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GEOGRAPHIC INTELLIGENCE REPORT

POSSIBLE GUIDED-MISSILE TESTING RANGES
IN THE USSR

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SPECIAL ASSISTANT TO THE SECRETARY
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CENTRAL INTELLIGENCE AGENCY

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POSSIBLE GUIDED-MISSILE TESTING RANGES
IN THE USSR

I. Introduction

The purpose of this study is to determine the possible location of guided missile testing ranges in the USSR through an analysis of geographic conditions in relation to technical criteria recommended by the Guided Missile Intelligence Committee (GMIC). A statement of recommended technical criteria was prepared by the GMIC for the selection of testing ranges for both intercontinental ballistic missiles (ICBM) and intermediate range ballistic missiles (IRBM). Among the criteria are factors such as distance requirements, location of hazardous areas, logistic requirements at launch and impact areas, instrumentation, and security.

A detailed analysis of geographic conditions in the USSR provided the background for the selection of those areas that most nearly satisfy the conditions of the recommended criteria. The first section of the study is concerned with the procedural approach to the problem. A step-by-step regional analysis is made of such factors as distance from a non-Soviet bloc border, population density, logistics, distance requirements, terrain, and climate. In the next section of the study the most likely impact areas were selected. These were selected before determining possible launching points, since the launching-point selection is dependent on distance to the impact area. The subsequent portion of the study is concerned with the selection of possible launching points that most nearly satisfy

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the conditions of the recommended criteria. In addition, available information on reported guided-missile sites, whether confirmed or not, was taken into consideration.

II. Procedure

Through the application of the various criteria, large sections of the Soviet Union were tentatively eliminated from consideration. It soon became evident, however, that no one site specifically satisfied all the recommended criteria as set forth by the GMIC. Undesirable features of a particular locality had to be weighed against the desirable features. The selection thus became a process of eliminating those areas where the disadvantages exceeded the advantages. The criteria considered are discussed below.

A. Distance from a Non-Soviet Bloc Border

The Soviet testing ranges are likely to be located where danger of outside observation is at a minimum. According to the GMIC, both the launching and impact areas would probably be at least 500 miles* from the nearest non-Soviet bloc observation area. Since this would exclude Kapustin Yar and much of Kamchatka, however, the distance was arbitrarily reduced to 400 miles. Areas within 400 miles of non-Soviet bloc countries are shown on the accompanying maps. Potential observation areas closest to the USSR include, from west to east, Norway, Finland, Sweden (Gotland Island), Austria, Turkey,

*All distances, unless otherwise specified, are in nautical miles. One nautical mile equals approximately 1.15 statute miles.

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Iran, Afghanistan, Japan (Hokkaido), Aleutians (Attu Island), St. Lawrence Island (Bering Strait), and the Alaskan mainland. As is evident from the maps, distance alone tentatively eliminated large parts of the Soviet Union, particularly in Europe and Central Asia.

B. Population Density

Launching and impact areas are probably located where population is sparse. The hazard to population is high within a radius of 25 miles of the launch site and within about 125 miles of the impact area. For security reasons also, areas of sparse population are favored. On the three accompanying maps, the areas with population densities of over 25 and between 10 and 25 persons per square kilometer are shown. If the location of launch sites were limited to areas where the population density is less than 10 per square kilometer, much of European USSR would have to be eliminated from consideration.

A low population density is also required around the booster impact area, which is about 200 to 400 miles down range. The factors of safety and security, however, are possibly not as severe here as at the launch and impact areas.

C. Logistics

Several logistic factors must be considered, particularly for launch sites. Probably any launch site selected would be within 50 or 100 miles of an existing rail line. Roads and an airfield are also needed, but they could easily be constructed if the terrain is

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not excessively rugged. Of particular importance is accessibility to external supplies of missiles, auxiliary equipment, missile components, fuels, and instrumentation. The site should be located where sufficient fresh water is available for 2,000 to 10,000 persons. Logistical requirements for the impact area are less restrictive -- reasonably good accessibility, an airfield, and facilities to care for 100 to 400 persons.

The sources of missile supplies and fuels are largely in European USSR, and most of the Soviet rail network is concentrated in the western half of the country. These factors contribute to the conclusion that launching areas are in the west and that the missiles are fired toward the east.

D. Distance Requirements

The intercontinental ballistic missile (ICBM) requires a range of at least 3,000 miles for research and development purposes. For proof testing, 5,000 to 5,500 miles are needed. The maximum great-circle distance from the western to the eastern territorial limits of the USSR is only about 4,400 miles. Since missiles are being fired from west to east and follow a great-circle route rather than a fixed compass direction, the launch site will be located as far west as conditions will allow. The factors of population density and distance from non-Soviet bloc borders have already placed a restriction on much of the western part of the USSR. The areas farthest west that are not affected by these restrictions are the

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lower Volga, western Kazakhstan, and northeastern European USSR. From these areas the distance to the territorial limits of the country is 3,300 to 3,800 miles. Although this is ample for research and development purposes, it falls short of the distance needed for proof testing.

The intermediate range ballistic missile (IRBM) requires a range of at least 800 miles that is capable of extension up to 1,600 miles. A 1,600-mile range within Soviet territorial limits could be established at innumerable places. It is quite possible, however, that IRBM's would be launched from a site where ICBM's also are launched.

E. Terrain

The launch site is likely to be located in an area of relatively flat terrain. Mountains, depressions, and deep valleys or gorges would hamper the development of extensive facilities. It is particularly important that the terrain between the launch site and existing rail facilities offer no major obstacle to the construction of spur rail lines and roads. The terrain must also be suitable for the construction of an airfield nearby. Half-tracked vehicles should have access to the entire launch area the year round.

In western USSR, terrain conditions are generally more favorable in the steppe and desert regions to the south than in the central and northern forested regions, and extensive areas of relatively flat, undissected terrain are more common. The forest cover in the central and northern areas is a deterrent to vehicular movement and

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might also present a fire hazard. In contrast the steppe and desert areas are largely treeless and have a vegetation cover of grass or scattered low brush. The presence of swamps and the resulting poor trafficability eliminate from consideration much of Western Siberia and many areas in northern European USSR.

A major problem in the steppe and desert areas is the procurement of sufficient fresh water for the range-operating staff of 2,000 to 10,000 persons. The lack of water to a large extent restricts the location of launch sites to areas near large rivers or in which ground water is adequate to assure a plentiful supply of fresh well water.

F. Climate

Climatic factors most important to the selection of possible guided-missile launching areas include temperature and precipitation, winds, surface visibility, and cloud cover. The steppe and desert regions have the most favorable combination of climatic conditions in the USSR for missile operations. Conditions are more restrictive in the central and northern forested regions.

Annual precipitation totals are low -- 5 to 14 inches -- in the steppes and deserts of the lower Volga region and western Kazakhstan. The forested regions to the north receive 18 to 24 inches. Here the snow cover attains open-field depths of 20 to 30 inches, compared with 2 to 5 inches in the steppe and desert. The snow cover persists for 160 to 200 days in the northern forested region, as compared with 80 to 100 days in the south (the North Caspian -- Aral Sea region).

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Temperatures decrease from south to north. In the steppe and desert areas the average for January is about 10° to 14°F and for July 75° to 80°F; whereas the corresponding averages in the north are 3° to 10°F and 55° to 66°F. In winter, early morning lows generally reach 4° to 8°F in the south and -2° to +2°F in the north. In summer, afternoon highs generally reach 85° to 90°F in the south and 65° to 70°F in the north. Although the differences in winter temperatures are not excessive, summer temperatures are considerably higher in the south than in the north.

Average wind speeds are low throughout most of the western USSR. Winds of gale force (over 32 mph) occur on about 10 days a year, being somewhat more common in spring than in other seasons. In northern European USSR, overall wind speeds average about 6 to 8 miles per hour, while in the steppe and desert the average is 4 to 6 miles.

