

**International Baccalaureate**

**Extended Essay**

**The Failure of the  
German V-Weapon Program  
1943-45**

**Word Count: 3412**

### Abstract

The city of Antwerp, Belgium provides the place and the years 1944 to 1945 provide the time frame for this study in the use of key military weapons. The focus question of the essay asks, "How effective was the Nazi use of the V-series weapon against Antwerp as a method of warfare?" The city of Antwerp is clearly of historical relevance to the V-Series weapons, as Nazi powers used the majority of V-series weapons on this Northern European port and on the city of London, England.

To fully and accurately judge the effectiveness of these weapons, a range of their attributes and consequences were studied and judged. These included the opportunity cost, loss of life, development and production cost, and the failure or success of the mission of the V-Program. The Allies were bent on stopping these futuristic wonder-weapons, while the Axis powers were set on using them to their full destructive potential. Both sides achieved and failed to achieve objectives they had assigned with respect to their defense against or use of the V-Weapons. Evidence surrounding the results of these objectives was drawn from a key German source, General Walter Dornberger, commander of the Nazi rocket development base, and a contemporary Belgian source, historian Koen Palinckx, a resident of Antwerp.

The findings supported that Nazi powers did not use the V-1 and V-2 weapons as effective instruments of war. Indeed, Flemish author Koen Palinckx perhaps best summarized this conclusion when questioned whether the V-Weapons had been successful, he replied, "Absolutely not!"

Abstract Word Count: 254

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The Treaty of Versailles signed after the First World War dictated that Germany was no longer to have any heavy artillery. This was a primary reason why the Germans began to research rocketry and to develop a means of long range bombardment through rockets instead.<sup>1</sup> This is partially why so much interest and effort was put into the project of developing a rocket weapon. An up-and-coming rocket enthusiast attending school in Berlin during the early 1930's was Werner Von Braun. He was to become a key player in the development of German rockets, and in particular, the V-2 rocket. Von Braun joined the Verein für Raumschiffahrt (VfR) and became an early participant in rocket development in Germany.<sup>2</sup> After the rise of the Nazi regime in the early 1930's, private rocket development became illegal. The only way for Von Braun to continue his research would have to be with the military. At this time Von Braun connected with Walter Dornberger, a German artillery officer. Dornberger had appropriate connections and was able to help Von Braun secure a grant. According to Zaloga in V-2 Ballistic Missile 1942-52 Von Braun initially experimented at Kummersdorf and later at Peenemünde, on the Baltic coast.<sup>3</sup> As time progressed Peenemünde became the primary Nazi development grounds for rockets and jets.

By Mid 1942, the German assault had begun to slow across Europe, and what their Führer needed was a weapon with which to strike at a distance, one to be used to hinder the Allied progress through France, Belgium and Germany which would follow. Hitler ordered production to begin on

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<sup>1</sup> Paul Rincon, "V-2: Hitler's Last Weapon of Terror." BBC News September 2004  
< <http://news.bbc.co.uk/1/hi/sci/tech/3634212.stm> > (August 2006).

<sup>2</sup> Tracy Dungan, "Wernher Von Braun" V2rocket.com – The A4/V2 Resource Site Date unknown.  
< <http://www.v2rocket.com/start/chapters/vonbraun.html> > (August 2006).

<sup>3</sup> Steven J. Zaloga, V-2 Ballistic Missile 1942-52 (Oxford: Osprey Publishing Ltd, 2003) 6.

the A-4, later renamed by propagandists as the Vergeltungswaffe 2 (Vengeance Weapon 2), or simply V-2.<sup>4</sup> The V-2 rocket was a serious attempt by the German military to damage the Allied forces on the Western Front during World War II (1944-1945). (see Appendix 4)

Meanwhile a secondary flying bomb was developed as a cousin to the V-2. The V-1, Fieseler Fi 103, or 'buzz bomb', which was propelled by an Argus As 14 pulsejet, would buzz over its intended target until the engine cut out.<sup>5</sup> Then it would subsequently plummet to the earth and detonate. The V-1 in comparison to the V-2 was produced much quicker; being made from simpler parts, and was on average more reliable. Almost six times more V-1s were produced than V-2s by the end of the war.<sup>6</sup>

The city of Antwerp in Belgium received the brunt of the destruction caused by these weapons, much more so than London. (see appendix 2 and 3) Therefore, Antwerp must be considered when determining the effectiveness of this long-range bombardment. The focus question of this essay deals with the objectives given to and fulfilled by the V-weapons, resulting in a judgement of how effective they were as instruments of war against Antwerp. How effective was the Nazi use of the V-series weapon against Antwerp as a method of warfare?

