

CHAPTER 2

MAPS

Cartography is the art and science of expressing the known physical features of the earth graphical by maps and charts. No one knows who drew, molded, laced together, or scratched out us the dirt the first map. But a study of history reveals that the most pressing demands for accuracy and detail in mapping have come as the result of military needs. Today, the complexities of tactical operations and deployment of troops is such that it is essential for all soldiers to be able to read and interpret their maps in order to move quickly and effectively on the battlefield. This chapter explains maps; it includes the definition and purpose of a map and describes map security, types, categories, and scales.

2-1. DEFINITION

A map is a graphic representation of a portion of the earth's surface drawn to scale, as seen from above. It uses colors, symbols, and labels to represent features found on the ground. The ideal representation would be realized if every feature of the area being mapped could be shown in true shape. Obviously this is impossible, and an attempt to plot each feature true to scale would result in a product impossible to read even with the aid of a magnifying glass.

a. Therefore, to be understandable, features must be represented by conventional signs and symbols. To be legible, many of these must be exaggerated in size, often far beyond the actual ground limits of the feature represented. On a 1:250,000 scale map, the prescribed symbol for a building covers an area about 500 feet square on the ground; a road symbol is equivalent to a road about 520 feet wide on the ground; the symbol for a single-track railroad (the length of a cross-tie) is equivalent to a railroad cross-tie about 1,000 feet on the ground.

b. The portrayal of many features requires similar exaggeration. Therefore, both the selection of features to be shown, as well as their portrayal, are in accord with the guidance established by the Defense Mapping Agency.

2-2. PURPOSE

A map provides information on the existence, the location of, and the distance between ground features, such as populated places and routes of travel and communication. It also indicates variations in terrain, heights of natural features, and the extent of vegetation cover. With our military forces dispersed throughout the world, it is necessary to rely on maps to provide information to our combat elements and to resolve logistical operations far from our shores. Soldiers and materials must be transported, stored, and placed into operation at the

proper time and place. Much of this planning must be done by using maps. Therefore, any operation requires a supply of maps; however, the finest maps available are worthless unless the map user knows how to read them.

2-3. PROCUREMENT

Most military units are authorized a basic load of maps. Local command supplements to AR 115-11 provide tables of initial allowances for maps. Map requisitions and distribution follow the channels of Defense Mapping Agency Hydrographic, Topographic Center's Office of Distribution and Services. In the division, however, maps are a responsibility of the G2 section.

a. To order a map, refer to the DMA catalog located at your S2/G2 shop. Part 3 of this catalog, Topographic Maps, has five volumes. Using the delineated map index, find the map or maps you want based upon the location of the nearest city. With this information, order maps using the following forms:

(1) *Standard Form 344*. It can be typed or handwritten; it is used for mailing or over-the-counter service.

(2) *Department of Defense Form 1348*. Same as SF 344. You can order copies of only one map sheet on each form.

(3) *Department of Defense Form 1348M*. This is a punch card form for AUDODIN ordering.

(4) *Department of Defense Form 173*. This is a message form to be used for urgent ordering.

With the exception of the message form (DD 173), the numbered sections of all forms are the same. For example: In block 1, if you are in CONUS, enter "AOD;" if you are overseas, enter "AO4." In block 2, use one of the following codes for your location.

Location	Code
Europe	CS7
Hawaii	HM9
Korea	WM4
Alaska	WC1
Panama	HMJ
CONUS	HM8

Your supply section will help you fill out the rest of the form.

b. Stock numbers are also listed in map catalogs, which are available at division and higher levels and occasionally in smaller units. A map catalog consists of small-scale maps upon which the outlines of the individual map sheets of a series have been delineated. Another document that is an aid to the map user is the gazetteer. A gazetteer lists all the names appearing on a map series of a geographical area, a designation that identifies what is located at that place name, a grid reference, a sheet number of the map upon which the name appeared, and the latitude and longitude of the named features. Gazetteers are prepared for maps of foreign areas only.