In winter, surface visibility conditions are similar throughout much of the western USSR, with visibility of less than 2-1/2 miles on about half the days during each month. In the warmer part of the year, surface visibility in the steppe and desert is less than 2-1/2 miles only 1 or 2 days a month, compared with 5 to 10 days in northern European USSR.

Cloud conditions also favor the steppe and desert areas. In January the skies are cloudy 65 to 80 percent of the time in the north, as opposed to 50 to 70 percent in the steppe and desert. In

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July, skies are cloudy 45 to 65 percent of the time in the north and only 10 to 25 percent in the steppe and desert.

III. Selected ICBM Impact Areas

Impact areas are probably located in the Soviet Far East, but it is not specifically known whether the Soviets are using a single area or several areas. Two broad areas, however, seem to satisfy the conditions discussed in the previous section of the report. The more likely of the two -- the estimated impact area -- includes Kamchatka and the northern Kuril Islands. The second -- the possible impact area -- includes much of the western littoral of the Sea of Okhotsk and the Magadan-Kolyma region. Since the location of the impact areas has a direct bearing on the selection of possible launching points, the impact areas are considered first.

The Kamchatka-northern Kuril Islands area is selected as the estimated ICMB impact area. The most important reason is the fact that this area is farther from the launching sites in the west than any other part of the Soviet Union. It thus provides the maximum allowable range within USSR territorial limits. Geographically, Kamchatka is not the eastern-most part of the country, but missiles follow a great-circle route, not a fixed compass direction. The population density of the area is low, generally less than 1 person per square kilometer. The mountainous terrain provides good observation points. Fresh water is easily available for a staff of 100 to 400 persons. Much of Kamchatka and the Kuril Islands consists

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of rugged volcanic terrain in which cross-country trafficability is seriously restricted. However, an access road could be constructed for a project as important as this.

The extent of the estimated impact area is limited by distance from non-Soviet bloc areas. Parts of the area -- the east-central coast of Kamchatka and the Komandorskiye Islands -- extend beyond the prescribed 400-mile limit. This requirement was waived in view of reported activity in the area. The seaward boundaries of the impact area generally extend no farther than 50 miles from land. The northern limit of the impact area is so selected that missiles sent beyond Kamchatka and out over the Pacific (for 5,000- to 5,500-mile proof testing) would pass to the south of Attu and other islands of the Aleutian chain.

The western shore of the Sea of Okhotsk and the Magadan-Kolyma area is selected only as a secondary or possible impact area. The boundary extends into the sea for 50 miles (1) along the coast, (2) from the northern end of Sakhalin, and (3) around small, rocky Iony Island. Rugged terrain and an almost complete lack of roads prevents any considerable extension of the area inland, except at Magadan. Here a paved, all-year highway leads north to the network of roads in the famous Kolyma gold-mining district. If 3,000- to 3,200-mile testing is desired, this area might possibly serve as an impact area.

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IV. Selected Launch Areas

On the basis of the recommended criteria and geographic conditions, five areas have been selected as the possible locations of Soviet launching sites. In addition, available information on known or reported missile activity has been considered. No one site completely satisfies all requirements. Some are weak in several respects but strong in others. The advantages and disadvantages of each are described and evaluated.

A. Kapustin Yar

The Kapustin Yar area more nearly meets all the qualifications for a launching area than any other place within the Soviet Union. This conclusion would have been reached even if it were not known that missile installations do exist there. In selecting this site the Soviets evidently considered the same basic factors as those recommended by the GMIC and discussed in this study.

Kapustin Yar is located on the east bank of the Volga River just east of Stalingrad and within an area of semidesert climate and vegetation. It is in an area where the population density is less than 10 persons per square kilometer and is located just over 400 miles from the nearest potential observation area (eastern Turkey). Kapustin Yar is the western-most point in the Soviet Union that meets these qualifications. The site is relatively close to the heart of the European USSR and is fairly near sources of missile supplies and fuels. A rail line passes through the town of Kapustin

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Yar. The terrain is flat to gently rolling and favors the construction of roads and airfields. The climate is hot and dry in the summer and cold and dry in the winter; visibility and cloud-cover conditions are among the most favorable in the Soviet Union.

For ICBM purposes, a range of about 3,800 miles* can be attained within the USSR territorial limits. This is the calculated great-circle distance from Kapustin Yar to southern Kamchatka. If a distance of 5,000 miles is desired for proof testing, the range would have to extend 1,200 miles into the Pacific Ocean. The booster impact area, 200 to 400 miles down range, falls in an area of low population density southeast of Kuybyshev. From 200 to 300 miles down range the population density is less than 10 persons per square kilometer and from 300 to 400 miles slightly more than 10 persons. Throughout the booster impact area there is scattered agricultural activity, but there are no towns of significant size.

Kapustin Yar is also well located for IRBM purposes. Excellent conditions prevail to the east across central Kazakhstan, where the density of population is extremely low. An IRBM range could extend from Kapustin Yar eastward past Sagiz, Chelkar, and the southern tip of Lake Balkhash and terminate east of Alma-Ata. Another could extend east past Kalmykovo, Kandagach, and Uspenskiy (south of Karaganda) to the vicinity of Ozero Ala-Kul'. A great-circle

*The factors of earth rotation and time in flight are not taken into consideration in this study.

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distance of 1,400 to 1,500 miles is possible within the USSR territorial limits. For a testing range of 1,300 miles the Semipalatinsk nuclear testing range could serve as an impact area. For a distance of 1,600 miles the range would have to be extended across the Chinese border into northwestern Sinkiang. Natural conditions on the Chinese side of the border are still favorable, but security or other considerations probably rule out this possibility. It is also possible that the IRBM could follow the same path as the ICBM, with the range terminating in the vicinity of the Yenisey River, 1,600 miles from Kapustin Yar.

B. Aral'sk

The Aral'sk area lies on the northeastern edge of the Aral Sea in the desert zone of Central Asia. It possesses many of the same advantages as Kapustin Yar, along with certain drawbacks. The general area between Aral'sk and Ozero Tengiz (in the direction of the selected impact area at Kamchatka) is almost totally unpopulated. From 300 to 400 miles down range, however, there is some agricultural activity, a part of the New Lands program. The area is safely beyond the 400-mile limit from foreign borders. Terrain conditions are good -- flat to slightly hilly -- and airfields and access roads could be easily constructed. Climatic conditions are favorable, with hot and dry summers, cold and dry winters, excellent visibility, and a minimum of cloud cover. The main rail line from Moscow to Central Asia passes through Aral'sk. Fresh water should be available from

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either the Syr-Dar'ya River or wells in the sand dune region just east and northeast of Aral'sk.

The primary disadvantages are shorter potential range and greater distance from European USSR sources of missile supplies and fuels. The great-circle distance from Aral'sk to southern Kamchatka is 3,500 miles, 300 miles shorter than the range distance available at Kapustin Yar. For 3,000-mile development testing, the northern coast of the Sea of Okhotsk could serve as an impact area. For 5,000-mile proof testing, the range would have to be extended into the Pacific Ocean 1,500 miles beyond Kamchatka. Aral'sk is located relatively far from the sources of missile supplies and fuels in European USSR -- a disadvantage when compared with Kapustin Yar.

Aral'sk could possibly serve as a launch area for IRBM's. If the ICBM course were followed, an 800-mile range would extend to an area north of Barabinsk and a 1,600-mile range to an area north of Bratsk and Ust'-Kut. A possible IRBM impact area 700 miles east of Aral'sk is the nuclear testing range southwest of Semipalatinsk.

C. Kirov

The Kirov area is located in the northeastern part of European USSR within the taiga zone of northern coniferous forests. It is about 600 miles from Finland, the nearest foreign border, and is located in an area where the population density is less than 10 persons per square kilometer. Kirov was selected as a possible launch area because it is the westernmost part of the northern USSR

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that meets the above two qualifications. It is located fairly close to the heart of European USSR and fairly near sources of missile supplies and fuels. A rail line from Moscow and Gor'kiy passes through Kirov.