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<sup>4</sup> Eric Boyles and Mark Largent, "The German V2," The Race for Space (University of Minnesota, 1998) 9 <[http://www1.umn.edu/scitech/assign/space/preww2\\_v2.html](http://www1.umn.edu/scitech/assign/space/preww2_v2.html)> (August 2006).

<sup>5</sup> About, Inc. , "V-1 flying bomb." AllExperts. March 2005 <[http://experts.about.com/e/v/v/V-1\\_flying\\_bomb.htm](http://experts.about.com/e/v/v/V-1_flying_bomb.htm) > (August 2006).

<sup>6</sup> Todd J. Schollars, "German Wonder Weapons: degraded production and effectiveness". FindArticles. 2003 <[http://www.findarticles.com/p/articles/mi\\_m0IBO/is\\_3\\_27/ai\\_111852898/pg\\_1](http://www.findarticles.com/p/articles/mi_m0IBO/is_3_27/ai_111852898/pg_1)> (August 2006).

To accurately assess the effectiveness of the Nazi use of V-weapons against Antwerp, their objectives must first be taken into consideration. Economic considerations, collateral damage and unplanned side effects must also be taken into account.

Walter Dornberger's [V2](#), Tracy Dungan's website [V2rocket.com – The A4/V2 Resource Site](#) and the personal interview with Belgian author, Koen Palinckx, all provide invaluable insight into the issue at hand. The question is undoubtedly open to interpretation. Indeed there were conflicting sides fighting in the war, and there were also conflicting opinions about the use of the weapons. Naturally, both sides would boast about their ability to inflict harm on the other, as was common in propaganda. Many German posters depicted burning cities under the flame of the V-1 or 2, emphasizing its destructive powers.

Some sources say the V-1 and 2 were created primarily as a weapon to turn the tide of the war, one so technologically sophisticated and powerful that it would give back the edge the Germans enjoyed back in 1939. In an attempt to save Germany, the V-Weapons were focused entirely on the Western Front, in the hopes that peace could be sued with America and Britain, so that all of Germany's resources could be focused on defeating Soviet Russia. We know now that the Western Allies defeated the Nazis, but by how much did the V-Weapons impede their progress? Or did they burden the Nazis more than it did the Allies?

Antwerp, eighty kilometres from the North Sea on the River Scheldt, has often been a subject of attention among warring European states. After being liberated by Allied troops on September 4, 1944, the Germans realized its potential as a key Allied port for the ferrying in of supplies for the war effort.<sup>7</sup> They did just this; the Allies had Belgian dock workers in Antwerp paid to stay and

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<sup>7</sup>Max Hastings, [Armageddon: The Battle for Germany 1944-45](#) (New York, NY: Vintage Books, 2005) 197.

man the port as the city was put under continual attack from the air. Eventually, 9,000 dock workers, all Belgian Citizens, worked daily in the port unloading equipment and supplies with the Allied troops.<sup>8</sup> It was the vital importance of the port to the Allies that led the Germans to attempt a re-capture during their Ardennes offensive of 1944.<sup>9</sup> The port itself within the city was the intended target of the rockets and drones. However, guidance systems of the 1940s became renowned for their wild inaccuracy. The gyros and timers installed in the V-Weapons made sure that they could hit a target about the size of a city, so even without hitting the port, the city would suffer indirectly. The majority of shots fell on the city centre, yet the port was not left unscathed. At times hangars would be laid to waste or fires would start as a consequence of the bombs hitting their intended target, even ships were not immune to the destructive force of the warhead-tipped rockets. However, the flow of supplies through the port city of Antwerp and Liege were affected only in limited ways, and were not at all put out of action.

