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HR 70-14

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CENTRAL INTELLIGENCE AGENCY

WASHINGTON, D.C. 20505

15 February 1978

MEMORANDUM FOR: The Director of Central Intelligence

FROM : John N. McMahon
Deputy Director for Operations

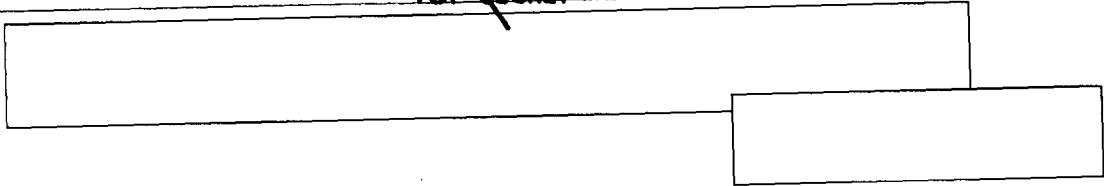
SUBJECT : MILITARY THOUGHT (USSR): The Supply of Fuel to Operational Formations Advancing from the Interior of the Country to a Theater of Military Operations

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". This article factually discusses the considerations and problems involved in supplying motor fuel to combat units moving to the battlefield by organic means, by rail, and by a combination of both means. Data are presented on the prescribed and required fuel reserves for trucks, tanks, and other combat vehicles, on their fuel consumption and needs on the march, and on their cruising ranges. Recommended measures to alleviate the difficult problem of fuel resupply on the move are set forth and fuel resupply by air is discussed briefly. This article appeared in Issue No. 3 (70) for 1963. The

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies. For ease of reference, reports from this publication have been assigned

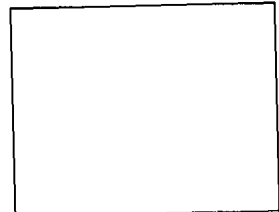
JNM
John N. McMahon

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Intelligence Information Special Report

Page 3 of 18 Pages

COUNTRY USSR

[Redacted]

DATE OF INFO

Late 1963

DATE

15 February 1978

SUBJECT

MILITARY THOUGHT (USSR): The Supply of Fuel to Operational Formations Advancing from the Interior of the Country to a Theater of Military Operations

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 3 (70) for 1963 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". The author of this article is General-Leytenant of Engineer-Technical Service V. Nikitin. This article factually discusses the considerations and problems involved in supplying motor fuel to combat units moving to the battlefield by organic means, by rail, and by a combination of both means. Data are presented on the prescribed and required fuel reserves for trucks, tanks, and other combat vehicles, on their fuel consumption and needs on the march, and on their cruising ranges. Recommended measures to alleviate the difficult problem of fuel resupply on the move are set forth and fuel resupply by air is discussed briefly.

End of Summary

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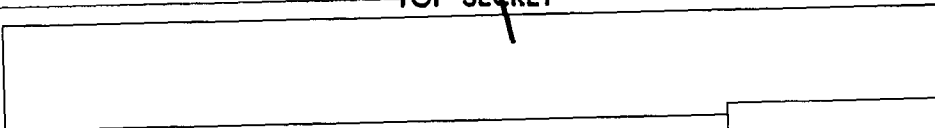
Comment:

The SECRET version of Military Thought was published three times annually and was distributed down to the level of division commander. It reportedly ceased publication at the end of 1970. The Russian language version [Redacted]

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The Supply of Fuel to Operational Formations Advancing from the Interior of the Country to a Theater of Military Operations

by

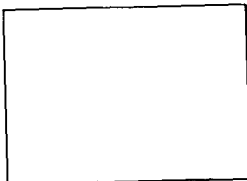
General-Leytenant of Engineer-Technical Service V. NIKITIN

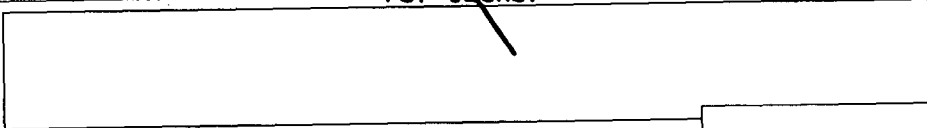
At present, when troops have been given the task of completing, if necessary, a rapid move over great distances, it is important to consider carefully whether all capabilities are being utilized to ensure the troops are continuously ready to do this.

