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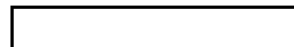
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Intelligence Memorandum

*The Rolling Thunder Program --
Present and Potential Target Systems*

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THE ROLLING THUNDER PROGRAM --
PRESENT AND POTENTIAL TARGET SYSTEMS*

Summary

This memorandum analyzes the effects achieved by the Rolling Thunder Program of air attacks on North Vietnam through 1966; it also estimates the probable effects which would be expected to ensue from restructuring Rolling Thunder in a variety of other ways, ranging from deescalation to substantial escalation. A summary of findings follows, with the details contained in Appendixes A through H.

* This memorandum was produced by CIA. Aside from the normal substantive exchange with other agencies at the working level, this memorandum has not been coordinated outside CIA. It was prepared by the Office of Research and Reports with a contribution from the Office of Current Intelligence. It was coordinated with the Office of Current Intelligence and the Special Assistant for Vietnamese Affairs; the estimates and conclusions represent the best judgment of this Office as of 31 January 1967.

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I. Rolling Thunder in 1966*

The evidence available does not suggest that Rolling Thunder to date has contributed materially to the achievement of the two primary objectives of air attack -- the reduction of the flow of supplies to the VC/NVA forces fighting in South Vietnam or the weakening of the will of the Hanoi regime to continue with the insurgency. There is no doubt, of course, that Rolling Thunder has lowered the capacity of transport routes to the South, and hence put a lower "cap" on the force levels which could be supported in South Vietnam. However, it is estimated that the "cap" is well above present logistic supply levels.

Also, Rolling Thunder has not succeeded in materially lowering morale in the North. While there undoubtedly is some war weariness, the general indication is that the North Vietnamese people are behind the regime.

The North Vietnamese leaders continue to insist, both in public and private statements, that they are willing to withstand even heavier bomb damage rather than accept anything less than their often stated demands for a settlement in Vietnam. Hanoi has been able to adjust its military and economic activities, which support its war objectives, to the bombing. Hence, while there may be some degree of escalation that would force the regime to reexamine its position, it is believed that as far as pressure from air attack is concerned, Hanoi would be prepared to continue the insurgency in South Vietnam indefinitely in the face of the current level and type of bombing program.

The will of the regime to continue the war is heavily bolstered -- and this is a key factor -- by the relatively massive flow of economic and military aid from the USSR, China, and the Eastern European countries. A comparison of 1966 measurable damage in North Vietnam with aid deliveries is revealing:

| | <u>Million US \$</u> | |
|----------|------------------------------|---------------------------|
| | <u>Measurable Damage</u> | <u>Aid Deliveries</u> |
| Economic | 94 | 275 |
| Military | 36 | 230 |
| Total | <u>130</u> | <u>505</u> |

* See Appendix A.

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The fact that aid was almost four times the damage inflicted by air attacks not only gives Hanoi the muscle needed to strengthen the VC/NVA insurgency and its own air defense but also provides the services to overcome economic difficulties. Under these circumstances, it is concluded that Hanoi would be able and willing to persevere indefinitely in the face of the present Rolling Thunder program.

Air attacks have not eliminated any important sector of the economy or the military establishment. The successful attack on petroleum storage facilities eliminated 76 percent of the JCS-targeted national capacity, but the strikes did not come until after the North Vietnamese had already implemented a system of dispersed storage. The petroleum import flow has been maintained at adequate levels. The heavy concentration of the Rolling Thunder campaign on the lines of transportation south of Hanoi -- particularly Route Packages 1 and 2 -- has not succeeded in cutting route capacities to the point where the flow of supplies needed to support the expanded insurgency in South Vietnam has been significantly impeded.

The principal losses to the economy have been indirect and stem from reduction in agricultural output and the fish catch, the impairment of foreign exchange earnings through a cut in normal quantities of exported commodities, the cost of repairing essential transport facilities, and disruptions of production due to dispersal and other passive defense measures (see Figure 1).

Aircraft losses by North Vietnam amounted to an estimated \$17 million in 1966, while damage to SAM's, naval equipment, barracks, and other facilities has also been significant (see Figure 2). These attacks have disrupted normal military practices, caused the abandonment of many facilities, and forced widespread dispersal of equipment. However, the capabilities of North Vietnam's military establishment continue at a high level.

