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29 August 1966

A STUDY OF DATA RELATED TO VIET CONG/NORTH VIETNAMESE ARMY LOGISTICS AND MANPOWER

Part One - Enemy Logistics in Support of Operations in South Vietnam

Part Two - Accuracy of Estimates of Viet Cong/North Vietnamese Army Strength, Attrition, and Infiltration Rates

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This study was done under the general supervision of G.W. Rathjens and H.W. Bode. The part on enemy logistics is largely the work of P.J. Schweitzer and the part on enemy manpower that of J.C. Armstrong. A.L. Bottoms and L. Wainstein assisted.

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PART ONE

ENEMY LOGISTICS IN SUPPORT OF OPERATIONS IN SOUTH VIETNAM

INTRODUCTION

This report describes the results of an examination of the intelligence estimates of enemy logistics capability and supply requirements in South Vietnam. The approach taken was to examine the methodology and learn how estimates are made, to note where differing estimates exist and why, to obtain a feeling for the range of uncertainties involved in the estimates, and how gaps may be filled in the future.

The topics covered are:

I. Estimated Trucking into Laos from NVN

II. Estimated Road Capacity of the Ho Chi Minh Trail

III. Stockpiling and Trucking Throughput from Laos to SVN

IV. Estimated Supply Requirements for Enemy Forces in SVN

V. The problem of Sea Infiltration

I. TRUCKING INTO LAOS FROM NVN

A. NUMERICAL ESTIMATES

CIA estimated average supply movement from NVN into the Laotian panhandle is 25-30 truckloads/day during the November 1965 - May 1966 dry season, and perhaps 4-8 truckloads/day during the current wet season (June-July 1966). At 2-1/2 - 3 tons of cargo per truck, these correspond to 70-90 tons/day during the dry season, and perhaps 25 tons/day during the wet season. An estimated 400-600 trucks are involved in Southern Laos, believed used in shuttling operations between supply areas.

Total supply movement by truck into the Laotian panhandle is thus 14,000 - 19,000 tons (=210 x 70-90) during the mid-Nov. 1965 - mid-June 1966 dry season.

These figures should be contrasted with an estimated supply movement into the Laotian panhandle by truck during the previous year of 17 truckloads/day at 2 - 2-1/2 tons/truck during the Dec. 1964 - May 1965 dry season, and essentially nothing during the ensuing wet season. With a movement of at least 35 tons/day during the 1964-1965 dry season, an estimated 6,000 - 7,500 tons of supplies entered Southern Laos.

The doubling of the Communist-held road net and fleet size, the improvement of roads and the introduction of larger trucks have

made possible the doubling of the dry-season movement rate over the last year.

Supplies are believed moved by cross-border porters from the termini of the Laotian feeder roads in the vicinity of the border to VC storage and assembly areas in SVN. The estimated 6000-10,000 full-time porters involved seems adequate.

Trucking of supplies directly across the DMZ is not believed to occur.

A map of the Laotian panhandle road net is given in Figure 1.

B. METHODOLOGY AND UNCERTAINTIES

1. The estimated rate of truck movement into Southern Laos is essentially based on a single source, roadwatch teams. The estimated cargo load per truck is based on identification of the truck models and approximate knowledge of their capacities over low class earthen roads.

2. Uncertainties pertaining to the estimated rate of truck movement include the following factors:

a. Roadwatchers are not on full-time station due to sweeps by the enemy and other reasons. The estimated movement of 28 cargo trucks/day into the panhandle of Laos is based on the following data during the 182-day period from 1 Dec. 1965 - 31 May 1966:

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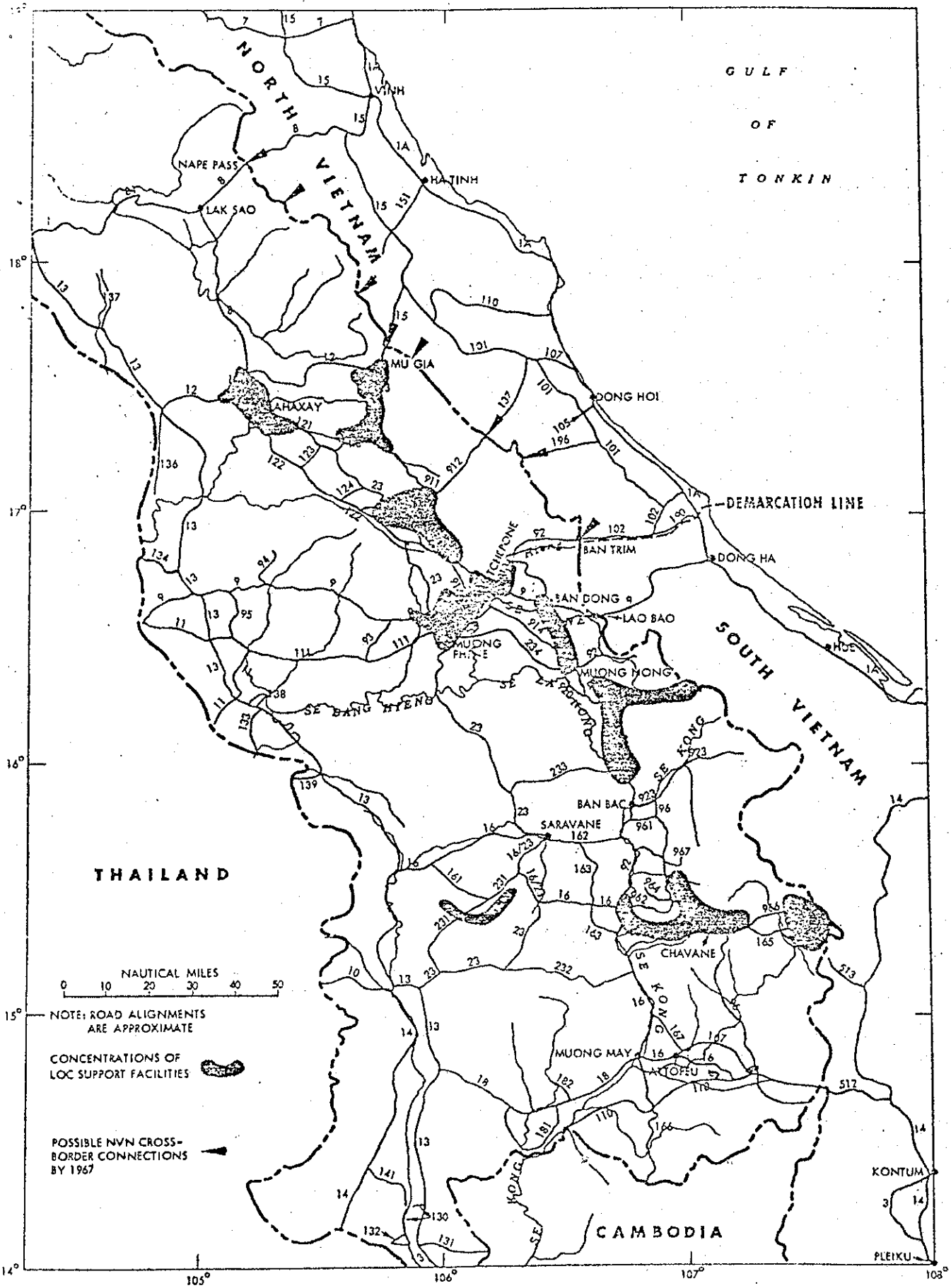

FIGURE 1. Lines of Communications in Southern Laos

Table 1. ROADWATCH REPORTS IN SOUTHERN LAOS

Route	Days of Coverage Out of 182	Southbound Cargo Trucks Counted[c]	Est. Total Southbound Cargo Trucks[d]	Avg. No. of Southbound Cargo Trucks/Day
911	96 (= 53%)	1301	3145	17.3
23[a]	141 (= 77%)	696	1148	6.3
12[b]	112 (= 62%)	498	734	4.0
				27.6

[a]South of the junction with route 911.

