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BOMB DAMAGE INFLICTED ON NORTH VIETNAM  
THROUGH APRIL 1967

Summary

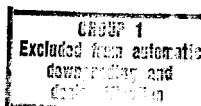
Through the end of April 1967 the US air campaign against North Vietnam -- Rolling Thunder -- had significantly eroded the capacities of North Vietnam's limited industrial and military base. These losses, however, have not meaningfully degraded North Vietnam's material ability to continue the war in South Vietnam.

Total damage through April 1967 was over \$233 million, of which 70 percent was accounted for by damage to economic targets. The greatest amount of damage was inflicted on the so-called logistics target system -- transport equipment and lines of communication.

By the end of April 1967 the US air campaign had attacked 173 fixed targets, over ~~80~~<sup>70</sup> percent of the targets on the JCS list. This campaign included extensive attacks on almost every major target system in the country. The physical results have varied widely.

All of the 13 targeted petroleum storage facilities have been attacked, with an estimated loss of 85 percent of storage capacity. Attacks on 13 of the 20 targeted electric power facilities have neutralized 70 percent of North Vietnam's power-generating capacity. The major losses in the military establishment include the neutralization of 18 ammunition depots with a loss of capacity of 70 percent. Over three-fourths of the 65 JCS-targeted barracks have been attacked, with a loss of about one-fourth of national capacity. Attacks on 22 of the 29 targeted supply depots reduced capacity by 17 percent.

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Through the end of April 1967, five of North Vietnam's airfields had been attacked, with a loss of about 20 percent of national capacity.

North Vietnam's ability to recuperate from the air attacks has been of a high order. The major exception has been the electric power industry. One small plant -- Co Dinh -- is beyond repair. Most of the other plants would require 3-4 months to be restored to partial operation, although two plants -- Haiphong East and Uong Bi -- would require one year. For complete restoration all of the plants would require at least a year. Restoration of these plants would require foreign technical assistance and equipment.

The recuperability problem is not significant for the other target systems. The destroyed petroleum storage system has been replaced by an effective system of dispersed storage and distribution. The damaged military target systems -- particularly barracks and storage depots -- have simply been abandoned, and supplies and troops dispersed throughout the country. The inventories of transport and military equipment have been replaced by large infusions of military and economic aid from the USSR and Communist China. Damage to bridges and lines of communications is frequently repaired within a matter of days, if not hours, or the effects are countered by an elaborate system of multiple by-passes or pre-positioned spans.

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THROUGH APRIL 1967

Cost of Damage

The Rolling Thunder program has achieved significant inroads in eroding North Vietnam's limited industrial and military base. These losses, however, have not been sufficient to meaningfully degrade Hanoi's ability to continue with the war. By the end of April 1967 the air campaign against North Vietnam had inflicted measurable damage to economic and military target systems estimated at over \$233 million. (See Table 1) Over \$165 million -- 70 percent of total damage -- is accounted for by attacks against economic targets. The cost of damage to specific economic and military target systems is shown in Figure 1 and 2.

In value terms, the greatest share of the damage inflicted on economic targets was sustained by the so-called logistics target system -- transportation equipment and facilities, and lines of communication -- which account for 42 percent of total economic damage. Most of the damage to military target systems was inflicted on barracks and airfields. Each of these systems has sustained over \$19 million of damage, for a combined total of over 58 percent of military damage.

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Table 1

Cost of Damage Inflicted on Targets in North Vietnam  
February 1965-April 1967

Million US \$				
<u>Type of Target</u>	<u>1965</u>	<u>1966</u>	<u>January-April 1967</u>	<u>Total</u>
Economic	36.2	93.3	36.2	165.7
Military	32.5	19.1	16.0	67.6
Total	<u>68.7</u>	<u>112.4</u>	<u>52.2</u>	<u>233.3</u>

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Physical Effects

The effect of the bombing program has varied with the intensity of the campaign and the characteristics of the target system under attack. (See Table 2.)

a. Economic Targets

By the end of April 1967 the US air campaign had attacked 173 fixed targets, over 80 percent on the JCS target list. In physical terms the greatest damage has been inflicted on electric power plants and petroleum storage facilities. Thirteen of 20 JCS-targeted electric power facilities have been destroyed with a loss of 131,000 kilowatts (kw) or 70 percent of power-generating capacity. One plant at Co Dinh was so severely damaged that it cannot be repaired. Restoration times for partial operation of most of the remaining plants would be a minimum of four months but would generally require foreign technical assistance. At least two plants -- Uong Bi and Haiphong East -- would require a year for partial operation to be restored. Complete restoration in every instance would require at least one year. Although the North Vietnamese are apparently willing to make the necessary effort when partial operation can be restored within a short time, they appear willing to abandon plants when a major reconstruction effort would be required.