We are cognizant of the fact that during a move the troops will use all types of transportation but that the bulk of the troops will undoubtedly move by organic means. Hence, it is very important to estimate the distance troop transportation can cover upon the consumption of a single fueling.

It is known that in border military districts the motor transport of the large units held in continuous readiness must be able to complete a march of 500 kilometers with the one fueling it possesses. This run can be made only if the vehicles carry jerry cans with an added reserve of fuel and if they make the move over relatively good roads and not in columns. But if the vehicles move in columns and over poor roads, they will cover considerably less distance. Furthermore, we must also keep in mind that a large unit making the march must be ready at all times to maneuver. Consequently, under no circumstances must one permit all of the fuel in the fuel tanks to be used up. Experience has confirmed the fact that under modern conditions, each vehicle must at all times hold on to the minimum reserves of fuel which range from one fifth to one fourth of the capacity of the fuel tanks.

Thus, if we consider all of the factors affecting the cruising range of the vehicles, and namely the fact that travelling on poor roads can use up from 10 to 30 percent more fuel than that established by norms, that proceeding in a column uses up an additional five to ten percent over the norm, and that if we add to this the minimum reserves of fuel of 15 to 20 percent of a total fueling that must be held at all times in the





vehicle fuel tanks, it turns out that when motor transport is under march conditions, on a single fueling it cannot cover 500 kilometers, but only about 300 kilometers.

Of course, it is possible that some vehicles will have small fuel containers, but this refers to vehicles having limited cargo capacity. And even on most of these special vehicles it will be completely impossible to carry these containers.

If, as we established above, a vehicle with one fueling can essentially complete a one-day march of 300 kilometers, then the absolute majority of the tracked vehicles, on one fueling, are incapable of covering this distance. For example, the cruising range of the T-54 tank on one fueling is 220 kilometers, but when moving in column on a march it is 190 kilometers. And if it is remembered that there is also the minimum reserve of fuel in the fuel tanks (one fifth of a fueling), then the T-54 tank can cover on one fueling only 150 kilometers in all.

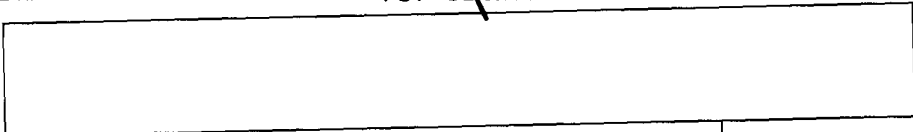
The cruising range of heavy tanks is even less. On a single fueling they can only make a march of 80 kilometers. Several other tracked vehicles have similar cruising ranges.

Thus, with respect to fueling, troops with heavy tracked equipment have very reduced movement capabilities, this being one of the reasons compelling us to use railroad transportation to the maximum for movements.

At the same time, the situation demands that vehicles in line units have a cruising range of no less than 300 kilometers.

As is known, in a modern war troops will have to accomplish long-distance marches not only while moving up, but also while conducting combat actions at high rates of speed. That is why cruising range is of such operational-tactical importance and is one of the fundamental tactical-technical characteristics of any vehicle. And since this is the case, when designing vehicles, first, one should without fail build in the capability of carrying enough fuel in the fuel tanks so as to provide the troops with superior movement capabilities; second, it is necessary to make design changes in the fuel systems of the vehicles being mass-produced by mounting on them additional fuel tanks that are connected to the engine fuel system; and third,





the cruising range of the vehicles in the hands of the troops and of those with which the units are being equipped should be increased by installing special fuel containers (drums, jerry cans) on them.