Neither the terrain nor the climate at Kirov is as favorable as in the desert and steppe areas of the south. The area is characterized by undulating to hilly relief, dense forests, and many small rivers. Although obtaining fresh water is no problem, the many rivers and creeks increase the difficulty of constructing access roads. Cross-country trafficability in the general launch area is further restricted by the forests. Winters are cold and dry; summers are moderate and wet. The snow cover is seldom more than 2 feet deep, but it persists for almost 6 months. During much of the year, surface visibility is fair. The sky is cloudy more than two-thirds of the time in winter and almost half the time in summer.

The great-circle distance from Kirov to southern Kamchatka is about 3,300 miles -- ample for research and development testing of an ICBM. The booster impact area, 200 to 400 miles down range, would fall astride the sparsely populated northern Ural Mountains. Conditions for IRBM testing are not equally favorable. About 800 miles down range is an area of swampy and inaccessible terrain, and 1,600 miles down range is a remote and inaccessible portion of the Central Siberian Plateau.

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~~S-E-C-R-E-T~~D. Kola Peninsula

The Kola Peninsula in the northwesternmost corner of the USSR is notable largely because of the important port of Murmansk. This peninsula was selected as a possible launch area mainly because of observer reports that missile activity is carried on here. As a launch site the Kola Peninsula violates many of the criteria established by the GMIC. It is near the Finnish border and thus subject to possible observation. Non-Soviet fishing boats, particularly British and Norwegian, commonly ply the waters of the Barents Sea, where the booster charge might well be visible to them. The area is far from sources of missile supplies and fuels. Climatic conditions are generally unfavorable -- very cold winters, a 7-month snow cover, and cloudy skies about three-fourths of the time the year round. Rocky terrain, poor drainage, and a forest cover contribute to the difficulty of cross-country trafficability.

The great-circle distance from the Kola Peninsula to southern Kamchatka is about 3,200 to 3,300 miles. Although this is ample for ICBM research and development testing, it is no better than that at the three possible launch areas already discussed. The booster impact area would fall over the Barents Sea. The range might possibly be used for IRBM testing. About 800 miles down range is the Kara Sea--Ob' Estuary area, and 1,600 miles down range would be in the vicinity of Nordvik.

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The location of the launching point as indicated on the map is somewhat arbitrary. The site indicated has relatively flat terrain and is as far from the Finnish border as distance from the railroad will permit. If a launch area is already located on the Kola Peninsula, it may perhaps be in the Murmansk--Severomorsk area. It might possibly be of a non-testing nature, designed rather for use in case of war. Murmansk is the point in western USSR closest to the eastern United States.

E. Carpathian Mountains

A possible launching site was selected in the Carpathian Mountains, almost solely because this location would provide the maximum possible range length within the territorial limits of the USSR. The great-circle distance to southern Kamchatka is about 4,300-4,400 miles. Although this site is interesting as a possibility, it violates many of the criteria recommended by the GMIC.

The launch site is in a mountainous area near several Satellite frontiers. It is only 300 miles from Austria, the nearest potential observation area. The population density is high, and the removal of the populace within a 25-mile radius would be a major undertaking. Road and rail facilities are available nearby. The site is probably conveniently located with regard to missile supplies and fuels. Except for deep winter snows in the mountains, climatic conditions are generally acceptable.

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A favorable aspect is the location of the booster impact area. The well-known Pripyat' Marshes lie 200 to 340 miles down range. This is a low-lying area of extensive marshes and forests. Scattered tracts of farmland support a population of between 10 and 25 persons per square kilometer. A 1,600-mile IRBM would land in the vicinity of the Arctic Coast east of Nar'yan-Mar.

F. Other Possible Launch Areas

Several other areas within the Soviet Union might possibly serve as launching points. The five locations described are merely the most likely possibilities on the basis of natural conditions and available evidence.

Considerable speculation has centered on the Arabatskaya Strelka, a narrow spit on the east coast of the Crimea. A railroad was recently constructed to Valok, and the area was incorporated into Khersonskaya Oblast'. An ICBM range from here to Kamchatka would have a distance of about 4,300 miles. The area is only 200 miles from the Turkish coast, however, and the booster impact area would fall astride the densely populated, industrialized Donets Basin. The IRBM prospects are considerably better. A missile launched in an easterly direction would cross the northern end of the Caspian Sea and proceed across the wastelands of Central Kazakhstan. Much of the course would coincide with the IRBM range extending eastward from Kapustin Yar. A range distance of over 1,900 miles would be possible before reaching the Chinese border, compared with less than

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1,500 miles from Kapustin Yar. Furthermore, the nuclear testing range between Semipalatinsk and Lake Balkhash, 1,700 miles down range, might provide a convenient impact area.

Considerable speculation has been aroused by the Soviet request to observe the October 1958 solar eclipse from Atafu Island. The island is part of the New Zealand-controlled Tokelau group (near Samoa) in the South Pacific. It is remotely possible that the request to observe the eclipse could be a cover for recording the performance of an ICBM launched from the USSR deep into the Pacific. A 5,500-mile arc measured from Atafu passes through Eastern Siberia. Conveniently astride the arc is the railhead town of Ust'-Kut, about 100 miles northwest of Lake Baikal. A great circle drawn between Ust'-Kut or a more northerly point and Atafu Island extends into the Pacific at the southern end of the Kuril Islands, and nowhere passes through land other than Soviet territory. Ust'-Kut is favorably located for an IRBM range; 1,600 miles to the east is the west coast of Kamchatka.

The Kapustin Yar ICBM range could be lengthened by moving the launch area back to the southwest, to the vicinity of Stavropol'. This would add 250 to 300 miles to the range length, making the great-circle distance to Kamchatka 4,050 to 4,100 miles. The booster impact area would then fall in the Kapustin Yar area. This shift, however, would place the launch area within 200 miles of the

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Turkish border, and the few miles gained would hardly warrant the transfer of installations from the already established site at Kapustin Yar.

V. Summary

An analysis of geographic conditions related to the technical requirements for testing guided missiles provided a basis on which the possible locations of guided-missile ranges in the USSR were selected. A step-by-step regional evaluation was made to determine those general areas that most nearly satisfy the required conditions. This procedure involved the following factors:

1. Distance from a non-Soviet bloc border -- Distance alone tentatively eliminated from consideration large areas, particularly in Europe and Central Asia.
2. Population density -- Low density is a requirement for both launch and impact areas, thus provisionally eliminating much of European USSR except in the southeast and northeast.
3. Logistics -- Because of the dense rail network and nearness to sources of supplies, it is probable that launch sites are in the western half of the country and that the missiles are fired from west to east.
4. Distance requirements -- Although the maximum great-circle distance possible within Soviet territorial limits is 4,400 miles, the factors of high population density and proximity to non-Soviet bloc borders probably limits the maximum length of a testing range to 3,300 to 3,800 miles.

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5. Terrain -- In the western part of the USSR the terrain is generally more favorable for launching operations in the steppe and desert regions to the south than in the north.

6. Climate -- For missile operations the steppe and desert regions possess the most desirable combination of climatic conditions in the USSR.

On the basis of the factors discussed, the two impact areas in the Soviet Far East that would provide the maximum firing-range distance from the west have been selected:

1. The estimated impact area, which includes Kamchatka and the northern Kuril Islands.

2. The possible impact area, which includes much of the western littoral of the Sea of Okhotsk and the Magadan-Kolyma region.

Five points in the west have been selected as possible launching sites on the basis of geographic conditions and recommended technical requirements, supplemented by available information on reported missile sites.

1. Kapustin Yar more nearly meets all the qualifications than any other place in the USSR. It is in an area of low population density, favorable terrain and climatic conditions, fairly near sources of supply, and more than 400 miles from a foreign border. Distance to Kamchatka is 3,800 miles. Kapustin Yar is also a probable range-head for IRBM testing.