2-4. SECURITY

All maps should be considered as documents that require special handling. If a map falls into unauthorized hands, it could easily endanger military operations by providing information of friendly plans or areas of interest to the enemy. Even more important would be a map on which the movements or positions of friendly soldiers were marked. It is possible, even though the markings on a map have been erased, to determine some of the information that had been marked upon it. **Maps are documents that must not fall into unauthorized hands.**

a. If a map is no longer needed, it must be turned in to the proper authority. If a map is in danger of being captured, it must be destroyed. The best method of destruction is by burning it and scattering the ashes. If burning is not possible, the map can be torn into small pieces and scattered over a wide area.

b. Maps of some areas of the world are subject to third party limitations. These are agreements that permit the United States to make and use maps of another country provided these maps are not released to any third party without permission of the country concerned. Such maps require special handling.

c. Some maps may be classified and must be handled and cared for in accordance with AR 380-5 and, if applicable, other local security directives.

2-5. CARE

Maps are documents printed on paper and require protection from water, mud, and tearing. Whenever possible, a map should be carried in a waterproof case, in

a pocket, or in some other place where it is handy for use but still protected.

a. Care must also be taken when using a map since it may have to last a long time. If it becomes necessary to mark a map, the use of a pencil is recommended. Use light lines so they may be erased easily without smearing and smudging, or leaving marks that may cause confusion later. If the map margins must be trimmed for any reason, it is essential to note any marginal information that may be needed later, such as grid data and magnetic declination.

b. Special care should be taken of a map that is being used in a tactical mission, especially in small units; the mission may depend on that map. All members of such units should be familiar with the map's location at all times.

c. Appendix B shows two ways of folding a map.

2-6. CATEGORIES

The DMA's mission is to provide mapping, charting, and all geodesy support to the armed forces and all other national security operations. DMA produces four categories of products and services: hydrographic, topographic, aeronautical, and missile and targeting. Military maps are categorized by scale and type.

a. **Scale.** Because a map is a graphic representation of a portion of the earth's surface drawn to scale as seen from above, it is important to know what mathematical scale has been used. You must know this to determine ground distances between objects or locations on the map, the size of the area covered, and how the scale may affect the amount of detail being shown. The mathematical scale of a map is the ratio or fraction between the distance on a map and the corresponding distance on the surface of the earth. Scale is reported as a representative fraction (RF) with the map distance as the numerator and the ground distance as the denominator.

$$\text{Representative fraction (scale)} = \frac{\text{map distance}}{\text{ground distance}}$$

As the denominator of the RF gets larger and the ratio gets smaller, the scale of the map decreases. Defense Mapping Agency maps are classified by scale into three categories. They are small-, medium-, and large-scale maps (Figure 2-1). The terms "**small scale**," "**medium scale**," and "**large scale**" may be confusing when read in conjunction with the number. However, if the number is viewed as a fraction, it quickly becomes apparent that 1:600,000 of something is smaller than 1:75,000 of the same thing. Therefore, the larger the number after 1:, the smaller the scale of the map.

(1) *Small.* Those maps with scales of 1:1,000,000 and smaller are used for general planning and for strategic studies (bottom map in Figure 2-1). The standard small-

scale map is 1:1,000,000. This map covers a very large land area at the expense of detail.

(2) *Medium*. Those maps with scales larger than 1:1,000,000 but smaller than 1:75,000 are used for operational planning (center map in Figure 2-1). They contain a moderate amount of detail, but terrain analysis is best done with the large-scale maps described below. The standard medium-scale map is 1:250,000. Medium scale maps of 1:100,000 are also frequently encountered.

(3) *Large*. Those maps with scales of 1:75,000 and larger are used for tactical, administrative, and logistical planning (top map in Figure 2-1). These are the maps that you as a soldier or junior leader are most likely to encounter. The standard large-scale map is 1:50,000; however, many areas have been mapped at a scale of 1:25,000.

