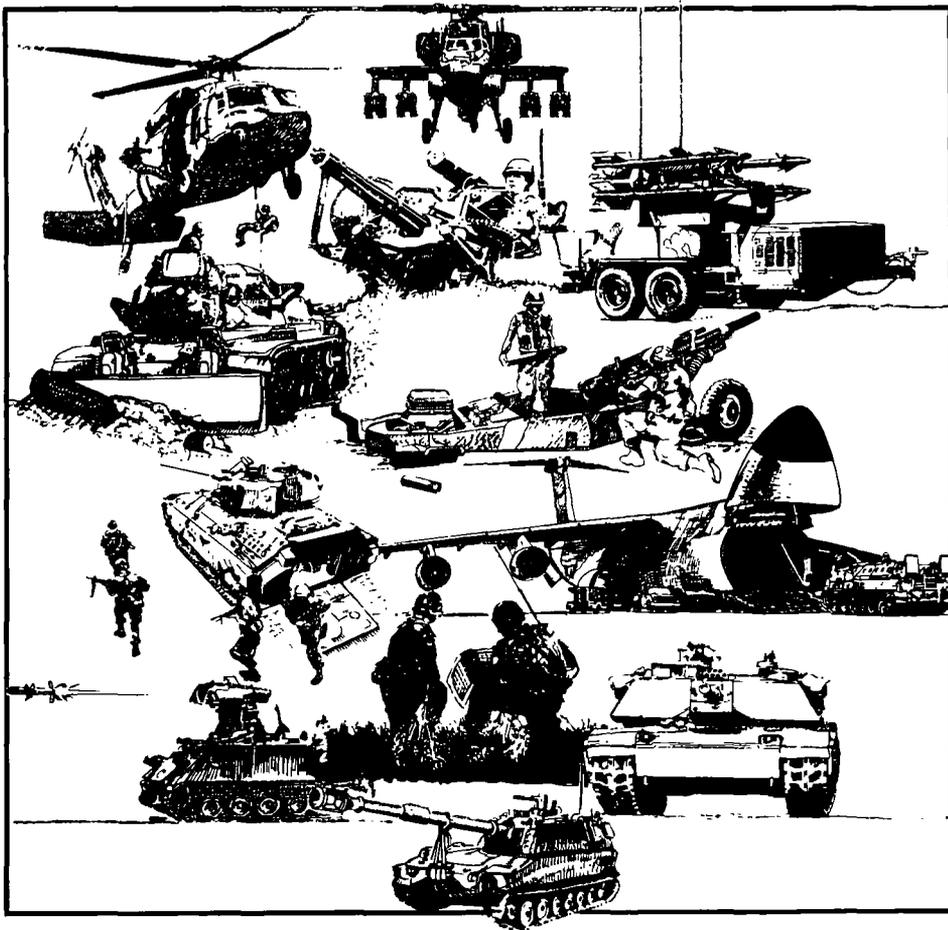


Figure 1-2. Tailored topographic support needed for the battlefield

ones are field artillery, aviation, air defense, intelligence, maneuver units, signal corps, engineering, and logistics. In addition, Table 1-2 relates typical topographic support to Army systems.

Table 1-2. Topographic support to Army systems\*

Standard Products (Provided by the DMA)	Army Systems	Special-Purpose Products (Produced by Topographic Engineer Units) or Services
Standard Topographic Maps: 1:50,000 1:250,000 (JOG-G) Gazetteers Air Target Materials City Graphics JOG-A	Command	Terrain Analysis (see note) Photomaps Minor Map Update MOUT Analysis Weather Effects on Terrain War Damage Analysis Lines of Communication Operations and Intelligence Overlays and Overprints
Standard Topographic Maps: 1:50,000 1:250,000 (JOG-G) Standard Terrain Analysis Products. CCM for the MBT Transportation—Road and Bridge Maps FLIPs VOD	Maneuver	CCM Analysis for all Types of Army Vehicles (Wet and Dry) Conditions CCM Analysis for Threat Vehicles (Wet and Dry) Conditions Route Analysis Zones of Entry Nonstandard Maps Photomaps River/gap Crossing Information Cover and Concealment NOE (Aviation Support) MOUT Analysis Flood Prediction
Standard Topographic Maps: 1:50,000 1:250,000 (JOG-G) PPDB Trig Lists DTED DFAD Air Target Materials Geodetic Survey Control Points (first order)	Weapon	Line of Sight Geodetic Survey Control Points (second order) Nonstandard Maps Photomaps Deep Battle Target Interdiction Analysis Cover and Concealment Route Analysis
Standard Topographic Maps 1:50,000 1:250,000 (JOG-G) Transportation—Road and Bridge Maps City Route Graphics JOG-A	Support	Route Analysis CCM Analysis for all Types of Army Vehicles (Wet and Dry) Conditions Map Storage and Distribution Nonstandard Maps Photomaps Material Resource Locations MOUT Analysis

\*This table depicts some of the topographic support available.

NOTE: See Table 1-1, page 1-4.

Before battle, commanders use current CONPLANS/OPLANS/OPORDs to anticipate and identify, through command channels, their topographic support requirements. The DMA compiles, produces, stores, and supplies bulk standard maps, charts, and related products; standard terrain analysis data bases; and digital topographic data. Using all-source intelligence and DMA products, topographic units develop functional data bases for specific geographic regions. These data bases provide the basic reference for the portrayal of the wide variety of terrain information needed to produce timely and tailored responses in battle.

This peacetime requirements process enables the DMA to produce, maintain, and store, in map depots throughout the world, the bulk of standard MC&G products required during the first 60 days of combat. During combat, the DMA continues to provide the bulk of standard topographic products needed to fight the battle. Topographic units supplement and enhance the agency's effort by providing quick, combat-oriented topographic information and products to Army commanders and staffs at division, corps, and theater levels. Information may include analysis through deep-battle target interdiction, mobility and counter-mobility, war damage, and weather analysis impact. Information is normally provided orally or in a quickly prepared rough graphic format.

When resupply is interrupted or products no longer portray up-to-date conditions, topographic units also provide expedient substitutes. These products are prepared in limited quantities to meet critical needs.

Topographic survey units continue to provide quick and accurate positional information needed by artillery, signal, and command and control elements. After the battle, there is again a need for standard products to support follow-on battle planning and to replenish stocks depleted during combat.

## **RESPONSIBILITIES FOR TOPOGRAPHIC OPERATIONS ON THE BATTLEFIELD**

### **Support Relationships**

Commanders at all levels, based upon unit mission and assigned area of responsibility, define the topographic requirements needed to support specific CONPLANS/OPLANS/OPORDs. At all levels, requirements are contained in a topographic annex to each CONPLAN/OPLAN/OPORD similar to that found in Appendix C of this manual. The commander is responsible for maintaining and managing the unit's basic load of products. That is, he or she ensures the proper conservation and use of maps. In addition, the commander can establish the transportation priorities needed to ship products from supply points to users. Every division and corps commander is responsible for effectively employing attached units from the topographic battalion at EAC.

**Division engineer.** The commander of the division engineer combat battalion is the division engineer. This special staff officer is responsible to the division commander for all engineer related matters—including topographic engineering. The division engineer is the chief adviser to the division commander on how to effectively use the battlefield terrain.

Specifically, the division engineer has a responsibility to—

- Provide advice to the division commander on effective use of the terrain.
- Coordinate division topographic support requirements and priorities with the G2 and division terrain team.
- Assist the G2 in evaluation of requirements, setting of priorities, and selection of alternatives.
- Coordinate terrain team deployment in support of the G2.
- Coordinate, through the corps engineer, support from the corps topographic company.
- Coordinate division engineer tasking of organic engineers for field collection of terrain data.
- Prepare the topographic operations annex for division CONPLANS/OPLANS/OPORDs in coordination with the G2, G3, and G4, and chief of the division terrain team.

Responsibility for topographic engineering is normally focused in the office of the Assistant Division Engineer (ADE), where one NCO from the division terrain team is physically located for liaison purposes and to assist the engineer in the execution of the above responsibilities. The remainder of the division terrain team is normally located with the G2 staff. This arrangement provides timely support to the division staff, and gives immediate access to the all-source intelligence data that is critical for the preparation of current products. This also helps the G2 and engineer to work closely together as a team for the mutual satisfaction of division topographic requirements.

To satisfy their responsibilities, the division engineer and ADE must be familiar with the capabilities and limitations of engineer topographic units; they must give high priority to the management of all engineer resources; and they should also have special security clearances to operate in the all-source intelligence arena.

**Corps engineer.** Like the division engineer, the corps engineer has a dual responsibility. The corps engineer is the corps engineer brigade commander as well as a special staff officer responsible to the corps commander for all engineer related matters—including topographic engineering. The corps engineer is aided by the corps topographic engineer, located in the ACE office.

The corps engineer has a responsibility to—

- Plan and coordinate advice to the corps commander on the effective use of the terrain.
- Coordinate corps topographic support requirements and priorities. This includes backup of division requirements which exceed the capabilities of supporting division terrain teams.
- Task the corps topographic company with providing support for the corps and supported divisions.
- Coordinate support and advice from the topographic battalion at EAC.
- Prepare the topographic operations annex for corps CONPLANS/OPLANS/OPORDs.
- Define stockage requirements for maps to be held by topographic units supporting the corps.
- Provide, through supporting units, supply-point storage and distribution of standard topographic products at corps level.

**Theater Army engineer.** The theater Army engineer is the principal adviser to the theater Army commander for all engineer matters—to include topographic engineering. The primary staff for topographic matters is the theater P&C team. This team is normally attached to the theater Army engineer staff or the engineer command. The theater Army engineer helps the P&C team to orchestrate topographic support with higher headquarters, the DMA, and allied organizations as required. The theater Army engineer and the P&C team have a responsibility to—

- Provide operational control (OPCON) of the theater topographic battalion and, indirectly, all topographic assets in the theater.
- Furnish overall planning, management, and coordination of topographic support to the theater Army.

- Act as theater-level map inventory control point.
- Provide topographic technical expertise to the commander and staff.
- Provide topographic support for the theater Army and to coordinate these requirements with higher joint headquarters, the DMA, and host nation/allied topographic offices.
- Prepare the topographic annex in conjunction with the theater Army staff.
- Coordinate with the G2 staffs.

**Battalion commander.** The commander of the topographic engineer battalion at EAC commands all topographic units within the theater, except the P&C team. This commander has a responsibility to—

- Provide priority general support to subordinate topographic assets for requirements beyond the capability of the direct support unit.
- Furnish topographic support to all Army units at EAC.
- Manage the in-theater topographic production program.
- Provide supply-point storage and distribution of standard topographic products at EAC and corps levels.
- Store theater-level MC&G war reserve stocks.
- Assist assigned units with topographic technical supplies.
- Provide direct and general support maintenance of topographic equipment located at all assigned units.
- Coordinate, with the theater P&C team, production demands that exceed the capabilities of the topographic battalion.

**Defense Mapping Agency (DMA).** The Defense Mapping Agency is the main supporter in battlefield topographic operations. This agency provides MC&G support to the US armed forces. The DMA responsibilities are to—

- Produce all standard topographic, aeronautical, and nautical products (see Appendix B).
- Provide supply point distribution of theater-level MC&G stocks.
- Coordinate MC&G agreements with allied forces and host nations.

### Employment of Units

All topographic units within a theater of operations are components of the engineer topographic battalion. Detachments and companies from this battalion can be located at division, corps, and EAC levels, providing rapid-response, nonstandard, and special-purpose topographic products to aid the tactical commander.

The primary focus of topographic support is to the tactical commander. To ensure that units actually fighting the AirLand Battle receive the most responsive and best tailored topographic support, priority support is to the forward-deployed tactical units.

Requirements for support which cannot be met by forward-deployed units because of priority workload or project complexity will be passed to the unit at the next higher level of command to do.

Tactically deployed topographic units should use static facilities such as warehouses, hangars, and barns whenever possible. In a warfare situation that is potentially nuclear, facilities which provide the best protection from the effects of a nuclear detonation should be chosen. The use of static facilities will greatly reduce their battlefield signature. Figure 1-3 depicts a typical employment concept for topographic units in a theater of operations.

Availability of support within the time constraints dictated by tactical commanders is important. When time is crucial, product content is more important than looks. Quickly prepared, special hand-drawn graphics are normally used at division level. Immediate access to all-source intelligence is critical for the preparation of the latest topographic products at both corps and division levels.

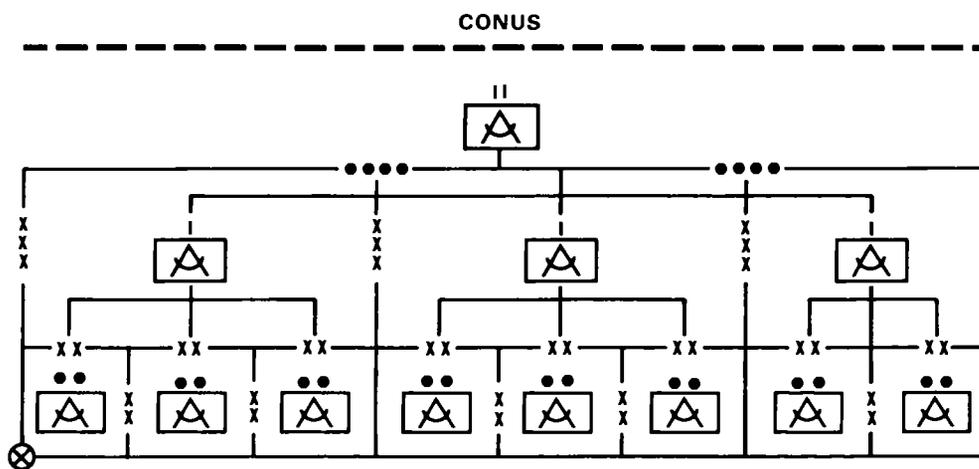


Figure 1-3. Topographic engineers in a theater of operations

## COMMAND AND SUPPORT RELATIONSHIPS

### General Relationships

Topographic engineer units are controlled by two kinds of relationships. *Command* relationships reflect the chain and degree of authority. *Support* relationships describe the manner of support. Table 1-3 shows details of these relationships.

Table 1-3. Command and support relationships

<b>An engineer element with a relationship of:</b>	<b>Direct Support (DS)</b>	<b>General Support (GS)</b>	<b>Operational Control (OPCON)</b>	<b>Attached/Assigned</b>
Is commanded by:	Parent unit	Parent unit	Supported unit	Supported unit
Maintains liaison and communication with:	Supported and parent units	Supported and parent units	Supported and parent units	Supported unit
May be task-organized by:	Parent unit	Parent unit	Supported unit	Supported unit
Can be:	Used to provide support to a particular unit. May be given task or area assignments.	Used only to support the parent force as a whole. May be given area/task assignments.	Placed under OPCON or DS to brigades or task forces or retained as GS.	Further attached. OPCON, or DS to brigades or task forces, or retained as GS.
Responds to support requests from:	Supported unit	Parent unit	Supported unit	Supported unit
Has work priority established by:	Supported unit	Supported unit	Supported unit	Supported unit
Makes spare work effort available to:	Parent unit	Parent unit	Supported unit	Supported unit
Forwards request for additional support through:	Parent unit	Parent unit	Supported unit	Supported unit
Receives logistical support from:	Parent unit	Parent unit	Parent unit*	Supported unit*

\*NOTE: When attached, the engineer element is provided administrative/logistic support. When placed under OPCON, the parent unit provides support in the common classes of supply to the maximum extent possible.

All units within a theater of operations are assigned to the topographic battalion supporting the theater. This battalion provides topographic supply and intermediate maintenance of equipment to all units within the theater. Traditionally, a company from the battalion is placed in direct support of each supported corps, with detachments from that company placed in direct support of each division in the corps.

However, in AirLand Battle, because of the need for greater response to the tactical commander, the lethality of the modern battlefield, the distances involved, and the concept of deep attack using ground forces, the normal engineer use of the direct support relationship is much less applicable. Instead, the command and support relationship which best fits the situation from the tactical commander's viewpoint must be adopted. Particularly at division level, OPCON and the attachment will be used more now than in the past.

#### **Echelons Above Corps (EAC)**

The P&C team assigned to the theater Army engineer staff provides overall management, planning, and coordination of topographic support to the theater Army. The commander of the P&C team is the primary topographic officer in the theater and provides advice to the theater Army commander and staff on topographic matters. The P&C team is responsible for determining support requirements for the theater Army. The team then coordinates with higher level joint headquarters, DMA, and host/allied nations for acquisition of products, source materials, and data bases. It is typical for the P&C team to have OPCON of the topographic battalion at EAC.

The topographic battalion at EAC provides the full spectrum of functional support to all theater Army assets. This includes terrain analysis, production, map storage and distribution, supply, and intermediate maintenance support of topographic equipment. This battalion is assigned to the theater engineer command (ENCOM) and is normally located in the communications zone (COMMZ).

Except for the P&C team, all topographic units within the theater are assigned to the topographic battalion. One company is assigned per supported corps, and one detachment per supported division. If requirements are such that a separate topographic company or detachment is needed in general support of the theater, this unit will also be assigned to the topographic battalion.

#### **Corps**

A topographic company from the battalion at EAC is placed in direct support of each supported corps. Capabilities of this company include terrain analysis and production (minus survey). Survey and map distribution assets may be added as needed to fulfill specific requirements of the supported corps.

Depending on the distance from the battalion and the tactical situation, the topographic company may be attached to the corps for administration and nontopographic logistics support. Topographic supply and intermediate maintenance for equipment will be provided by the topographic battalion at EAC.

In addition to its normal complement, one terrain detachment per supported division is assigned to the topographic company. An element of the company is usually placed in direct support of the corps tactical operations center (TOC) to furnish rapid-response and special-purpose topographic support to the corps staff for IPB and operations planning. Additional elements of the company may be task-organized and placed in direct support of a supported division or task force for a limited time in order to provide more responsive support for a particular tactical operation. Requirements which cannot be satisfied by the company because of priority workload or complexity are passed to the topographic battalion for quick completion.

The topographic engineer company, less division support elements, is normally located in the corps rear area in direct support of the corps. Selected personnel from this company provide forward support at the corps TOC. Terrain analysts working in the TOC require routine access to all-source intelligence for preparation of up-to-date products.

### **Division**

A detachment from the topographic engineer company at corps level is normally placed in direct support of each supported division. Because of the small size and lack of more sophisticated equipment, capabilities of this detachment are usually limited to terrain analysis. Requirements which cannot be satisfied by the detachment due to workload, complexity, or lack of equipment are passed to the topographic company at corps for priority completion.

Priority is placed on providing terrain analysis support to the division staff for IPB and operations planning. The topographic detachment at the division is normally collocated with the G2 staff to provide immediate access to the all-source intelligence information vital to the preparation of up-to-date products. Single-color, hand drawn, special-purpose graphics in limited quantities are the rule rather than the exception. To the maximum extent possible, verbal responses will be used.

The topographic engineer detachment is typically attached to the division for administration and nontopographic logistics support. Topographic supply and intermediate maintenance of equipment are provided by the topographic battalion at EAC through the company at corps level.

Additional elements of the topographic company at corps level may be task-organized and placed in direct support of the division for a limited time to provide expanded capabilities to bolster a particular tactical operation.

Preparation for combat begins in peacetime. To ensure success in combat, peacetime military unit operations and training have always stressed development and maintenance of a high state of readiness. The major purpose of topographic operations in peacetime is to prepare the tactical commander to execute wartime missions.

Topographic operations during peacetime are of utmost importance because of the need to portray significant information about potential battlefield terrain. Wartime topographic operations are addressed in CONPLANS/OPLANS/OPORDs. Joint operations plans, for example, have a separate MC&G operations annex—Annex M (see Appendix C).

Terrain analysis is the key to obtaining information about potential battlefield terrain in any part of the world. In brief, terrain analysis is the collection and storage of information in data bases which is later used to prepare map overlays, generate analyses, and produce geographic studies. These activities aid in both military planning and tactical missions. Chapter 2 discusses terrain analysis.

An important facet of operations carried out by topographic engineer units is production, or the graphic portrayal and reproduction of map products. Data bases and aerial imagery—plus other information sources—are used to make and copy maps, map overlays, and charts. All are outlined in this chapter.

Support efforts play a direct role in military operations. For instance, ensuring that intelligence data such as target locations and enemy order of battle are ready when and where needed figure heavily in prebattle activities. During battle, support shifts to providing tactical commanders with updated products. During postbattle, the emphasis switches to revising maps to show changes in terrain caused by the conflict.

Maintaining enough stock of technical supplies to produce map products for soldiers in the field is a vital topographic engineer support job. Logistical coordination, as a result, is a key function performed by these engineer units that is explained in this chapter.

Also covered in this chapter are techniques for employing topographic units. Issues such as how to lessen electronic signatures, whether to place units inside or outside of buildings, and when to use the camouflage are discussed.

## PREPARATION FOR TOPOGRAPHIC OPERATIONS

### **Intelligence Preparation of the Battlefield**

Intelligence preparation of the battlefield (IPB) is a systematic and continuous approach to analyzing the enemy, weather, and terrain in a specific geographic area. Much IPB activity takes place before the battle, allowing commanders to make advance decisions that affect possible CONPLANS/OPLANS/OPORDs development. This approach integrates enemy doctrine, weather/environmental effects, terrain, and specific aspects of combat intelligence to predict enemy capabilities, vulnerabilities, and courses of action that may take place. Specifics are found in FM 34-1.

Graphics are basic to IPB analysis. Staff who carry out the IPB process use annotated military maps, multiple overlays, photographs with overprinted grids, and map substitutes. All such graphics are capable of computer assisted cathode ray tube (CRT) display. Current information is maintained by updating graphics, not by rewriting volumes of materials. These graphics are the basis for many aspects of intelligence and operations planning. They serve, too, as extension to the analysis of the area of operations and the intelligence estimate.

Ideally trained and equipped to aid in this process, topographic units are vital to the success of IPB. Engineer terrain analysts analyze the battlefield terrain and the effects of weather/environment upon it to predict the impact of terrain on military operations. Intelligence order of battle analysts correlate aspects of terrain with enemy combat system capabilities. Both types of analysts combine their talents to analyze the military aspects of terrain (OCOKA). Together they provide the tactical commander with more valuable information than either could provide separately.

### **Data Bases**

A data base is an assembly of information that can be used for many purposes. In Army topography, data bases are assembled to form the basic reference material needed to perform most aspects of topographic support. Responsibility for assembly of these functional data bases lies with the unit commander, other Army agencies, and the DMA. Information in each topographic functional area data base may be combined or exchanged with the others. Together they form the data base used by topographic engineer units.

**Terrain analysis.** Terrain analysis teams acquire as much terrain data as possible for their respective areas of interest. The DMA is responsible for producing the planning terrain analysis data base (PTADB) at a scale of 1:250,000 and the tactical terrain analysis data base (TTADB) at 1:50,000 scale used by the terrain analyst to support the maneuver commander's needs. In those areas of the world where coverage is not available, the terrain analysis team must be able to prepare these data bases and dedicate much of its peacetime operations to this effort.

The terrain analysis data base contains information from any source deemed appropriate by the terrain analysis supervisor at division, corps or EAC levels. The DMA and the Army Terrain Analysis Center of the Engineer Topographic Laboratories located at Fort Belvoir, VA, provide the majority of the information normally considered appropriate for this data base. Both produce, for example, transparent map overlays for many areas throughout the world at map scales of 1:50,000 and 1:250,000. For each map sheet, these overlays depict—

- Vegetation.
- Surface configuration (slope).
- Surface materials (soils).
- Transportation.
- Obstacles.
- Surface drainage.
- Water resources (1:250,000 scale)\*.

Each major command identifies to the DMA (through command channels) those areas of the world for which they need standard overlays. After the DMA produces them, these terrain analysis overlays are requested by Army topographic units and included in their terrain analysis data base.

In addition to supporting the standard DMA program, the Terrain Analysis Center produces various other types of standard and nonstandard worldwide terrain analyses for many different users. For example, water resources information is incorporated as part of the agency's PTADB (1:250,000 scale)\*.

Furthermore, many geographic studies and analyses are produced by various agencies. The Defense Intelligence Agency (DIA), the US Geological Survey (USGS), allied nations, and commercial agencies each maintain their own type of terrain analysis data base. Aerial imagery from various sources are included in the terrain analysis data base. In many cases, the imagery is more complete or more current than graphic map overlays, and can be used to augment or update overlay information. Aerial imagery is available through Army intelligence channels. Revisions and other additional information may be obtained through the intelligence collection planning process from the tactical units. Other units that are involved in providing this information are from engineer, combat and combat service support, and reconnaissance elements.

\*Water resource information is compiled for selected arid regions only.

**Production.** The topographic production function includes graphic portrayal of information (usually in cartographic and photographic format) and reproduction of these graphics (usually on a lithographic press).

The cartographic/reproduction data base used by topographic engineer units includes at least a single copy of every available 1:250,000 and/or 1:50,000 scale military map or local national map in each unit's area of interest. During peacetime, this map may be photographed by topographic units to produce a negative and a positive film copy. This copy is placed in the cartographic/reproduction data base. The copy is then used as needed to produce a black-and-white reproduction of the standard four-color topographic map. This black-and-white reproduction (monochrome) base can be used as the background for an operations or situation map overlay, terrain analysis map overlay, or any other kind of map overlay or overprint. It may also be used as a substitute for a multicolor map. As stated before, overprinting (surprinting) standard DMA products is not recommended.

The cartographic/reproduction data base may also include separate color flats used by the DMA to make a standard multicolor topographic map. These flats, or reproducibles, represent separately each color found on the map. Ideally, it is better to use these reproducibles to make expedient map updates.

Aerial imagery, specifically that of a quality to support preparation of a photomap, may be in the data base which becomes available during an operation. This imagery is normally available through intelligence channels.

**Geodetic positional.** The geodetic positional data base consists primarily of a listing of geodetic control points set up within a given geographic area and keyed to standard topographic maps (trig list). In addition, the APPS data base produced by the DMA is included in the survey data base. The APPS is an instrument topographic surveyors use to perform quick survey measurements through the use of aerial photographs.

As with the terrain analysis data base, the topographic engineer unit commander must consider all aspects of requisite survey data and acquire the data necessary to satisfy operational requirements. Data acquired may be used to satisfy eventual combat needs, particularly siting air defense field artillery weapons and communications systems.

## TOPOGRAPHIC OPERATIONS

### Factors Affecting Operations

Topographic engineer operations, like all military operations, are affected by the factors of mission, enemy, terrain, troops, and time available (METT-T). The different types of military operations (offense, defense, rear-area combat, military operations on urbanized terrain (MOUT), and other special operations) affect the type, frequency, and amount of topographic support required and/or available. Communication networks and unique technical supplies essential for topographic support will also affect the degree to which and the efficiency with which this support can be provided.

The method of employment of topographic engineers must be considered like all combat service support activities, because the engineers are vulnerable to attack. Topographic engineers have little organic protection from attack and require external assistance to maintain local security. As a result, these units must carefully select battlefield locations that offer maximum unit survivability.

The ever-changing battlefield of the AirLand Battle may be a factor affecting the availability of topographic support. Forward-based combat units can be positioned several hundred kilometers away from rear-based support activities. Thus, it is important that these forward units have adequate topographic engineer support readily available, in order to reduce their reliance on rear-based support.

### Impact of Military Operations

All military operations require topographic engineer support. Topographic support operations may be preplanned (contingency) in peacetime, or they may evolve from specific battlefield situations. About the same amount of topographic functions are performed during each type of military operation. The support priorities usually will change depending on the particular stage of combat.

**Prebattle.** Prebattle operations occur either before a particular battle starts during wartime or, more importantly, before the conflict itself starts. This is the stage of military operations that requires the largest amount of topographic preparation. Topographic support concentrates on—

- Terrain analysis.
- Storage and distribution.
- Production (reproduction, cartography, and survey).

The IPB process, previously discussed, plays a primary role in prebattle support. Engineer and intelligence analysts work together. For example, it is important that the topographic engineer company at corps maintain direct contact with the

corps all-source analysis section. This contact ensures that intelligence materials required by terrain analysts—such as aerial photography, target locations, enemy order of battle, enemy equipment characteristics, and weather data—are available.

Conventional topographic products are especially important during this stage of operations. Standard topographic maps and terrain data bases associated with various pieces of terrain information are all a part of the topographic data base. These products must be readily available prior to combat. During this prebattle phase, tactical commanders and topographic engineers must jointly establish priorities for products and coordinate their production. This ensures that commanders are provided with accurate and timely support during the battle phase.

**Battle.** In combat, the emphasis of topographic support changes. The focus of topographic support during battle is on providing the tactical commander with expedient, tailored, and updated products. Expedient responses, especially at division level, are necessary to properly and adequately inform commanders of the impact of terrain on the battle at hand.