[b]Supplies moving westward toward Mahaxay.

[c]Northbound cargo trucks approximately balance.

[d]Extrapolations are done monthly, hence this column is not obtainable from the previous two columns.

The uncertainty due to extrapolation of intermittent coverage is difficult to assess. Traffic patterns tend to be highly irregular, especially on route 911, which replaced route 23 as the major road south of MuGia. A typical truck count on route 911 over successive nights might be 110, 40, 0, 70, 30, 0, 0, ... with large convoys interspersed with very low levels of activity. It is difficult to do statistical analyses on data of this type to see what effect reporting gaps might have; the confidence interval will be very large. In addition, road coverage is not consistently for 24 hours. Finally, the data may be conservatively biased due to enemy road sweeps before heavy convoy movement.

Complicating the situation further is the fact that the pattern of activity and observation is not homogeneous in time.

December and January saw unusually large cargo truck movement, presumably to refill depleted stocks. February saw a sharp drop in cargo trucks, replaced by the movement of about 500 trucks with the North Vietnamese Army (NVA) southward on route 911.[1] It is not known whether these troops were headed for SVN, the Attopeu area, or elsewhere. In March the troop movement ceased and cargo movement resumed, but at a lesser level than in December and January. The period 9 April - 31 May had very little road coverage due to teams being swept off station. Higher aerial truck sightings (and kills) have led to the conclusion that April and May had a high level of truck activity, presumably in anticipation of the oncoming rainy season.

b. The credibility of the roadwatch teams cannot be assessed due to lack of controlled cases. Correlation analyses between stations seems impossible due to highly erratic patterns of activity and to different levels of activity on different links. With erratic patterns and gaps in coverage, it is generally impossible to trace a southbound convoy from one station to the next, or to identify a returning convoy at the same station. Aerial observations can only be grossly checked against roadwatch reports (e.g., the general level of activity on a route increased one week) because the aircraft

[1]The CIA estimate of four personnel-carrying trucks/day, or about 730 total during the period, is comprised mainly of this February movement. The remaining truck movement of personnel is about one truck/day, consisting of military and laborers.

observe much longer road segments, containing several shuttle-links. In addition, some fraction of the trucks are invisible from the air due to darkness, foliage masking, and hiding off the road when strike aircraft approach. One encouraging feature here is that truck counts for north- and southbound movement tend to balance out.

Due to lack of controlled cases, there is no way of assessing whether roadwatch reports are exaggerated or inaccurate due to darkness. Due to the slow truck speeds (5-10 mph) involved, it is felt that accurate truck counts can be obtained. If so, the roadwatch reports would give a lower bound to truck movement in Southern Laos, provided the extrapolation is correct.

c. There is uncertainty in the average cargo carried per truck. Only a small percentage of the trucks are actually identified by roadwatchers, so that no breakout of the truck mix exists. Cargo capacities range from 2 tons up to 6 tons or more for the larger models, such as the Maz-502 and STAR-66. An estimate of 3 tons/truck is used, compared with 2 tons/truck a year ago, since the majority of the identified trucks have capacities of 3 tons or larger.

Roadwatchers do not generally estimate tonnage on the truck, especially when cargo is canvas-covered. There is

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uncertainty as to whether or not the heavier trucks are loaded to capacity. Overloading is not thought to occur, since roadwatchers did not report trucks straining to climb grades. This might also be due to the slow speeds involved and the recently introduced heavier trucks with powerful motors.

A 1/2 ton uncertainty in the 3 ton/truck capacity is taken as reasonable.[1] The uncertainty in cargo loading per truck may be 17%, a significant amount.

d. There is no quantitative estimate of supplementary supply movement by porter, bicycle, pack animal, cart or waterway. Extent of trail activity cannot be deduced from the air -- in fact, much of the extensive trail system is invisible to the air. A second problem is distinguishing military movement over the trails and waterways from local commerce when the same facilities may serve both functions.

e. Information on rainy-season supply movement is incomplete. Roadwatchers on 911 indicate movement of two trucks/day (sum of north and southbound) during June - 12 July, and no trucks thereafter. A team on the route 23 bypass south of MuGia Pass reports no truck movement. These would indicate a sharp decrease in truck traffic through MuGia into Laos.

[1] It would be difficult for road-watchers to estimate capacity more accurately than this. For high density cargo, such as ammunition, a half ton occupies a cube 3.5 feet on a side. For low density cargo such as rice, truck volume capacity is exhausted before weight capacity.

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However, spring 1966 saw the opening of route 912, which apparently replaced MuGia as the major access route to Laos from SVN. Roadwatchers on 92 report 3 trucks/day south and 2 trucks/day north for 17 days in June. However, the team was not on station all day, so these figures are a minimum. Ten days of reporting, 25 July - 3 August, on route 92 south of 922 indicated 160 truck sightings in both directions, which could imply an average of eight trucks/day headed south. Unfortunately, there are no roadwatch teams on route 912, so that direct estimates of rainy-season trucking is difficult. A 13-truck convoy was caught on 912, revealing its use. Aerial observation of route 137 in NVN, which leads into route 912, has indicated a southward flow of trucks much greater than eight/day. No confirmation exists of whether these supplies cross the border or are held in stockpile in NVN. The skimpy data given above may indicate a southbound movement of 4-8 trucks/day, but is not conclusive. Another source of uncertainty is potential tapoffs to route 922, so that the roadwatch team on route 92 might not be seeing part of the traffic.

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II. ROAD CAPACITY OF HO CHI MINH TRAIL

A. NUMERICAL ESTIMATES

The agreed estimate of road capacity for trucking in Southern Laos is 400/100 tons/day in the dry/wet season. These figures are capacities from the North Vietnam access points to Southern Laos to within a few miles of the South Vietnamese border. The bottleneck road capacities are in the Laotian panhandle, not in North Vietnam. More specifically, the capacity is determined by the lateral feeder routes to the SVN border, not by the backbone routes of the Ho Chi Minh Trail. The above estimates are sometimes averaged (dry season: November-May; wet season: June-October) to yield a year-round road capacity of 270 tons/day.

