10-1958

Sheet P 5 Series M641 (CCM), Cross-Country Movement and Terrain Map, Halberstat, Germany, 1958

Robert Bolin , depositor
University of Nebraska - Lincoln, rbolin2@unl.edu

CROSS-COUNTRY MOVEMENT AND TERRAIN

GERMANY 1:100,000

EDITION 1-AMS (USAREUR)

REFER TO THIS MAP AS:
SHEET P 5
SERIES M641 (CCM)

MAP EXPLANATION

EVALUATION OF TERRAIN FOR CROSS-COUNTRY MOVEMENT

This map deals with cross-country movement, or movement away from roads. It examines specifically the influence of terrain factors on movement, including maneuvering, of a standard medium tank, like the type now used by United States military forces.

Nine areal units cover the evaluation of all combinations of slope and soil conditions that are significant to cross-country movement in the map area. The numbers of the map units in the AREAL SLOPE — SOIL EVALUATION correspond to numbers of units in the table of TERRAIN TYPES on sheets prepared before 1957. In the expanded, more precise series of evaluations shown on the present map, the direct sequence of numbers is disturbed by the displacement of unit 5 in the table. As representing terrain types, the numbers are used in the same sense on all sheets of the series. Thus, the continuity of numbered units between adjoining sheets is maintained throughout the series. Escarpments and embankments that are distinct hindrances to movement in areas of low or moderate slope, are shown by special symbols. The degree of hindrance to movement caused by forests and drainage features is indicated by additional special symbols.

Data on the terrain factors and the evaluation are generalized to suit the scale of the map. In some areas too small to delineate on a map of this scale, minor deviations from the presentation on the map can be expected.

In the evaluative mapping, urban areas are excluded. The effects of frozen or snow-covered ground and established lines of communication are described in the sheet summary on the reverse side. Evaluations make no allowance for the use of auxiliary equipment to facilitate movement of the tank.

For planning tactical operations, the user may require additional details on terrain conditions. They are obtained best by local reconnaissance.

AREAL SLOPE - SOIL EVALUATION

Evaluation	Map Unit	Description
PASSABLE at all times	1	Slopes less than 5%. Sandy or gravelly soils; stable when wet or dry.
	2	Most slopes 5 to 45%. Sandy, gravelly or shallow soils; stable when wet or dry.
PASSABLE most of time	3	Slopes less than 5%. Highly plastic clay soils; unstable when wet, for short periods in spring.
	4	Slopes less than 5%. Silt and slightly to moderately plastic clay soils; unstable when wet, most of winter and spring.
DOUBTFUL OR IMPRACTICABLE part of time	6	Most slopes 5 to 45%. Highly plastic clay soils; unstable when wet, for short periods in spring.
	7	Most slopes 5 to 45%. Silt and slightly to moderately plastic clay soils; unstable when wet, most of winter and spring.
IMPRACTICABLE most of time PASSABLE OR DOUBTFUL part of time	5	Slopes less than 5%. Sand, silt and clay soils. Waterlogged much of time; frequently flooded. Unstable when wet, autumn, winter and spring.
IMPRACTICABLE at all times	8	Slopes less than 5%. Peat and muck, permanently wet; unstable at all times.
	9	Slopes 45% or more. Soils generally stony; not differentiated.

Explanation of Evaluation Terms:

Passables Slope and soil conditions will permit 40 or more passes in trace of the standard medium tank or maneuvering of a single vehicle.

Doubtful: Slope and soil conditions may or may not permit a few passes of the standard medium tank and probably will not permit maneuvering.

Impracticables Slope or soil conditions will not permit maneuvering and probably will not permit one pass of a vehicle.

EVALUATION OF EMBANKMENTS AND ESCARPMENTS in otherwise passable terrain

Evaluation	Symbol	Description
MAXIMUM HINDRANCE		**Embankments** and cuts. More than 45% slope. More than 3 m high, and generally less than 15 m high. Barbs point down slope.
		Escarpments and other natural slopes. More than 45% slope. Generally more than 15 m high. Barbs point down slope.

EVALUATION OF FORESTS

Evaluation	Symbol	Description
MINIMUM HINDRANCE		Trunk diameters and spacing in forest (including recently cut areas and nurseries) create no serious obstacles to movement and maneuvering.
MAXIMUM HINDRANCE		Trunk diameters and spacing restrict movement and maneuvering generally to lanes in forest. Arrows indicate orientation of forest lanes, occuring singly or in closely spaced nets. Absence of arrows indicates no one orientation predominates.

