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LOGISTICAL PROBLEMS OF THE TIBETIAN CAMPAIGN

17 April 1959

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ANNEX A. Communist China: Selected Roads

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LOGISTICAL PROBLEMS OF THE TIBETAN CAMPAIGN

Summary and Conclusions

Chinese Communist ground force strength in the Tibet Military District is currently estimated at about 60,000 men. Present supply requirements are approximately 64 short tons per day per division of 15,000 men, or a total of 256 tons per day for the total force. Trucks moving over the Lan-chou - Lhasa road via Golmo are able to deliver 385 tons per day in Lhasa.

If the Chinese Communists should decide to double their present strength in Tibet to a total of 120,000 men, the Lan-chou - Lhasa road would not be adequate as a supply route, since it can support only 90,000 troops for a sustained period (3 months or more). Logistic support for the present force of 60,000 men could be sustained and 30,000 men could be moved in over a 30-day period. Following this the road would have to be used almost exclusively to resupply the 90,000 troops in position.

The Chinese Communists have experienced great difficulty in keeping open the Ya-an - Lhasa road, the only alternate route between China and the Lhasa area of Tibet. If the Chinese Communists decide to reopen this road they could probably do so within a period of 30 to 60 days. Initially the capacity of this road would be about half that of the Lan-chou - Lhasa road, so it would be able to support logistically only a force of 45,000 men. Three to four weeks would be required to move 30,000 men to Tibet over the road. Thus, establishment and maintenance of a force of 120,000 men in Tibet would require the full capability of the Lan-chou - Lhasa road via Golmo and the partial use of the Ya-an - Lhasa road and could not be accomplished in less than 60 days.

It would not be possible for the Chinese Communists to support logistically a force of 180,000 men (triple the present strength) by surface transportation alone. The Ya-an - Lhasa road after initial reconstruction could only support an additional 15,000 men for a total of 135,000 by both routes. However, through extensive improvement and construction extending over a period of many months with some disruption to the movement of supplies over the route, it conceivably could be so improved that its capacity would be approximately equal to that of the Lan-chou - Lhasa road, then 180,000 men could be supported. During this extended period of time the only possibility for additional logistic support for forces deployed in Tibet would be through air transportation.

Currently there are 20 Tu-4 and 40 Il-14 aircraft available to the Chinese Communist Air Force. In addition, there are about 50 Il-14's in the Civil Air Fleet of Communist China. From the air base at Lan-chou, these

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aircraft could supplement the logistic support provided by road transport to a moderate extent, possibly by as much as 128 tons per day, the requirement for two divisions of 15,000 men each. If the Chinese are willing to commit half of their combined military and civil air transport capability to this operation, allowing for a 25-percent operational reserve, they could probably supply a force of 35,000 men (150 tons per day) by airlift.

The tonnage required to sustain 180,000 troops in Tibet would not place an undue burden on the railroad system of Communist China, since no more than 2 to 3 trains per day would be required to deliver supplies to the staging areas. The impact on the combined civilian and military truck park of the country would also be negligible. Sufficient trucks exist in the Tibet - Tsinghai-Sinkiang area to handle traffic on the Lan-chou - Lhasa route, and enough trucks are available for use on the Ya-an - Lhasa route. The limitation is not the number of trucks, but the capacity of the supply roads.

The most serious vulnerability identified in this study is the limited capacity of the supply routes. The southern route from Ya-an to Lhasa is closed at present and would require a military campaign plus a period of reconstruction before it could be used. The northern route from Lan-chou is of limited capacity at best, and is subject to interdiction at several points between Golmo and Lhasa. Only a concentrated effort by the Chinese at keeping the road open will permit a sustained flow of supplies to Tibet.

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1. Troop Strength in Tibet.

Chinese Communist ground force strength in the Tibet Military District is now estimated at approximately 60,000 troops. Thus, logistic support has to be provided for the equivalent of 4 divisions at 85 percent strength. Consideration will also be given in this report to the logistical situation if this number of troops were to be doubled or tripled.