B. METHODOLOGY AND UNCERTAINTIES

1. The estimate of road capacity is based on standard U.S./U.K. methodology (see, for example, Army Field Manual FM 55-15, pp. 96-109) which accounts for road width, shoulder width, surface type (unimproved or improved earth, etc.), gradient and curvature, 3 ton cargo per truck, road condition (poor, fair, good), and subsurface condition (wet, moist, dry). For one lane roads, return traffic is assumed to use the road half of the time. Adequate road maintenance is assumed. Uncertainties involved in these estimates include the following factors:

a. The methodology assumes 24 hour road usage while in Southern Laos almost all truck movement occurs in the 12 hours of darkness. The estimates are

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nevertheless believed roughly correct because the methodology assumes only 12 hours of truck movement per day (so-called 50% operational phasing factor), with the remaining time devoted to driver sleep and rest periods, refueling and truck maintenance, road maintenance, and so forth. The North Vietnamese can be expected to attempt to utilize as much of the dusk-to-dawn period as possible, with the other functions delegated to daylight hours.

b. The methodology does not account for delays due to road interdiction such as for crater fill-in and landslide removal, crossing fords, and pulling off the road under foliage when strike aircraft approach. Delays due to road repairs are minimized by by-passing or by shuttling on both sides of the cut, with storage or porter effort bridging the gap. Adequate personnel have been positioned along the roads to achieve adequate maintenance, realign heavily-interdicted or poorly-drained road segments, and repair road cuts within a few hours or days. Also, counter-balancing to some extent the loss of capacity due to interdiction is the paucity of civilian or crossing traffic which would impede the military traffic flow.

c. There is leeway in the estimate of road capacity due to the judgments involved in assessing road condition as good, fair, or poor, and in assessing subsurface condition as wet, moist, or dry. The variation as one proceeds along the spectrum of possibilities is large (e.g., the difference

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between dry and wet season capacity is a factor of 4). CIA and DIA concur on road conditions, indicating that consistent judgments are possible.

d. Even if all the above factors are properly accounted for, it must be remembered that the methodology yields only planning factors, useful for rough calculation and for comparison of alternate routes, but whose absolute values may be inaccurate due to variations in local conditions, driver discipline, and so forth. For example, road capacities can be doubled or tripled for periods of a few days, with severe road deterioration then requiring road abandonment during extensive maintenance. The quoted figure is a 90-day average which accounts for such spurts.

e. The methodology, based on experience, is approximate, but there is general agreement among the transportation professionals that the numbers are reasonable. The estimated capacities for dirt roads are believed conservative and may be low by as much as a factor of two.

2. The estimated dry-season road capacity of 400 tons/day is at least quadruple the estimate of current truck movement in Laos, and at least 10 times the highest (DIA) estimate of enemy ammunition requirements in South Vietnam. There is no doubt that the enemy is not road-limited in Laos during the dry season. (In addition the alternating pattern of heavy and light activity may indicate that the truck fleet is not being fully utilized). The road capacity estimate could be decreased by a factor of at least 3 or 4 before the road-limited case is reached at present consumption rates. The precise value of the estimate is therefore not important at present.

3. Wet season road capacity (June-October) is estimated by CIA at 100 tons/day. This number was concurred in by DIA. DIA estimates road capacity somewhat lower, about 50-70 tons/day, but then rounds to the next higher multiple of 50. The judgment factor is very important here in estimating how badly ground saturation deteriorates the subsurface. Truck movement would be intermittent, with road washouts and rutting limiting usage to only occasional periods.

4. Photography taken during June and July has shown that the enemy is operating under strain to keep trucks moving during the rainy season. Stockpiling of corduroying material and gravel along the road has been observed. Some parts of the roads have completely deteriorated, with no fresh tracks observed for several weeks on some sections and 12-18" ruts on others. Maintenance ability is apparently unable to keep up with the rains. Periodic outages may be experienced, and portering is required around road sections closed by landslides and washouts. With route 96 open only intermittently for trucks, there is no through trucking route from NVN down to the feeder route 165. The truck fleet may be operating in sections separated by severely deteriorated road segments. The concept of throughput road capacity loses its usefulness under these conditions.

5. Human and animal portage over trails, and increased use of the waterways help supplement movement and help bridge deteriorated segments. However, it seems impossible to quantify the amounts involved. Examples where this may be important include the following:

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a. NPIC reports little vehicle movement on route 922, but primitive movement over an extensive paralleling trail net does not show on photography.

b. Route 96 is closed but alternate routing southward by boat on the SeKong River is possible. Limited aerial coverage has not permitted quantification, although the previous wet season saw extensive use of canoes, of size larger than that normally used by the natives, on the SeKong.

c. There has been limited coverage of the Se Bang Hieng River which runs from the DMZ into Laos. Boating over sections or portering over nearby trails is possible.

d. Route 110 from Cambodia has deteriorated despite the presence of repair crews. However, the extent of usage of the accompanying trails is unknown.

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III. STOCKPILING AND TRUCK THROUGHPUT FROM LAOS TO SVN

A. NUMERICAL ESTIMATE

Of the 70-90 tons/day entering the Laotian panhandle by truck from NVN during the 1965-1966 dry season and 15 tons/day rice trucked from Cambodia into Laos, 35-40 tons/day are believed available for movement into SVN. This quantity could be either stockpiled in Laos for rainy-season use, or moved into SVN. There is no quantitative estimate of the pipe-line capacity in southern Laos, or of stockpiling on either side of the Laos/SVN border, due to limited ability for aerial or photographic detection of small dispersed storage areas hidden under heavy jungle canopy up to several kilometers off of numerous secondary roads. MACV and ARVN, at the Combined Intelligence Center, Vietnam (CICV), are currently studying the number, size and distribution of supply caches found inside SVN. Knowledge of the VC redistribution system is very limited.

B. METHODOLOGY AND UNCERTAINTIES

1. With the present lack of trail watchers at the Laos/SVN border, there is no direct estimate of the quantity of goods portered from Laos into SVN. Aerial observation of the trails is difficult and does not reveal extent of usage.

2. The residual amount of goods available for movement into SVN is indirectly estimated as the difference between the gross supply movement by truck into southern Laos and the amount

consumed in Laos, 48 tons/day. The estimation of the latter figure is discussed in Section III while the calculation of the residual amount potentially moving to SVN is discussed in Section IV.

3. Supply Consumption in Southern Laos

a. The calculation of supply requirements in Southern Laos is a theoretical one, with resulting uncertainty in the answer due to uncertainty in the assumptions made. The actual break-out of the 48 tons/day consumption is given in Table 2 and discussed below.

b. There is no confirmation of this tap-off estimate from roadwatch teams, who generally cannot identify truck contents or destinations. It is not known whether a convoy is split-loaded, with cargo for both corridor personnel along the way and SVN, or whether exclusively one item, say ammunition, going from one ammunition cache in Laos to another fifty miles further south.

Table 2. SUPPLY REQUIREMENTS IN THE LAOTIAN PANHANDLE

Class	Requirements (Pathet Lao and NVA)		
I (Food)	1.5 PL + 2.6 NVA =	4.1	tons/day
II and IV	2.4 PL + 3.5 NVA =	9.9	
III (POL for Truck Fleet)		8.7	
V (Ammunition)	.9 PL + 3.5 NVA =	4.4	
		23	tons/day Military Support
Food for Infiltrators and Porters		10	"
Food for Road Laborers		15	
		48	tons/day

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c. The 23 tons/day requirement for the military is a May 1966 DIA estimate obtained as follows:

1) Food requirement for the 12,000 Pathet Lao and 7000 NVA in the panhandle south of Route 8 is estimated as 18 ounces of rice per man-day; this is an average of lower and upper estimates of 7 to 28 ounces per man-day. Of this requirement, one-fourth is assumed externally supplied for the Pathet Lao, while 70 percent is assumed to be externally supplied for the NVA. All fruits, vegetables, and meats are assumed to be obtained locally. The NVA require greater external support because of their greater sophistication, mobility, less local familiarity and less opportunity to fraternize, and policy decisions to avoid antagonizing the natives.