There was in fact a limited scope of aerial defense measures. The V-2, coming back down to earth at a supersonic speed, was unstoppable by contemporary standards. The V-1 however flew in a straight path with unvarying speed, which made it an easy target for anti-aircraft guns. Its low altitude aided in this, as well as its inability to avoid hazards led to barrage balloons bringing down more. Eventually after these techniques were improved, the percentage of V-1s dropping on London and Antwerp decreased dramatically. However, 22,000 men alone were required

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<sup>8</sup> Tracy Dungan, "City of Sudden Death," [V2rocket.com – The A4/V2 Resource Site](http://www.v2rocket.com). Date unknown. < <http://www.v2rocket.com/start/chapters/antwerp.html> > (August 2006).

<sup>9</sup> Gregory Kennedy, [Germany's V-2 Rocket](#). (Atglen, PA: Schiffer Military History, 2006) 79.

to maintain and operate Flying Bomb Command Antwerp X; the shield of anti-air batteries surrounding the port city of Antwerp.<sup>10</sup> Since the V-1 was intended to hinder the Allies, it did just this, whether it was actual physical destruction, logistical disruption, or a drain on resources for the Allies.

However, in his book "Antwerpen Onder de V-Bommen 1944-1945", or "Antwerp under the V-Bombs 1944-1945", Koen Palinckx considered as to whether the entire V-Project had been worth it. He summarized his entire argument into two words, "Absolutely not".<sup>11</sup> (see Appendix 1) His justification for this straightforward answer was that the V-Weapons were intended by Hitler and the Nazi Generals to replace the dwindling might of Germany's airforce, the Luftwaffe. Naturally, the rocket's purpose had not originally been intended to replace the airforce, but to augment the artillery groups. Indeed, as an airforce replacement, the V-Weapons compared poorly to allied strategic bombing campaigns over Germany. As Forest Brown stated in "The Story of Antwerp X", the tonnage of bombs dropped on Antwerp during the 154 day bombardment was equal to the amount dropped on Berlin in 3 minutes, although this claim can be disputed.<sup>12</sup> After all, "The Story of Antwerp X" was published by the United States military.

Although there were impacts in Antwerp without incident, the V-Weapons sometimes fell on much more important targets. The Rex disaster was one of these occurrences. Hundreds of young men and women were killed when a V-2 made a direct hit on the theatre complex roof.

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<sup>10</sup> Koen Palinckx, Personal Interview, Trans. Nickolas Oberg. August 18, 2006.

<sup>11</sup> Forest E. Brown, The Story of Antwerp X. (Cherbourg: 50 AAA Brigade, U.S. Army, 1945) 4.

<sup>12</sup> Brown 31.



Among them were American and British soldiers.<sup>13</sup> These random hits reinforced the terror image of the V-Bombs, giving it that propaganda factor which the Nazis always encouraged. Koen Palinckx confirmed the disruption caused by the V-Weapons, but indicated that their use was an overall failure. Since there was no longer a guarantee of safety in the port, it became impossible to move delicate supplies such as guns and explosive ammunition through. Troops were included in the list, because if a lucky V-1 or 2 were to destroy such a shipment, the ensuing damage would be severe. This resulted in all the sensitive supplies having to be redirected through other ports (*e.g.* ports in Normandy in France).<sup>14</sup> Figures of the time indicate the port of Antwerp was not operating near to full capacity. This redirection resulted in the wasting of fuel for transport, as well as unnecessary delays and the immense logistical effort required in maintaining these stretched supply routes.

However, the V-Weapons brought their share of troubles to the Germans as well as to the Allies. The project itself had over 12,000 working at Peenumünde at its height, as well as thousands more working as forced slave labour to produce the rockets in the underground production facilities at Mittelwerk, Wiener Neustadt and Friedrichshafe.<sup>15</sup> This extraordinary example of manpower was comparable to that of the Manhattan project in size and scope. Money as well as people, was piled into the project.

Millions of Reichsmarks were used to fund the development and eventual construction of the missiles and flying bombs. Had the Nazis invested this many in the more traditional methods

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<sup>13</sup> Tracy Dungan, "City of Sudden Death " [V2rocket.com](http://www.v2rocket.com) – [The A4/V2 Resource Site](http://www.v2rocket.com). Date unknown. < <http://www.v2rocket.com/start/chapters/antwerp.html>> (March 25, 2006).

<sup>14</sup>Koen Palinckx, Personal Interview, Trans. Nickolas Oberg. August 18, 2006.

<sup>15</sup>Neufeld, Michael J., [The Rocket and the Reich](#). (The Free Press: New York, NY, 1995) inside cover.

of warfare such as the production of tanks and planes to combat the ever increasing amount of enemy armies, they could have theoretically made a much larger impact on the outcome of the war.