Distribution of topographic products becomes critical during the battle stage. The dynamic state of the battlefield will cause frequent unit movement. Unit movement beyond areas covered in their basic load of maps will require distribution of additional map products.

**Postbattle.** When the battle ends, topographic emphasis changes again. As during the battle stage, units will require new and additional standard products during this stage of combat. To prepare for the next battle, unit basic map loads may need partial or complete replacement. Standard products may need revision or hasty update to reflect changes to the terrain resulting from the battle. Topographic survey may be required to recover or reestablish geodetic survey control points. New survey control points for weapon systems and signal systems, for example, may require installation.

Terrain analysis is still important during the postbattle stage. The battle will significantly alter the terrain, requiring the updating of previously performed terrain analysis. Previously completed expedient products that have potential value for the next battle may also have to be updated by the terrain analyst.

### **Communications**

Topographic engineer units have little radio and wire communications. They must rely completely upon communications networks of supported units in order to effectively carry out their missions. The unit commander must establish communications to lower headquarters and to supported units. This, along with

internal communications, will effectively use all the unit's available communication assets. Topographic units will usually require additional support from supported units.

### **Technical Supplies**

Topographic engineer units require large quantities of low-density supply items such as map paper, printing inks, drafting supplies, map-size photographic film, lithographic printing plates, and chemicals for photographic developing and printing. In certain topographic functional areas, it is impossible to provide support without these supplies. Because topographic technical supplies are low-density, the unit commander must initiate proper and adequate logistic coordination in order to obtain supplies from the unit providing support. This is especially important during peacetime. Contingency stocks of wartime supplies, such as map paper, must be planned for by topographic and logistical commanders. For the contingency stocks to remain usable, perishable materials (*shelf-life* items) must be rotated.

Because topographic engineer units at corps level and below are not collocated with their battalions, obtaining supplies can become an administrative and logistical problem. The higher unit headquarters must attempt to assist lower headquarters in dealing with problems associated with providing topographic technical supplies.

### **Method of Employment**

The visual and electronic signatures of the topographic engineer unit are significant and must be considered when siting engineers near maneuver command headquarters. To lessen the effect of their electronic signature, commanders and staff personnel at division, corps, and theater levels recommend appropriate employment locations of topographic units.

When possible, the unit is placed inside facilities such as a warehouse or factory. This provides some protection from nuclear weapons effects and disguises its location. Dispersing the unit in wooded areas under camouflage nets is possible but degrades the unit's efforts to provide rapid, efficient support. For example, it would not be advisable to have 50-meter dispersion for all unit vehicles because the dispersion will adversely affect production efficiency and create a much larger electronic signature. In certain cases, equipment configuration is constrained because equipment generator cables are less than 35 meters long.

If open or wooded area employment is the only alternative, equipment should be placed close together and well camouflaged. External protection support (other than personal small arms defense) is required for topographic units, regardless of mode of employment.



The Defense Mapping Agency (DMA) is a separate DOD agency under the direction, authority, and control of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence. The director is responsible to the Joint Chiefs of Staff (JCS) for operational matters within their cognizance, as well as for needs associated with the joint planning process. The chairman of the JCS is authorized to delegate to and communicate directly with the agency. Figures A-1, A-2, and A-3 illustrate the position of the agency relative to other MC&G activities of the federal government and to the DOD.

The DMA was established in 1972 to provide MC&G support to the armed forces and all other national security operations. The director is program manager and coordinator of all DOD MC&G resources. Under this charter, the director is also responsible for managing DOD's MC&G research and development, and test and evaluation.

Its mission is to provide MC&G support and services to the Secretary of Defense, the Joint Chiefs of Staff, the Military Departments, Unified and Specified commands, and other DOD components through the production and worldwide distribution of maps, charts, precise positioning data, and digital MC&G data for strategic and tactical military operations and weapon systems. The agency also provides management and coordination of all DOD MC&G resources and activities. Its legal responsibility is to provide nautical charts and marine navigational data for use of all vessels of the US.

## ORGANIZATION

The DMA employs about 9,000 people in 50 locations around the world (see Figure A-4). The headquarters is located on the grounds of the US Naval Observatory in Washington, DC.

### **Hydrographic/Topographic Center (H/TC)**

The Hydrographic/Topographic Center (H/TC), with headquarters in Brookmont, MD, is primarily concerned with the topographic mapping of land areas, hydrographic charting of seas, and the shape of the earth. The H/TC supports land, sea, and air operations of the military by providing maps and charts vital to both strategic and tactical operations.

### **Aerospace Center (AC)**

The Aerospace Center (AC), with headquarters in Saint Louis, MO, is responsible for products and services for aerospace navigation. Aeronautical charts, FLIPs, cartographic materials in support of National Aeronautics and Space Administration (NASA) space flights, air target materials, and precise positioning data are among the products produced on a worldwide basis by the AC. In addition,

the center is a major producer of digital MC&G data used for weapons guidance systems, in command and control systems, and for a variety of other military applications.

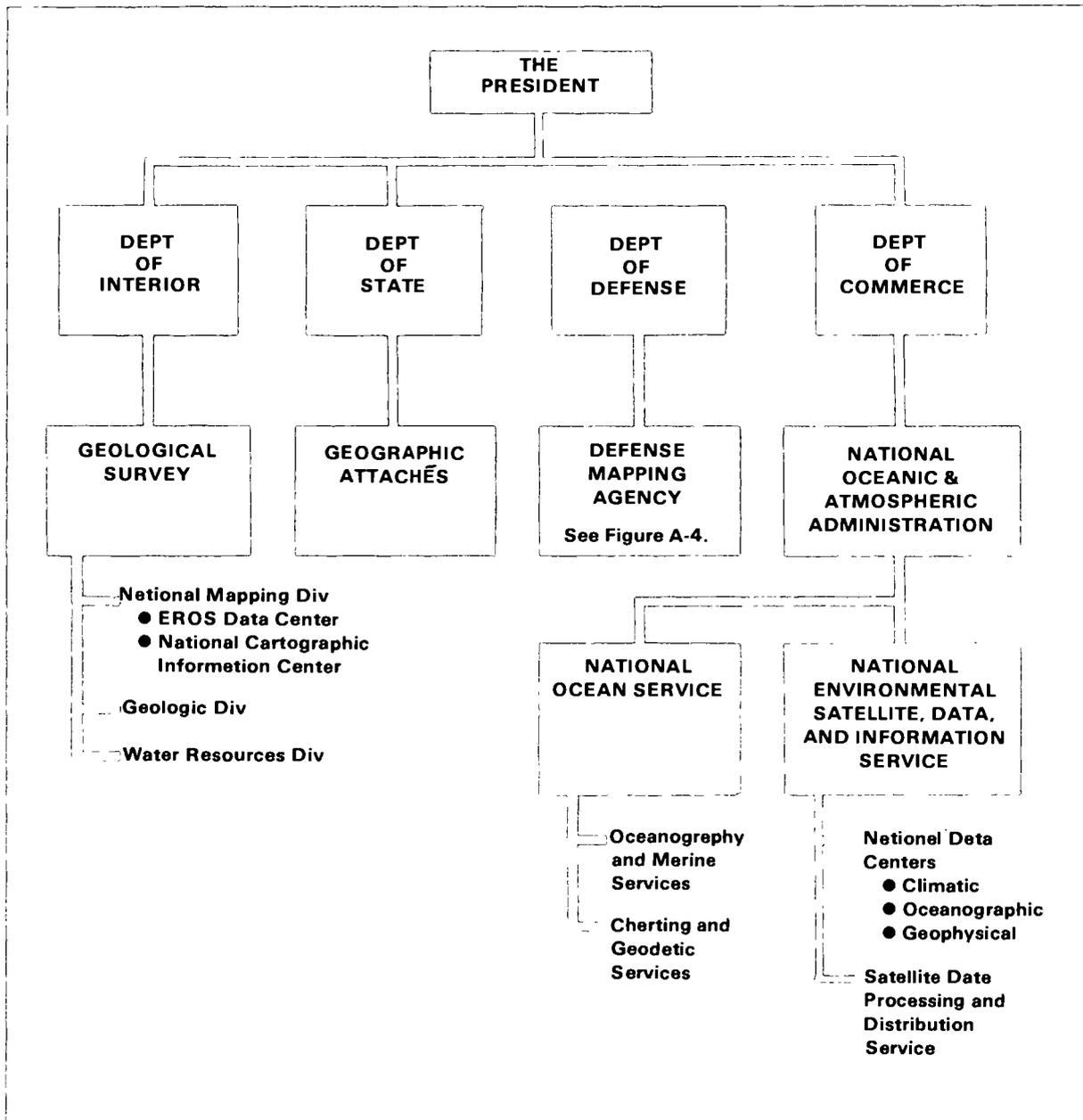


Figure A-1. National mapping, charting, and geodesy community

**Defense Mapping School (DMS)**

The Defense Mapping School (DMS) at Fort Belvoir, VA, is the sole training facility for officers, noncommissioned officers (NCOs), and enlisted members (EMs) of all services in MC&G skills. This school offers courses ranging from the basic techniques of surveying, cartography, reproduction, and terrain analysis to the management of mapping organizations.

**Office of Distribution Services (ODS)**

The Office of Distribution Services (ODS), headquarters is located in Brookmont, MD. Major distribution centers are in Philadelphia, PA, and Clearfield, UT. These centers distribute DMA products to users through 13 subordinate distribution units located around the world.

**Special Program Office for Exploitation Modernization (SPOEM)**

The Special Program Office for Exploitation Modernization (SPOEM) at Reston, VA, is charged with procuring equipment. This office also develops system requirements to fully automate the agency map and chart production process.

**Inter-American Geodetic Survey (IAGS)**

The Inter-American Geodetic Survey (IAGS), at Fort Sam Houston, TX, is responsible for mapping and charting programs conducted jointly with the mapping agencies in Latin American countries. The IAGS has staff offices in 15 Latin American countries and operates a cartographic school at Fort Clayton, Panama, for the training of Latin American students.

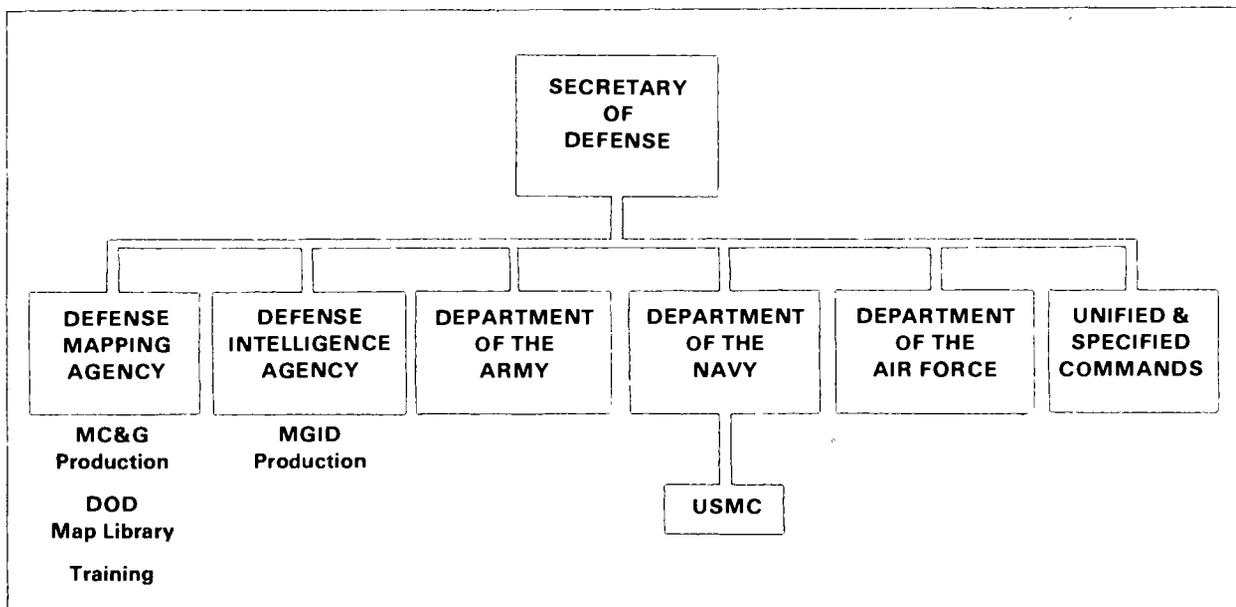


Figure A-2. Department of Defense mapping, charting, and geodesy community

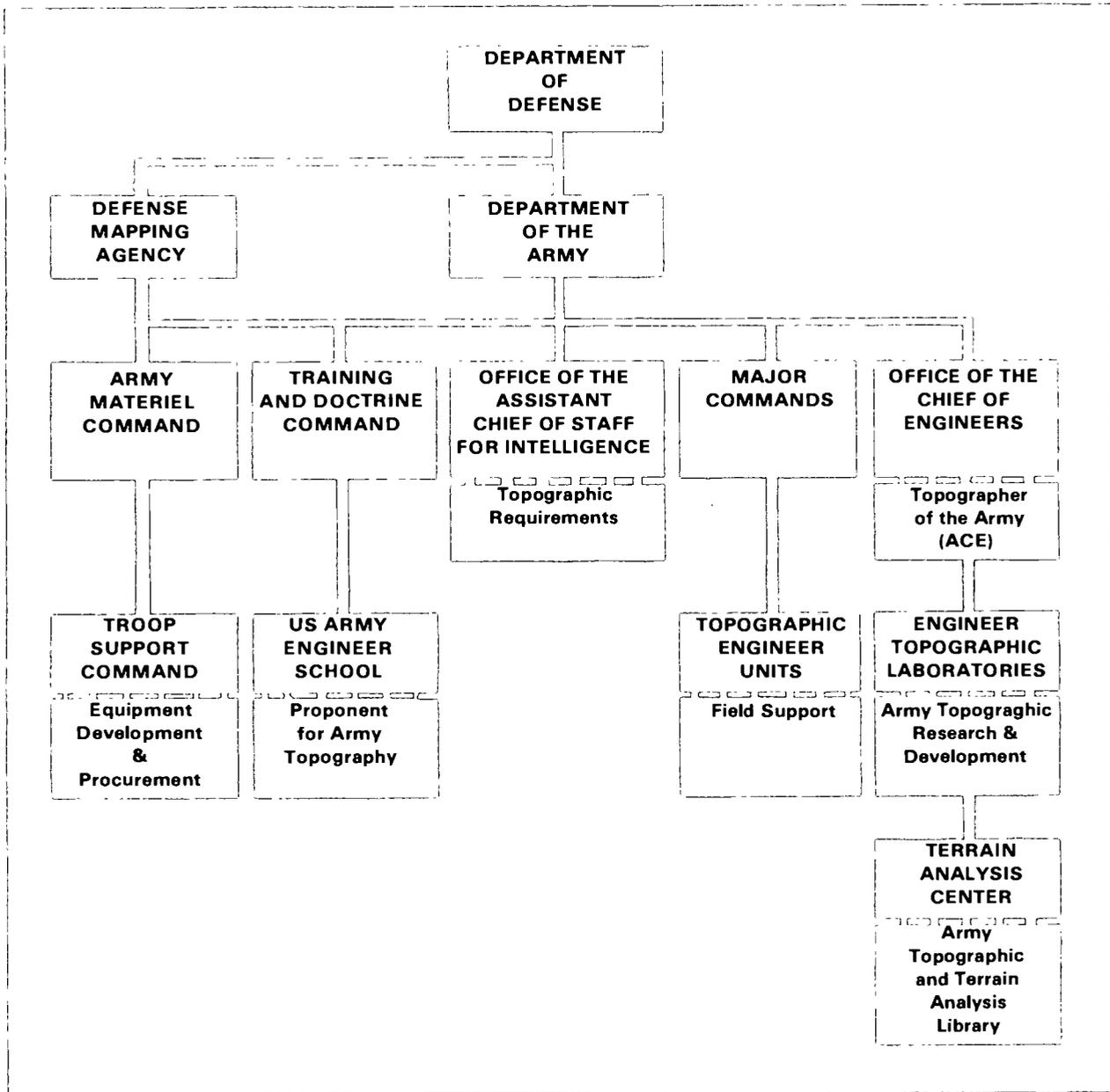


Figure A-3. Defense Mapping Agency's relationship to the Army mapping, charting, and geodesy community

## USER COMMUNITY

### **Defense Intelligence Agency (DIA)**

The Defense Intelligence Agency (DIA) provides intelligence data and technical assistance to DMA to support the DOD Terrain Analysis Program (TAP). This agency retains management and production of military geographic information and documentation (MGID) by providing basic area intelligence for general military geographic and logistic data bases and studies. The DIA also provides aerial photography storage, retrieval, and distribution; and US representation to North Atlantic Treaty Organization (NATO) on MGID. The majority of DIA products are textual or data-based. The DIA will permit some graphic production, but only through agency cooperation.

### **United States Geological Survey (USGS)**

The DMA maintains close alliance and cooperation with civilian agencies in the US Government that are engaged in MC&G activities (see Figure A-4, page A-6). The United States Geological Survey (USGS) has responsibility for mapping the United States, its possessions, and its territories. Through exchange agreements, the DMA obtains topographic information from the USGS at military scales and specifications to include registration to the universal transverse mercator (UTM) and military grid reference system (MGRS) to meet military training requirements. Most of the areas covered are for military installations. However, for other areas, standard USGS maps without the military specifications can be ordered on special requisition by authorized DOD activities through the ODS if ordering for more than 100 copies per line item. If less than or equal to 100 copies per line item, DOD activities may order directly from USGS. Requests should be made only to support CONPLANS/OPLANS/OPORDs and training missions with stated requirements since reimbursable accounts are maintained between the DMA and the USGS.

### **National Ocean Service (NOS)**

The National Ocean Service (NOS), through the National Oceanic and Atmospheric Administration (NOAA), provides charts and related information for the safe navigation of marine and air commerce in the US, its possessions and territories, and the Great Lakes. The NOS' National Geodetic Service (formerly known as the US Coast and Geodetic Survey) provides a network of horizontal and vertical control of the US for essential mapping, charting, and other engineering work. In addition to maritime charts, NOS also produces airport obstruction charts showing runway and flight paths for landing and takeoff, together with the positions and elevations to these operations. These charts provide data for engineering plans to clear obstructions, improve airports facilities, and provide guidelines for civilian aviation safety. The NOS also handles commercial sale of DMA-supplied products such as Notices to Airmen and Notices to Mariners.

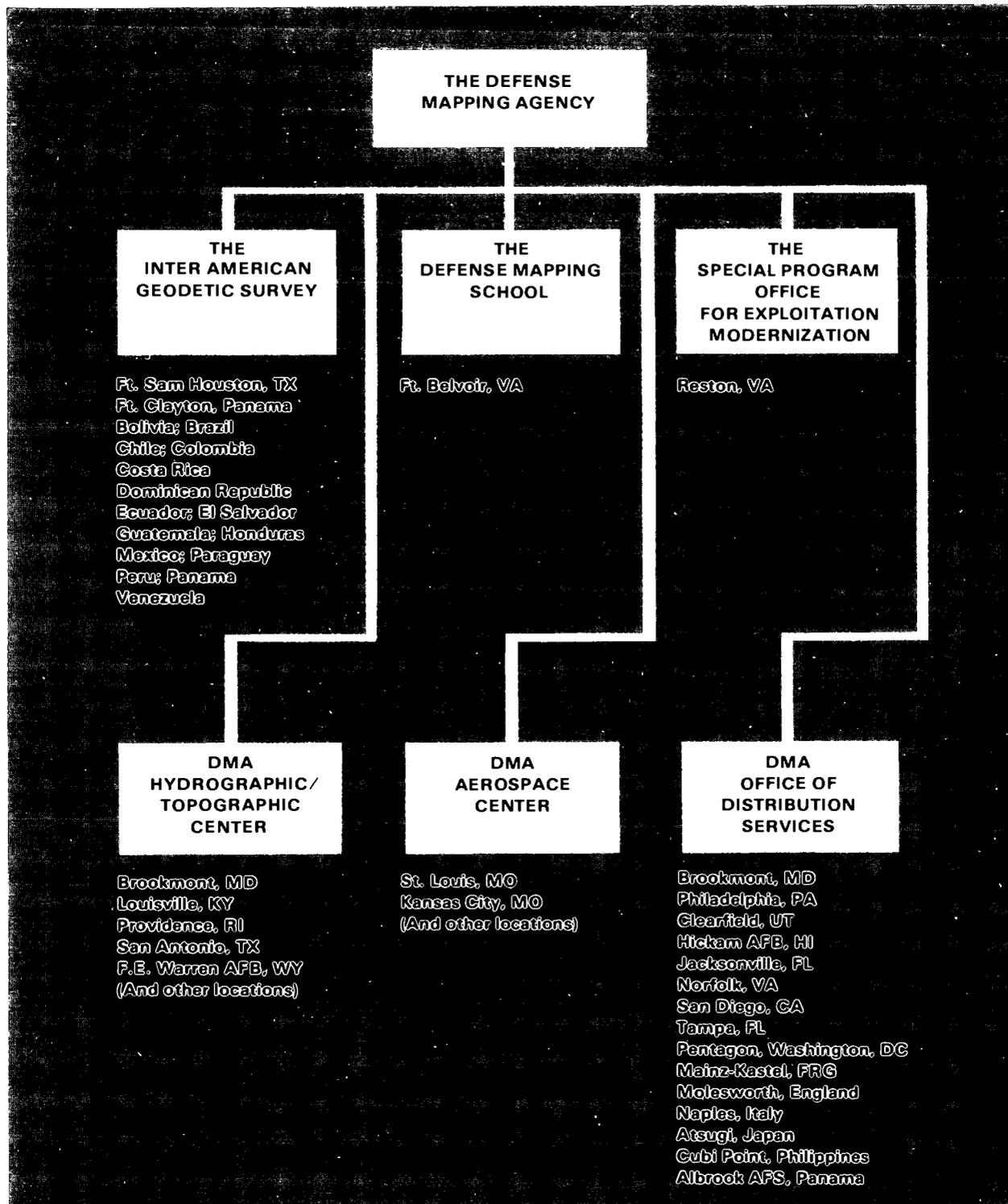


Figure A-4. Organization of the Defense Mapping Agency

### **International Agreements**

The DMA is the DOD agent for fostering international cooperation, and for negotiating and concluding agreements in the MC&G field. Supplementing the production capacity of the agency, international programs are essential to satisfying the huge volume of MC&G products required by US military forces to cover foreign areas. The DMA has contact with mapping organizations in almost 200 countries and has formal agreements with over 70 governments. The NATO countries and Latin America nations are two of the more significant groups that take part in these joint efforts.

These agreements can be bilateral or multinational. They may involve product exchanges, cooperative production programs, technical assistance, standardization, and facsimile reproduction, either in **individual** or **umbrella**-type agreements.

### **Individual Agreement**

An individual exchange agreement is one in which the two countries involved exchange products. For topographic products, one country furnishes medium- and small-scale maps and copies of related publications, such as gazetteers and trig lists. The host country then provides the same type of products, but of larger scales covering the country itself.

Cooperative agreements involve DMA assistance to the host country in the form of DMA equipment and/or technical expertise. In return, the DMA receives MC&G products resulting from the host country projects and is granted access to the host country to pursue its own program requirements. It was through a series of cooperative agreements with Latin American countries that the IAGS was originally established.

Facsimile agreements permit countries to reproduce each others nautical products for sale to mariners. The DMA satisfies its statutory responsibility to make charts available to mariners through the International Hydrographic Organization (IHO) exchange agreements and other facsimile nautical chart exchange agreements. The only significant constraint is that one nation cannot undersell the original producer of the chart.

### **Umbrella Agreement**

Most future agreements will take the form of an umbrella agreement between the DMA and the cooperating agency of the other country. These agreements will state the general conditions under which it has agreed to exchange or cooperate. Each agreement will have separate annexes for topographic maps, air charts, and nautical charts. Currently such arrangements exist with over 50 countries such as Australia, Denmark, Canada, Federal Republic of Germany, Korea, and Turkey.

In NATO each country "has a sovereign right to retain in their own hands production, reproduction and supply of MGID of their own territory and to place restriction on the distribution of this material and its subsequent use." Supreme Headquarters Allied Powers Europe, "NATO Geographic Policy, Enclosure 4: Military Geographic Information and Documentation (MGID)," mimeographed (Brussels, Belgium, 1985).

Therefore, the DMA **does not produce** MC&G products of other NATO nations' territory. To fulfill requirements of US military forces, the DMA can **reproduce** products through negotiated signed international agreements described in the previous paragraphs.

The main goal of standardization agreements is interoperability (to ensure that forces of all nations use the same maps of any particular area). The standardization of MC&G products within NATO is coordinated by the Military Agency for Standardization (MAS) through issuance of standardization agreements (STANAGs).

It is through these standardization efforts that bilateral exchange agreements provide the US with products that can be placed directly in the supply system without costly reworking. For example, maps of NATO nations are now printed with English in the margin. The grid needed by US forces is used by all NATO forces and is printed on the maps. The map series and sheet numbering systems are the same as those used by the US.

With MAS responsible for standardization of NATO products, Supreme Headquarters Allied Powers Europe (SHAPE's) geographic staff devotes its efforts to the establishment of mapping and charting policy. The staff also maintains an overview of the MC&G production effort in the NATO countries to ensure that maps and charts will be available for NATO forces.

### **MC&G POLICY DEVELOPMENT**

Basic overall policy for DOD MC&G support is established by the director of the DMA. The director acts as program manager and coordinator for all DOD MC&G resources and activities. In managing MC&G resources not assigned to the agency, the director reviews policies, plans, and programs. Appropriate recommendations are then provided of the findings to the Secretary of Defense, the Joint Chiefs of Staff, the Department of the Army, and the Unified and Specified (U&S) Commands. The director, DMA is responsible for evaluating the performance and effectiveness of MC&G activities.

The Department of the Army (DA) is the developer of policy and doctrine for Army MC&G units. The department organizes, trains, and equips MC&G units for

assignment to U&S Commands. Available resources are then identified to accomplish non-Army MC&G functions and for Army MC&G functions that require non-Army resources.

The Assistant Chief of Staff for Intelligence (ACSI) has general staff responsibility for supervising of combat intelligence which includes Army topographic activities. The ACSI identifies, coordinates, and confirms topographic needs and services in support of material systems as well as doctrinal and conceptual developments. The US Army Engineer School (USAES), as the proponent school for topographic engineering within the Training and Doctrine Command (TRADOC), is responsible for developing topographic troop organizations, operational concepts and doctrine for field Army support. By regulations, the Deputy Chief of Staff for Operations and Plans (DCSOPS) has the ultimate responsibility for organization, force structure, operations, concepts, and doctrine Armywide. The chief of research, development, and acquisition provides Army topographic research, development, testing and evaluation except funding for basic research (6.1), exploratory development (6.2), and nonsystems advanced development (6.3A). The latter are included under the responsibilities of the chief of engineers. The chief of engineers also provides direct support to other Army staff agencies by coordinating and technically supervising Army MC&G, and by programming and managing terrain analysis and its detailed production plans. The Assistant Chief of Engineers (ACE) is designated as topographer of the Army. Army Regulation (AR) 115-11 describes various major Army command (MACOM) and DA staff responsibilities in detail.

The U&S Commands maintain staff capabilities to direct MC&G activities within their commands. Army components of unified commands have Army MC&G units assigned to satisfy the MC&G requirements of tactical commanders for responsive battlefield support.

The DMA issues general policy guidance to each of the services in its program objective memorandum (POM). In turn, the Army issues the DA Consolidated Topographic Program (CONTP), which allocates Army topographic resources and assigns responsibilities to topographic units.

## **MC&G REQUIREMENTS**

The requirements process includes the procedures by which MC&G users and the DMA identify requirements for standard products and services. These requirements are confirmed annually and are the basis for allocating DMA production resources.

Each year, the U&S Commands and military services are directed by the DMA to submit requirements for MC&G products and services needed to support their respective missions. Policy guidance is found in formal documentation such as **DMA Instruction (DMAINST) 8050.4<sup>1</sup>**, **DMAINST 8050.3<sup>2</sup>**, and other more specific planning documents at service and U&S Command levels. Although not establishing policy, the DMA's **User's Guide: Submitting Area Requirements for Products and Services**, provides a detailed treatment of the submission activities, including guidelines and instructions pertaining to major MC&G products.

Requirements submissions identify the standard MC&G products needed to support the mission of the organization. In most cases, the mission or operational objective is described in a CONPLAN/OPLAN/OPORD or similar document. The MC&G officer assembling the product has a responsibility to determine—

- What products are needed to support the CONPLAN/OPLAN/OPORD.
- Where the products are needed (geographic coverage).
- Why the product is needed (intended use).
- Which priority level should be assigned.