It should be noted that as yet very little attention is being devoted to increasing the cruising range of vehicles by making specific design changes in them. Otherwise, how can one explain, for example, the fact that the new ZIL-157 truck that is being produced has a cruising range inferior to that of the ZIL-151 truck, or that the new T-55 tank has a cruising range only 30 kilometers greater than that of its predecessor, the T-54 tank?

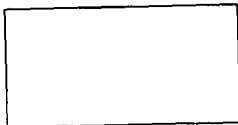
Increasing the cruising range of vehicles by mounting fuel containers on them has been essentially completed at present. However, there has been no uniformity in this matter. In certain large units a cruising range of over 500 kilometers has been provided (of over 300 kilometers by our calculations), but in most of them it is under 500 kilometers.

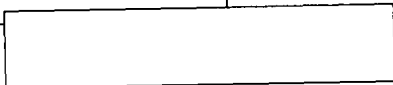
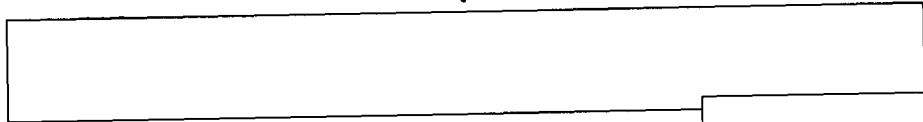
In order to ensure that all vehicles can make a one-day march of 300 kilometers, taking into account the minimum reserve of fuel of one fifth of a fueling, it will be necessary to place on each vehicle the additional amount of fuel (in liters) shown in Table 1.

From the table one can see that most tracked vehicles will have to have two to three fuel drums mounted on them.

But heavy tanks in general are poorly suited for movement over long distances under their own power. To ensure they can cover 300 kilometers, it is necessary to have vehicles with fuel following them calculating on 11 drums for each tank, and it is also necessary to spend much time repeatedly refueling them.

Mounting additional fuel containers on the vehicles does not completely solve the problem of supplying the troops during a one-day march. As is known, the additional containers are not connected to the fuel supply system and during the march it is necessary to halt the columns frequently and for long periods of time so as to pour fuel from the containers into the fuel tanks. And nevertheless, under prevailing conditions, this way is the





most acceptable one of increasing the rate of movement.

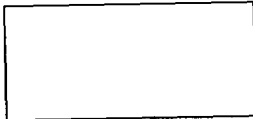
Supplying troops with fuel during their movement by organic means depends primarily on the amount of fuel consumed, which in turn is determined by the distance of the movement, the composition of the troops, the availability and condition of the equipment, and the movement conditions. Thus, for moving troops 300 kilometers in the summer under aggressive enemy actions, minimum fuel requirements (in tons) will amount to those in Table 2.

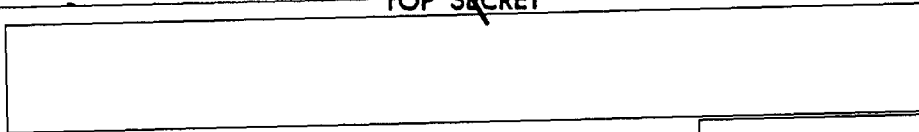
Knowing the number of days of march, one can determine the total fuel required to move by organic means over any distance. For example, to move a combined-arms army and a tank army 1,500 kilometers, 17,500 tons of fuel are required for each one; to move two combined-arms armies, one tank army, a front headquarters, and the large units, units, and facilities subordinated to the front over the same distance, and also to rebase the front air army, approximately 100,000 tons of fuel are needed.

If tanks and other heavy equipment are transported by railroad, the consumption of fuel in the troop move will be considerably reduced. However, in determining the fuel requirement for the move, one should consider the possibility of moving all of the equipment by organic means, since at any moment it may be necessary to unload the equipment being transported by railroad in order to continue the move by organic means.

Naturally, it is not possible to have in the transportation means all of the fuel the troops will require before the move is initiated. How and where can one accommodate the amount of fuel required to support the troops during the move?

