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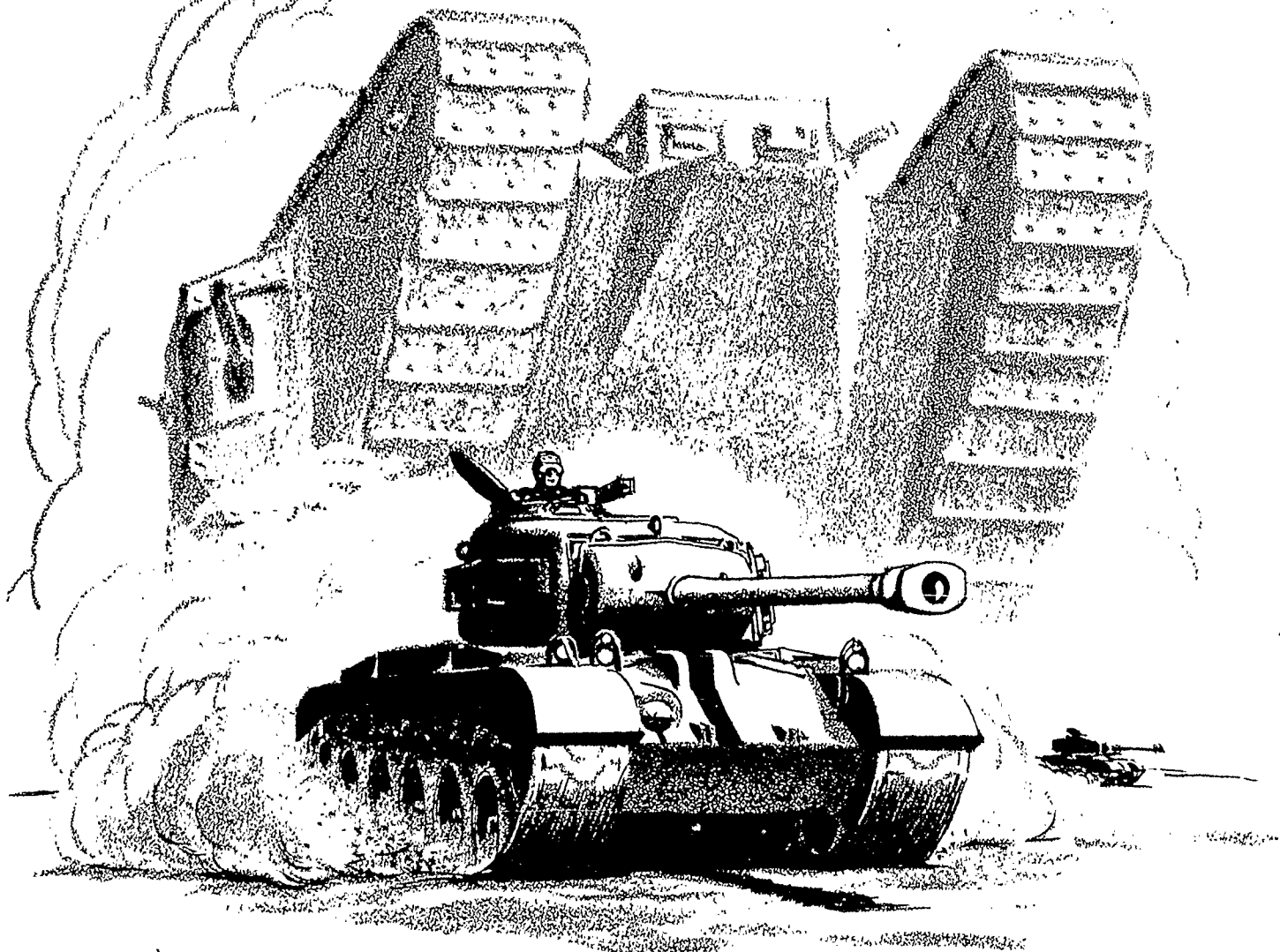
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Terrain, Weather, and Hydrographic conditions in Turkey and adjoining Countries Relative to Their Effect on Armored Employment

VOLUME II



A RESEARCH REPORT

Prepared at
THE ARMORED SCHOOL
Fort Knox, Kentucky
1951 - 1952

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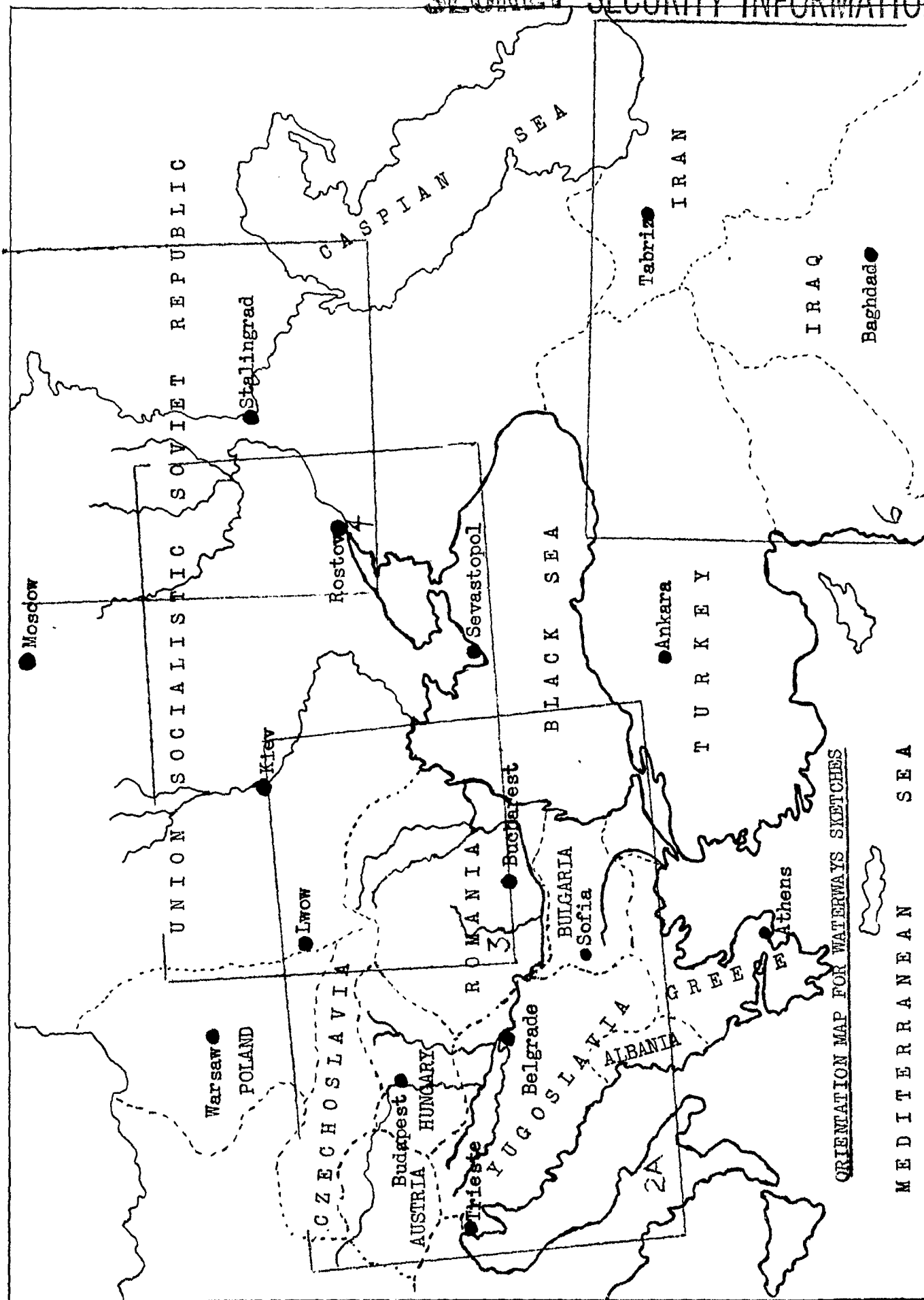
CHAPTER 7

INLAND WATERWAY TRANSPORTATION

Major rivers running perpendicular to the zone of advancing military forces present major terrain barriers. Conversely, when they parallel the axis of advance they tend to secure flanks and provide a logistical line of communication. Rivers constitute one of the biggest problems for planning large scale military operations, either plans for their full utilization or to cross them as barriers. As barriers, they have been adopted in many parts of the world as political boundaries, in many cases preventing bridge construction because of distrust between nations.

The DANUBE RIVER is a combination barrier and axis of advance into the BALKANS. Its west to east course between ROMANIA AND BULGARIA, strategically bisects these two countries and is a barrier to north and south movement. Its northern course through HUNGARY, and its tributary the SAVA RIVER, provides an excellent avenue of approach to the heartland of CENTRAL EUROPE from the ADRIATIC SEA. As well its lower course is an entry from the BLACK SEA to the east.

The main rivers of SOUTH EUROPEAN RUSSIA are all major avenues of approach deep into Soviet territory. As entries they are further enhanced by leading inland from the BLACK SEA, except the VOLGA RIVER. This fact affords modern invaders a more-or-less sheltered sea area from which to launch operations. Because of the heavy demands of armored warfare, utilization of these advantageous routes of entry is imperative.



ORIENTATION MAP FOR WATERWAYS SKETCHES

MEDITERRANEAN SEA

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South European Russian Waterways

In all of RUSSIA there is approximately 125,000 miles of streams, of which about 25,000 miles are navigable for river craft.¹ The bulk of these navigable streams are in EUROPEAN RUSSIA and for centuries have had their role in historical events. Streams have been the means of transporting materials used to build roads and railways, resulting in the latter supplementing inland water transport.

Prior to World War II much engineering was started to improve and augment existing natural waterways. The BLACK SEA was connected to the BALTIC SEA for sea going vessels. Dams were built to improve navigation and provide cheap hydro-electric power. A canal was started to connect the great VOLGA RIVER with the DON RIVER, supposedly west from STALINGRAD, the completion of which has recently been reported. Current press reports have applauded the mechanization and modernization of inland shipping, which indicates its share of importance in Soviet economy. Soviet water transport figured heavily in Russian postwar reconstruction in the war ravaged area covered by this study.

Any proposed military operation into EUROPEAN RUSSIA from BLACK SEA bases, should not overlook the exploitation of river craft for logistical purposes. It is well known concept that much more tonnage can be towed by a tug boat, than equal rail motive power can move. On natural waterways, the cost per ton-mile, and upkeep maintenance is likewise far less than other modes of transportation. Because of the tonnage demands of armored warfare, which this area

LEGIBILITY POOR

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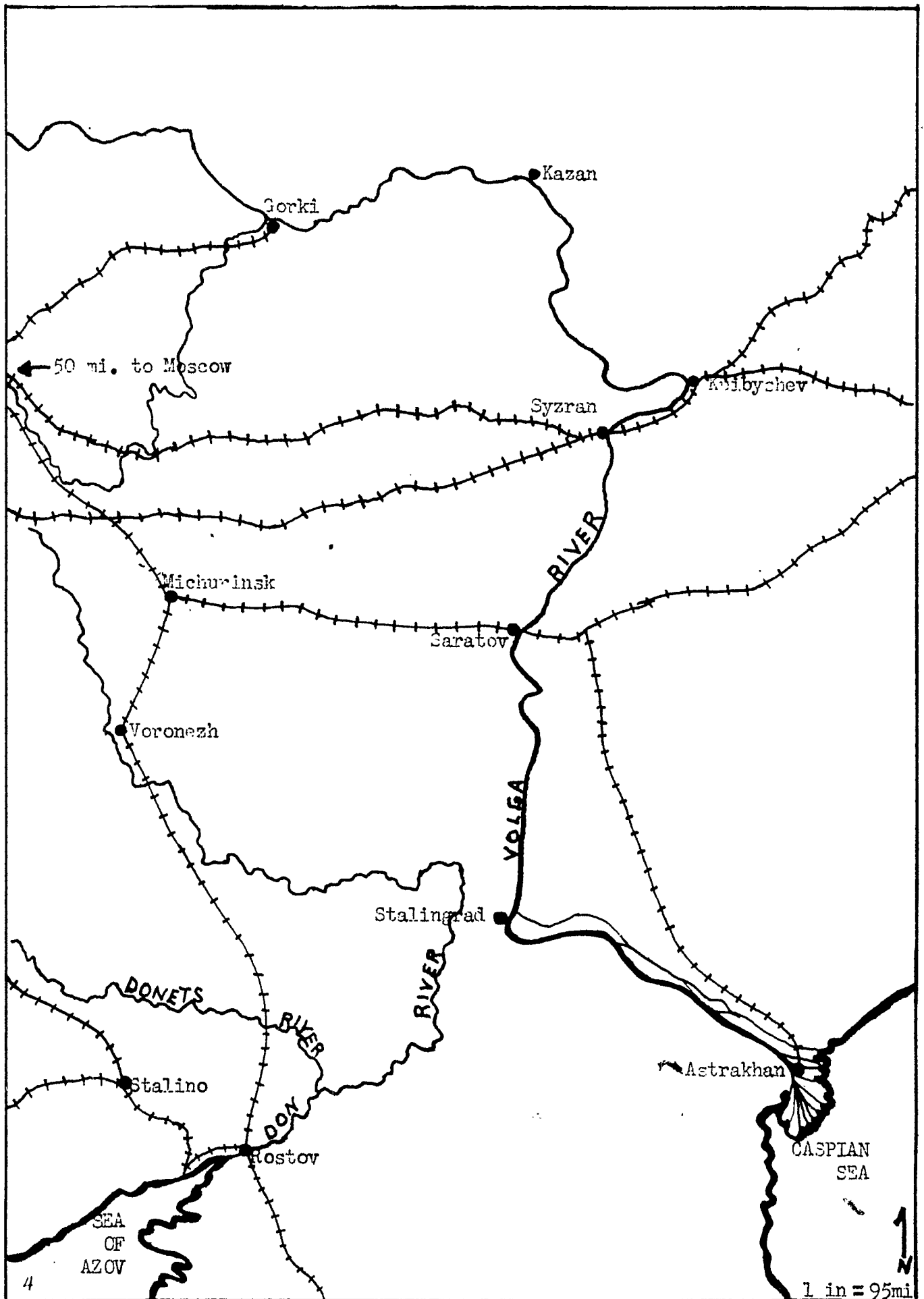
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favours, water transport would undoubtedly make a large contribution, if adequate prior plans for utilization were effected.

The VOLGA RIVER, is the longest and most important river in EUROPEAN RUSSIA, and the longest river of EUROPE. Its total length is 2,325 miles, draining an area of 563,300 square miles. In the lower reaches, the VOLGA is subject to floods in the spring which overflow and wash away much fertile alluvial earth. The depositing of this earth in the delta region of its mouth on the CASPIAN SEA creates a constant dredging job to maintain navigation.

For the purposes of this study, only the stream from KAZAN, which is a little north from due east of MOSCOW, to the CASPIAN SEA is discussed. From KAZAN to STALINGRAD, a distance of 938 miles, the normal draught is seven feet. There were 37 commercial landing stages and 28 harbors in 1939. Six of these harbors are considered safe and ice proof. From STALINGRAD to ASTRAKHAN, a distance of 343 miles, navigation is normally similar to that above STALINGRAD. But from ASTRAKHAN to the CASPIAN SEA, a distance of 71 miles, a non-tidal estuary causes tricky navigation and constant dredging is required to maintain depths of eight feet.

The drawbacks to navigation on the VOLGA RIVER are long winter frosts, shallowness of river during late summer droughts, and formation of alluvial islands in the channel. During the winter the upper reaches of the river are used as sledge routes, with ice lasting from 90 to 160 days. The average dates of break up are April 16th at KAZAN, April 7th at STALINGRAD, and



March 17th at ASTRAKHAN.²

The DON RIVER with a total length of 1,325 miles flows into the SEA OF AZOV, at ROSTOV, which gives EAST EUROPEAN RUSSIA an outlet into the BLACK SEA. The course runs generally southeast from MOSCOW, with a broad loop toward STALINGRAD, coming within 48 miles of the VOLGA RIVER west of this big city. The river is characterized by wide variables in widths and depths. The width varies from 500 feet to 1,870 feet, and depths vary from 4 feet to 70 feet. It has many tributaries, of which the VORONEZH, KHOPEL, MEDVYEDITSA and DONETS RIVERS are navigable. The DONETS RIVER with a total length of 680 miles gives access to KHARKOV during high water seasons.

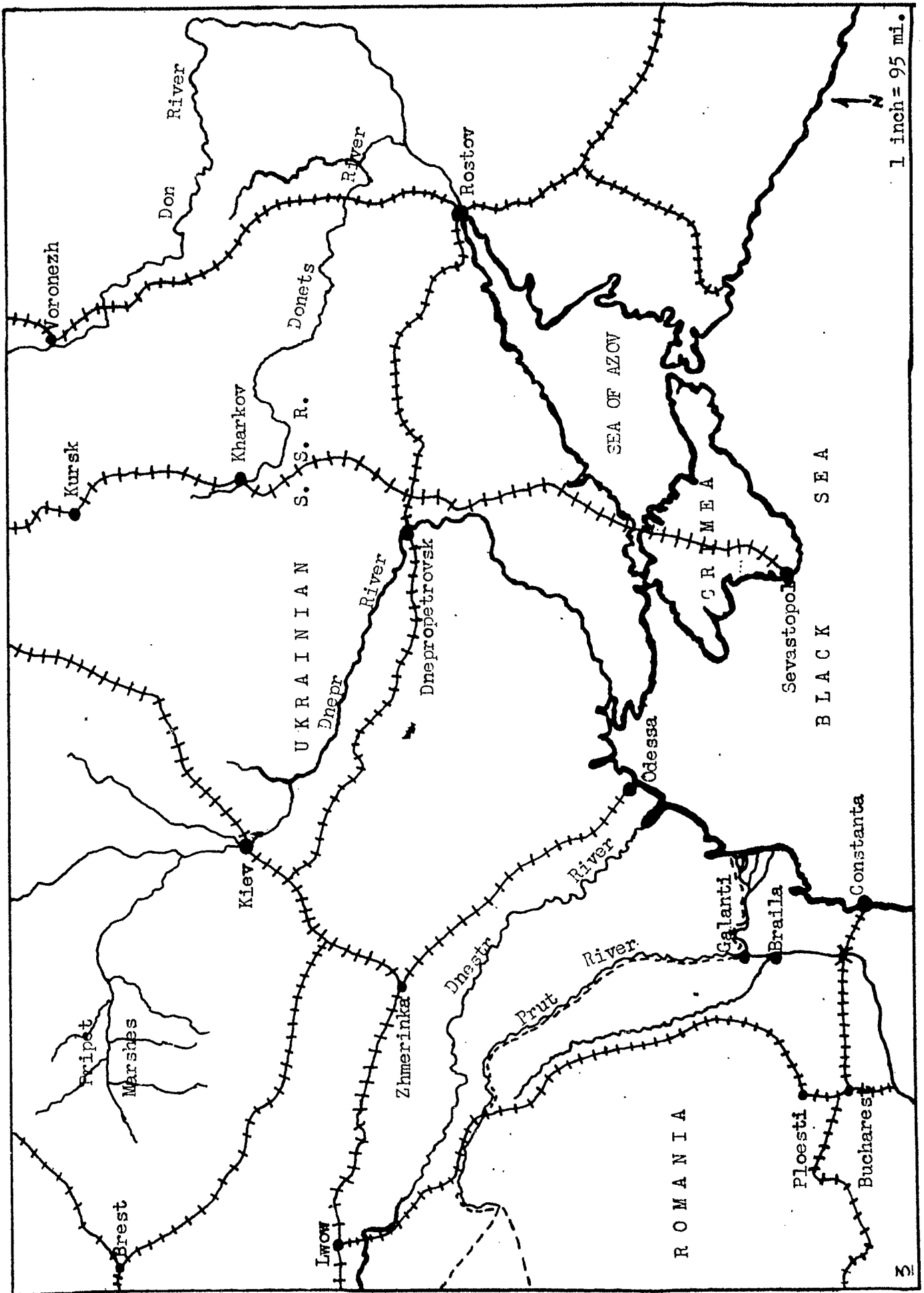
The lower section of the DON RIVER is subject to two annual floods, one caused by the melting snow of the CAUCASUS AREA in early spring, and a later flooding by thaws in its northern tributaries. By the beginning of June the river begins to subside, and navigation almost ceases during August. September rains again allow small craft to navigate until winter freezes begin. The DON RIVER is usually closed by ice from November or December to March or April, and at rare intervals it freezes in October. The delta of the river remains open an average of 250 days each year.³ Recent press reports have confirmed the completion of a 60 mile canal connecting the DON and VOLGA RIVERS near STALINGRAD. River barges of 2,000 ton capacity will be standard, and it is doubtful if sea going vessels will be able to negotiate the canal. From the Volga River

the barges will be raised 289 feet through nine locks, then to be lowered 144 feet through four locks to the Don River. A dam at TSYMLYANSKAYA is to back water up to the canal level and provide a reservoir for operating the locks.⁵

The DNEPR RIVER bisects WEST EUROPEAN RUSSIA for a distance of 1,410 miles. Canals have been constructed which make this river the most important waterway of RUSSIA, connecting the BLACK SEA in the south with the BALTIC SEA in the north. This river has some difficult rapids which have been the subject of engineering works for almost a century. Most of the difficult portions have been bypassed by canal construction, and the river is navigable for 10 to 12 feet draught vessels beyond SMOLENSK, west of MOSCOW. In 1927, a dam was constructed at the rapids near DNEPROPETROVSK, under American supervision, with sluices and docks to allow ships to pass. This was also a major source of electricity for UKRAINIAN industry. The dam was destroyed by the Germans in World War II.

The BEREZINA and PRIPET RIVERS from the west, SOZH and DESNA RIVERS from the east are navigable tributaries. The DNEPR RIVER is connected to the BALTIC SEA by the DNEPR-BUG CANAL, PEREZINA, and OGINSKI CANALS. At KIEV, the river is free from ice an average of 234 days each year. It is ice free at DNEPROPETROVSK for 270 days, and at KHERSON near the mouth for 277 days.⁴

The DNESTR RIVER has its headwaters in the vicinity of the strategic inland communications center of LVOV, and runs southeast into the BLACK SEA at the important port of ODESSA. This river used



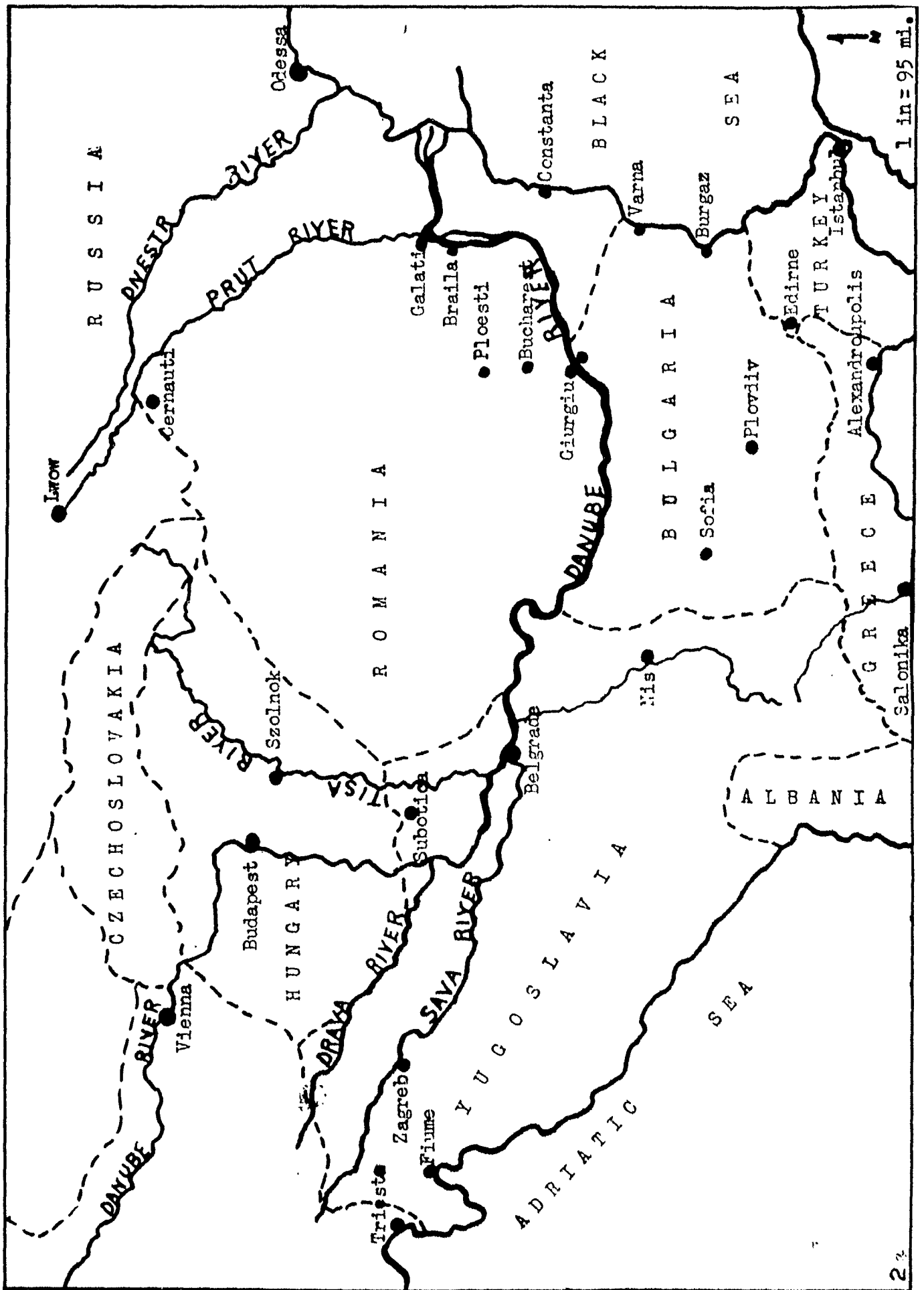
to be the boundary between RUSSIA and ROMANIA, but since 1947 the boundary was moved westward to the PRUT RIVER, putting the DNESTR RIVER entirely in Soviet territory.