2) Class II and IV requirements are .4 and 1.0 pounds per man-day for PL and NVA, respectively. These estimates are based on U.S. World War II and Korean data adjusted by judgment for the limited guerrilla, patrol and hit-and-run type combat in the panhandle. The breakdown is given in Table 3.

3) POL requirement is for 268 trucks (=2/3 of 400) at 50 miles per night and 5 miles per gallon. This comes to 2680 gallons/day = 8 tons/day. Generator fuels and lubricating oils add .7 tons/day.

4) Ammunition expenditures of .14 lb/man-day for the Pathet Lao and 1.00 lb/man-day for the NVA are based on expenditure rates of one basic load (see Section IV) per month. Two-thirds of the total are attributed to AA fire,

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3. The estimate of 15 tons/day rice supply for road laborers and another 10 tons/day rice supply for infiltrators and porters is a CIA estimate, based on 1.5 lbs. rice per man-day. (That is, an estimate of 20,000 road laborers and 13,000 porters and infiltrators).

Table 3. CLASS II AND IV SUPPLY REQUIREMENTS IN SOUTHERN LAOS (lb/man-day)

Type	U.S.	Pathet Lao	NVA
Chemical		Negligible	Negligible
Engineer[a]	1.6	.10	.40
Medical	.1 - .3	.05	.05
Ordnance[b]	2.9	.10	.30
Quartermaster[c]	1.2	.08	.12
Signal	.75	.05	.10
Transportation[d]	.11	.02	.03
	6.7	.40	1.00

[a] Primarily consumable hardware such as nails, wire, piping. Bamboo thatch, and hand tools ignored.

[b] NVA have more vehicles and need more spare parts.

[c] PL are more poorly clothed than NVA.

[d] Pontoons, etc., are usually built locally.

4. Calculation of Supplies Delivered to the SVN Border

An estimated 35-40 tons/day * trucked into southern Laos during the 1965-1966 dry season were available for movement into SVN. The calculation, with approximate figures, is given in Table 4.

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Table 4. DRY SEASON SUPPLY THROUGHPUT TO SOUTHERN LAOS

84 tons/day	Trucked from NVN (at least 28 trucks/day averaged at 3 tons/truck
-17 tons/day	(~20 percent loss due to pilferage, accidents, air strikes).
+15 tons/day	Rice trucked into Laos from Cambodia
82 tons/day	Gross supply input to southern Laos
-23 tons/day	Support of PL/NVA combat forces in southern Laos
-10 tons/day	Food for porters and infiltrators
-15 tons/day	Food for road laborers
34 tons/day	Net amount available for SVN

Since the road watch reports give a lower bound to the trucking entering Laos from NVN, the 35 to 40 tons/day available for SVN during the dry season should be considered as a lowest estimate.

The 35 to 40 tons/day number for net throughput to SVN is larger than estimated VC/NVA requirements (20 to 30 tons/day) and leaves an undetermined excess for stockpiling (for wet-season use). It seems clear that dry-season trucking into southern Laos was more than adequate for dry-season VC/NVA needs.

5. Sensitivity Analysis

A sensitivity analysis of Table 4 is performed in Table 5 to indicate the range of uncertainties involved in the calculated dry-season potential throughput to SVN. The error brackets associated

Table 5. SENSITIVITY ANALYSIS OF DRY SEASON SUPPLY THROUGHPUT

84 ± 18 tons/day	Trucking from NVN
-17 ± 4	Losses
+15	Rice from Cambodia
82 ± 22 tons/day[a]	Gross supply input to southern Laos
-23 ± 5	Military requirements in panhandle
-25 ± 6	Food requirements for laborers, porters, and infiltrators
34 ± 33 tons/day[b]	Net amount available for SVN

[a] 82 ± 18 if root-mean-square deviation is used.
[b] 34 ± 20 if root-mean-square deviation is used.

with the various numbers are chosen by the author as reasonable for the following reasons:

a. The 84 ± 18 tons/day input from NVN due to 25 to 30 trucks/day with 2 1/2 to 3 1/2 tons of cargo each (ignoring possible bias due to road sweeps).

b. The 17 ± 4 tons/day loss is a 20 ± 5 percent loss rate applied to the 84 tons/day.

c. The ± 5 tons/day range in the 23 tons/day Laos military support is not unreasonable considering the large set of judgments which entered the computation. It could consist of several contributions since simple sensitivity analyses show that

1) A 10 percent uncertainty in the estimate of number of military personnel leads to a ± 1.8 tons/day in requirements for Class I, II, IV and V supplies (see Table 1).

2) A 6-ounce/man-day uncertainty in the external rice requirement per man-day (for 19,000 troops) leads to an uncertainty of 3.5 tons/day.

3) An uncertainty of 50 trucks on the road or equivalent uncertainties in the miles per truck-day or miles per gallon lead to an uncertainty of 1.9 tons/day in the POL requirement.

4) An uncertainty of 20 percent in the Class II and IV supply requirement leads to a 2.0 tons/day uncertainty in total supply requirement.

5) A 50 percent uncertainty in the level of combat leads to a 2.2 tons/day uncertainty in the ammuntion expenditure rate.

6) Uncertainties due to seasonal variations and combat fluctuations may occur, as well as inaccuracies in the estimate of laborers and porters.

7) Usage of fuel tankers in southern Laos may decrease the 8.7 ton/day POL requirement by truck.

The root-mean-square of the first five uncertainties comes to 5 tons/day.

d. The 25 $\pm$ 6 range for rice requirements for laborers, porters, and infiltrators would result from a 6-ounce/man-day uncertainty in the daily rice requirement or a 25% uncertainty in the number of personnel.

Perusal of Table 5 shows that the uncertainty in the net dry-season amount available for SVN is considerable. If the 20 to 30 tons/day supply requirement in SVN is now subtracted from the 34 $\pm$ 20 tons/day net throughput in Laos, it is clear that while dry-season stockpiling seems likely, indirect calculation of the magnitude is tenuous.

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IV. SUPPLY REQUIREMENTS FOR COMMUNIST FORCES IN SOUTH VIETNAM

A. NUMERICAL ESTIMATES

See Table 10.

B. METHODOLOGY

1. Of the 5 classes of military supplies needed by the VC/NVA forces in South Vietnam, Class I (food) is believed supplied fully from internal sources and Class III (POL) is believed negligible. The following discussion is confined to Class V (ammunition) and to Classes II and IV (medical, chemical, engineer, ordnance, signal and quartermaster supplies, specifically in the case of the VC/NVA medical supplies, radios, telephone wire, batteries, and clothing).

2. The ammunition requirement is computed after the following four estimates are made:

a. the mixture of weapons for a company or battalion (or battalion equivalent) is estimated, along with the manpower in the company or battalion.

b. the "basic load" in pounds of ammunition for the company or battalion is obtained by estimating the number of rounds for each weapon and the weight per round. The basic load of ammunition for the unit is defined as the prescribed amount of ammunition normally carried by the unit. Since each unit is assumed able to engage in 3 days of combat without resupply, the unit is assumed to expend 1/3 of its basic load per day of combat.

c. the average number of combat-days per month for the Communist forces is estimated,

d. an Order of Battle estimate is needed for the number of enemy forces.