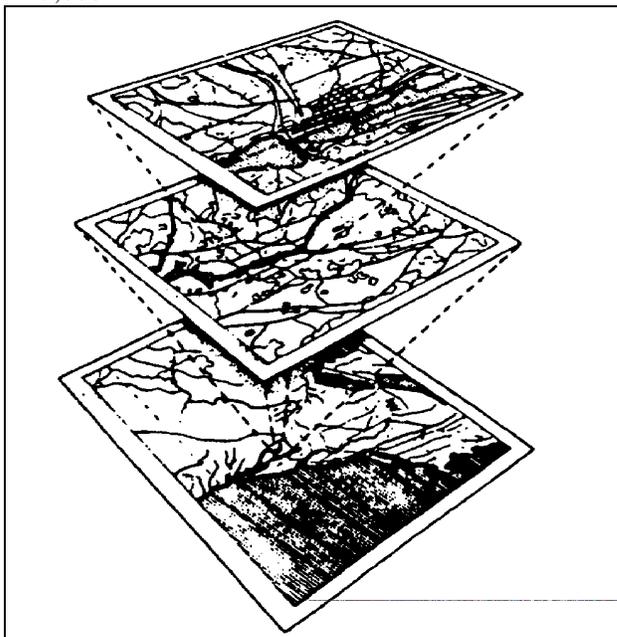


Figure 2-1. Scale classifications.

b. **Types.** The map of choice for land navigators is the 1:50,000 scale military topographic map. It is important, however, that you know how to use the many other products available from the DMA as well. When operating in foreign places, you may discover that DMA map products have not yet been produced to cover your particular area of operations, or they may not be available to your unit when you require them. Therefore, you must be prepared to use maps produced by foreign governments that may or may not meet the standards for accuracy set by DMA. These maps often use symbols that resemble those found on DMA maps but which have completed different meanings. There may be other times when you must operate with the only map you can obtain. This might be a commercially produced map run off on a copy machine at higher headquarters. In Grenada, many of our troops used a British tourist map.

(1) *Planimetric map*. This is a map that presents only the horizontal positions for the features represented. It is distinguished from a topographic map by the omission of relief, normally represented by contour lines. Some times, it is called a line map.

(2) *Topographical map*. This is a map that portrays terrain features in a measurable way (usually through use of contour lines), as well as the horizontal positions of the features represented. The vertical positions, or relief, are normally represented by contour lines on military topographic maps. On maps showing relief, the elevations and contours are measured from a specific vertical datum plane, usually mean sea level. Figure 3-1 shows a typical topographic map.

(3) *Photomap*. This is a reproduction of an aerial photograph upon which grid lines, marginal data, place names, route numbers, important elevations, boundaries, and approximate scale and direction have been added. (See Chapter 8)

(4) *Joint operations graphics*. These are based on the format of standard 1:250,000 medium-scale military topographic maps, but they contain additional information needed in joint air-ground operations (Figure 2-2). Along the north and east edges of the graphic, detail is extended beyond the standard map sheet to provide overlap with adjacent sheets. These maps are produced both in ground and air formats. Each version is identified in the lower margin as either Joint Operations Graphic (Air)

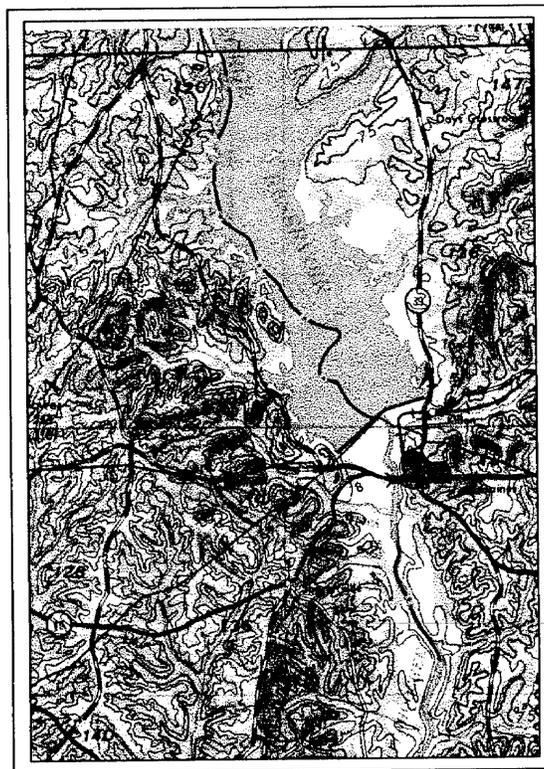


Figure 2-2. Joint operations graphic (air).

or Joint Operations Graphic (Ground). The topographic information is identical on both, but the ground version shows elevations and contour in meters and the air version shows them in feet. Layer (elevation) tinting and relief shading are added as an aid to interpolating relief. Both versions emphasize airlanding facilities (shown in purple), but the air version has additional symbols to identify aids and obstructions to air navigation. (See Appendix D for additional information.)