The DNESTR RIVER drains an area of 29,670 square miles. It meanders excessively, and compared to most Russian rivers has a rapid current, even during low water. The average current has been calculated at one and seven-elevenths miles per hour. The average width of the channel is 500 to 750 feet, although at points it is as much as 1,400 feet wide. The depth is variable and changeable, with no specific figures given. A granite spur from the CARPATHIAN MOUNTAINS causes rapids in parts of the upper reaches that make navigation for steamboats hazardous. Engineering has helped improve the channel at this point, but the problem will be ever present. Numerous small tributaries run into the river, but none of importance to navigation.

There are two spring floods, the earlier in February or early March is caused by thaws of ice, and the latter in June is caused by melting snows in the CARPATHIAN MOUNTAINS. These floods usually raise the level of the water 20 feet. In some years the level of water is so low that navigation is possible for only three or four weeks. Other years the water stays so high that navigation is uninterrupted.⁶

Danube River System

The Danube River system is the commercial life line of



the BALKANS. Of the four countries bordering on the river, ROMANIA probably derives the greatest transport value, and BULGARIA the least. The Peace Treaty of 1947 attempted to settle festering navigation rights problems, by guaranteeing free rights of navigation. The achievement of this goal is an improbability at the present time. The traffic through ROMANIA, and along the ROMANIA-BULGARIA border is monopolized by the Romania Sea and River Transportation Company. One-fourth of this company is owned by Soviet Russia. Soviet flotillas were employed in the armor battles for BUDAPEST, HUNGARY in January of 1945, and the DANUBE'S logistical contribution was probably tremendous.

The DANUBE RIVER is 1,750 miles long, draining an area of 320,200 square miles. It is navigable for its entire length through the BALKAN AREA, playing a primary role in the economies of HUNGARY, ROMANIA and YUGOSLAVIA. Many of its major tributaries are also navigable, which further enhances its value. All highways and railways of the three above mentioned countries supplement Danubian inland shipping as transportation means.

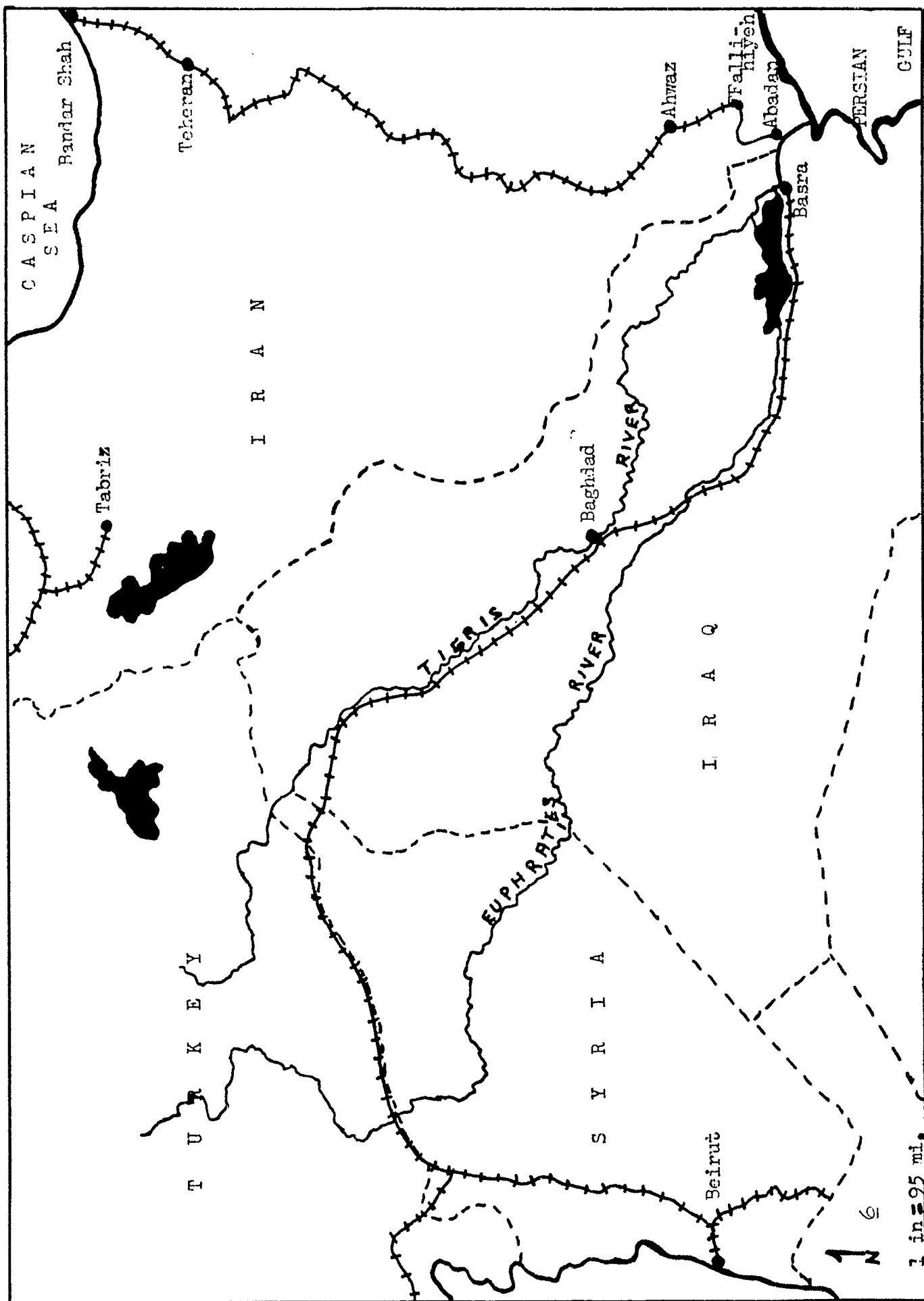
From the mouth of the river to BRAILA, ROMANIA, an approximate distance of 110 miles, sea going vessels of up to 4,000 tons displacement can navigate. Before dredging operations were accomplished eight foot draught was the maximum depth. It is believed ships of up to 20 foot draught can still go to BRAILA, and GALANTI which is located between the tributaries of the SERE and PRUT RIVERS. These cities are important transshipment and rail head points.

River craft and barges of 600 tons displacement can navigate the rest of the length of the river, passing through YUGOSLAVIA and HUNGARY into CENTRAL EUROPE. The DANUBE RIVER is normally closed to shipping for approximately 50 to 60 days during January and February each year due to freezing.⁷

The first important navigable tributary of the DANUBE is the SAVA RIVER, the confluence of which is at BELGRADE, YUGOSLOVIA. The river is 442 miles long, having its headwaters in the DINARIC ALPS north of TRIESTE. Of its total length, 360 miles are considered navigable to special river craft and barges. This distance reaches from well above the important communications center of ZAGREB, downstream to BELGRADE and to the DANUBE RIVER.⁸

The DRAVA RIVER generally parallels at 40-50 miles to the north of the SAVA RIVER, and enters the DANUBE some 150 miles upstream from the SAVA entrance. The mouth of the river is 20 feet deep and 1,055 feet wide, and is navigable for river streamers for about 95 miles upstream. It is navigable for floating rafts only upstream to MARBURG in the northernmost corner of YUGOSLOVIA. This river furnishes part of the boundary between HUNGARY and YUGOSLAVIA. The DRAVA VALLEY is the ancient invasion route into the ALPINE countries for peoples of the EAST.⁹

The TISA RIVER has its headwaters in the CARPATHIAN MOUNTAINS and follows a winding course over the flat eastern HUNGARIAN PLAIN for about 870 miles. It generally parallels the DANUBE RIVER at approximately 80 miles to the east. Its north



to south course crosses HUNGARY into YUGOSLAVIA where it enters the DANUBE about 40 miles north of BELGRADE. The FRANCIS JOSEPH CANAL connects the two rivers in northern YUGOSLAVIA. The river is navigable for river steamers for about 200 miles north to the port of SZOLNOK. This port is the railhead on the railway running east from BUDAPEST to ARAD, ROMANIA.^{9, 10}

Tigris and Euphrates Rivers.

The TIGRIS and EUPHRATES RIVERS both have their headwaters in the mountains of EASTERN TURKEY, and combine to flow into the PERSIAN GULF. The TIGRIS RIVER is 1,150 miles long, and the EUPHRATES is 1,700 miles long.¹¹ The lower portion of these rivers, known as the SHATT-AL- ARAB, is navigable for seagoing vessels for approximately 100 miles inland from the PERSIAN GULF to BASRA. Most of this lower portion serves as a boundary between IRAQ and IRAN, and is the petroleum export outlet for both countries. River vessels totaling 60,000 tons navigate from BASRA to BAGHDAD. But due to the arid climate, navigation goes no further than BAGHDAD and is limited to the TIGRIS RIVER for the most part.

NOTES FOR CHAPTER 7

¹Theater Book-Russia, A study prepared by the G-2 Section, Armored Force, (Fort Knox, Kentucky 1943) Tab, Waterways.

²Encyclopedia Britannica, The University of Chicago Press (Chicago, 1946) Vol 23, p 243.

³Op cit, passim, Vol 7, p 521.

⁴Op cit, passim, Vol 7, p 462.

⁵U.S. News & World Report, a weekly publication, (Dayton, Ohio, 22 Feb 1952) p 38.

⁶Encyclopedia Britannica, The University of Chicago Press (Chicago, 1946) Vol 7, p 463.

⁷Op cit, passim, Vol 7, p 44.

⁸Op cit, passim, Vol 20, p 15.

⁹Op cit, passim, Vol 7, p 624.

¹⁰Op cit, passim, Vol 22, p 246.

¹¹John Kiernan, Information Please, Almanac. (New York: The Macmillan Company, 1952) p 519.

CHAPTER 8

COASTS, LANDING BEACHES AND PORTS

Turkey

TURKEY, separated by the DARDENELLES, SEA OF MARMARA and the BOSPORUS, into ASIATIC and EUROPEAN TURKEY is a country almost surrounded by water. It is bounded on the north by the BLACK SEA, on the south by the MEDITERRANEAN SEA, and on the west by the AEGEAN SEA, and cut entirely in two by the SEA OF MARMARA. For the purpose of discussion the coast of TURKEY will be divided into three areas: THE STRAITS REGION, THE PONTUS MOUNTAIN REGION, and THE TAURUS MOUNTAIN REGION. The STRAITS REGION includes the entire coast of EUROPEAN TURKEY and that part of ASIATIC TURKEY between the BOSPORUS on the north and the DARDENELLES on the south. The PONTUS MOUNTAINS REGION includes all of ASIATIC TURKEY'S coastline from the BOSPORUS to the border of U.S.S.R. The TAURUS MOUNTAINS REGION includes all of the coastline of ASIATIC TURKEY from the DARDENELLES to the border of SYRIA.

Coasts. The BLACK SEA Coast of EUROPEAN TURKEY from BABA BURNU to the SAKARYA BASIN is steep, wooded, and backed by mountains in many places. The abrupt termination of the coastal mountains 40 miles west of BABU BURNU marks the beginning of the SAKARYA BASIN which is 30 miles wide and extends 35 miles inland.¹ It affords exits to ADAPAZARI, ISMIT, and the interior. From this basin west to the BOSPORUS the shoreline is backed by massive, flat topped,

wooded hills with very minor beach areas. The coasts from the GREEK border to the COO STRAIT are varied and complex. At the mouth of the MARITSA RIVER which marks the border there is a flat marshy delta plain. The town of ENEZ serves as a port for EDIRNE via flat bottomed river boats.² Extending south and east to the base of the GELIBOLU PENINSULA the coast is backed by rugged hills and fringed by a shoal bank. The western shores of the GELIBOLU PENINSULA are steep and inaccessible except through shallow plains. The eastern shores of GELIBOLU PENINSULA are steep and rocky with the approaches impeded by strong currents and eddys. Northeast from the DARDENELLE STRAITS to the town of TEKIRDAG the shore is hilly and rough. The shore fronts the broad ERGENE PLAIN from TEKIRDAG to ISTANBUL. The coast here has low cliffs or embankments broken by beaches and backed by rolling hills. The coast from ISTANBUL to the BOSPORUS is characterized by long, low, narrow beaches located within bays or bights. The BOSPORUS on both the European and Asiatic sides features steep shore lines backed by hills. Beaches are short, disconnected but provide very good exits. Strong currents in the BOSPORUS create poor approaches and anchorages.³ Along the Asiatic side of the SEA OF MARMARA from the BOSPORUS at USKUDAR to IZMIT the coast is backed by large, flat topped hills broken by shallow coastal plains. A road and railroad parallel this coast. Coastal plains continue from ISMIT to the head of GEMLIK KORFEZI where landing facilities exist. The Asiatic shore of the DARDENELLES is lined with long narrow beaches backed by

cultivated plains. Across the DARDENELLES from CAPE HELLES the AEGEAN coast of TURKEY is low and sandy from KUMKALE to YENI-SEHIR where the shore becomes steep and continuous.

The TAURUS MOUNTAIN REGION begins at DELAMAN NEHRI and extends some 560 miles east to the head of the ISKENDERUM then south about 80 miles to the SYRIAN border. This section contains a variety of coastal terrain including bold steep shores indented with bays, which provide natural harbors; stretches of high bluffs without indentation; and beaches fringed with plains, dunes, marshes, and lagoons. Throughout the length of this coast line the shore is backed by high formidable mountain barriers which isolate the coast from the interior. Only two points along the coast are connected by railroad with the interior.⁴

The PONTUS MOUNTAIN REGION begins at the BOSPORUS and extends east to the border of the USSR. The coast is relatively straight, unindented and harborless. Its chief characteristics are unobstructed approaches, simple outline and exposure to the winds and storms of the BLACK SEA. The coastal strip is narrow and rises abruptly to high wooded mountains except at the YESIL IRMAK and RIZIL IRMAK deltas. At the northern end of the mountains the shore line becomes abrupt with only scattered beaches. The only exits from the shores are through narrow stream and river valleys or by narrow foot paths.⁵ The regularity of the coastline deprives it of shelter or safe anchorage for vessels. There are a few small ports along the coast which afford a little security for ships because the coastal mountains

neutralize the effect of onshore winds. A coastal road has recently been built from SINOP through TRABZON almost to the USSR border. This area contains numerous landing beaches but west of this area the mountains again fall steeply to the sea.

Ports. TURKEY has only 14 ports worth commenting upon. Five of these can be classified as principal, four as secondary, and five as minor. The principal ports are ISTANBUL, IZMIR, HAYDARPASA, TEKERDAG, and SILIVRI. The secondary ports are BANDIRMA, CANNAKALI, MERSIN, and ISKENDERUM. The five most important minor ports are SAMSUM, TRABZON, GIRISUM, ORDU, and ZONGULDAK. Detailed information on these ports is not available at this station. However, the present capacity of the ISTANBUL port area is reported as 6000 tons with 2000 tons for IZMIR and 1000 tons for the remaining major ports.

Landing Beaches. There are innumerable landing beaches in TURKEY including 19 known beaches on the BLACK SEA coast of EUROPEAN TURKEY, 36 known beaches on the BLACK SEA coast of ASIATIC TURKEY and many others. The beaches of interest exist on the BLACK SEA in the vicinity of ISTANBUL. Usability for operations is based upon transportation and cross country movement to and from beach area.

Southern Russia

RUSSIA borders on the BLACK SEA on the north and east from the ROMANIAN border to the TURKISH border. The SEA OF AZOV is included within this coast line.

Coast. From the northern mouth of the DANUBE RIVER to SEVASTOPOL near the southern plain of the CRIMEA the coast is low

and irregular. To the west of ODESSA occasional cliffs and hills break the monotony of the low shoreline. Quite a number of salt lakes parallel the coast and are separated from the beaches only by low sandy ridges.⁶ To the east of ODESSA the coast becomes higher and wilder than the western portion. Along this stretch are found steep clay hills cut by ravines, stretches of cliffs, and some headlands. Inland salt lakes are still found behind some of the lower sections and a few others are marshy and swampy. There are numerous sand bars and shores along this portion of the coast.

The southeast coast of the CRIMEA is comparatively high and precipitous except for the low eastern peninsula. The coast is cut by small bays or coves with sand and gravel beaches. In the eastern section, however, the beaches are larger and more numerous.

The AZOV SEA, a shallow inlet of the BLACK SEA, has a depth of about 50 ft which is steadily decreasing.⁷ This is caused by the deposit of sediments from the DON RIVER. In spite of its size it produces four times as much fish as the BLACK SEA. The southern coast of the sea is low and dotted with scattered hills. The western coast is formed by a low, sandy, and narrow peninsula behind which is a long lagoon. High cliffs ranging from 90-130 feet line the coast with some of these forming promontories with extensive sand beaches and banks. The eastern shore is low and backed by lagoons and marshes.

A short distance east of the entrance to the SEA OF AZOV the tips of the CAUCASUS MOUNTAINS run into the sea. From this point

Table VI

Principal Ports of Russia, South Coast

Name	Anchorage	Entrance	Harbor	Wharfage (ft)	Tide Range	Ice Conditions	Inland Clr	Year & Max Ton	Naval Establishments	Building or Repair Facility
Odessa 46°30'N 30°45'E	Extensive in bay, off port in 30' to 40' over soft mud & shells. In harbor road inside breakwater is protected anchored ago in 28' to 32'	The Entrance most used 350' wide, 31' to 33' deep. N. ent as wide with 13' to 33' deep	About 700 acres of enclosed harbor with depths to 33'	9490-5430-4435-1100-20455	Non-tidal Max rise 2'7" Max fall 10" 4'0" Seasonal variation of Black Sea & outflow or rivers	From 2" to 4" from Dec to Mar Max fall 10" in 1937 Usually kept open	3RR lead from Odessa. New roads lead along coast. Other roads lead north.	1935 841,040	No	All shipyards were destroyed by the Germans but minor repairs were obtainable in 1944. The Marti yards built small warships.
Kherson 46°37'N 32°37'E	Vessels moor to buoys in roadstead outside channel.	Dredged channel from Black S. had 1940 depth of 23'. Channel through Bay had bottom width of 350'. Rvach ent to Dnepr used by seagoing vessels.	Roadstead in Dnepr 1700 acres with 30' to 40' depths	4120-4120	Non-tidal. Canalization above loops level constant except during spring floods when max rise may reach 8.5".	Aver 12" to 14", but may reach 27" in severe winters. Usually kept open.	Singlo track RR. Several roads lead inland and along coast.	1935 266,806	No exclusively naval est. but Comintern yards built motor torpedo boats and gunboats.	Several yards building and repairing commercial and naval vessels. The only floating drydock building yards in USSR are reported located here.

Table VI

Principal Ports of Russia, South Coast

Name	Anchorage	Entrance	Harbor	Tharfrage (ft)	Tide Range	Ice Conditions	Inland Clr	Year & Max Ton	Naval Establishments	Building or Repair Facility
Sevastopol 44°27'N 33°32'E	For vessels of deepest draft & large enough for Black Sea fleet.	To main harbor 2000' wide be- tween 5-fm. contours; midchann- el depths 10fms. Channels to small harbors well marked.	Best & safest in Black S. About 4 miles long & 3/4 mi. wide mid- channel depths 8 to 10fms Many coves and harbors open from bay.	740 3300 7785 4730 16,555	Non- tidal but reg. fluctua- tions have mean range of 28".	Never frozen over.	Single track thru Simfer- opol Highways connect into Crimean Peninsula net.	1935 312	Prior to capture by Germans, port was main base and hdqrs of Black Sea Fleet. Except for small portion port used for Navy.	Several building & repair yards. Ships up to destroyers built here. Navy yard primarily maintenance yard. Dock on north side receive capital ships up to 30,000 T.
Mariupol 47°05'N 37°34'E	Several areas in 15' to 25.5' of water.	About 8 1/2 mi. long, 24' deep in 1941 with a bottom width of 328'.	More than 250 acres of sholt- ered water area in two port arens.	11,265 3720 800 15,785	Non- tidal, reg. seasonal varia- tions caused by wind with mean range of 6'.	Ice aver. 105 days ea. yr. 30" thick Easterly winds, if continuous may pack ice to 10' thick.	Double track into USSR net. Low typo (dirt) roads in- land & along coast.	1935 1,495,233 (In 1932 1,775 800 short tons of coal shipped)	No data	Present status of the two marine repair plants is unknown. The one in Zintsov harbor could accomplish all commercial repairs required by the merchant fleet in the Sea of Azov.

Table VI

Principal Ports of Russia, South Coast

Name	Anchorage	Entrance	Harbor	Wharfage (ft)	Tide Range	Ice Conditions	Inland Clr	Year & Max Ton	Naval Establishments	Building or Repair Facility
Rostov 47°13'N 39°42'E	Unlimited in road- stead Bol'shoy Taganrog- skiy Royd. Vessels donied anchorage in reachés of rivér, canals, or dredged channels.	Approach channel is 250' wide 12' deep except for last 7 mi. below Rostov, Channel simuous.	3 3/4 mi. stretch of Don with 18' to 22' depths in midstream.	12,940 12,940	Non- tidal River level much fluct- uation May be lowered 9' or raised 10'.	From 1' to 1 1/2' generally closos river bot. Dec. and late March.	Double track to north & south give best rail connect- ions of any Black S. Port Roads poor.	No data	None	Two small yards for river craft.

Principal Ports of Russia, South Coast

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Principal Ports of Russia, South Coast

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Table VI

Secondary Ports of Russia, South Coast

Name	Entrance	Anchorage	Wharfage		Depth Along ft. side	Berthage No. Type	Hoisting Facilities	Est. un- loading capac- ity	Covered Storage	Circ- umfer- ence	Fuel	Repair Facili- ties	Remarks
			No.	Longth									
Yevsk	At least 230' wide and 11' deep.	Open shelter. Large road- stead anch- orage with depths of 19' to 20'.	3	2570	14' to 17'	9	200'	None	1400 short tons Black Sea.	General cargo 6 ware- houses in port area.	No data. minor re- pairs (any more destroyed)	Shops for cargo handled chiefly by lighterage in roadstead.	
45° 44' N 38° 16' E													
Sukhumi	Open and 800' depth.	Good shelter. 7 3rd class berths in bay.	1	670	16' to 30'	2	N3-S	None	500 short tons Black Sea	General storage 30,000 sq ft	No data	Shops for minor re- pairs. Large floating drydock, beached & damaged.	Floating dry- dock not norm- ally at Sukhumi.
43° 00' N 41° 01' E													
Ochomchiri	At least 246' wide 21' deep.	Open shelter. Large road- stead anchor- age, depths up to 63'.	2	620	21'	2	N3-S	No data.	1000 short tons Black S. sq ft.	General cargo 5000 sq ft.	Coal minor re- stocks pair fac. bunk- for boats ers Marine RR locally mined avail. for boats. coal.	Primary import- ance as ship- ping point for locally mined coal.	
42° 44' N 41° 26' E													

Table VI

Secondary Ports of Russia, South Coast

Name	Anchorage	Entrance	Harbor	Wharf- age (ft)	Tide Range	Ice Conditions	Inland Clr	Year & Max. 1935	Naval Establishments	Building or Repair Facility
Nikolayev 46°57'N 31°59'E	Prohibited in harbor. Ves- sels berth at wharves or moor to buoys close off the wharves.	A 43mi long 150' wide 28' deep channel from Black Sea through Dnep- rovskiy Limn, up Yuzhnyy Bug.	Mole pro- tected 40 acres with 12' 23' depths coastwise trade har- bor. For- eign port about same size 25' to 30' deep.	1075 9240 10,315	Nontidal Variations 2.6' above or below Fresh winds raise or lower 3'.	Frozen about 92 days ea. yr mid-Dec to mid-Mar Ice about 20". Ice breakers keep open.	No RR connections USRR nat and roads lead to Kherson, Odessa, Kirovovog- rad.	1935	No port area for exclusive naval base. Some naval barracks, a rail aviation school, naval testing basin, and Admiralty offices.	Chief naval ship- building yards of Black Sea area & only one in area capable of build- ing capital ships. Two other yards built & repaired naval & commer- cial vessel.
Yalta 44°30'N 34°10'E	2 mi. south of town Harbor in roadstead in 10 to 13 fms over mud & sand. Current & swell when winds south.	From south 33' to 35' depths in fairway.	35 acres Mole pro- tected, 27' to 33' in SE & 9' to 10' in N & NW. Recent- ly reported many shoals.	135 300 1590 460 2485	Nontidal Range 2' with max rise of 1.2" & fall of 10".	Ice free.	No RR Highways lead in- land & along coast.	No data	None	Small craft repairs only.
Feodosiya 45°02'N 35°24'E	In bay off port in 5 to 12fms. Over soft mud Sheltered from all but easterly winds.	Between breakwater & mole about 980' wide & 30' depth.	Mole pro- tected basin of 64 acres with 24' depths ex- cept 3 acres of 19'.	340 3790 600 4730	Nontidal Range of 2' above & below datum of 5.25" above aver min.	Open year round. Ice breakers rarely required.	No RR USRR nat. Roads lead inland & along coast.	1935	No data.	Small port-owned shops for repair to moderate-size vessels.