2. Supply Requirements for Troops Stationed in Tibet.

It has been estimated that it would take 38.55 short tons\* per day to supply a Chinese infantry division of 15,000 troops on garrison duty in Tibet. This would be increased to 147 tons per day for a full combat operation. For a situation such as exists at present (garrison duty plus limited combat or "mopping up" type operations) an additional 25 tons per day of POL would be required over and above the supplies necessary for a garrison type of operation. Thus, present requirements are approximately 64 tons per day per division of 15,000 troops, or a total of 256 tons per day for the 60,000 troops estimated to be in Tibet at the present time. If the number of troops were increased to 120,000 or to 180,000, the supply requirement would increase correspondingly to 512 or 768 tons per day.

3. Supply of Troops Stationed in Tibet by Motor Truck.

a. Highway Routes into Tibet.

For purposes of logistical support, three alternate highways lead into Tibet. One of these is operational at present, one could be made operational in approximately 30-60 days, and the other is of no practical use in the present situation. An additional route extends to the Tibet border but is of no value in providing support for troops operating in the Lhasa area. The four highways are listed below in order of their present importance:

(1) Lan-chou - Lhasa.

The only land supply route of logistical importance leading into Lhasa at present is the Lan-chou - Lhasa highway. This route is about 1,400 miles from the railhead at Lan-chou in Kansu province to Lhasa. The Chinese Communists give the eastern terminal of the road as Hsi-ning, about 100 miles west of Lan-chou, thus reducing the total length to about 1,300 miles from Hsi-ning to Lhasa. From Hsi-ning the route passes through Huang-yuan, Ch'a-k'a and Pa-lung to Golmo (Ka-erh-mu). This portion of the route is limited all-weather, approximately 26 feet in width. An alternate route from Golmo leads north to a railhead on the Trans-Sinkiang Railroad at Hsia-tung in western Kansu province. The distance from the railhead and characteristics of this road make it very comparable to the

\* Tonnages are given in short tons throughout this report except where otherwise indicated.

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Lan-chou - Golmo portion of the route. It is believed at this time that the Hsia-tung to Golmo route is being used primarily for traffic to and from the Tsaidam oil basin and that the Lan-chou - Golmo highway is the principal logistical route. Because of these alternate routes leading into Golmo, the critical section of the road is that portion from Golmo to Lhasa.

From Golmo to the Tang Pass (on the Tsinghai-Tibet border) the road is limited all-weather, approximately 15-30 feet in width. A section of the road from this point to the Tang-hsiung airfield is fair weather, about 12-15 feet wide, with the remainder of the route limited all-weather from the airfield to Lhasa.

The surface of the route from Lan-chou to Lhasa is assumed to be in fair to good condition with surfacing of gravel, crushed rock, or improved earth. This route was hastily constructed and opened to traffic in 1954. Since that time constant improvements have been made with the Chinese claiming that the entire route has been widened to 32.8 feet. It is doubtful that this standard has been reached. Most bridges along the route are less than 100 feet in length, characteristically of timber construction, and load capacity of 8 tons although some small streams are probably still forded. There are no known tunnels on the route. The sections of this route most susceptible to interdiction appear to be the bridges (those crossing dry streams could probably be easily forded), passes, and the section from Nagchhu Dzong (Hei-ho) to Yang-pa-ching.

Central and southern Tsinghai is an extremely barren, high, desolate plateau. Although this area is generally free of difficult passes and mountains, ravines, and deeply entrenched streams, the high elevations (the plateau at about 15,000 feet and mountains rising to 20,000 feet) coupled with intense cold, frozen soil, and severe gales have greatly handicapped motor truck operation. Operating efficiency is cut down by altitude, radiators boil at low temperature, and fuel consumption is very high.

(2) Lan-chou - Yushu.

This route begins at Lan-chou, follows the Lan-chou - Lhasa route west through Hsi-ning to Huang-yuan, and then travels southwest to Yushu. The portion of this route from Huang-yuan to Yushu is fair-weather of unknown width. A caravan route of questionable motorability leads west from Yushu to meet the Lan-chou - Lhasa route between Tang Pass and Nagchhu Dzong. The Yushu road could be used to transport supplies to the garrison at Chamdo. However, it is of no significance in supporting general operations in Tibet proper.