The requirement cycle starts with command graphics and computer listings provided by the DMA in February of each year. These are used to display the necessary categories of information by manual annotation. In June, the updated and validated requirements are returned by the military services and the U&S Commands to the DMA. From then until September, the DMA reviews the submitted requirements and grants approval for production.

In mid-October, the approved requirements changes are entered into the ARAPS system, which is the DMA's automated file for recording and managing item-level information about the requirements. The ARAPS system supports production programming, product maintenance, and distribution; it also generates periodic management reports.

Two very important reports that are widely distributed within the MC&G user community are the **Mapping, Charting, and Geodetic Area Requirements** document (Gray Book), which is published in January of each year and the

<sup>1</sup> Submission and validation of mapping, charting requirements

<sup>2</sup> Area requirements and product status (ARAPS) systems

**Maps, Charts, and Related Products Requirements, Status, and Programs.** The first publication presents, in one volume, the consolidated requirements that resulted from the prior year's requirement cycle. For each major MC&G product, an index map or table displays the geographic areas and priorities of the validated requirements. The **Maps, Charts, and Related Products Requirements, Status, and Programs** documents (Assessment Graphics) is a four-volume set which displays product availability and current production programs in graphic or tabular form against the requirements shown in the Gray Book. These volumes cover aeronautical charts, hydrographic charts, topographic maps, and missile and target materials.

## AVAILABLE PRODUCTS

### Description List and Catalog

The **DMA List of Approved Products and Services** is published in December of each year. It is a short list with descriptions of all the major products and services offered by the DMA.

Examples and descriptions of some of the following approved products may be found in Appendix B of this manual. Ordering procedures and line-items available are found in appropriate volumes of the **DOD DMA Catalog of Maps, Charts, and Related Products**. The following products should be ordered as maps:

- Strategic/Planning Graphics.
  - Joint Operations Graphics (JOG).
  - Tactical Pilotage Charts (TPC).
  - Operational Navigation Charts (ONC).
  - Vertical Obstruction Data (VOD).
  - Cross-Country Movement for the Main Battle Tank (CCM-MBT).
  - Coastal Nautical Chart.
  - Harbor and Approach Chart.
  - Gazetteer.
  - Trig Lists.

- Tactical Graphics.
  - Topographic Maps.
  - Cross-Country Movement (NATO Standard).
  - Road and Bridge (R&B) (NATO Standard).
  - Cross-Country Movement - Main Battle Tank (CCM-MBT) (DMA Standard).
  - Transportation Map (DMA Standard).
  - Military City Plan.
  - City Route Graphic.
  - Bottom Contour Chart.
  - Combat Chart.
  - Point Positioning Data Base (PPDB).
  - Trig Lists.

The DMA catalog gives full instructions and ordering procedures for both standard products and special services to include crisis support. Availability of the DMA catalog for Army units is controlled by MACOM policy which outlines authorization and requisition channels. This catalog is organized into 7 parts and 28 volumes. Individual volumes may be ordered. Individual pages to a volume are no longer issued. Following is a listing of the **DOD DMA Catalog of Maps, Charts, and Related Products**:

**PART 1 - AEROSPACE PRODUCTS**

Volume I - Aeronautical Charts and Flight Information Publications.

Volume II - Weather Plotting Charts.

Aeronautical Products Monthly Bulletin.

Aeronautical Products Semiannual Bulletin Digest.

**PART 2 - HYDROGRAPHIC PRODUCTS**

Volume I - United States and Canada.

Volume II - Central and South America and Antarctica.

Volume III - Western Europe, Iceland, Greenland, and the Arctic.

Volume IV - Scandinavia, Baltic, and USSR.

Volume V - Western Africa and the Mediterranean.

Volume VI - Indian Ocean.

Volume VII - Australia, Indonesia, and New Zealand.

Volume VIII - Oceania.

Volume IX - East Asia.

Volume X - Miscellaneous Charts and Publications.

Hydrographic Products Monthly Bulletin.

Hydrographic Products Semiannual Bulletin Digest.

Hydrographic Products Annual Price List.

Volume XI (SECRET) - Classified Nautical Charts and Publication (U).

(CONFIDENTIAL) - Quarterly Bulletin for Classified Nautical Charts and Publication (U).

Volume XII - Ordering Procedures and Crisis Support.

### **PART 3 - TOPOGRAPHIC PRODUCTS**

Volume I - Western Hemisphere - All Scales.

Topographic Products Monthly Bulletin for Volume I.

Topographic Products Semiannual Bulletin Digest for Volume I.

Volume II - Europe, Africa, and the Middle East - All Scales.

Topographic Products Monthly Bulletin for Volume II.

Topographic Products Semiannual Bulletin Digest for Volume II.

Volume III - Asia, Australia, and the Pacific Islands - All Scales.

Topographic Products Monthly Bulletin for Volume III.

Topographic Products Semiannual Bulletin for Volume III.

Volume IV (SECRET) - Classified Topographic Maps and Related Products (U). All Scales (U).

(CONFIDENTIAL) - Bulletin Digest for Classified Topographic Maps and Related Products (U).

(CONFIDENTIAL) - Quarterly Bulletin for Classified Topographic Maps and Related Products (U).

Volume V (CONFIDENTIAL) - Terrain Analysis Non-Lithographic Products All Scales (U).

### **PART 4 - TARGET MATERIAL PRODUCTS**

Volume I (CONFIDENTIAL) - Air Target Materials Charts (U).

Volume II (SECRET) - Mining Materials (U).

Volume III (SECRET) - Point Positioning Data Base (U).

### **PART 5 - SUBMARINE NAVIGATIONAL PRODUCTS**

Volume I (CONFIDENTIAL) - SSBN Special Navigational Material - Atlantic Area (U).

Volume II (CONFIDENTIAL) - SSBN Special Navigational Material - Mediterranean Area (U).

Volume III (CONFIDENTIAL) - SSBN Special Navigational Material - Pacific Area (U).

**PART 6 - GENERAL-PURPOSE PRODUCTS**

Volume I - Public Sale.

**PART 7 - DIGITAL DATA PRODUCTS**

Volume I - Terrain and Feature Data.

Volume II - Vertical Obstruction Data.

**Release of Products**

Maps and charts at scales of 1:250,000 and larger are subject to limitations and cannot be released outside the US government without prior approval of:

**DMA Office of Distribution Services**

**ATTN: PP**

**Washington, DC 20315-0010**

Maps produced by foreign agencies cannot be released without prior approval of the producing nations. Requests for approval must be obtained through the supporting Army topographic unit to the DMA Office of Distribution Services Product Release Officer, Attention PP.

**Automatic initial distribution (AID).** An AID is the automatic issue of predetermined quantities of new or revised MC&G products to customers who have established AID accounts. A customer's basic load or reference files of MC&G are kept current when no individual requisition actions are required. Upon publication of new or revised maps, charts, catalog changes, and bulletin digests, the DMA thus automatically distributes these products to customers with established AID accounts. All standard MC&G products managed by the ODS as well as the FLIPs are available for AID. Those Defense Mapping Agency account holders who wish to establish or change an AID account should send a clear text message or letter to the appropriate agency in accordance with (IAW) AR 95-14 or to:

**DMA Office of Distribution Services**

**ATTN: IMA**

**Washington, DC 20315-0010**

Requests must identify the products and the quantities required and should list a point of contact with a telephone number. Once established, AID accounts are revalidated annually by the customer using a requirements listing furnished by the DMA.

**Digital data.** The MC&G digital data are available in various forms as products and services. The **DOD DMA Catalog of Digital Data (U)** contains standard

types of data such as the Digital Terrain Elevation Data (DTED) and the Digital Feature Analysis Data (DFAD). The **(SECRET) DOD DMA Catalog of Point Positioning Data Bases (PPDB) (U)** lists those PPDBs available for use with the Analytical Photogrammetric Positioning System (APPS). Requests for these catalogs should be addressed through the supporting topographic unit to—

**DMA Aerospace Center  
ATTN: PPG  
3200 South Second Street  
St. Louis, MO 63118-3399**

### CRISIS SUPPORT

“A crisis is an incident or situation involving a threat from a source external to the US, its territories and possessions, that rapidly develops and creates a condition of such diplomatic, political, or military importance to the US Government that the commitment of US Military Forces and/or resources is contemplated to achieve our national objectives.” **Joint Operations Planning System (JOPS)**, Vol. IX (Washington, D.C., Department of Defense, Pentagon).

Responsiveness to the MC&G needs of military users is the most important objective of the DMA. To enable the DMA to support US military requirements in sudden crisis type of situations, a notification system has been established between the Joint Chiefs of Staff and the DMA. The National Military Command Center (NMCC) will notify the DMA when a potential crisis situation begins to develop. The center alerts the DMA to conduct an immediate inventory of its holdings in the geographic area of concern and to prepare for or initiate production of required products. Crisis support procedures are contained in—

- **DMA Catalog of Maps, Charts, and Related Products** (Information Sections).
- **DMAINST 8052.6.**<sup>1</sup>
- Supplemental guidance issued by higher headquarters.

The DMA will respond with the most appropriate support, within the constraints of the suspense date and availability of source data, and will continue to revise or replace products for the duration of the crisis. In a noncrisis situation, routine requisitioning procedures contained in **DMAINST 8052.1**<sup>2</sup> should be used.

<sup>1</sup>Procedures for obtaining MC&G products in support of crisis situations

<sup>2</sup>Validation of requirements for new or modified non-crisis mapping, charting and geodetic (MC&G) products and services

Standard, off-the-shelf products will be provided if they are appropriate and available. Examples and descriptions of various nonstandard topographic products are found in Appendix B. Some which may be provided include—

- Black-and-white reproduction of foreign map (See LIBRARY HOLDINGS in the following paragraph).
- Overprinted map (updated from most current photography).
- Scaled photoprint (enlarged black-and-white photo).
- Black-and-white photomap.
- Color-intensified photomap (black and white with major features highlighted in color).

### LIBRARY HOLDINGS

The DMA library has holdings of maps, charts, and related items for areas that are not shown in the catalog. A part of these holdings includes native editions for other topographic products and foreign countries. Although the agency does not have large quantities for issue, given proper notice, copies can be reproduced for use in a crisis situation.

### TRANSPORTATION

The ODS **does not** deliver MC&G products. Since it does not have organic transportation assets, this agency must rely upon public transportation, public distribution systems (US Postal Service), commercial parcel, express services, pickup by customer, or the military services transportation assets to move MC&G products. No matter which system is used, the **using command** will establish the priority for transport of all MC&G products. This is done regardless of whether or not the products are in support of a crisis.

This appendix provides examples and description of some of the MC&G products available to the tactical commander. These products are divided in two categories, standard and nonstandard.

**Standard** MC&G products are those produced to strict mapping standards by the DMA. Maps, aeronautical and hydrographic charts, terrain analysis, factor overlays (CCM included), and digital (DFAD and DTAD) data are some of the types of products available. These products are normally obtained through supply channels using the procedures outlined in the **DOD DMA Catalog of Maps, Charts, and Related Products**. Examples of some of these products are found in the **Standard Products** portion of this appendix.

**Nonstandard/special-purpose** MC&G products, such as map substitutes, operations and intelligence overlays, overprints, and terrain analysis special-purpose items, may not meet strict DMA mapping standards. Army topographic units primarily produce nonstandard products in response to needs identified by the tactical commander. Examples of some of these products are found in the **Nonstandard Products** portion of this appendix.

Standard Products

UNCLASSIFIED

NAME- ANCHORAGE INTERNATIONAL ASSOTW VOLUME NO-  
PAGE NO- 01

COUNTRY CODE- J2 CATEGORY CODE -

RE NUMBER- J118.DAD37 ALTERNATE NAME- NONE

PUBLISHED DATE-

DATE OF LATEST INFO- 91 MAR ICAO DESIGNATOR- PANC

GENERAL

GEOGRAPHIC COORDINATES SOURCE OF COORDS (U) MAGNETIC VARIATION ELEVATION

81 10 09N 149 59 43W QUAD ANCHORAGE A8 DCEC 1952 025E 00144

GRID COORDINATES, GRID SYSTEM, BASE REF POINT (U)

DAVIC 3388926785116 UTM-CLARKE 1866

MIDWAY BETWEEN POINTS WHERE EXTENDED CENTERLINE OF RUNWAY 320 INTERSECTS CENTERLINE OF RUNWAYS 06L/24R AND 06R/24L

GRAPHIC REFERENCES (U)

ONC DIT, FLIP ENROUTE ALASKA AND FLIP ENROUTE SUPPLEMENT ALASKA, USGS ANCHORAGE QUAD.

LOCATION AND LANDMARKS (U)

FOUR MILES SW OF ANCHORAGE, 45 MILES NW OF WHITTIER, 52 MILES NW OF KENAI.

TERRAIN AND DRAINAGE (U)

ADJACENT TO COOK INLET, SURROUNDED BY RELATIVELY FLAT TERRAIN. MOUNTAINOUS TERRAIN TO THE NE, E AND SE.

ARTIFICIAL AND NATURAL DRAINAGE IS ADEQUATE. AIRFIELD ACREAGE INCLUDES SEAPLANE FACILITIES ON LAKES HOOD AND SPENARD.

CONTROLLING AGENCY(IES) (U)

ALASKA DIVISION OF AVIATION, MILITARY LANDING RIGHTS.

OPERATIONS

OCCUPANTS, USERS, TRAFFIC (U)

FOUR DOMESTIC AND 9 INTERNATIONAL SCHEDULED AIR CARRIERS, 408 GENERAL AVIATION AIRCRAFT AND 8 MILITARY AIRCRAFT REDDED DOWN. CHARTER, INSTRUCTION, AIR TAXI AND AIRCRAFT SALES ACTIVITIES. APPROXIMATELY 130600 AIRCRAFT OPERATIONS ANNUALLY. ALASKA ANG IS A TENANT.

AUXILIARY AIRFIELDS (U)

NAME DISTANCE DIR RWY LGTH SURFACE CAPACITY

SEARCH AND RESCUE (U)

USCG RESCUE COORDINATION CENTERS AT JUNEAU AND KODIAK HAVE SAR RESPONSIBILITY FOR MARITIME AREA AND USAF RESCUE COORDINATION CENTER AT ELMENDORF AFB HAS SAR RESPONSIBILITY FOR CONTINENTAL AREA.

IMMIGRATION AND CUSTOMS FACILITIES (U)

AERODROME OF ENTRY. CUSTOMS SERVICE AVAILABLE 1800Z-0300Z, MONDAY THRU SATURDAY EXCEPT HOLIDAYS, OTHER TIMES 1 HOUR PRIOR NOTICE REQUIRED.

PLANS FOR CONSTRUCTION (U)

UNKNOWN

INDIGENOUS PERSONNEL (U)

SKILLED AND UNSKILLED LABOR AVAILABLE IN THE LOCAL COMMUNITY.

NAVIGATIONAL AIDS AND COMMUNICATIONS

NAVIGATIONAL AIDS/AIR TRAFFIC CONTROL SERVICES (U)

CONTROL TOWER, APPROACH CONTROL, VOR/DME, NDB LOM AND LMM, AIR GROUND, ASR AND ILS.

POINT-TO-POINT COMMUNICATIONS (U)

TELEPHONE, TELEGRAPH AND TELETYPE.

U.S. COMMUNICATIONS FACILITY(IES) (U)

COMPLETE FACILITIES AT ELMENDORF AFB 7 MILES NWE.

AIR TRAFFIC CONTROL CAPABILITY (U)

020 ARR PER HR MAX IN IFR WITH PRIORITY OVER DEP

030 DEP PER HR MAX IN IFR WITH NO ARR

020 DEP PER HR MAX IN IFR WHEN MAX ARR ALSO OCCUR

030 ARR PER HR MAX IN VFR WITH PRIORITY OVER DEP

040 DEP PER HR MAX IN VFR WITH NO ARR

030 DEP PER HR MAX IN VFR WHEN MAX ARR ALSO OCCUR

REMARKS-THE ABOVE RATES ARE ESTIMATED

AIRFIELD DESCRIPTION

RUNWAYS (U)

DIMENSIONS	MAG/BRG	SFC	COND	CAPACITY	R/LTS	RWY	J8	AG	ELEV	OVERRUN	APCL	GRAD	AL
10897X03150	06R/24L	ASP	GOOD	ESNL-56574/185-PSL	A	06R	N	N	00124	N	50-1	-0.28	A
176 0X0270	06L/24R	ASP	GOOD	ESWL-56574/185-PSL	A	06L	N	N	00121	N	50-1	-0.28	N
						24R	N	N	00094	N	50-1	-0.37	A
						24R	N	N	00081	N	50-1	-0.37	N
10489X01150	140/320	ASP	GOOD	ESWL-56574/184-PSL	A	140	N	N	00144	N	34-1	-0.35	N
						320	N	N	00115	N	50-1	-0.35	N

TERRAIN (U)

Figure B-1. Automated air facilities information file

DESCRIPTION

The file provides operational status, physical characteristics, and other information on world airfields and related aeronautical support facilities to aid in production of DOD MC&G products. The file also assists DOD operational and contingency planners.

REYKIR	PPL	65 28 N	19 22 W	22914	01	REYKJAHLEIDHARHEIOHI
REYKIR	FRM	64 03 N	20 27 W	22923	01	REYKJAHREPPUR
REYKIR	FRM	64 30 N	21 10 W	22903	01	REYKJAHVER
REYKIR	FRM	65 11 N	13 49 W	22919	01	REYKJAKVÍSL
REYKIR	FRM	65 15 N	21 06 W	22912	02	REYKJANES SEE RE
REYKIR	FRM	65 20 N	20 53 W	22912	01	REYKJANES
REYKIR	FRM	65 33 N	20 13 W	22913	01	REYKJANES
REYKIR	FRM	65 34 N	17 47 W	22916	01	REYKJANES
REYKIR	FRM	65 40 N	19 06 W	22914	01	REYKJANES
REYKIR	FRM	65 53 N	19 45 W	22914	01	REYKJANES
REYKIR	FRM	65 59 N	18 48 W	22915	01	REYKJANES SEE REYKJ
REYKIR	FRMS	65 54 N	17 18 W	22916	01	REYKJANES SEE HVER
REYKIR	FRMS	66 02 N	19 09 W	22914	01	REYKJANES OYB SEE
REYKJABUNGA	HLL	65 20 N	20 52 W	22912	01	REYKJANESFJALL
REYKJAOALSÁ	STM	64 39 N	21 30 W	22900	01	REYKJANESGRUNN
REYKJADALUR	FRM	64 10 N	20 17 W	22923	01	REYKJANESHYRNA
REYKJAOALUR	VAL	64 58 N	21 27 W	22906	01	REYKJANES PENINSULA
REYKJAOALUR	VAL	65 44 N	17 23 W	22916	01	REYKJANESTÁ
REYKJAOALUR	VAL	65 57 N	18 47 W	22915	01	REYKJANYBBA
REYKJAOISKUR	PT	65 53 N	19 45 W	22914	01	REYKJARÁ
REYKJAFELL	HLL	64 09 N	21 38 W	22902	01	REYKJARESHYRNA SEE
REYKJAFELL SEE REYKJAFJALL	MT	65 22 N	19 30 W	22900	00	REYKJAR FIORO SEE
REYKJA FIORO SEE REYKJAFJÖROHUR	FJO	66 16 N	22 04 W	22910	00	REYKJARFJAROHAROALUR
REYKJAFJALL	HLL	65 52 N	17 16 W	22916	01	REYKJARFJÖROHUR
REYKJAFJALL	MT	65 22 N	19 30 W	22900	01	REYKJARFJAROHAROALUR
REYKJAFJALL	MT	65 33 N	17 48 W	22916	01	REYKJARFJAROHARFJALL
REYKJAFJAROHARHÁLS	HLL	65 53 N	22 30 W	22909	01	REYKJARFJARDHARHREPP
REYKJAFJAROHARÓS	STM	66 15 N	22 04 W	22910	01	REYKJARFJAROHARKAMBUR
REYKJAFJÖLL	MT	63 55 N	19 08 W	22922	01	REYKJAR FJÖRD SEE R
REYKJA FJÖRO SEE REYKJAFJÖROHUR	FJO	66 16 N	22 04 W	22910	00	REYKJARFJÖROHUR
REYKJAFJÖROHUR	PPL	66 16 N	22 05 W	22910	01	REYKJARFJÖROHUR
REYKJAFJÖROHUR	FJO	66 16 N	22 04 W	22910	01	REYKJARFJÖRDHUR
REYKJAEIOHI	HTH	64 02 N	20 27 W	22923	01	REYKJARFJÖROHUR
REYKJAEIOHI	HTH	65 57 N	17 07 W	22916	01	REYKJARFJÖROHUR SEE
REYKJAEIOHI	HTH	65 58 N	18 43 W	22915	01	REYKJARFJÖROHUR

Figure B-2. Gazetteer

DESCRIPTION

Gazetteers contain names approved by the US Board of Geographic Names in compliance with Public Law 242, and names appearing on official maps or appropriate sources. They are the basic reference sources for determining names approved for federal use and known variants.



Figure B-3. Topographic map

DESCRIPTION

1:100,000 Scale (TM 100)

This topographic tool is a tactical map having greater area coverage than the large-scale map produced to large-scale specifications. A map of this scale is produced only when a special requirement exists.

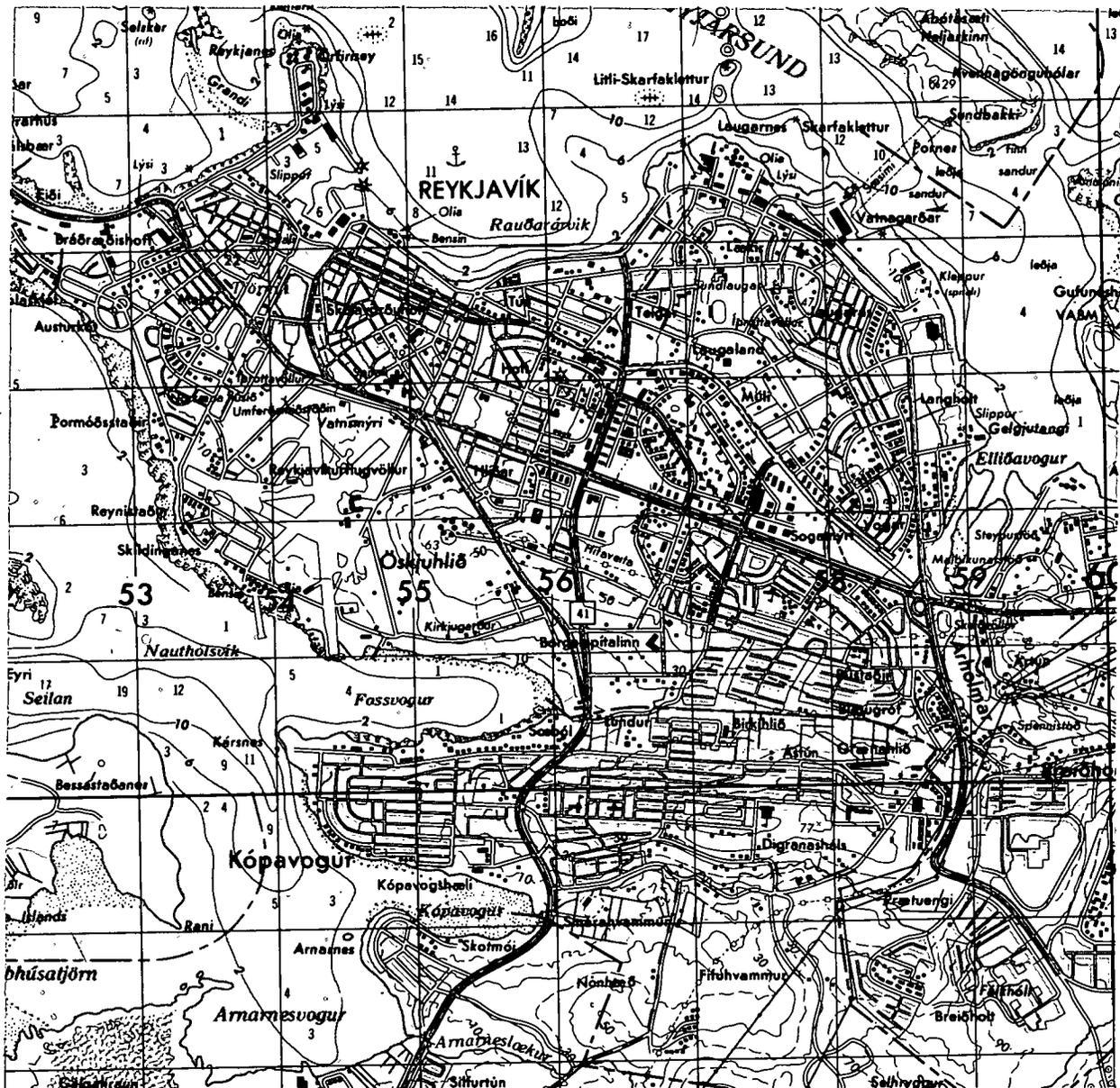


Figure B-4. Topographic map

DESCRIPTION

1:50,000 Scale (TM 50)

This type of map is the standard large-scale map with elevations shown as contours and spot elevations. Natural and man-made features are portrayed with appropriate symbols. The map serves most of the tactical and administrative needs of all branches of the services.

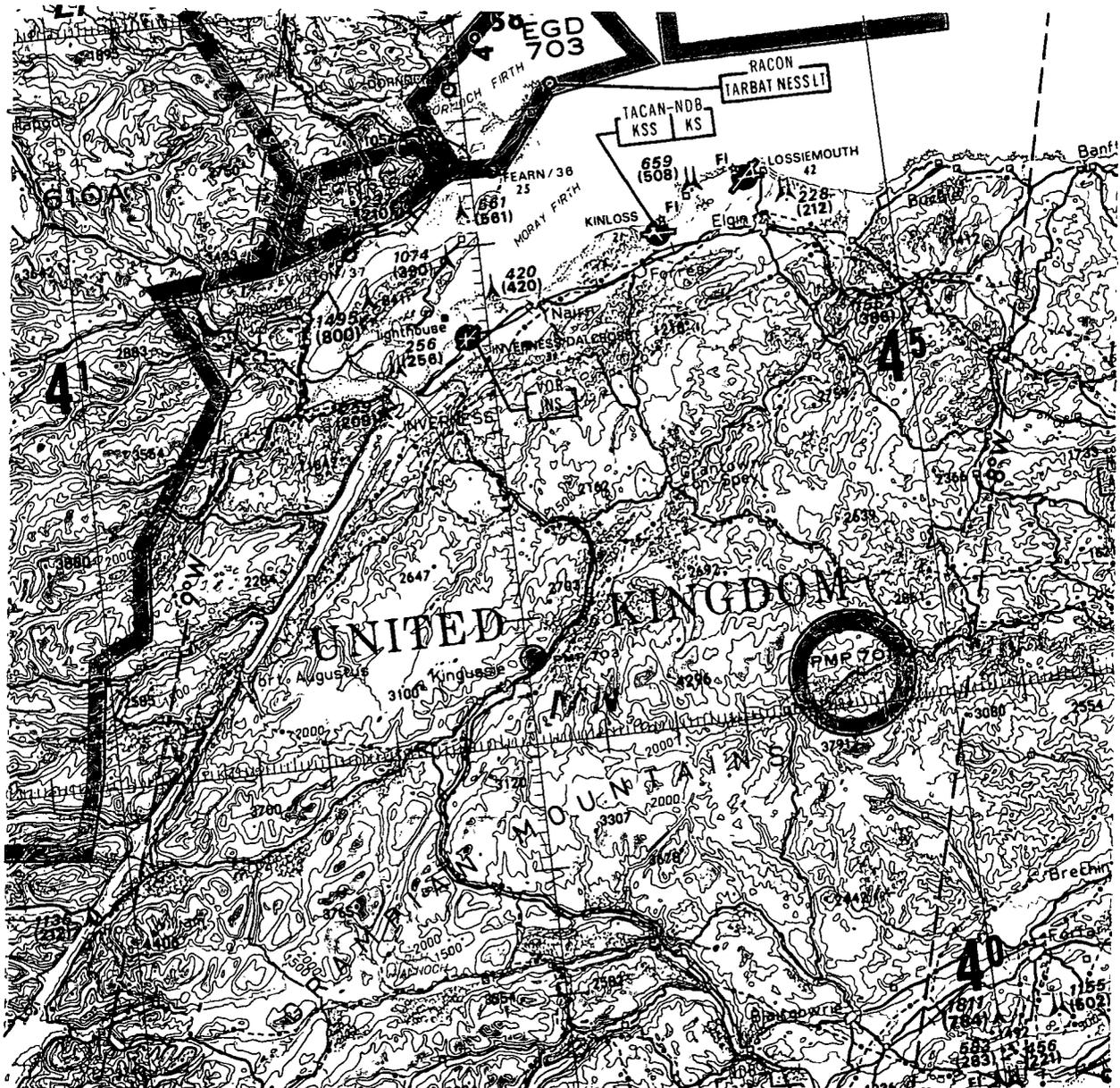


Figure B-5. Operational navigation chart

DESCRIPTION

1:1,000,000 Scale

An operational navigation chart is used for medium-altitude en route navigation by dead reckoning, visual pilotage, celestial, radar, and other techniques. This chart is also used for low-altitude operations (500 feet to 200 feet above ground level (AGL)), operational planning, and preparation of visual cockpit display/filmstrips.