The total enemy ammunition requirement is then estimated as

$$\sum_i \left(\frac{B_i}{3}\right) C_i F_i \qquad (1)$$

where F_i is the number of units of type i,
B_i is the basic load for each unit of type i and
C_i is the number of combat-days per day (that is, $\frac{1}{30}$ x number of combat days per month) for units of this type.
The sum is over all types of units.

The following paragraphs describe application of this methodology by the various intelligence agencies.

3. DIA Basic Load Computation

DIA methodology is to divide all enemy main forces, including support forces, into battalion equivalents of 530 men apiece. The weapons mix for the VC battalion equivalent is given in the first column of Table 6. The basic load for each weapon is given by the next three columns. This basic load data comes from a March 1965 MACV Relative Firepower Study. The total basic load per VC battalion equivalent is taken as 8.0 tons. The basic load per NVA battalion equivalent is increased to 12.0 tons to account for 120mm mortar and 75mm artillery support. With 530 men per battalion equivalent, basic loads come to 30 lb/VC and 45 lb/NVA, averaged over combat and combat support troops.

Table 6. DIA COMPUTATION OF BASIC LOAD FOR 530-MAN BATTALION EQUIVALENT

Weapon	Number/Bn.	Rounds/Wpn.	Weight/Round	Weight/Bn.(lb.)
Rifle	102	40	.6 oz	153.0
Carbine	313	40	.6 oz	469.5
LMG/Assault Gun	34	2160	.6 oz	2754.0
12.7 mm MG	20	1760	4.5 oz	9900.0
57 mm RR	10	10	12 lb	1200.0
40 mm RL	5	5	4 lb	100.0
60/61 mm Mortar	11	20	3 lb	660.0
80/81 mm Mortar	5	20	7.3 lb	730.0
				15966.5 lb. = 8.0 tons

With ammunition expenditures of 1/3 of basic load per day of combat and an estimated 1 day of combat per month, the ammunition expenditure rates come to .33 lb/man-day for the VC and .50 lb/man-day for the NVA. These are averages over the entire month over both combat and combat support troops. The ammunition expenditures rate for 30 June 1966 (38,000 NVA, 63,000 VC Main and Local Forces, 18,000 combat support forces) is calculated as .5(38,000) + .33 (81,000) = 46,000 lb/day or 23 tons/day.

4. CIA Basic Load Computation

CIA uses a similar methodology also based on MACV information. The details and numerical values used have not been investigated

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due to the apparent fairly close agreement with the DIA methodology (see Table 10).

5. Army Basic Load Computation

Army Intelligence has recently researched a limited number of captured documents and POW reports to deduce the average manpower and basic ammunition and signal equipment load for NVA infantry battalions (647 men, 3.41 tons), VC Main Force infantry battalions equipped, as are the NVA, with a Chinese family of 7.62mm weapons (75 percent of NVA strength, 485 men, 2.56 tons), the remaining VC Main Force and Local Forces infantry battalions equipped with a mixture of weapons (65 percent of NVA strength, 420 men, 2.22 tons), separate VC infantry companies (88 men, .38 tons), and support companies (signal, 12.7mm AAA MG, 82mm mortar, 75mm RR, etc.) for regimental headquarters (5.38 tons per regiment).

The details are omitted, but some of the results are tabulated in Tables 7 - 9. Of special note is the much smaller Army estimated basic load per battalion (3.41 tons versus 12.0 tons for DIA NVA battalion equivalent; however, this difference is decreased by the additional basic loads given by the Army to regimental support companies) which leads to much lower expenditure rates: with 1 day of combat per month and 1/3 of the basic load consumed per combat day, ammunition consumption rates come to 8 tons per day total, of which 3 tons per day are for the 61 + 15 Main Force battalions using the Chinese 7.62 family (see Table 9).

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Table 7. ARMY CALCULATION OF BASIC LOAD
NVA INFANTRY BATTALION (647 MEN)

Weapon	Wpns/Bn	Rounds/Wpn.	Weight/Round		Weight/Bn. (lb)
Pistol	25	35	0.3	oz	17
SMG	143	180	0.3	oz	482
Rifles	219	110	0.6	oz	898
AR	27	300	0.6	oz	3360
HMG (7.62)	3	1800	0.6	oz	203
LMG (7.62)	6	650	0.6	oz	146
81mm Mortar	2	20	7.6	lb	304
60mm Mortar	6	20	3.0	lb	360
Grenades	?	2/armed man	1.5	lb	?
2 W Radio	5		20	lb	100
15 W Radio	1		35	lb	35
Telephones	7		5.0	lb	35
Commo. Wire	8 Km		42	lb/Km	336
Grenade Launchers	18 - 27	?	?		?
Pyrotechnic Pistols	2	?	?		?
					6822 lb = 3.41 tons

Table 8. ARMY CALCULATION OF BASIC LOAD FOR REGIMENTAL SUPPORT COMPANIES

Company	Men	Basic Load (tons)[a]
75mm RR	90	.93[b]
82mm Mortar	75	.63[c]
12.7mm AAA MG	120	2.5[d]
Reconn	105	.3
Signal	94	.69
Trans	150	.08
Medical	70	.03
Engineer	75	.2
		5.38 tons/regiment

[a] Class V, including grenades, plus signal gear.

[b] Primary component is .6 tons due to 6 75mm RR, 8 rounds each at 25 lb/round.

[c] Primary component is .45 tons due to 6 82mm mortars, 20 rounds each, at 7.6 lb/round.

[d] Primary component is 2.27 tons due to 9 12.7mm AAA MG, 1800 rounds each, at 4.5 oz/round.

Table 9. ARMY CALCULATION OF BASIC LOAD FOR ENTIRE ENEMY FORCE

	Units	Basic Load (Tons)
61	NVA Inf Bn (@ 3.41)	208
15	VC Main Force Bn (new 7.62 family @ 2.56)	38
36	VC Main Force Bn (mixed wpns @ 2.22)	80
35	VC Local Force Bn (mixed wpns @ 2.22)	78
20	Support Bn (Engineer, Artillery, Signal, etc.)	59
101	Separate VC Inf. Platoons (@ .09)	9
173	Separate VC Inf. Companies (@ .38)	69
	Support Companies to the 19 NVA, 13 VC Regiments (@ 5.38)	172
		713 tons

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The principal reason for the lower Army estimate is the inclusion of the 12.7mm machine gun only in AA support companies for enemy regiments, while DIA uses the MACV fire power estimate of 20 12.7mm machine guns per battalion equivalent. Table 6 shows that the DIA basic load calculation is very sensitive to this assumption; for example, if the number of these machine guns drops from 20 to 6 per battalion equivalent, then the basic load drops from 8 tons to 4.5 tons per VC battalion equivalent and from 12.0 tons to 8.5 tons per NVA battalion equivalent. The DIA-calculated ammunition expenditure rate for 30 June 1966 would drop from 23 tons/day to 14 tons/day. Army and DIA treatment of other heavy weapons are also dissimilar. Table 11 shows that ammunition expenditure rates are sensitive to requirements for mortars and recoilless rifles, even if 12.7mm MG requirements are small.