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2. Aral'sk possesses many of the same advantages as Kapustin Yar, but it is farther from sources of supply and the distance to Kamchatka is only 3,500 miles.

3. Kirov is the most suitable launch site in the northeastern European USSR. It is 600 miles from the Finnish border, and is fairly near sources of missile supplies, but the terrain and climate are not so favorable as in the steppe and desert. The distance to Kamchatka is 3,300 miles.

4. Kola Peninsula was selected in spite of relatively unfavorable conditions, largely because of reported missile activity in the area. It is close to the Finnish border and far from sources of supply; and the terrain and climate are generally unsatisfactory. The distance to Kamchatka is 3,200-3,300 miles.

5. The Carpathian Mountain site provides the maximum possible range length within USSR territorial limits (4,400 miles), but it is close to Satellite frontiers and the population density is high. The booster impact area conveniently falls astride the Pripyat' Marshes.

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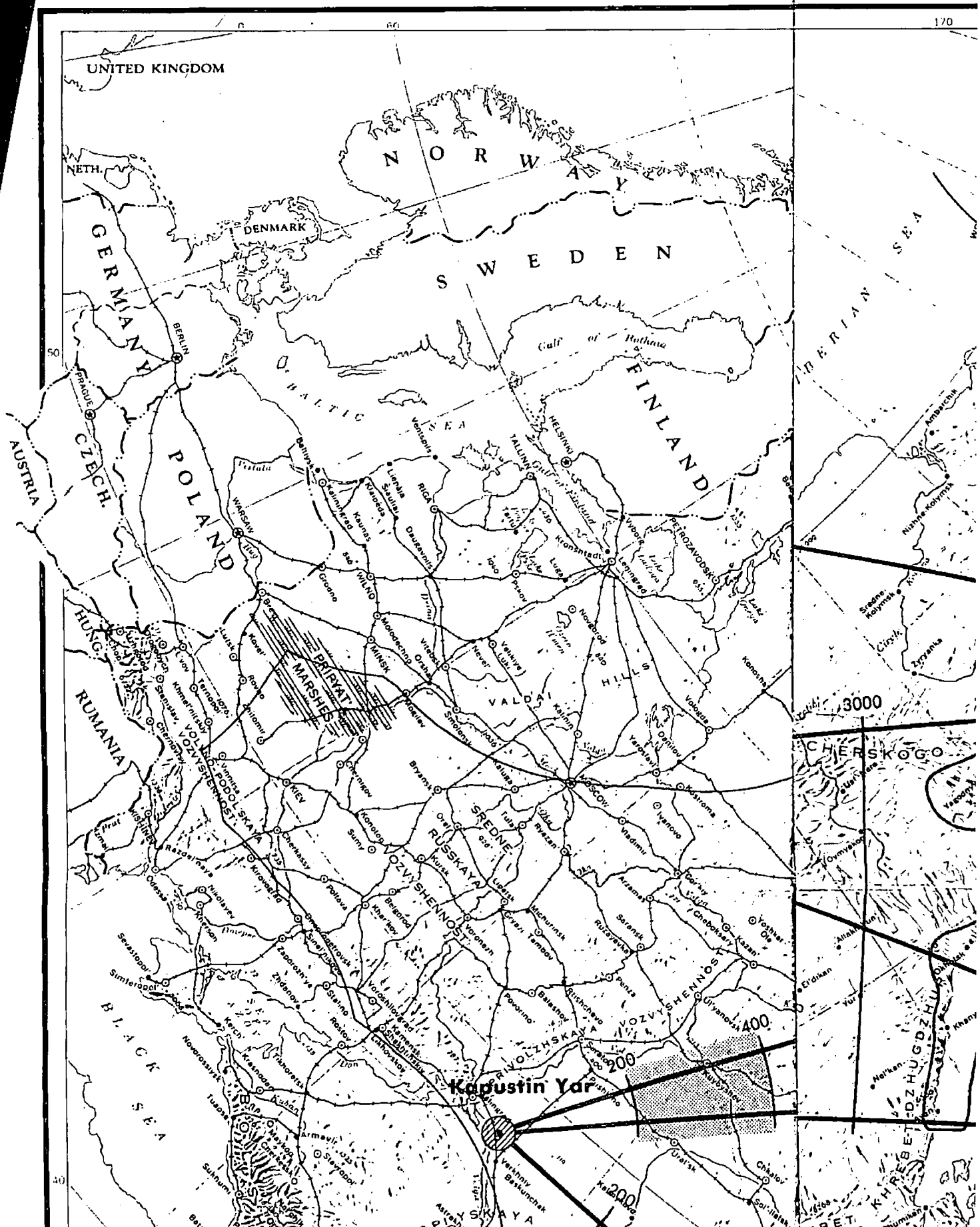
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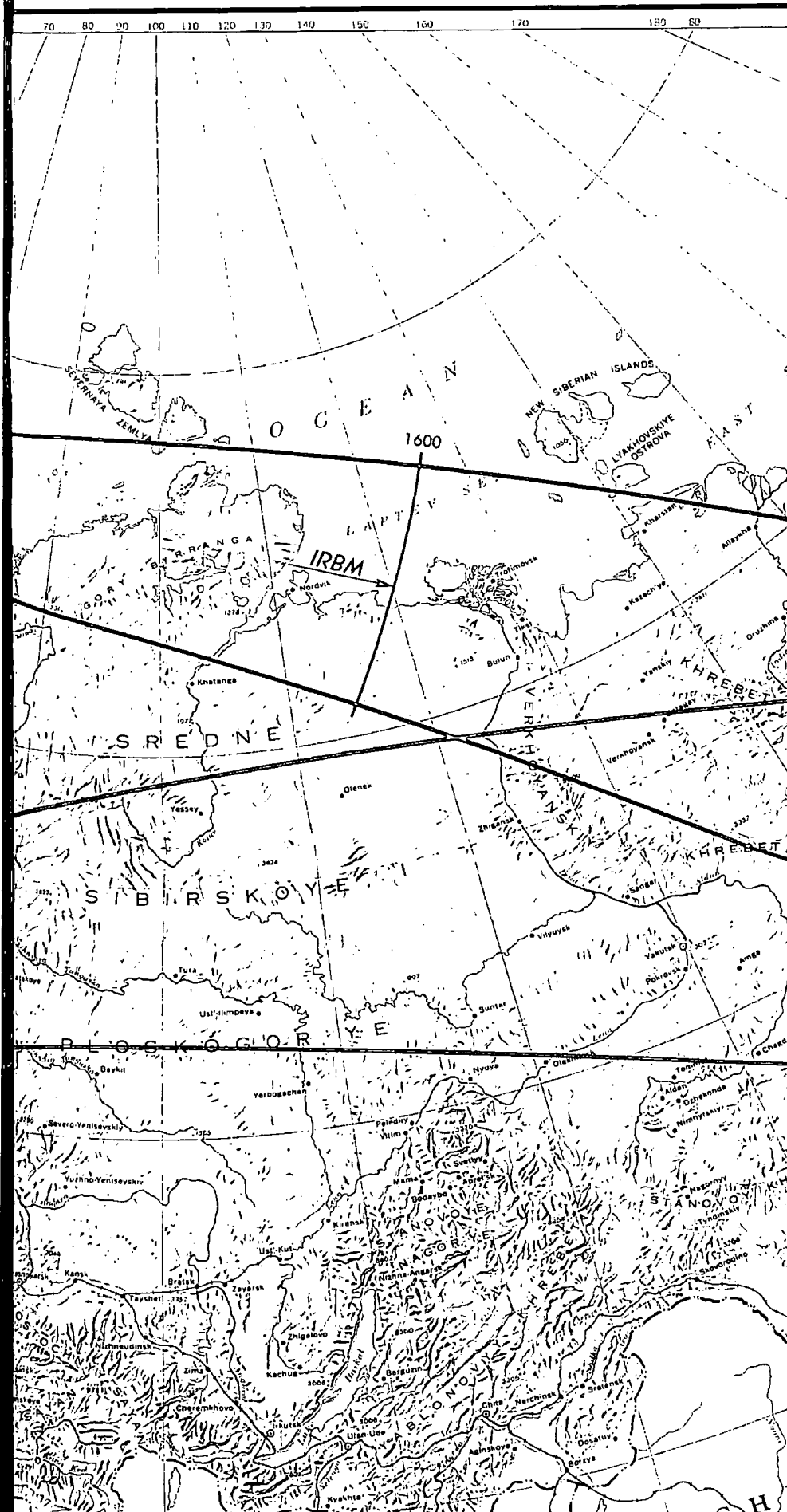
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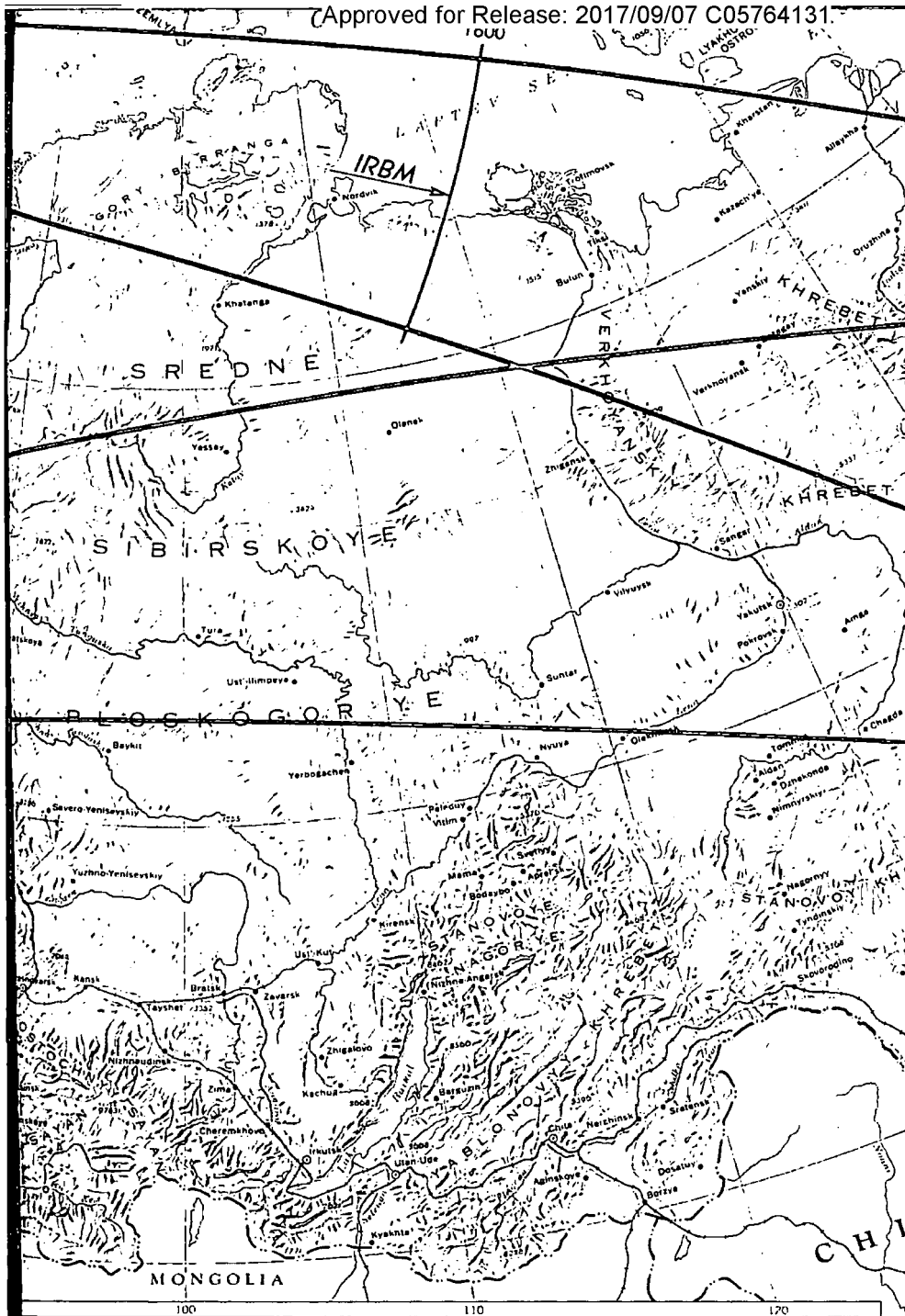