All of the 13 major bulk petroleum storage facilities in North Vietnam have been attacked with a loss of about 85 percent -- 109,000 tons -- of their storage capacity. The North Vietnamese very quickly

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Table 2

Results of Air Strikes Against JCS Target  
Systems in North Vietnam  
February 1965-April 1967

<u>Target System</u>	<u>Number Targets</u>	<u>Number Attacked</u>	<u>Percent of Capacity Des- troyed or Inactive</u>
Power plants	20	13	70
POL storage	13	13	85
Railroad yards	4	3	5
Maritime ports	6	3	-
Bridges	61	52	-
Barracks	65	50	24
Ammo depots	18	18	70
Supply depots	29	22	17
Airfields	11	5	19
Naval Bases	5	3	20

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devised an effective system of maintaining petroleum imports so that they have made no effort to repair the damaged facilities. At the end of April 1967 dispersed storage facilities with a capacity ranging between 65,000 and 80,000 tons had been constructed. Petroleum imports have been maintained at a level sufficient to keep stocks at between 60,000 - 75,000 tons, representing about 100 - 120 days of supply.

Only six manufacturing facilities have been subjected to air attack. We are unable to assess the effects of the attacks on the Thai Nguyen Iron and Steel Combine. Photography covering strikes through 23 April indicates that the production of pig iron may still be possible, if a power source is available. The Haiphong cement plant is currently inoperative but could be restored to operate at about 85 percent of capacity within 90 days. No effort has been made to repair the Nam Dinh textile mill and much of its equipment was dispersed after the first strike in July 1965. Damage to the Viet Tri paper mill was repaired within six months after it was attacked. The Cam Pha coal treatment plant was repaired in even a shorter time. The heavily damaged Lang Chi explosives plant has been inoperable since it was attacked in the summer of 1965. The damage to manufacturing facilities has generally not been severe. They can usually be operable within a few months after attack. The major obstacle to industrial operations in North Vietnam is the lack of electric power which has probably forced most of North Vietnam's modern industry to stop or sharply curtail its operations.

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The remaining economic facilities that have been attacked have not presented significant problems in recuperability. In most cases the loss of capacity has been well under 20 percent and damage has not been severe. Losses of transport equipment have been replaced by imports. Although over 400 bridges have been destroyed or damaged, multiple by-passes have been built for almost every bridge so that traffic is maintained. Bomb damage to lines of communications is generally repaired within a matter of days if not hours after the attack.

#### Military Targets

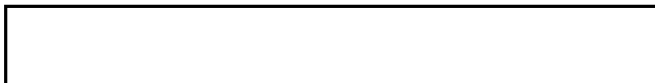
The two military target systems suffering the greatest damage are ammunition depots and barracks. About 70 percent of the capacity of ammunition depots and 24 percent of the capacity of barracks have been destroyed by air attack. The North Vietnamese response to these attacks has been either to abandon the facilities or to implement an extensive program for the dispersal of their military supplies. No other military target system has had its capacity reduced by more than 20 percent. The damage inflicted has apparently been within acceptable limits since no major effort to repair these facilities has been detected. We are unable at this time to assess the impact of the recent strikes against the airfields at Key, Hoa Loc and Kien An. At the end of April 1967 only 19 percent of North Vietnam's airfield capacity has been destroyed or made inactive. The capacity of

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the airfields that have not been attacked is more than adequate to accommodate North Vietnam's small air force. Losses of military equipment have not only been replaced by military aid from the USSR but in most cases -- SAM's, radar, antiaircraft guns -- the North Vietnamese inventory is now significantly greater than it was when the bombings started. With the possible exception of the losses sustained since late March 1967, aircraft losses have also been replaced so that despite the loss of 46 fighter aircraft, the inventory is being maintained at about current levels.

