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Airborne Troops as a Tactical and Operative Military Revolution

by Tal Tovy

In 1898, Jan Bloch published six volumes dealing with future warfare entitled The Future of War in its Technical, Economic and Political Relations. The book examines military technological developments and the techno-tactics at the end of the 19th century.[1] As we know from history, about 15 years after the publication of the book the First World War broke out and Bloch's predictions about future warfare were almost exactly realized. But his perceptions regarding this were not accepted by his contemporaries, especially not by the senior military officers in Germany and France.[2]

The character and range of the war surprised the higher military command of all the countries that participated in the war, which led especially on the Western front to a state of immobility.

Bloch was not the only one who foresaw the changes in the future battlefield. For example, already in the 1880s, General Sheridan, the commander of the American Army, envisioned the new character of war operations that would constitute the main methods of warfare on the Western front in Europe during the course of the First World War. From an analysis of the American Civil War (1861-1865) in which he had participated, and of the Franco-German War (1870-1871) in which he served as an observer, Sheridan claimed that the rival armies would protect themselves in dugouts and that any side that tried to go out on a direct frontal attack against enemy lines would be destroyed. Sheridan's estimate was derived from the understanding that improvements in firepower, in the rate and precision of firing, made war far more lethal and destructive.[3]

As said before, most of the senior officer rank in Europe failed to understand the changing nature of warfare as a result of technological developments at the techno-tactical level. The immediate intellectual challenge was to comprehend the future aspects of warfare in connection with the rapid technological changes. Today the commonly accepted term for this process is Revolution in Military Affairs (RMA).

Research in military history has proved that in many cases it was these new technologies that changed the nature of warfare. Whichever side was wise enough to develop new

[1]Walter Pintner, "Russian Military Thought: The Western Model and the Shadow of Suvorov", in: Peter Paret (ed.), *Makers of Modern Strategy: From Machiavelli to the Nuclear Age* (Princeton: Princeton University Press, 1986), 365-366.
[2] Azar Gat, *The Development of Military Thought: The Nineteenth Century* (Oxford: Clarendon Press, 1992), 110-112.
[3] On technological developments at the end of the 19th century and the beginning of the 20th century, see: Robert A. Doughty and Ira D. Gruber, *Warfare in the Western World*, Vol. 1*: Military Operations from 1600 to 1871* (Lexington Mass.: D.C. Heath and Company, 1996), 495-500. On the influence of technological developments upon strategy and tactics during the 19th century, see: William McElwee, The Art of War (London: Weidenfeld and Nicolson, 1974), 106-146.

technologies and to integrate them into new warfare doctrines had a decisive advantage. This article attempts to claim that the operation of airborne forces during the Second World War was a military revolution at the tactical and operational level. The basis for this claim is that the activation of airborne forces led to an essential change in the perception of the concept Line of Communication (LOC). The article will first examine the sources for the use of the concept RMA and the classical aspect of the concept LOC. This is in order to provide a theoretical dimension for the examination of historical test cases. Following this, through a discussion of a number of airborne campaigns that were conducted during the Second World War, the article will exemplify these tactical and operational changes in the LOC concept.

The geophysical nature of the LOC concept constituted a paradigm for thousands of years. From the middle of the 18th century extensive theoretical literature on the subject began to be written. By an analysis of paratroop operations during the Second World War we shall try to determine whether this new operational perception was able to undermine the basic foundations of the classical LOC paradigm.

During the war, a number of airborne campaigns were carried out in all the war arenas and in the various forces. A study of geographical distribution shows that most of the campaigns including the largest ones (at the division level and above) were carried out in the arena of Western Europe first by Germany and later by the United States and Britain, and therefore the article will be focused on an analysis of the campaigns in this arena.