John Walker's article on rocket production costs provides the following information:

*V-2 Rocket Production Information*<sup>16</sup>

<i>Total Number of Rockets Built</i> . . . . .	6 240
<i>Total Number Launched</i> . . . . .	3 590
<i>Successful Launches (81%)</i> . . . . .	2 890
<i>Failed Launches (19%)</i> . . . . .	700
<i>Total Expenditures on Rocket Development</i> . . . . .	\$ 2 Billion USD
<i>Development Cost Per Rocket</i> . . . . .	\$ 350 000 USD
<i>Manufacturing Cost Per Rocket</i> . . . . .	\$ 43 750 USD

At a cost of 250,000 Reichsmarks, four German Tiger tanks could be produced for every V-2 Rocket. One rocket cost approximately 1,000,000 Reichsmarks.<sup>17</sup> Since the number of V-2s built was just over 6000, theoretically 24,000 Tiger tanks could have been made if the industrial and military capacity to build and crew them existed. Since only 1,350 Tiger 1 tanks were produced during the war, it can be seen more Tiger tanks could have provided a substantial boost to German ground forces.<sup>18</sup> Alas for the Germans, the money was figuratively lost on the production of the V-Weapons.

As well as providing a financial difficulty for the Germans, the V-Program ensured bitter competition between the different sections of the German military, each trying to gain control of

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<sup>16</sup>Walker, John. "A Rocket a Day Keeps the High Costs Away," Index Librorum Librorum September 27, 1993. <<http://www.fourmilab.ch/documents/rocketaday.html>> (August, 2006).

<sup>17</sup>Walker.

<sup>18</sup>Trueman, Chris. "Tiger Tank," History Learning Site September 27, 1993. <[http://www.historylearningsite.co.uk/tiger\\_tank.htm](http://www.historylearningsite.co.uk/tiger_tank.htm)> (August 22, 2006).

the prodigious project all for themselves while outdoing the others.<sup>19</sup> Especially in the case of which V-Weapon would be used, creating an intense rivalry between the scientists at Peenemünde (developing the V-2) , and the airforce (developing the V-1). Eventually, both were used. Even though, precious time and focus were lost on this useless feuding. With respect to the port of Antwerp, it should also be noted that the vast majority of V-1s and V-2s were inaccurate to the point that they ended up far from their intended target, the port itself. So despite causing the disruption of trade and traffic through the city, the bombs were not able to meet Nazi objectives which were to render the port of Antwerp completely useless to the Allies. With respect to this objective the bombs failed decisively.

Hence, it can be deduced that the V-Program held both pros and cons for Nazi Germany. There are mixed opinions as to whether the cons outweigh the pros or vice versa. Most historical accounts, however, claim that the V-Program was either not worth it or completely ineffective. General Walter Dornberger himself expressed his feelings about the rocket:

*It will be said that we should have produced more fighters and bombers instead of the A4 (V2). The reproach is a foolish one and can easily be refuted. . . . The rocket will be stigmatized as too expensive. This objection, too, merely obscures the issue.<sup>20</sup>*

Yet he finally concedes that:

*Only one thing can be said with absolute certainty: the use of the V2 may be aptly summed up in the two words: 'too late'.<sup>21</sup>*

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<sup>19</sup>Neufeld, Michael J., *The Rocket and the Reich*. (New York: The Free Press, 1995) inside cover.

<sup>20</sup> Dornberger, Walter, *V2*. (Stratford Place, London: Hurst and Blackett, 1954) 255.

<sup>21</sup> Dornberger.

Dornberger, unlike many others, asserted that there were both positive and negative aspects to the project and the weapon. Yet he argued that had the situation been different, the weapon could very well have won the war. Dornberger noted a shortsighted vision by German military leadership along with a lack of understanding of technical issues concerning the rocket as primary reasons for program failure.<sup>22</sup>

Propaganda wise, the V-1 and 2 had been successes for the Germans. Much like in the Battle of Britain, the Nazis, with the V-Weapons, attempted to use overwhelming air power to crush enemy resolve, forcing surrender. During the Battle of Britain, however, it is reported that an anti-Nazi sentiment was created, hence the Nazi propaganda plans backfired. Whether the same effect reoccurred with the use of V weapons is open to debate. What did indeed happen, was that the Nazi cause did gain a morale boost, while their adversaries did suffer psychological setbacks. The German troops and people were inspired by the perception that their nation was technologically superior to the Allies, and that with such wonder weapons they would undoubtedly win this war. It was important for the Germans to gain a psychological edge since the Nazi retreat across Eastern Europe coupled with the Allied landings in Normandy had created a blanket of defeatism over the once proud Germans. Open opposition to the government formed. By combining an offensive in the Ardennes along with the V-Weapons in Antwerp and London, that feeling of optimism was briefly regained by the Nazis.