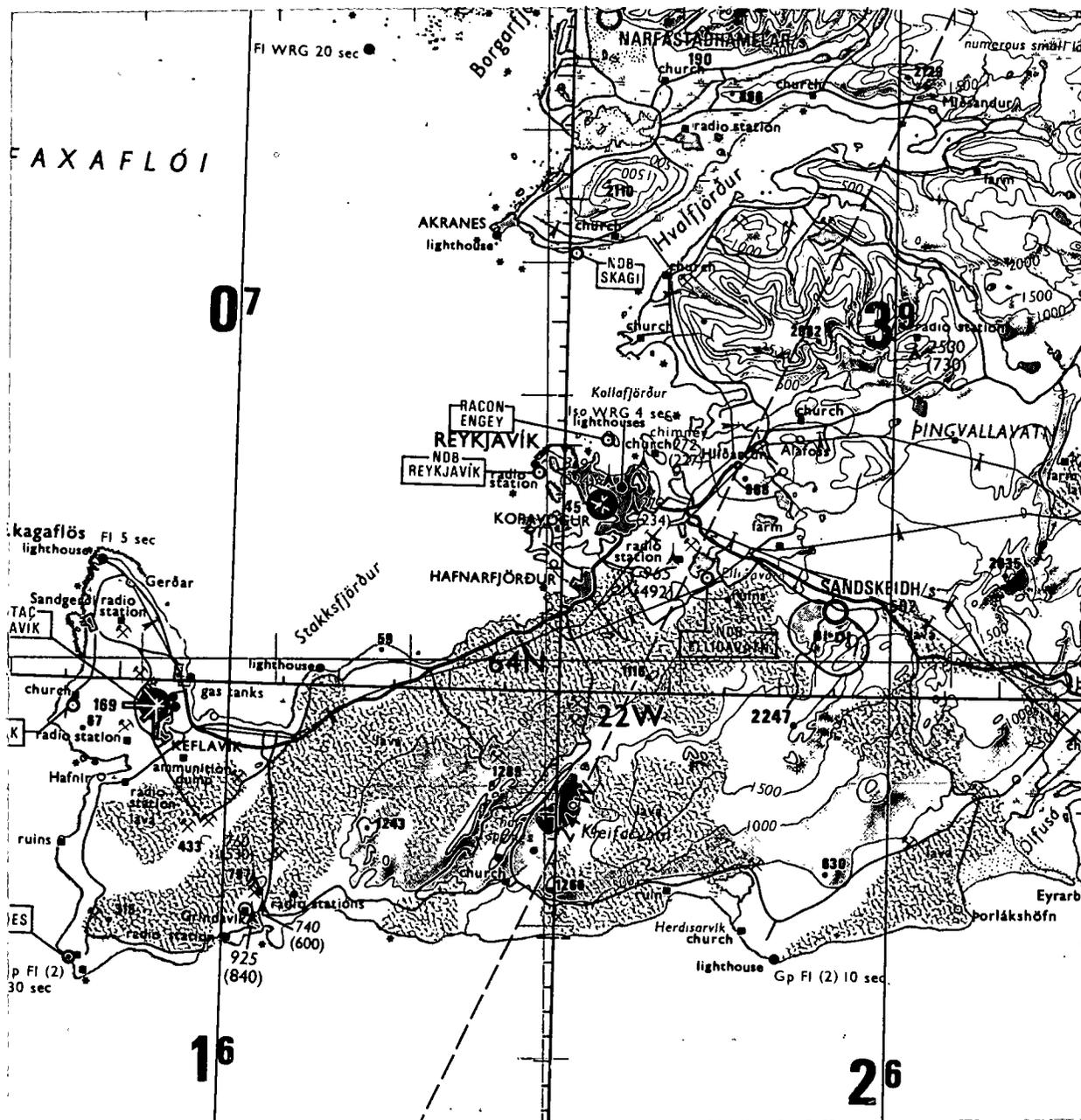


Figure B-6. Tactical pilotage chart (TPC)

DESCRIPTION

1:500,000 Scale

A tactical pilotage chart is used for low-altitude, high-speed visual and radar navigation in planning, and tactical air operations.

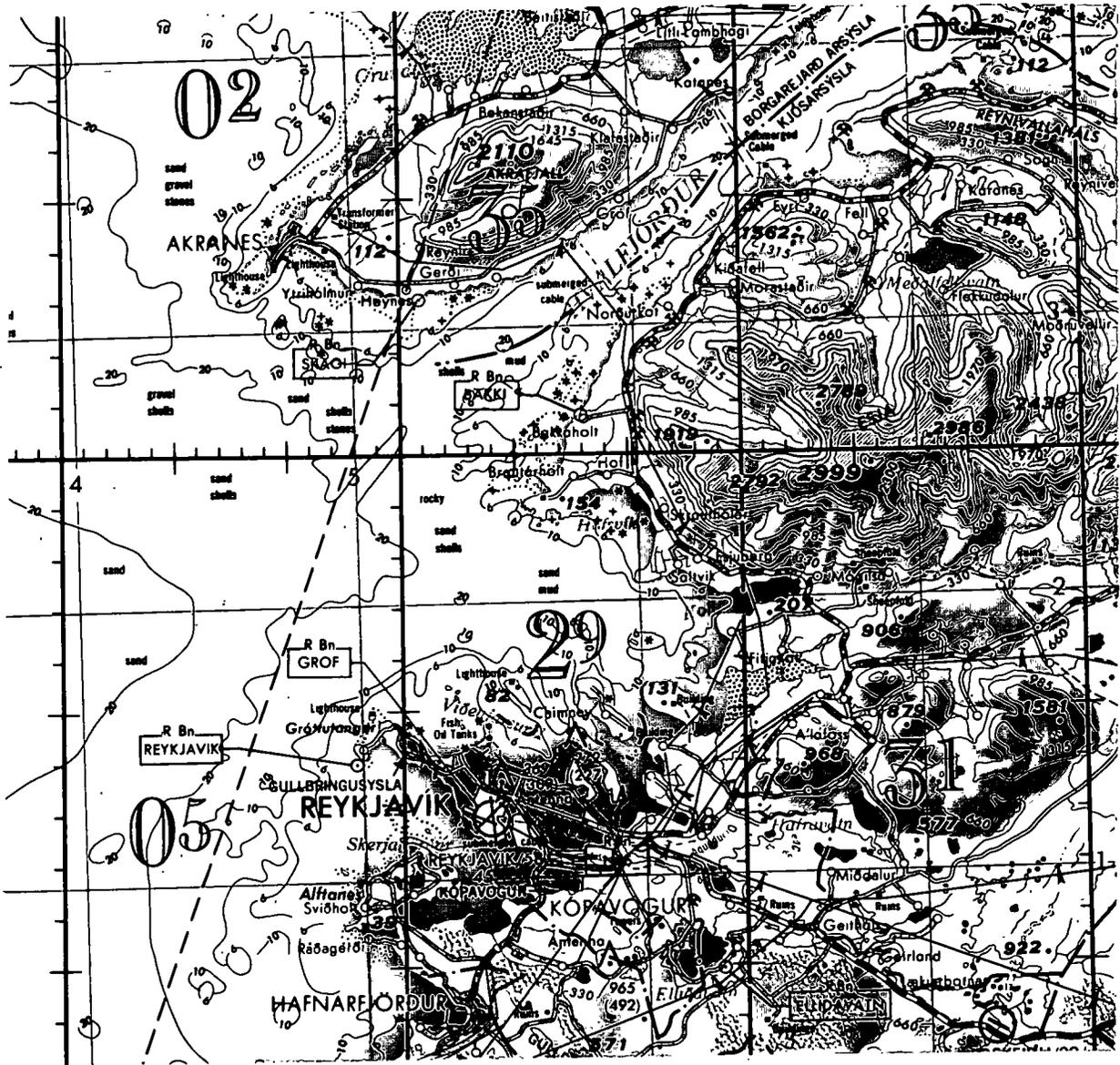


Figure B-7. Joint operations graphic (AIR) (1501-AIR)

DESCRIPTION

1:250,000 Scale

The 1501 series of graphics is the standard 1:250,000-scale DOD topographic map. Three versions are produced from the same base. Series 1501-AIR (JOG-A) provides for tactical and other air activities including operations in support of or in conjunction with ground forces. See also listing for series 1501 (JOG-G) (3BB) and series 1501-Radar (JOG-R) (4AC).

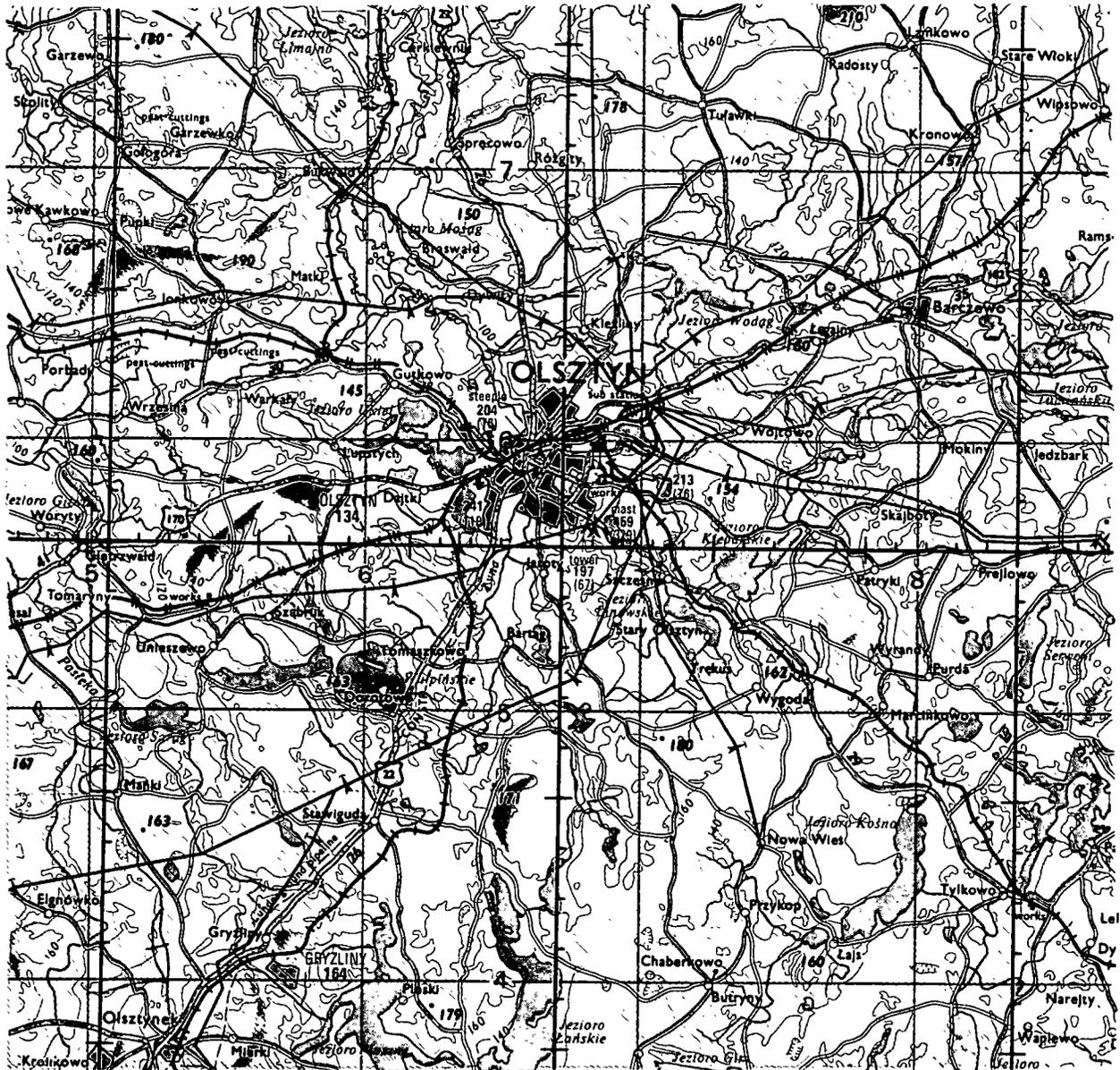


Figure B-8. Joint operations graphic (GROUND)

DESCRIPTION

1:250,000 Scale

The 1501 series of graphics is the standard medium scale DOD topographic map. Three versions are produced from the same base: series 1501 (JOG-G) for ground operations; series 1501-AIR (JOG-A) for air operations; and series 1501 for targeting. See also listing for JOG-A (1AE) and JOG-R (4AC).

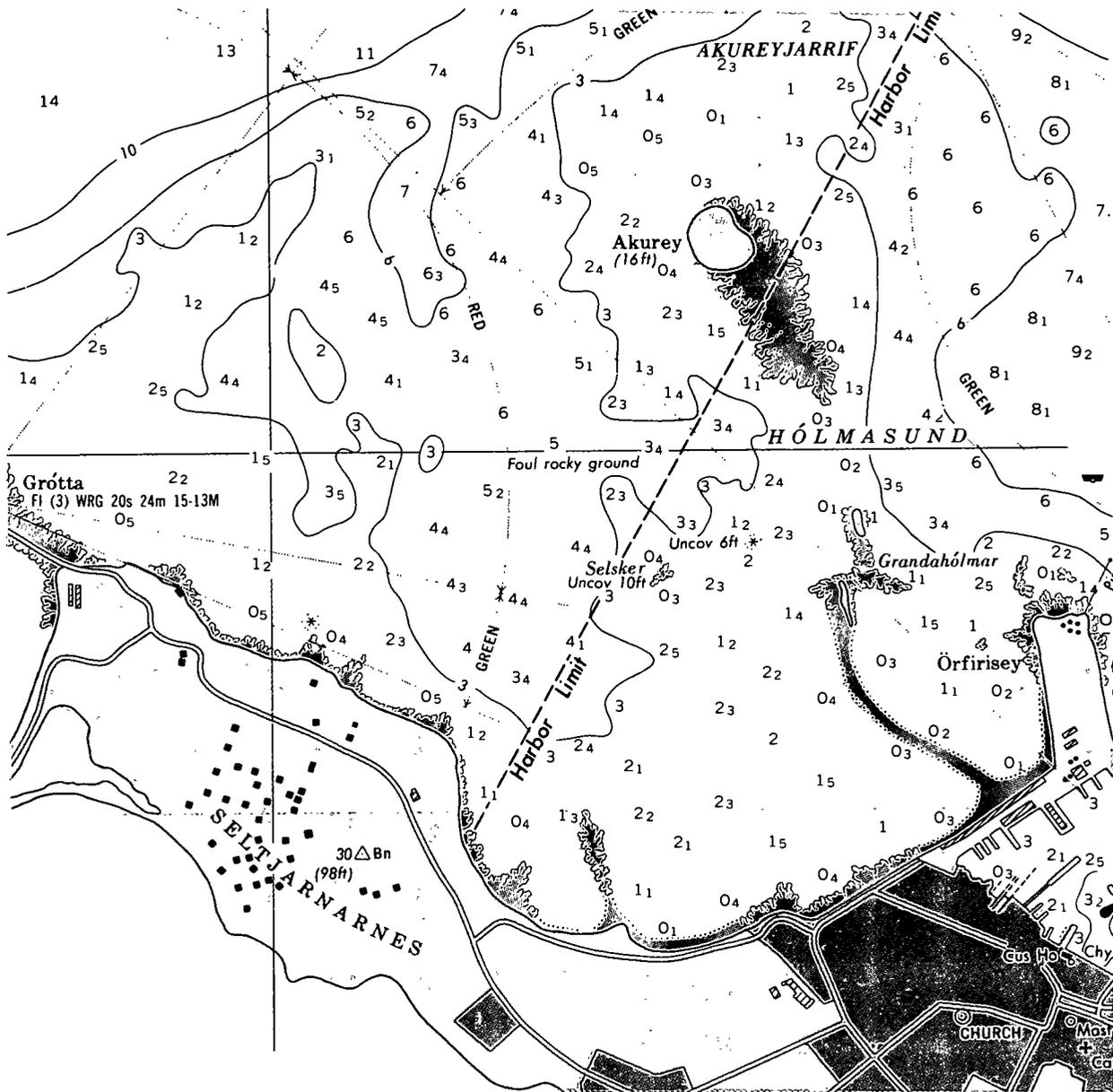


Figure B-9. Harbor and approach chart

DESCRIPTION

Various Scales

A harbor and approach chart is a large-scale nautical aid used for safe navigation in entry, exit, berthing, and anchorage in world ports and harbors. It also provides coverage for bays, coves, navigable rivers, and channels.

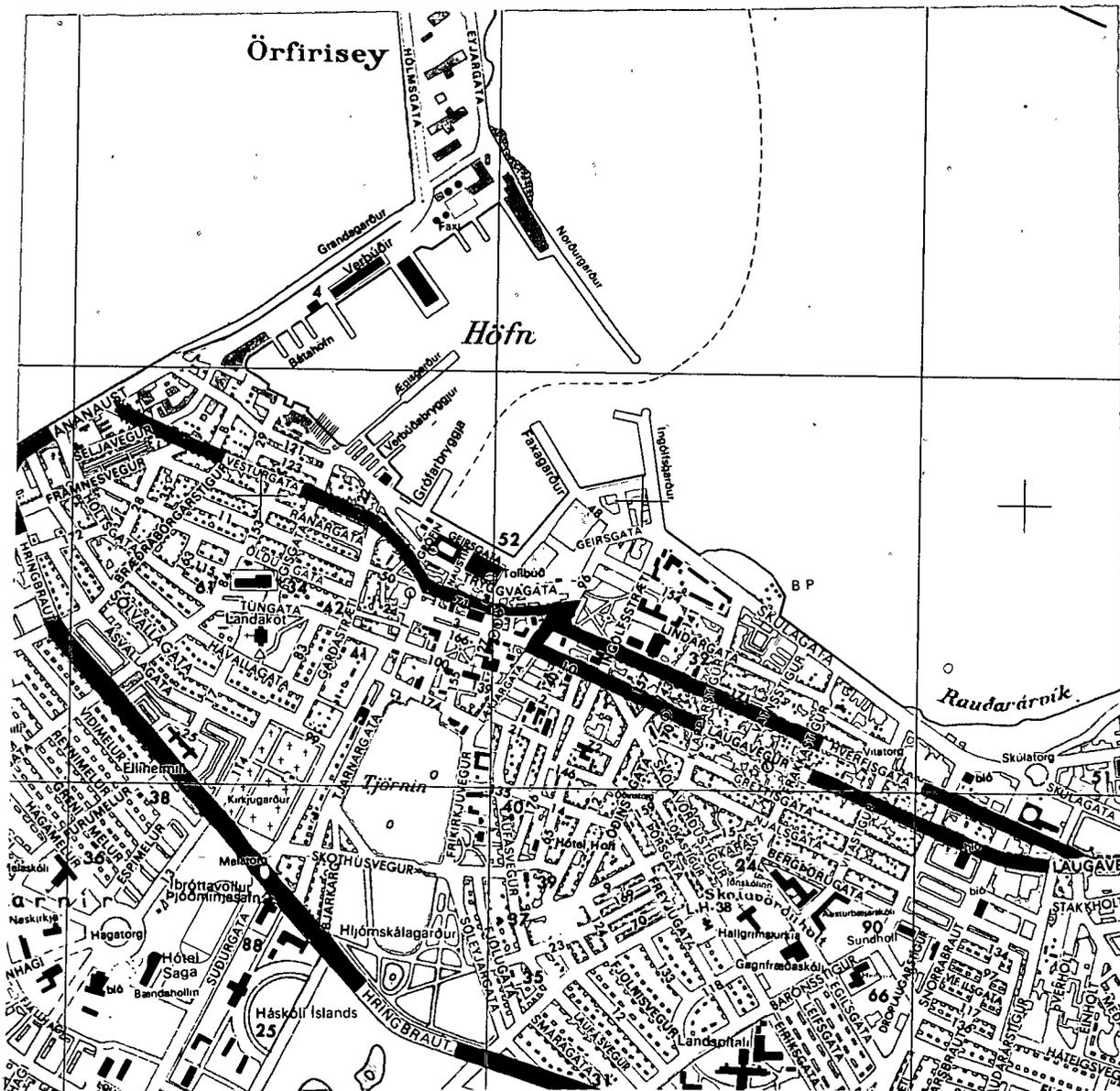


Figure B-10. City route graphic

**DESCRIPTION**

1:25,000 Scale (Normally Standard)

A city route graphic is the standard DMA city product. It is used as a tactical map for combat operations, through route information, and administrative purposes. The extent of the city is generalized; militarily significant and landmark buildings are individually represented. Militarily significant relief is shown. When available, complete street information (including names) is shown.



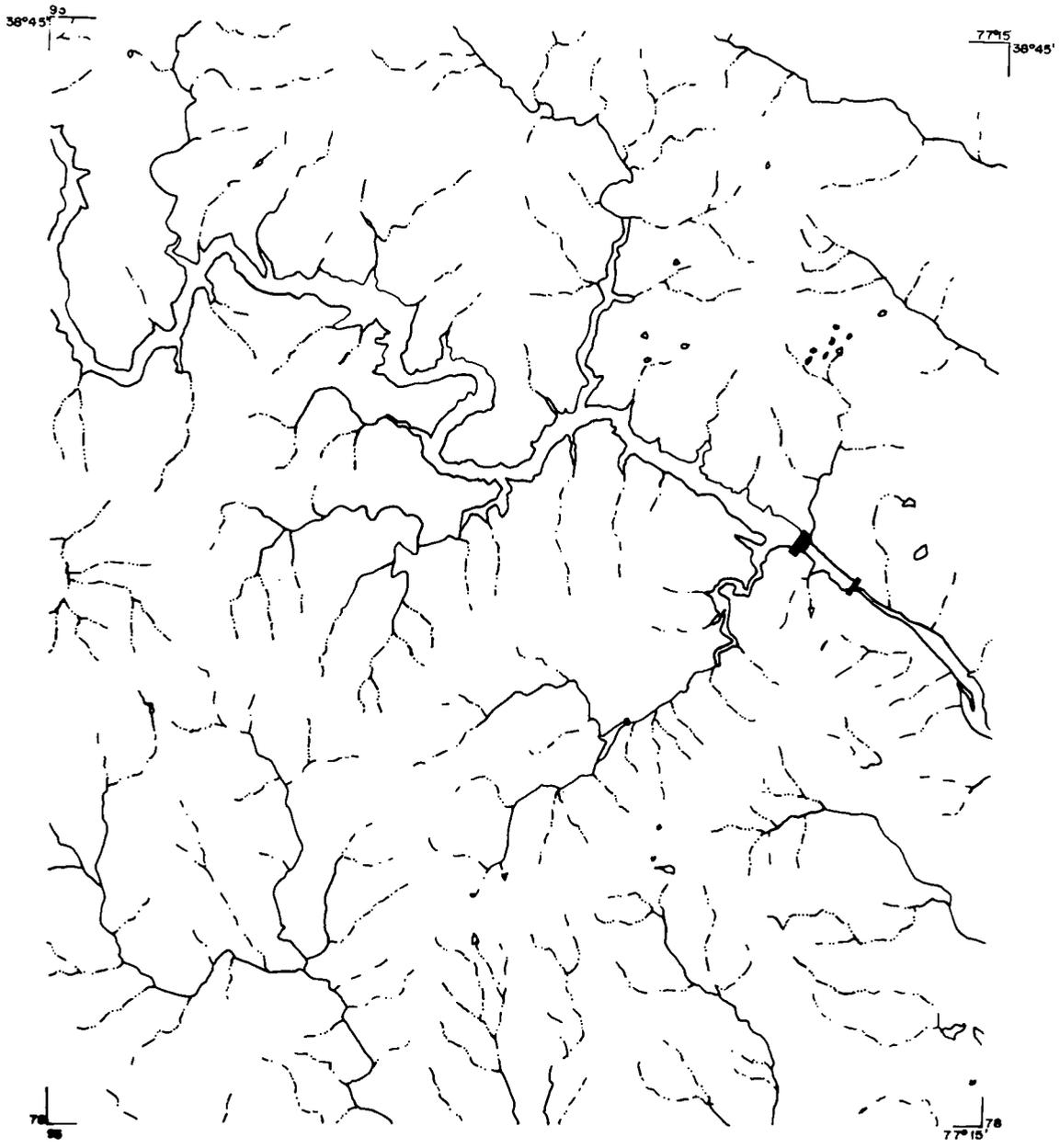


Figure B-12. Hydrology overlay

DESCRIPTION

1:50,000 Scale

The overlay depicts various open-water features and facilities such as lakes, rivers, and dams.

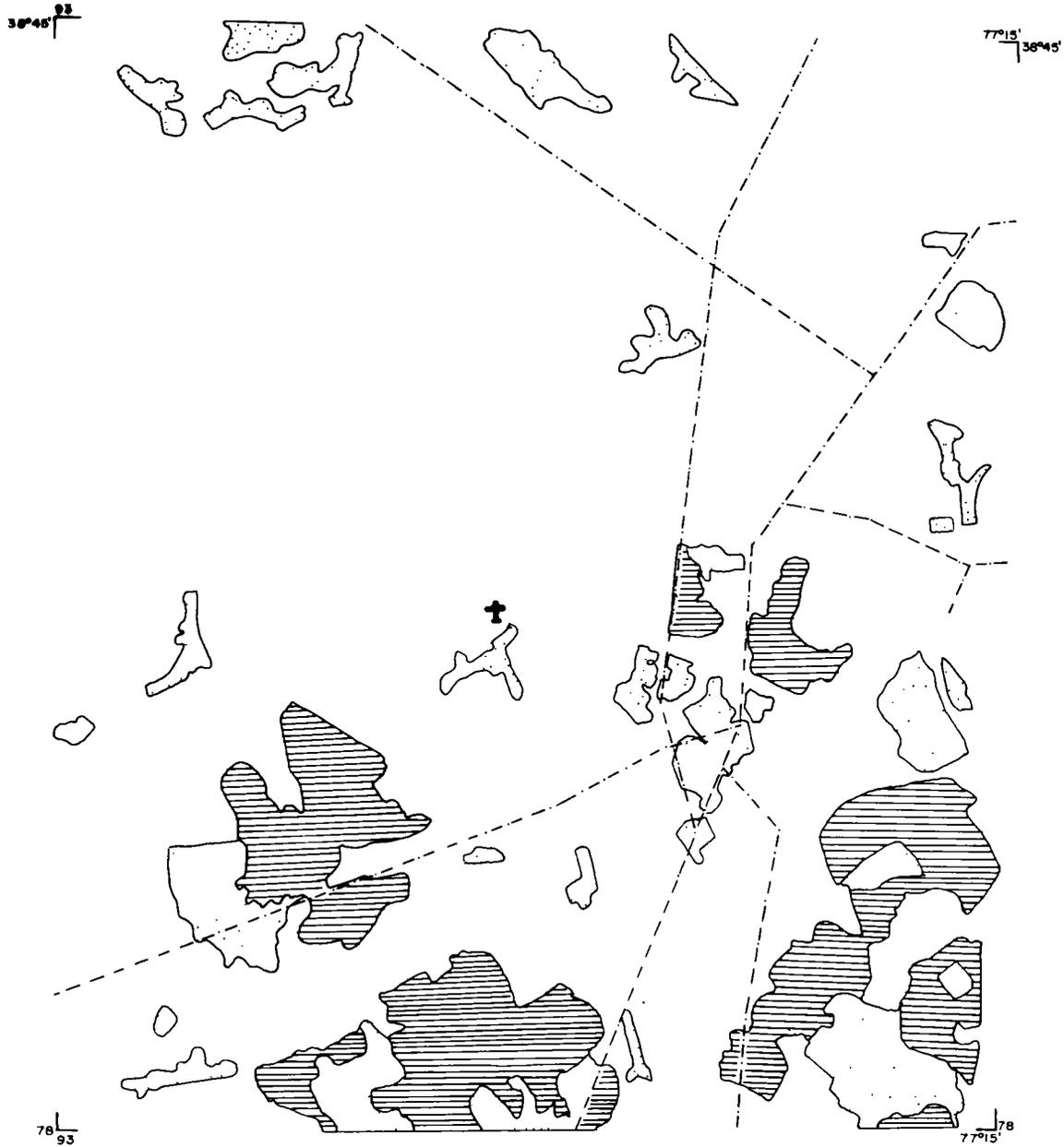


Figure B-13. Urban and industrial overlay

DESCRIPTION

1:50,000 Scale

The overlay shows the percentage of roof coverage in urbanized areas.