In 1966, the attack sorties flown against North Vietnam increased 217 percent over 1965 and the program became virtually an armed reconnaissance campaign (see Figures 3 and 4). Attacks flown against fixed JCS targets in 1966 (including armed reconnaissance restrikes) amounted to less than 3 percent of total attack sorties. About one-third of the 242 JCS targets remained unattacked; a large number of these represent powerplants, important industrial installations, and key transport targets. Most of the armed reconnaissance sorties were flown south of Hanoi, particularly in Route Packages 1 and 2

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(see Figure 5). The cumulative damage to economic and military facilities is estimated at \$200 million of which \$130 million occurred in 1966. These data plus the cost of the attack are shown in Figure 6.

Preliminary estimates for civilian casualties in 1966 are about three times those in 1965, reflecting primarily the stepped-up level of attack. Military casualties in 1966 are below the level of 1965, largely because military barracks were heavily hit in 1965 but not in 1966. Estimated casualties are presented in the table.

Estimated Casualties from Rolling Thunder
1965-66

| | <u>1965</u> | <u>1966 ^{a/}</u> | <u>Total</u> |
|----------------------|---------------|---------------------------|-------------------------|
| Civilians | <u>6,000</u> | <u>17,900 to 20,200</u> | <u>23,900 to 26,200</u> |
| Fixed targets | 2,000 | 900 | 2,900 |
| Armed reconnaissance | 4,000 | 17,000 to 19,300 | 21,000 to 23,300 |
| Military | <u>7,200</u> | <u>4,650</u> | <u>11,850</u> |
| Fixed targets | 4,300 | 400 | 4,700 |
| Armed reconnaissance | 2,900 | 4,250 | 7,150 |
| Total | <u>13,200</u> | <u>22,550 to 24,850</u> | <u>35,750 to 38,050</u> |

a. Preliminary estimates.

While these estimates are the best presently available and are believed to be the right order of magnitude, they are subject to error. The estimate for civilian casualties is more reliable than that for the military. The total casualties are small in relation to a total population of over 18 million, but losses have undoubtedly had a disruptive effect.

II. Alternative Target Systems

A. General

A number of alternative target systems have been examined in order to estimate the probable effects of their neutralization. These

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alternatives include an attack on modern industry, the mining of the major ports and water entrances to North Vietnam, interdiction of the levees in the Red River delta, and an unrestricted bombing campaign with the exception of attacks against populated centers. These alternatives are discussed in detail in Appendixes B through E. In addition the effects of a reduced air campaign confined to Route Packages 1 and 2 and the infiltration network through Laos are discussed in Appendix F. The estimated casualties to be expected from these alternative programs are discussed in Appendix G. Finally, the effect of these programs on the will to persist of North Vietnam's leadership is discussed in Appendix H.

B. Modern Industry in North Vietnam as a Target System*

A review of modern industry in North Vietnam has resulted in the selection of 20 facilities for inclusion in this target system:

Seven electric power generating plants

One cement plant

One explosives plant and one potential
explosives material supplier

One rubber products facility

One chemical plant

Four engineering plants

One steel producing complex

Three coal processing plants

The neutralization of all these North Vietnamese industrial facilities would eliminate the fruit of several hundred million dollars in capital investment, cut off the source of perhaps one-quarter or more of the gross national product and most foreign exchange earnings, and could halt the construction of additional modern plants in North Vietnam by other Communist countries. It would also disrupt the functioning of other sectors of the economy through the loss of electric

* See Appendix B.

power and such materials as cement and some fertilizers and chemicals, add to the burden of aid from the Communist countries, and produce at least temporary displacement of the urban labor force.

A graduated, selective program beginning with air attack against all the facilities in one industry (such as all powerplants) probably offers a more promising vehicle for the application of pressure against the North Vietnamese regime than a widespread escalation against numerous industrial targets in a variety of industries. Such a program not only would maximize the economic and military impact of the attacks but also would provide Hanoi with a continuing opportunity for second thoughts. If Hanoi failed to react, the completion of the total program would deal a serious blow to North Vietnam's hopes for economic progress and status, negating a decade of intense effort devoted to the construction of modern industry.