Table VI

Secondary Ports of Russia, South Coast

Name	Anchorage	Entrance	Harbor	Wharf- age (ft)	Tide Range	Ice Conditions	Inland Clr.	Year & Max Ton	Naval Establishments	Building or Repair Facility
Korch'	Roadstead in W part of	3 mi long 260' wide	About 140 acres, 14'	4360 1940	No lunar tides	Icebound for 40 days	Rail to USSR	1936 23,875	None.	about 7 mi. S of harbor is small yard for repair of com- mercial vessels & building of small craft.
45°21'N 36°29'E	Korchenskaya Bukhta for vessels draw- ing 12' to 13'. Those of deeper draft anchor Yuz- hnyy Peregru- zochnyy Reyd.	19' deep in 1941. In '38 20.5' Branch channels to petroleum pier & met- allurgical works 15' deep.	22' deep in N. Soft mud bottom.	6300	Diff. of 3' has been ob- served.	during Jan. and Feb.	Two seasonal low-type roads to W.			
Osipenko	Extensive in Skiy Reyd in 18' over, soft mud.	7 1/2 mi long channel from ent. to Bordynskiy Zaliy to protecting breakwater is 300' wide at bottom. maintained at 22' deep.	25 acre mole-pro- tected bas- in behind a 2100 break- water par- allel to & 1/2 mi off shore.	2985 2985	No lunar tides Max fall about 1.5' rise about 3' from mean sealevel.	Ice forms from mid- Dec to late March. Open period is 296 days.	Rail to USSR not. Three third- rate roads.	1934 126,800	None.	Small craft repairs.
Taganrog	Extensive in Bol'shey Taganrogskiy Reyd in 18' to 23' over good holding ground.	Dredged channel, 5 3/4 mi. long 180' wide at bot- tom with least depth of 13' in 1938.	Three mole- & breakwater formed bas- ins have total water area of 69 acres with depths of 13' & 14' (1938).	3355 3620 6975	Neutidal Range due to winds about 8.5'	Ice closes port from mid-Dec to March & may attain 2.2' thickness.	Rail to two double track lines All weather roads along coast but lower type lead to N.	No data.	None.	A small yard for small craft & above-water re- pairs to larger vessels. A larger yard reported under construction.
47°12'N 38°57'E										

southeastward for approximately 250 miles high cliffs and steep slopes line the coast. These give way occasionally to small lowlands, pocket beaches, and narrow stream valleys coming down from the mountains. South of SUKHUMI the coastal plain becomes wider and extends to the south as far as BATUMI. The beaches along here are sand and gravel but are broken by bluffs in several places. Parts of the inland terrain is marshy. The coast becomes high again to the south of BATUMI and continues to the TURKISH border.

Ports. The principal RUSSIAN BLACK SEA ports are ODESSA, KHERSON, SEVASTOPOL, MARIUPOL, ROSTOV, NOVOROSIYSK, TUAPSE, POTI, and BATUMI. The secondary ports are NIKOLAYEV, YALTA, FEODOSIYA, KERCH, OSIPENKO, TAGONROG, YEKSK, SUKHUMI, and OCHECHIRI. (See Table VI.)

A wide variety of landing beaches exist on the north shore of the BLACK SEA between the mouth of the DANUBE RIVER and PORT KATON.

The Balkan Peninsula

Romania. At the western end of the BLACK SEA ROMANIA is bordered on the north by the U.S.S.R. and on the south by BULGARIA. The coastal frontage is approximately 125 miles northeast - southwest.

Coasts. The coastline, for 50 miles south of the U.S.S.R. border, is the low marshy DANUBE RIVER DELTA. This delta, only slightly above sea level, is poorly drained marshland, sand dunes, low plains, and inland lakes. This is traversed by three main

channels of the DANUBE RIVER on their way to the BLACK SEA.

The balance of the coast line is comparatively straight although broken by a few shallow bays. There are several small islands offshore surrounded by comparatively shallow water. The coast inland is low (sea level) and level for 15-20 miles where it gradually rises to a height of 100-400 feet. The DANUBE RIVER forms a north-south barrier about 25-50 miles inland from the coast. It is lined for its entire length here by marsh and isolated lakes. The river itself runs in two or more channels in this area and the main channel is approximately 2100 feet wide.

Ports. ROMANIA has only one principal BLACK SEA port and one minor coastal port. She also has 2 principal and 4 minor ports on the DANUBE RIVER which is navigable for 90 miles upstream on the middle or SULINA DISTRIBUTARY.

The BLACK SEA ports are CONSTANTIA, the leading port of ROMANIA, and the insignificant port of MANGALIA. On the DANUBE RIVER the ports of GALATI and BRAILA, are major maritime ports. The ports of SULINA, TULCEA, ISACCEA, and GHECET are of minor importance.

CONSTANTIA, located on the south central part of the coast just south of DANUBE DELTA, is the chief port of ROMANIA and the only one capable of handling deep-draft vessels.⁹ It is a modern, well equipped port capable of unloading 10,000 tons of general cargo each day. The harbor is situated on the south side of CAPE CONSTANTIA and consists of an artificial basin 700 by 1,100 yards

with an average center depth of 30 feet and wharf side depth of 26 feet.¹⁰ The harbor entrance is located between two breakwaters and is 175 yards wide and 30 feet deep. Unprotected anchorage is available in roadstead but is subject to gales from the sea.

There are 12,000 linear feet of berthing accommodations for general cargo vessels; 1,100 feet of bulk grain wharfage and four tanker berths.¹¹ A total of 19 Liberty type ships with drafts of 22-28 feet can be accommodated at the wharves.

The port is connected to a double track standard gauge railroad which runs to BUCHAREST and also connects with a north-south line from BULGARIA to the DANUBE DELTA. There are several poor highways radiating from CONSTANTIA with one fair gravel road running north to TULCEA. Daily rail clearance of CONSTANTIA is reported to be 28,000 tons of general cargo, 3,000 tons of grain, and 50,000 tons of oil products.¹² There is a 7,800 ton capacity dry dock on the west side of the harbor.

MANGALIA, the other coastal port, is of negligible importance and is located on the extreme southern ROMANIAN coast. Ocean going vessels can be handled only in the open anchorage off the town. The port proper is limited to small craft drawing less than 12 feet. It is connected to CONSTANTIA and BUCHAREST by rail and to CONSTANTIA by a paved highway.

The DANUBE RIVER ports are reached thru the middle or SULINA DISTRIBUTARY of the DANUBE. It has an entrance depth on the BLACK SEA of 22 feet and is navigable for 90 miles upstream for small

ocean going vessels.¹³ It is normally frozen over for two months of the year but occasionally is open for traffic throughout the year.

GALATI, located about 80 miles up the DANUBE RIVER, is the principal DANUBIAN PORT and is capable of unloading 10,000 tons daily.¹⁴ The wharf facilities comprise two harbor basins and quays along the river front. There are about 8,000 feet of alongside berthage and 10,000 feet of offshore or pontoon berthage available.¹⁵ The harbor has a depth of 20 feet in the basins and 22 feet at the river berths. There are berths for about 50 small vessels.

The port is cleared by a number of railroads of both standard and RUSSIAN gauge. There are several roads leading inland. There is a 1,200 ton capacity floating dry dock in the harbor.

BRAILA, located about 92 miles up the DANUBE RIVER, is considered to be the head of navigation for ocean going vessels. The unloading capacity of the port is estimated to be 5,000 tons per day.¹⁶ The landing facilities consist of a harbor basin and wharves along the river. There are 6,800 feet of berthage at the quays and 18,000 feet at the river wharves and pontoons.¹⁷ The harbor depth ranges from 20 feet in the basin to 22 feet at the river berths. The port is cleared by both railroad and highway.

SULINA, located just inside the mouth of the SULINA DISTRIBUTARY, is a transshipping point for grain arriving by river barge. There are no accommodations for ocean going vessels. Quays, suitable for river craft, are built along a 2 mile section of the north bank

and a 3 mile section of the south bank. Two wharves, available for deep draft ships, were destroyed during the war but may have been rebuilt since. There are no rail lines and few good roads connecting SULINA to the interior.

TULCEA, located about 38 miles up the DANUBE, is capable of unloading 1,000 tons of general cargo each day. The port has a 3,900 foot quay at which 3 deep draft and 4 river craft berths are available.¹⁸ The port is cleared by rail and highway.

ISSACCEA, located 56 miles up the DANUBE is primarily a river craft port. It is not readily available to larger vessels and the facilities are limited to three pontoon wharves.

GHECET is located directly across the river from BRAILA and serves as an auxiliary port. The clearance facilities for its 15 wharves are negligible.

Landing beaches. The landing beaches along the coast of ROMANIA are unknown. Landings could probably be made at almost any place along the southern 2/3 of the BLACK SEA coast. The area in and around CONSTANTIA appears to offer the best possibilities for inland communications. The formidable DANUBE RIVER barrier still exists inland and is crossed by only one road and one railroad in this area.

Bulgaria. The seacoast of BULGARIA consists of a 79 nautical mile north-south frontage on the west coast of the BLACK SEA. The actual measurement along the coastline is approximately 117 nautical miles.

Coasts. The coast is moderately high, fringed with a narrow but strong strip of beach and backed by high hills or mountains. The shore is marshy in spots with few sandy beaches. The only important indentations along the coast are the GULF OF BURGAZ and VARNA BAY.

From the southern boundary of BULGARIA the coast runs northwest as far as BURGAZ BAY and the shoreline is hilly and heavily wooded. Several small coves where small streams empty into the sea provide emergency anchorage for small vessels. The south shore of BURGAZ BAY has three hilly and wooded peninsulas extending out to the north. North of the bay a narrow strip of marshland separates the bay from a lagoon. Sharp cliffs line the shore to the north almost as far as NESER (Messemaria). NESER stands on a rocky peninsula and is connected to the mainland by a narrow isthmus of sand. A few miles north of NESER the coast bends to the east and continues in a fairly straight line to CAPE EMINE. From CAPE EMINE, a bold headland, the coast runs generally north, with few indentations, to the mouth of the KAMCHIYA RIVER. The coast is backed by steep hills from which small streams wind their way to shore. The coast runs northeast from the KAMCHIYA to CAPE GALATA where it turns to the west to form VARNA BAY. The coast extends north to EVKINOGRAD BAY and thence to EVK and BATOVA BAY. The shore line is backed by cliffs ranging from 60-130 feet high along this portion. To the north of BATOVA BAY abrupt cliffs backed by hills line the shore the remainder of the distance to the ROMANIAN border.

The BLACK SEA, while not subject to tidal influence, is subjected to variations caused by barometric pressure and wind.

Ports. BULGARIA has two principal and three secondary ports. The ports of BURGAZ and VARNA are the principal ports and AKHTOPOL (Agathopoli), NESEBR (messemaria), and TSAREVO (Vassiliko) are the secondary ports.

BURGAZ is located on the north side of the bay of BURGAZ and is 120 air miles northwest of the BOSPORUS. The size of the harbor area is 163 acres of which 87 acres has been dredged to a depth of $23\frac{1}{2}$ feet.¹⁹ The entrance to the bay is 23 miles wide and 17 miles deep. The western shore of the bay is low and sandy and covered with reeds. North of the city of BURGAZ there is a narrow marsh land separating the bay from a lagoon. Beyond this lagoon are steep cliffs that extend to the north. The town of BURGAZ is on high ground at the head of the bay. At a point 1200 yards west of the harbor a canal connects a salt water lake (LAKE VAYA KOI) to the harbor. A standard gauge railroad provides an exit to PLOVDIV where the main line runs to SOFIA.

VARNA located at the head of the bay of VARNA and about 150 air miles north of the BOSPORUS is the second most important port. The harbor is 800 by 530 yards or approximately 116 acres, and the inner harbor has been dredged to 25 feet with depths of 24 to 31 feet available in the outer harbor.²⁰ The south shore of the bay is hilly, the west shore is low and marshy with a narrow neck of land separating the bay from LAKE DEVNA on the west. The DEVNA

Table VII

MAJOR PORTS, BULGARIA

NAME	HARBOR	ANCHORAGE	WATERVES		NO. OF ALONG SIDE BERTHS	MECHANICAL HANDLING FACILITIES		COVERED STORAGE	CLEAR- ANCE	EST. PORT CAP. UN- LOADING	REPAIR FACIL- ITIES	REMARKS
			TOTAL LENGTH	DEPTH ALONG SIDE								
Burgaz 42°29'N 27°29'E	Arti- ficial	Unlimited Class I&II	2325'	23½'	6C, 3E, 1 tanker	10T traveling crane	Transit sheds ?	Rail: 2	Rail: 2	2250	A small shipyard	Rail lines are a standard gauge running to Pkivdiv & a standard gauge north.
	Entrance	outside harbor	715'	14½'		5T cloc overhead	houscs	Road: 2			reported.	
	450' wide	40 acres				40T floating crane	45,000 sq ft.					
	23' deep	inside harbor				6 inch gas pipe line	Gold					
		Class III				2 8 inch oil pipe lines on break- water.	1800 sq ft. Bulk? Petroleum 110,000 bbl					
Varna 43°12'N 27°55'E	Arti- ficial	12 vessels can moor to breakwater	4722	25	8-B	12T mounted on rr truck	Transit sheds	Rail: 1	Rail: 1	2960	Small floating drydock	Rail line standard gauge which connects to mainline west of port.
	Entrance	inner harbor	835	23		40T floating crane.	Warehouses	Road: 3			270' x 69' x 15½'	
	220yds wide	Varna Bay suitable	5000	?			45,000 sq. ft. Bulk Petrol- cum					
	30' deep	for cruiser squadron & four capital ships.					10,000 bbl					

CANAL which is 150-180 feet wide and 26 feet deep connects the harbor to LAKE DEVNA. There is a railroad and several good roads connecting VARNA with other parts of BULGARIA.

TSAREVO which serves the southeastern part of BULGARIA is located 91 miles northwest of the BOSPORUS. The small natural harbor which is about 900 yards in diameter is protected on the north by a rubble breakwater. Depths available in the center of the harbor are 32 feet with a gradual shoaling to the sides.²¹ The harbor entrance is 600 yards wide and 11-15 fathoms deep. Poor roads form the only exit from the beach but should take care of the estimated daily unloading capacity of 200 short tons.

AKHTOPOL is situated in a small cove 85 miles northwest of the BOSPORUS. The harbor is protected by a breakwater extending to the north and provides shelter for vessels having a draft of 16 feet or less. Depths for anchorage reach as much as 24 feet over sand bottom but average 12 feet. The shore line is shingle. Entrance to the cove is 100 yards wide and 27 feet deep. A poor unimproved road provides the only exit to the interior. The daily estimated unloading capacity is 80-100 short tons.

NESEBR is 122 miles northwest of the BOSPORUS. The town is located on a rocky peninsula which is connected to the mainland by a narrow isthmus of sand which is sometimes covered by water. The harbor is located in a bight on the south side of the peninsula and is 2,200 yards wide and 800 yards long. This natural harbor is sheltered from north and west winds but open to south and east winds.

Anchorage is available 800 yards off shore in water 5-8 fathoms deep. Another anchorage north of the peninsula has water 7 fathoms deep but no protection from northerly winds. There is one poor unimproved road to take care of the daily unloading capacity of 80-100 short tons.

The currents are influenced by the direction and velocity of the wind. A moderate north - northwest gale will result in a current onto the coast and to the south. This amounts to $\frac{1}{2}$ knot at first but increases with the wind. With a calm or light wind no current is experienced.

Landing beaches. There are fifty-three known landing beaches on the coast of BULGARIA ranging in size from pocket beaches to those 6 miles long.²² The two best and largest will be the only ones discussed here.

POMORIYE extends from the east side of the town of POMERIYE for 6 miles. The beach varies in width from 250-300 feet and is composed of firm sand. The bottom slope is fairly gentle with the 30 ft depth line generally $\frac{1}{4}$ to $\frac{1}{2}$ mile off shore. From the south end of the beach a road connects with POMORIYE and from there a railroad and roads connect with BURGAZ.

REKA GOLEMA KAMCHIYA extends south from the mouth of the river REKA GOLEMA KAMCHIYA for 6 miles. Beach varies up to 600 feet in width and is composed of sand. The bottom slope is uniform and fairly steep with the 30 foot depth about 200 yards offshore. There are secondary exit roads to FUNDUKLEE and NOVA OREKKOVA.

On the basis of reports available at this time it is reasonable to assume that the combined unloading rate of the five main ports would be approximately 5,600 short tons each 8 hr shift. This could be materially increased and would depend to a large extent on mechanical handling facilities and ability to clear the harbor.

Greece. The coastline of GREECE is very irregular and long with the total coastline being almost 1,500 miles if we include the outlying islands. The numerous gulfs and peninsulas are a result of the subsidence of the land and the countless islands and sunken rocks are a continuation of the mountain chains of the mainland. Eastern and southern GREECE is the only area where lowlands of any appreciable size come down to the sea. The coast is cut up and island fringed. This is characterized by deep gulfs and irregular shaped peninsulas. Plains continue inland from the head of the gulfs. The irregularity increases to the south and islands are more numerous. Western GREECE generally follows the line of the PINDUS MOUNTAINS and the shores are abrupt and inhospitable. The shore line though regular is broken by the GULF OF PATROS and AMVRAKIA. East of the CHALCIDICE PENINSULA the coasts of THRACE are smooth and almost harborless. The coast line is backed by alternating marshy troughs and plateaus. In general the coast line of the GREEK islands rise abruptly from the sea and are backed by high hills or mountains.

Ports. The best ports of the country are situated along the eastern and southern coasts. The principal ports are PIRAEUS and SALONIKA. PATROS, VOLOS, KALAMAI, KAVALLA, ALEXANDROUPOLIS, KHALKIS,

LAVRION, TZAGIZI (Amphipolis), and PREVEZA are secondary ports. The principal island ports are KERKIRA, IRAKLION (Candia), SIROS, KHANEA (Ganea) PHIOS, MITILINE, and VATHI.

PIRAEUS, the port of ATHENS is by far the most important port in GREECE.²⁴ PIRAEUS consists of three main harbors, the outer or LEONTOS harbor, the inner or MEGAS harbor, and the inner most or HALON basin. The outer or LEONTOS lies between two breakwaters and is 400 yards wide and 950 yards long with depths varying from 30-90 feet through the central part.²⁵ The inner or MEGAS harbor is a land-locked basin surrounded with quays. The entrance is about 210 yards wide. The exact size of MEGAS harbor is not known but is considerably (approximately 100%) larger than LEONTOS and has depths ranging to 32 ft. The HALON basin lying to the north of MEGAS harbor is 520 yards long east-west and 300 yards wide north-south. The port is well protected from all winds except those from the southwest. Prevailing winds vary from southwest to northeast. The port of PIRAEUS is connected to ATHENS by three railway lines, one single track and one double track standard gauge and one single track narrow gauge. There are also two main highways connected to ATHENS. The port is rated at 4,000 short tons per day providing sufficient tugs, lighters and land transport are available.²⁶

SALONIKA is capable of handling 2500 short tons per day and is cleared by 3 rail lines.²⁷ The harbor is approximately 11 miles long and 7 miles wide.

PATRAS, the third most important port in all GREECE, is the

most important PELOPONNESIAN Port.²⁸ PATRAS is approximately 1,400 yards long and 500 yards wide and has been dredged to a depth of 30 feet except near the moles. Vessels too large to enter the harbor berth outside with two anchors down and stern secured to a detached mole. The holding is very poor, however. Strong westerly winds continually interrupt unloading. There is a single narrow gauge rail-line connecting PATRAS with ATHENS and also a poor road. The port has an unloading capacity of 1000 short tons per day.

VOLOS is situated in a bay on the north side of the GULF OF VOLOS and serves as a clearing port for the THESALIAN PLAINS and as a fleet base.²⁹ The port proper is triangular in shape with the entrance 475 yards wide. The exact depths of the harbor are not known but the 10 fathom curve runs from CAPE SESKLO to GORITZA and depths gradually lessen as the head of the Gulf is approached. There is a single track narrow gauge rail line which connects with the main rail line at LARISSA. The port is rated at 800 short tons per day.

KALAMATI (Kalamata) is located in the northeast end of the MESSENIAN GULF. It is backed at the northwest by the MESSENE PLAINS, a rich agriculture area. The harbor proper is 1,000 yards long and 700 yards wide with a depth ranging from 19-30 feet.³⁰ The port is protected by two breakwaters and the entrance is 200 yards wide and 26 feet deep. Temporary anchorage outside the harbor has a depth of 12 fathoms over sand bottom. There is a single track narrow gauge railroad which runs northwest to ATHENS. The estimated port capacity is 1,000 short tons per day.

KAVALLA located midway between SALONIKA and ALEXANDROUPOLIS is an open roadstead exposed to the south. The port is backed by a high range of hills which command not only the sea approaches but also the PHILIPPI PLAINS to the north. The harbor proper is approximately 1,300 feet long and 980 feet wide with a reported depth of 26 feet.³¹ The depth at the entrance to the harbor is 6 fathoms. There is a good exit road to DRAMA and two lesser roads to STAVROS and XANTHI. The nearest railroad is located at DRAMA, 15 miles to the north. The rated capacity of the port is 400 short tons per day.

ALEXANDROUPOLIS, an open roadstead port, is small and undeveloped. The last reported harbor depth was 6-10 feet but was undoubtedly improved by the GERMANS and BULGARIANS during the war. There is unlimited anchorage $\frac{1}{2}$ to 1 mile offshore which is $4\frac{1}{2}$ fathoms deep over mud. The port is primarily a lightorage port and is rated at 1,000 short tons per day. The port is located on the main line of the SALONIKA - ISTANBUL railway, which is a single track standard gauge line. A fairly good road leads to KOMOTINE thru MAKRI and SAPPAT.

KHALKIA is the fifth most important port in GREECE and lies in the KHALKIS STRAITS. It is approximately 40 air line miles north of ATHENS and is connected to ATHENS by a single track standard gauge railroad. The rated capacity is 700 short tons per day.

LAVRION (Laurion) located in ERGASTERIA BAY is about 800 yards square and has a depth of 3-8 fathoms over muddy ground. It is used primarily to handle ore shipped from the SOUNION district.³²

The port is connected to ATHENS by a narrow gauge railroad and a fair road. The estimated capacity of the port is 550 short tons per day. There is unlimited deep water anchorage which is exposed to south and southeasterly winds.

PREVEZA on the west coast of central GREECE is a sheltered anchorage which can be approached through a channel 120 feet wide and 19 feet deep. The depth along the 1,900 foot quay is only 2 ft to 5 feet unless dredged since the war. All unloading must be done by lighters. A narrow gauge rail line is reported to be the only means of rail exit from the harbor. The estimated unloading capacity is 2,500 short tons per day.

TZAGREZI (Amphipolis) located midway between SALONIKA and KAVALLA at the mouth of the STRUMA RIVER has an artificial harbor 360 yards square. The depth at the piers is 24 feet. The entrance is 120 yards wide. This port was under construction at the time of the axis attack on GREECE.³³ The port is connected with the main MACEDONIAN rail line at SERRES by a single track standard gauge rail line. An improved coast road connects it with both KAVALLA and SALONIKA. The estimated daily unloading capacity is 1200 short tons per day.