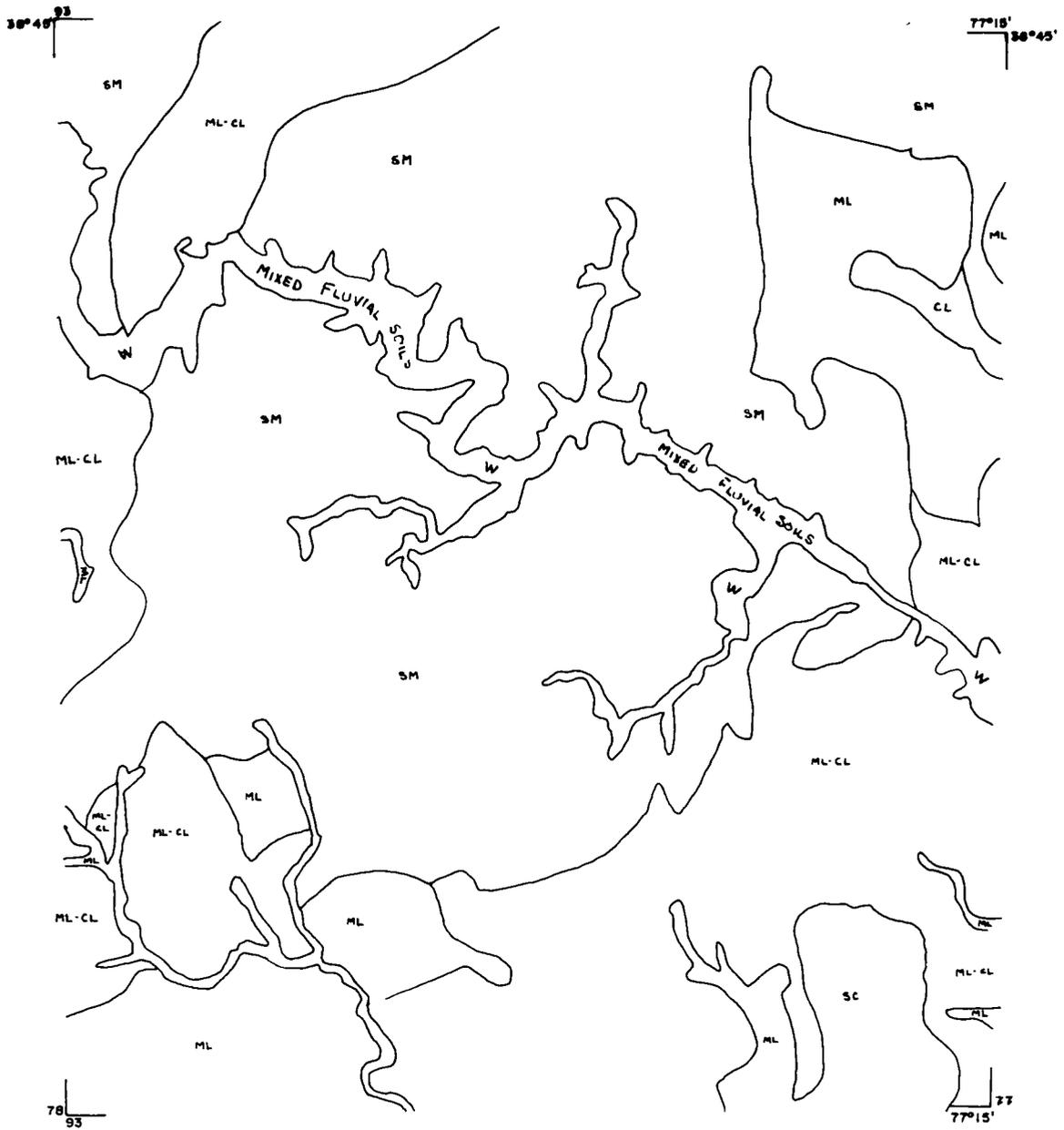


Figure B-14. Soils overlay

DESCRIPTION

1:50,000 Scale

The overlay portrays soil types and characteristics, based on the unified soil classification system (USCS).



Figure B-15. Cross-country overlay (dry)

DESCRIPTION

1:50,000 Scale

The overlay shows cross-country mobility estimates, expressed in terms of GO, RESTRICTED, SLOW, and NO-GO.

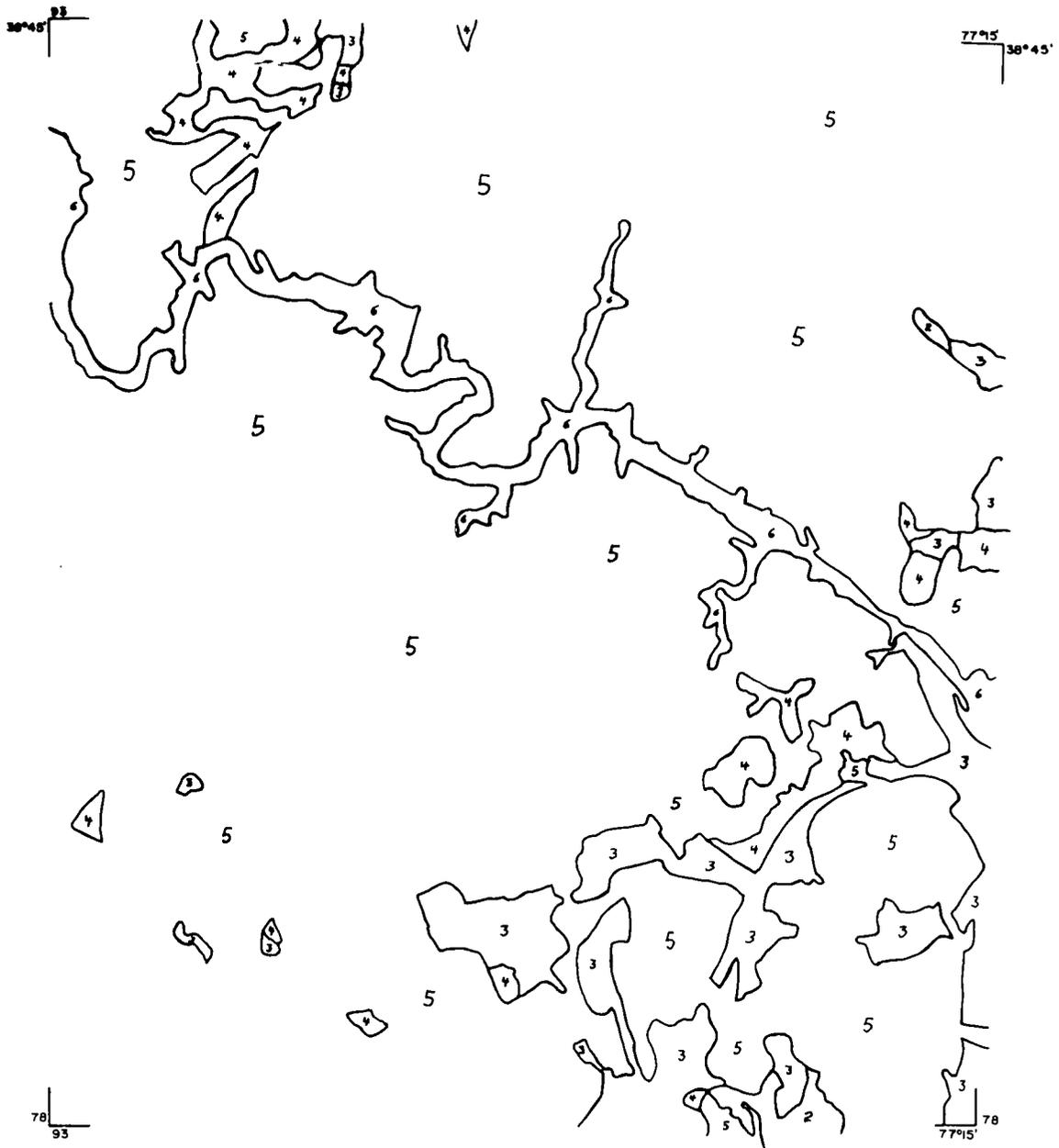


Figure B-16. Cross-country overlay (wet)

DESCRIPTION

1:50,000 Scale

The overlay depicts cross-country mobility estimates, expressed in terms of GO, RESTRICTED, SLOW, and NO-GO.



Figure B-17. Cover overlay

DESCRIPTION

1:50,000 Scale

The overlay shows percentage of roof and slope cover from direct and indirect fires.

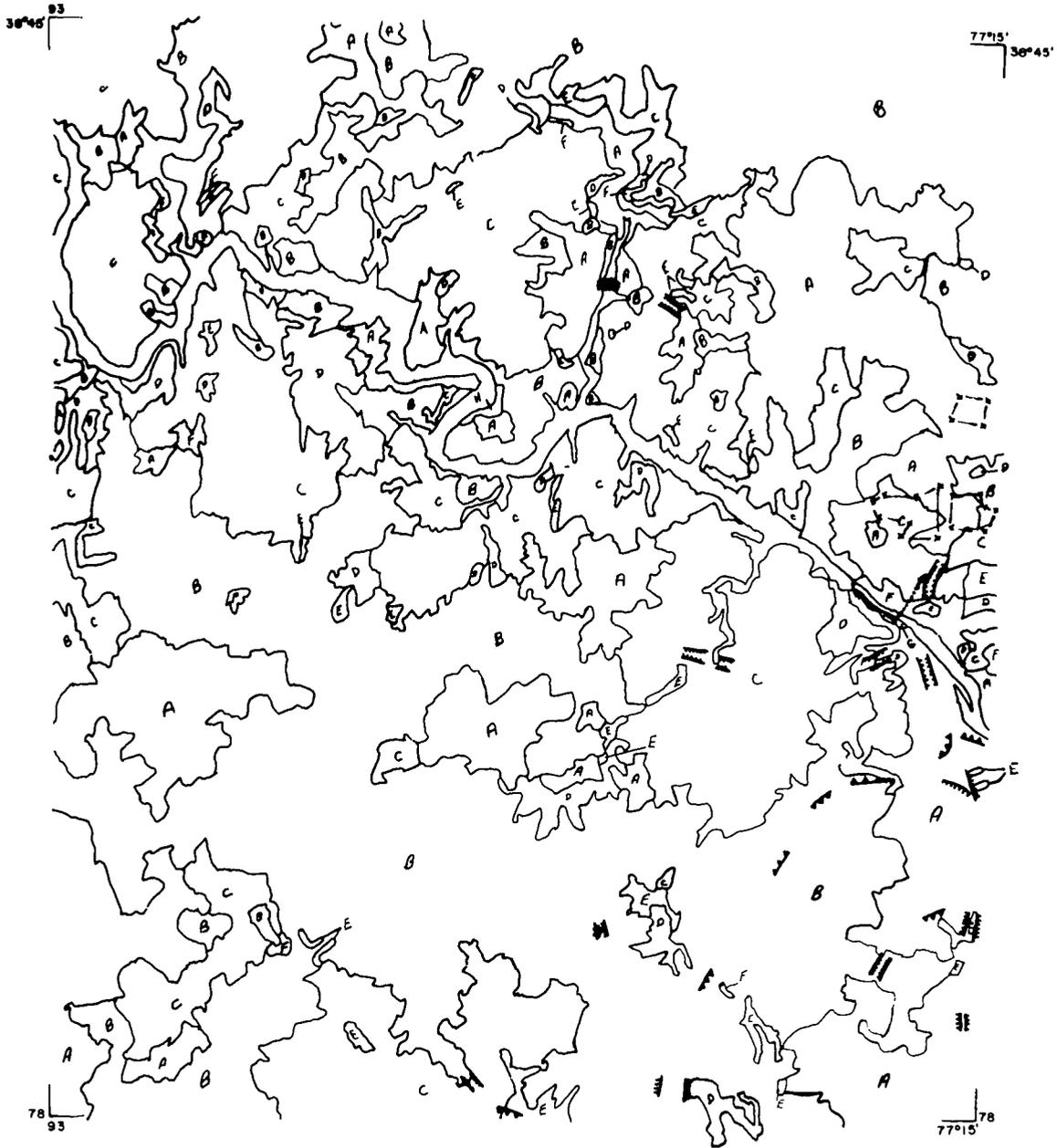


Figure B-18. Slope overlay

DESCRIPTION

1:50,000 Scale

The overlay portrays various categories of slope and micro obstacles which can significantly affect cross-country mobility.

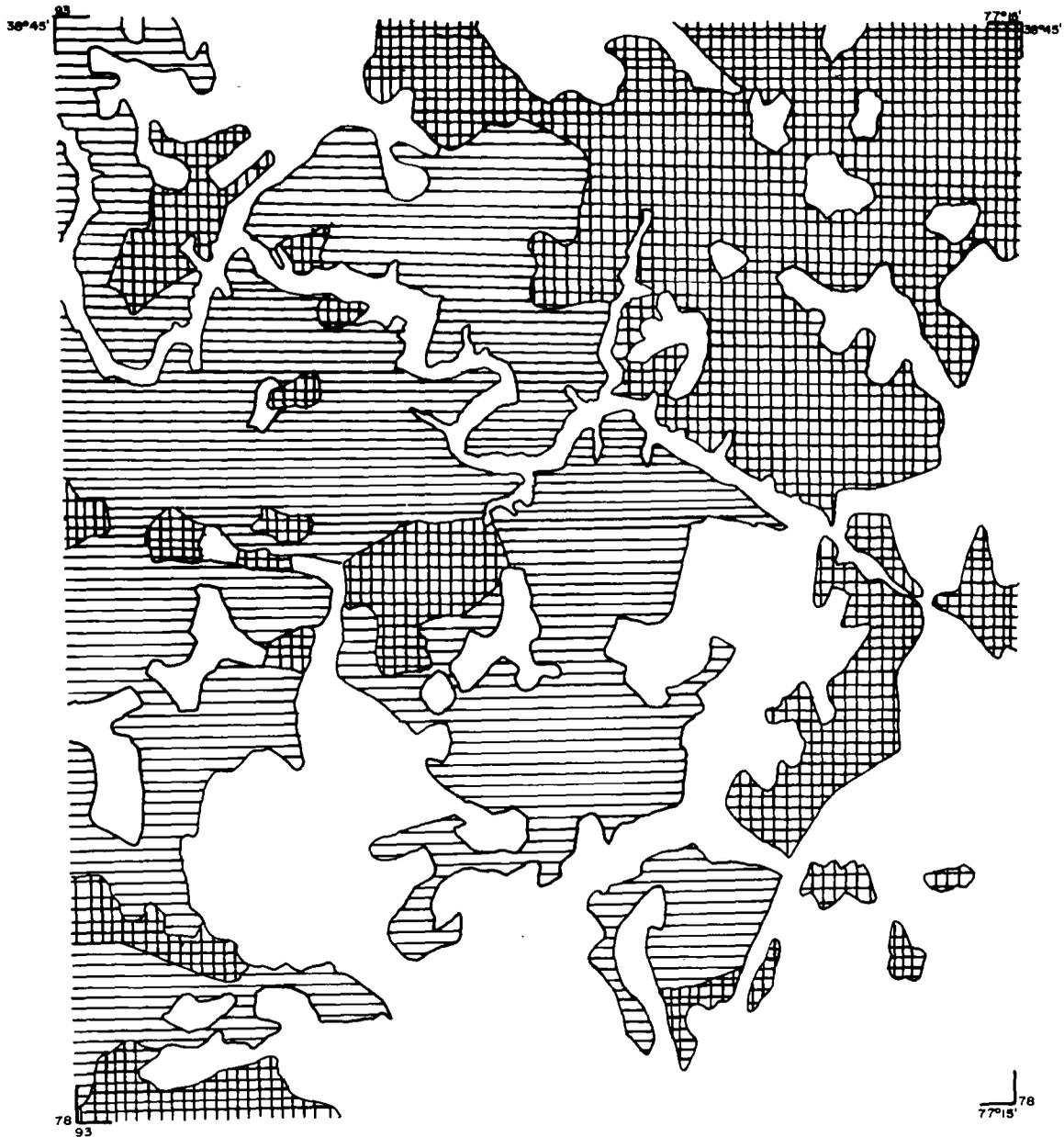


Figure B-19. Concealment overlay

DESCRIPTION

1:50,000 Scale

The overlay depicts concealment from overhead observation for both summer and year-round operations.

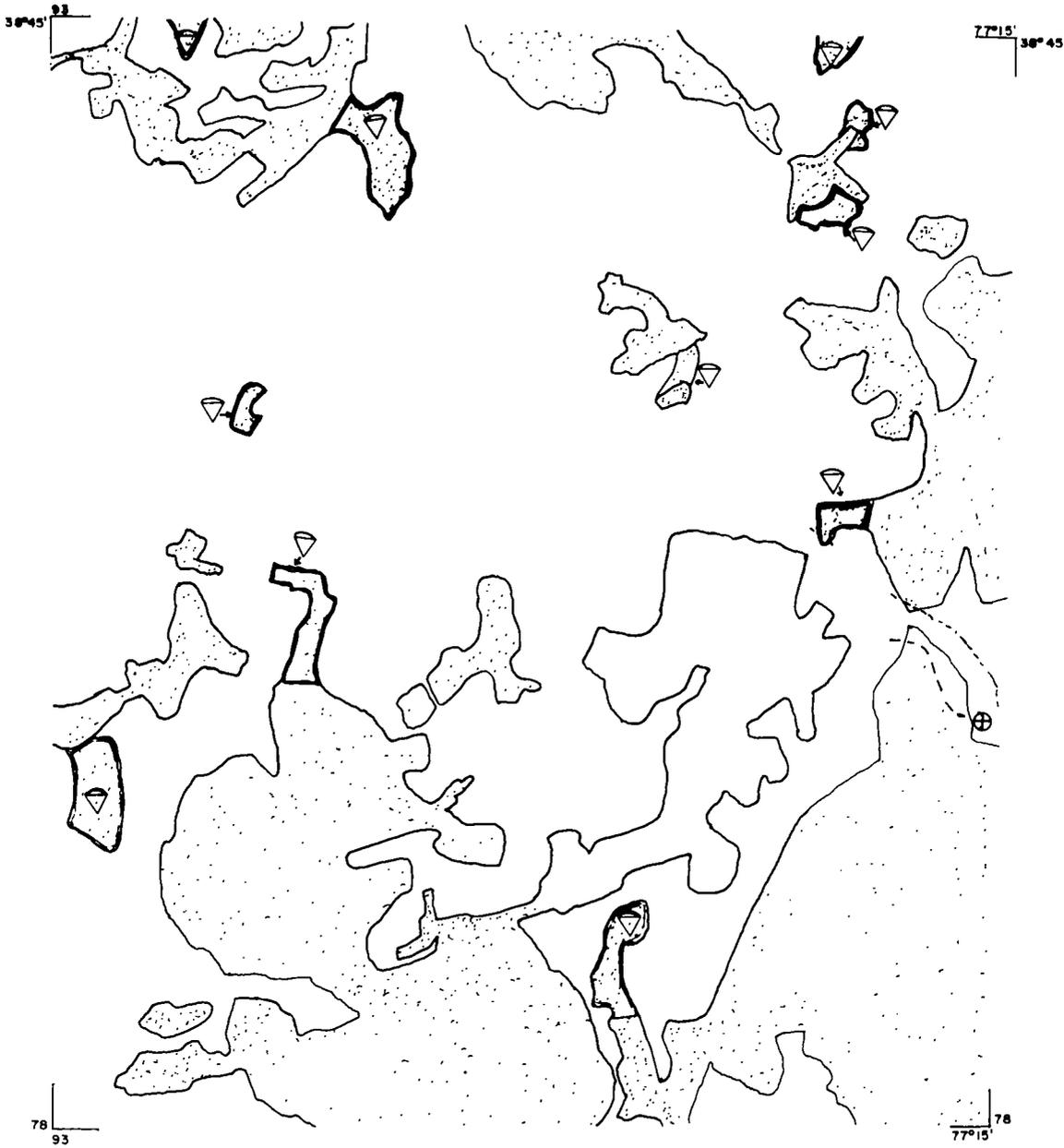


Figure B-20. Special Forces tactical overlay

DESCRIPTION

1:50,000 Scale

The overlay depicts special tactical features for a Special Forces unit.

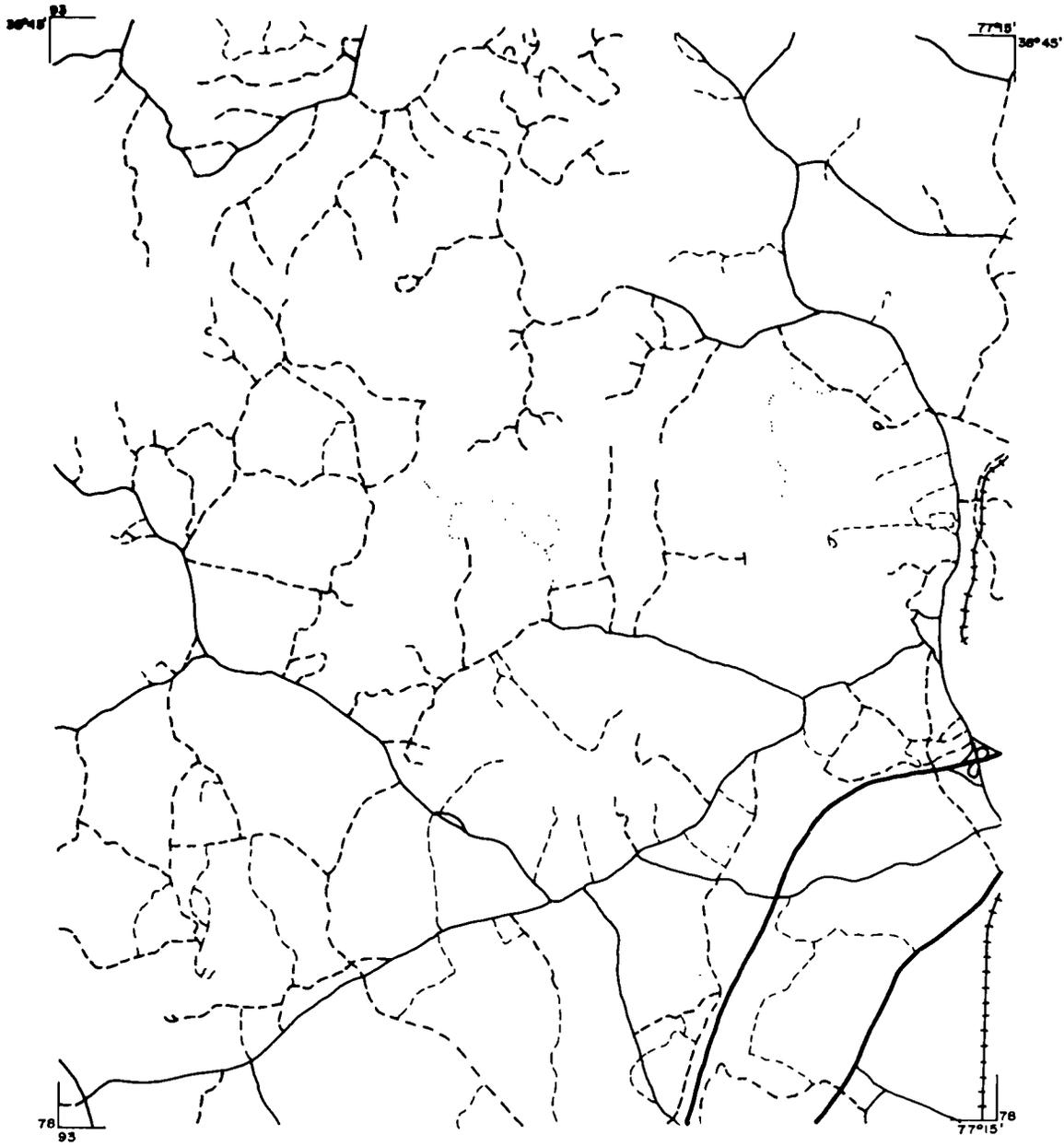


Figure B-21. Lines-of-communication overlay (roads/railroads)

DESCRIPTION

1:50,000 Scale

The overlay shows lines-of-communications features (roads, and railroads only).

# operations topographic annex to CONPLANS/OPLANS/OPORDs

## appendix c

All brigade-level and higher commands prepare a topographic annex to all CONPLANS/OPLANS/OPORDs. This annex provides the direction needed by subordinate elements of the command to obtain support from topographic units and guidance for the employment of those units. The format for the topographic annex is shown on page C-4 with an example shown on page C-11. This format is the same as that used by the U&S commands, which is Annex M (MC&G) of the Joint Services Operations Plans (JSOPs). Note that all the references in Appendix C refer to a general OPORD. Proper preparation of the annex demands detailed identification and definition of all requirements for topographic products and services, whether it is provided by DMA or field units. Some of these considerations are addressed in **Planning Factors** section of this appendix. The preparation of the topographic annex is not limited to topographic products, but applies to any products and services in the MC&G field which are required to support the command's CONPLANS/OPLANS/and OPORDs.

As with the preparation of any CONPLAN/OPLAN/OPORD, the quantity and complexity of information contained within the format of the annex will vary with the level of the unit developing the plan. For instance, preparing the annex for a brigade without a supporting topographic unit will be quite simple compared to that for a corps.

### **Planning Factors**

The types of products and services needed to carry out unit missions, as well as the quantity and frequency of the support desired, are addressed in the Format for Topographic Annex, page C-4.

To calculate the quantity of maps required for a particular OPLAN, plot the geographical areas covered by the unit's areas of operations, influence, and interest on copies of appropriate indexes from DMA or MACOM map catalog. A small-scale map of the general area is also used to correlate the area to the index. Factors to be considered in setting up areas of operations and interest are given in FM 100-5. Areas of operations are designated by the next higher level of command. Example parameters are shown in Figures C-1 and C-2, pages C-2 and C-3. An alternative method is listing the stock numbers for all the sheets required. Usually a combination of both methods is done, since each has specific advantages.

The next step is to determine the size and type of units to be employed, since this defines the quantity of products required to support the OPLAN. The MACOMs usually publish supplements to AR 115-11, which contain a list of generic units and the quantities of MC&G products each are authorized to order. If a supplement has not been published, the tables found in Section 5, Mapping, of FM 101-10-1 provides the necessary guidance (a prototype annex, which shows sample MC&G Annex, is found in this appendix on page C-11). The quantity per sheet is then the sum of authorization for all subordinate units.

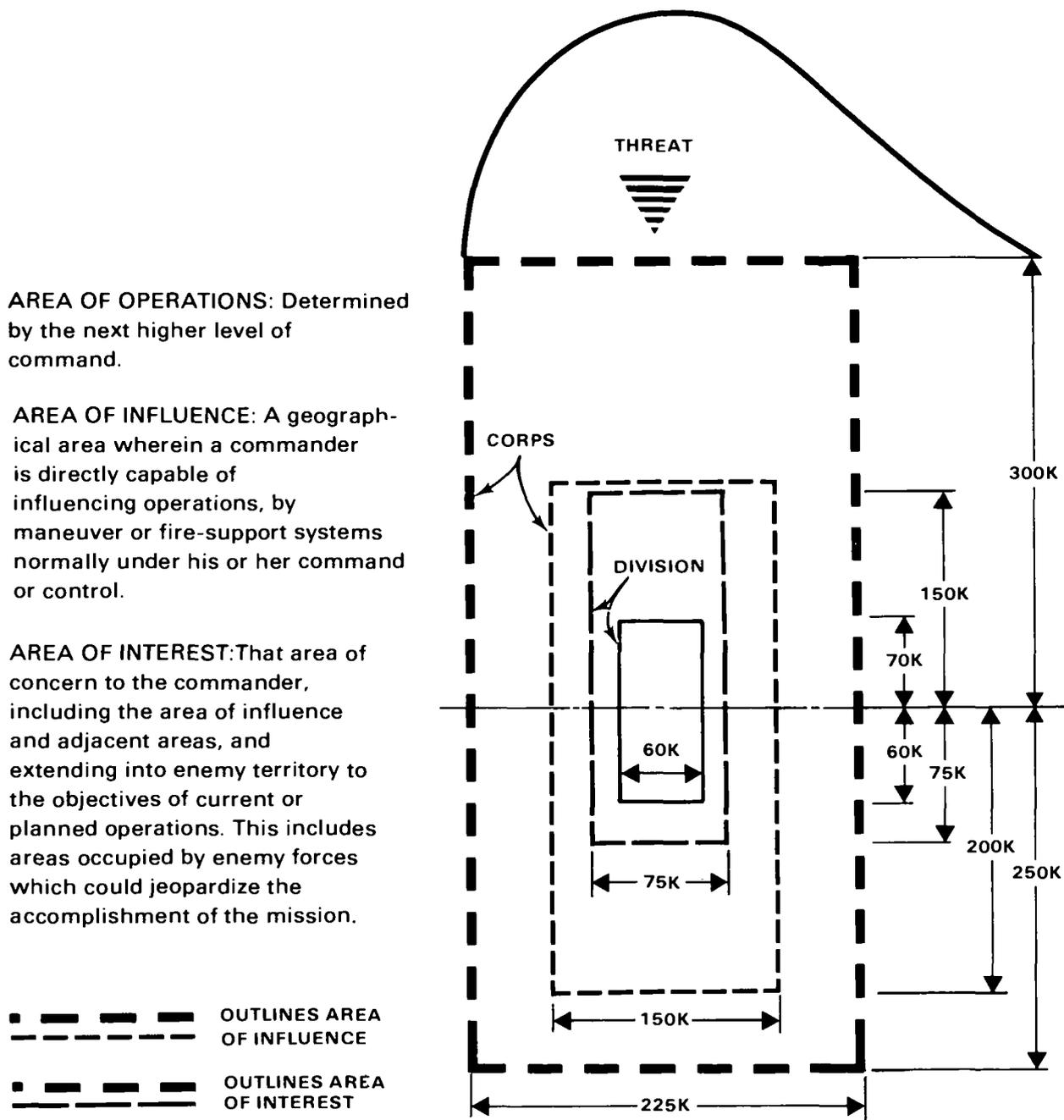


Figure C-1. Areas of influence and interest

The quantity per sheet multiplied by the number of sheets required for the geographical area is the *basic load*. The term *days-of-supply* is meaningless for maps, since the speed with which a unit moves through any given area is determined by the mission as influenced by weather, terrain, and enemy situation.