There are two factors which are important to keep in mind in considering the effects of any escalated program of air attack:

(a) The North Vietnamese leadership has been making an even greater effort than usual over the past two months to prepare the people of North Vietnam for further sacrifices during 1967.

(b) The will of the North Vietnamese to persist in the war depends not only on the effect of the air-strikes in the North but also on how they assess the war situation in South Vietnam.

While severe damage to the modern industrial sector would place additional pressures on the regime, it is not believed that this burden by itself would be intense enough to bring Hanoi to negotiate. The most relevant evidence -- the neutralization of much of the heavy industry in North Korea during the Korean War -- would suggest that the burden would be bearable.

Modern industry in North Vietnam -- machinery, chemical, fertilizer, cement, and electric powerplants -- makes a contribution to the military capability of the North Vietnamese and Viet Cong forces in South Vietnam and/or to the air defense capability in the North, but this contribution is not vital. The essentially agrarian nature of the

economy together with numerous local and handicraft facilities, which reportedly meet 70 percent of the population's demand for consumer goods, provides a strong buffer against economic collapse.

The deficit of essential economic goods needed to sustain North Vietnam's economy and the military supplies which are vital to the country's air defense, as well as to the maintenance of large-scale aggression in South Vietnam, come from other Communist countries. In the absence of an effective program for the interdiction of the transport system, it is expected that the flow of imports would increase. A successful air attack on all of the modern industry facilities listed above would increase import requirements well above present levels. The combined current capacities of the sea and land routes leading to North Vietnam could sustain the flow.

The experience in the Korean War -- the most relevant one for comparison -- suggests that the loss of modern industry may not be a decisive factor, by itself, in critically reducing the will to persist, at least as long as the abundant flow of war-supporting supplies continues.

C. The Mining Program*

Two alternative mining programs were examined. The first is a conventional mining program designed to prevent the use of deep-draft oceangoing ships but lacking a capability to prevent the use of shallow-draft craft such as coasters and lighters. The second alternative is a program using a newly developed mine with a capability against shallow-draft shipping.** Both mining programs assume the use of intensive armed reconnaissance against lines of communication and transport targets in order to maximize the potential effects of the program.

The interdiction of the port of Haiphong would cause serious concern to the Hanoi leadership. Their reaction would depend on the effectiveness of the mining and the success of alternate methods of supply. As long as North Vietnam believed that it could receive essential supplies, its resolve to fight on would probably remain.

* See Appendix C.

** This mine is the MK 36, a modification of the standard MK 82 aerial bomb, which is effective against even unpowered small craft in depths up to 50 feet. It can be delivered by all aircraft capable of using the MK 82, and requires the same delivery techniques as the MK 82. The MK 36 is to go into mass production in the spring of 1967.

The North Vietnamese could probably continue to supply the Viet Cong, the air defense system and essential war-supporting activities in the North with supplies for a while, using current stockpiles and imports, even in the face of a reduced flow over Communist China's road and connecting rail system. However, should the logistic pinch become severe enough to deplete stocks in North Vietnam, the chances of a reexamination by Hanoi of its whole approach to the war would increase markedly.

The immediate impact of either mining program would be a disruption of normal transport activity ranging from a situation in which a substantial portion of imports could be maintained by sea and coastal water movement to one of almost complete denial of water access to North Vietnam.

Either mining program would have serious disruptive effects on the North Vietnamese transport system and the effectiveness with which it accommodates the movement of foreign trade. Almost all export trade would cease and foreign exchange earnings would become negligible. It is estimated, however, that unless the rail and road lines to China were interdicted, surplus transport capacity and adequate equipment would exist, and hence North Vietnam will attempt to maintain the flow of virtually all normal imports plus the new import requirements generated by the attacks on modern industry. Thus the effects of the mining program will tend to be those of delay but not denial of imports.

A mining program directed solely against oceangoing shipping would increase the traffic burden on the major rail connections to Communist China to the extent that North Vietnam would be hard pressed to meet all normal traffic requirements by using rail connections, but the traffic could be handled by resorting to road and inland water routes.