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(3) Ya-an - Lhasa.

This highway is approximately 1,400 miles long extending from Ya-an to Lhasa. Ya-an is connected by road to the railhead at Ch'eng-tu, 100 miles to the northeast. The route to the west passes through Tatsienlu (K'ang-ting), Kan'tzu, Te'ko, Chamdo (Ch'ang-tu) and T'ai-chao on its way to Lhasa. From Ya-an to Chamdo (a distance of about 620 miles) this route is limited all-weather, about 15-30 feet in width. From Chamdo to Lhasa the road is fair-weather and about 15 feet in width.

Construction of this difficult route began in 1950 and was completed in December of 1954. Three major mountain ranges and four large rivers had to be crossed. The Chinese Communists have experienced great difficulty in keeping this route open, especially the section west of Chamdo where extensive repairs were necessary after the road was opened in 1954. In addition to natural causes, this portion of the road has been frequently damaged or blocked by dissident groups. It is probable that the Chamdo to Lhasa section of the road has been inoperable for some time and that extensive repairs would be necessary to reopen this portion of the road as a logistical supply route.

An alternate route (243 miles long) extending west from Tungolo (a short distance west of Tatsienlu) via Batang to Patang (south of Chamdo) may have been completed. This route is fair-weather of unknown width. It is possible that a small section of the road between Batang and Ningching is still in very poor condition and that additional work would be necessary if this section were to be used as a major supply route. In any event, operation of this route for a supply route into Tibet is dependent upon the opening of the section of the road from Chamdo to Lhasa.

A route west from Chamdo to intersect the Lan-chou - Lhasa route near Nagchhu Dzong is currently under construction. The route may have been completed as a fair-weather route as far as Dinching. The uncompleted section from Dinching to Nagchhu Dzong eliminates this as a supply route at present.

(4) Sinkiang - Tibet.

A fourth route, of no practical logistical importance, is the Sinkiang-Tibet highway route. The route extends from Kashgar (K'o-shih) in Sinkiang to Gartok in extreme western Tibet. This portion of the road is considered to be fair-weather with the exact width unknown. From Gartok two routes of limited motorability extend to Zhikatse and Nagchhu Dzong. The route from Gartok to Nagchhu Dzong, a point on the Lan-chou - Lhasa route, is thought to be little more than a course marked across the plateau and of no logistical value. Although motor vehicles may have been operated between Gartok and Zhikatse, this route is of limited motorability and of no logistical value. A section of road from Gartok running southeast to Taklakhar has been completed.

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b. Factors Affecting Road Movement.

(1) Basic Road Capacity.

The basic capacity of a road is expressed as the number of vehicles per hour each way that the road is physically capable of supporting over a period of 3 months. In arriving at a capacity figure the following factors are considered: road construction; width; condition; grades, curves and bottlenecks; and effects of weather. The basic capacity is applicable during daylight hours and under fair weather conditions. It has to be reduced if operations take place at night or during bad weather. If essential road maintenance is neglected, the basic road capacity may be increased by 50 to 100 percent for a short period not exceeding 7 days.

(2) Operational Road Capacity.

The standard vehicle for purposes of assessing convoy performance and densities in Communist China is the 3-ton truck. The average load carried by a vehicle is assumed to be 3 tons. This allows for use of 3/4-ton, 1 1/2-ton, 6-ton, and 10-ton trucks, as well as for local overloading. If it is necessary to use a road at its basic capacity over a period of time, allowance must be made for road maintenance, administrative traffic, and other operating factors. For planning purposes, it is estimated that 10 hours per day is the maximum time that a road can be used for supply operations. This allows 9 to 12 hours a day for road maintenance which is normal for China and Southeast Asia, 2 to 4 hours for administrative traffic, including supply of personnel permanently stationed along the road, and several hours for such operating factors as realignment of convoy spacing and vehicle breakdowns. Additional allowance would have to be made if civilian or operational military traffic were also using the supply route.

(3) Consumption of Fuel.