The actual damage that was caused by the missiles paled in comparison to the Allied strategic bombing campaigns over Germany later in the war. In Antwerp and London, the terror and disruption caused was actually greater than physical damage. Thousand of houses were destroyed,

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<sup>22</sup> Dornberger.

thousands were killed, yet these seemingly impressive numbers are emphasized simply due to the weapon's futuristic qualities. Hitler himself stated that the rockets could only create that desired decisive effect if they were used 5000 at a time. This was a questionable strategy, as it was impossible to store a single rocket for several days without sensitive equipment aboard breaking.<sup>23</sup>

The cost of the V-2 project was impressive. What the Allies invested in aerial defense and countermeasures ended up far from the \$2 Billion USD total used for the V-2 Project. If the cost of the V-1 program were included, then the difference in spending is even greater. Financial evidence indicates that the Germans lost out on this facet of their military arsenal.

A comparison between the manpower that went into the project, and the manpower to stop the V-Bombs, is not a clear-cut situation. The Nazis employed thousands of laborers from nearby concentration camps for the construction of the rockets while the Americans sent their anti-aircraft units from the front to defend Antwerp. The workers used from the concentration camps, had they not been busied with the continuous construction of the rockets, would theoretically have been used for some other form of menial labour. They were of lesser value to the Reich than the AA units were to the Americans. However, the American anti-aircraft units now unable to support their comrades in the front may not have actually been as needed as is thought; the Allied air superiority at the time ensured the Luftwaffe was never again able to make decisive strikes en masse.

The advanced minds of the German scientists, unlike the American troops and POW slaves could have been used in other fields of war related research, and thereby benefited the other

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<sup>23</sup> Dornberger.

advanced weapons programs which received at times less attention than was required. The too-late Nazi jet fighters were such an example, where not enough attention was invested into the project to allow it to make a significant impact on the war. It can therefore be concluded that with respect to the usage of manpower for and against the rocket, the Germans lost out significantly.

German, Belgian, American and British sources were used during the course of this extended essay investigation. Within each of these categories lay the subcategories of the different arguments that were made surrounding the practicality of the V-Weapons, as well as the time the source was created. What appears to be a common trend among contemporary sources made during or shortly after the war can be noted. Frequent reference to the technological superiority of the weapons and the impressive counter defense (i.e. the accomplishment of shooting them down by the Allies) was noted. Clearly the novelty of these weapons resulted in most historical accounts being in some part effected. This may have led historians to draw conclusions that were one-sided. These interpretations would generally reflect that had the V-Weapon been used elsewhere or earlier, the war could have turned in the Germans favour. The fact that some sources were German intensified this notion, in part to do German reluctance to accept defeat at the time. Such was the case in Dornberger's V2 and Brown's The Story of Antwerp X. Since modern sources now enjoy the benefit of hindsight they are able to more holistically judge past events. The modern sources used in this essay offer more of a consensus between themselves, despite coming from different nationalities. Koen Palinckx, a Belgian national, came to similar conclusions made by British and American sources; the V-Weapons used in any situation could not have won the war alone, yet could very well have aided in victory.

The random incidence of military and civilian death over Antwerp and London eventually turned into a mere trickle as allied advances all across Europe forced V-Weapons onto different targets. Casualties in Antwerp and London consequently diminished. Without a doubt the coming of the V-Weapons brought about great difficulties for the *Germans*. For a device to be defined as an effective weapon of war, it would have to meet certain criteria. For example, weapons would have the potential meet their intended goal, and would also have to cause more trouble to the enemy than to the Nazi cause. Only one of these categories was partially met, the terror following the rockets into the ground spread successfully. Simply stated though, the V-Weapons were not launched in sufficient number, and neither did they crush enemy morale up to the point of surrender. What they did do however, was serve their propaganda roles as wonder weapons. Furthermore, they inadvertently accelerated Germany's downfall as precious resources were taken away from more traditional weapons of war. Hence, it may be thought that the V-1 flying bomb and V-2 rocket could be described as counter productive instruments of war with respect to the Nazi cause. While they hindered enemy advancement on the western front, they did little to halt or reverse the Allied push to Berlin. The V-rocket production distracted the German arms production facilities from what could be described as what really mattered, Antwerp continued to function as a port city and thrives even today.