The ports of the principal islands and the minor ports of the Greek mainland will not be discussed because of the problem of inland communication over poor roads and inadequate rail lines.

Landing beaches. The discussion of the landing beaches will be limited to a discussion of the more important approaches to the

major strategic areas of GREECE. These are the approaches to ATHENS, SALONIKA, the straits between the GULF OF PATRAS and the GULF OF CORINTH, and the island of KERKIRA (Corfu).³⁴

There are two landing beaches giving access to ATHENS. The first of these is located south of PIRAEUS. Two small landing beaches one 2,500 yards and one 3,100 yards long provide good exits to ATHENS. The second is a 7 mile long beach on the western side of the GULF OF PETALIOI. The exits to ATHENS, 16 miles distant, are excellent.

There are three primary landing beaches to approach SALONIKA. The first of these is a 20 mile long beach on the west side of the GULF OF THERMAI which gives good exits over the coastal plain to SALONIKA. The second is an 8 mile long beach on the east side of the GULF OF THERMAI. The exit is across low, level, and poorly drained land. The third beach is a poor secondary route, from a 6 mile wide beach on the west coast of the GULF OF STRIMON, across the CHALCIDICE PENINSULA to SALONIKA.

The straits between the GULF OF PATROS and the GULF OF CORINTH may be approached from a landing area at the northwest corner of the PELOPONNESUS. This beach is 13 miles long with poor wet weather exits.

Landings on KERKIRA (Corfu) can be made on a 7 mile wide beach located on east side of the island.

GREECE has an abundance of natural and artificial ports, whose combined unloading capacity is impressive, and innumerable landing beaches. The problem of how to clear these ports with a very poor

road system and inadequate rail system is of major difficulty to logistic support. The roads and railroads suffered so much damage during the war and neglect since the war that it is said the fastest means of communication between major cities is that provided by ships.

Much of the information on ports is at least 10 years old and very sketchy. There have undoubtedly been many improvements since this material was published.

Albania. ALBANIA is a very small and primitive Balkan country along the eastern shore of the ADRIATIC SEA. It is bordered on the north and east by YUGOSLAVIA and on the south by GREECE. It is approximately 200 miles long and 75 miles wide at its widest point.

Coasts. The coast line is generally low in the north backed by a high mountain range. Near the port of VALONA limestone hills gradually close to the waters edge. The water is shallow to moderate depth for some distance offshore. Considerable silt is carried down by the rivers and dumped into the coastal waters.

Ports. There are seven comparatively important sea ports along the coast. The ports of DURRES (Durazzo) and GJI I VLONES can be classified as principal; SHENGJIN and SARANDE as secondary; KEP I PALERMOS, PORTA ROMANA, and GJI I LALZES as minor ports.

DURRES (Durazzo), situated on the bay of GJI I DURRESIT, is approximately thirty seven miles south of the YUGOSLAV border and is the chief port of ALBANIA. The bay itself is surrounded by a swampy lagoon on the north, high hills on the northeast and east, and a low fertile valley on the southeast. The harbor proper is 3,900 feet long

and 2,100 feet wide and, except for a short expanse in the south-east, has a firm, sandy shoreline.³⁵ Parts of the enclosed harbor are heavily silted but continuous dredging maintains an average depth of 19 feet. The port is connected to the capital city of TIRANI by a standard gauge (4' 8") rail line and a modern highway. The tides and currents in the vicinity of the harbor are negligible with a high water interval of 4 hours and 19 minutes. The mean high water spring rise is 1 foot and the neap rise is 0.7 feet. The current normally sets north past GJI I DURRESIT and attains a maximum rate of 1.5 knots.

GJI I VLONES, the second most important port in ALBANIA, is 60 miles north of the GRECO-ALBANIAN border and comprises the port facilities of several small coastal towns. The coastline along the southern and northeast side of the bay is low and sandy and is backed by marshy ground; the east side is fronted by a narrow sand beach backed by high rocks; west shore by steep rocks reaching to the waters edge. The harbor measures 9 miles north-south and 5 miles wide at the entrance. The depth ranges from 10 to 27 fathoms with the 5 fathoms curve varying from 200 yards off shore on the east side of the bay to 1 mile on the northeast side.³⁶ The port is connected to the asphalt mine at SELENICE by a narrow gauge (2' 0") railroad and to the interior by secondary roads. It is well sheltered from winds except those from the northwest. The tides are weak and irregular with a spring range of 1 foot and a mean range of 0.7 foot during calm weather. During strong northwest wind the spring range increases to as much as 2 feet. A 0.5 knot current normally sets northwest off the entrance

Table VIII

MAJOR PORTS OF ALBANIA

Name	Harbor	Anchorage	Wharves	No. of Along side Berths	Mechanical Handling Facilities	Covered Storage	Clear- ance	Est.un- loading cap. Lt/day	Repair Facil- ities	Remarks
Principal Ports										
Durres 41°19'N 19°27'E	Artificial Ent. 215 yds wide, 25' deep Tides: MHWS rise 1 ft MHW rise 0.7'	Unlimited Class II and III	955' 2720' 400'	1B, 1C 60 220' of light- erage 1 tanker Na	Four 5 to 10T shore cranes 20T floating crane 2 10" pipe- lines on E breakwater	Transit sheds: Na Warehouses: Na Cold: Na Bulk: Na Petroleum: Na	Rail: 1 Road: 1	2000 1 small yard capable of acomodating 3 500T ships	1 small yard capable of acomodating 3 500T ships	RR single track, std. gauge line that branches to Tirane & Pegin Command Hdqtrs & operating base of Albanian Navy
Gji i Vlones 40°27'N 19°22'E	Natural N.ent. 4.5 mi. wide and 30-90 ft deep. S ent 2.5 mi wide and 120-280' deep. Tides: MHWS range 1 ft MHW range 0.7 ft	Unlimited Class I, II & III Several fixed moorings	2120 6-20	2C	3 cranes, cap. un- known	Transit sheds: Na Warehouses: 36,500 sq ft Cold: Na Bulk: Na Petroleum: 119,500 bbl	Na Rail: 2 Road: 2	400 1 small yard capable of repairs on vessels up to 300 tons	1 small yard capable of repairs on vessels up to 300 tons	Believed to be operating base for USSR Navy Coast Patrol. 1 offshore tanker berth (TL-M-BTI) Rail narrow- gauge, no practical im- portance as cir- fac.
Secondary ports										
Sarande 39°52'N 20°00'E	Natural Ent. 1.75mi wide and 180' deep Tides: MHWS range 0.9 ft MHW range 0.6 ft	12 Class II 2 Class III	250	5-6	1 crane cap. un- known.	Transit sheds: Na Warehouses: 4800 sq ft Cold: Na Bulk: Na Petroleum: Na	Na Road: 1	300	None	Naval coast patrol oper- ations. Small amt of stor- age in pri- vate ware- house

Table VIII

MINOR PORTS AND LANDINGS, ALBANIA

PORT	HARBOR AND CHANNEL	FREE-SWINGING ANCHORAGE	TOTAL WHARF- AGE	CLEAR- ANCE	REMARKS
Kep i Palermos (40°03'N, 19°48'E)	Type: natural Average harbor depth: 60-265 ft. Min. channel depth: 250 ft.	1 Class III, 0.6 mi from wharf.	25 feet	Rail: None Road: 1	(No data on harbor-area, tidal rise, or depths alongside wharves) Bottom of bay deepens so rapidly offshore that anchors may drag during bora.
Porta Romana (41°23'N, 19°26'E)	Type: open road- stead Average harbor depth: Na Min. Channel depth: Na	Extensive, all classes in open roadstead 1.0 mi from wharves.	800	Rail: none Road: 1	There is a narrow road to Durres, 5 mi to S. 4 underground petroleum tanks with total capacity of about 2,500 bbl.
Gji i Lalzes (41°31'N, 19°29'E)	Type: open road- stead Average harbor depth: Na Min. channel depth: Na	Extensive, all classes in open roadstead 2.0 mi from wharves.	390	Rail: None Road: 1	Harbor used by motor vessels up to 100 tons.

Table VIII

MINOR PORTS AND LANDINGS, ALBANIA

Name	Harbor	Anchorage	Wharves		No. of Alongside Berths	Mechanical Handling Facilities	Clearance	Est. un- loading cap. Lt/day	Repair Facili- ties	Remarks
			Total	Depth Along side						
Shengjin 41°49'N 19°35'E	Improved natural Ent. 30yd wide and 18' deep Tides: MHWS range 1 ft MEWN range 0.7 ft	Unlimited Class I, II and III	165 165	16	Lighter- age	None	Transit sheds: Road: 1 Na Warehouses: Na Cold: Na Bulk: Na Petroleum: Na	300	Na	Minor base for coast patrol boats. Length of offshore wharf variously reported as 260'-325'. Length of other pier between 165-206'. Depths along side unknown.

Class	Minimum Diameter	Minimum Depth	Type Vessel	
I	800	38	Capital naval ship, large passenger ship. Standard oceangoing cargo vessel. Destroyer, small cargo vessel.	
II	500	30		
III	300	20		
Class of Berths	Vessel Length Feet	Draft Feet	Equivalent Vessel Type	
A	500	30	C3	
B	460	24-28	Liberty-Victory-C2	
C	350	18-21	C1 - M - AVI	
D	250	16	Standard Coaster	
E	200	12	Small Coaster	

to the bay.

SHENGJIN located in the small bay on the north coast of PELLG I DRINIT is 10 miles south of YUGOSLAVIA, 2,600 feet long east to west and 2,400 feet long north to south. The north and west shores are composed of rubble and backed by steep hills. The eastern shore is a sand and gravel beach backed by swamp. The harbor depths range from 20 to 30 feet with shoal water inside and outside the harbor proper. The roadstead is open and exposed to northwest, west, and southwest winds.³⁷ There is a 40 to 70 foot wide breakwater extending 900 ft southwest from a high rocky point near the entrance to the harbor. The port is connected to the inland town of SHKODER (Scutari) by a secondary road. The tide is weak with a mean spring range of 1 foot and a mean range of 0.7 foot. The outflow of the Drin River creates a weak northwest current along the east coast of the bay.

SARANDE situated on the north shore of GJI I SARANDES is located near the southern border of ALBANIA. The bay is 1.75 miles long north-south and indents the coastline about 0.75 miles. The shoreline, except for the area in front of the town, is rocky and backed by steep hills. The harbor depth ranges to a maximum depth of 32 fathoms and with an average of 16 fathoms in the center. The bay is sheltered from all winds except those from the south-west.

The tide is weak with a spring range of 0.9 feet and a mean range of 0.6 feet. The current has a north set and reach a speed of 1.5 to 2 knots with a strong south wind.

KEP I PALERMOS situated on the southwest coast is a natural harbor with one exit road to the interior.

GJI I LALZES and PORTA ROMANA situated along the northwest coast are open roadsteads with one road each leading to the interior.

Landing beaches. There are of course numerous landing beaches along the seacoast of ALBANIA but the majority present the problem of a good inland exit from the beach. The more important ones are one 2 mile beach, vicinity of DURRES; two 2,400 foot beaches, vicinity of GJI I VLONES; a 2.5 mile beach, vicinity of SHENGJIN; and a 600 foot beach, vicinity of SARANDE.³⁸

Beach number one commences at a point approximately 2100 feet east of MOLI DE LEVANTE and continues to the southeast. The beach is 90 feet wide, and the gradient averages 1:14 between the 2 fathom line and the shoreline. There is no road clearance immediately behind the beach.

Beach number two begins 1 mile south of SKELE E VLONES and extends for 2,400 feet. The beach is 30-45 feet wide, and the gradient averages 1:66 from the 3 fathoms line.

Beach number three begins immediately north of UJTE FTOHTE and extends for 2,400 feet. The beach is 30-45 feet wide, and the gradient varies from 1:17 to 1:50 from the 3 fathom line.

Beach number four begins south of the port of SHENGJIN and runs for 2.5 miles. The width of the beach varies from 350 feet to 540 feet and then dwindles to nothing at the south end. The offshore gradients vary from 1:50 to 1:90.

Beach number five begins 2 miles south of the bay of SARANDE. The beach is 600 feet long and 90 feet wide. The beach is fairly steep and has an exit road 750 feet inland.

These ports were extensively damaged during WORLD WAR II but should be repaired and improved as of this date. The Italians used the ports of DURRES, GJI I VLONES, and SHENGJIN during the Italo Greek Campaign.³⁹

The combined unloading capacity of the four best ports, based on an 8 hour day, is estimated to be 3000 short tons. This could undoubtedly be increased, but the problem of clearance of port area still remains a major factor.

NOTES FOR CHAPTER 8

¹ NIS (Tentative), Turkey, Descriptive Analysis of Military Regions (Washington 25, D.C.: 15 June 1948) ch II, Sec 26, p 13.

² Ibid, p 14

³ Ibid, p 14 a

⁴ Ibid, p 80

⁵ Ibid, p 53

p 13 ⁶ JANIS 40, European U.S.S.R. Brief (Washington 25, D.C.), ch I,

⁷ Ibid, p 14

⁸ Ibid, p 25, Table I - 1 and

ch I, p 19, Table I - 1 ^{JANIS 41, The Caucasus Area U.S.S.R. (Washington 25, D. C.)}

⁹ SR 12, Rumania, (Washington 25, D.C.: 5 October 1946)

¹⁰ Ibid, p 57

¹¹ Ibid, p 57

oh 1

- 12 Ibid, p 57
- 13 Ibid, p 58
- 14 Ibid, p 58
- 15 Ibid, p 58
- 16 Ibid, p 58
- 17 Ibid, p 59
- 18 Ibid, p 59
- 19 JANIS 38, Bulgaria, Military Geography (Washington 25, D.C.)
- 20 Ibid; passim
- 21 Ibid; passim
- 22 Ibid; passim
- 23 Ibid, chap 3
- 24 SR 10, Greece (Washington 25, D.C: March 1948) p A-4
- 25 ONI-113, Greece (Washington 25, D.C: July 1943) p 433
- 26 Ibid; passim
- 27 Ibid, p 520
- 28 SR 10, Greece (Washington 25, D.C: March 1948) p II-4
- 29 Ibid, p A-5
- 30 ONI-113, Greece (Washington 25, D.C: July 1943)
- 31 Ibid, p 373
- 32 Ibid, p 433
- 33 Ibid, p 486
- 34 SID, Greece, Topographic (Washington 25, D.C: March 1948)
- 35 NIS 20, Albania (Washington 25, D.C: January 1951)

³⁶Ibid; passim

³⁷Ibid; passim

³⁸Ibid; passim

³⁹Ibid; passim

⁴⁰Ibid; passim

CHAPTER 9

CROSS COUNTRY MOVEMENT

Turkey

TURKEY because of its peculiar arrangement and diversified terrain will be broken down into six separate and distinct areas in order to facilitate discussion. These areas are called the STRAITS REGION, PONTUS MOUNTAIN REGION, TAURUS MOUNTAIN REGION, CENTRAL PLATEAU REGION, EAST ANATOLIAN HIGHLANDS REGION, and the SOUTHEASTERN PLAINS and LOW PLATEAU REGION.¹

The Straits Region includes all of EUROPEAN TURKEY and that part of ASIATIC TURKEY west to the CENTRAL PLATEAU. It includes those areas intimately associated with the STRAITS (DARDENELLES, SEA OF MARMARA and the BOSPORUS). The region measures 345 miles north-south and 280 miles east-west.

The relief of the European section consists of a broad central plain bordered on the north by rugged mountains and on the south by low (500-600 feet) flat topped hills. The Asiatic section consists of a series of valleys and ridges running generally west to east. At the east end of the valleys access is gained to the CENTRAL PLATEAU via a steep slope.²

The soils over about three-fourths of the region are well-drained shallow or deep loam. The soil tends to be thin on steep slopes and to be slippery when wet. It becomes dry and dusty soon after a rain. Poorly drained silt and clay soils cover the north side

of the ERGENE PLAIN, and it is very slippery when wet and hard when dry. In the lower parts of the major river valleys and on the lake plains alluvial soil will be found. This is subject to waterlogging in the rainy season. It is very slippery when wet and soft and fluid when saturated.

The vegetation below 2,000 feet along the coast consists primarily of scrub brush, grass, and marsh plants. The scrub reaches 6 to 9 feet in height, is dense, and resembles the chaparral of California. There are some patches of impenetrable thorn brush. The ERGENE PLAIN is cultivated and consists primarily of crops and pasture grass. The seaward slope of the mountains from 2,000 feet to timber line (5,200-6,000 feet) is covered with deciduous and coniferous forest.

The precipitation in this region is moderate with more than 20 inches falling in the mountains. The summer in the south is hot and practically rainless. The winter is warm in the south, mild in coastal zones and cold inland. The days of snow-cover vary from none in the coastal zone and southwest to 8-30 days in the mountains. The major thaw period occurs from late February on lowlands to late March in mountains. The ground is dry over 50 per cent of the time for 6-9 months of the year.

The outlook for cross country movement is generally favorable in the warm seasons on the ERGENE PLAIN and on the mainlands of ASIATIC TURKEY. There are numerous obstacles to north-south movement such as high mountains, dense forests, unfordable rivers, ravines,

marshes, and lakes. East-west movement presents fewer obstacles. The most favorable period occurs from April or May through September or October when the ground is dry and firm.³ Ground is likely to be waterlogged during the spring thaw. The least favorable period is December through March when the soil is likely to be snow covered or frozen with high water and floods prevalent during the latter part of the period.

The Pontus Mountain Region includes the barrier mountains bordering the BLACK SEA coast from BABA BURNU near ZONGULDAK eastward to the border of the USSR. This region is 640 miles long and approximately 90 miles wide.

The relief features rugged mountains which parallel the BLACK SEA. They constitute a major barrier to communications between the coast and the interior. The elevations gradually increase from 4,000 feet in the west to 10,000 feet in the east except in the vicinity of SAMSUN the elevation drops to 3,000 feet. The principal valleys parallel the mountains and make north-south movement very difficult. Only a few rivers cross the mountains and they flow through narrow, steep gorges. The coastal plain is narrow and broken.

The soils generally over three-fourths of the area are well-drained shallow or deep loam. The soil is thin on steep slopes, slippery when wet, and dry and dusty soon after a rain. On the coastal plain at the mouth of the YESIL IRMAK RIVER the soil is silty and poorly drained.⁴ It is subject to waterlogging and is extremely soft and slippery. Some of the smaller river basins contain a mixture of

sand and silt.

The vegetation along the coast, below 1,500 feet, consists primarily of scrub brush (6-9 foot high), dense evergreen and rhododendron and thorny brush. This is almost impenetrable on foot.⁵

Deciduous forest with dense underbrush cover the mountain slopes from 1,500-3,500 feet. Above 3,500 feet and extending to timber line (6,000-7,500 foot), coniferous forests grow with fir on the seaward slopes and pine on the inland side.

The precipitation is heavy with an annual average of over 100 inches in the extreme east. The temperatures are mild near the coast but fall rapidly with the increasing elevation. The heaviest precipitation occurs in autumn but some falls each month. Snow is very frequent in winter, with the least precipitation occurring on slopes and enclosed valleys. The days of snow-cover vary from less than 30 days in the lowlands to over 180 days on the highest slopes in the east. The major thaw period occurs from late February on the lower slopes to April on the higher slopes. There are 5-8 months of the year when ground is dry for 50 per cent of the time.

The outlook for cross country movement is unfavorable throughout the year. This is especially true of north-south movement and can be attributed primarily to steep mountain slopes, ravines, dense forests, rivers, and marshes. The most favorable period is May through October except in the far east when the period is shorter.⁶ The ground is dry and firm during this period. The least favorable time is November through April. The thaw occurs in late February on

the upper slopes. The ground is likely to be snow-covered and frozen in the coldest months.

The Taurus Mountains Region includes the barrier mountains and the adjacent coastal plain along the Mediterranean coast. The length of this region is 520 miles east-west and has a north-south width of 285 miles.

The relief of this region features high rugged mountains whose summits exceed 11,000 feet. These mountains border the Mediterranean Coast. A few passes (5,000 feet) break their solid front with the most important defile being the CILICIAN GATES.⁷ The north slope of these mountains are not as steep as the seaward slopes. The only level places of any size are the ANTALYA and ADANA plains.⁸

The soil generally over three-fourths of the area is a well-drained loam. The soil is slippery when wet and dry and dusty soon after a rain. At lower elevations alluvial soils are common. They are subject to waterlogging in rainy season and are soft and fluid when saturated.

The vegetation along the coast below 1,200 feet elevation consists of scrub and brush similar to the Straits area and also grass, trees and marsh plants. Between 1,200-3,000 feet coniferous forest will be found on the seaward slopes. Above 3,000 feet and extending to timber line (6,000-6,700 feet) the coniferous growth thins out on the seaward slope and grass covers the inland slope. The summits of the mountains and the many plateaus are barren.

The precipitation exceeds 20 inches everywhere and increases to 80 inches or more in the mountains rimming the ANTALYA Plain. Summer on the coastal plain is very hot and practically rainless. Winter is warm on the coastal plain but gets colder as the elevation increases. The majority of the precipitation occurs in the winter, especially on the southern slopes. The number of days with snow-cover vary from no days in the coastal plain to over 30 days at the highest elevations. The major thaw occurs from February through April. There are 5-9 months of the year when the ground is dry for 50 per cent of the time.

The outlook for cross country movement is unfavorable throughout the year except on the ANTALYA and ADANA Plains. The important obstacles to north-south movement are the rugged mountains, dense forests, rivers, marshes, and irrigation ditches. The most favorable period occurs from May through October.⁹ Some soils are waterlogged until June. The least favorable period would be December through March. The highlands would likely be frozen and snow-covered during the winter months. High water and floods usually occur during the thaw period.

The Central Plateau Region is located between the PONTUS MOUNTAINS on the north and the TAURUS MOUNTAINS on the south and between the mountains of the STRAITS REGION on the west and the high ridged mountain plateau of the east. The east-west length is 520 miles and the north-south width is 285 miles.

The relief of this area consists mainly of rolling upland and

basin plains at an average of about 4,000 feet elevation. The slopes, that exist, are generally less than 10 per cent, but scattered ridges and volcanic mountains occasionally rise above the level of the plateau.¹⁰

The soil is varied with over one-half of the area covered with well-drained loam. The soil is slippery when wet but dries rapidly after rains. Some of the larger basins contain either loam or a sand and silt soil. This is more prevalent in the south. Poorly drained alluvial soils exist in river beds and lake plains and are subject to waterlogging.

The vegetation consists chiefly of steppe grass with light scrub or coniferous forests on the slopes and mountains. Some basins have salt grass and reed patches. The crops are planted in valleys and along streams.

The precipitation is generally less than 20 inches, and a large area receives less than 12 inches. The maximum precipitation occurs in winter and spring. The summers are fairly hot and practically rainless. The winters are cold with the temperature decreasing from west to east. The number of days with snow-cover varies from less than 30 days in the west to over 30 days in the east and on the mountain slopes. The major thaw period occurs in late February in the west and late March in the east. There are 5-8 months of the year when the ground is dry for 50 per cent of the time.

The outlook for cross country movement is generally good in all directions. Some of the more important obstacles are lakes,

marshes, large meandering rivers (fordable) and steep walled gullies. All of these can be by-passed. The most favorable period is April to June through October.¹¹ The ground at this time is hard and dry. The least favorable period is November through March to May. The ground is likely to be wet and soft from the spring thaw during the latter part of this period.

The East Anatolian Highlands Region is a high mountain ridged plateau located between the CENTRAL PLATEAU on the west, the TURKISH BORDER on the east and between the PONTUS MOUNTAIN REGION on the north and the SOUTHEASTERN PLAINS AND LOW PLATEAUS on the south. The region is 515 miles east to west and 100-315 miles north to south.

The relief consists mainly of high basin plains linked by valleys. The average elevation of the area is 6,000 feet. Broad mountains and large extinct volcanic cones rise above the general level of the area. The general trend of the valleys is east-west.

The soil is a well-drained loam over 3/4 of the area and is slippery when wet but dries quickly after rains. Well-drained sand and silt soils exist in some river basins. Poorly drained alluvial soils are prevalent east of LAKE VAN GOLU. This is slippery when wet and soft and fluid when saturated.

The vegetation in the east and western portion consists chiefly of alternating belts of short grass and barren ground. Scrubby deciduous growth occurs in the central and southern parts at elevations between 4,500 feet and 7,000 feet. Oak forest cover some

mountain slopes.

The precipitation varies with the topography, but generally exceeds 20 inches with spring getting the maximum. The summers are hot on the basins and plateaus.

The outlook for cross country movement is generally unfavorable in many parts and especially to north-south movement. It is favorable in some parts during the summer months but not the level basins and high plateaus of the northeastern and western section. There are many formidable terrain obstacles. The most favorable period is May or June through October and the least favorable is November through April. The spring thaw occurs from late February through April with resulting high water and floods.