In assessing the amount of tonnage which can be delivered to a point, an allowance has to be made for consumption of fuel along the route. For this purpose the route should be divided into stages the length of which will vary with the type of road and the terrain. Normally, a distance of about 100 miles per stage should be assumed. The consumption of fuel per stage is estimated to be about 5 percent of the total tonnage available at the beginning of each stage, starting with the second stage. Fuel for the first stage would be available from base supplies and would not be part of the basic load.

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c. Supply of Troops in Tibet.

(1) The Present Garrison.

It is assumed that the base used by the Chinese Communists to supply their troops in Tibet is located at Lan-chou in Kansu Province. Supplies presumably arrive at Lan-chou primarily by railroad over the Lung-Hai or Pao-t-ou - Lan-chou lines. From Lan-chou they move by truck via Hsi-ning and Golmo to Lhasa from which they are distributed to individual units by local means of transportation. It is estimated that the basic capacity of the Lan-chou to Lhasa road is 25 trucks per hour in each direction. This estimate takes into consideration such factors as the moisture content of the soil, conditions of the road surface, the terrain, and the width of the road. If the road is used for a maximum of 10 hours per day, the daily capacity is 250 trucks moving in each direction.

If, as is estimated the Chinese Communists are capable of doing, 250 trucks are loaded each day in Lan-chou with an average load of 3 tons, it is possible for the Chinese to dispatch 750 tons daily from their supply base. The distance from Lan-chou to Lhasa is approximately 1,400 miles. Although the Chinese have reportedly been able to drive this distance in about 11 days, for purposes of a sustained military movement of the kind under discussion here, it is assumed that the trip would take 14 days. Thus the total distance would be broken into 14 stages of 100 miles per stage. Assuming fuel consumption of 5 percent of the total tonnage available at the beginning of each stage (except the first stage), the original 750 tons would dwindle to 385 tons by the time the trucks reached Lhasa. The 5 percent figure contains an allowance for fuel consumption on the return trip, so the maximum effective load delivered in the Lhasa area would be approximately 380 to 390 tons each day. This amount of tonnage would be about 50 percent above the 256 ton daily requirement of the estimated 60,000 troops currently stationed in Tibet. Thus, under present conditions, the Chinese should have no trouble supplying their troop strength in the area entirely by road.

(2) Increase in Size of Present Garrison.

If the Chinese Communists should double their present estimated troop strength in Tibet to 120,000, their estimated daily supply requirement would be 512 tons. This is about 33 percent above the daily capability of the Lan-chou - Lhasa road of 385 tons. The tonnage requirement for 120,000 troops could be delivered for a short period of

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time, perhaps a week or two, but could not be sustained indefinitely. Therefore, without use of the southern route from Ya-an to Lhasa, it is estimated that no more than 90,000 troops could be supported in the Lhasa area by road under present conditions. If the present Tibet garrison were tripled (180,000 troops), it would be necessary to open the southern route or place reliance excessively on an air lift. The problems associated with an air lift are discussed below.

If the Chinese move additional troops from Lan-chou or Golmo to Lhasa, there will be some interference with the supply operation currently underway while the operational traffic is on the road. However, there appears to be enough of a cushion between the 256 tons per day required by the troops currently in Tibet, and the basic capability of the road of 385 tons per day delivered at Lhasa, to allow for the simultaneous movement of supply traffic and operational traffic. Once the new troops reach a total of about 90,000 the entire capacity of the road would have to be used for resupply. Under those circumstances there would be little or no capacity available for civilian or operational military traffic.

The movement of 30,000 additional troops to Lhasa under present conditions would take about a month if the staging area were in Lan-chou. About two-thirds of the daily capacity of the road (165 trucks) is used to supply the 60,000 troops presently in position in Tibet. This would leave a capacity of 85 trucks per day to be used by the new units moving into position. If each infantry division of 15,000 men moved on its organic transportation it would take about 5.3 days to get all elements of the division on the road. Leading elements of the division would begin to arrive in Lhasa in 14 days. By the middle of the 19th day the entire division would be in the area. The next division would begin to arrive on the 19th day and would complete its movement on the 24th day. These calculations do not take into consideration the resupply problems of the first elements to arrive which would complicate the movement of the last division. Thus, it is estimated that it would take at least a month and possibly somewhat longer to move 30,000 men to Tibet by truck under present conditions. Once these troops were in position the entire capacity of the highway would have to be used for resupply. If the Chinese should decide to move 30,000 troops to Lhasa in excess of the 90,000 troops which can realistically be supplied by the Lan-chou - Lhasa road, they may be able to do so on a crash basis. Such action, however, would probably result in such severe damage to the road that it would not be able to support logistically the troops in Tibet.