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**Other**

Palinckx, Koen. Personal Interview. Trans. Nickolas Oberg. August 18, 2006.

## Appendices

### Appendix 1

#### **Partial Koen Palinckx Interview Transcript:**

18 August, 2006  
Villapark 4, Ekeren, Belgium

N.O.: Why was Antwerp the target of the V-Bombs?

K.P.: In one objective, "the harbor." As a strategic target Antwerp had something important to offer. If we go back to the time of Napoleon or even further back we can see it has always been a place that attracted military leaders because of its strategic position. After the rapid liberation of Belgium in the September days of 1944, faster than the Germans expected, the harbor fell into the hands of the Allies, intact. This became a nuisance for the Germans because of the port being so far inland, the advantage of the port. It meant transport from and to the harbor would take less time. The Germans knew that it was the biggest and closest port to Germany, the biggest on the continent, which could immediately be used. It could be used to increase the speed of the march towards Germany for the allies. Until this point all the tiny harbours in Normandy had been used to transport material to the troops on the front line.

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This was a logistical advantage for the Americans and British fighting the Germans. The Germans realized they would have to destroy the harbor, or hinder any harbor activity. The city of Antwerp itself was not in itself the target. The inhabitants received terror from the weapon explosions, as well as the reduction of troop morale. The news would undoubtedly get around and so it was therefore a sort of terror propaganda. An instrument to show the rest of the world that Germany was not yet out of the fight. So it was a psychological weapon as well as a tool for flattening the harbor.

N.O.: You've talked about the various effects the V-Bombs have had on the city, terror, moral, destruction, what was the primary effect on Antwerp for you?

P.K. : On Antwerp itself, the terror of course. It became a completely dead city in this period. From November 44 to March 45 you have to imagine that public life ground to a halt. People were very impressed with Nazi use of these new weapons. That effect was enormous. If you interview people from that period there's a great impact still remaining . . . for example, the sounds of the explosions. For the Belgians as a whole it was mainly the terrorizing affect that had the impact. The harbor became a restricted military zone

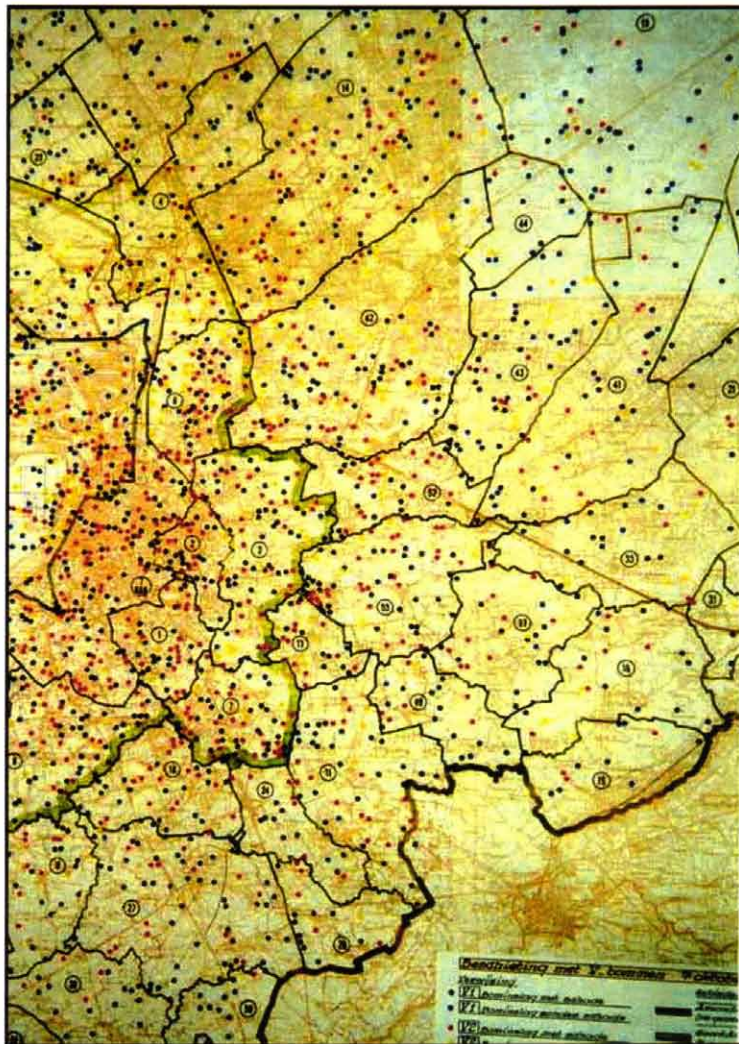
...