Note: In rugged areas the two forest types are not distinguished but all are shown by the maximum hindrance symbol.

EVALUATION OF DRAINAGE FEATURES

Evaluation	Symbol	Description
LITTLE OR NO HINDRANCE		Small streams and ditches. Easy to cross all or most of year.
SEASONAL HINDRANCE		Streams and canals. Difficult to cross during periods of high water. (See sheet summary on reverse)
PERENNIAL HINDRANCE		Large streams and canals. Difficult to cross all or most of year.

M 641 (CCM)
Edition 1-AMS (First Printing 11/58)

Cross-Country Movement Intelligence:
Prepared under the direction of the Engineer, USAREUR, by the 139th Engineer Detachment (Terrain) and USOS Team (Europe) August 1958. See general statement (reverse side) regarding sources of information.

Base Map:
Geographical Section, General Staff, No. 4416. (AMS M 641)
Published by War Office, 1944
Fourth Edition, 1954.

Users noting errors or omissions on this map are urged to mark hereon and forward to the Engineer, USAREUR, Attn: Intelligence and Mapping Branch.

GRID ZONE DESIGNATION 32U
100,000 M SQUARE IDENTIFICATION: NC PC
40

IGNORE the SMALLER figures of any grid number. these are for finding the full coordinates. Use ONLY the LARGER figures of the grid number. example. 57 40000

TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 1000 METERS

SAMPLE POINT: MANNDORF

1. Read letters identifying 100,000 meter square in which the point lies: PC
2. Locate first VERTICAL grid line to LEFT of point and read LARGE figure labeling the line either on the top or bottom margin, or on the line itself: 3
3. Estimate tenths from grid line to point: 5
4. Locate first HORIZONTAL grid line BELOW point and read LARGE figure labeling the line either on the left or right margin, or on the line itself: 5
5. Estimate tenths from grid line to point: 1

SAMPLE REFERENCE: PC3551

If reporting beyond 10 in any direction, prefix Grid Zone Designation, as: 32UPC3551

Scale 1:100,000

1 0 1 2 3 4 5 6 7 Statute Miles
1 0 1 2 3 4 5 6 7 8 9 10 Kilometers
2000 0 2000 4000 6000 8000 10000 12000 Yards
1 0 1 2 3 4 5 6 Nautical Miles

TRANSVERSE MERCATOR PROJECTION

10,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 32, INTERNATIONAL SPHEROID

THE LAST FOUR DIGITS OF THE GRID NUMBERS ARE OMITTED

LEGEND

Road classification is NOT based on reconnaissance. Reliability uncertain

Motor Highway (independent of road system) Reichsautobahn, 2 carriage ways each metalled and 7.5 m. wide
Connecting points with road system where known
Under construction
Main roads. Reichsstrassen with route numbers — Metalled and mostly 6 m. wide — 56
Other Main Roads. (mostly Landstrassen 1. Ordnung) metalled and 5.5 m average useful width
Secondary Roads. Metalled and 4 m. average useful width
Other Roads and Cart Tracks. Not always motorable and often unmetalled

Railway, Multiple track (normal gauge) with station, halt
Railway, Single track (normal gauge)
Railway, Narrow gauge, tram or Spur track
Urban Areas

CONTOUR INTERVAL 10 METERS UP TO 50 METERS AND 25 METER INTERVAL THEREAFTER

HEIGHTS IN METERS

HALBERSTADT, GERMANY

PRINTED BY 656 ENGR BN (TOPO) (ARMY) 12-59 10458-1R 6M
EICRP

DESCRIPTION OF THE CRITERIA FOR EVALUATION OF CROSS-COUNTRY MOVEMENT CONDITIONS

General Statement

Terrain consists of various elements, which alone and in combination influence cross-country movement of vehicles. The primary factors are slope and soil. Either can facilitate movement or act as a hindrance. Where slope is not the limiting factor in movement, trafficability of the soil becomes the major consideration. Other elements can modify the inherent suitability of slope and soil, generally by creating barriers. This is true of certain forests, natural escarpments and artificial embankments, and natural and artificial drainage.

The evaluation of movement conditions has been accomplished by direct ground and aerial observations of the map-area, examination of detailed topographic and special maps, interpretation of aerial photographs, performance and interpretation of field and laboratory soil tests, and utilization of detailed records on forests and streams.

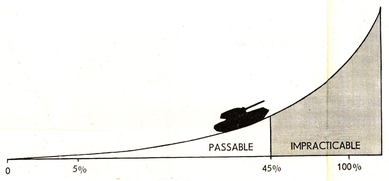
Comments on the general effect of individual terrain factors and the criteria used in determining their influence on tank movement follow.