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In order to move realistically the remaining 30,000 troops into Tibet and supply a total of 120,000 troops by road, the southern route from Ya-an to Lhasa must be reopened. This would require, first, a military operation of some magnitude to reduce the rebel activity in the area. Secondly, several sections of the road would have to be completely rebuilt. These two operations would probably take at least 30 and possibly 60 days. Once the road were opened, its capacity would initially be about half that of the Lan-chou - Lhasa road. Thus, if 30,000 troops began moving from a staging area around Ya-an, they would be in position in Tibet in 3 to 4 weeks. The capacity of the road would then be sufficient for resupply of this contingent.

If the Chinese desire to triple the number of troops presently in Tibet (60,000 to 180,000), 15,000 men above the 120,000, discussed previously, could probably begin to move in over the reconstructed southern route from Ya-an, a month after it has been opened to traffic. These troops could also be supplied by this route. The remaining 45,000 men would have to wait, however, upon substantial improvement of the Ya-an route, an operation which would ~~take~~ several months.

4. Impact of Logistical Support on Railroads and on the Motor Truck Park.

(1) Railroads.

A logistical build-up of the type discussed in this report would have no significant effect on the railroads of Communist China. Even if the Chinese reached the point where they were using the Lan-chou - Lhasa road to capacity for purposes of resupply, no more than the equivalent of one freight train per day would be needed to haul the supplies to the staging area in Lan-chou. Under these conditions a total of 750 tons would have to be moved daily into Lan-chou, an amount which could easily be carried by one train. Although the Lung-Hai line carries heavy traffic between Lan-chou and Cheng-chou and congestion often exists in the classification yards along the line, trains carrying military supplies would be given such a high priority that they would not be affected by these local conditions. Washouts and local flooding occasionally occur on the line, but never to the extent that traffic is impeded for any great length of time.

An alternate rail route to Lan-chou is the Pao-t'ou - Lan-chou line which was completed and opened for traffic in 1958. Although this line is not as high a capacity line as the Lung-Hai, it would provide an acceptable alternate way of getting supplies to Lan-chou if the Lung-Hai line were closed down for any appreciable length of time.

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FOL, for an operation in Tibet, probably would be supplied by the refinery in Lan-chou. Crude petroleum for the Lan-chou refinery is hauled from the Yu-men field along the eastern section of the Trans-Sinkiang Railroad. This traffic does not place a great strain on the railroad line in this area and thus would not be a critical factor in the situation.

If the southern road to Tibet were opened and it became necessary to open a staging area in the Ya-an or Cheng'tu areas, supplies would move by rail to Cheng'tu over the Lung-Hai and Pao-chi - Cheng'tu lines. Approximately 375 tons per day would be required. This amount of tonnage would place no great burden on the Lung-Hai line nor even on the Pao-chi - Cheng'tu line which is a much lower capacity line. The latter line, however, is much more subject to washouts and landslides and conceivably could be closed indefinitely under certain conditions. If this situation occurred, the necessary supplies would have to be trucked around the break in the line. This would be a time-consuming operation but would not seriously affect the flow of supplies to the staging area at Cheng'tu or Ya-an.

(2) Motor Truck Park.

In order to supply 90,000 troops in Tibet, the Lan-chou - Lhasa road would have to be used to capacity. This would require continuous use of slightly less than 7,000 trucks per month. About 5,130 trucks would be on the road at one time, 380 would be loading or unloading, 1,100 would be undergoing repairs or maintenance and 330 would be required for vehicle replacement. This would amount to about 8 percent of the 90,000 trucks in the civilian truck park at the end of 1958. Since an equal number of trucks are owned and operated by the military, an operation of the magnitude contemplated here would not place an undue strain on the total truck park of the country.