We have already established that the fuel reserves in troop transportation enable one to complete a one-day march. But, so that the troops can have the capability of immediately refueling the vehicles and prepare to continue the march, there has to be an additional reserve in the troop transportation. Only under such conditions can one count on supplying the troops with timeliness and attain the necessary rates of advance.





What are the possibilities of stowing fuel in the troop transportation?

The consumption of fuel in the course of a one-day march, in fuelings, amounts to the following: gasoline -- 0.9 fueling, diesel fuel -- in the motorized rifle division -- 1.6 fuelings, in the tank division -- 2.2 fuelings, aviation gasoline -- 1.1 fuelings.

But the organic fuel transporting means of the vehicles in line units have been designed to contain and transport the following: motor vehicle and aviation gasoline -- up to .25 of a fueling, diesel fuel -- 1.0 fueling, and a corresponding amount of oil and lubricants.

If this is converted to tons, then in order to stow the necessary reserves we are short motor transport for the following: 300 tons in the motorized rifle division and 400 tons in the tank division.

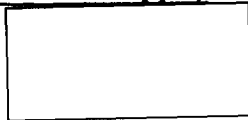
Thus, to support a troop move it will be necessary to allocate for the fuel reserve the following additional three-ton vehicles: 100 to the motorized rifle division and 140 to the tank division.

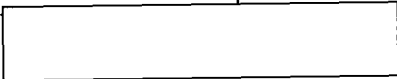
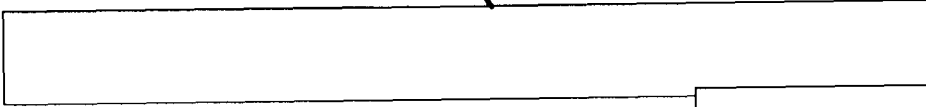
Do we have this capability?

To answer this question it will be necessary to examine the level of troop reserves with respect to the basic types of materiel and to examine whether these are compatible with the conditions for the conduct of modern combat actions.

The transportation of the tank division carries 780 tons of ammunition* and 480 tons of fuel, whereas the average daily consumption of ammunition in battle amounts to 270 tons and that of fuel to 410 tons. Consequently, the ammunition reserves transported are sufficient to conduct combat actions for a period of three days, but the fuel reserves are sufficient for only one day.

* Collection of Articles of the Journal "Rear Services and Supply of the Soviet Armed Forces," No. 47, pages 19-20.





Since troops under modern conditions must possess high mobility, in our opinion it would be advisable to establish approximately equal ratios of fuel and ammunition in the troop reserves.

If the reserves of ammunition in troop transportation are prescribed at the level of a two-day requirement, then we will be able to detail approximately 90 vehicles for the fuel reserve.

In addition, during the troop move additional motor transport can be detailed to haul fuel by reducing the reserves of other types of materiel that are not needed at the time.

But when the troops are being moved by railroad, what are the required troop fuel reserves and where are they to be stowed?

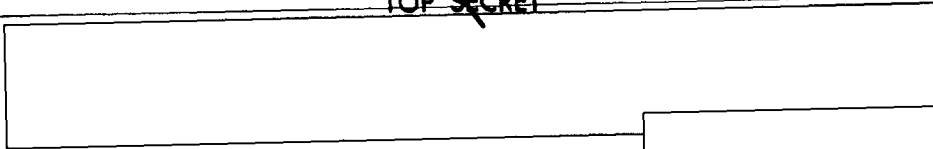
During exercises, heavy equipment is usually transported by railroad and trucks proceed under their own power. In these cases, almost all of the motor transport hauling fuel for the large units shifts over to support the units and subunits making the march. As a rule, the means that haul and dispense fuel are not included in the railroad trains.

Is this correct? It seems to us that it is not. As already mentioned, under modern conditions the part of the troops being transported by railroad may at any time be unloaded in order to continue the move by organic means or in order to negotiate a barrier line. In this case, by what means will fuel be issued to refuel the heavy equipment? The fuel in the fuel tanks of the vehicles and in small fuel containers will suffice for only a single march and then these vehicles will be unable to move; the heavy tanks will be unable to negotiate even one barrier line.