*Planning stocks* are those maps required by commanders and staffs to plan an anticipated operation. Allowances, most of the time, are no more than 20 percent of the basic load. Command guidance should define whether or not this quantity is authorized *in addition to* or is *part of* the basic load.

*Operational stocks* are those consumed, through loss or destruction, during execution of the CONPLAN/OPLAN/OPORD that must be replaced. Operational stock allowances are usually limited to no more than 20 percent of the basic load.

Overlap must be considered. A simple addition of authorizations for all units under a command is *not* the total number of maps required for *any* particular map sheet. To correctly figure this total, look at the geographic area coverage required for *each* unit at any level, based upon the unit's mission and employment capabilities. Questions such as, "Do all brigades in a division require coverage for the entire division area?" need to be addressed. For an infantry squad or a tank platoon, the answer should be *no*. On the other hand, entire coverage may be required for an attack helicopter unit in the covering force or a brigade in reserve, even though all the maps may not be in use at the same time.

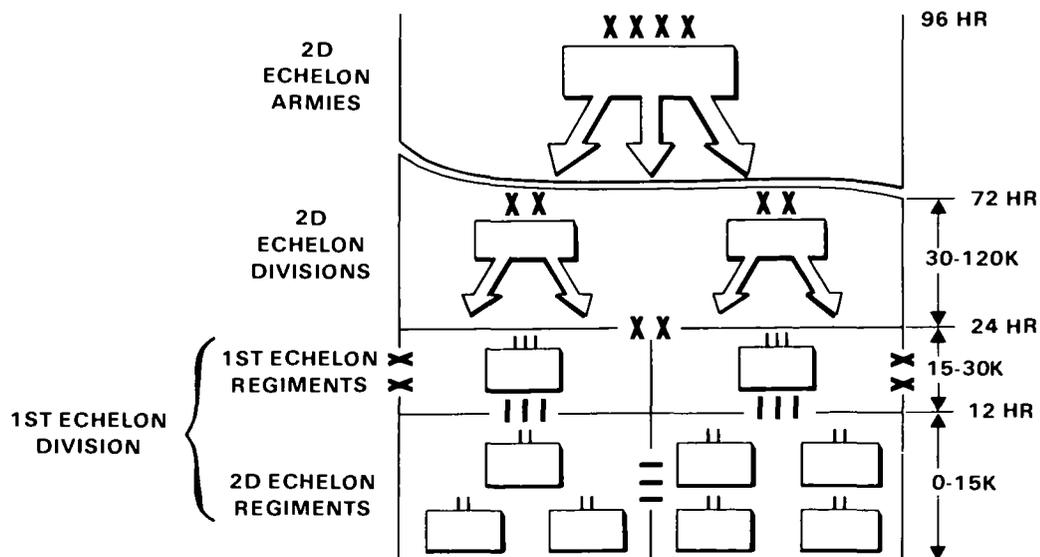


Figure C-2. Second-echelon threat

Format for Topographic Annex

CLASSIFICATION

HEADQUARTERS, ORIGINATING UNIT  
ADDRESS  
DATE

ANNEX TO                      HQ    OPLAN (Number)    (U)

TOPOGRAPHIC OPERATIONS (U)

- ( ) REFERENCES:
  - a. List those standard maps that are required for an understanding of this annex.
  - b. List those documents which provide the guidance required for the necessary planning functions that are relevant to this annex.

1. ( ) SITUATION

a. ( ) MC&G Requirements. List the MC&G products that are required to support this plan. Show desired area coverage and quantitative requirements in Appendix 1 in the format prescribed or portray them graphically using standard index bases. See Planning Factors, page C-1, for quantity calculation guidance.

b. ( ) Available Products. Provide a general statement regarding the availability and adequacy of the MC&G data and related material required to support the plan.

c. ( ) Capabilities. List those topographic engineer forces that are assigned or attached. Show latest arrival date (LAD) for each topographic engineer unit that is contained in the time-phased force deployment list (TPFDL). If this is of sufficient length, use Appendix 2, an appendix for recording detailed transportation requirements and procedures. Reference the appendix. Take notice that the format for Appendix 2 should follow local procedures.

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d. ( ) Supporting Capabilities. List those topographic engineer forces that are not assigned or attached but which will be required to provide topographic support needed to implement this plan. Specify the type of command relationship desired for each unit plus the type and duration of support required.

e. ( ) Assumptions. List those assumptions upon which this annex is based. The assumptions should state expected conditions over which the commander has no control.

2. ( ) MISSION. Provide a clear, concise statement of the topographic mission essential to support the basic plan.

3. ( ) EXECUTION

a. ( ) Concept of Topographic Operations.

(1) ( ) General. Give a broad statement on how the command will provide the topographic support necessary to meet the commander's overall mission requirement. Include--

- Time phasing of operations.
- Nature and purpose of topographic operations to be conducted.
- Support that is interrelated or cross-service.
- Support from DMA.
- Support provided by agreements, coordination, and cooperation necessary for the successful implementation of this plan. Describe the scope and extent of host nation support (HNS) that is available to enhance topographic operations in support of the plan.

(2) ( ) Deployment. Summarize the requirements for deploying topographic engineer forces and depot activities from their normal peacetime locations. Include the area of operations, emphasizing careful time planning of this deployment.

(3) ( ) Employment. Describe in general terms how deployed topographic engineer forces are to be employed to conduct topographic operations.

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b. ( ) Tasks. Proper planning demands that provisions be made for the effective operation of all topographic engineer units supporting the command. Effective stockage and issue of MC&G products depend upon timely knowledge of impending operations, threats, and command movements. Explain detailed responsibilities of staff/commanders for issuing this information and the topographic units acting upon it. In separate numbered subparagraphs, list the topographic tasks assigned to each element of the command and for those units that provide support to the plan. Each of the tasks should be spelled out in a concise statement. Every task statement should include a mission to be performed in terms of further planning or execution of the overall plan. These task assignments should be sufficiently detailed to ensure that all elements essential to the concept of the operation are described properly. Ensure that responsibilities are assigned to establish, validate, and submit MC&G requirements and to task topographic engineer units supporting the plan. State responsibilities for defining and adjusting command stockage levels at map supply points. Specify map and data storage and distribution responsibilities for pick-up and storage.

c. ( ) Coordinating Instructions. The final subparagraph, lettered appropriately, should be in separately numbered subparagraphs. List those instructions that apply to the entire command or to two or more elements of it that are necessary for proper coordination of the MC&G support. Specify points of contact within the command who can authorize the release of war reserve stocks held or who can resolve command MC&G problems. At division level, the DISCOM operates the maps supply points; at brigade level, distribution is through the S4. You must state whether a push or pull system will be employed. You must also specify any restrictions or quantity of the special products which may be required. Also, give an explanation of the command's system for setting priority and for allocating resources to deal with demands on limited resources. Include a brief description of how notification of forces and agencies will be carried out and how notification will be time sequenced. Provide the conditions under which contacts with host nation agencies are authorized and identify those points of contact.

4. ( ) ADMINISTRATION AND LOGISTICS

a. ( ) Supply and Storage.

(1) ( ) MC&G Products. Provide instructions on the MC&G supply and storage procedures and requirements. Give guidance for obtaining routine and emergency replenishment of MC&G products. Address

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any expected constraints on this replenishment. Include the planned locations of command and supporting MC&G storage sites and facilities. Specify the type and quantity of MC&G products to be held by the supporting command's units. Give guidance for lead times that are required for furnishing nonstandard special-purpose product support or responding to large quantity orders.

(2) ( ) Support of Topographic Engineer Units.

Topographic engineer units normally rely on supported units for the majority of logistics support. Specify the requirements needed for the provision of nontopographic as well as topographic logistics supports.

b. ( ) Transportation.

(1) ( ) MC&G Products. The MC&G products are normally provided on a supply point basis, whereby units which need products are responsible for picking up those products from established supply points. Supply guidance for the movement of MC&G products from supporting supply points to the ultimate users. List, as a minimum, the time-phased transportation requirements list (TPTRL) portion of the Time-Phased Force Deployment Data (TPFDD) reflecting movement of MC&G materials. List any transportation shortfalls in the required support of topographic operations. Also, list contingency plans to fully carry out and sustain topographic operations in the event that full transportation requirements cannot be provided. Appendix 2 may be used, if necessary, to list detailed transportation requirements and procedures.

(2) ( ) Topographic Engineer Units. Topographic engineer units may also require assistance from supported commands to move organic equipment. Supply guidance for integrating the topographic engineer unit's transportation requirements into the command's movement plan.

c. ( ) MC&G Support. Supply instructions for obtaining planned support. Itemize the division of responsibilities between organic units and supporting topographic engineer units to ensure that actions to procure and stock MC&G products are complementary. Identify points of contact for emergency procurement. Normally, access to DMA support is only available through the supporting command.

d. ( ) Reports. If reports are required, specify how they are to be formatted as well as what time limits, methods, and classification

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apply to their submission. Enter this in Appendix 3. Follow local procedures for format.

5. ( ) COMMAND AND SIGNAL

a. ( ) Priorities. Delineate the priority of MC&G support to supported units and the priority of production for MC&G products.

b. ( ) Command Relationships. Include primary and alternate locations of all major topographic engineer units and supporting DMA organizations. Specify the command and control relationships between the command and its attached or supporting MC&G units and organizations if this has not previously been addressed.

c. ( ) Command and Control. Provide a statement describing the scope and types of any special signal support that is required for MC&G operations. With the exception of survey units, most topographic units have few communications capabilities. Thus, explicit tasks are assigned to ensure that these units are effectively supported by the command's assets. This is especially critical in the case of distribution platoons operating map supply points. The Communications-Electronics Annex (Annex T) to this OPLAN must be referenced.

s/  
General  
Commander in Chief

CLASSIFICATION

CLASSIFICATION

OFFICIAL:

(APPROPRIATE LEVEL) ENGINEER

Appendixes:

- 1 - Mapping, Charting, and Geodesy Requirements List
- 2 - Mapping, Charting, and Geodesy Transportation Requirements (Optional)
- 3 - Mapping, Charting, and Geodesy Reports (Optional)

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(FORMAT: Mapping, Charting, and Geodesy Requirements List Appendix)

HEADQUARTERS ORIGINATING UNIT  
 ADDRESS  
 DATE

APPENDIX 1 TO TOPOGRAPHIC ANNEX TO HQ OPLAN (NUMBER) (U)

MAPPING, CHARTING, AND GEODESY REQUIREMENTS LIST (U)

REQUIRED ITEMS 1/	COVERAGE REQUIRED 2/	COVERAGE AVAILABLE 3/	QUANTITY 4/
1. <u>STANDARD AEROSPACE PRODUCTS</u>			
2. <u>STANDARD HYDROGRAPHIC PRODUCTS</u>			
3. <u>STANDARD TOPOGRAPHIC PRODUCTS</u>			
4. <u>STANDARD AIR TARGET MATERIALS</u>			
5. <u>SURVEY REQUIREMENTS</u>			
6. <u>TAILORED PRODUCTS</u>			
7. <u>STANDARD MULTIUSE DATA BASES</u>			

1/ Generalized description such as map series or scale. Stock number of a specific item is not required.

2/ Area to be covered described by geographic coordinated, political boundaries (identified by geopolitical codes), recognizable geographic area. Display in a TAB as a graphic or list.

3/ Display status in a TAB as a graphic or list related to coverage required, or source for special-purpose products.

4/ Number of copies of each sheet, chart, or item needed to support the OPLAN. A list by stock number is attached as a TAB.

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## Sample MC&amp;G Annex

## CLASSIFICATION

Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

ANNEX M to 99th ID (M) OPLAN 1234 (U)

TOPOGRAPHIC SUPPORT (U)

( ) REFERENCES:

a. ( ) MC&G

- (1) ( ) Series V791X (Sheets 1877 I through IV, 1977 I through IV, 2077 Sheets III and IV)
- (2) ( ) 1501G NL 10-03, NL 10-06  
NL 11-01, NL 11-04
- (3) ( ) 1501A NL 10-03, NL 10-06  
NL 11-01, NL 11-04

b. ( ) Planning Guidance

- (1) ( ) DOD DMA Catalog of Maps, Charts, and Related Products
  - (a) ( ) Part 1, Volumes I, II: Aerospace Products
  - (b) ( ) Part 3, Volumes I, IV, V: Topographic Products
- (2) ( ) DMA Catalog of Digital Data
- (3) ( ) DMA Catalog of Point Positioning Data Bases
- (4) ( ) DMA Supporting Plan - CONUSCOM (U)
- (5) ( ) LVth Corps OPLAN 1234 (U)
- (6) ( ) 99th ID (M) Regulation 5-105-Series, Mapping, Charting, and Geodesy Procedures (Topographic Operations)

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1. ( ) SITUATION.

a. ( ) MC&G Requirements. Refer to Appendix 1 for products, scales, coverage, and availability.

b. ( ) Available Products.

(1) ( ) Standard products described in DOD DMA Catalog of Maps, Charts, and Related Products, Part 3, Topographic Products, and Part 1, Aerospace Products, are available as indicated. Available standard products are adequate in terms of position accuracy and elevation. Cultural features constructed after 1975 are not shown.

(2) ( ) Reconnaissance aerial photography coverage is currently only partially available. Side-looking airborne radar (SLAR) will be available on call. Land satellite (LANDSAT-D), Shuttle Imaging Radar D (SIR-D), and Systeme Probatoire pour l'Observation de la Terre (SPOT) imagery are available through the 604th Topographic Engineer Company (Corps).

c. ( ) Capabilities.

(1) ( ) The 484th Terrain Analysis Detachment from the 604th Topographic Engineer Company is in direct support. The team chief will deploy with the division tactical operations center (DTC) (Jump) to arrive at D + 4 hours; the remainder of the team will arrive with the DTC (Support Element) at D + 2 days.

(2) ( ) The DISCOM operates the division map distribution point.

d. ( ) Supporting Capabilities.

(1) ( ) The 604th Topographic Engineer Company (Corps):

(a) ( ) Has a first priority to provide any additional terrain analysis assistance on call.

(b) ( ) Holds stockage for standard map products available in accordance with Appendix 1. Exceptions are noted in paragraph 3.b.(6) in this Annex. Call for products are on a priority basis to this division in accordance with the Topographic Annex to the LVth Corps OPLAN 1234 (U).

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(c) ( ) Provides direct support topographic production as required. A topographic printing squad will be attached to the 99th ID (M) upon implementation of this OPLAN.

(2) ( ) The 33d Tactical Reconnaissance Wing has priority to support this division with aerial imagery reconnaissance.

(3) ( ) The 201st MI Bn (Aerial Xplt) has priority to provide SLAR coverage as required.

(4) ( ) Weather information is available as required through the staff weather officer (SWO) at the LVth Corps.

e. ( ) Assumptions.

(1) ( ) The DMA products in Appendix 1 are available in the required quantities.

(2) ( ) For standard topographic sheets not currently available, DMA has scheduled for their completion through agreements with the host nation. Additionally, black and white copies of provisional products are available on 36 hours call; 120 hours are required for color.

(3) ( ) Aerial imagery will be available within mission times when requested.

(4) ( ) Special-purpose products are completed and available before implementation of this OPLAN.

2. ( ) MISSION. The mapping, charting, and geodesy mission in support of 99th ID (M) OPLAN 1234 (U) is to provide required maps and terrain analysis graphics and information on a timely basis.

3. ( ) EXECUTION.

a. ( ) Concept of Topographic Operations.

(1) ( ) General. Distribution of standard products will be provided through the DISCOM's map distribution section. Terrain analysis support will be provided by the 484th Terrain Analysis Detachment with tasking priority established by the G2.

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(2) ( ) Deployment.

(a) ( ) The 484th Terrain Analysis Detachment will deploy in two segments. The team chief will deploy with the DTOC (Jump) to provide terrain information updates to prepared products. These updates are based on a firsthand observation of the area. The team chief's medium of information dissemination will be verbal until arrival of the remainder of the unit at D + 2 days when hard copy overlay changes may be required.

(b) ( ) Planning map stockages are maintained down to brigade level. Planning graphics will be issued to battalions at D - 7 days but in no case later than D - 3 days. Initial operating stocks will be issued at D - 1 day (quantities are listed in Appendix 1).

(c) ( ) The DISCOM map stocks will deploy according to the following priorities: Priority I, area of interest stocks and priority II, area of influence stocks. Stocks will be deployed at D + 36 hours with DISCOM map distribution point to be operational by D + 48 hours.

(3) ( ) Employment. The 484th Terrain Analysis Detachment provides terrain analysis products to support the combat, combat support, and combat service support functions of the 99th ID (M). As many products as possible will be provided prior to implementation of this OPLAN. These products are listed in Appendix 1 to this Annex in the order of priority. Once deployment takes place, efforts will be concentrated upon providing responses to specific queries (a consulting service that, organizationally, is directly responsible to the commander) and revising/updating overlays. The updates are prepared in order to refine information resulting from weather, man-induced effects (such as bombing or dam breaching), and geologic effects that occur during the time this OPLAN is in effect. Requirements will be forwarded through the division engineer to the G2 for establishment of priority.

b. ( ) Tasks.

(1) ( ) The G2 will:

(a) ( ) Establish priorities for production of terrain analysis plus standard and other nonstandard products.

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(b) ( ) Validate standard product requirements. The G2 will provide special-purpose products and terrain information in support of operations under this OPLAN as in Appendix 1.

(2) ( ) Division engineer will:

(a) ( ) Charge the 484th Terrain Analysis Detachment with the task of assisting all staff sections and units to identify terrain information requirements for a thorough preparation of the battlefield.

(b) ( ) Provide, in coordination with the 484th Terrain Analysis Detachment, terrain information necessary for the Analysis of the Area of Operations (Annex A) to this OPLAN.

(c) ( ) Coordinate with the corps topographic engineer on requirements for special-purpose products which cannot be satisfied by the 484th Terrain Analysis Detachment.

(d) ( ) Coordinate employment of the printing squad attached from the 604th Topographic Engineer Company (Corps).

(e) ( ) Coordinate with DISCOM to ensure that standard products available are ordered, stocked, and maintained in accordance with Appendix 1.

(f) ( ) Provide annual review of this OPLAN and Annex to ensure that complete MC&G support is planned and programmed. Additionally, provide update of product availability status.

(3) ( ) The 484th Terrain Analysis Detachment will:

(a) ( ) Produce terrain analysis overlays in support of this OPLAN before its implementation. This is a first priority; it comes before production of other products for other OPLANs or exercise plans.

(b) ( ) Provide a consulting service to the division staff on all terrain-related matters.

(c) ( ) Maintain a data base (both digital and hard copy) of terrain information for the command.

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(4) ( ) The DISCOM will:

(a) ( ) Order standard topographic and terrain information products listed in Appendix 1.

(b) ( ) Issue planning stockages by following TAB E, Appendix 1, as they are received.

(c) ( ) Maintain stockage of map products in accordance with Appendix 1. (Trig lists will be maintained by division artillery (DIVARTY). See 3.b.(6).)

(d) ( ) Maintain 10 sets of planning stockage for the LVth Corps area of interest at 1:250,000 scale. Maintain 10 sets of planning stockage for the LVth Corps area of influence at 1:50,000 scale.

(e) ( ) Issue basic load stockage upon implementation of this OPLAN and prepare to deploy distribution point.

(f) ( ) Maintain currency of all stocks as new editions are published through the DMA automatic distribution system. The DISCOM will also issue new editions of planning stocks as they arrive.

(g) ( ) Maintain stockage of special-purpose terrain analysis overlays which are produced and distributed in support of this OPLAN. The level will be equivalent to one quarter of that for the standard 1:50,000 Transportation Map.

(h) ( ) Operate a field map distribution point after deployment.

(5) ( ) Brigades will:

(a) ( ) Consolidate and verify requisitions from subordinate units for standard map products per TAB D to Appendix 1 and submit them to DISCOM two weeks after receipt of this OPLAN.

(b) ( ) Consolidate and verify requirements for terrain analysis products or information beyond those established by this OPLAN and submit them to the division engineer.

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(c) ( ) Maintain 100 percent of stockage allowance for areas of influence plus 10 percent planning stockage for areas of interest as per Appendix 1. Overlay areas will be maintained at planning stockage level (10 percent) only.

(6) ( ) The DIVARTY will, in addition to those tasks in paragraph 3.b.(5), maintain stockage allowance of trig lists and point positioning data bases (PPDB) in accordance with Appendix 1.

(7) ( ) The 99th Cav Bde (Air Attack) will, in addition to those tasks in paragraph 3.b.(5), maintain stockage allowance of aeronautical navigation aids as listed in Appendix 1.

(8) ( ) All personnel are charged with the responsibility to ensure good map supply discipline, conservation, and security in accordance with FM 21-26, and the 99th ID (M) Regulation 5-105-1.

(9) ( ) All units are responsible for immediate pickup of map stocks or terrain analysis products when so notified.

c. ( ) Coordinating Instructions.

(1) ( ) The G2 will set priority on requests for special-purpose products that exceed those required by this OPLAN.

(2) ( ) All requests for special-purpose products not included in Appendix 1 will be routed through the Division Engineer.

(3) ( ) The DISCOM is the point of contact for standard products order and issue. Stocks outside the area of influence will be released only upon order of the G2.

(4) ( ) Requests for standard products will be on Standard Form (SF) 344 (Multiuse Standard Requisitioning/Issue System Document). Requests for special-purpose products will be on 99th ID (M) Form 484.

(5) ( ) Notification for pickup of products, whether standard or special-purpose, will be via secure voice radio using command Communications-Electronics Operation Instructions (CEOI) abbreviations and frequencies.

(6) ( ) All units will maintain their operational stockage in a deployable ready status.

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4. ( ) ADMINISTRATION AND LOGISTICS.

a. ( ) Supply and Storage.

(1) ( ) Standard products stocked by the DISCOM will be stored in accordance with 99th ID (M) Regulation 5-105-4. All units will maintain their basic load in a deployable ready status. Authorizations in Appendix 1 are the basis of issue.

(2) ( ) Supply-point distribution for standard MC&G products provided by DISCOM will be vicinity GG273854; alternate site is GG279819. The 604th Topographic Engineer Company (Corps) distribution site will be located vicinity GG405991 with an alternate site vicinity GG455853 after deployment.

(3) ( ) Supply-point distribution for special-purpose products provided by the 484th Terrain Analysis Detachment vicinity DTOC (Main).

(4) ( ) The 48th Terrain Analysis Detachment will order topographic peculiar supplies through the 604th Topographic Engineer Company (Corps) and will maintain such supplies sufficient for 30 days of operation.

b. ( ) Transportation. The 484th Terrain Analysis Detachment Chief will deploy with the DOTC (Jump) to arrive at D + 4 hours. Transportation will be provided by the 99th CEWI Bn until arrival of the remainder of the Terrain Team which will deploy with the DTOC (Support Element) at D + 24 hours. Once in the area of operations in total, the Terrain Team is self-mobile.

c. ( ) Support. The Division Engineer coordinates directly with the Corps Engineer for assistance as needed.

d. ( ) Reports.

(1) ( ) Loss of classified MC&G products will be reported through the S2/G2 using the Report of Loss - Sensitive Documents Report in the Intelligence Annex.

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(2) ( ) The DISCOM reports standard MC&G product usage to the Division Engineer, as of 1800Z each day to arrive not later than (NLT) 0200Z the following day. Items that must be recorded are the type of product, sheet number, quantity issued, and unit requesting issue. Negative report is required.

(3) ( ) The 484th Terrain Analysis Detachment reports special-product production to the Division Engineer in the following format:

- Requesting unit or section.
- Type of product/Number of copies.
- Number of sheets coverage.
- Date/Time requested.
- Date/Time required.
- Production time (man-hours).

Report will be as of 2400Z to arrive NLT 0400Z the following day. Negative reports are required.

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5. ( ) COMMAND AND SIGNAL.

a. ( ) Priorities. Priority of support is to the Division Staff; then 2d, 3d, and 1st Brigades, in turn.

b. ( ) Command Relationships. See Task Organization Annex (Annex B) of this OPLAN. The 484th Terrain Analysis Detachment less the Team Chief will be located with DTOC (Main) adjacent to the all-source analysis section (ASAS). The Team Chief will be located with the DTOC (Jump). The 604th Topographic Engineer Company (Corps) will be located vicinity GG372891 with an alternate at GG421901.

c. ( ) Signal. See Communications-Electronics Annex (Annex T) of this OPLAN and CEOI. Primary reliance will be upon the ASAS communication system for receipt of data to support the 484th Terrain Analysis Detachment.

SMITH  
MG  
Commander

Official:

JONES  
DIVISION ENGINEER

Appendix:

1 - MC&G Requirements List (U)

CLASSIFIED BY \_\_\_\_\_  
DECLASSIFY ON \_\_\_\_\_

CLASSIFICATION

## CLASSIFICATION

Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

APPENDIX 1 to TOPOGRAPHIC ANNEX to 99th ID (M) OPLAN 1234 (U)

## MC&amp;G Requirements List (U)

<u>Required Items</u>	<u>Coverage Required</u>	<u>Coverage Available</u>	<u>Quantity /3</u>
1. <u>Aerospace Products</u> (See Note 7)			
a. Series 1501-Air; 1:250K	See TAB A	See TAB A	48
b. FLIP, En route, US	L-1, L-9, H-1	L-1, L-9, H-1	24
c. FLIP, Terminal, US	Vol-1	Vol-1	24
d. Tactical Pilotage Charts	F16A, F16B E16D, E16C	F16A1, F16B	24
2. <u>Hydrographic Products</u>	Not used		
3. <u>Topographic Products</u>			
a. Series 1501-Ground, 1:250K	See TAB A	See TAB A See Note 4	See TAB E
b. Series V791 - Standard 1:50K	See TAB B	See TAB B	See TAB E
c. Series 1501 - Cross- Country Movement, 1:250K	See TAB A	NONE	19
d. Series 1501 - Transportation, 1:250K	See TAB A	NONE	128
e. Series 1501 - Water Resources, 1:250K	See TAB A	NONE	4
f. Series V791 - Cross- Country Movement-Main Battle Tank, 1:50K	See TAB B	<u>/2</u>	86

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<u>Required Items</u>	<u>Coverage Required</u>	<u>Coverage Available</u>	<u>Quantity /3</u>
g. Series V791 - Transportation, 1:50K	See TAB B	<u>/2</u>	203
h. APPS I Data Base Point Positioning Data Base	See TAB B	NONE	6
i. Digital Terrain Elevation Data for FIREFINDER	See TAB B	<u>/2</u>	1
j. Digital Feature Analysis Data Base <u>/1</u>	See TAB B	<u>/2</u>	1
k. Trig Lists	See TAB B	YES	13 <u>/5</u>
l. Gazetteer	United States	YES	3
m. Planning Terrain Analysis Data Base <u>/1</u>	See TAB A	NONE	1
n. Tactical Terrain Analysis Data Base <u>/1</u>	See TAB B	<u>/2</u>	1
4. <u>Air Target Materials</u>	See TAB A	Series 200 Only	2
5. <u>Nonstandard Products</u>			
a. River-crossing Information, 1:50K	See TAB B	TTADB	15
b. MOUT Overlays for centers larger than 4 squares Kilometers, 1:25K	See TAB B	PPDB	40
c. Communications/Line-of- sight overlays, 1:250K	See TAB A	NONE	5
d. Line-of-sight for TOW, 1:50K	See TAB B	NONE	40
e. Construction materials (raw) information, 1:250K	See TAB A	PTADB PPDB	5

CLASSIFICATION

CLASSIFICATION

<u>Required Items</u>	<u>Coverage Required</u>	<u>Coverage Available</u>	<u>Quantity /3</u>
f. Construction materials (processed) information, 1:250K	See TAB A	PTADB PPDB	5
g. Terrain Masking for NOE flights (Helicopter), 1:50K	See TAB B	TTADB	50
h. Cover and Concealment, 1:50K	See TAB B	TTADB	30
i. Potential Air Defense Artillery Locations (Vulcan and Chapparal), 1:250K	See TAB A	PTADB TTADB	15
j. Environmental and Waste Disposal (Solid and Liquid), 1:50K	See TAB B	TTADB	5

NOTES:

- /1 For 484th Terrain Analysis Detachment use only.
- /2 Only available for Yakima Firing Range found on sheets V791X 1977 (I to IV) and V791X 2077 (III, IV).
- /3 Division Total for individual units, see TAB D.
- /4 Published 1501A-series charts may be used in lieu of 1501G-series maps for planning purposes only.
- /5 To be maintained by DIVARTY and DIVISION ENGINEER only.
- /6 Copies of all nonstandard products are to be included with Annex A, Analysis of the Area of Operations, to this OPLAN. Number indicates additional copies required.
- /7 For authorization of aeronautical, navigation aids consult page 4-7, Section 4, Volume I, Part I, DOD DMA Catalog of Maps, Charts and Related Products.