Additional

Other factors which tend to cloud comparison of the estimates are that:

a. Army includes grenades, radios, signal wire, etc. in its basic load while DIA does not, thus increasing the disparity in the two basic load estimates.

b. The MACV firepower study used by DIA to estimate enemy basic load has not been examined. Without understanding

of the study, the applicability of the "battalion equivalent" concept is not apparent, especially in view of the wide disparity of sizes and rates of combat of various enemy battalions, nor is the inclusion of combat support forces understood.

The difference in estimates of basic load is due to different samples of captured documents and POW reports employed by the various intelligence agencies. The MACV weapons mix given in Table 6 is reportedly based on captured documents from a single enemy battalion. Similarly the Army weapons mix is essentially based on a single (but different) captured document describing the Table of Organization and Equipment (T.O.&E.) of an ideal VC battalion, but confirmed by other documents.

It is noteworthy that there is an extremely large monthly "take" of intelligence material from SVN. The Washington area intelligence experts responsible for logistics estimates who were contacted (CIA,DIA, Army) all stressed that their limited human resources were inadequate for detailed study of this material. All agree that the present intelligence material has not been fully exploited (at the national level; the processing at MACV level has not been examined). This author has seen scores (a small sample) of captured documents and POW reports from the NIC (National Interrogation Center) and MIC (Military Interrogation Center) in Saigon which give T.O.&E.'s for squad-size units through division-size units. Due to inadequate manpower, this information is not being systematically tabulated to provide a continuous monitoring of weapons breakdown.

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It should be noted that the information available is often spotty and highly variable. The T.O.&E.'s for some enemy battalions are much better known than others. Furthermore, companies within the same battalion or battalions within a regiment may differ considerably in manpower (e.g., from 200 to 800 men/battalion) and in weapons. In particular, the number of heavy mortars, recoilless rifles and machine guns show large fluctuations from one unit to the next. Information on these heavy weapons is often incomplete since low-grade POW's often only report on their own platoon or company. A final complication is that even if the number of weapons per enemy unit is adequately estimated, considerable uncertainty remains due to variations in the number of rounds per weapon, especially for the heavier weapons. The information on rounds/weapon in POW reports is not as abundant as information on weapons/unit. To obtain a larger statistical sample, it may prove necessary to request that NIC and MIC ask POW's specific questions on basic load for each type of weapon, extra ammunition distribution before engagements, and, in general, the ammunition discipline obeyed by the enemy.

It is clear that a more thorough investigation of this mass of data can be performed, if a sharper picture of enemy T.O.&E.'s is desired. Such a study would necessarily be a statistical one and could determine the extent to which the concepts of "battalion equivalent", "standard battalion", and breakout by separate units are justified. Until such a statistical analysis of the data is performed, differing estimates of unit sizes, weapon mixes and basic

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loads are inevitable and understandable in view of the spottiness and high variability of the information. As more information becomes available from the field and more manpower is available for analysis of the "take", this situation is expected to improve. However, since the basic load estimate is most sensitive to the number of heavy weapons and number of rounds for each, and since the statistical spread of data on these weapons is greatest, uncertainty up to as much as, say, 50% in the basic load estimate can be expected.

6. Enemy Class II and IV external requirements are estimated by DIA as .012 lb/man-day for the VC (.01 medical and signal supplies, plus .002 for 5% weapons replacement per year) and .502 lb/man-day for the NVA (.5.. roughly one-tenth of U.S. consumption -- for class IV plus. 002 weapons replacement). These numbers are apparently also used by CIA (See Table 10). These requirements are taken as independent of combat rates.

The numbers are essentially based on military judgment, buttressed by comparative U. S. consumption figures. The intelligence feed-back from the field has been inadequate for re-evaluation of the numbers; our knowledge of enemy medical requirements, for example, is very fragmentary. This situation may change as more enemy documents are captured, more POW's are asked these questions, and the intelligence mosaic filled in. Little basis presently exists for determining inaccuracies in the estimates.

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Table 10. ESTIMATES OF CURRENT AND PROJECTED VC/NVA EXTERNAL SUPPLY REQUIREMENTS (TONS/DAY)

30 June 1966 (38,000 NVA, 63,000 VC Main and Local Forces, 18,000 VC Combat Support Forces)

	1 combat day/month		2 combat days/month	
	Ammunition	Total	Ammunition	Total
DIA	14.7 - 22.8	24.4 - 32.8	29.4 - 45.6	39.1 - 55.6
CIA	11.5 - 19.6	21.2 - 29.6	22.9 - 39.1	32.6 - 49.1
Agreed Number	12 - 20	20 - 30		

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1 January 1967 (60,000 NVA, 65,000 VC Main and Local Forces, 20,000 VC Combat Support Forces)

DIA	20.4 - 29.0	35.7 - 44.6	40.7 - 58.1	56.0 - 73.7
CIA	15.3 - 23.9	30.6 - 39.5	30.5 - 47.9	45.8 - 63.5
Agreed Number		30 - 45		45 - 75

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7. Computation of enemy external supply requirements hinges on estimation of the fraction of ammunition which must be received from out of country. At the minimum, all of the NVA units and the fraction of the VC Main Forces which are equipped with the Chinese family of 7.62mm weapon need externally-supplied ammunition. At the maximum, all enemy main and local forces use externally-supplied ammunition. Guerrillas are assumed to be completely-self sufficient. These extremes are shown in Table 10, taken from a DIA study. Higher figures are calculated for all ammunition obtained externally, lower figures for external ammunition requirement only for the NVA and 50% of the VC Main and Local Forces. Total external requirements are the sum of ammunition and Classes II and IV, the latter being computed as in 6. Estimates from DIA, CIA, and agreed numbers are shown for comparison purposes.

Perusal of Table 10 reveals that CIA and DIA estimates roughly agree, although Army estimates would be considerably lower. The conclusions reached about ranges and uncertainties by this author, based on the table, are that

a. Uncertainties of up to 100 percent can be expected in calculated external supply requirements, due to basic-load disagreements among analysts.

b. The ranges between upper and lower estimates, and between agencies, although large in percentages, are actually small (10 tons/day = 3 trucks/day) in absolute value, all within the logistic capability of the enemy.

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c. Thus estimates of 20 to 30 tons/day for current external requirements should be considered as equally reasonable, all within "noise level" of the models and of enemy logistic capability. The important feature is that the total requirements run near 20 tons/day, not 200 tons/day. The enemy is far from road-limited, during the dry season, at these rates of combat.

d. While present disparities between various estimates are not significant,noticeable divergencies will appear at higher enemy combat rates or higher enemy force levels.

8. There are three weak links in the ammunition expenditure which deserve discussion. The first, the uncertainties in the basic load estimate, has already been described. The second, the consumption rate per day of combat, is discussed next. The third, the number of combat days per month is discussed in Section 9.

The ammunition consumption rate per day of combat is taken as 1/3 of the basic load. This is based on the nominal ability of a unit to defend itself for 3 days without resupply, and is buttressed by a DIA scenario of a two-day attack against a permanently fortified position, in which 3.4 and 2.0 tons of the 8.0 ton DIA basic load per battalion equivalent are expended on the first and second days. Expenditure rates are in agreement with World War II data. The average ammunition expenditure per day is 2.7 tons, or 1/3 of the basic load. The calculation is given in Table 11 and again is most sensitive to assumptions about the heavier weapons (not necessarily 12.7mm MG).