From this it follows that it is absolutely essential that the railroad trains transporting heavy equipment have transportation means that ensure the supply of fuel and the refueling of the vehicles.

Keeping in mind that troop moves are greatly dependent on a continuous supply of fuel, in our view there must also be the timely establishment, in addition to that of troop fuel reserves, of fuel reserves on the anticipated routes of movement. In view of the fact that the planning for troop movements in the initial





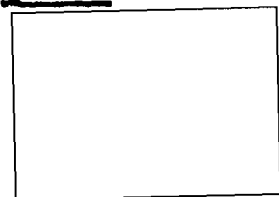
period of war is carried out in peacetime, we can ahead of time determine the amount of the fuel reserves and the method of positioning them in the zones of advance of the large units. In determining the amount of the reserves, one should keep in mind that in addition to replenishing the fuel consumed during the advance, in the line units one must also establish stocks and a reserve of fuel after the march is completed.

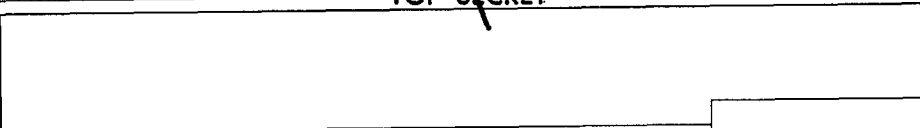
These reserves must be positioned primarily in fixed depots located near the troop movement routes, and upon determining the routes, the fuel reserves that are available along the line of travel must be taken into account. But if in the vicinity of the troop move there are no fixed depots, then one should establish field depots beforehand using the mobile reserves. Main pipelines or depot pipelines may be laid down to these field depots from fixed depots located along other routes.

The disposition in depth of the fuel reserves previously established in the zones of movement of the formations should be carried out along limit lines that correspond to the planned daily marches of the troops. This will make it possible to use troop motor transport more efficiently for supplying fuel from these depots to the halt areas for the day.

We must not fail to keep in mind that in a number of theaters of military operations advancing troops will pass through the territory of allied countries. That is why the prior establishment and positioning of fuel reserves on the movement routes involves additional difficulties. Nevertheless, all of the variants in positioning fuel reserves in the territory of allied countries must be worked out and coordinated during peacetime.

When large masses of troops are moving under conditions of intense enemy actions and even when adequate supplies of fuel are available on the movement routes, interruptions in the supply may occur. Therefore, it is very important to prepare reserves of fuel in the depots in the interior of the country for the quick delivery of these reserves by air or motor transport. These depots should be positioned near logistical support airfields as well as near the routes over which newly activated motor transport units and large units will be sent to the fronts and armies.





It would be best if the fuel that is to be supplied by air were put into drums and jerry cans beforehand. This would facilitate loading it into any transport aircraft or helicopters and facilitate distributing fuel in line units.

The supplying of fuel for a troop move depends to a large degree on preparing with timeliness those depots, which are located in the zone of advance, to issue rapidly a great amount of fuel to the motor transport. Without a doubt, the appropriate preparatory work must be carried out in peacetime. In particular, so as to create those conditions best favoring the rapid dispensing of fuel to the troops, the dispensing areas should be set up beyond the limits of the depot area in a place where it is possible to accommodate under concealment the large number of incoming motor transport. It will be necessary to lay down depot pipelines from the storage tank yards of the depots to these dispensing areas. We must work out beforehand for each of these depots a complete technical diagram of the fuel dispensing and determine the number and output of the pumping means.

The length of the fuel dispensing areas must provide for the filling up of up to 75 tank trucks (a motor transport company) an hour.

Together with tank trucks, trucks with sides will be extensively employed to deliver fuel. Therefore, provision must be made to equip the depots with means to rapidly fill up with fuel a large number of drums and jerry cans.