Historiography concerning the operation of paratroop forces during the Second World War deals mainly with the military dimension. This means their practical activation in the various battlefields and an analysis of the success or failure of this or that operation. Therefore one may divide the research literature on paratroop forces into two main groups. The first group consists of discussions about those operations in the framework of a general discussion about the military history of the Second World War. The second group consists of studies that deal only with a discussion and analysis of operations in books that are focused only on paratroop operations. This literature does not take into account the activation of paratroops during the Second World War as a tactical revolution. An additional group is the memoirs of paratroopers at all levels of command. In this literature one can find in greater detail the training techniques and battle tactics of the paratroop forces and are therefore of great value in understanding the operational nature of those units.

RMA and LOC

In course of human history a number of revolutions have occurred that had far-reaching influences on human society in all its various aspects, such as the crank handle, gunpowder, mass recruitment, the armored corps operations during the Second World War, and nuclear arms.[4]

The concept RMA became an accepted neologism in the corridors of the Pentagon from where it entered military studies in the 1990s. It may be asserted that this concept has two origins. The first is theoretical and the second is historical. The theoretical origin of the term was the discussion held in the Soviet Union during the 1970s and the beginning of the 1980s. Soviet

[4] A number of books have been written on the issue of technological influence on war and warfare. Worthy of notice are: Bernard and Fawn Brodie, *From Crossbow to H-Bomb* (Bloomington: Indiana University Press, 1973); William H. McNeil, *The Pursuit of Power: Technology, Armed Forces, and Society since A.D. 1000* (Oxford: Basil Blackwell, 1983); Martin van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: The Free Press, 1989); Christopher Bellamy, *The Evolution of Modern Land Warfare* (London: Routledge, 1990).

military thinking claimed that as a result of decreased political-military utility of nuclear weaponry and in view of the improvement in the combat abilities of the new and advanced technologies over those of conventional arms, a military revolution was occurring. This conclusion was reached by the Russians from the lessons learned in the Vietnam War and the Yom Kippur War in which massive use was made of precision-guided missiles (PGM). They laid emphasis on three technological developments that they thought were to be found only in the possession of the United States and were the basis for the military revolution: the high covert ability of warfare platforms (stealth), cruise missiles, and the PGM.[5]

The second origin is the historiographical debate on the gunpowder revolution and its influence on history.[6] The first to advance the thesis of the gunpowder revolution as a military revolution was the historian Michael Roberts,[7] who claimed that during the 16th century and at the beginning of the 17th century four changes could be distinguished from the warfare conducted in medieval times. These four changes were: superiority of infantry armed with muskets over cavalry and infantry armed with spears; significance increase in the size of armies, mainly in musket-armed infantry; the search for the decisive battle; the increasing need for military bureaucracy dealing with logistics. Roberts identified these trends in reform that were conducted by the King of Sweden, Gustavus Adolphus during the Thirty Years War (1618-1648). The sources for the Swedish reforms are to be found in the tactical reforms carried out by Maurice of Nassau during the Dutch war of independence (1567-1648).[8] Until the 1990s the thesis of Roberts was accepted without question. But over the past two decades a fascinating historiographical controversy began with regard to the ideas presented by Roberts. The main gist of the argument was over the tactical-technological nature of the gunpowder revolution, the question being which means and tactics of warfare began the revolution. This issue also led to the problem of determining when the military revolution of the modern age began.[9]

Quite plainly, it may be asserted that RMA brought about changes in the operational paradigm that in its turn created new patterns of military activity that had an influence on the battle and even on the war as a whole. Military thinking in the decades before the French Revolution began to emphasize the integration of geographical knowledge into war plans. The military thinkers of that period, foremost among them Lloyd, Tempelhoff and especially Bülow, claimed that it was necessary to carry out a geographical analysis of a given arena when a

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[5] Williamson Murray and MacGregor Knox, "Thinking about Revolution in Warfare", in: MacGregor Knox and Williamson Murray (eds.), *The Dynamics of Military Revolution 1300-2050* (Cambridge, 2001), 3-4. See also: Andrew F. Krepinevich, *The Military-Technical Revolution: A Preliminary Assessment* (Washington D.C.: Center for Strategic and Budgetary Assessments, 2002), 5-7.