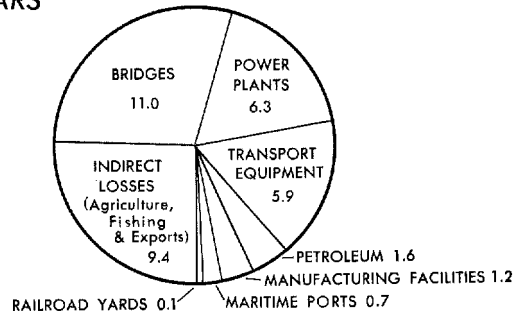
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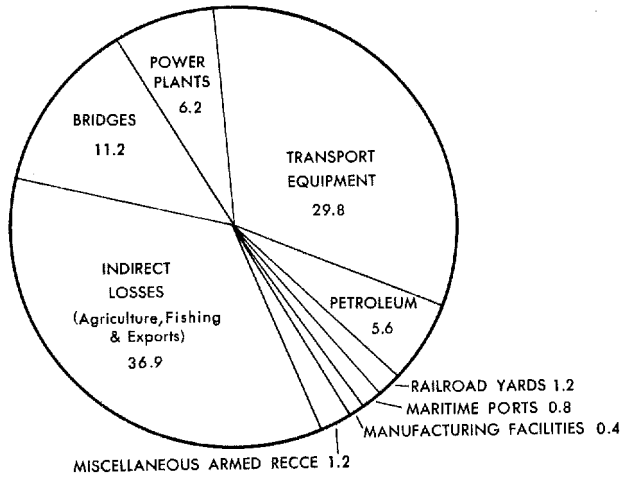
# ECONOMIC DAMAGE

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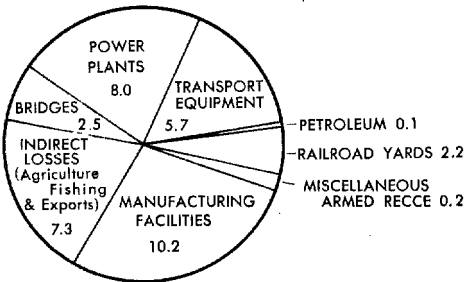
**1965**  
**36.2**



**1966**  
**93.3**



**1967**  
**Jan-Apr**  
**36.2**



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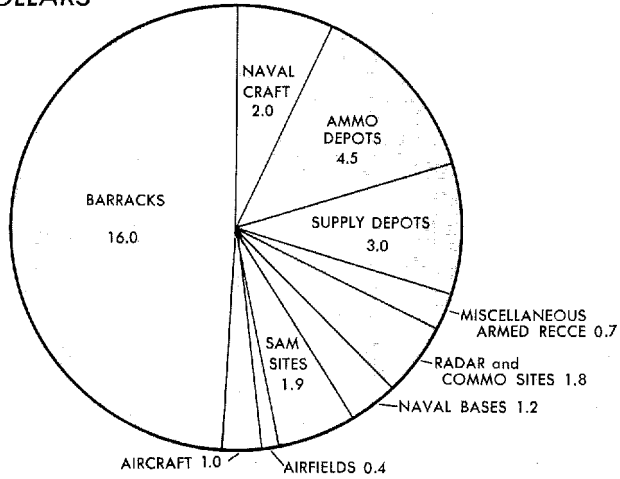
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Figure 1. Value of Economic Damage in North Vietnam, by Sector, 1965, 1966, and Jan-Apr 1967

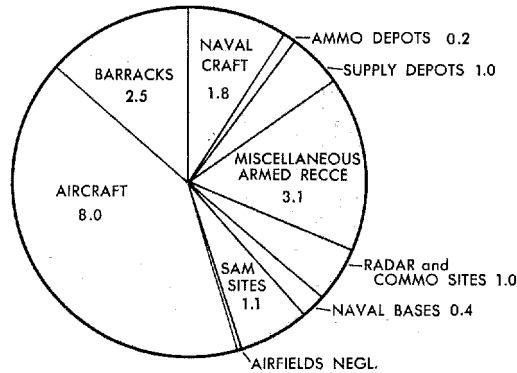
# MILITARY DAMAGE

MILLION US DOLLARS

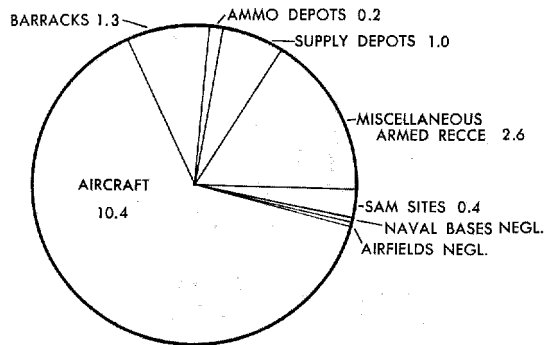
**1965**  
**32.5**



**1966**  
**19.1**



**1967**  
**Jan-Apr**  
**16.0**



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Figure 2. Value of Military Damage in North Vietnam, by Sector, 1965, 1966, and Jan-Apr 1967