A program including mining of coastal and inland waters would be much more effective. North Vietnam would have to rely almost completely on the existing road and rail connections to Communist China and use them at or near capacity levels. If intensive interdiction and armed reconnaissance were carried out against these vital transport links, North Vietnam would face increasingly serious problems. The vulnerability of transport equipment, the difficulties of maintaining lines of communication, and the cost and unreliability of transport would all increase significantly. Some import programs would almost certainly have to be reduced. These problems alone

would not be sufficient, however, to degrade meaningfully the flow of essential military materials or to prevent North Vietnam's continued support of the war in the South.

D. Interdiction of the Levees in the Red River Delta*

The rice fields and populated centers of the delta are protected by an elaborate system of levees which have greatly reduced flooding from natural causes. Damage to the rice crop -- the staple food in North Vietnam -- would be maximized if these levees were breached when the Red River is at its height, some time in the period mid-July to mid-August.

The areas most vulnerable to flooding, if the primary levees of this system were breached, are the Ha Dong area southwest of the Red River and the Ha Bac area northeast of the river. If only the main levees were breached, it is estimated that the crop loss would be on the order of several hundred thousand tons of rice -- over 5 percent of the annual production of rice. If the secondary levees were also effectively breached, the decrease in rice production could reach a million tons, or over 20 percent of annual production.

To mitigate the effects of the flooding, Hanoi would be forced to divert a very sizable work force away from other activities, including those of a military supporting nature, for a period of weeks until the major damage had been repaired.

A successful attack on the levee system at Ha Dong would be exceedingly disruptive in the short run. There are probably 1.5 million people in the Ha Dong area, including Hanoi. This Agency has not made an independent study of the probable level of casualties; military target studies estimate they would be small, numbering in the hundreds rather than thousands. Homes in the village areas would be destroyed, and factory activity would be halted. Over the long run, the effect on rice availabilities would probably be the hardest problem for the regime. The loss of at least several hundred thousand tons, and perhaps a million tons, of rice, particularly in a year of below-average harvests, would force Hanoi to seek outside sources of supply. Communist China, which in an average year produces 75 million to 85 million tons of rice, could provide the necessary amount.

If the effects of the attacks on modern industrial targets and the mining program were at maximum levels, the attack on levees

* See Appendix D.

would increase North Vietnam's cumulative import requirements from the present level of 4,200 tons a day to a total of from 6,100 to 8,000 tons a day. The transport capabilities of North Vietnam in this situation would fall short of maximum requirements by 15 to 20 percent. Their ability to sustain imports would be influenced strongly by the effectiveness of interdiction programs against the road and rail connections to China.

If an interdiction campaign reduced the capacity of the rail lines on a sustained basis by only one-third and of the road systems by only one-fourth, the available route capacity would then be only 6,400 tons a day. The rail cut could be sharper than one-third; the road cut represents the maximum interdiction sustained to date in North Vietnam. The North Vietnamese would then be hard-pressed to move even their minimum import requirements. If the interdiction program were even more successful, the regime would face increasingly severe problems. Hard decisions would have to be made about the imports which could be forgone and a system of more rigorous rationing would probably become necessary. More importantly the continuity and reliability of the flow of essential military and economic assistance from the USSR and Communist China would become a matter of highest concern.

Since the major burden of a successful attack on the levees would fall on the civilians in agricultural areas, there probably would be a highly adverse public reaction in the West. This criticism would be more strident than that which would be expected from attacks on any other target system, with the possible exception of raids on population per se. The military effects of "levee busting" would probably be both limited and short lived; the effect on the Hanoi regime's will to continue would be marginal.

Hanoi's reaction to strikes on the Red River levees would depend on the damage done by the strikes, the effectiveness of the regime's countermeasures, and Hanoi's ability to obtain food from China and the USSR. The Hanoi leaders probably believe that North Vietnam can localize damage from attacks on the dike system and that the attacks will not limit their abilities to persist in the war. The North Vietnamese would certainly exploit the golden opportunity presented by such attack in their propaganda effort to put intense political pressure on the United States.