USSF

IT





POSSIBLE GUIDED MISSILE TESTING RANGES

Kapustin Yar and Kola Peninsula

Possible launching site
(with 25 mile radius hazardous area).

Population density over 25 persons per
square kilometer.

Booster impact area.

Population density 10 to 25 persons
per square kilometer.

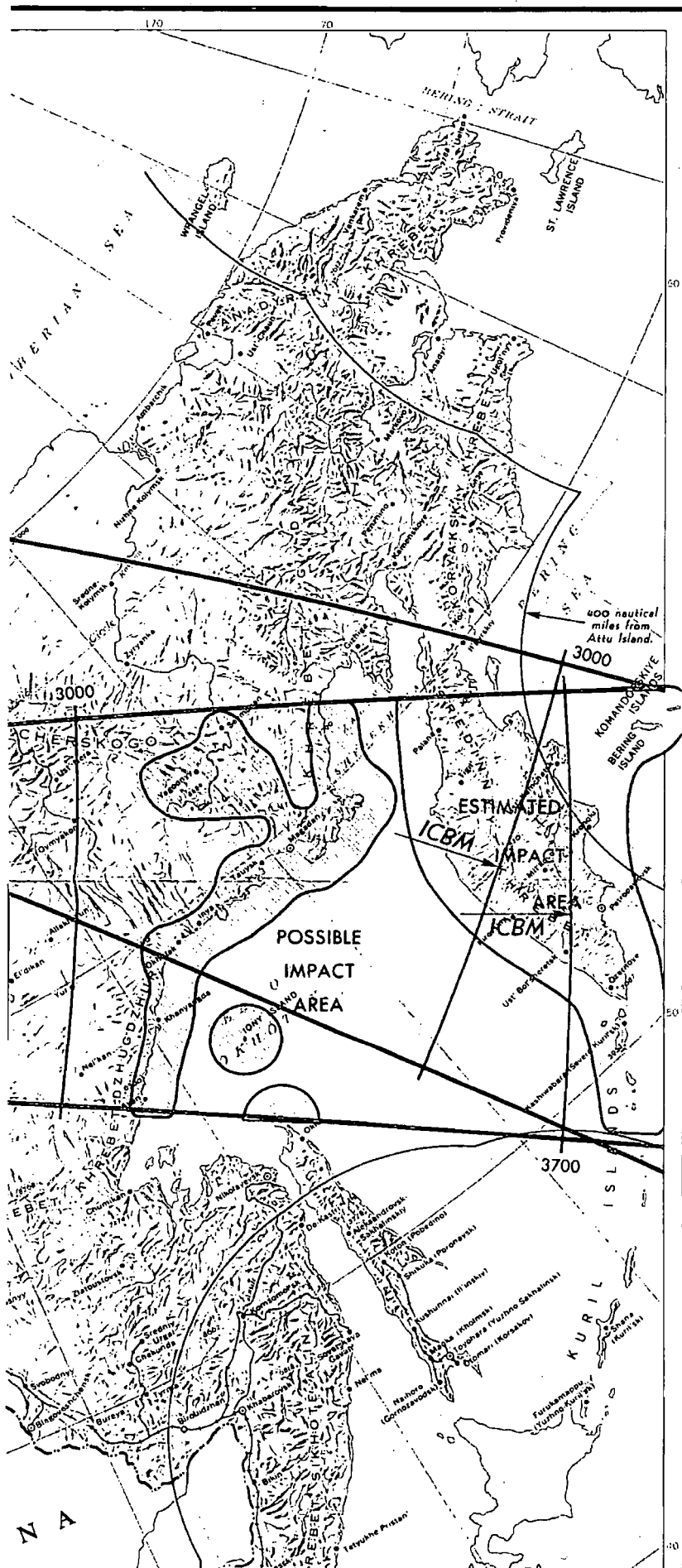
Territory within 400 nautical miles of
non-Soviet bloc country.