At the present time, the construction of fixed pipelines is under way in our country, and this will ensure the most stable delivery of fuel to the theaters of military operations. These pipelines can also be used to provide fuel to the advancing troops. Along the routes of the fixed pipelines provisions are being made to construct fuel bases equipped for the massive dispensing of fuel to motor transport directly out of the pipelines. For this purpose, branch lines are being made that terminate in storage pits in asphalted areas next to the motor roads. In peacetime the branch lines from the pipelines and the storage pits in the asphalted areas are put on standby reserve.

Replenishing the fuel reserves of line units during the move will evidently be carried out in the halt areas for the day after



the completion of each day's march. With what means will the fuel be issued in these areas?

Under conditions of the initial period of war when there is a brief period of threat, army and front motor transport units and large units will be in the activation phase. Consequently, they will be unable to participate in the supplying of fuel to the advancing troops and we will have to count on troop transportation only. The latter can cope with this task if in the vicinity of the troop movement routes there are a sufficient number of depots with reserves of fuel and if measures have been taken to ensure the more or less free passage of convoys with fuel over the movement routes.

To do this, it will be necessary to position troop motor transport, loaded up with fuel before the movement is initiated, within the columns of the first echelon so that it may arrive at the day's halt area before the arrival of the main body of the large unit and prepare itself to issue fuel. After completing this work, the troop motor transport transporting fuel must be dispatched to the depots to get fuel before the units begin to move out of the first day's halt area. Only the minimum number of transportation means with fuel are to remain as part of the division column.

By using routes that are free, troop motor transport will spend less time travelling to the fuel depots and consequently, it will have the opportunity, once it has got the fuel, of arriving in good time at the next day's halt area.

Thus motor transport delivering fuel during the advance of the troops must work under great pressure. Drivers will have absolutely no rest. That is why each vehicle of the units and subunits transporting fuel must have two drivers.

In those cases where it is impossible to position depots on the movement routes or when they have been destroyed by the enemy, the superior command must plan the supplying of fuel in the day halt areas. For deliveries, one can use motor transport units that are going to fill out the fronts and that have been loaded up in advance with fuel at depots or along the routes of the fixed pipelines in the interior of the country. Consequently, it will be necessary to plan beforehand the use of



these motor transport units so that they can be distributed in a balanced manner throughout all of the troop movement routes.

During a move there may arise an urgent need to supply fuel by means of air transport. To provide for the replenishment of a tank division's one-day's consumption of fuel (870 tons) approximately 80 aircraft sorties or two regimental sorties are required using AN-12 aircraft. In organizing the supplying of fuel by air it is very important to select the proper landing airfields for the aircraft and to coordinate the work of troop motor transport and air transport units. Obviously, the landing airfields for transport aircraft must be chosen in the vicinity of the day halt areas. But sometimes, on the contrary, it will be more advantageous to relocate the day halt areas near the aircraft landing airfields.

Fuel can also be supplied by air by helicopters from depots located on adjacent routes or from the day halt areas of the following or previous days. Using helicopters considerably simplifies organizing the issuing of fuel to the troops because helicopters can deliver it directly to the location of the tank and motorized rifle units and when special simple equipment is available, tanks can be refueled immediately.

In the initial period of a war, a large amount of railroad transport with fuel may be jammed up in the troop movement zones as a result of the enemy's destruction of railroad bridges, tunnels, and other installations. The higher supply organ that has the responsibility of supporting the advancing troops in this area must organize the issuing of fuel to the troops from the railroad transport.

The rate of advance will depend not only on the timely delivery of fuel to the troops, but to a considerable degree also on the organization of the refueling. The point is that when large numbers of vehicles with limited cruising ranges are present, it will be necessary to refuel them, not only in the day halt areas, but also on the march. In the latter case, vehicles will be refueled manually by their drivers from jerry cans, and tanks and other vehicles on which fuel drums are mounted will be refueled by their crews with the help of small-size refueling equipment at brief halts during the entire march. Naturally, the frequent refueling of the vehicles during a march will hold up





the movement of the columns and require additional exertions on the part of the drivers.

