

CARTOGRAPHY

Maps for Fighters

Charts, photographs and atlases are marshalled for use by experts in compiling military maps which are absolute essentials of any military operation.

By **MARTHA G. MORROW**

► **GENERALS PLANNING** a campaign or directing a battle live in a litter of maps, if we may believe the pictures we see. Maps are spread on the table at headquarters, more maps lie folded or rolled in cases or on chairs, big maps all speckled with pins hang on the wall.

Regimental commanders on the march consult maps, as anxiously as any tourist motoring in strange territory. There are no friendly signposts to point the way—and the penalty for taking the wrong turn is likely to be severe. Company commanders moving into line have maps of their own and adjoining sectors of the front. Artillerymen must have maps of split-hair accuracy, for a line misplaced by a tenth of a millimeter on the map may throw their fire off the target by a hundred yards, or even cause them to shell their own front-line infantry.

Maps thus appear as absolute neces-

sities in any kind of military operation, from the greatest to the least. Soldiers must have, first of all, good shoes. Then they must have weapons and ammunition. Then food. Probably good maps would come next—if indeed they should not come even before food.

Making up-to-the-minute maps, accurate in every possible detail, is the job of the Army Map Service, which serves both the Army and Navy. On the outskirts of Washington, D. C., there is a camouflaged, windowless building. This is the military map center of the U.S.A., the scene of great activity, continuous research, and painstaking checking and rechecking.

All available data concerning the region to be mapped are sought. An old guidebook or a new atlas, a map from a refugee's suitcase or recent photographs taken from a bomber, all may be utilized in mapping the region. The country has been scoured for bits of information that might be useful.

The completed maps are printed on paper which will stand up under hard wear and rough treatment. Though the map should fall in the mud or have grease spilled on it, it can be washed off and used again.

Airplane pilots, flying by night, are thankful for the fluorescent maps. These maps, printed on a newly-developed paper, literally spring to life when the pilot's tiny ultraviolet light, invisible to the enemy plane spotter below, is turned on.

Unfortunately for the map-maker, the spheroidal shape of the earth cannot be presented on a flat surface without distortion. The well-known geographic coordinates, our longitude and latitude, are considered too cumbersome for military use, and a system of rectangular coordinates called a military grid has been devised. Since Pearl Harbor, this system has been adopted to fit all areas outside this country where the British grid was not already in use.

The scale of the map is determined by its eventual purpose. Maps used in planning a campaign, for instance, are less detailed than target maps or those for the ground forces. In a scale of 1 to 63,360, such as might be used in a tactical map, one inch on the map represents a mile on the earth's surface.

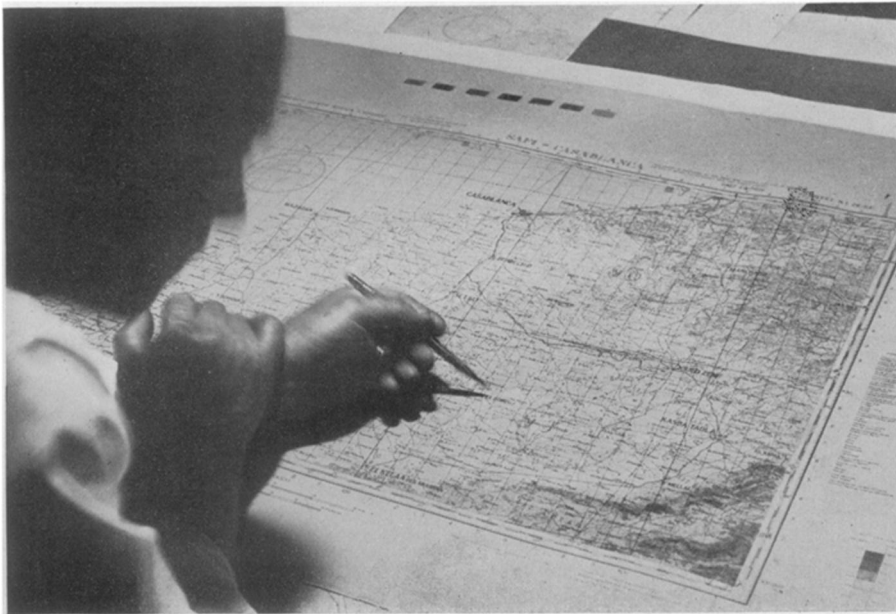
Value of a Map

The value of a map depends on the reliability of the sources from which it is compiled. Wherever possible, it is customary to use cartographic material published by the government of the country shown.