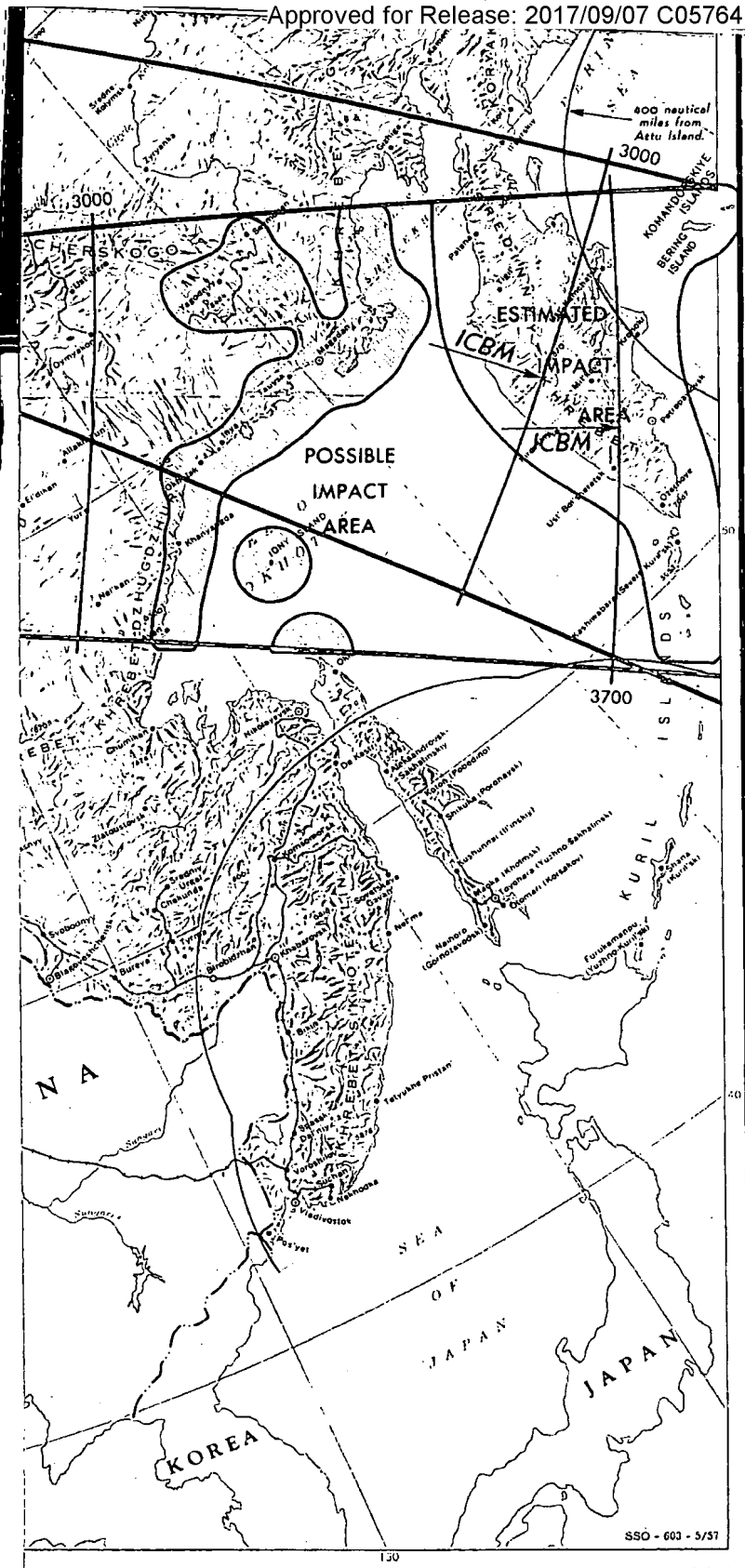
in nautical miles.