- TABS: A - ( ) 1:250,000 Scale Area Coverage Requirements (U)  
 B - ( ) 1:50,000 Scale Area Coverage Requirements (U)  
 C - ( ) Host Nation Standard Product Availability (U)  
 D - ( ) Listing of MC&G Allowances (U)  
 E - ( ) Quantity Requirements for Standard Topographic Maps (U)

CLASSIFICATION

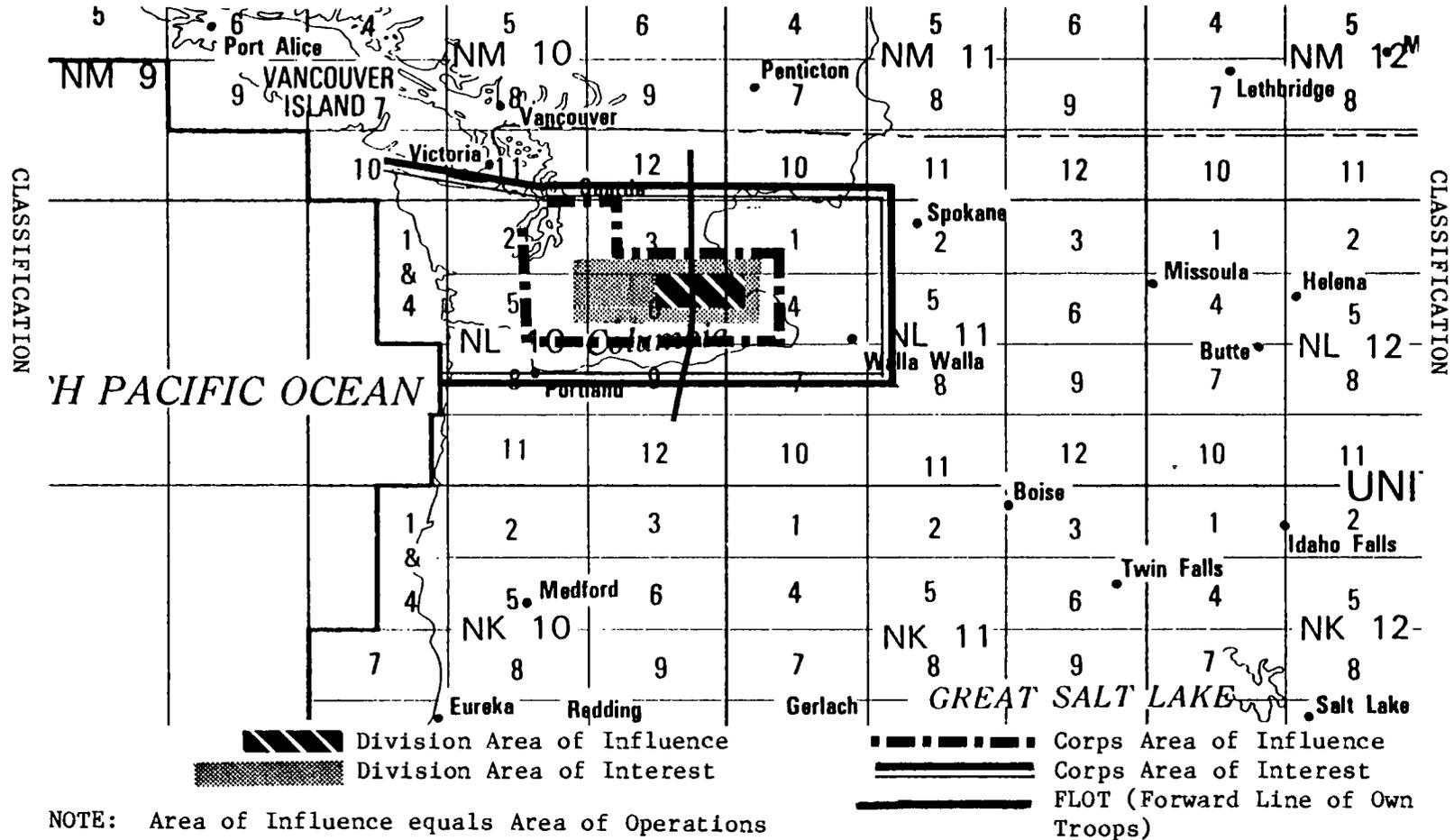
Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

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TAB A to APPENDIX 1 to TOPOGRAPHIC ANNEX to 99th ID (M) OPLAN 1234 (U)

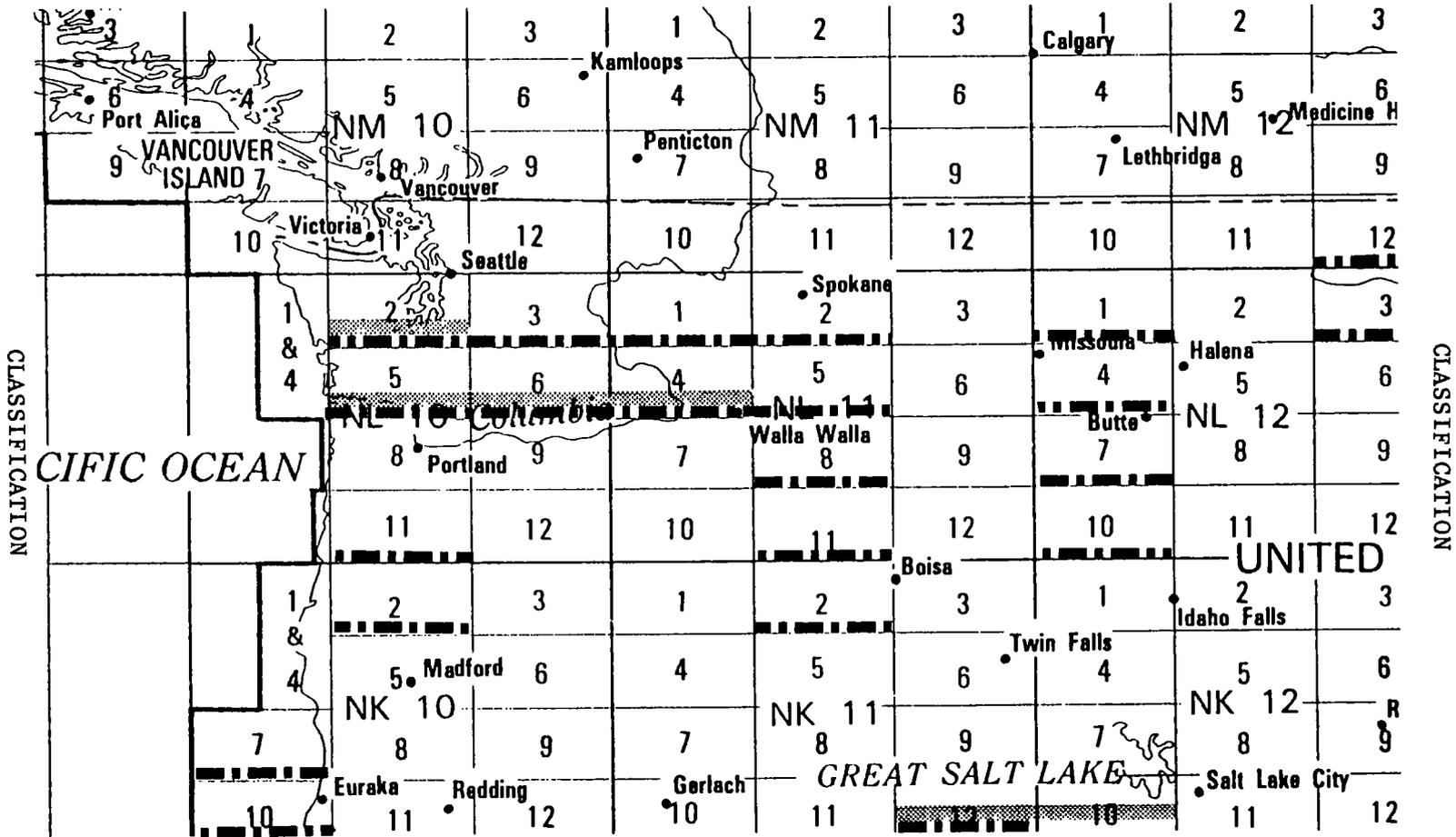
1:250,000 Scale Area Coverage Requirements (U)

1. ( ) Series 1501 Coverage required



NOTE: Area of Influence equals Area of Operations

2. ( ) Series 1501 Availability



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CLASSIFICATION

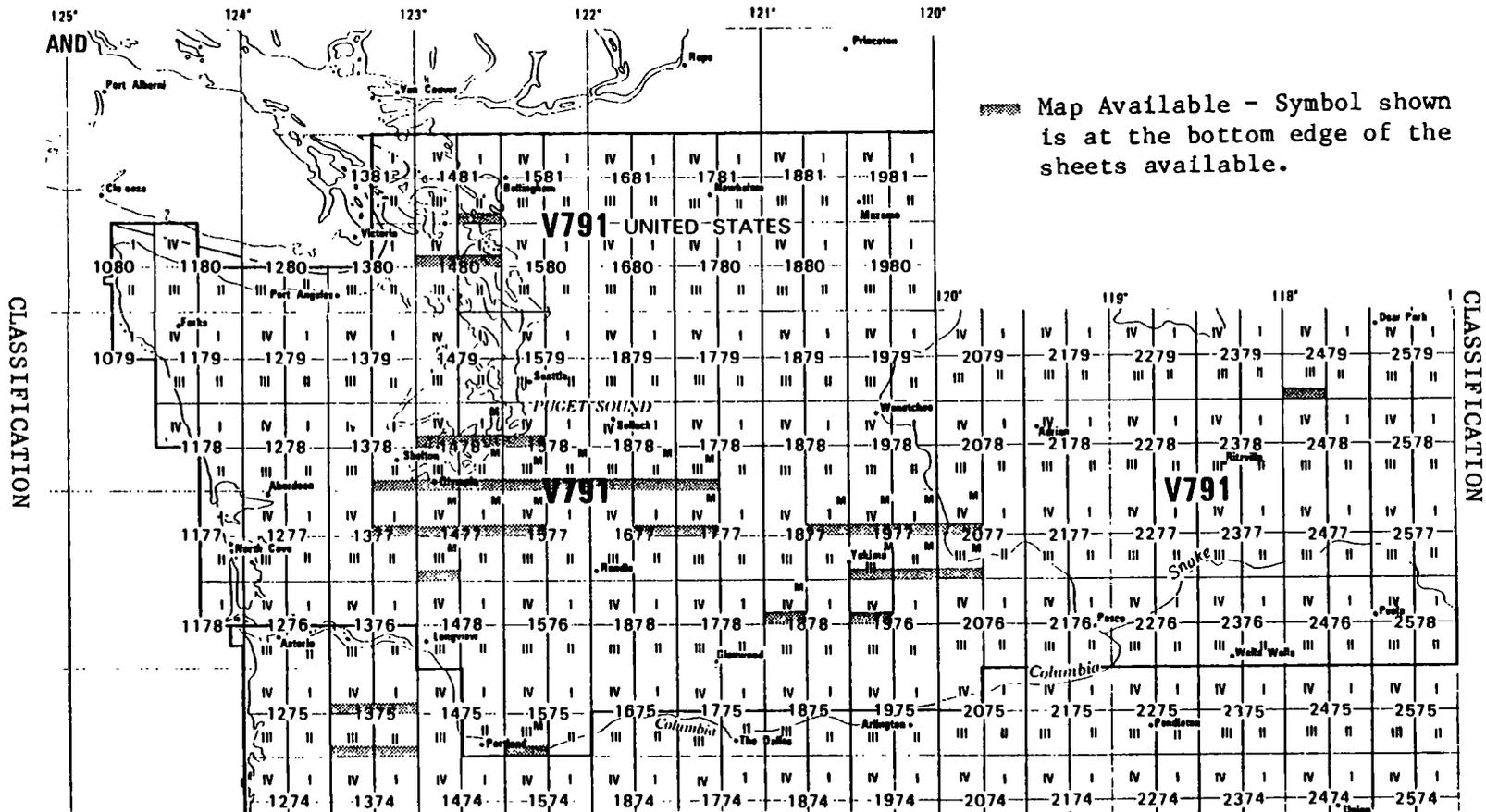
CLASSIFICATION

 1501 - Ground  
 1501 - Air  
 Symbol shown is at the bottom edge of the sheets available



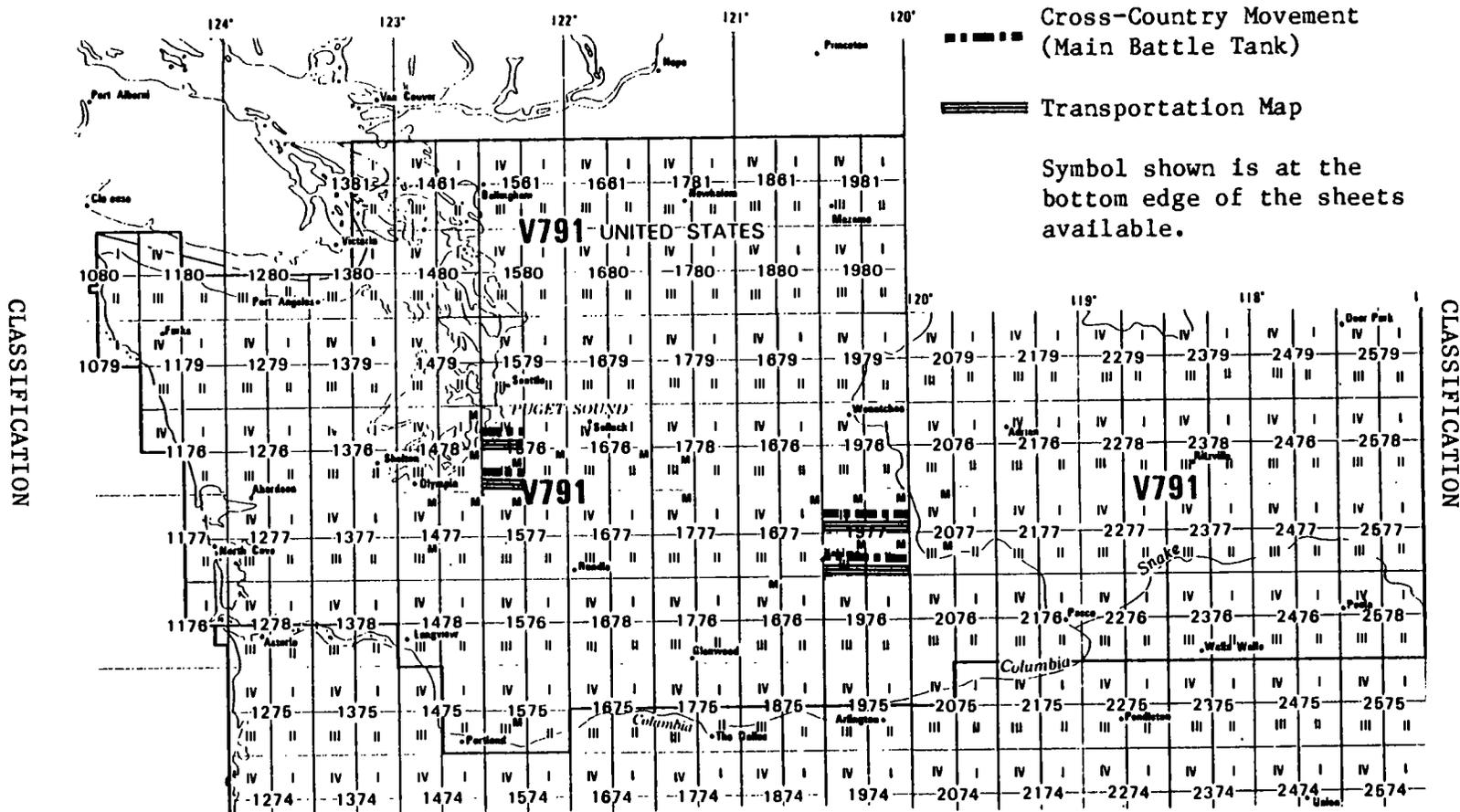
2. ( ) 1:50,000 Standard Topographic Products Available

(For the most current listing, consult the DMA catalog, monthly bulletins, and semiannual update.)



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3. ( ) Standard Terrain Information Products Available (1:50,000)



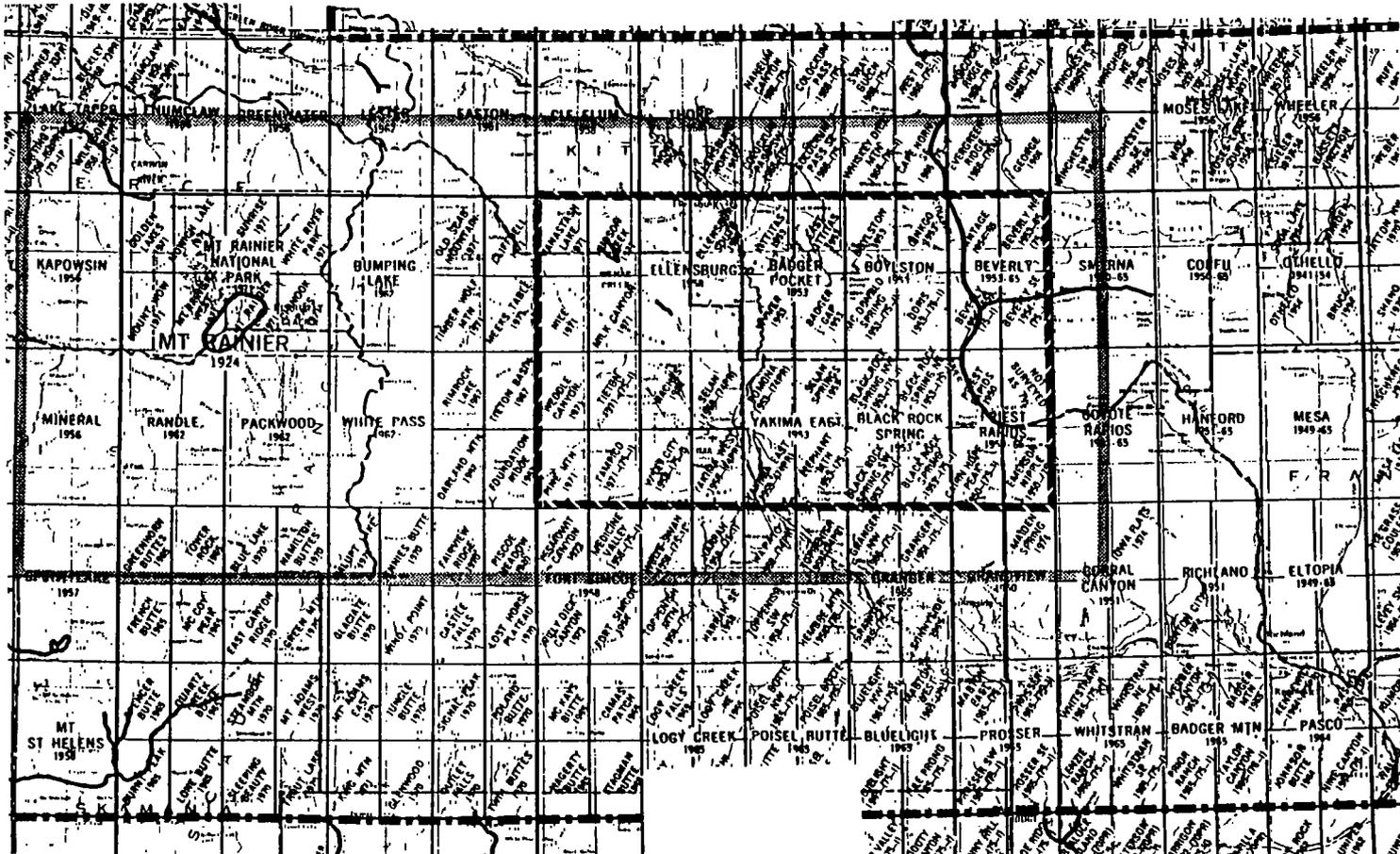
TAB C to APPENDIX 1 to TOPOGRAPHIC ANNEX to 99th ID (M) OPLAN 1234 (U)

Host Nation Standard Product Availability (U)

Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

- ▬▬▬▬▬ Division Area of Influence
- ▬▬▬▬▬ Division Area of Interest
- ▬▬▬▬▬ Corps Area of Influence

NOTE: Maps are not military scale nor have UTM grid.



CLASSIFICATION

CLASSIFICATION

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CLASSIFICATION

<u>TYPE UNIT</u>	<u>No. Units</u>	1:250K /2			1:50K /2			Map /2	
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG	
Inf Bn (FVS)	6	50(300)	0	1(6)	97(582)	2(12)	2(12)	1(6)	#
HHC	1	25	0	1	20	2	2	1	
Rifle Co	4	5(20)	0	0	15(60)	0	0	0	
Antiarmor Co	1	5	0	0	17	0	0	0	
Division Arty	1	19	0	5	42	3	6	3	#
HHB	1	5	0	3	20	2	4	2	
TAB	1	14	0	2	22	1	2	1	
155mm SP Bn	3	18(54)	0	10(30)	52(156)	4(12)	15(45)	2(6)	#
HHB	1	6	0	3	23	4	4	2	
Btry	3	3(9)	0	2(6)	8(24)	0	3(9)	0	
Svc Btry	1	3	0	1	5	0	2	0	
8 in SP/MLRS Bn	1	30	0	6	51	4	12	2	#
HHB	1	14	0	2	15	4	4	2	
Btry (8 inch)	2	4(8)	0	1(2)	8(16)	0	2(4)	0	
Btry (MLRS)	1	4	0	1	10	0	2	0	
Svc Btry	1	4	0	1	10	0	2	0	

CLASSIFICATION

CLASSIFICATION

<u>TYPE UNIT</u>	<u>No. Units</u>	1:250K /2			1:50K /2			Map /2	
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG	
Cav Bde (Air Atk)	1	465	2	8	483	5	12	8	#
SEE NOTE /3									
HHT	1	15	2	2	19	2	4	2	
Cbt Spt Avn Bn	1	158	0	2	122	1	2	1	
HHC	1	15	0	1	9	1	1	1	
GS Avn Co	1	49	0	0	51	0	0	0	
CSAC (Aug)	1	34	0	1	36	0	1	0	
TAMC	1	6	0	0	14	0	0	0	
Regt Avn Spt Trp	1	54	0	0	12	0	0	0	
AHB(AH1S)	2	48(96)	0	0	65(130)	0	0	1(2)	
HSC	1	12	0	0	27	0	0	1	
AHC	3	12(36)	0	0	12(36)	0	0	0	
AHB(AH64)	2	48(96)	0	0	65(130)	0	0	1(2)	
HSC	1	12	0	0	27	0	0	1	
AHC	3	12(36)	0	0	12(36)	0	0	0	

CLASSIFICATION

CLASSIFICATION

Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

TAB D to APPENDIX 1 to TOPOGRAPHIC ANNEX to 99th ID (M) OPLAN 1234 (U)

Listing of MC&G Allowances (U) (NOTE 1)

TYPE UNIT	No. Units	1:250K /2			1:50K /2			Map /2	
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG	
HHC, 99th Inf Div	1	14	3	3	24	5	5	2	#
MP Co	1	20	0	1	10	1	1	1	#
Signal Bn	1	9	0	5	48	5	8	1	#
HHC	1	3	0	2	8	2	2	1	
Cmd Op Co	1	2	0	1	7	1	2	0	
Fwd Cmmo Co	1	2	0	1	11	1	2	0	
Sig Spt Op Co	1	2	0	1	22	1	2	0	
ADA Bn	1	22	0	7	132	5	8	1	#
HHB	1	8	0	2	14	2	3	1	
Btry (DIVAD)	3	3(9)	0	1(3)	25(75)	1	1(3)	0	
Btry (Chapp)	1	2	0	1	20	1	1	0	
Btry (MANPADS)	1	3	0	1	23	1	1	0	

CLASSIFICATION

CLASSIFICATION

<u>TYPE UNIT</u>	<u>No. Units</u>	1:250K /2			1:50K /2			Map /2	
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG	
Engr Bn (Ribbon)	1	16	1	7	126	6	8	1	#
HHC	1	2	1	2	7	1	3	1	
Engr Co	4	3(12)	0	1(4)	28(112)	1(4)	1(4)	0	
Bridge Co (Rib)	1	2	0	1	7	1	1	0	
MI Bn (CEWI)	1	46	6	8	103	7	13	3	#
H&H Opns Co	1	9	1	2	10	2	2	1	
EW Co	1	22	0	1	33	0	2	0	
I&S Co	1	8	2	1	42	2	5	1	
S&S Co	1	4	0	1	15	0	1	0	
Terrain Anal Det	1	3	3	3	3	3	3	1	
NBC Co	1	6	0	1	13	0	1	0	#
HHC, Bde	3	22(66)	2(6)	4(12)	20(60)	2(6)	4(12)	1(3)	#
Tank Bn (MI)	3	95(285)	0	1(3)	47(141)	2	2	1(3)	#
HHC	1	15	0	1	15	2	2	1	
Tank Co	4	20(80)	0	0	8(32)	0	0	0	

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<u>TYPE UNIT</u>	<u>No. Units</u>	CLASSIFICATION						
		1:250K /2			1:50K /2			Map /2
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG
Cav Sqdn	1	100	0	4	82	2	6	1
HHT	1	28	0	2	30	2	4	1
Cav Trp	2	25(50)	0	1(2)	15(30)	0	1(2)	0
Air Cav Trp	2	11(22)	0	0	11(22)	0	0	0
Div Spt Cmd	1	61	0	10	114	6	18	5 #
HHC	1	9	0	2	15	2	4	3
DMMC	1	3	0	0	9	0	1	0
AG Co	1	3	0	0	5	0	0	0
Finance Co	1	3	0	0	3	0	0	0
Maint Bn	1	16	0	4	36	2	8	1
HSC	1	4	0	2	10	2	3	1
Lt Maint Co	1	4	0	0	10	0	1	0
Hvy Maint Co	1	1	0	0	10	0	1	0
Msl Spt Co	1	7	0	1	7	0	2	0

CLASSIFICATION

<u>TYPE UNIT</u>	<u>No. Units</u>	CLASSIFICATION							
		1:250K /2			1:50K /2			Map /2	
		STD	CCM	TRANS	STD	CCM	TRANS	CATALOG	
S&T Bn	1	27	0	4	46	2	6	1	
HHC	1	5	0	2	10	2	3	11	
S&S Co	1	10	0	2	12	0	1	0	
TMT Co	1	10	0	0	10	0	1	0	
TMT(HET)	1	2	0	0	14	0	1	0	
Medical Bn	1	15	0	1	48	0	5	1 #	
HCS	1	3	0	1	8	0	1	1	
Med Svc Co	1	3	0	0	7	0	1	0	
Med Co	1	3(9)	0	0	11(33)	0	1(3)	0	
Fwd Spt Bn	3	8(24)	0	3(9)	22(66)	0	3(9)	1 #	
HHD	1	4	0	1	8	0	1	1	
Bde Supply Co	1	2	0	1	8	0	1	0	
Fwd Maint Co	1	2	0	1	6	0	1	0	
Engr Bn (Cbt)	1	27	1	6	80	7	26	1 #	
HHC	1	7	1	2	20	3	6	1	
Engr Co (Cbt)	4	5(20)	0	1(4)	15(60)	1(4)	5(20)	0	
DIVISION TOTALS		1,479	19	128	2,279	86	203	48	

CLASSIFICATION

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<u>UNIT</u>	<u>NUMBER OF TRIG LISTS</u>	<u>/2</u>
Division Artillery		
HHB	2	
FA Bn, 155-mm (SP) (X3)	1(3)	
FA Bn, MRLS/8in (X3)	1(3)	
TAB	1	
Division ADA Bn (x4)	1(4)	
Division Engineer	1	
TOTAL	14	

NOTES:

- /1 - Extract from FM 101-10-1, Staff Officer's Field Manual: Organizational, Technical, and Logistical Data (Unclassified Data)
- /2 - Numbers indicate authorization for that level of unit.
- /3 - For authorization of aeronautical navigation aids, consult page 4-7, Section 4, Volume I, Part I, DOD DMA Catalog of Maps, Charts, and Related Products.
- ( ) Number in parentheses indicates total authorizations for all of that type unit in the next higher command.
- # - Indicates lines to be totaled for division requirements. If parentheses are shown, use that number for total.