The Southeastern Plains and Low Plateaus are primarily plains and low tablelands located between the SYRIAN border on the south, the TAURUS MOUNTAINS REGION on the west and the EAST ANATOLIAN HIGHLANDS on the north and east. This region is 295 miles east-west and 80 miles north-south.

The relief consists of plains and low plateaus traversed northwest to southeast by a broken chain of mountains. There are belts of cut-up tableland and deep stream and river beds throughout the area. The DICLE NEHRI (Tigris River) gorge in the east and the FIRAT NEHRI (Euphrates River) gorge in the west form formidable barriers.¹²

The soil over three-fourths of the region is a well-drained deep loam. There are well-drained loams and loams and loams

and silts near the Syrian border and poorly drained alluvial soils south of MARAS in the AMIK GOLU TROUGH.¹³ The alluvial soils are subject to prolonged waterlogging and are soft and fluid when saturated.

The vegetation is mostly short grass. There are large areas of barren ground. Bushes and light deciduous growth will be found on hill slopes and dense undergrowth in the central area and northern fringe.

The precipitation is generally less than 20 inches. The summers are very hot and dry. Violent thunderstorms can be expected in the spring and early summer. The winters are mild along the Syrian border. There are from 0-30 days of snow-cover and few days with the ground frozen. The major thaw period occurs from late February to late March. There are 7-9 months when the ground is dry for 50 per cent of the time.

The outlook for cross country movement is generally favorable over large areas due to the low slopes. The most favorable period is April to June through October.¹⁴ The ground is dry and hard at this time. The least favorable period is December through February.

The Caucasus and Southern Russia

The Caucasus because of its formidable and varied terrain will be divided into five areas for ease of discussion. These five areas are the PRE-CAUCASION LOWLANDS, MAJOR CAUCASUS RANGES AND BASINS, TRANS-CAUCASION LOWLANDS, TRANS-CAUCASION HIGHLANDS, the CASPIAN COASTAL CORRIDOR and SOUTHERN RUSSIA.

The Pre-Caucasian Lowlands are located to the north of the CAUCASIAN MOUNTAINS and extend from the SEA OF AZOV to the CASPIAN SEA.

The relief of this area consists primarily of large monotonously flat plains. These plains are separated by low, dissected, rolling terrain. The altitudes rise to from 600 feet near the foothills to a maximum of 2650 feet south of STARVROPOL. The flat terrain is broken by minor variations such as shallow ravines, gullies, and sand dunes. The greatest local relief is south of KUBAN. The coastal areas of the SEA OF AZOV and the CASPIAN SEA are low and swampy. The eastern part of the region is lower and drier than the western.

The soil primarily consists of belts of sand, loam, clay, and gravel that attain great thickness in places. The bedrock is rarely exposed and then as bluffs overlooking stream beds.

The vegetation consists mainly of low growing types such as grass, low shrubs, and crops. High grass and reeds grow in the marshy ground near the coast and along the lower course of the KUBAN RIVER. The water courses are marked by narrow strips of forest and small wooded areas dot the foothill meadows. The vegetation presents no obstacle to movement and except for the high grasses and reeds little cover for even a prone man.

Cross country movement is very good during the dry season from mid-summer to mid-autumn. There are some obstacles such as marshes, rivers, and sand dunes. The marshy terrain can't be traversed by vehicles even when frozen.¹⁵ During heavy rains or sudden thaws

off-road movement is difficult.

The Major Caucasus Ranges and Basins include the mountain range proper.

The relief of this area is a complex northwest-southwest region of high, rugged, Alpine type mountains. A large portion of this region ranges from 9,840 to 13,125 feet in elevation. The highest peaks are usually snow capped or covered with glaciers. There are numerous sharp-crosted spurs and ridges branching off from the main peaks. Isolated basins lie between the spurs and ridges. The valleys of the east are narrower than those in the west. There are limestone caves and underground passages throughout the area. The northern foothills and slopes are more gentle than the southern. There are some rolling plateaus in the northeastern part.

The soils consist primarily of mixed shallow to deep loam and clay. Outcrops of bedrock are common in certain areas and rock fragments are mixed with the soil.

The vegetation is varied and the tops of many mountains are bare. Below the line of perpetual frost, forests extend over about half of the area and low growth over the other half. The forests range from dense to scattered stands and include both broadleaf and coniferous types. A heavy undergrowth chokes out forests on the lower slopes facing the Black Sea. The undergrowth throughout the rest of the area is sparse or absent. Low growing vegetation such as rank alpine plants and bunch grass line the valleys.

The outlook for cross country movement is impossible throughout

the area. The drier southeastern region is barely trafficable and movement is generally confined to well established routes. In the foothill belts, covered with loam and clay soils, foot movement is stopped for 6-10 weeks during the spring thaw.¹⁶ Moderate to heavy snow stops all traffic in the winter.

The Trans-Caucasian Lowlands borders on the Black Sea in the west and extends to the Caspian Sea in the east.

The relief of this area consists of a flat coastal and river flood plain with dunes near the coast and natural levees forming the only dry places in undrained areas. North of the RION RIVER flat topped and steep sided spurs jut into the lowland. There are few elevations over 300 feet. The lowland along the KURA and lower AREXES RIVERS ranges from small plateaus near GORI and TBILISI to an extensive flat plain bordering the CASPIAN SEA. The KURA is lined with terraces as far as YRVLAKH. Numerous fan shaped crescents of alluvial deposits occur where mountain streams enter the plains. There are a few low mud volcanoes in the northern part near the CASPIAN SEA.

The soils range from fine textured silts, loams, and clays of the deltas and flood plains to sand and gravel on the hilly uplands.

The vegetation west of the RION-KURA divide is dense forest crowded with undergrowth. In the northeastern section crops are gradually replacing this. East of the SURAMSKY KHREBET, except on the LENKORAN PLAIN, trees are limited to stream lines. The eastern

area has sparse vegetation typical of the steppes and ~~savannas~~. There are large areas of irrigated crops here, however. The forests of RION and LENKORAN lowlands are very dense.

This area offers fair trafficability from early summer to mid-autumn. The degree of trafficability varies from one area to another. The area is least trafficable along the BLACK and CASPIAN SEAS during the winter rainy season.¹⁷ Inland the period of least trafficability is in the spring during thaws. The coastal marshland is not negotiable for the greater portion of the year. Snowfall is generally light and the ground is seldom frozen deeper than 1 foot and is subject to sudden thaws. The summers are dry, dusty, and hot.

The Trans-Caucasian Highlands lie between the TRANS-CAUCASIAN LOWLANDS on the north and the TURKISH BORDER on the south.

The relief consists mainly of high plateaus. The northern part of the region is covered by rugged mountains with sharp ridges and spurs. The area elsewhere has extensive flat areas with low hills or isolated knobs of extinct volcanoes. There are many boulders on the upland, and the streams have cut deep gorges and valleys. The long narrow ARAXES VALLEY is located in the southern part of this area.

The soils range from shallow to deep loams and clays mixed with gravel and boulders on the slopes and fine silt on the middle ARAXES flood plain. There are many outcroppings of bed rock.

The vegetation consists of a sparse growth of grasses and shrubs. There are irrigated crops in the river valleys and forests of varying thickness on the north and east slopes of the mountains. The eastern end is bordered by shrubs.

The area offers fair to poor trafficability from May through October.¹⁸ The ground is usually dry and dusty at that time. Dust storms lasting as long as two days occur during the summer. Snow fall is generally light. Cross country movement, except for the middle ARAXES VALLEY and scattered valleys and plateaus, could best be accomplished by moving on established routes. Some of the forests would present obstacles.

The Caspian Sea Coastal Corridor is a narrow north-south lowland between the CASPIAN SEA and the BOLOHOY KARKAZ RIVER.

The relief of this area is characterized by narrow lowlands cut by steep sided flat bottomed stream beds. Mud volcanoes dot the western part of the APSHERONSKIY POLUOSTRON which lies near the southern end of the corridor.

The soils are sandy, gravelly or loam type soils. There are isolated patches of alluvial soil, salt marsh, clay, and peat. These often become sticky following prolonged rains.

The vegetation is scant and consists of steppe and semiarid type vegetation. Orchards, vineyards and low lying crops line the streams.

Cross country movement is easier in this area than in any of the others. This region would provide the easiest approach to the oil fields of BAKU.¹⁹ The surface materials are most trafficable from May through October when the ground is dry and firm. Cross country movement is favorable for over 240 days each year. During and shortly after heavy rains the area would offer poor trafficability.

Southern Russia

European Russia's most distinguishing feature is the extensive plain with an almost total lack of relief, in contrast with the rest of the European continent. Lowland sections frequently alternate with more elevated and strongly dissected sections which might be called hills. The general level of the plain is about 550 feet and few hills rise above 670 feet. One contrast in this plain is found in the southwest which is an upland deeply cut by numerous valleys, 150-400 feet deep. In the central part there are a series of uplands running generally north-south. In the eastern portion an area called the PRE-VOLGA HILLS is actually a north-south plateau with an elevation above sea level of 1,000 feet. The major highlands are the UKRAINIAN CARPATHIAN MOUNTAINS and the KOLA KARELIA LOW MOUNTAINS.²⁰ The balance of the area is rolling wide plains.

The vegetation is very varied. Vegetation ranges from Mediterranean forests in the south to dry desert in the CASPIAN LOWLANDS to tundra in the north. The extreme southern part is a vast grassland on which trees are either absent or rare. Much of this area is under cultivation. West and north of the lower VOLGA the grasses are sparse and saline in spots. The moist VOLGA flood plain is the only area with trees in the southeastern part.

Trafficability and cross country movement is affected more by weather than terrain. The least favorable conditions occur in the spring when even improved roads fail in spots. Another unfavorable period is October and November when alternate periods of freezing and

thawing of the surface soil disrupt the normal soil drainage before the onset of persistent freezing. Any precipitation during this period makes for poor trafficability. Winter is the most favored time for widespread cross country movement.²¹ Surface materials are frozen deep enough to support most military vehicles during the winter. In summer surface materials are generally trafficable but varies from day to day with the amount of precipitation.

Balkan Peninsula

Romania measures approximately 400 miles east-west and 300 miles north-south at its widest point. The TRANSYLVANIA ALPS and the CARPATHIAN MOUNTAINS form a huge crescent which extends from RUTHENIA in the north to the center of ROMANIA where it curves sharply to the west and runs to the HUNGARIAN PLAINS. This crescent effectively divides ROMANIA into three areas: THE SOUTHERN AND EASTERN PLAIN AND PLATEAUS, THE CARPATHIAN-TRANSYLVANIA MOUNTAINS, and the CENTRAL AND WESTERN BASIN, MOUNTAINS AND PLAIN.

The Southern and Eastern Plain and Plateaus consist of all of ROMANIA to the south and east of this huge crescent. It contains the WALLACHIAN PLAIN, DANUBE DELTA, DOBRUJA PLATEAU AND MOLDAVIAN PLATEAU.

The WALLACHIAN PLAIN lies between the TRANSYLVANIA ALPS and the DANUBE RIVER and is an area of fertile soils and the PLOESTI Oil fields. Most of the area is under 100 feet elevation with the south central portion giving way to rolling terrain with elevations as high as 400 feet.

The DANUBE DELTA includes that area adjacent to the DANUBE and its tributaries from GALATI east to the BLACK SEA. It consists primarily of a giant network of lakes, marshes, and river beds. Most of the area is intermittently flooded with no area more than 5 feet above sea level.²²

The DOBRUJA PLATEAU includes all the area east of the north-south DANUBE RIVER between the DANUBE DELTA and the BULGARIAN border. In the northern part of this region high hills rise to a height of 1,300 feet in places and gradually descend to the south into low hills and wide valleys. It is bordered on the DANUBE and BLACK SEA by high cliffs 300-400 feet in height. In the south the valleys open into a monotonously flat steppe land that is broken only by intermittent streams.

The MOLDAVIAN PLATEAU extends east from the CARPATHIAN MOUNTAINS to the PRUT RIVER. The area is separated by a depression in the center into a northern and southern part. Both of these slope from high hills in their northwest to low flat lands in their southeast. Valleys in the north are 500-600 feet deep and become broader and shallower in the southeast. The southern part is higher and more dissected than the northern. The area flattens gradually into the WALLACHIAN PLAIN to the south.

The CARPATHIAN and TRANSYLVANIA MOUNTAINS present a formidable mountain barrier running generally through the center of ROMANIA.

The CARPATHIANS consist primarily of a series of parallel north-south mountain ranges. The summits are smooth and rounded with fairly uniform elevations of less than 5,000 feet. The highest and most rugged part lies at the western end. The two most important mountain passes are the OITUZ and the GHIMES.²³

The TRANSYLVANIA ALPS run generally east to west and are more rugged than the CARPATHIANS reaching an elevation of 6,600-8,000 feet. The broad uplands are dissected by deep narrow valleys. The Alps are lower in the west and include several large valleys. The DANUBE flows through a gorge, in the western end, which averages less than 400 feet wide. Several routes through the alps follow either narrow river valleys or flat uplands. The most important of these are the TURMU ROSA along the OLT RIVER; VULCAN along the JIU RIVER, BRAN connecting CAMPULUNG and BRASOV, PREDEAL directly south of BRASOV, and a low pass connecting the CERNA and TIMIS valleys.²⁴

Sheltered mountain valleys parallel both the CARPATHIANS and TRANSYLVANIA ALPS. The most important of these are the MURES VALLEY near GHEORGHIEI, the OLT VALLEY near MERCUREACI, and one east of BRASOV.

The central and western basins, mountains, and plains include all the area north and west of the inner side of the crescent.

The TRANSYLVANIA BASIN between the BIHOR MOUNTAINS and the inner side of the arc is primarily a series of rolling hills and winding valleys. The hills run from 2,000-2,300 feet in elevation and the valleys vary from 1,000-1,300 feet. The greater part of the

area is grassland but some agriculture thrives along the rivers.

The BIHOR MOUNTAINS lie to the west of the TRANSYLVANIA BASIN and vary from mountains of 5,600 feet in the northwest to high plateaus in the east and south.

The MIDDLE DANUBE PLAIN along the western border of ROMANIA gradually merges with the HUNGARIAN PLAIN. It consists of marsh land, sand dunes, poorly drained grassland, and cultivated land. The soil is excellent when drained.

The vegetation of ROMANIA is varied with 20 per cent of the land being covered by forest. The WALLACHIAN PLAIN is wooded in the north but gives way to grassland and cultivated fields in the south. The DANUBE DELTA is primarily marshland. The DOBRUJA PLATEAU is covered with heavy deciduous forest above 650 feet but has flat areas in the south covered by grass. The MOLDAVIAN PLATEAU has few trees except on hills, and is primarily grassland with some marsh in the south. The TRANSYLVANIA BASIN is partially forested with the southern part grassland. Coniferous forests from 4,000-5,200 feet are common in the BIHOR MOUNTAINS. Cultivated areas extend to 4,000 feet. The DANUBE PLAIN consists of marsh, grassland and cultivated fields.

The climate of ROMANIA varies from humid with long severe winters in mountain regions to semi-arid with large yearly temperature ranges in the lowlands. June is the month when rainfall is the heaviest. The late summers are sunny and snows are frequent in the winter. The annual rainfall varies from 60 inches in mountain areas to 15 inches in parts of the DOBRUJA PLATEAU. The winters are

universally cold averaging 20° to 30° F in January.

The possibility for cross country movement will vary from excellent in the plateaus and some plains to impossible in the mountains. The trafficability ranges from poor to excellent. The obstacles to cross country movement include the mountain ranges, the DANUBE RIVER and its tributaries and the numerous marshes and swamps. Limited cross country movement is possible in all areas except the DANUBE DELTA, the higher parts of the CARPATHIAN, TRANSYLVANIA and BIHOR MOUNTAINS and parts of the MIDDLE DANUBE PLAIN. The movement in even the more promising areas would be hindered by numerous streams and steep valleys.

Bulgaria is a land of moderately rugged mountains, lowland and highland basins and low plateaus. In the north the DANUBE RIVER VALLEY rises to the broad tableland of the CENTRAL BALKAN MOUNTAINS which run generally east-west. These ranges are separated from the higher SOUTHERN HIGHLANDS region to the southwest by the CENTRAL DEPRESSION. The CENTRAL DEPRESSION consists of a series of valleys and basins.

The SOUTHERN HIGHLANDS are rugged mountains with rounded summits which run along the YUGOSLAV border from the STRUMITSA RIVER to KYUSTENDIL. Their lowest point is 3,000 feet. The STRUMA-STRUMITSA BASIN lies at the southwestern end of these mountains. In the upper STRUMA BASIN the STRUMA VALLEY widens with the STRUMA RIVER draining a series of enclosed basins on the flanks. The STRUMA BASIN is separated from the SOFIA BASIN, to the north, by the VITOSHA PLANINA MOUNTAINS. To the east of the STRUMA BASIN the major corridor through

the RHODOPE MOUNTAINS is in the MESTA VALLEY.²⁵ Rugged hill country extends along the TRUKISH border from the MARITSA RIVER to the BLACK SEA.

The CENTRAL DEPRESSION, an area of valleys and basins, begins at SOFIA. The SOFIA BASIN is an elliptical depression which measures 46 miles northwest-southeast. It is flat and marshy in the northwest and well drained and rolling in the southeast. The PLOVDIV to the southeast is another elliptical depression which is 100 miles long and 30 miles wide. It is connected to the SOFIA BASIN by rolling terrain. The MARITSA basin is low and marshy with rice fields along its banks. The ZAGORA BASIN is separated from the PLOVDIV and MARITSA BASINS by a series of north south hills. It is connected to the TUNDZHA BASIN in the southeast by a single ridge and rolling terrain.

The BALKAN MOUNTAINS to the west of SOFIA are round topped and range from 2,000-6,500 feet. A spurred ridge extends along the YUGOSLAV border and reaches 5,000 feet where they turn southeast. The WESTERN AND CENTRAL BALKANS are separated by the narrow ISKR GORGE. The CENTRAL BALKANS extend 160 miles to the east and feature steep south slopes and gentler north slopes. There are six north-south passes over the range in this stretch.²⁶ The EASTERN BALKANS are much lower and consist of two or more east-west ridges which are parallel.

The DANUBIAN TABLELANDS can best be described as an undulating area which slopes gently to the DANUBE RIVER. The river itself has

cut deep into the land and formed high bluffs and cliffs. The southern part of this area has been dissected by the north-south tributaries of the DANUBE. The northern part of the area is rolling upland 1,000-1,500 feet high and gradually gives way to undulating hills and plateaus.

The vegetation is varied according to the elevation and soil. The SOUTHERN HIGHLANDS consists of forested mountains, alpine pastures, and rocky wastes. Pine and fir predominate at 4,000-4,500 feet; birch, pine and fir at 3,000-4,000 feet; and hardwood below 3,000 feet. The forests are generally open and free of underbrush near villages. The valleys and basins are cultivated.

The CENTRAL DEPRESSION consists primarily of fields and pastures with woodland on the slopes and swamps. The SOFIA BASIN is generally open and cultivated except the marsh area north of SOFIA. The area southeast of SOFIA is devoted to crops, vineyards, and rose bushes. The marshy area in the MARITSA BASIN is mostly marsh grass and rice. The area then trends to pasture, fields and orchards.

The north slopes of the BALKAN MOUNTAINS are covered with dense forest and undergrowth. The south slopes and eastern end run to pasture, scrub thicket, and steppe grass. There are local thickets of bramble which would retard movement.

The DANUBIAN TABLELANDS were originally treeless grassland blanding into wooded Balkan foothills. This is rapidly giving way to cultivated areas in the northern plateau.

The climate is as varied as the vegetation. The summers are generally long and warm and the winters cold, especially in the north. The annual rainfall is between 20-30 inches with early summer receiving the maximum.

The very nature of the east-west compartmentation of BULGARIA discourages north-south movement. Conditions for cross country movement range from fair to good in the DANUBIAN TABLELANDS and the MARITSA VALLEY. They are generally poor elsewhere. Cross country movement, while generally good on the rolling upland of the DANUBIAN TABLELAND, is likely to be interrupted by steep valleys and marshes. The hilly area bordering the BLACK SEA is suitable only for short range deployment. Deployment from roads is generally not possible in the BALKAN MOUNTAIN REGION. The basins and valleys of the CENTRAL DEPRESSION are suitable for deployment and limited cross country movement except in the marsh areas of SOFIA and the MARITSA BASIN. There are large flooded areas in the lowlands during the spring thaws. In the RHODOPE MOUNTAINS deployment is extremely limited and local in character, and cross country movement is virtually impossible. Southwest of SOFIA movement is possible across the plains of PERNIK, RADOMIC and KYUSTENDIL. The STRUMA RIVER valley is narrow and gorge-like and the MESTA VALLEY is even worse.

Yugoslavia is rugged and mountainous over two thirds of its area with an extensive lowland area in the north central portion. The country has a precipitous coastline. The PANNONIAN PLAIN in the

north is protected by the DANUBE and SAVE RIVERS.

The DINARIC ALPS parallel the west coast of YUGOSLAVIA and slope sharply to the ADRIATIC SEA. These mountains descend gradually to northern GREECE and the SALONICA PLAIN. This barrier is cut by the VARDAR VALLEY and the MONASTIR GAP.²⁷ There is a high ridge line along the BULGARIAN border and mountains on the south-eastern ROMANIAN border. The southern part of YUGOSLAVIA has steep rugged mountains along the ALBANIAN border. The only avenue of ingress from the coast is the NERITVA RIVER BASIN.²⁸

The PANNONIAN PLAIN is quite low, averaging less than 350 feet, and often monotonously flat. This plain is wedge shaped and is an extension of the Hungarian plain. It rises gradually into the SLOVENIAN and CENTRAL YUGOSLAV mountains on the west and south.

The vegetation of YUGOSLAVIA is 30 per cent forest. This is mixed coniferous, deciduous, Mediterranean scrub, and steppe grass and is located mainly in the highland areas or in other difficult areas. There is very little land under cultivation in this forest region. In the southern part, near the GREEK border, vegetation is very sparse with large areas of alpine flora. Along the ADRIATIC coast the vegetation is low scrub and impenetrable thorn vines. Steppe type vegetation is found on the PANNONIAN PLAIN in the north where 75 per cent of the total land area is in cultivation.

The mountains and coast lines feature well drained and rocky soil. The PANNONIAN PLAIN is a mixture of loam and alluvial type soil.

The summers are warm and the winters mild along the coast and

Pannonian plain. The winters are severe in the mountains with heavy snow. The average annual rainfall is 24.37 inches.

Because of the rugged terrain cross country movement is impossible over much of YUGOSLAVIA. The mountain areas are better suited for small groups with pack animals or for guerillas. Heavy snows and precipitation the year around limit movement in the mountains to well established routes. Cross country movement is possible in certain directions with reconnaissance. These areas are the TRIESTE area and peninsula west of FIUME, a section of the southern coast from SIBENIK to DUBROVNIK, and a sizable area south of the MORAVA VALLEY, lying between ALBANIA and BULGARIA. These are in addition to the PANNONIAN PLAIN which offers the best possibilities for cross country movement. The best time for this is from midsummer to early autumn because of dry ground and favorable weather. Spring is the most difficult time for movement because of melting snow and swollen rivers. YUGOSLAVIA lies astride two historical invasion routes. They are the MORAVA-VARDAR and MORAVA MARITSA TRENCHES.

Greece is a mainland peninsula composed of parallel mountain ranges traversed by several valleys. It has a very extensive coastline (approximately 1500 miles) and an extensive Archipelago in the southeast. The valleys and basins have been centers of settlement for centuries.

The coastal lowlands are most extensive in the east and northeast with about one half of the country above 1,500 feet elevation.

In the central mountain core and in CRETE several mountain peaks rise above 6,500 feet and in the northeast MT OLYMPUS rises to 9,571 feet.

The most extensive lowland area of GREECE extends from the basin of the FLORINA RIVER in the west through a narrow corridor at LAKE VEGORRIUS, then through the plain of SALONIKA and over an alternating series of low smoothly sloping hills and plains in THRACE to the MARITSA RIVER.³⁰ The highest elevation along this plain is around 3,000 feet and the average is below 1,000 feet. Smaller lowland areas are located around LARISA and ATHENS in the east and north and south of the gulf of PATRAS. Large marshes exist in the western part of the SALONIKA PLAIN and northwest of KAVALLA in THRACE.

The PINDUS MOUNTAINS extend for 160 miles down through the center of GREECE and vary from 40-60 miles wide. They form effective barriers to east-west movement. They gradually recede as they continue south but remain extremely rugged. The summits are usually rounded and bare.³¹ There are two passes through the mountains. METSOVIAN PASS (5,000 feet) in the north connects KALABAKA and JANNINA via the LYCAS RIVER VALLEY. The other is a pass in the south near MT TIMFRISTOS and connects the SPERKHIOS VALLEY and KARPENISION.