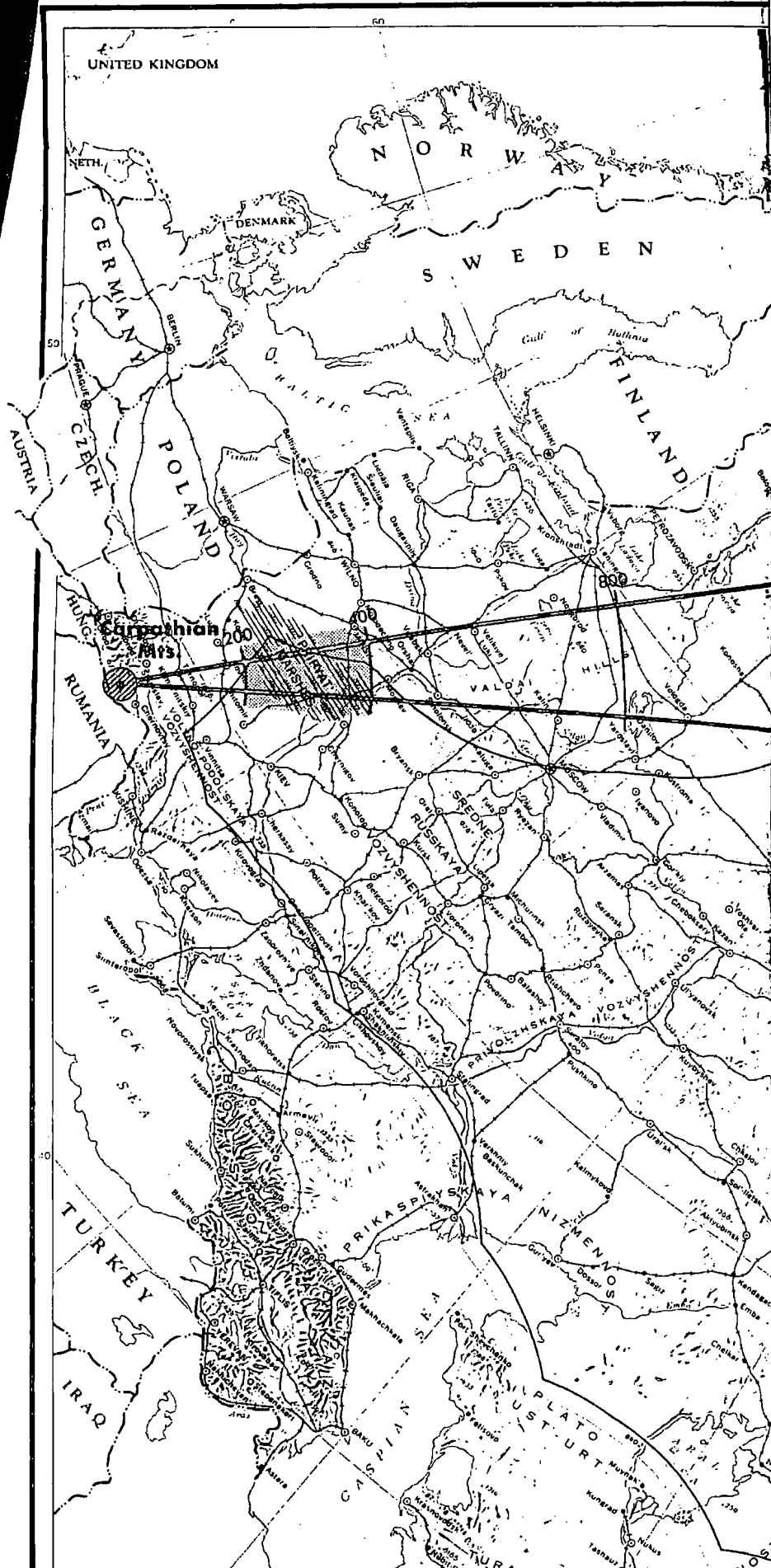
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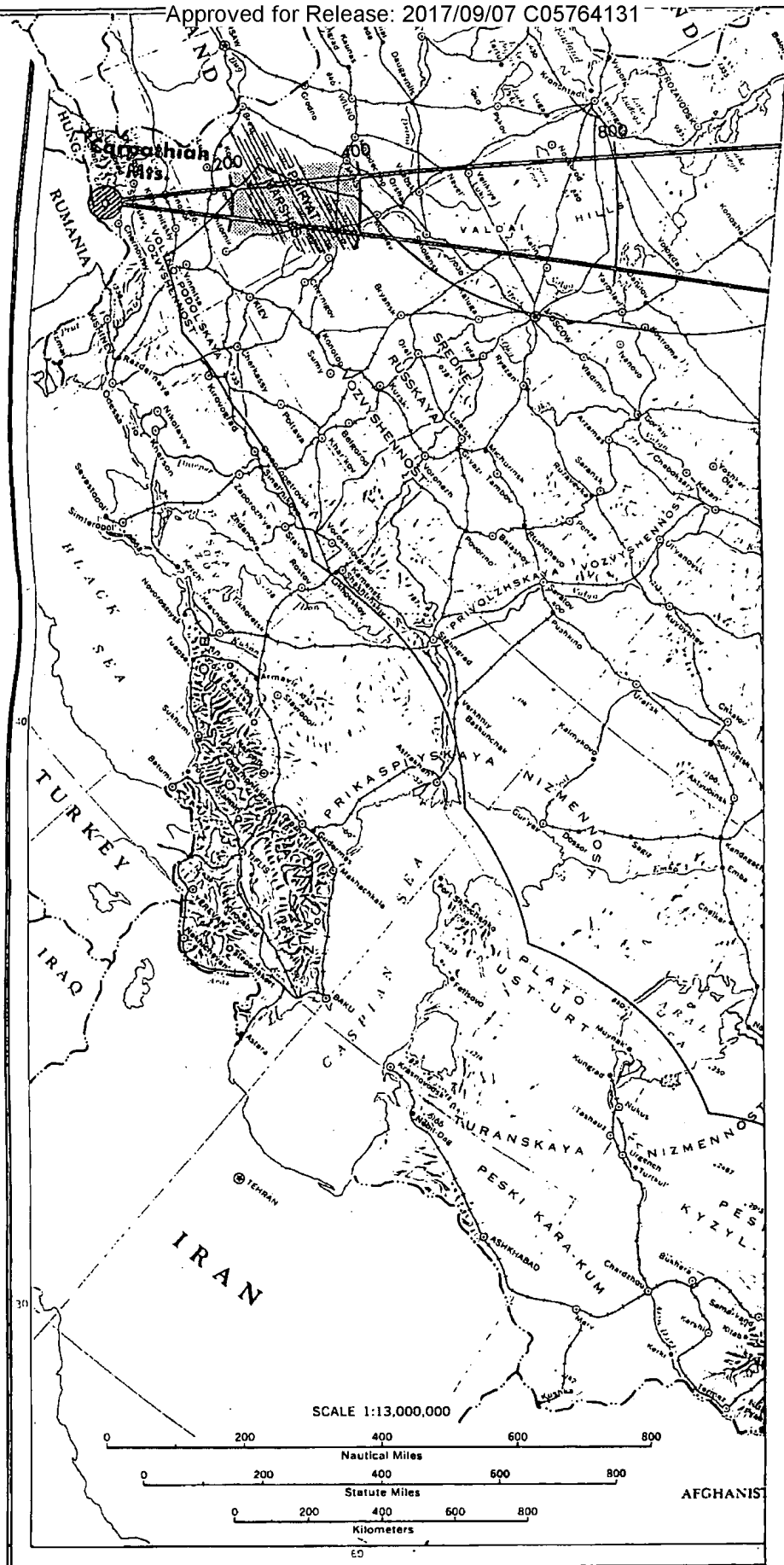
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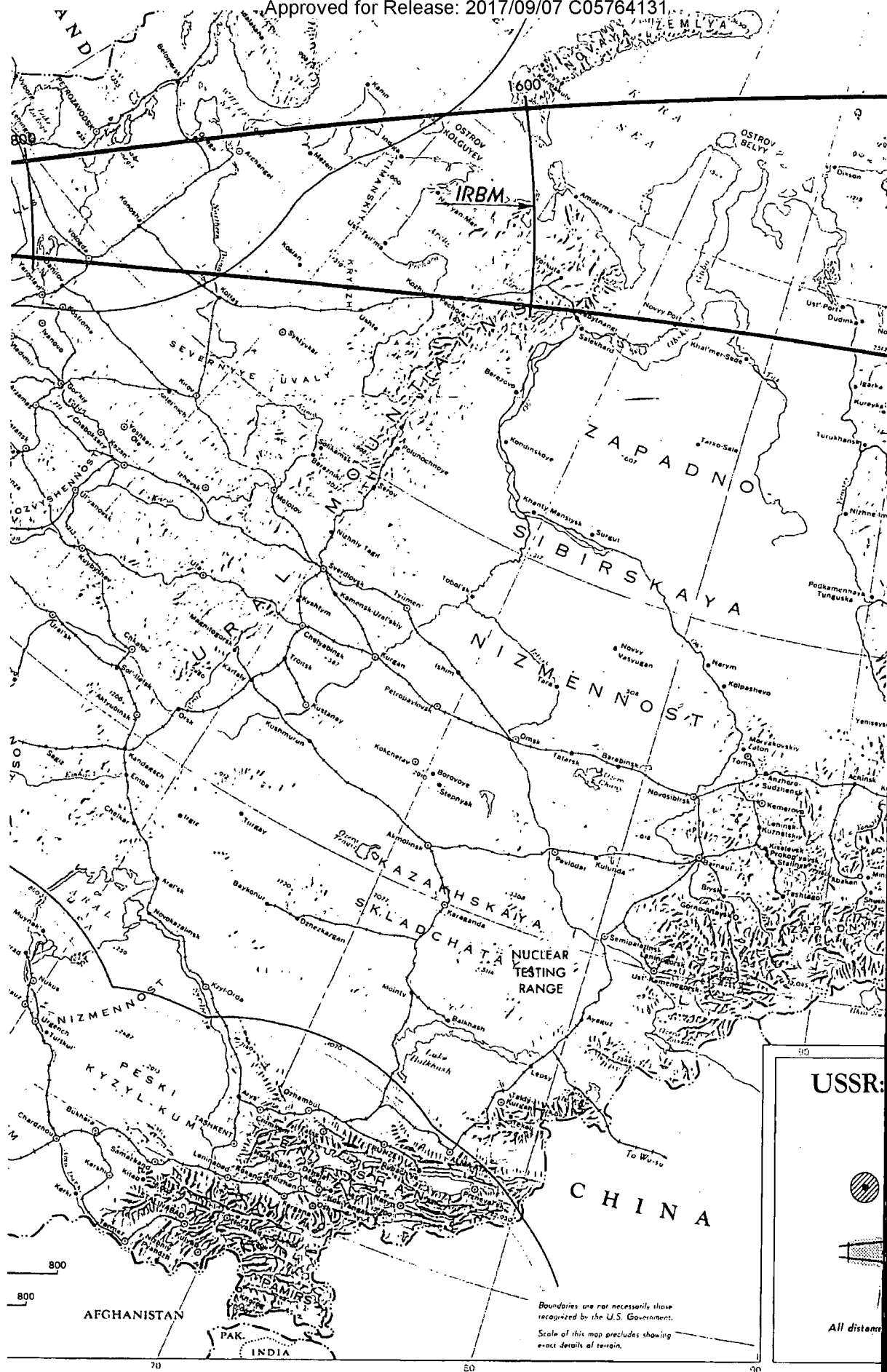