E. An Unlimited Bombing Campaign*

The major thrust of an unlimited bombing campaign following the previous alternatives would be against transportation and military targets and a small number of economic targets.

1. Transportation Targets

Although the transportation system has been a major target since the inception of the Rolling Thunder program, the weight of the bombing effort has fallen on Route Packages 1, 2, and 3, where military and economic requirements for traffic movement have been relatively small in relation to route capacity. Hence, despite the weight of attack, the North Vietnamese have been able to keep essential supplies flowing.

The basic concept of an unlimited attack on transportation would be to take advantage of the two major factors which emerge from the bombing campaigns outlined earlier. First, a higher import requirement -- ranging from 6,100 to 8,000 tons -- would result from the neutralization of most production facilities and, second, North Vietnamese ports and the inland waterway system would be closed, or nearly closed, by mining. Under these circumstances, the remaining rail and road connections to Communist China would be forced to operate at -- or virtually at -- capacity. An analysis of North Vietnam's transport capabilities leads to two conclusions:

(a) The uninterdicted capacity of the roads and the rail lines, allowing sufficient time to organize the necessary truck transport, would probably be sufficient to transport the required daily tonnages in full to North Vietnam, even if the ports were mined.

(b) Given a successful interdiction campaign, the net capacity of the roads and the rail lines would be insufficient to satisfy the maximum daily requirement and, therefore, some reduction in the desired levels of supplies would take place.

* See Appendix E.

If an unlimited interdiction program were highly successful, the regime would encounter increasing difficulty and cost in maintaining the flow of some of their most essential military and economic goods. In the long term the uncertainties and difficulties resulting from the cumulative effect of the air campaigns would probably cause Hanoi to undertake a basic reassessment of the probable course of the war and the extent of the regime's commitment to it.

2. Other Potential Targets

In addition to industrial-economic targets, there are a number of military facilities presently on the JCS target list whose neutralization would be of importance in blunting the military capabilities of North Vietnam. The most prominent of these are 11 airfields. There are also a number of barracks and smaller military supply depots widely dispersed throughout North Vietnam. In an unlimited campaign these facilities presumably would be taken under attack.

Other potential targets include such varied installations as a number of primary radio communications centers, the six plants constituting North Vietnam's pharmaceutical industry, transport repair facilities, textile plants, food-processing plants, and fertilizer plants. Neutralization of these targets would cause further disruption of economic and military activity in North Vietnam. But the principal gain to be expected by taking them under attack is that their neutralization would increase North Vietnam's import requirements and aggravate further their difficult problems in logistics and distribution.

Air attacks on the miscellaneous industrial and repair facilities in the "unlimited" package would probably bring only marginal additional pressure on Hanoi unless the attacks significantly impeded the flow of essential war-supporting supplies and equipment currently flowing in from the USSR, China, and other Communist countries.

F. Restriction of Rolling Thunder to Route Packages 1 and 2 and Laos*

About 60 percent of all airstrikes in North Vietnam and Laos during 1966 were carried out against targets in the "logistic funnel" which comprises Route Packages 1 and 2 in North Vietnam and the road network through the Laotian Panhandle. The total effort in these

* See Appendix F.

three areas during the first 11 months of 1966 amounted to about 68,000 attack sorties delivering about 112,000 tons of ordnance to the target area. Despite this effort, the level of supplies currently needed to support the VC/NVA forces fighting in the South has continued.

Concentration of all air attack forces on the "logistic funnel" would increase by about 60 percent the bombing program in this area, raising the level of ordnance expended from 10,000 tons to around 16,000 tons per month. In a short time the North Vietnamese would respond to the intensified bombing by increasing the size of the labor force engaged in repair work. The estimated requirement of a 30 percent increase in repair and reconstruction manpower could be drawn from areas of North Vietnam no longer being bombed and would be made up of experienced repair crews. Moreover, their air defenses in the "funnel" also would be strengthened to aid in countering the intensified bombing program.