In determining the value of a map as a source, a check is made against existing maps which are known to be reliable. The date the map was made, when the latest corrections were added, the reliability of the publisher, and clarity of detail are all considered. When a compiled map is used, it is first checked against the sources listed.

Corrections are constantly being made on maps kept on file, so that they will always be up to date when needed. The corrections may be noted on transparent sheets placed over the master map, or made on photographs of the map.

A detailed Japanese map may bear the names of hundreds of villages, never before translated into English, all print-



CONTRAST—Fluorescent maps spring to life under ultraviolet rays. Notice how dark the man's face and hands are in comparison with the many details visible on the fluorescent map shown in this picture.

ed in foreign characters. These must be expressed in our alphabet so that when pronounced they will sound like the original Japanese names.

Two languages sometimes appear on maps of foreign countries. In this case the native word for farm, inn or bridge might be used on the map proper and be translated in the glossary at the bottom. Such a map would assist an officer or soldier to receive local help in finding an objective.

Large-scale topographic maps generally make the best maps upon which to base additions and corrections. Others may give railroads, roads, and other important information which should be incorporated into the new map. Photographs taken by pilots flying over enemy territory may supplement the information already on hand.

The difference between single and double track railroads, main and secondary roads, important or unusual buildings, camouflaged installations, canals and airports can be recognized by an expert from photographs. Each photograph is studied intently for additions, deletions or revisions to be made on the map.

Should Overlap

To be of the greatest service, consecutive photographs should overlap about 60%. The side lap between adjacent flights usually ranges between 15 and 30%. In war zones, however, the photographing plane is frequently driven from its predetermined course by enemy fire.

Photographs taken from an airplane are ordinarily vertical, but frequently the plane tilts just as the shot is taken. The angle at which the photograph was made is calculated and the picture photographed with the camera tilted the same number of degrees in the opposite direction. The resulting scene looks approximately as it would have if taken from a vertical position.

Outstanding points such as church towers or bridges are located and used as a guide in piecing together the picture-puzzle. The prints are cut to match as nearly as possible and a mosaic made. This is photographed and becomes the basis upon which additions and corrections on the map are made.

The maps selected as a base are photographed, and a blue line print is made from the mosaics. This is mounted on a board so it will not shrink or show other distortion, and given to a compiler to ink in the desired features. Non-pertinent data are left in blue. It need not be



FURTHER PROCESSES—Regions to be tinted a specific shade are inked solid in black on the color separation map. Additions and changes noted on the transparent gluetone, which has been rolled back, are shown being transferred to the map.

erased, as in the photographic process used the blue will not show up.

The compilation is drafted in colored inks which are the same as those to appear on the finished colored maps. Blue is the one exception; since blue will not photograph, all blue lines appear in green.

These maps are checked in great detail with the original sources and when corrections must be made, are sent back to the compiler for additions or changes. To make corrections legible and to avoid marking up the drafted copy, a transparent, acetate overlay is placed over the drawing before the check is started. Corrections are then made on the overlay.

Maps usually appear in four or five colors. Rivers, lakes and oceans are shown in blue on multicolored maps. Contours and other information related to the elevation of a mountain or valley are shown in brown. Man-made features such as railroads, bridges, buildings, and names of cities and towns appear in black. Roads or highways are printed in red. Woods, forests, orchards and vineyards are appropriately shown in green.

When corrections have been made and checked, the map is photographed. The new blue line board shows in one color all the lines and symbols of the multicolored map. Now each color that is to

appear on the finished map must be drafted separately in black.

Several shades of blue, green or brown are sometimes used to give a more vivid picture of the region at a glance. The tints become progressively darker with an increase in height, so that a mountain top is darker brown than the valley and the seashore. Regions to be tinted a specific shade are inked solid in black.

Plate Made for Each Color

A plate is made for each color to appear on the finished map. In printing, the various colors are made to fall in place exactly. A map would be spoiled, for instance, if the contours governing the path of a river, shown in brown, were shifted slightly to one side of the river in blue. Some of the presses at the Army Map Service are equipped to apply two colors, thus diminishing the chance of error.

About 25 copies of a map are run off and sent for a final check. If important errors are discovered the presses may be stopped and corrections made on the plates themselves. Thus the maps to serve our fighting forces are as accurate as the knowledge at hand and a constant search for new information can make them.