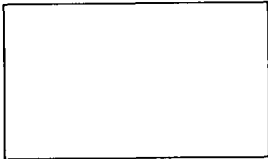
Heavy tanks are particularly hard to refuel during a march. For this to be done rapidly it will be necessary to have tank trucks and vehicles with sides carrying fuel in drums as part of the columns. This will make it possible, in the shortest time, to move the refueling means up to the tanks, refuel the tanks, and exchange empty drums for full ones. The fueling means with the fuel reserves must without fail be placed on trucks and other vehicles having high cross-country mobility so that they can follow the columns of heavy tanks, and if need be, overtake them.

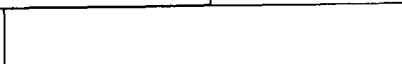
In organizing the movements of the columns, one must keep in mind that owing to the considerable amount of time lost in refueling, the rate of advance of heavy tanks will be considerably below that of medium tank units.

The greatest amount of work will be done in the day halt areas where, along with the refueling of the equipment, it will be necessary to pour fuel into the fuel tanks and containers mounted on the vehicles. Naturally, in order to save time it will be necessary to set up refueling lines that are as long as possible. This can be achieved if each vehicle hauling fuel is equipped with a device to dispense fuel into the fuel tanks of the vehicles or into special containers. In this respect, fuel supply vehicles and tank trucks with mechanical pumps have great advantages. But since as yet line units have very few of these means, most of the vehicles have to be refueled using manual pumping means. This requires great exertions on the part of the personnel of the units.

To more efficiently operate the refueling means, it is advisable to have the vehicles being refueled come up to the refuelers rather than the other way around. This eliminates losing time in regrouping, setting up, and removing the refueling means.

As shown by the experience of a number of exercises, the time lost in moving refueling means to the subunits and in searching for them in the day halt areas can be considerably reduced if refueling means with reserves of fuel, in the form of mobile refueling posts equipped with highly efficient tank trucks





on a chassis providing a cross-country mobility equalling that of the vehicles they refuel, are kept continuously with the subunits (tank battalions).

In conclusion, we shall briefly dwell on the supply of fuel for large units and formations committed to action. When attacking formations are advancing at high rates of speed, troops completing the move will find themselves a considerable distance away from the front lines at the time they are committed to the engagement. That is why the large units must travel anew a rather long distance. At the same time, the troops must engage in combat with a full supply of fuel.

The transporting and dispensing of fuel to the troops on the line of commitment to the engagement requires meticulous organization and great exertions because this work must be accomplished in a short period of time and as a rule, under conditions of aggressive enemy actions.

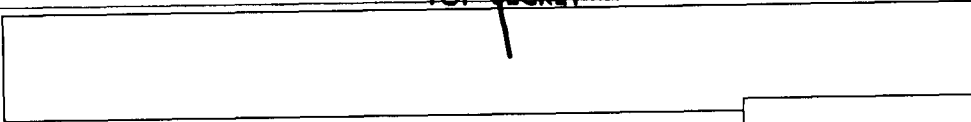
As concerns the supply of fuel for troops shifted by air, this amounts essentially to supplying aviation fuel for the flights of transport aircraft, the consumption of this fuel being rather considerable. Thus, in airlifting one motorized rifle division without heavy equipment by means of AN-12 aircraft, approximately 10,000 tons of aviation fuel can be consumed.

Troops being airlifted consume a relatively small amount of automotive fuel in moving up for emplaning as well as after deplaning. Therefore, reserves of this fuel in the emplaning or deplaning areas can be negligible.

The support for the transport aviation allocated to shift the troops will depend primarily on the tactical-technical capabilities of the aircraft and helicopters. Modern transport aircraft having an actual flight range of up to 3,000 kilometers make it possible to airlift troops and cargo to a distance of 1,500 kilometers without having to be refueled in the troop deplaning areas. Consequently, a supply of fuel for the transport aircraft should be established only in the areas of the airfields earmarked for the emplaning of the troops.