It is estimated that the military truck park available in Tibet and adjacent regions is adequate to support the present garrison of 60,000 troops. If the garrison is increased to 90,000, supply could still be maintained since the additional troops not only would bring their organic truck park, but also would be accompanied by independent motor transport units. The Chinese Army has enough trucks in most parts of the country to divert additional transport units to Tibet without curtailing priority uses elsewhere.

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Although there are several thousand civilian trucks engaged in economic activities in Kansu, Tsinghai, and Sinkiang, their importance to the local economy is so great that the diversion of more than a relatively few trucks to the Tibet operation could not be expected. Some, however, could probably be used without serious impact on the local economies.

In the unlikely event that large numbers of civilian trucks were needed, the Chinese would probably divert them from the eastern or central sections of the country. In these areas, where the average length of haul by truck is relatively short, various means of primitive transport could be used to provide the necessary transport service. Moreover, current truck production in Communist China is estimated at 1,500 to 1,800 units per month. Consequently, compensation for the requisitioning of large numbers of civilian trucks could be made rather quickly from new production.

4. Supply of Troops Stationed in Tibet by Air.

The Chinese Communist Air Force is estimated to have 20 Tu-4<sup>s</sup>, 40 Il-14<sup>s</sup>, and a number of smaller aircraft which might be suitable for forward area operations and airdrops. The small aircraft would not be suitable, however, for use in an airlift to Tibet. The Civil Air Fleet has about 50 Il-14<sup>s</sup>, and a lesser number of smaller transports. Accordingly, the total aircraft in Communist China, probably suitable for an airlift, are 20 Tu-4<sup>s</sup> and 90 Il-14<sup>s</sup>.

If the Chinese Communists should consider using an airlift to augment the Lan-chou - Lhasa road for the supply of 120,000 men in Tibet, they would find that it would be necessary to lift 128 tons per day -- the supply requirement for 30,000 men. It has been estimated earlier in this report that the Lan-chou - Lhasa road can support 90,000 men.

The most practicable airfield within the interior of China for an airlift to Tibet is the rail-served field at Lan-chou, 1,380 air kilometers (850 statute miles) from the Lhasa airfield. It is estimated that on the westbound trip (Lan-chou to Lhasa) at the high altitude of flying necessary, an Il-14 could carry a supply load of two tons and a Tu-4, 11.8 tons. It is further estimated that the average aircraft performance would be no more than one round trip daily. Therefore, to lift 128 tons to Lhasa, each day, would require 64 Il-14<sup>s</sup> or about 11 Tu-4<sup>s</sup>.

Even if it were possible, by a crash movement over the road or by excessive use of an airlift to increase the garrison in Tibet to 120,000 troops, an airlift to assist in the supply of a garrison of this size would require the use of 11 of the 20 Tu-4<sup>s</sup> available to the Chinese Air Force. If Il-14<sup>s</sup> were used exclusively, all aircraft of this type

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available to the Air Force would be needed, and, in addition, almost half of the Il-14's available to the Chinese Civil Air Fleet would have to be requisitioned. This requirement does not take into account the need for an operational reserve of aircraft which may be as high as 25 percent, and may increase the total aircraft requirement by that amount. The total aircraft requirement would thus impinge very substantially on the operational airlift capability of military and/or civilian aviation in Communist China.

If an airlift to augment the Lan-chou - Lhasa road for the supply of 180,000 men in Tibet is considered, the Communists would find that it would be necessary to lift 384 tons per day -- the supply requirement for 90,000 men. The Lan-chou - Lhasa road can support 90,000 men. An airlift of this magnitude would require the use of at least 20 Tu-4's and 74 Il-14's. It would not only necessitate the use of all Tu-4's available to China, but also the major portion of all Il-14's in the military and civil fleets. Taking into account the 25 percent reserve necessary to support continued operations, the number of aircraft required would exceed the transport capability of all the Tu-4's and Il-14's presently in China.