A second mountain mass forms a semi circular curve from the GULF OF THERMAI west to the PINDUS MOUNTAINS. It is characterized by isolated highlands with steep seaward slopes. The elevations in general exceed 2,000 feet.

The southern end of the RHODOPE MOUNTAINS extends into eastern GREECE between the STRUMA and NESTOS RIVER and drops sharply to the plains bordering the Aegean Sea.

GREECE has been largely deforested and grasses predominate below 600 feet. Forest areas can still be found in the rugged mountain areas but this forest amounts to only 15 per cent of the total land area. The trees are generally wide spaced and of medium height. Only 1/5 of the land area is cultivated. This is limited primarily to valleys and basins in the eastern and southern sections of GREECE. Some areas are entirely bare while others are covered with low brush and grass.

The mountain soil in general is firm, well drained and often rocky. Many of the plains areas have poorly drained alluvial soils interspersed with swamps and marshes. Some of the plains have medium texture loam soils and scattered areas in the northeast with sandy well drained soils.

Large cross country movement of wheeled or track vehicles is impossible over a large portion of GREECE and the associated islands because of the mountainous terrain. Movement across the mountains is restricted to gorges, passes, and corridors.

The best areas for cross country movement are limited to the interior basins and small coastal plains. These offer good trafficability in dry weather and poor to fair in wet weather. Dust would be a problem in dry weather. Mountain troops would be needed in the PINDUS MOUNTAINS.

Albania is a low lying coastal plain except in the south where it rises inland to a region of rugged inaccessible mountains. Western ALBANIA from the YUGOSLAV border to VALONA and inland as far as a line roughly joining SCUTARI-TIRANA-BERAT-VALONA is a plain generally below 600 feet.³³ The surface is not uniform but is diversified and small ridges rise to 1,000 feet and run generally northeast-southwest. There is considerable poorly drained land.

Eastern ALBANIA and the coastal lands south of VALONA are mountainous with peaks rising to 9,000 feet in the north and 7,000 feet in the south. There are some mountain lowlands in the south between ELBAUSEN and LAKE OKHRIDA, but this flat land is subject to flood.

The winters are cool and rainy and the summers warm. The rain and cold increase inland. The annual rainfall is 47 inches.

The alluvial plains of the coastal region begin to dry in May but aren't hard until June. Certain areas of marshland dry out in midsummer but others remain impassable throughout the year. Climatic conditions impose great restrictions on movement from October until May.³⁴ In the plains travel must be confined to roads during this period. In the mountains roads are poor and likely to be blocked by snow in the winter. Trafficability ranges from impossible to poor. There are eight highways leading into YUGOSLAVIA and four into GREECE.³⁵

NOTES FOR CHAPTER 9

¹NIS, Turkey, Descriptive Analysis of Military Regions
(Washington 25, D.C: 15 June, 1948) Ch II, Sec 26, p 26-1

²Ibid, p 26-17

³Ibid, p 26-35

⁴Ibid, p 26-52

⁵Ibid, p 26-71

⁶Ibid, p 26-67

⁷Ibid, p 26-79

⁸Ibid, p 26-78

⁹Ibid, p 26-96

¹⁰Ibid, p 26-102

¹¹Ibid, p 26-123

¹²Ibid, p 26-156

¹³Ibid, p 26-163

¹⁴Ibid, p 26-167

¹⁵JANIS 41, USSR, The Caucasus Area Military Geography
(Washington 25, D.C.) Ch II, p 1-8

¹⁶Ibid, p 1-7

¹⁷Ibid, p 1-7

¹⁸Ibid, p 1-7

¹⁹Ibid, p 1-8

²⁰JANIS 40, European USSR, (Washington 25, D.C.) Ch 11, p 11-1

²¹Ibid, p 11-3

²²SR 12, Rumania, (Washington 25, D.C: 5 October 1946) p 53

²³Ibid, p 54

- ²⁴Ibid, p 54
- ²⁵JANIS 38, Bulgaria, Military Geography (Washington 25, D.C.)
Ch II, p 1-30
- ²⁶Ibid, passim
- ²⁷SID, Yugoslavia, Armed Forces (Washington 25, D.C: Jan 48)
Ch VI, p 41
- ²⁸Ibid, passim
- ²⁹G.L. McEntee (Col, USA Ret) Military History of the World
War 1914-1918, Ch XVIII, p 128
- ³⁰SID Greece, Digest (Washington 25, DC: March 1948) Ch 1
- ³¹Ibid; passim
- ³²Ibid; passim
- ³³NIS 20, Albania (Washington 25, DC) p 37-3
- ³⁴Ibid; passim
- ³⁵Ibid, p 32-2

CHAPTER 10

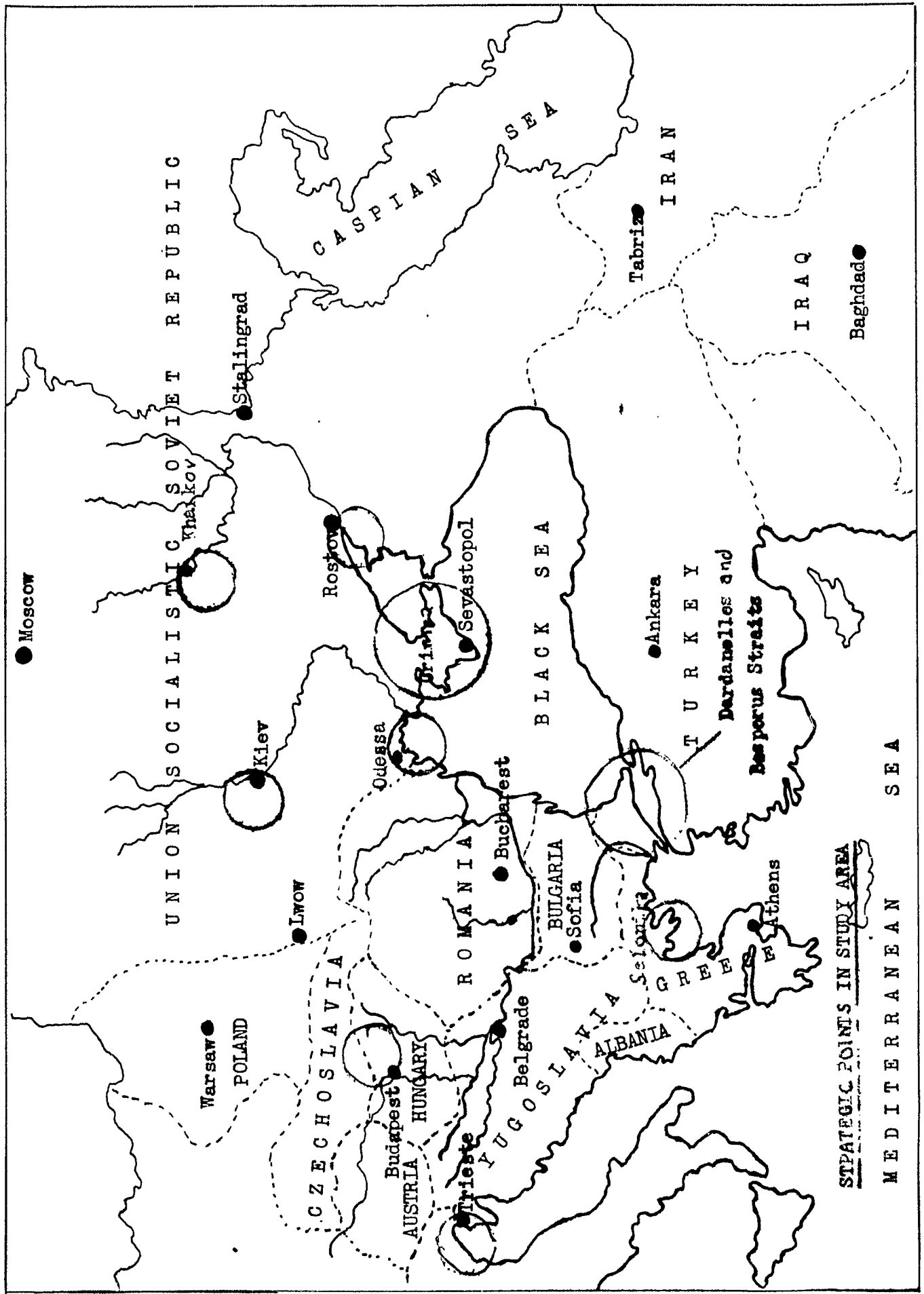
STRATEGIC AREAS

Strategic areas gain their importance from their position in relation to military routes of approach. The importance of maintaining friendly naval and air superiority over the MEDITERRANEAN SEA approaches are undebatable. Armored warfare employed in its primary offensive role requires huge tonnages to be moved over water in order to place its firepower on foreign soil where most effective. Therefore, strategic areas in the BALKANS and SOUTHERN RUSSIA resolve themselves to these ports of entry, and areas suitable as intermediate objectives for mobile armored warfare.

Strategic areas present themselves around three large bodies of water leading landward from the MEDITERRANEAN. The most important is considered to be the entrances to the BLACK SEA, and its ports into SOUTH RUSSIA. The next in importance are ports of land entry facing the AEGEAN SEA, all of which are controlled by GREECE. Third, and of equal importance as the second, is the ADRIATIC SEA entry in the TRIESTE-FIUME area.

Black Sea Area

The DARDANELLES and BOSPORUS STRAITS, which constitute the only warm water, readily accessible outlet for RUSSIA and her Balkan Satellites of ROMANIA and HUNGARY, has long been a problem area. The two straits enclose the MARMARA SEA and give entrance from the MEDITERRANEAN SEA, through the AEGEAN SEA to the BLACK



STRATEGIC POINTS IN STUDY AREA

MEDITERRANEAN SEA

SEA. Due to the narrowness and length of the STRAITS, fortifications on both shores, controlled by TURKEY, can easily command the passage-way.

ISTANBUL, the major city of the STRAITS AREA, is located on the EUROPEAN or west side of the BOSPORUS STRAITS. In 1940, the population of ISTANBUL was reported as 789,346. This population represented all major religions and many ethnic groups of the BALKAN and NEAR EAST areas. Air service connects ISTANBUL with ANKARA, the capitol of TURKEY. The location of the city also lends it to a thriving commercial business. It is the EUROPEAN terminus and trans-shipment point of the Oriental Express Railway. In 1938, there were 15,041 ships of 13,059,000 tons passed through the BOSPORUS STRAITS. During the same period 9,025 ships of 15,370,000 tons passed through the DARDANELLES. This difference in tonnages indicates the importance of the city as a transshipment point.¹

As a strategic area, giving entrance deep into Soviet territory, it is of the utmost importance that this area be controlled by Allied or friendly nations in time of war. Previous wars in this area have indicated that land attack has to be employed to control the STRAITS, and naval assault is futile. Therefore, the defense of TURKEY and her loyalty to the Western Nations is necessary for these STRAITS to be at friendly disposal for military operations.

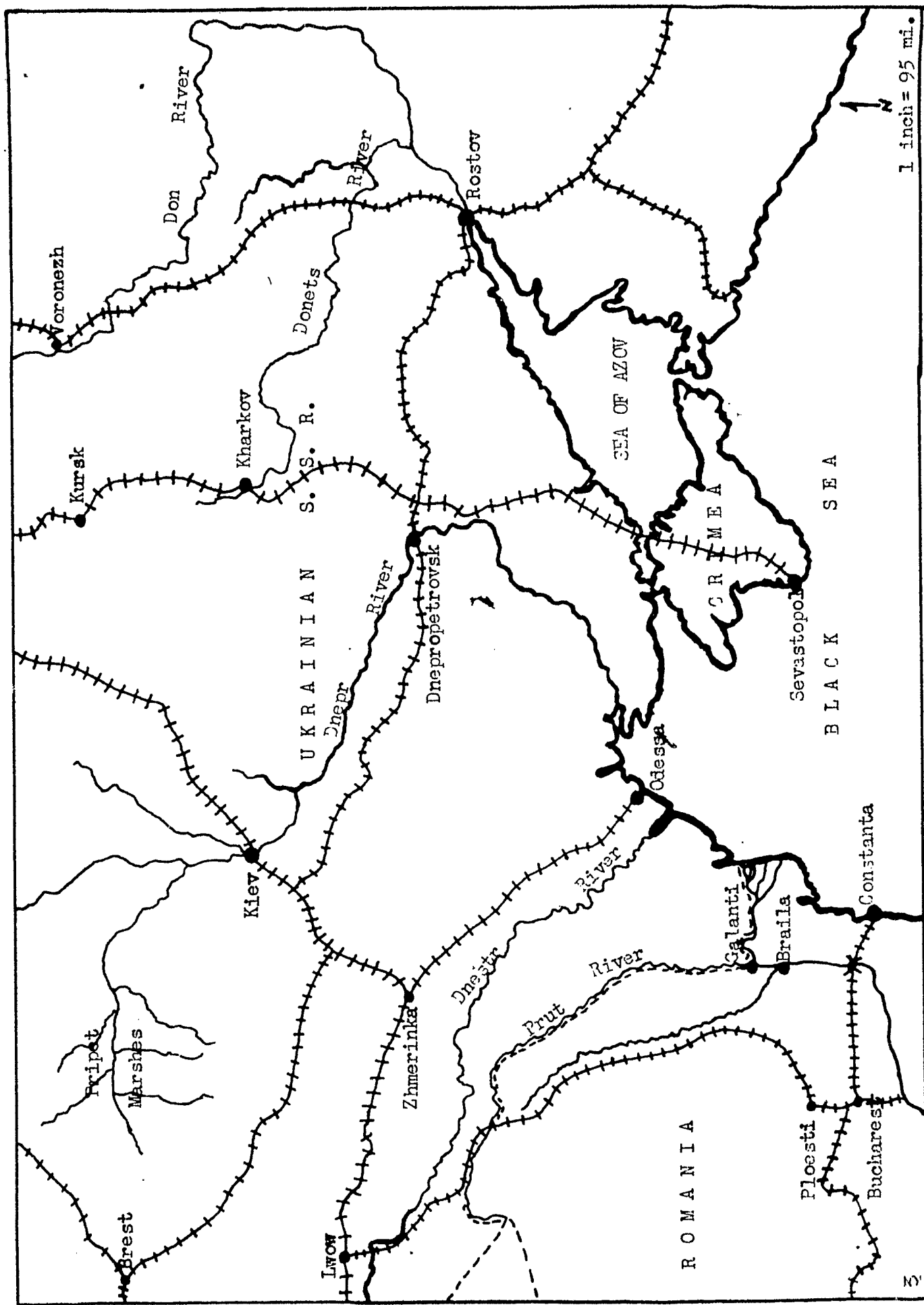
The CRIMEAN PENINSULA, which hangs from SOUTH EUROPEAN RUSSIA into the BLACK SEA, is an important strategic area. Its importance arises from its possibly being used as a foothold and assembly area

for large scale assaults into RUSSIA. Superior air and naval forces would of necessity be required as a preliminary requisite for putting ground formations ashore and sustaining them. The island nature and size of this peninsula, its command of inward communication routes, and proximity to the rich UKRAINE make it extremely important as an amphibious spring board.

SEVASTOPOL, the major city on the peninsula, is a port capable of being expanded to accommodate any military force employed in the area. A railway and highway runs almost straight north for approximately 900 miles to MOSCOW. Due to this railway having many side connections after entering the mainland, large scale logistical operations could utilize other major ports such as ROSTOV and ODESSA. Other smaller ports and landing areas on the SEA OF AZOV, which lies northeast of the CRIMEAN PENINSULA, provide further dispersion.

The CRIMEAN PENINSULA is connected to the mainland by a marshy isthmus three to four miles across. The dimensions of the peninsula are approximately 200 miles east to west, and 110 miles north and south, comprising an area of 9,952 square miles.²

Although this area has strategic implications as a foothold and troop marshalling area, the routes of attack from it overland are not without shortcomings. The initial terrain encountered to its north is rather rugged and would be defensible, but not impregnable. Therefore, its strategic significance is not fully dependent on its tethers to the mainland, but to its proximity to ROSTOV on the east, ODESSA on the west and other smaller ports



1 inch = 95 mi.

2

and landing areas between these points.

The strategic port city of ODESSA lies between the mouths of the DNEPR and DNESTR RIVERS on the northwest shores of the BLACK SEA. The port contains five harbors, and has two breakwaters of 4,020 feet and 2,120 feet. These facilities give ample sheltered waters. The harbors are frozen for an average of 16 days each year, but modern ice breakers could easily keep them open the year round. Port facilities in the harbors have been well developed, and are capable of handling large industrial machinery.³

The military importance of the city is its location at the terminus of transportation facilities extending deep into the UKRAINE. The main roads and rail routes branch to approach KIEV and LVOV, both being key inland cities. This avenue of entrance is on good going terrain and is flanked by terrain barriers of the DNESTR and BUG RIVERS.

The TANGANROD-ROSTOV areas are of secondary importance as ports of entry. The port facilities are underdeveloped, and anchorage at piers is limited to five to six feet in depth. Lighterage is required for most large shipments. Both ports are ice bound two or three months each winter.⁴ Their strategic importance lies in their ample communications connections toward MOSCOW, and the fact that ROSTOV funnels these transport facilities into the CAUCASUS AREA and the port of BAKU on the CASPIAN SEA. The routes to MOSCOW north from these cities are flanked on the east by the vast DONBASS BASIN. Therefore, this area lends itself as a logical right flank for military operations in the UKRAINE.

The city of KHARKOV is the administrative center of the UKRAINE. In 1939 its population was 833,434, and is probably over one million at the present date. It is an important industrial city, and is the major communications hub between MOSCOW and the BLACK SEA-CAUCASUS AREA.⁵

The city of KIEV, rated as the third largest city in the SOVIET UNION, could very probably be rated first in importance, economically. It lies in the DNEPR RIVER at a point commanding all communications from the BALKANS and CENTRAL EUROPE to MOSCOW. The vast PRIPET MARSHES to its northwest canalize movement through KIEV. The freightage of goods on inland shipping on the DNEPR RIVER that is transshipped at KIEV is tremendous.

From the viewpoint of considering the UKRAINE an economic and military prize for an area of operations in SOUTHERN RUSSIA, KIEV with KHARKOV would be the logical objectives for securing the area. Both are communications centers and both have terrain barriers incompatible to good armor operations on their flanks.

Other BLACK SEA ports of secondary strategic importance are those ports on the eastern shores. The principal ports are BATUMI, POTI and NOVOROSSISK, being major sea rail terminals, and flank the CAUCUS MOUNTAINS on the west. BATUMI and POTI, located just north of the TURKEY-RUSSIA border, connect by rail through the KURA RIVER corridor with BAKU on the CASPIAN SEA. NOVOROSSISK is opposite and east of the CRIMEA PENINSULA, and connects by rail inland with the ROSTOV-BAKU rail line. These areas have strategic importance only

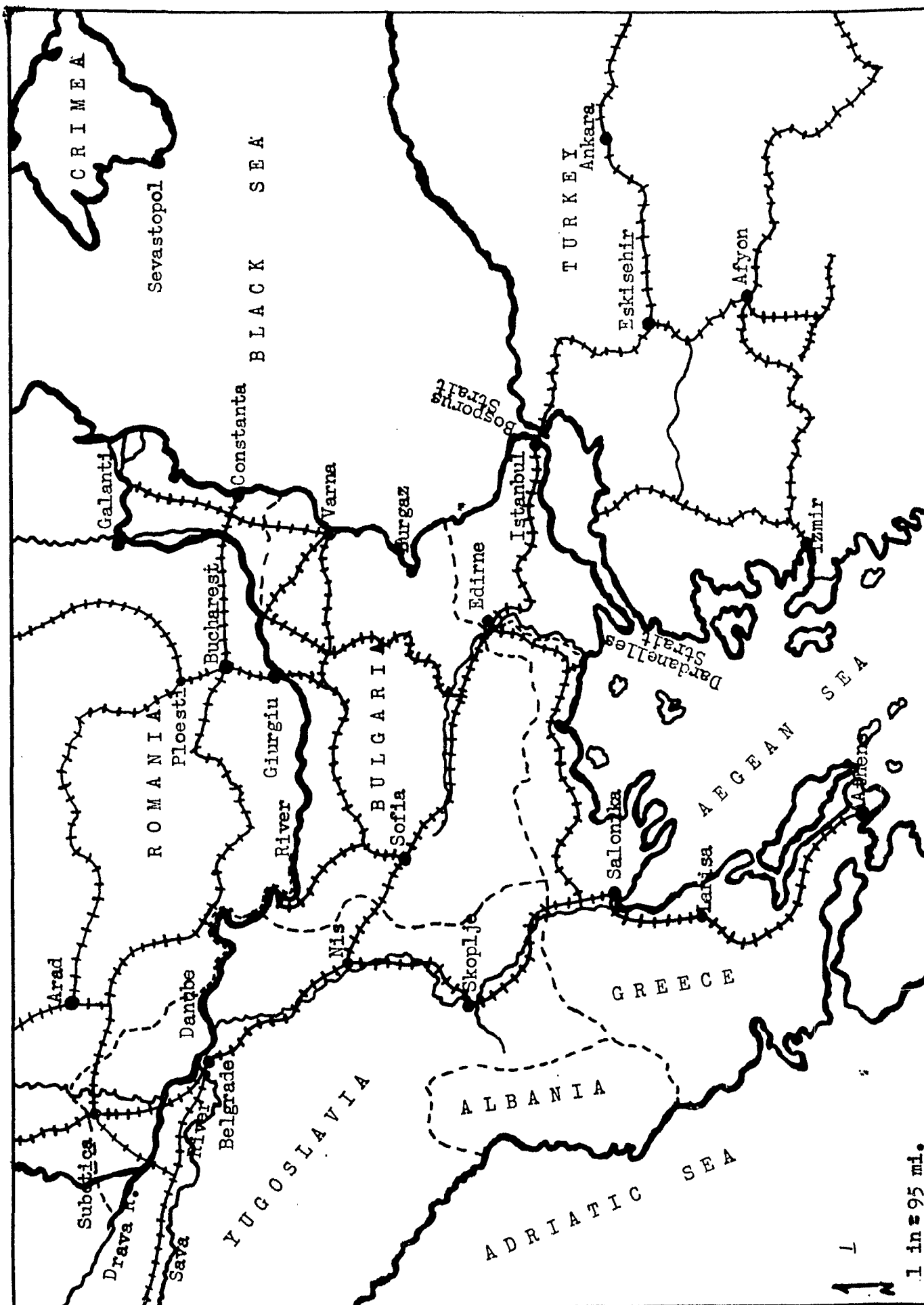
as would concern an isolated operation to penetrate and occupy CAUCUS MOUNTAIN areas by natural corridors from the BLACK SEA.

Balkans and Aegean Peninsula

The geographic position of GREECE dominates all other factors in the military significance of the country. Its position, especially the island of CRETE, dominates the sea lanes of the MEDITERRANEAN to the SUEZ CANAL and into the BLACK SEA. Of most strategic importance is the port of SALONIKA in northern GREECE, that gives entry to YUGOSLAVIA through the VARDAR RIVER valley and the MONASTIR GAP. The STRUMA RIVER valley is a somewhat restricted entry to SOFIA, BULGARIA. Supporting SALONIKA is the ATHENS-PIRAEUS port and lodgement area to the south.

Contributing to the strategic potential of the country is the highly indented coast line which lends opportunity for small naval craft operating bases. Scattered lowlands over numerous possible close support aircraft bases, and perennial fair weather favors such air operations. Armored operations in GREECE would be hampered by restricted roads through mountainous terrain. But the German army employed three Panzer Divisions in taking SALONIKA from the north. Therefore, it is altogether feasible that United States Armor employed in the present infantry-armor ratio could be profitably employed from Greek beachheads and harbors.