Slope

With good traction and no vegetation barriers, the standard medium tank can move and maneuver effectively on slopes with a maximum grade of 45%. Performance on steeper slopes requires unusually favorable ground conditions or special auxiliary equipment, which cannot be taken into account in the present evaluation of movement.

On this map, all areas, in which there is a concentration of slopes of 45% or more, are separated out (Map Unit 9)as forming a severe hindrance to tank operation. Locally, within these areas, smaller areas, not large enough to show on a map of this scale, consist of gently rolling or relatively flat land. These smaller areas are, in some cases, easily accessible from roads, and can have local importance.

Artificial embankments (including canal banks, road and railway cuts) and natural escarpments, terrace slopes and valley walls with slopes of 45% or more, which do not have sufficient areal extent to be shown as map units, are indicated by special symbols (see Map Explanation).



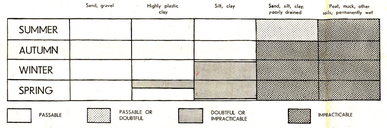
Soil

Trafficability of soils depends largely on their bearing and traction capacities. The properties of the soil that affect these capacities include texture, plasticity, cohesion, amount of organic matter, and permeability. They determine the rate of soil wetting and the character of the soil when either wet or dry. Hence, for most soils, the bearing and traction capacities are dependent on soil moisture conditions. For all soils, except coarse-grained types, the strength or stability decreases with increasing moisture content. Fine-grained soils with moisture content at or near maximum are unstable and will not support moving vehicles. Coarse-grained soils retain their strength regardless of the moisture content. They are, therefore, apt to be trafficable almost always, whereas fine-grained soils range widely in trafficability. Not all fine-grained soils become wet with equal rapidity nor retain this condition for the same length of time. Some are trafficable most of the time, others become unsuitable for traffic even after rather short periods of wet weather.

Some soils, because of their topographic position, are permanently waterlogged and frequently inundated. This condition may exist in a wide range of soil types, but is encountered most commonly in peat and muck, which are found in flat or depressed parts of plains.

Another condition that renders soils untrafficable is the presence of many large stones or rock outcrops. This condition exists partly in areas that are also untrafficable because of excessively steep slopes. On this map, therefore, trafficability of the soil is not evaluated in areas characterized by slopes of 45% or more.

The classification of the soils, description of their salient features, and evaluation of their trafficability are treated specifically in the Map Explanation. In the table below, the general evaluation of the trafficability of the different types of soil is shown for the different seasons of the year. Summer is considered to include approximately the months of June, July, and August; autumn, September, October, and November; winter, December, January, and February; and spring, March, April, and May.



Vegetation

Movement conditions produced by slope or soil can be modified by the presence of a forest that cannot be avoided. The effect of the forest on movement is determined by diameter and spacing of tree trunks and dimensions of the vehicle. German forests are predominantly a cultivated crop, managed by fairly standard methods. For a given species, the physical characteristics of trees in the same broad age group are fairly uniform. This condition aids greatly in evaluatina the forest as a hindrance.

For the standard medium tank, trees with trunk diameters of less than 8 cm are of slight hindrance, since they can generally be pushed over. The limiting diameter for over-turning a single tree is 15 cm for deep-rooted trees (like oak) and 20 cm for shallow-rooted trees (like spruce). The over-turning of trees within stands can present complications. Thus, it is likely that, if several trees are pushed over, some will not fall clear, but instead will interlock with other trees to form a new barrier to movement. Another difficulty can arise from the broad root systems of overturned shallow-rooted trees. An advancing tank can become high-centered on the roots.

If the trees cannot be turned over, movement and maneuverability are dependent on trunk spacing. The spacing must exceed the width of the tank and its turning radius. Tree spacing of 5 m and more permit complete freedom of operation for the medium tank.

On this map, forest and associated vegetation are separated into two types, based on the relative hindrance to movement. On slopes of less than 45% the forests, in which tree diameters are less than 8 cm or spacing is greater than 5 m, are classed as minimum hindrance; all others are maximum hindrance. Most German forests have an excellent system of forest lanes. On the map, arrows are used to show the predominant orientation of lanes on which medium tanks can operate. Where no symbol is used, the roads are oriented in several directions and no one orientation predominates.

In areas with slopes of 45% or more, slope alone is a major hindrance to movement, although the effect of forest is to intensify the difficulties of movement. All of the forest is classified as maximum hindrance, although locally it may be of the minimum-hindrance type.