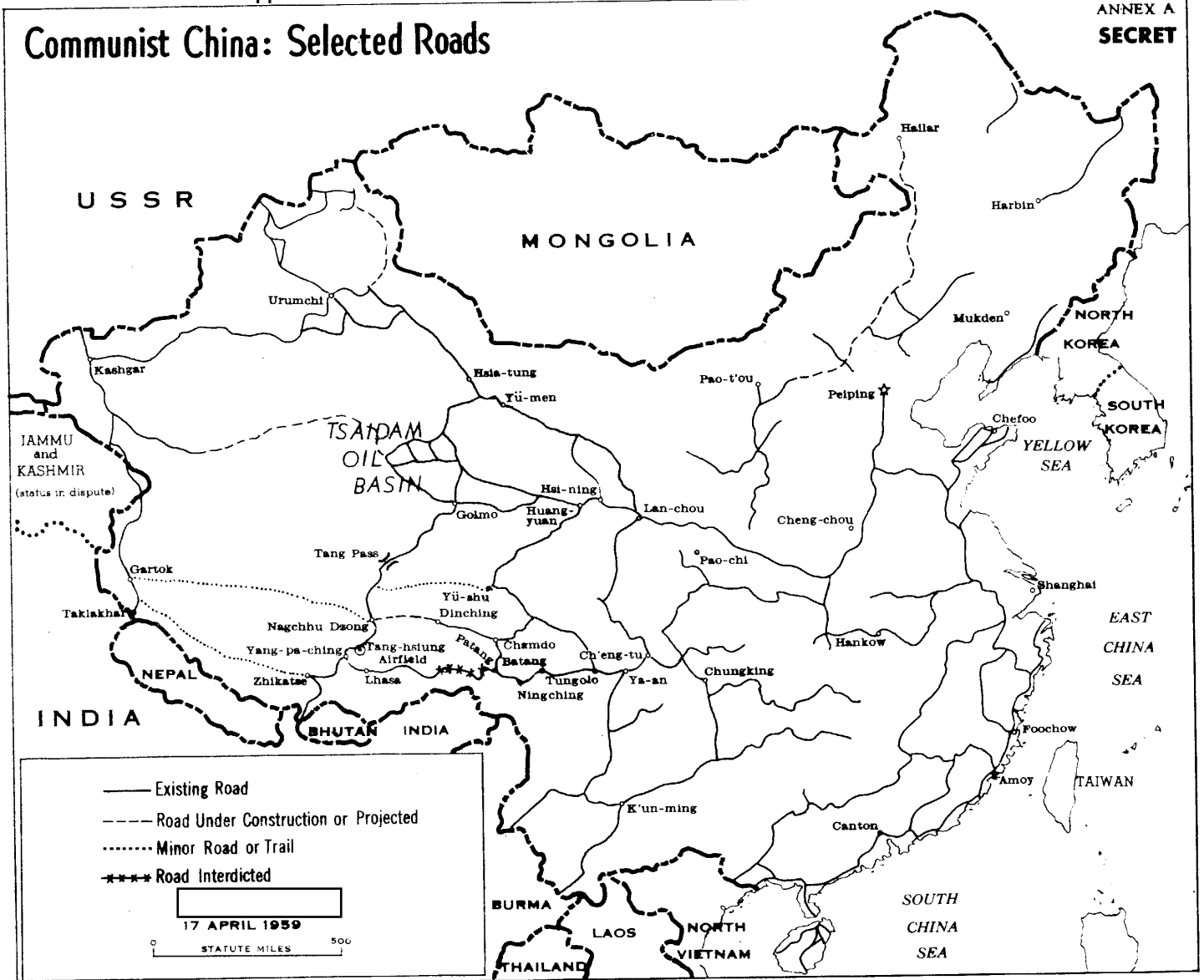
In view of the above, it is estimated that the Chinese Communists could with substantial disruption in other air services rely on an airlift to augment the Lan-chou - Lhasa road to support a troop strength in Tibet of the magnitude of 120,000 men. The operational air-lift capability of the entire civil and military fleets, however, could not augment sufficiently the Lan-chou - Lhasa road for the supply of 180,000 men.

A realistic airlift in terms of the capability and commitments of air transport in China would approximate 150 tons per day. Such an airlift would require the constant operation of no more than 7 Tu-4's and 34 Il-14's, or an equivalent combination of such aircraft.

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