SALONIKA, the great port city in NORTHERN GREECE, is equally important with any other area of the BALKANS and NEAR EAST. It is the only area on the BALKAN PENINSULA with the harbor, port, and



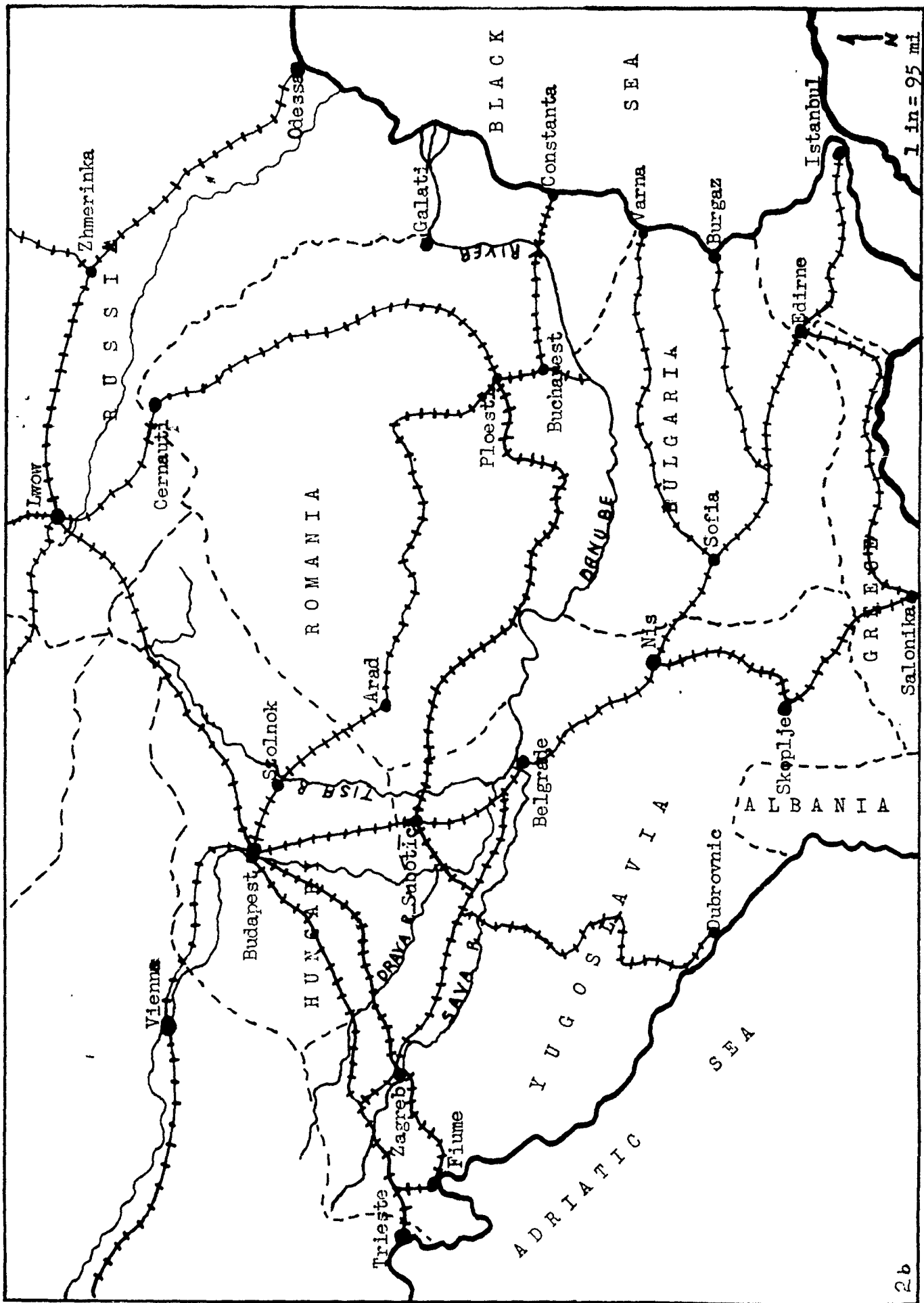
transportation facilities to support large scale military operations. It has a population of approximately one-quarter million.

The strategic importance of the area is its being the gateway into the Soviet Satellite of BULGARIA, and as an entrance into the BELGRADE-NIS areas of YUGOSLAVIA. As a seaward entrance to the BALKANS it commands the approaches of the VARDAR and STRUMA RIVER valleys. As a logistics base for military operations it could be supplemented by minor ports to the east. Also the ATHENS area further south on the AEGEAN PENINSULA provides an excellent staging area.⁶

TRIESTE is the westernmost port of entry into the BALKAN AREA, the control of which has been recently disputed. Its importance to all surrounding countries, and especially the Soviet Satellites in the BALKANS, is attested by the lack of accord on its present disposition. According to the Italian Peace Treaty of 1947, the area is to remain under British, American, and Yugoslav military command pending adoption of an instrument for its permanent government.

The strategic importance of the city is its port facilities, industry, and inland communications extending into the heart of EUROPE, connecting with VIENNA and BUDAPEST. Traffic handled by the port during 1949 totaled 3,482,490 metric tons.⁷

This port is the ingress port for a military envelopment of the western flank of the BALKAN PENINSULA. Although rugged terrain separates the port area from the SAVA RIVER valley, this offers the shortest route of invasion into HUNGARY. Again similar to the CRIMEA in the BLACK SEA, TRIESTE and DUBROVNIK provide double ports on a small peninsula. This terrain



feature affords maximum employment of naval firepower in the event of assault landings, and a protected shore marshalling area.

BELGRADE, the captiol and commerical center of YUGOSLAVIA, is located on a triangular foreground overlooking the confluence of the SAVA and DANUBE RIVERS. The cities' population is approximately 270,000. Its location in the area commanding the communications routes along the SAVA, TISA, and DANUBE RIVERS gives it strategic significance. This central area is also approximately inland from the port of SALONIKA, GREECE, and the port of TRIESTE at the head of the ADRIATIC SEA. This city is a logical intermediate objective for ground operations into HUNGARY and RUMANIA from either of the above mentioned ports.⁸

SOFIA, the capital of BULGARIA lies in an upland plain of 1700 feet altitude, which gives it command of communications east across BULGARIA, north to the DANUBE RIVER, west to NIS, YUGOSLAVIA, and south to GREECE. Its population in 1934 was 287,095 and in recent years has become more important due to political and economic centralization under Communist domination. Being the principal transportation center, with roads, and railways leading away in all directions, makes it a point controlling communications between Bulgaria and the rest of EUROPE. Approaches are relatively difficult from the west and south, but rather easy from the north and east, along the CENTRAL BULGARIAN DEPRESSION and the DANUBIAN TABLELANDS. The SOFIA area is an objective necessary for the occupation of BULGARIA only, regardless of whether it be approached from the east, south or west.

Also of importance are CONSTANTA, VARNA, and BURGAZ, port cities located on the west shores of the BLACK SEA. CONSTANTA, ROMANIA is a rail terminus which connects directly with BUCHAREST, and crosses the only lower DANUBE RIVER bridge near CERNAVODA. Its importance is gained from its development as an export exit for oil from the Romanian oil fields. VARNA and BURGAZ, both BULGARIAN ports are important as sea ports and terminal points of trans-Bulgarian railways and highways. Militarily, these three ports are important as entrances to the DANUBE PLAIN, which constitutes an east-west corridor dividing the BALKANS.

NOTES FOR CHAPTER 10

¹Encyclopedia Americana, The Americana Corporation, (New York, 1947) Vol 6, p 309.

²Op cit, passim, Vol 6, p 705.

³Op cit, passim, Vol 16, p 703.

⁴Op cit, passim, Vol 19, p 569.

⁵Op cit, passim, Vol 13, p 360.

⁶Op cit, passim, Vol 19, p 890.

⁷John Kiernan, Information Please, Almanac, (New York: The Macmillan Company, 1950) p 599.

⁸Op cit, Americana, Vol 3, p 318.

⁹Op cit, passim, Vol 20, p 924.

CHAPTER 11

STRATEGIC ROUTES OF APPROACH

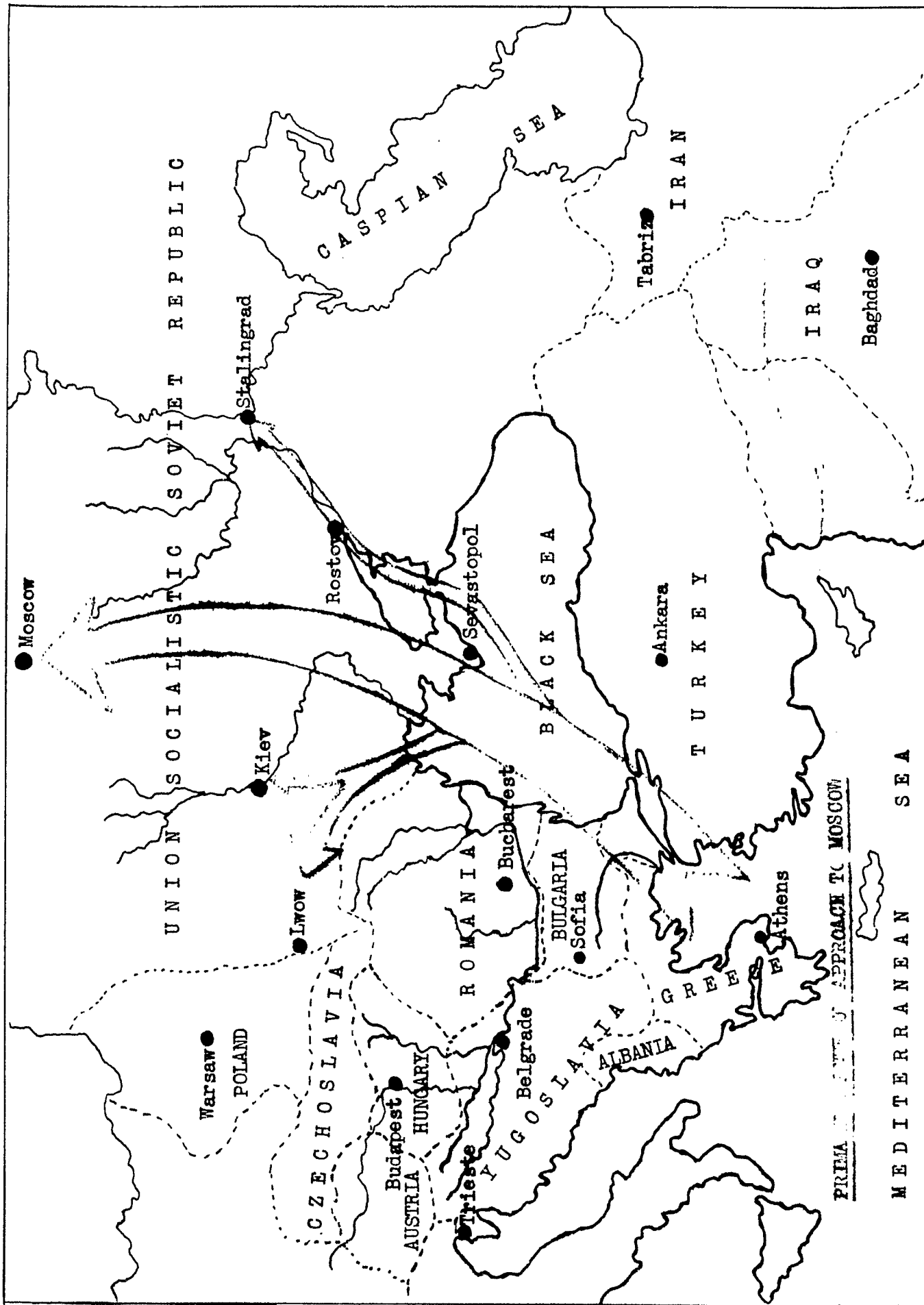
United States strategic concepts of conducting its National Defense by active offense against foreign shores, especially, depends on armor for implementing land offensives. The huge tonnage displacement of armored divisions and the excessive logistical requirements for their operations dictate to some degree the areas for their employment. Sea-borne invasion being implemented should by all means place these land offensive weapons as close to their objective as possible.

The main avenues of approach, of natural consequence, follow the same patterns as previously pointed out under relief, rivers, and transportation routes. Two primary areas present themselves as targets, SOUTH EUROPEAN RUSSIA and the BALKANS. Both areas present problems for armored operations. But it is emphatically stated that the first priority would be, if at all possible, for armor to make its major effort from BLACK SEA bases and landings into the UKRAINE of RUSSIA.

Dardanelles-Black Sea-Crimea-Kharkov-Moscow.

The most ambitious of military operations, consisting of the complete combined forces team, is visualized as approaching MOSCOW from the south. Considering weather, terrain, and transportation factors, it is believed this is the primary route to the fountainhead of world communism.

Several feasible plans for utilizing this invasion route are



conceivable, using as many as four or more field type armies. The CRIMEAN PENINSULA is a logical lodgement and build-up area for further penetrations deep into Soviet territory. The BLACK SEA area is adequate in size for maneuver of supporting naval units. The critical feature of such a grandiose plan of operations is the restricted and vulnerable water passage through the DARDANELLES and BOSPORUS STRAITS. Therefore, air and naval superiority in the area of operations would be most desirable.

By land from the northern edge of the CRIMEA to MOSCOW is approximately 800 miles. This distance is over rolling terrain favorable for armored operations. The area is adequately covered by railways and highway nets. Numerous rivers, constant communication line maintenance, and seasonal weather conditions are major factors to be considered in prior planning.

The west flank of this approach is covered by a natural corridor extending inland from ODESSA, along the DNESTR RIVER to the communications hub of LVOV. This corridor severs the SOVIET UNION from her Balkan Satellites. Following existing major transportation routes, this enveloping action would also occupy KIEV. The PRIPET MARSHES to the north furnish flank security to some degree, but would require constant surveillance.

The east flank of this operation would involve the securing of a line generally cradled by the DON RIVER, or possibly the VOLGA RIVER. In any event the full development of such an ambitious operation would squeeze off the CAUCUS oil supply without the necessity

of traversing those difficult mountains.

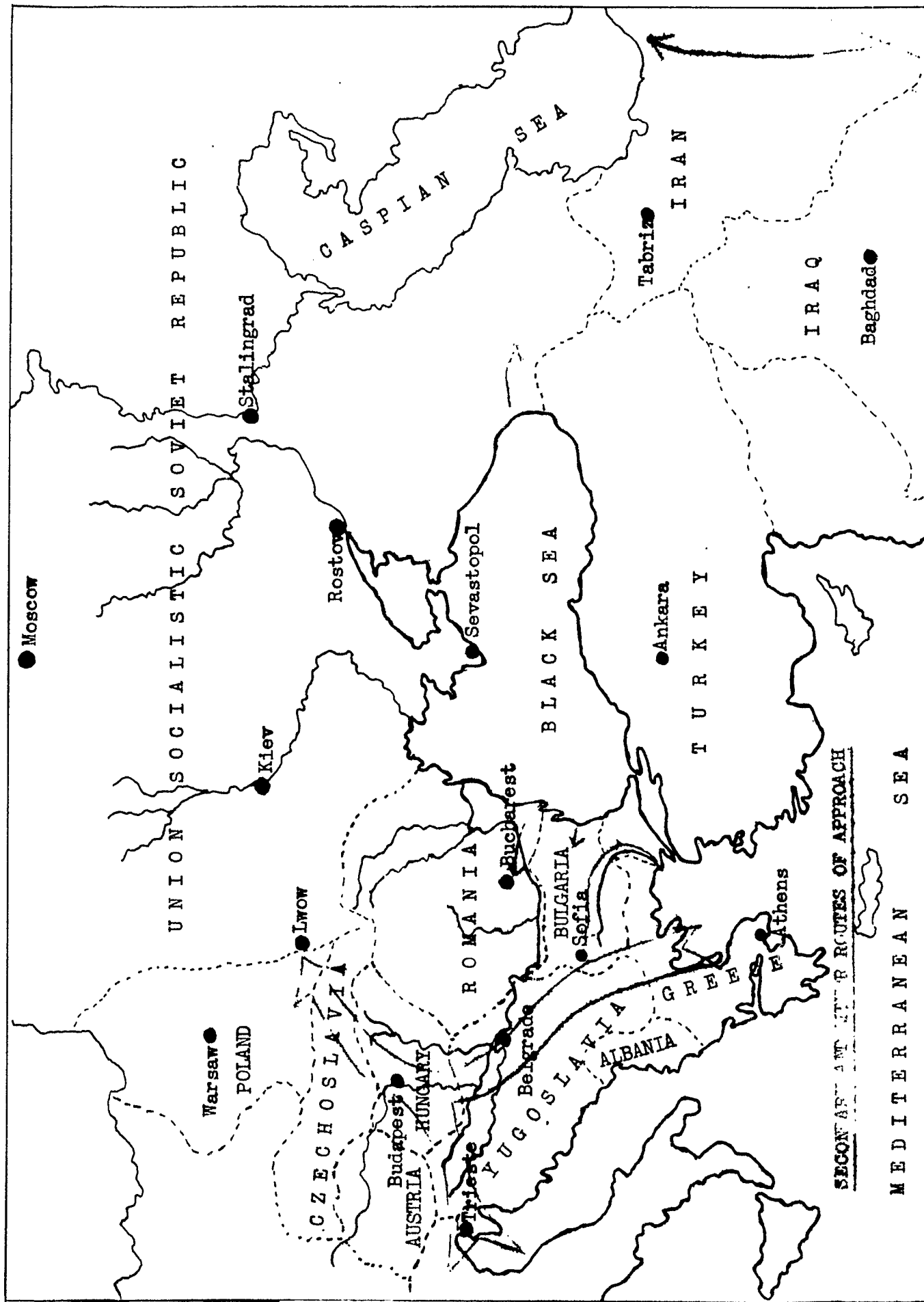
As proved by the German and Russian campaigns across this terrain in east and west directions, each town was an objective, and each crossroad and river a contested point. These east and west campaigns crossed the major rivers at right angles, whereas an invasion from the south would use them as lines of communications.

Not to be forgotten is the fact that the greatest share of SOVIET RUSSIA'S industrial and economic might lies in this concentrated area south of MOSCOW. A contributing factor also is the rumored dissatisfaction of the UKRAINIAN populations with their Soviet masters. It is of interest that the UKRAINE was allowed to enter the United Nations Organization as a separate nation. Could this be the precedent on which to base the formation of a new nation following future military decisions?

Salonika-Belgrade-Budapest-Lvov

The natural invasion route which splits the BALKAN PENINSULA north and south, has its sea outlet at the strategic Creek port of SALONIKA. The VARDAR RIVER and MORAVA RIVER provide a trench approximately 400 miles in length reaching to the Danube River Plain in the vicinity of BELGRADE.

For military operations there are three routes into the NIS-SOFIA area, an area half-way between SALONIKA and BELGRADE. Highway and railway routes pass through the MONASTIR GAP, near the GREECE-YUGOSLAVIA border, approximately 80 miles west of the VARDAR RIVER. The VARDAR RIVER itself, in this area is characterized by gorges and



broader basins to provide channelways through rugged mountains. The third route follows similar rugged terrain through the STRUMA RIVER valley on a due north direction from SALONIKA to SOFIA. Each mountain restriction on either of these three routes would provide a defensive strongpoint to be overcome.

From NIS to BELGRADE, the MORAVA RIVER VALLEY is broad and flat with ample area for military movement. Marshy areas and flash floods would constitute the only impediments. A rail line exists along this route which could support one field army, but doubtfully could support any greater forces. Invasion thus far along this route would be a difficult, but not an impossible or improbable undertaking.

For the remainder of the distance to SOVIET TERRITORY this route is supplemented by the SAVA RIVER-TRIESTE-FIUME entrance. North from BELGRADE the DANUBE and TISA RIVERS form the broad HUNGARLIAN PLAINS where maneuver area for armored warfare is complimented. The TISA RIVER flows southward from high in the CARPATHIAN MOUNTAINS. Two rail lines go through two passes on their way toward LVOV in SOVIET TERRITORY.

Trieste-Sava River-Belgrade-Budapest-Lvov.

Although it was stated that this route supplemented the SALONIKA-BELGRADE approach, it could properly rate equal importance. This route is one-half the distance of the other into the BUDAPEST area, and about two-thirds in miles to the Soviet center of LVOV.

The first 100 miles inland from the TRIESTE-FIUME area is over restricted and rugged terrain. The lime stone formations

have weathered into shear bluffs and escarpments which limit cross-country mobility to lightly equipped troops; however, two rail lines connect these two port cities with ZAGREB, and are capable of supporting large military operations.

The major rivers, the SAVA and DRAVA, are crossed at right angles by this route. The terrain covered, after the first 100 miles, is all good going terrain and is augmented by two rail lines all the distance to BUDAPEST. These lines are the major commercial outlets for HUNGARY and CZECHOSLOVAKIA.

Minor Routes of Approach.

The MARITSA RIVER flows into the AEGEAN SEA at ALEXANDROUPOLIS in Eastern GREECE. It is the border between GREECE and TURKEY from its mouth to a short distance above EDIRNE, TURKEY. The river then flows generally westward between the PHODOPE and BALKAN MOUNTAINS, providing an avenue of approach to SOFIA from the east. This river also provides an entry for land approaches to terrain dominating the DARDANELLES and BOSPORUS STRAITS. A rail line follows this route.

The PERSIAN GULF and IRAN could possibly be considered as an avenue of approach. If the BLACK SEA and EASTERN MEDITERRANEAN were rendered untenable, the NEAR EAST approaches would possibly merit attention for small scale diversionary or special operations. Due to extended distances, rugged terrain and lack of developed communications, this area is believed to be limited in inducements for armor operations.

The east-west avenues into BULGARIA and ROMANIA from the BLACK SEA are of importance as routes for occupation of those two

countries. These avenues would tend to supplement the other major routes of approach into the BALKANS, and operations into SOUTH RUSSIA. This precept is based on the requirement of necessarily having control of the STRAITS into the BLACK SEA.

CHAPTER 12

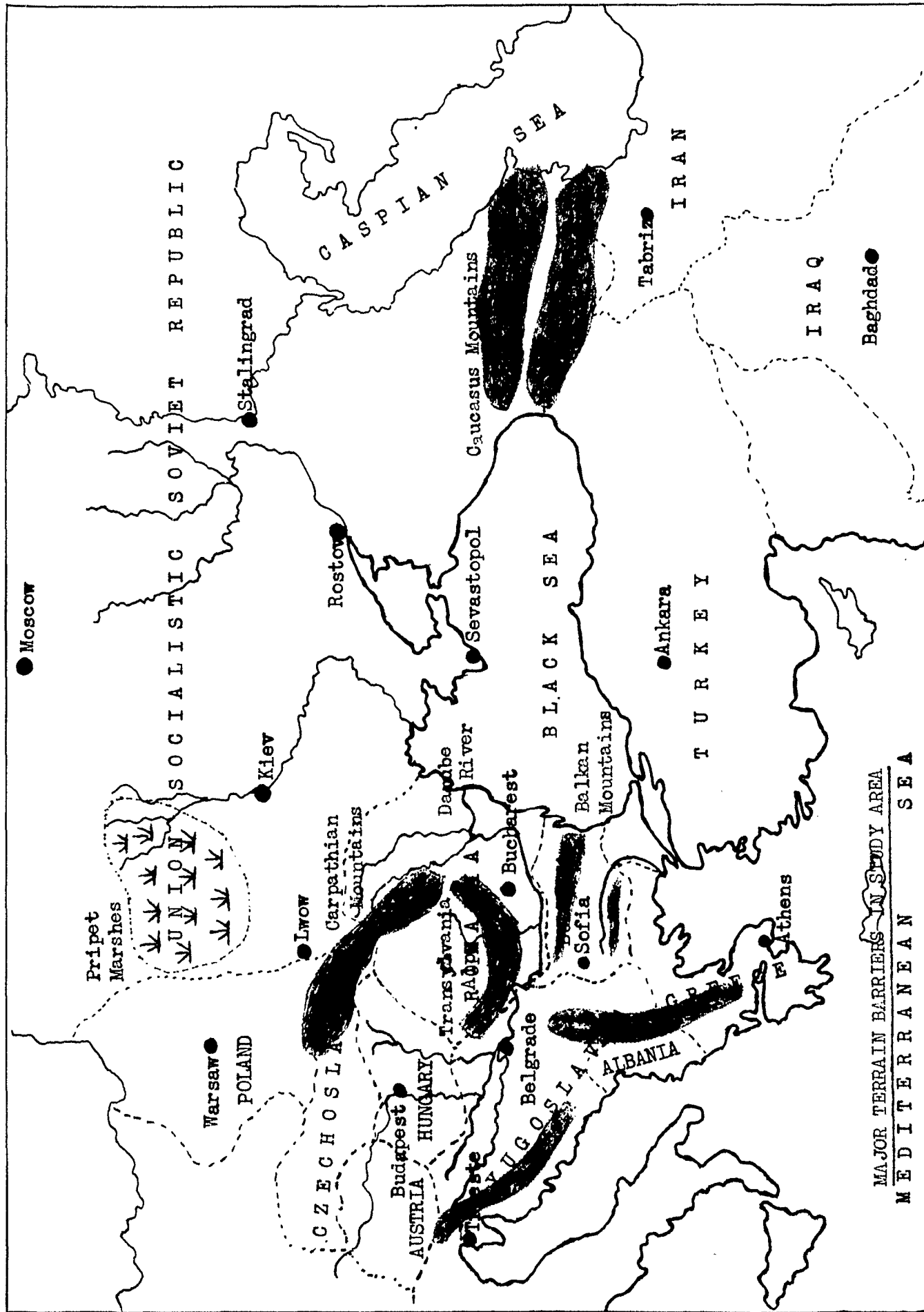
SUMMARY

The whole land area of study consists of terrain over which tanks can operate, but some areas are restrictive to large armored formations. Likewise, it is realized that wherever the enemy may employ armor, it will by necessity have to be countered by comparable sized armored units. With these factors in mind, this study has sought conclusions to determine terrain that is compatible to armored divisions in their primary offensive role.