PENETRABLE FOREST

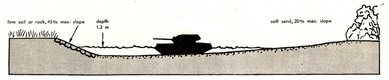
Drainage

Natural and artificial drainage features are hindrances to cross-country movement. Normally they are crossed by an established system of bridges and ferries. This map, however, evaluates the degree of difficulty drainage features present to crossing, independent of existing facilities.

Ease of crossing is measured in terms of fordability. Fordability is dependent on characteristics of the drainage feature and performance capacities of the vehicle not equipped with a fording kit. The significant characteristics of a drainage feature vary independently along its length. Fording, even of the smallest streams, requires selection of sites where favorable conditions coincide. The most favorable sites for fording by the standard medium tank are those where: (1) water depth is less than 1.2 m; (2) velocity of flow is less than 5 feet per second; (3) banks are no higher than 1 m or less than 45% in slope; (4) banks and bottom are firm. With hard banks and bottoms, bank slopes up to 45% can be negotiated; in softer materials, slopes may need to be as low as 20%. Boulders, sufficiently large and numerous to hinder crossing may occur within the stream, especially in areas of rugged terrain.

For this map, drainage features are considered no hindrance if they are easy to cross because fords are common and usable with little or no improvement; they are considered a hindrance if difficult to cross because suitable fords are lacking or rare, or any fording would require considerable preparation of approaches, reinforcement of bottoms or the use of special equipment on the standard tracked vehicle.

Depth and velocity of water vary with seasons and seasonal norms vary from year to year. Interpretation of water conditions for this map is based on seasonal means established from past records. On such basis some streams are classified easy to cross all or most of the year and some are classified easy to cross in certain seasons. However, at any given time abnormally increased depths caused by unseasonable floods or unusually wet years can make these streams a greater hindrance than they are rated to be. Conversely, unusually low water may permit fording of some streams classed as difficult to cross. Local reconnaissance is especially important for drainage features, to locate fords and ascertain water depths at the time proposed for action.



LIMITS OF FORDABLE SECTION

SUMMARY OF TERRAIN AND CROSS-COUNTRY MOVEMENT
SHEET P5 HALBERSTADT

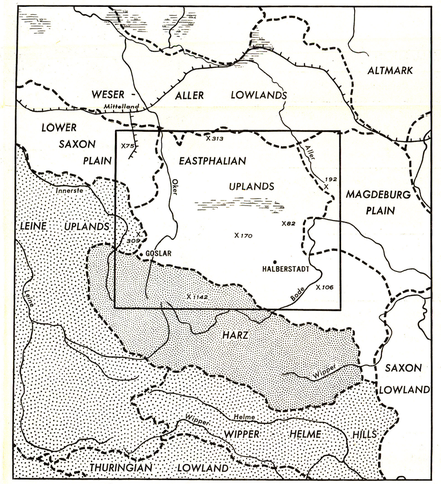
General terrain evaluation: Most of the Halberstadt sheet-area consists of plains, except the hills in the southwest referred to as the Leine Uplands and the Harz. The greater part of the plains falls into the Eastphalian Uplands, and a small part lies in the Lower Saxon Plain and the Magdeburg Plain. The plains are silt covered and have a flat to undulating surface with scattered low hills. Extending east-west across the central part of the Eastphalian Uplands is a broad poorly drained flat containing a large marsh. Local relief on the plains ranges principally from 5 to 25 m; altitudes range from a low of 75 m in the Lower Saxon Plain to a high of 313 m in the Eastphalian Uplands. Drainage of the plains is by the Oker and Bode Rivers, which have their sources in the Harz, and by the Aller River. Most of the plains are in low-growing crops, some parts are in pasture, and a few large tracts are in forest. The Leine Uplands consist of NW-SE trending forested ridges rising 25 to 100 m above the broad valley of the Innerste River that is chiefly in low-growing crops. The Harz are very rugged, steep, forested hills rising 150 to 300 m above the adjacent areas, although in parts of the interior, especially in the southeast, local relief is milder, ranging generally from 25 to 100 m. Population within the sheet-area is concentrated in villages, most of which occur on the plains and in the valleys.

General evaluation of cross-country movement conditions: Movement of tanks in the northern part of the sheet-area would be hindered only by the Oker River, in the central part of the Eastphalian Uplands by the broad marsh and seasonally by the Oker River, and in the south by the steep forested hills of the Harz and seasonally by the Bode River. Between these obstacles, movement is feasible; forests and local steep hills could be bypassed.