CLASSIFICATION

## CLASSIFICATION

Headquarters  
 99th Infantry Division (Mech)  
 Fort Bagley, VA 29999  
 12 August 1998

TAB E to APPENDIX 1 to TOPOGRAPHIC ANNEX to 99th ID (M) OPLAN 1234 (U)

## Quantity Requirements for Standard Topographic Maps (U)

Series 1501G

	<u>Sheet No.</u>	<u>Total Quantity</u>	<u>DISCOM Stockage</u>
	NL 10-1&4	10	10
	NL 10-2	10	10
#	NL 10-3	1,524	262
	NL 10-5	10	10
#	NL 10-6	1,524	262
	NL 10-8	10	10
	NL 10-9	10	10
#	NL 11-1	1,524	262
	NL 11-2	10	10
#	NL 11-4	1,524	262
	NL 11-5	10	10
	NL 11-7	10	10
	NL 11-8	10	10
	NM 10-10	10	10
	NM 10-11	10	10
	NM 10-12	10	10

## Computational Method:

Total Quantity = Division allowance-inherent unit overlap + 20 percent  
 DISCOM maintenance level + 10 sets for LVth Corps area  
 of interest

$$1,524 = 1,479 - 217 \text{ (one Bde allowance)} + 250 + 10$$

## Assumptions:

1. Not more than two maneuver brigades will operate over the same terrain.
2. A maneuver brigade contains 1 HHC Bde, 1 Tank Bn (MI), and 2 Inf Bn (FVS).
3. Division separate units, Artillery and Cav Bde (Air Attack), will operate throughout the division area of influence.

CLASSIFICATION

CLASSIFICATION

4. The DISCOM maintains 20 percent of the division basic load allowance for area of influence and 100 percent from there to limits of the area of interest.
5. All units maintain stock allowance as planning and basic load stocks prior to deployment.
6. The DISCOM maintains only standard topographic maps; all other products are issued to user.
7. The DISCOM maintains 10 sets of LVth Corps area of interest.

Series V791X

	<u>Sheet No.</u>	<u>Total Quantity</u>	<u>DISCOM Stockage</u>
	1476 I	10	10
	II	10	10
	1477 I	10	10
	II	10	10
	1478 I	10	10
	II	10	10
	1479 I	10	10
X	1576 I	2,432	2,230
	II	10	10
	III	10	10
	IV	10	10
X	1577 I	2,432	2,230
X	II	2,432	2,230
	III	10	10
	IV	10	10
	1578 I	10	10
X	II	2,432	2,230
	III	10	10
	IV	10	10
	1579 II	10	10
	III	10	10
	1676 I	2,432	2,230
	II	10	10
	III	10	10
X	IV	2,432	2,230
X	1677 I	2,432	2,230
X	II	2,432	2,230
X	III	2,432	2,230
	IV	2,432	2,230

CLASSIFICATION

CLASSIFICATION

Series V791X

	<u>Sheet No.</u>	<u>Total Quantity</u>	<u>DISCOM Stockage</u>
	1678 I	10	10
X	II	2,432	2,230
X	III	2,432	2,230
	IV	10	10
	1679 II	10	10
	III	10	10
X	1776 I	2,432	2,230
	II	10	10
	III	10	10
X	IV	2,432	2,230
X	1777 I	2,432	2,230
X	II	2,432	2,230
X	III	2,432	2,230
X	IV	2,432	2,230
X	1778 II	2,432	2,230
X	III	2,432	2,230
X	1876 I	2,432	2,230
X	II	10	10
	III	10	10
X	IV	2,432	2,230
#	1877 I	2,432	414
#	II	2,432	414
#	III	2,432	414
#	IV	2,432	414
X	1878 II	2,432	2,230
X	III	2,432	2,230
X	1976 I	2,432	2,230
	II	10	10
	III	10	10
X	IV	2,432	2,230
#	1977 I	2,432	414
#	II	2,432	414
#	III	2,432	414
#	IV	2,432	414

CLASSIFICATION

CLASSIFICATION

Series V791X

	<u>Sheet No.</u>	<u>Total Quantity</u>	<u>DISCOM Stockage</u>
X	1978 II	2,432	2,230
X	III	2,432	2,230
X	2076 I	2,432	2,230
	II	10	10
	III	10	10
X	IV	2,432	2,230
X	2077 I	2,432	2,230
X	II	2,432	2,230
#	III	2,432	414
#	IV	2,432	414
X	2078 II	2,432	2,230
X	III	2,432	2,230
	2176 I	10	10
	II	10	10
	III	10	10
	IV	10	10
#	2177 I	10	10
	II	10	10
	III	10	10
	IV	10	10
	2178 II	10	10
	III	10	10
	2276 I	10	10
	II	10	10
	III	10	10
	IV	10	10
	2277 I	10	10
	II	10	10
	III	10	10
	IV	10	10
	2278 II	10	10
	III	10	10

X - Division Area of Interest  
 # - Division Area of Influence

CLASSIFICATION

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Computational Method:

Total Quantity = Division allowance-inherent unit overlap + 20 percent  
DISCOM maintenance level + 10 sets for LVth Corps area  
of influence

$$2,432 = 2,279 - 261 \text{ (One Bde Allowance)} + 404 + 10$$

Assumptions: See page C-37.

WEIGHT COMPUTATION:

1:50K  
95 sheets total  
33 at 2,230 = 73,590  
10 at 414 = 4,140  
52 at 10 = 520

1:250K is nominal = 100 pounds  
16 sheets total  
4 sheets at 262 = 1,048  
12 sheets at 10 = 120  
Total 1,168

78,250 total move required by DISCOM 7,143 pounds (3.57 TONS)  
26,846 sheets preissued 1:50K  
5,048 sheets preissued 1:250K  
105,096 total division issue 1:50K  
6,216 total division issue 1:250K

CLASSIFICATION



<b>AC</b>	Aerospace Center
<b>ACE</b>	Assistant Chief of Engineers
<b>ACSI</b>	Assistant Chief of Staff for Intelligence
<b>ADA</b>	air defense artillery
<b>ADE</b>	Assistant Division Engineer
<b>AFB</b>	Air Force Base
<b>AFS</b>	Armed Forces Station
<b>AG</b>	Adjutant General's Corps
<b>AGL</b>	above ground level
<b>AHB</b>	assault helicopter battalion
<b>AHC</b>	assault helicopter company
<b>AID</b>	automatic initial distribution
<b>APPS</b>	Analytical Photogrammetric Positioning System
<b>AR</b>	Army regulation
<b>ARAPS</b>	area requirements and products status
<b>ARTEP</b>	Army Training and Evaluation Program
<b>ASAS</b>	all-source analysis section
<b>atk</b>	attack
<b>avn</b>	aviation
<b>bde</b>	brigade
<b>bn</b>	battalion
<b>btry</b>	battery
<b>cav</b>	cavalry
<b>cbt</b>	combat
<b>CCM</b>	cross-country movement
<b>CEOI</b>	Communications-Electronics Operation Instruction
<b>CEWI</b>	combat electronic warfare intelligence
<b>chapp</b>	chapperal
<b>cmd</b>	command
<b>co</b>	company
<b>COMMZ</b>	communications zone
<b>CONPLAN</b>	contingency plan
<b>CONTP</b>	Consolidated Topographic Program
<b>CONUS</b>	continental United States
<b>CONUSCOM</b>	Continental United States Command
<b>CRT</b>	cathode ray tube
<b>CSAC</b>	Combat Support Aviation Company
<b>CTOC</b>	corps tactical operations center
<b>D</b>	due date
<b>DA</b>	department of the Army
<b>DACONTP</b>	Department of Army Consolidated Topographic Support Program
<b>DCSOPS</b>	Deputy Chief of Staff for Operations and Plans
<b>dept</b>	department

<b>det</b>	detachment
<b>DFAD</b>	Digital Feature Analysis Data
<b>di</b>	division
<b>DIA</b>	Defense Intelligence Agency
<b>DISCOM</b>	division support command
<b>div</b>	division
<b>DIVAD</b>	division air defense
<b>DIVARTY</b>	division artillery
<b>DMA</b>	Defense Mapping Agency
<b>DMAINST</b>	Defense Mapping Agency Instruction
<b>DMAL</b>	Defense Mapping Agency List
<b>DMMC</b>	division materiel management center
<b>DMS</b>	Defense Mapping School
<b>DOD</b>	Department of Defense
<b>DS</b>	direct support
<b>DTED</b>	Digital Terrain Elevation Data
<b>DTOC</b>	division tactical operations center
<b>EAC</b>	echelon above corps
<b>EM</b>	enlisted member
<b>ENCOM</b>	engineer command
<b>enr</b>	engineer
<b>EROS</b>	Environmental Resources and Services
<b>EW</b>	electronic warfare
<b>FA</b>	field artillery
<b>FLIP</b>	flight information publication
<b>FLOT</b>	forward line of own troops
<b>FM</b>	field manual
<b>FVS</b>	fighting vehicle system
<b>fwd</b>	forward
<b>G2/S2</b>	intelligence, US Army
<b>G3</b>	operations, US Army
<b>G4/S4</b>	logistics, US Army
<b>G5</b>	civil affairs, US Army
<b>GS</b>	general support
<b>GTA</b>	graphic training aid
<b>H&amp;H</b>	headquarters and headquarters
<b>HET</b>	heavy-equipment transporter
<b>HHB</b>	headquarters and headquarters battery
<b>HHC</b>	headquarters and headquarters company
<b>HHT</b>	headquarters and headquarters troop
<b>HNS</b>	host nation support
<b>HQDA</b>	Headquarters, Department of the Army
<b>HSC</b>	headquarters services command

<b>hvy</b>	heavy
<b>H/TC</b>	Hydrographic/Topographic Center
<b>IAGS</b>	Inter-American Geodetic Survey
<b>I&amp;S</b>	intelligence and security
<b>IAW</b>	in accordance with
<b>ID</b>	infantry division
<b>IHO</b>	International Hydrographic Organization
<b>IPB</b>	intelligence preparation of the battlefield
<b>JCS</b>	Joint Chiefs of Staff
<b>JOG</b>	Joint Operations Graphic
<b>JOG-A</b>	Joint Operations Graphic (AIR)
<b>JOG-G</b>	Joint Operations Graphic (GROUND)
<b>JOG-R</b>	Joint Operations Graphic (RADAR)
<b>JOPS</b>	Joint Operations Planning System
<b>JSOP</b>	Joint Services Operations Plan
<b>LAD</b>	latest arrival date
<b>LANDSAT-D</b>	land satellite
<b>lt</b>	light
<b>MACOM</b>	major Army command
<b>MANPAD</b>	man-portable air defense
<b>MAS</b>	Military Agency for Standardization
<b>MBT</b>	main battle tank
<b>MC&amp;G</b>	mapping, charting, and geodesy
<b>mech</b>	mechanized
<b>med</b>	medical
<b>METT-T</b>	mission, enemy, terrain, troops, and time available
<b>MGID</b>	military geographic information and documentation
<b>MGRS</b>	military grid reference system
<b>MI</b>	military intelligence
<b>MI Bn(CEWI)</b>	military intelligence battalion (combat electronic warfare intelligence)
<b>MLRS</b>	multiple launch rocket system
<b>MOUT</b>	Military operations on urbanized terrain
<b>MP</b>	military police
<b>msl</b>	missile
<b>NASA</b>	National Aeronautics and Space Administration
<b>NATO</b>	North Atlantic Treaty Organization
<b>NBC</b>	nuclear, biological, chemical
<b>NCO</b>	noncommissioned officer
<b>NLT</b>	not later than
<b>NMCC</b>	National Military Command Center
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NOE</b>	nap-of-the-earth

<b>NOS</b>	National Ocean Service
<b>OCOKA</b>	observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach
<b>ODS</b>	Office of Distribution Services
<b>ONC</b>	operational navigation chart
<b>op</b>	operation
<b>OPCON</b>	operational control
<b>OPLAN</b>	operation plan
<b>OPORD</b>	operation order
<b>P&amp;C</b>	planning and control
<b>POM</b>	program objective memorandum
<b>PPDB</b>	point positioning data base
<b>PTADB</b>	planning terrain analysis data base
<b>R&amp;B</b>	road and bridge
<b>regt</b>	regimental
<b>S&amp;S</b>	supply and service
<b>SF</b>	standard form
<b>SHAPE</b>	Supreme Headquarters Allied Powers Europe
<b>sig</b>	signal
<b>SIR-D</b>	Shuttle Imaging Radar D (Band or 4th Version)
<b>SLAR</b>	side-looking airborne radar
<b>spt</b>	support
<b>SPOT</b>	Systeme Probatoire pour l'Observation de la Terre
<b>SPOEM</b>	Special Program Office for Exploitation Modernization
<b>sqdn</b>	squadron
<b>SSBN</b>	United States Nuclear Missile Submarine
<b>STANAG</b>	Standardization Agreement
<b>std</b>	standard
<b>svc</b>	service
<b>SWO</b>	staff weather officer
<b>TACOM</b>	theater area commander
<b>TAMC</b>	Theater Army Materiel Command
<b>TAP</b>	Terrain Analysis Program
<b>TM</b>	technical manual; topographic map
<b>TMT</b>	transportation motor transport
<b>TOC</b>	tactical operations center
<b>TOPS</b>	Topographic Operations
<b>TOW</b>	tube-launched, optically tracked, wire-guided
<b>TPC</b>	tactical pilotage chart
<b>TPFDD</b>	Time-Phased Force Deployment Data
<b>TPFDL</b>	time-phased force deployment list
<b>TPTRL</b>	time-phased transportation requirements list
<b>TRADOC</b>	Training and Doctrine Command

<b>trans</b>	transportation
<b>trp</b>	troop
<b>TTADB</b>	tactical terrain analysis data base
<b>(U)</b>	unclassified
<b>US</b>	United States
<b>U&amp;S</b>	Unified and Specified
<b>USAES</b>	United States Army Engineer School
<b>USCS</b>	unified soil classification system
<b>USGS</b>	United States Geological Survey
<b>USMC</b>	United States Marine Corps
<b>UTM</b>	universal transverse mercator
<b>VOD</b>	Vertical Obstruction Data
<b>xplt</b>	exploit



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## REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or comply with FM 5-105.

### Army Regulation (AR)

**115-11** Army Topography

### Field Manuals (FM)

**34-1** Intelligence and Electronic Warfare Operations

**100-5 (HTF)** Operations (How to Fight)

**101-10-1** Staff Officers' Field Manual: Organizational, Technical, and Logistical Data (Unclassified Data)

### Standard Form (SF)

**344** Multiuse Standard Requisitioning/Issue System Document

## RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required in order to understand FM 5-105.

### Army Regulations (AR)

**115-10** Meteorological Support for the US Army (AFR 105-3)

**115-12** US Army Requirements for Weather Service Support

**380-Series** Security

**381-Series** Military Intelligence

### Army Training and Evaluation Program (ARTEP)

**5-335** Engineer Topographic Units

### Defense Mapping Agency Instructions (DMAINST)\*

**5000.20** DMA Management Information System (DMIS)

**5160.1** Management of Service MC&G Activities

**5630.1** Data Elements and Data Codes Standardization Procedures

\*Available from:

Director, Defense Mapping Agency Hydrographic/Topographic Center  
ATTN: ACI  
6500 Brooks Lane  
Washington, DC 20315-0030

**Defense Mapping Agency Instructions (DMAINST) (Continued)\***

- 8000.2** DOD Mapping, Charting, and Geodesy (MC&G) Libraries and Related Data Acquisition, Analysis, Evaluations and Services
- 8002.2** Defense Mapping Agency (DMA) Policy on Processing Requests for Cartographic Aerial Imagery
- 8010.1** Preparation and Implementation of Mapping, Charting and Geodesy Standardization Agreements
- 8011.1** Intragovernmental Agreements
- 8012.1A** Negotiation of International Agreements
- 8050.1A** DMA Systems Requirements File
- 8050.3** DMA Area Requirements and Product Status (ARAPS) System
- 8050.4** Submission and Validation of Mapping, Charting and Geodesy Requirements
- 8052.1** Validation of Requirements for New or Modified Non-Crisis Mapping, Charting and Geodetic (MC&G) Products and Services
- 8052.6** Procedures for Obtaining MC&G Products in Support of Crisis Situations
- 8130.1** Defense Mapping Agency Product Specifications
- 8430.1** Point Positioning Data Bases (PPDB) Program
- 8440.1** Management of Terrain Analysis Program (TAP)
- 8570.1** DMA Product Maintenance System (PMS)
- 8600.1** Administration of Defense Mapping Agency (DMA) Automated Distribution Management System (DADMS)
- 8600.3** DMA Distribution of Maps, Charts and Related Publications
- 8600.4** The Defense Mapping Agency (DMA) Policy on Folding Maps and Charts
- 8600.5** MC&G Distribution Support Policy for Crisis/Contingency Situations

\*Available from:

Director, Defense Mapping Agency Hydrographic/Topographic Center  
ATTN: ACI  
6500 Brooks Lane  
Washington, DC 20315-0030

**Defense Mapping Agency (DMA)**

**DOD-DMA** Catalog of Maps, Charts, and Related Products

Available from:

Defense Mapping Agency  
Office of Distribution Services  
6101 MacArthur Blvd  
Washington, DC 20315-0010

**Department of Defense Regulations and Manuals (DOD)\***

**DOD-DMAHTC** Glossary of Mapping, Charting and Geodetic Terms

**DOD-DMAHTC** Product Specifications for the Hard Copy Planning  
Terrain Analysis Data Base (PTADB) and for the  
Hard Copy Tactical Terrain Analysis Data Base  
(TTADB)

**DOD-DMATC Manual**

**1-40130** Quality Control Program

Available from:

Director, Defense Mapping Agency Hydrographic/Topographic Center  
ATTN: ACI  
6500 Brooks Lane  
Washington, DC 20315-0030

**Department of Defense Publications Directives**

**5104.21-DIA** Defense Intelligence Agency Responsibility  
Relating to Terrain Analysis

**5105.40-DMA** Defense Mapping Agency Responsibility Relating to  
Engineer Responsibility for Mapping, Charting and  
Geodesy Glossary of Mapping, Charting and  
Geodetic Terms

**Field Manuals (FM)**

**5-1** Engineer Troop Organizations and Operations  
**5-30** Engineer Intelligence  
**5-34** Engineer Field Data  
**5-35** Engineer's Reference and Logistical Data  
**5-36** Route Reconnaissance and Classification  
**5-100** Engineer Combat Operations  
**5-101** Mobility  
**5-102** Countermobility

**Field Manuals (Continued)**

<b>5-103</b>	Survivability
<b>5-233</b>	Construction Surveying
<b>6-2</b>	Field Artillery Survey
<b>6-121</b>	Field Artillery Target Acquisition
<b>21-26</b>	Map Reading
<b>21-31</b>	Topographic Symbols
<b>21-33</b>	Terrain Analysis
<b>24-1</b>	Combat Communications
<b>30-10</b>	Military Geographic Intelligence (Terrain)
<b>30-10A</b>	(C) Special Applications of Terrain Intelligence (U)
<b>31-71</b>	Northern Operations
<b>34-22</b>	Military Intelligence Battalion (CEWI) (Aerial Exploitation) (Corps)
<b>34-81</b>	Weather Support for Army Tactical Units (AFM 105-4)
<b>90-2 (HTF)</b>	Tactical Deception (How to Fight)
<b>90-3 (HTF)</b>	Desert Operation (How to Fight)
<b>90-4 (HTF)</b>	Airmobile Operations (How to Fight)
<b>90-5 (HTF)</b>	Jungle Operations (How to Fight)
<b>90-6 (HTF)</b>	Mountain Operations (How to Fight)
<b>90-10 (HTF)</b>	Military Operations on Urbanized Terrain (MOUT) (How to Fight)
<b>90-10-1 (HTF)</b>	An Infantryman's Guide to Urban Combat (How to Fight)
<b>90-13 (HTF)</b>	River Crossing Operations (How to Fight)
<b>100-10</b>	Combat Service Support (How to Support)
<b>100-15 (Test)</b>	Larger Unit Operations
<b>101-5</b>	Staff Organization and Operations
<b>101-5-1</b>	Operational Terms and Symbols
<b>101-10-2</b>	Staff Officers' Field Manual: Organizational, Technical, and Logistical Data Extracts of Nondivisional Tables of Organization and Equipment

**Graphic Training Aid (GTA)**

<b>5-2-14</b>	How to Order a Map
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**NATO Standardization Agreements (STANAGs)\***

<b>1103 IGEO</b>	Standard Procedures for the Emergency Printing of Nautical Charts Published by One NATO Nation and Reprinted by Another
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\*STANAGs are available, upon request, from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

**NATO Standardization Agreements (STANAGs) (Continued)\***

<b>1113 IGEO</b>	General Specifications for Projections Required for Nautical Charts for Polar Regions and the Higher Latitudes
<b>1120 IGEO</b>	Code Designation System for Special Naval Charts
<b>2010 ENGR</b>	Bridge Classification Markings
<b>2021 ENGR</b>	Computation of Bridge, Raft, and Vehicle Classifications
<b>2022 INT</b>	Intelligence Reports
<b>2174 M&amp;T</b>	Military Routes and Route/Road Networks
<b>2201 MC</b>	Standard Unit of Vertical Measure to be Shown on Land Maps
<b>2205 MC</b>	Use of Identical Maps by NATO Armed Forces Operating on Land
<b>2210 MC</b>	Trig Lists (Lists of Geodetic Data)
<b>2211 MC</b>	Geodetic Datums, Spheroids, Grids and Grid References
<b>2215 MC</b>	Evaluation of Land Maps
<b>2216 MC</b>	Vertical Aerial Cartographic Photography
<b>2251 MGD</b>	Scope and Presentation of Military Geographic Information and Documentation (MGID)
<b>2253 MGD</b>	(MGD) Roads and Road Structures
<b>2254 MGD</b>	MGD-Navigable Inland Waterways
<b>2255 MGD</b>	MGD-On Ports
<b>2256 MGD</b>	MGD-Inland Hydrography
<b>2257 MGD</b>	MGD-Railways
<b>2259 MGD</b>	MGD-Terrain
<b>2260 MGD</b>	MGD-Electric Power
<b>2263 MGD</b>	MGD-Coastal Areas and Landing Beaches
<b>2269 MGD</b>	MGD-Engineer Resources
<b>2271 MGD</b>	MGD-Urban Areas
<b>3178 REM</b>	Rolled Air Film and Air Framing Camera Standard Image Format Sizes
<b>3188 PEM</b>	Negative File, Black and White, for Air Photography
<b>3189 PRI</b>	Titling of Air Reconnaissance, Air Survey and Mapping Imagery
<b>3205 IRI</b>	Points Designation Template for Air Imagery
<b>3277 PRI</b>	Air Reconnaissance Request/Task Form
<b>3365 IGEO</b>	Proper Names of 69 Stars
<b>3408 MC</b>	Position Reference Systems for Aeronautical Charts
<b>3409 MC</b>	Projections for Aeronautical Charts

\*STANAGs are available, upon request, from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

**NATO Standardization Agreements (STANAGs) (Continued)\***

<b>3412 MC</b>	The Colour and the Minimum Aeronautical Overprint for Topographic Aeronautical Charts
<b>3591 MC</b>	Criteria for Maximum Elevation Figure for Topographic Aeronautical Charts
<b>3599 REM</b>	Edge Numbering of Films Used for Aerial Photography
<b>3600 MC</b>	Topographical Land Maps and Aeronautical Charts 1:250,000 for Joint Operations
<b>3666 IGEO</b>	Maximum Printing Sizes for Maps, Aeronautical Charts and Geographic Products
<b>3671 MC</b>	Edition Designation System for Land Maps, Aeronautical Charts and Military Geographic Documentation
<b>3672 MC</b>	Indexes to Series of Land Maps and Aeronautical Charts and Indexes to Military Geographic Information and Documentation (MGID)
<b>3673 MC</b>	Evaluation Criteria for Nautical and Special Naval Charts
<b>3675 MC</b>	Symbols on Land Maps, Aeronautical Charts and Special Naval Charts
<b>3676 MC</b>	Marginal Information on Land Maps and Aeronautical Charts
<b>3677 MC</b>	Standard Scales for Land Maps and Aeronautical Charts
<b>3678 MC</b>	Method of Adding the Military Grid to Nautical Charts in the NATO Area
<b>3689 MC</b>	Place Name Spelling on Maps and Charts
<b>3690 MC</b>	Standard Printing Sizes for Maps of Various Scales
<b>3710 MC</b>	Military City Maps
<b>3715 MC</b>	General Specifications for Non-Sub Contact Charts
<b>3716 MC</b>	Map Series Numbering
<b>3721 MC</b>	Automatic Data Processing (ADP) Master File for Maps and Aeronautical Charts
<b>3754 MC</b>	Automatic Data Processing (ADP) War Reserve Stock File for Maps and Aeronautical Charts
<b>3764 IRI</b>	Exchange of Imagery
<b>3768 IRI</b>	Guide to Security Classification of Air Reconnaissance Imagery
<b>3769 IRI</b>	Minimum Resolved Object Sizes for Imagery Interpretation
<b>3809 IGEO</b>	Digital Terrain Elevation Data Exchange Format
<b>3833 IGEO</b>	Symbols for Use on Maps of Training Areas for Land Forces
<b>3884 IRI</b>	Air Imagery Interpretation Annotation
<b>3891 IGEO</b>	Exercise Mapping
<b>3952 IGEO</b>	Digital Geographic Information
<b>3953 IRI</b>	Methods of Presenting Symbols and Graphic Information on Reconnaissance Products

\*STANAGs are available, upon request, from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

**Technical Manuals (TM)**

<b>5-232</b>	Elements of Surveying
<b>5-235</b>	Special Surveys
<b>5-237</b>	Surveying Computer's Manual
<b>5-240</b>	Compilation and Color Separation of Topographic Maps
<b>5-241-8</b>	Universal Transverse Mercator Grid
<b>5-243</b>	Cartographic Aerial Photography (AFM 95-6)
<b>5-245</b>	Offset Photolithography and Map Reproduction
<b>5-441</b>	Geodetic and Topographic Surveying
<b>5-442</b>	Precise Astronomic Surveys
<b>5-443</b>	Field Classification Surveys
<b>5-545</b>	Geology
<b>9-258</b>	Elementary Optics and Application to Fire Control Instruments

**PROJECTED PUBLICATIONS**

Projected publications are sources of additional information that are scheduled for printing but not yet available.

**Defense Mapping Agency (DMA)**

**DM 8358.1** Datums, Ellipsoids, Grids, and Grid Reference System

Available from:

Director, Defense Mapping Agency Hydrographic/Topographic Center  
 ATTN: ACI  
 6500 Brooks Lane  
 Washington, DC 20315-0030

**OTHER PUBLICATIONS**

Department of the Army Consolidated Topographic Support Program  
 (DACONTP), OACSI, DA

Available from:

Office, Assistant Chief of Staff, Intelligence  
 ATTN: DAMI-ISP  
 Headquarters, Department of the Army  
 Washington, DC 20310-1001



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**9 SEPTEMBER 1987**

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