Considerations.

Relief. The configuration of the earth's surface is the outstanding consideration for planning large scale ground operations. This factor is one which is generally stable and changes very little over a period of time. Also it is a subject that when submitted to writing, is dealt with in broad general descriptions. The details have to be determined by reconnaissance agencies either just prior to projected operations or during these operations. These details or military aspects of the local tactical area, include: critical terrain features; observations and fields of fire; obstacles; concealment and cover; and local avenues of approach, or corridors and cross compartments.

The area covered by this study falls into three general areas, as concerns the compatibility of the terrain with armored warfare. The area of first importance is SOUTH EUROPEAN RUSSIA, separated



MAJOR TERRAIN BARRIERS IN STUDY AREA
MEDITERRANEAN SEA

from the BALKANS by the CARPATHIAN MOUNTAINS, bounded on the south by the BLACK SEA and on the east flank by the VOLGA RIVER. This area commonly known as the UKRAINE, and RUSSIAN STEPPELANDS, compares in character to the CENTRAL PLAINS of the UNITED STATES. The major rivers run north to south, emptying into the BLACK SEA and CASPIAN SEA. The area has broad plains, providing prospects of ample maneuver space for the employment of large armored formations.

The second most important area is the BALKAN PENINSULA, including ROMANIA, HUNGARY, YUGOSLAVIA, BULGARIA, GREECE, and EUROPEAN TURKEY. Employment of armored divisions in an offensive role from south to north would be feasible, but the terrain favors the defender. The main barriers to movement are: the DINARIC ALPS of YUGOSLAVIA, paralleling the coast line; the BALKAN and RHODOPE MOUNTAINS running east and west in BULGARIA, the DANUBE RIVER, and the CARPATHIAN MOUNTAINS bounding north ROMANIA and HUNGARY. These successive terrain features serve to divide the satellite countries from SOVIET RUSSIA.

This BALKAN AREA is characterized as sparse tree covered mountainous terrain, with the exception of the river valley corridors and relatively narrow adjacent plains. This characteristic would force a canalization of armor forces and accompanying lines of communications through these river valleys. The main route of approach consist of the VARDAR, MORAVA and DANUBE RIVER valleys from SALONIKA, GREECE to BUDAPEST, an approximate 700 mile distance. A supplementary route enters at the port of TRIESTE combining with the other route at the DANUBE RIVER, and traverses approximately 400 miles between TRIESTE

and BUDAPEST. From BUDAPEST north to LVOV, RUSSIA through two narrow CARPATHIAN MOUNTAIN passes is another 400 miles. Thus, canalized routes of approach, and extended main supply routes place limitations on operations through the BALKAN PENINSULA.

The area of least importance is the TURKEY and mid-east countries of SYRIA, IRAQ and IRAN. This area faces RUSSIA across the BLACK and CASPIAN SEAS on an approximately 1500 mile front. The land portion of this front consists of the CAUCASUS MOUNTAINS, between the two bodies of water, on an approximate 450 mile front. These mountains are a formidable barrier to heavy military movement to the north and south. Terrain favorable for armored formations exist only in CENTRAL TURKEY and the arid desert of IRAQ, both areas being well behind the logical defensive zone of the CAUCASUS MOUNTAINS.

Climate. Weather considerations for combined forces operations in this area is a factor rating of equal importance with relief. Winter freezes augment trafficability during the winter months in SOUTH RUSSIA, whereas spring thaws and early autumn rains create ground flotation problems. Rivers and streams in the area freeze sufficiently to stop water transportation from two to six months at various localities, but the ice is generally of insufficient strength to support military traffic. Winter snows block mountain passes of the BALKAN PENINSULA and the CAUCASUS MOUNTAINS. Therefore, development of equipment and troop training for offensive operations must consider winter warfare requirements.

Transportation. The communication routes are stamped upon

the terrain in a pattern dictated by the relief. The SOUTHERN RUSSIA area of less than 1,000 miles from the BLACK SEA to MOSCOW, is covered by a rail and highway net to adequately support armored formations. Main supply routes from south to north are further augmented by navigable waterways with high tonnage capabilities during warm seasons. The rail and highway net is by no means modern. The climatic considerations outlined above, and numerous stream crossings constitute a great planning factor for engineer troop requirements.

In the BALKAN and NEAR-EAST area, the transportation means are sparse, of low quality, and lacking in alternate routes. This factor limits their logistical capabilities, and makes them extremely vulnerable to interdiction at restricted locations. Operations in the BALKAN AREA, in conjunction with a major action into SOUTH RUSSIA, would profit by use of BLACK SEA ports and avenues of ingress.

Strategic Areas. Those areas of the utmost strategic importance, are those controlling amphibious movement deep into the territory of RUSSIA. The historically coveted DARDANELLES and BOSPORUS STRAITS control seaborne movement between the MEDITERRANEAN and BLACK SEAS. Within the BLACK SEA, the CRIMEAN PENINSULA provides a area of just less than 10,000 square miles jutting into the BLACK SEA, within 1,000 land miles of MOSCOW. Superior naval and air forces could isolate this peninsula for use as a troop lodgement and attack position into SOUTH RUSSIA. Its proximity to transportation routes and its land configuration renders it vital to an offensive operation with objectives in EUROPEAN RUSSIA.

GREECE is to the BALKAN PENINSULA, as the CRIMEA is to EUROPEAN RUSSIA. The port areas of the ATHENS-PIRAEUS complex, and SALONIKA, are the seaborne approaches into BULGARIA and CENTRAL YUGOSLAVIA. GREECE has limited maneuver capabilities for operations but adequate potential air bases, harbors, and troop staging locations to support large scale operations from her borders. The holding of GREECE commands the MEDITERRANEAN SEA approaches to the SUEZ CANAL and the BLACK SEA.

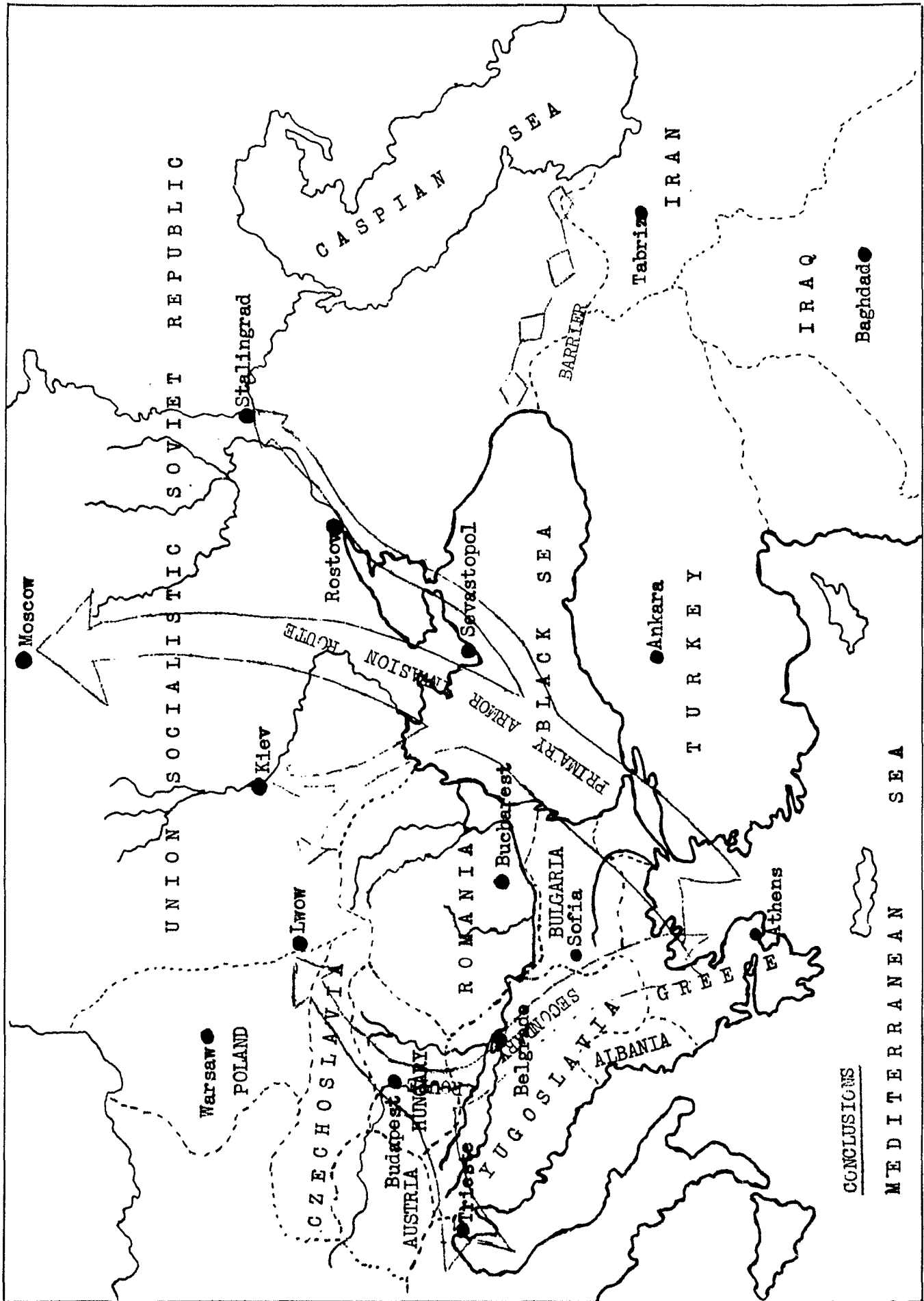
TRIESTE is a sea entrance deep into the BALKANS, which shortens the invasion route into the DANUBE BASIN. Its harbor capabilities and rail ingress lines toward HUNGARY make this port merit the present deadlock between the Soviet and Western Nations over its final political disposition.

Other strategic points in the area consist of ports on the BLACK SEA shores, and inland cities that command avenues of approach. These inland cities of SOFIA, BELGRADE, BUDAPEST, BUCHAREST, LVOV, KIEV, KHARKOV, and STALINGRAD all are major land objectives. The ports and harbors of ROSTOV, ODESSA, CONSTANTA, VARNA, and BURGAZ provide important supplementary entrances for military occupation of the whole area.

Conclusions

The most favorable route for employment of large armor supported offensives is by amphibious invasion to occupy the CRIMEAN PENINSULA as a lodgement area for penetrations into SOUTH RUSSIA.

SECRET



CONCLUSIONS

MEDITERRANEAN SEA

SECRET

SECURITY INFORMATION

The second most favorable invasion route is through the BALKAN PENINSULA by seaports of SALONIKA and TRIESTE to consolidate the BALKAN AREA south of the CARPATHIAN MOUNTAINS.

Supplementary routes into BULGARIA and RUMANIA exist from BLACK SEA ports for smaller operations toward intermediate objectives.

The CAUCASUS AREA is unfavorable for the employment of large armored formations in offensive warfare.

Recommendations.

Persons interested in armor operations into SOUTH RUSSIA and the BALKANS should note the above conclusions and these recommendations as guides to more detailed study of the area.

It is recommended that further studies be made of the terrain aspects in this area, based on problems encountered by German and Soviet armored operations in World War II.

Based upon more detailed studies, research should determine the adequacy of present armor equipment concerning floatation and power ratios. Study of organization should determine if requirements exist for further augmentation of engineering units and equipment is necessary.

It is recommended that present logistical organization be augmented for fullest utilization of inland rivers for heavy tonnage movement to support offensive operations into this area.

SECURITY INFORMATION

BIBLIOGRAPHY

This bibliography is presented in two parts; the first part lists all documents, magazines, atlases, etc, by title while the second portion consists of a short list of books listed by author.

DOCUMENTS, ATLASES, AND MAGAZINES

ALBANIA, NIS Report 20, Washington, D. C.

ATLAS of WORLD MAPS, US Army Service Forces, 1943

BALKAN THEATRE BOOK, The Armored Center, Fort Knox, Ky,
1943.

BALKAN CAMPAIGNE 1940 - 1941. THE, US Military Academy,
West Point, N. Y. 1945.

GERMAN INVASION OF RUSSIA, THE, US Military Academy,
West Point, N. Y. 1943.

GREECE CHAPTER 1, SID Report, DIA Intelligence Division,
Washington, D. C. 1948.

GREECE, Central Intelligence Agency, Washington, D. C.,
1948.

JOINT ARMY NAVY INTELLIGENCE STUDIES, Military Intelli-
gence Division, JCS, Washington, D. C.

38, October, 1943

40, - - , 1948

41, November, 1947

MILITARY GEOGRAPHIC STUDY OF EUROPE AND NORTH WEST AFRICA,
A, Asst Chief of Staff, G-2, Dept of the Army, Washington, D. C.,
September 8, 1951.

NATIONAL GEOGRAPHIC MAGAZINE, National Geographic Society,
Washington, D. C.

Vol. XLVI, No. Six, Dec. 1949, "War Torn Greece Looks
Ahead."

Vol. XLIX, No. Two, Feb. 1951, "Yugoslavia, Between East
and West."

Vol. C, No. Two, Aug. 1951, "Turkey Paves The Path of
Progress."

RAND- MCNALLY COSMOPOLITAN WORLD ATLAS, 1951

RUMANIA, NIS report 22, Chapter 8, Sect 8, Washington,
D. C.

RUMANIA, SR 12, Central Intelligence Agency, Washington,
D. C., 5 October, 1946.

STRATEGIC STUDY OF GREECE, Office of Naval Intelligence,
Washington, D. C., July 1943.

SUPPLEMENTAL MATERIAL ON THE FIRST WORLD WAR, U. S. Military
Academy, West Point, N. Y., 1943.

THEATRE BOOK RUSSIA, The Armored Center, Fort Knox,
Kentucky, 1942.

TURKEY, CHAPTER II, Central Intelligence Agency, Washington,
D. C.

U. S. S. R., THE CAUCASUS AREA, Intelligence Division,
Department of the Army, Washington, D. C., 1949.

U. S. S. R., Intelligence Division, Department of the Army,
Washington, D. C.

YUGOSLAVIA, NIS Report 21, Chapter 8, Washington, D. C.

YUGOSLAVIA, SID Report, Chapter 6, Washington, D. C.,
January, 1948.

BOOKS

Elliott, George Fielding, "If Russia Strikes," Bobbs
Merrill Co Inc, New York, N. Y., 1948.

"Encyclopedia Americana", American Book, Stratford Press,
Inc., New York, N. Y., 1947.

"Encyclopedia Britannica", The University of Chicago Press,
Chicago, Ill., 1946.

"Funk and Wagnalls Encyclopedia", Unicorn Press, New York,
N. Y., 1950

Gottman, Jean, "A Geography of Europe", Henry Holt and Co.,
New York, New York, 1950

Keiran, John, "Information Please Almanac", The Mac' Millan Co, New York, N. Y., 1952.

Kendrew, W. G., "The Climate of the Continents", Oxford University Press, New York, N. Y., 1942.

Liddell Hart, B. H., "The German Generals Talk", William Morrow and Co, New York, N. Y., 1948.

McEntee, Girard Lindsley, "Military History of the World War", Chas Scribner and Sons, New York, N. Y., 1937.

Miller, A. Austin, "Climatology", E. P. Dutton and Co. Inc. New York, N. Y., 1943.

Miller, Francis Trevelyan, "History of World War", The John Winston Co, Philadelphia, Pa., 1945.

Sanders, Liman Von, "Five Years in Turkey", Williams and Wilkins Co., Baltimore, Maryland, 1927

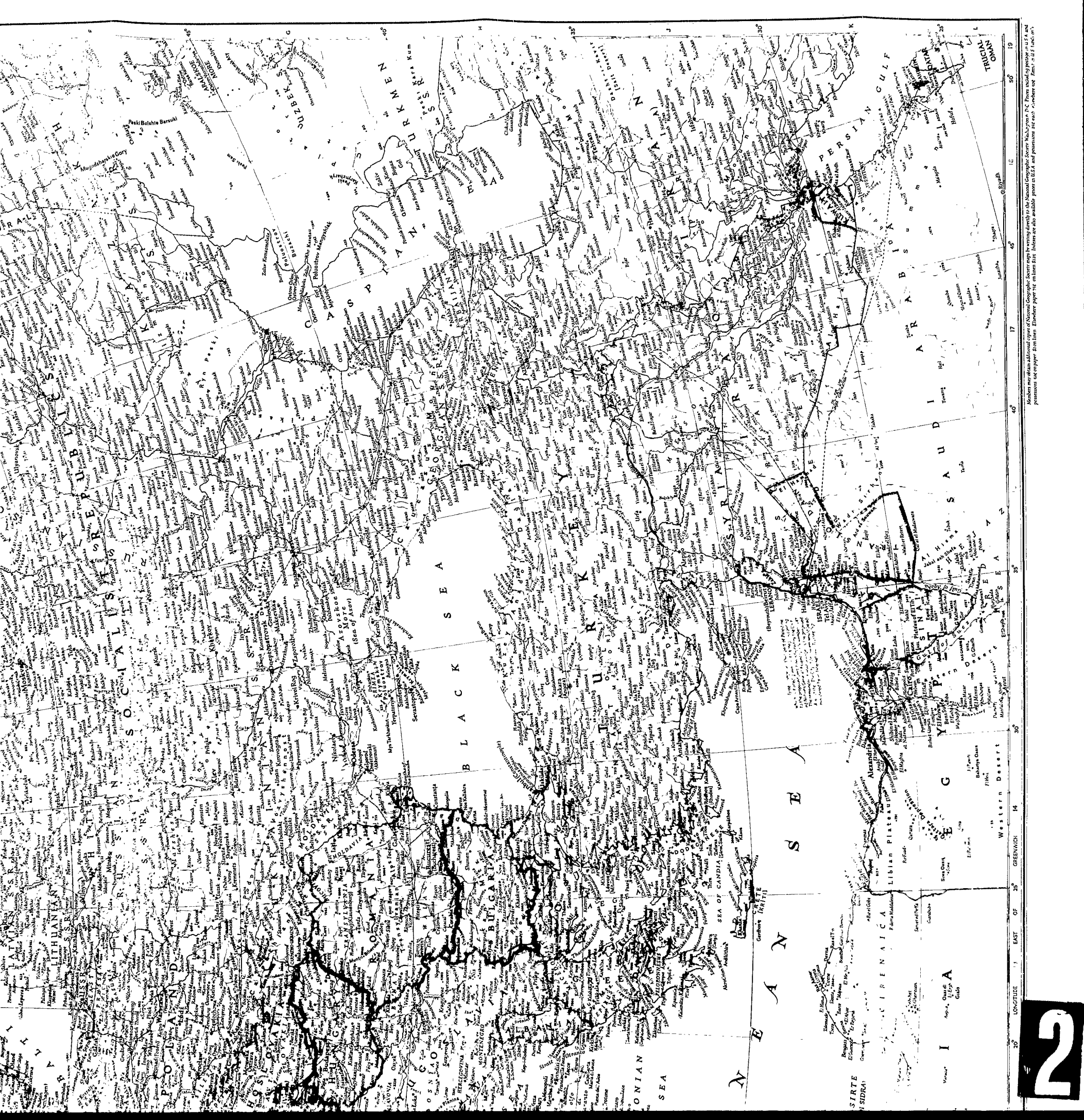
Shabad, Theodore, "Geography of USSR, A Regional Survey", Columbia University Press, New York, N. Y., 1951.

Tannehill, Ivan Ray, "Weather Around the World", Princeton University Press, Princeton, N. J., 1943

Tobin, Chester M., "Turkey, Key to the East", George Putnam and Sons, New York, N. Y., 1944

Van Valkenburg, Samuel and Huntington, Ellsworth, "Europe", John Wiley and Sons, New York, N. Y., 1935.





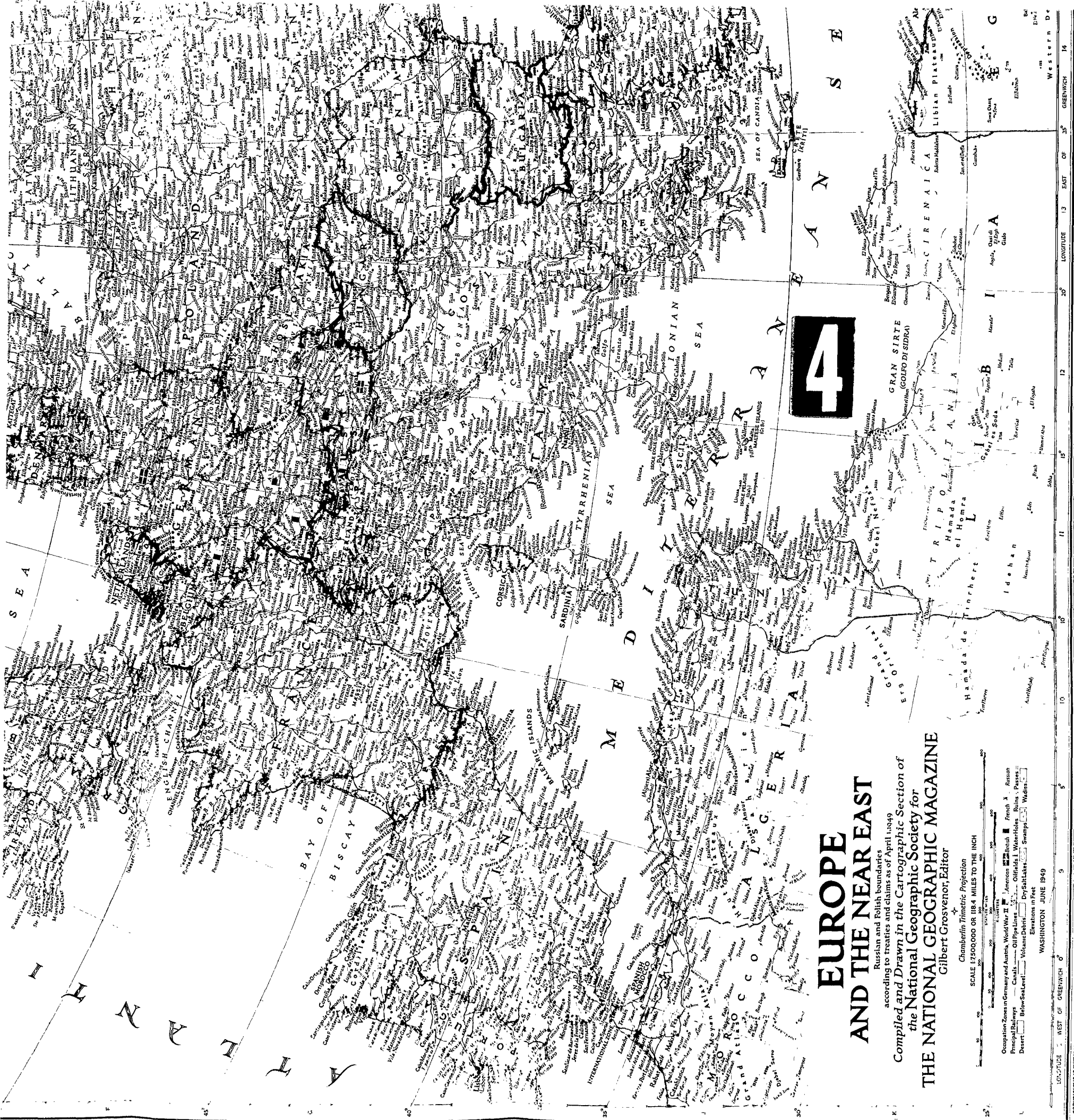
Map of Eastern Europe, the Middle East, and North Africa. Includes major cities, rivers, and seas. A coordinate grid is overlaid on the map.

Relief by John J. Brennan

Geographical Equivalents

Appendix

Members of the
National Geographic Society
are urged to preserve carefully
all maps published in their
National Geographic Magazine



EUROPE AND THE NEAR EAST

according to treaties and claims as of April 1949
Compiled and Drawn in the Cartographic Section of
the National Geographic Society for
THE NATIONAL GEOGRAPHIC MAGAZINE
Gilbert Grosvenor, Editor

Chamberlin Trimetric Projection
SCALE 1:750,000 OR 1/8.4 MILES TO THE INCH

Occupation Zones in Germany and Austria, World War II
Principal Railways
Canals
Oil Pipeline
Offshore Islands
Water-Holes
Ruins
Passes
Desert
Below Sea Level
Volcanic Debris
Dry Salt Lakes
Swamps
Wadis

Elevations in Feet

WASHINGTON JUNE 1949