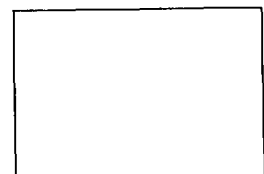
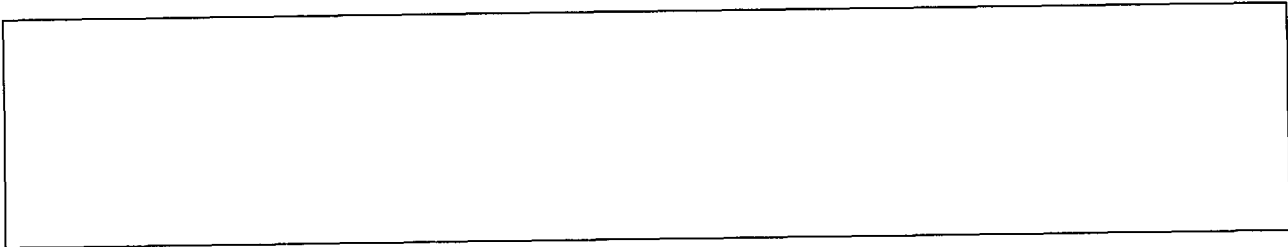
However, the airlifting of troops when formations are being moved up may have to be carried out over distances exceeding the





flight radius of transport aircraft (over 1,500 kilometers). In this case, appropriate supplies of fuel will be needed not only in the emplaning areas, but also in the deplaning areas.

Helicopter units can also be used to lift troops. The flight range of modern helicopters makes it possible to transport troops and cargo over distances no greater than 500 kilometers. Consequently, when troops are lifted a distance that exceeds this capability, it will be necessary every 500 kilometers to land the helicopters and refuel them, and to do this there must be depots with adequate supplies of fuel along their flight routes.



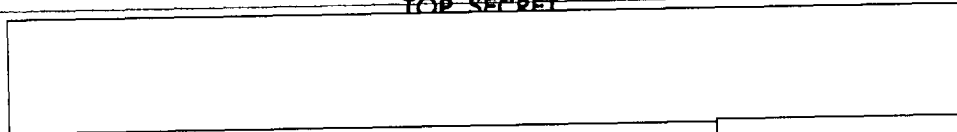
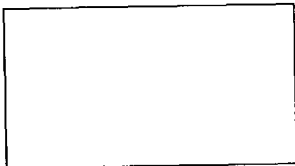


Table 1

Vehicle	Additional Fuel Required (liters)
T-54 Tank	640
T-55 Tank	530
T-10 Tank	2,200
PT-76 Amphibious Tank	650
ZSU-57-2 Self-propelled AA Gun	490
SU-100 Self-propelled Gun	350
BTR-50P Armored Personnel Carrier	650
AT-L Light Tracked Artillery Tractor	150
AT-S Medium Tracked Artillery Tractor	380
MAZ-200 Tractor	160
MAZ-210 Truck	80
YaAZ-214 Truck	160
AT-11 Artillery Tractor	200
GAZ-51 Truck	40
ZIL-157 Truck	100
BTR-40 Armored Personnel Carrier	100



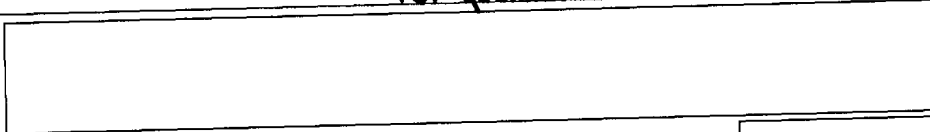


Table 2

Large Units and Formations	Gasoline	Diesel Fuel	B-70 Aviation Gasoline	Oil and Lubricants	TOTAL
Motorized Rifle Division	250	330	10	60	650
Tank Division	200	580	10	80	870
Combined-Arms Army	1,100	1,860	270	270	3,500
Tank Army	960	2,040	270	300	3,500