If you look at it as a whole, then it was contrary to what most authors have to say about the strategic use of the weapons. The concept that the weapons came, too late is not true. If you look at the numbers of the capacity of the harbor in that time, the tonnage potential, and what actually was unshipped then you can see the slowing affect the weapons had on Allied logistics.

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Palinckx, Koen. Personal Interview. Trans. Nickolas Oberg. August 18, 2006.

**Appendix 2 – A map with legend of the ‘fall of shot’ of V1 and V2s**



"City of Sudden Death." V2rocket.com – The A4/V2 Resource Site. 1999.

Viewed March 2006. < <http://www.v2rocket.com/>>.

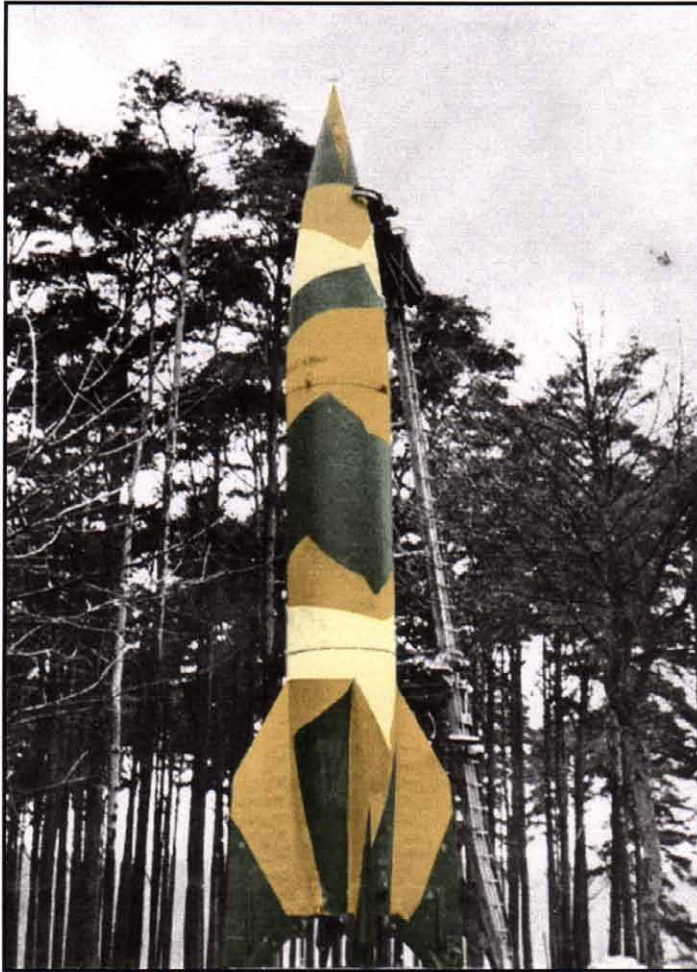
**Appendix 3 – The Destruction caused by a V-2 impact**



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"City of Sudden Death." [V2rocket.com](http://www.v2rocket.com) – The A4/V2 Resource Site. 1999.  
Viewed March 2006. < <http://www.v2rocket.com/start/chapters/antwerp.html>>.

**Appendix 4 – A V2 rocket before launch (color added artificially)**



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"Markings / Colors / Camouflage" [V2rocket.com](http://www.v2rocket.com) – The A4/V2 Resource Site. 1999. Viewed March 2006. < <http://www.v2rocket.com/start/makeup/markings.html>>.