(5) *Photomosaic*. This is an assembly of aerial photographs that is commonly called a mosaic in topographic usage. Mosaics are useful when time does not permit the compilation of a more accurate map. The accuracy of a mosaic depends on the method employed in its preparation and may vary from simply a good pictorial effect of the ground to that of a planimetric map.

(6) *Terrain model*. This is a scale model of the terrain showing features, and in large-scale models showing industrial and cultural shapes. It provides a means for visualizing the terrain for planning or indoctrination purposes and for briefing on assault landings.

(7) *Military city map*. This is a topographic map (usually at 1:12,550 scale, sometimes up to 1:5,000), showing the details of a city. It delineates streets and shows street names, important buildings, and other elements of the urban landscape important to navigation and military operations in urban terrain. The scale of a military city map depends on the importance and size of the city, density of detail, and available intelligence information.

(8) *Special maps*. These are maps for special purposes, such as trafficability, communications, and assault maps. They are usually in the form of an overprint in the scales smaller than 1:100,000 but larger than 1:1,000,000. A special purpose map is one that has been designed or modified to give information not covered on a standard map. The wide range of subjects that could be covered under the heading of special purpose maps prohibits, within the scope of this manual, more than a brief mention of a few important ones. Some of the subjects covered are:

- Terrain features.
- Drainage characteristics.
- Vegetation.
- Climate.
- Coasts and landing beaches.
- Roads and bridges.
- Railroads.
- Airfields.
- Urban areas.
- Electric power.
- Fuels.
- Surface water resources.
- Ground water resources.

- Natural construction materials.
- Cross-country movements.
- Suitability for airfield construction.
- Airborne operations.

2 7. MILITARY MAP SUBSTITUTES

If military maps are not available, substitutes will have to be used. These can range from foreign military or commercial maps to field sketches. The DMA can provide black and white reproductions of many foreign maps and can produce its own maps based upon intelligence

a. **Foreign Maps.** These are maps that have been compiled by nations other than our own. When these must be used, the marginal information and grids are changed to conform to our standards if time permits. The scales may differ from our maps, but they do express the ratio of map distant to ground distance and can be used in the same way. The legend must be used since the map symbols almost always differ from ours. Because the accuracy of foreign maps varies considerably, they are usually evaluated in regard to established accuracy standards before they are issued to our troops. (See Appendix K for additional information.)

b. **Atlases.** Atlases are collections of maps of regions, countries, continents, or the world. Such maps are accurate only to a degree and can be used for general information only.

c. **Geographic Maps.** These maps give an overall idea of the mapped area in relation to climate, population, relief, vegetation, and hydrography. They also show general location of major urban areas.

d. **Tourist Road Maps.** These are maps of a region in which the main means of transportation and areas of interest are shown. Some of these maps show secondary networks of roads, historic sites, museums, and beaches in detail. They may contain road and time distance between points. Careful consideration should be exercised about the scale when using these maps.

e. **City/Utility Maps.** These are maps of urban areas showing streets, water ducts, electricity and telephone lines, and sewers.

f. **Field Sketches.** These are preliminary drawings of an area or piece of terrain. (See Appendix A)

g. **Aerial Photographs.** These can be used as map supplements or substitutes to help you analyze the terrain, plan your route, or guide your movement. (See Chapter 8 for additional information).

2-8. STANDARDS OF ACCURACY

Accurate, is the degree of conformity with which horizontal positions and vertical values are represented on a map in relation to an established standard. This standard is determined by the DMA based on user requirements. A map can be considered to meet accuracy requirement standards unless otherwise specified in the marginal information.