Effect of weather on movement: The silty soils which cover almost the entire sheet-area are most favorable for movement of tanks from early April through November, although occasionally after prolonged rains the bearing strength of the silts becomes low for short spells. These spells are most likely to occur near the beginning and end of this period. From December through March, conditions are unfavorable most of the time, owing to the persistence of deep mud. In winter, especially in January and February, the silty soils may be frozen sufficiently deep and hard to sustain traffic. Snow cover is usually deep in the Harz; in the remainder of the sheet-area it may be occasionally deep enough in January and February to be a slight hindrance. Fog would affect movement a few days during the period from October through December, by reducing visibility.

Stream regimen: The high-water period of streams occurs usually between mid-November and late April; during most of this period streams classified as seasonal hindrances are unfordable. Peak levels are generally in February and March, during which time the large streams may overflow their banks and streams classified as of little or no hindrance may become too deep to ford for short spells. Low-water levels are generally in August, September, and October.

Roads: A well-developed network of improved-surface roads, most of them suitable for one-lane traffic, covers the sheet-area.



- Plains
- Low mountains (relief 300 m to 1,000 m)
- Low hills (relief less than 150 m)
- Escarpments (slopes over 45%; height over 100 m shown in areas of Plains and Low hills)
- High hills (relief 150 m to 300 m)
- Marshes (permanently wet areas)
- Terrain area boundary
- International boundary

TERRAIN AREA	LANDFORMS, RELIEF	SOILS	VEGETATION	DRAINAGE	CULTURE	CROSS-COUNTRY MOVEMENT
MAGDEBURG PLAIN	Flat to undulating plains with scattered low ridges. Local relief: on plains 0-25 m; ridges 25-30 m. Slopes: on plains 0-5%; ridges 5-10%. Altitudes 76-192 m.	Silt.	Mainly low-growing crops; some pasture; very little forest.	Aller River in W. Bode River crosses in S. Numerous small streams oriented generally E-W.	Adequate system of roads. Settlement in scattered villages.	Fair. Movement feasible in any direction. Bode River and soils seasonal hindrances.
EASTPHALIAN UPLANDS	Flat to undulating plains; in central part with broad, poorly drained flat containing large marsh. Some scattered hills. Local relief: on plains 5-25 m; hills 25-100 m. Slopes: on plains 0-5%; hills 5-20%. Altitudes 82-313 m.	Silt. Clay of low plasticity locally in W and NE. Peat in marsh.	Low-growing crops dominant; some pasture. Large tracts of forest common on hills.	Oker and Bode Rivers flow N across area. Small streams oriented generally E-W. Ditches and canals drain poorly drained flats.	Extensive network of roads. Numerous villages scattered over the area.	Fair. Movement feasible. Hindrances: marsh in central part, ditches and canals, Oker River except in the S where it could be crossed seasonally, and local large forests. Forests and marsh could be bypassed. Soils seasonally muddy.
LOWER SAXON PLAIN	Flat to undulating plains with scattered low hills. Local relief: on plains 0-10 m; hills 25-100 m. Slopes: on plains 0-5%, mostly less than 3%; hills 5-25%. Altitudes 75-140 m.	Silt.	Mainly low-growing crops. Some pasture and small tracts of forest.	Numerous small streams oriented generally E-W. Large canal in N.	Many roads. Settlement in scattered villages.	Fair. Movement feasible. Hindrance: large canal in N. Forests easily bypassed. Soils seasonally muddy.
LEINE UPLANDS	Low hills with broad NW-SE trending valley along Innerste River. Local relief: valley 10-25 m; hills 25-100 m. Slopes: valley 3-12%; hills 12-30%. Altitudes 137-309 m.	Silt.	Forest on hills. Low-growing crops and some pasture in valleys.	Innerste River (50-70 m wide) flows N and W. Many small streams.	Adequate road system. Scattered small villages.	Poor. Movement feasible in valley. Forested steep ridges severe hindrance; could be bypassed. Soils seasonally muddy.
HARZ	Very rugged high hills dominant; low hills in S and E; highly dissected in N. Local relief: high hills commonly 150-300 m, in places up to 500 m; low hills 25-100 m. Slopes: dominantly over 45%; parts of interior 5-30%. Altitudes 252-1142 m.	Silt, in many places with rock fragments. Organic mat surface on flats at high altitudes.	Dense forest. Few clearings, mainly in E, in low-growing crops and pasture.	Oker and Bode Rivers and numerous small streams originate in Harz; flow generally N. Many small lakes in W.	Moderate number of roads. Settlement sparse.	Impracticable because of combination of extensive forests, steep slopes, and rough ground surfaces. Local movement feasible in clearings on well-drained smooth slopes.