Table 11. DIA CALCULATION OF AMMUNITION EXPENDITURE FOR TWO-DAY BATTALION ATTACK

Weapon	Number Battalion	Weight Round	Rounds 1st day	Rounds 2nd day	Weight Expended(lb)
Rifle	102	.6 oz	20	15	76.5 + 57.0
Carbine	313	.6 oz	6	3	68.9 + 33.0
LMG	34	.6 oz	170	100	214.2 + 124.0
12.7mm HMG	20	4.5 oz	50	30	280.0 + 170.0
57mm RR	10	12 lb	10	6	1200.0 + 720.0
40mm RL	5	4 lb	5	3	100.0 + 60.0
60mm Mortar	11	3 lb	70	40	2310.0 + 1320.0
81mm Mortar	5	7.3 lb	70	40	2555.0 + 1460.0
					6805 (lb) +3944(lb)
				=	10749 (lb) = 5.37 tons

There is nevertheless a major uncertainty in using the 1/3 basic load per day of combat as an across-the-board consumption rate. The uncertainty arises from the broad spectrum of engagements, running from ambushes which last a few minutes to battalion actions lasting for hours or days. Estimates based on World War II data can be extremely misleading, in view of the vastly different nature of most operations in that war from Vietnam. U.S. experiences has shown that expenditure rates during attacks against fortified positions can come to twice the rates for defense. In principle, enemy expenditures should separately consider length of engagement, size of force, whether enemy initiated or friendly initiated, whether an ambush or withdrawal, and so forth. Also involved is the problem that some enemy units bear the brunt of the fighting, and that the war is different in each Corps area. In addition, captured documents indicate that enemy units may receive more than one basic load of ammunition before an engagement: one MACV study stated that VC squads were issued 1.5, 1.5, and 2.5 times the basic loads for rifles, AR's and SMG's. In practice it would be impossible to consider separately each of these factors for every engagement. Consequently, considerable uncertainties exist. As the intelligence mosaic fills in, it should be possible to obtain more information on enemy ammunition discipline and then (if the statistics are large enough) narrow the uncertainty associated with this estimate.

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9. The across-the-board rate of combat, now estimated as 1 day of combat in 30 for the average enemy Main and Local Force soldier, is a crucial number since the overall ammunition consumption rate is proportional to it. It is considered that this number is very uncertain, and could potentially be in error by a factor of 2 or more.

The estimate itself is derived by DIA by extracting all significant engagements (company size and larger from the MACV Monthly Evaluation reports and SITREPS for the 6 months-- September 1965 - February 1966 inclusive. No breakdown by Corps area is given.

The judgments involved in this estimate of combat level include (a) field estimates of the size of the enemy force involved -- which could be very uncertain and (b) a DIA assessment of the intensity and length of combat, so that a 5 day enemy withdrawal is not weighted as 5 days normal ammunition consumption. A detailed examination of the DIA calculation could not be made because the work sheets were discarded. Credibility of the reporting system is also involved, due to (a) possibly exaggerated estimates made at the start of an engagement; (b) garblings of messages; (c) incidents never reported.

Field data are too fragmentary to provide feed-back on whether the 1 in 30 estimated level of combat is accurate. Statistical analysis of days in combat based on POW reports (even if credible) would of course be difficult due to different levels of combat by different units and in different areas.

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What would be most desired is direct intelligence data on resupply rates for various enemy units. This would obviate separate estimates for basic load, expenditure per combat day and level of combat. Captured documents such as those reflecting enemy expenditures for specific engagements would permit comparison with calculations. Again, the intelligence mosaic on this and on the VC internal distribution system is too fragmentary. A very small number of captured documents indicate company or battalion ammunition consumption for specific engagements and for extended periods of time. Perhaps more information of this type could be obtained from POW's. Because of their paucity, these direct indicators of ammunition consumption have not yet been used to "calibrate" the indirect calculations.

The enemy level of combat has risen (DIA estimate) from 1 day in 65 (May 1965) to 1 day in 31 (February 1966). MACV projects a level of 1 day in 7 by the end of 1966. In view of the importance of this level estimate in the determination of enemy external supply requirements, more attention should be paid to this estimate. This is especially important in order to establish whether logistic requirements via Laos can be pushed upward. An effort should be made to update this indicator at least quarterly and by corps area, instead of the present annual calculation. Ranges should be placed on these indicators to show how military judgment has entered the assessment of enemy strength, the duration and intensity of combat, and whether ambush, offensive or defensive operation. Such a weighted average of the engagements may prove as valuable an indicator of enemy effort as the present indicator, separate tabulation of the number of company-size, battalion-size, and multibattalion-size, and friendly-initiated engagements per month.

V. THE PROBLEM OF SEA INFILTRATION

1. The attitude of the intelligence community at large is that since the inception of MARKET TIME sea infiltration appears to be relatively minor but that considerable potential exists. However, each of the intelligence agencies has to a greater or less degree a reservation about the amount of sea infiltration. Since the full scale implementation of MARKET TIME there have been few interceptions of major movements -- two steel trawlers -- and almost negligible amounts of contraband seized in the junk inspection program.

2. Analyses of the MARKET TIME operation that have been carried out by the Operations Evaluation Group (OEG/CNA) personnel assigned to MARKET TIME confirm the U.S. Navy contention that the MARKET TIME operation has greatly curtailed sea infiltration.[1] These statistical analyses, in fact, claim an efficiency in the case of the steel-hulled larger trawlers that exceed the estimates of the U.S. commander of naval forces, Vietnam. The current estimate is that not more than two steel-hulled trawler shipments per month occur in the Ran Sac River area (IV Corps). The bases for this estimate are (1) the encounter with a trawler in May 1966 (2) somewhat older collateral reports of fairly well organized logistical

[1] The conclusion of the forthcoming OEG Study on MARKET TIME is that it is impossible to estimate the quantity of men and equipment entering South Vietnam from the sea; however, given reasonable assumptions as to the statistical nature of the search and the behavior of the various barrier patrols, it appears that only minor quantities are entering.

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10. In summary, the calculation of enemy main force external supply requirements is accomplished by a hybrid of theory and field intelligence. Generally, the present estimates are probably reasonable in view of the limited knowledge now available. Conceivably they could be off by a factor of 2 or more due to the sensitivity of the answers to the assumptions made. Even so, the amounts involved remain small, well within road capacity of the Ho Chi Minh Road System, and the ranges in the estimates amount to spreads of at most only a few truckloads per day. As more and more intelligence "take" is received and examined, more of the intelligence mosaic will be filled in. Better understanding of the four areas, basic load per unit, expenditure rate per day of combat, combat levels, and non-ammunition supplies can be expected. Nevertheless, uncertainties in the statistical sample due to varying unit sizes, equipment and rates of combat, will always leave uncertainty in these estimates.

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support activity in the Ran Sac River area. It should also be pointed out that until recently shortage of shallow draft craft hampered the patrol coverage in this particular area.

3. Two questions arise. The first is whether credence can be put in the theoretical analyses of MARKET TIME given the fact of two known interceptions. The second question concerns the adequacy of the junk inspection process and the somewhat subjective evaluation of the results of these inspections.

4. The coastline of South Vietnam totals nearly 1500 miles -- roughly the same extent on the U.S. East Coast from Maine to Florida. Most of the coastal area in the MeKong - Saigon River Delta is held by the VC. Better U.S./Vietnamese control exists in the vicinity of the coastal enclaves. In the delta region the highly interwoven system of rivers and canals provides a convenient means for redistribution of incoming supplies. To say the least, the coastal surveillance problem is formidable.