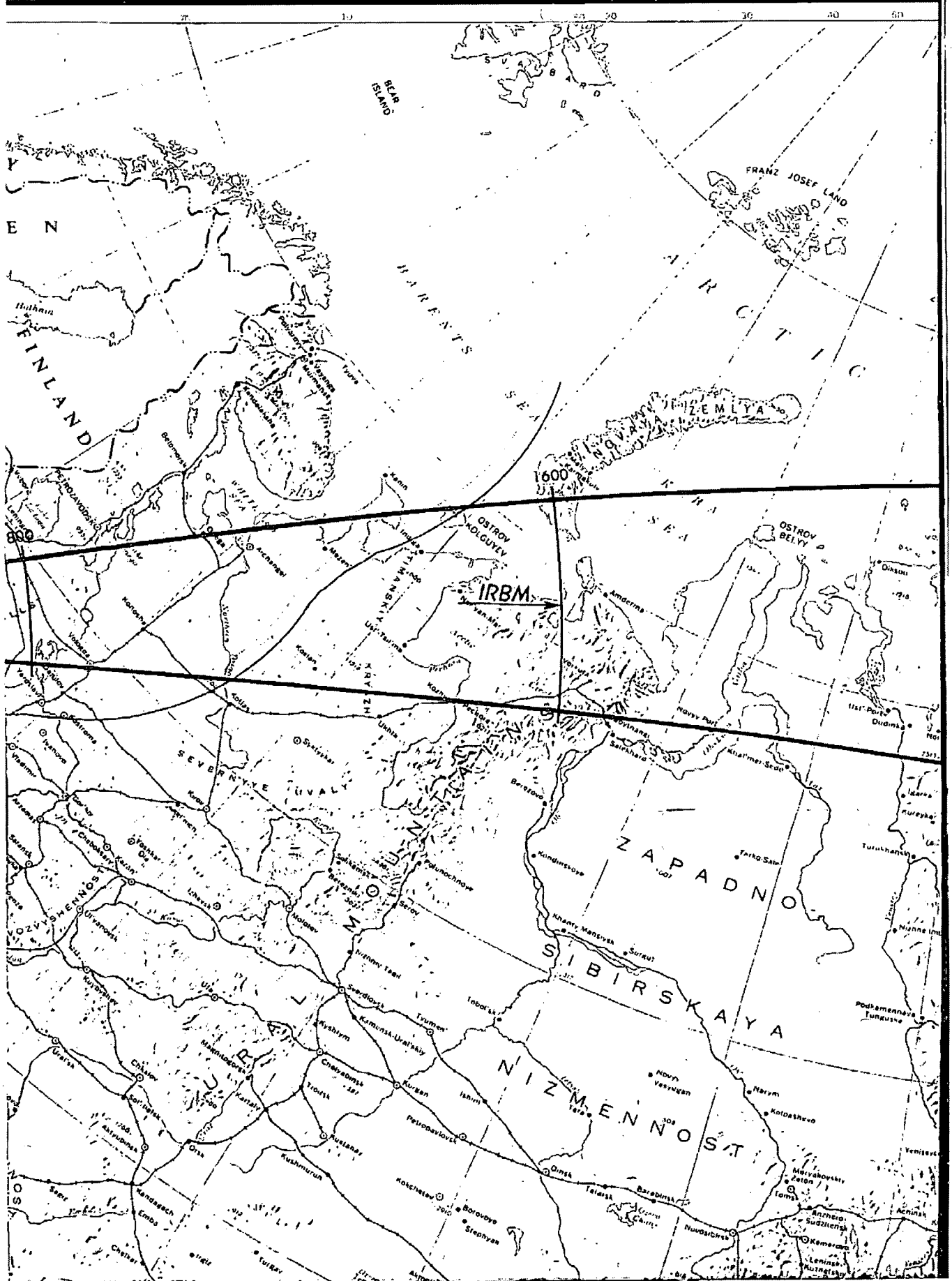
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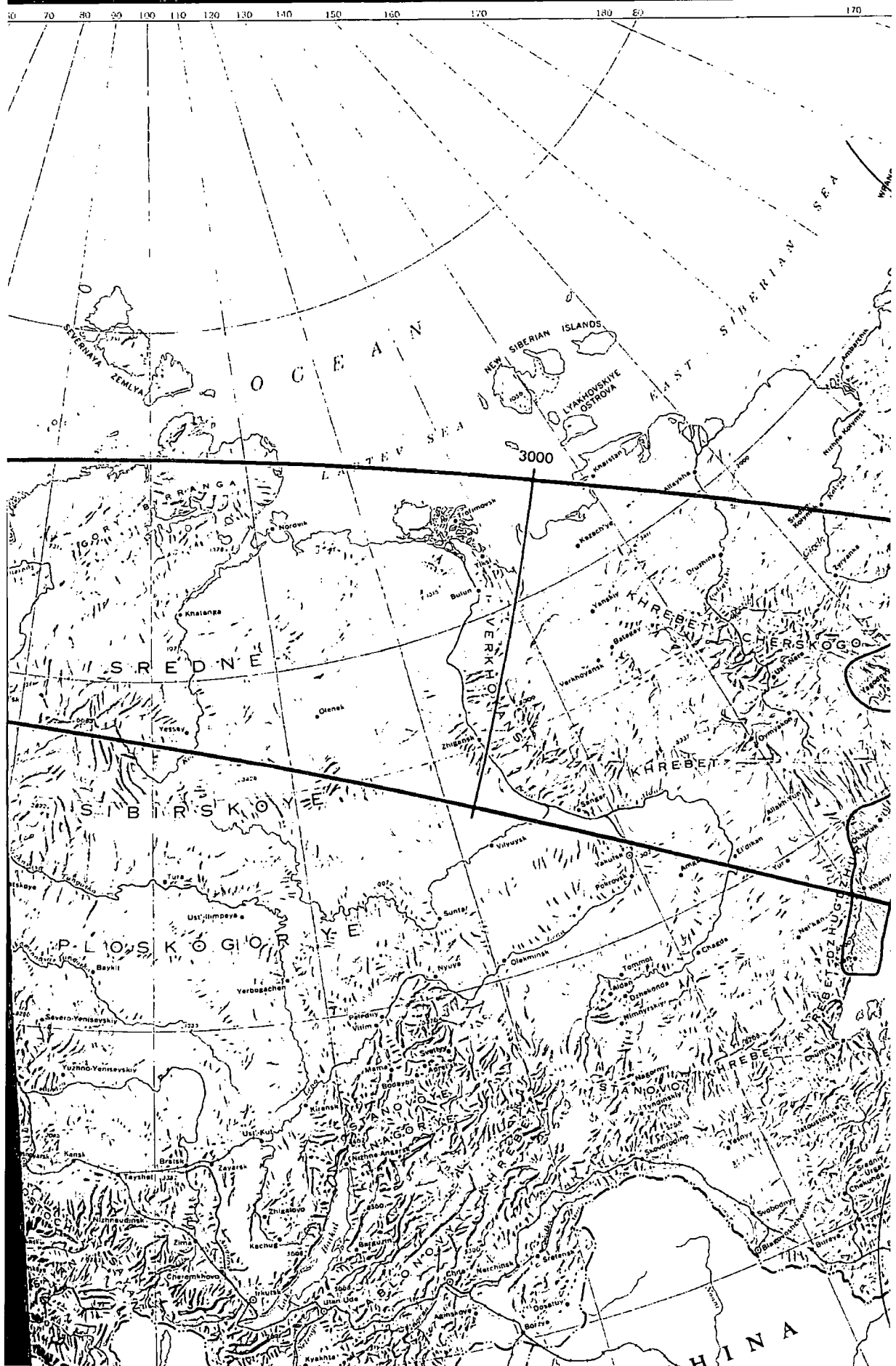
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