If the Rolling Thunder program were cut back to an interdiction campaign against Route Packages 1 and 2 plus Laos, Hanoi would regard the limitation as a clear victory. They would see it as evidence that political pressures on the United States as a result of the reaction to propaganda claims about civilian casualties inflicted further north had been effective. The regime would be encouraged in its belief that the United States will ultimately tire of the war and that its policy was forcing the United States to retreat.

A similar program to reduce the logistic capacity of the Communists, called Operation Strangle, was carried out during the Korean War with only limited effectiveness. A strip across North Korea 60 nautical miles in depth was bombed day and night for 11 months in an attempt to cut off supplies needed by the Communist armies. By means of a system of countermeasures very similar in scope to those now being carried out by the North Vietnamese, the Communists greatly reduced the effectiveness of the US bombing program while at the same time continuing to provide the necessary supplies for their war effort.

G. Estimated Casualties Resulting from Alternative Rolling Thunder Programs*

The alternative Rolling Thunder programs examined in this report would tend to yield casualties at a significantly higher rate than that observed in 1966. This arises principally because these programs tend to be centered on targets located in the more heavily populated

* See Appendix G.

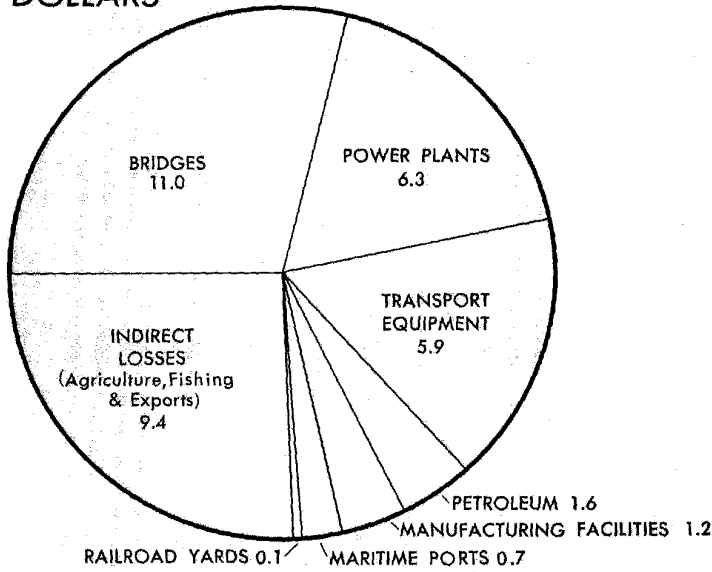
areas of North Vietnam. Specific numbers of casualties could not be estimated for every aspect of each campaign, particularly armed reconnaissance programs. A rough approximation indicates, however, that total casualties resulting from attacks on fixed targets could range from 15,000 to 20,000. Approximately one-third of these would be civilian casualties, most of whom would have been engaged in war related activities. Casualties in this amount -- if they were all sustained in 1967 -- would be at a level from two to three times higher than that obtained by attacks on fixed targets in 1965 and 1966 combined.

Armed reconnaissance in 1966 accounted for about 95 percent of total casualties. If the alternative bombing programs are carried out by cutting back significantly on armed reconnaissance programs in the areas south of Hanoi, there probably would be a marked decline in the number of casualties from this source. In this event the total casualties resulting from the alternative programs might not be significantly greater than the total casualties inflicted during the 1966 campaign.