5. It is scarcely necessary to dwell on the advantages of water transport for moving bulk shipments. Undeterred by operations such as MARKET TIME and GAMEWARDEN, sea infiltration with subsequent redistribution by means of the inland waterways network should be very attractive to the VC/NVA. There is information from several intelligence sources that the VC/NVA is organized to exploit sea infiltration possibilities. The trawler captured at Vung Ro Bay[1] contained enough ammunition and weapons to equip a regiment -- about

[1]The trawler was apprehended before the MARKET TIME operation was fully implemented.

one hundred tons. One hundred tons is the estimated daily capacity of the Laos road system during the rainy season. The key question, of course, is how the Communists weigh the risk of interception at sea against the relative ease of such shipments?

6. It is important to distinguish at the outset among the three classes of water-borne shipments that may be anticipated by the coastal surveillance forces. These are infiltration by large (100+ tons) steel-hulled trawlers, junks moving from North Vietnam or Cambodia to South Vietnam, and junks or sampans employed in coastal redistribution. Junks vary in their carrying capacity, but militarily significant quantities of arms, ammunition, medicines, or specialized items plus cadre personnel could be secreted aboard a junk. The scores of thousands of sampans similarly could each carry tiny, but in the aggregate, very significant quantities of supplies.

7. MARKET TIME has different capability against each class of target.

DESCRIPTION OF THE MARKET TIME OPERATION

8. Actual on station forces available and assigned to the MARKET TIME operation vary from time to time. In general, air and ship patrol sections are manned by U.S. forces and by some units of the Vietnamese Navy sea force. Close coastal patrols in specified areas are carried out by the Vietnamese Navy using sail, and motorized junks, as well as some units of the VNN Sea Force and River Force.

9. The ship population to be inspected for steel-hulled trawlers includes a fairly heavily used sea lane off the tip of the Ca Mau Peninsula in which ships of all nationalities, including tramps, travel. Trawlers and merchantmen carrying contraband can "hide" amongst the other shipping. They are safe from inspection because these sea lanes are in universally recognized international waters. As steel-hulled trawlers approach the coast of South Vietnam they become more conspicuous and are in principle readily detected and approached for investigation.

COMMENT: The air patrols are laid out in two tracks -- one from roughly the Cambodian border around the Ca Mau Peninsula to Vung Tau and the other along the coast from Vung Tau to the Demarcation Zone. Each track is about 700 n.mi. The plan is to have an aircraft continually on station on each track -- a practice that would have an aircraft pass a given point approximately every three hours. The aircraft fly at 1000-1200 feet which makes the radar horizon about 40 miles. There should be a very high probability of detecting a steel-hulled trawler within 40 miles of the A/C track. The extent to which A/C divert to inspect and photograph traffic is unknown. The opinion has been expressed that trawlers are given special attention only if they arouse suspicion such as by proceeding aimlessly or by moving inshore. It is not clear how information obtained by the VP aircraft is used by other elements of the MARKET TIME operation.

In addition to the VP flights there are some VNAF flights over the coast using O-1 light aircraft.

The outer zone that is patrolled by U.S. Navy ships is such that only about 50 percent of the long coastline can actually be kept under surveillance. The possibility that a prospective infiltrator could be aware of the movements of these forces and remain out of range (10-12 miles) cannot be discounted. Indeed the range of night observation devices is only about 5 miles.

The inshore zone is manned primarily by the VNN. Coverage is relatively good near junk force bases during the daytime. There is a strong tendency to secure operations at night.

It must be assumed that the patrol effort will be concentrated off rivers or inlets known to be potential reception areas. It should be noted further that it is estimated to require at least 10 hours to unload a trawler (10 tons per hour unloading rate). It stands to reason that given reasonably conscientious search effort the trawler is vulnerable to detection even if it eludes the patrol zones.

10. A second component of the population of sea traffic is the junks. These junks operate in great profusion along the coast of South Vietnam and in the river estuaries. They are engaged in fishing, local transport of fish and rice, and generally in local trade. There are nearly 50,000 junks in South Vietnam and on any

given day more than 5,000 of these may be at sea. Even at night perhaps as many as 1,000 are at sea or at anchor off the coast. The pattern of operations for these craft is near the coast in very shallow water in many places. (To a casual observer the movements of any junk within these collections appear almost random.) In principle an infiltrator could take advantage of the crowd of junks and lose himself in the background they provide. The risk the infiltrator runs then is that of being sampled by boarding an inspection party. Estimates are that less than 10 percent of the junks in any given area can indeed be boarded and inspected. There are two kinds of inspection. In one, papers are checked and a superficial examination of the junks' contents is made. In certain cases, perhaps when suspicions are aroused, the junk is brought into a junk force or river force base and unloaded or examined for concealed hiding places. This is a time-consuming process and a very small fraction of the junks actually boarded are subjected to thorough search. When one remembers that one rifle and 100 rounds of ammunition will equip a VC soldier for three days of combat, the military importance of seemingly small junks for arms and ammunition cannot be denied. The question arises as to whether the sieve is fine enough to catch militarily important movements of contraband.

Now the fact remains that of the thousands of junks that have been boarded and inspected, only about 100 have yielded contraband. On this basis the CNA calculations deduce that only small amounts

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of contraband actually are being introduced into South Vietnam through the use of junks.

The way that MARKET TIME is organized places by far the greater part of the burden of junk inspection on units of the Vietnamese Navy. The Vietnamese junk force is equipped with motor-powered and sail-powered junks. The vessels are approximately comparable in performance characteristics with junks that might be used for infiltration. It is not clear how the infiltrator could exploit his observations of the movements of the inspection vessels. In general, there is no speed advantage. There is always the possibility that an infiltrating junk can arrange for other junks to act as decoys or exploit the lessened search effort at night. In summary, prudence dictates that continued efforts be made to obtain additional information on the effectiveness of the sea blockade. Until corroborating evidence is obtained that the NVA and VC logistical organizations, that specialize in sea infiltration, are no longer operating, it cannot be assumed that important and/or relatively major amounts of supplies and equipments are not entering South Vietnam from the sea.

Although the magnitude of the transshipments that are made using the inland waterways is unknown, it is agreed that such routes are probably essential to the VC logistics systems. Such river patrols as have been carried out have failed to inhibit the inland waterways traffic. The U.S. Navy has an operation called GAME WARDEN that is designed to enforce better movement control. Nearly 100 specially designed armed river craft called SWIFTS are

being sent to Vietnam to take part in the MARKET TIME/GAME WARDEN operation. However, in view of the immense sampan population capable of carrying contraband either into South Vietnam from Cambodia, or as part of the VC internal distribution system, the possibilities of establishing a real degree of control over the waterways seems slight.

It may be said of both MARKET TIME and GAME WARDEN that they are expected not so much to control any flow of contraband as to have a deterrent effect on it. However, if the statistical analyses of seaborne infiltrations are correct and there really is only a minor flow, even though a significant one, this would seem to represent a deliberate Communist choice rather than one imposed by us on them. While CIA estimates that possibly up to 20 percent of cargo going by truck down the Panhandle is lost as a result of damage, pilferage, and air attack, this must be compared to the higher statistical possibility of interception of junks and a very much higher possibility of the interception of larger vessels.

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