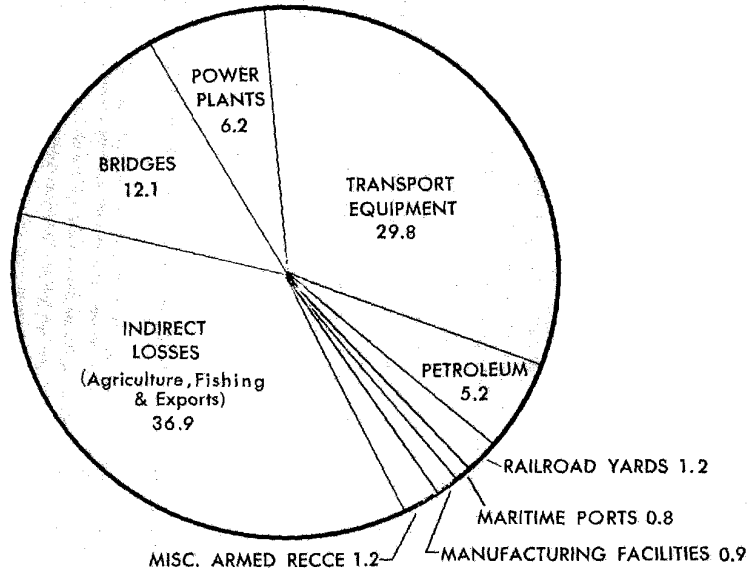
ECONOMIC DAMAGE

MILLION US DOLLARS

1965
36.2



1966
94.3



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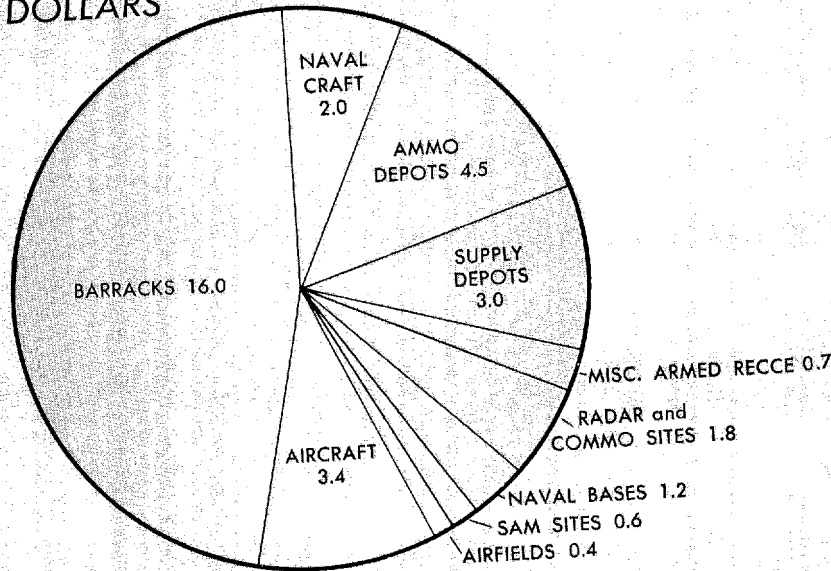
65560 1-67 CIA

Figure 1. Value of Economic Damage in North Vietnam, by Sector, 1965 and 1966

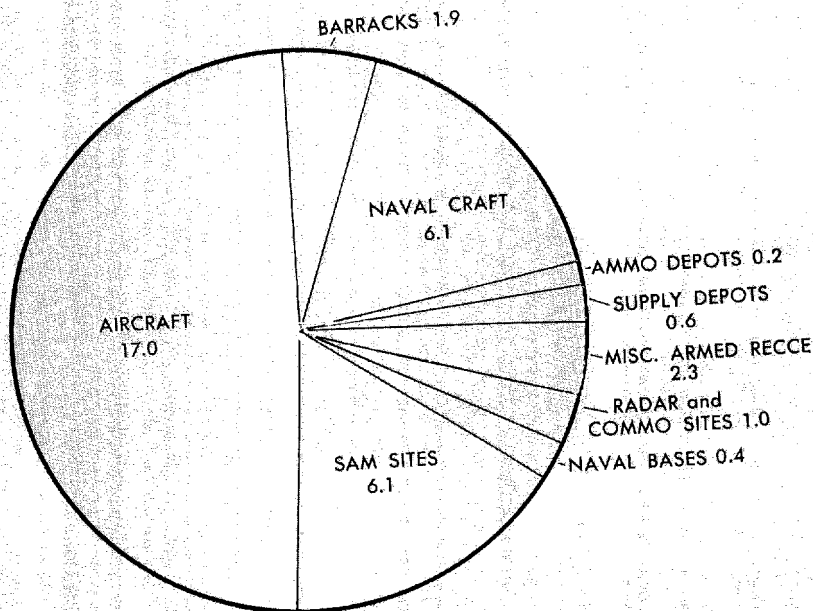
MILITARY DAMAGE

MILLION US DOLLARS

1965
33.6



1966
35.6



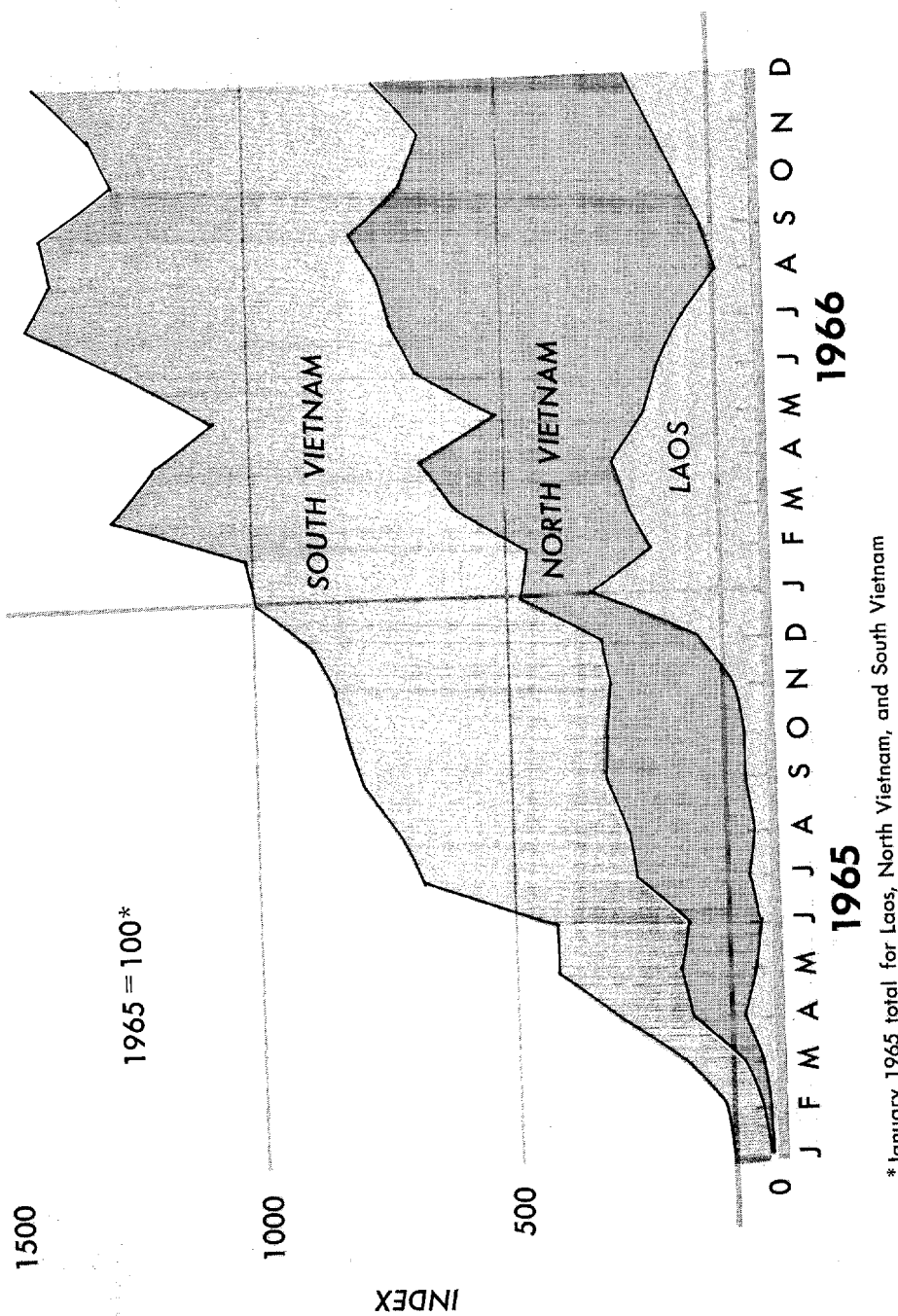
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Figure 2. Value of Military Damage in North Vietnam, by Sector, 1965 and 1966

SECRET

SORTIES FLOWN



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Figure 3. Index of Sorties Flown in Southeast Asia and Relative Amounts in Each Area, 1965 and 1966

25X1

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