[6] For a brief review of military revolutions in the course of history, see: Michael O'Hanlon, *Technological Change and the Future of Warfare* (Washington D.C.: Brookings Institution Press, 2000), 20-22.

[7] Michael Roberts, "The Military Revolution, 1560-1660", in: Clifford J. Rogers (ed.), *The Military Revolution Debate: Reading on the Military Transformation of Early Modern Europe* (Boulder, 1995), 13-29. The article was first published in 1956.

[8] Doughty and Gruber, *Warfare in the Western World*, Vol. 1, 10-17.

[9] To sum up the controversy and historiographical approaches, see: Clifford J. Rogers, "The Military Revolutions in History and Historiography", in: Clifford J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, 1995), 1-8. See also: Geoffrey Parker, "The 'Military Revolution, 1560-1660': A Myth?", in: Clifford J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, 1995), 37-49; Jeremy Black, "A Military Revolution?: A 1660-1792 Perspective", in: Clifford J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, 1995), 95-111; Jeremy Black, *European Warfare, 1494-1660* (London, 2002), 32-54; Clifford J. Rogers, "The Military Revolutions of the Hundred Years War", in: Clifford J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, 1995), 55-77; Thomas F. Arnold, "War in Sixteenth Century Europe: Revolution and Renaissance", in: Jeremy Black, *European Warfare, 1453-1815* (New York: St. Martin's Press, 1999), 23-44. See also the comprehensive discussion in: Stephen Morillo, *What is Military History* (Cambridge, Polity, 2006), 73-81.

general plans the advance his troops.[10] The military use of geography emerged from the development of cartography that became perfected thanks to the exact method of measurement practiced in the 17th and 18th centuries.[11] During the second half of the 18th century most of Western and Central Europe was covered by a network of detailed and precise maps. These maps did not only provide relevant and exact information of campaign arenas but also became important tools in the planning if campaigns.[12] As a result, military thinking combined strategic planning with geographical terms that described in geometrical schemata the movements of military forces within a geographical expanse.

The main schema was the description of a line that expressed the link between the home base of the army and the front. This line was called the 'line of operations', and later on the 'line of communication'. Along this line the army moved as well as the reinforcements and logistical supply chains.[13] In case of need the army will retreat along this line. Important implications derive from the nature of the operations line. The shortest and most convenient line should be chosen according to circumstances. The line should be drawn so that it is not exposed to the attacks from the wings and if it is too long there is a danger that the enemy would cut the line. Therefore the attacker who wishes to shorten his lines must try to advance his bases. The defender on the other side must maneuver so as to threaten the attacker's line of operations. The outcome of the war is therefore entirely dependent on the choice of the line of operations, its defense or its vulnerability. As said earlier, this article will try to refute the classic paradigm and point out the fact that the use of airborne forces undermines the classic position based on the LOC concept.

Development of Paratroop Forces and the Initial Undermining of the Classic LOC Paradigm

The first practical idea of activating airborne forces on a large scale can already be found at the end of the First World War. In October 1918 Colonel William Mitchell, an Air Force Officer in the Command Center of General Pershing, suggested conquering the city of Metz by an assault from the air rather than by a land maneuver that would cause many casualties. Mitchell's plan involved the parachuting of the First Infantry Division behind the German lines. This attack or vertical envelopment would, in his opinion, cause chaos in the German deployment and facilitate advancement on the ground. Although Pershing gave his consent to the idea, the plan had hardly taken shape before the general ceasefire came into force and the war

[10] On military thinking of that period, see: R. R. Palmer, "Frederick the Great, Guibert, Bulow: From Dynastic to National War", in: Peter Paret (ed.), *Makers of Modern Strategy: From Machiavelli to the Modern Age* (Princeton: Princeton University Press, 1986), 91-119; Azar Gat, *The Origins of Military Thought: From the Enlightenment to Clausewitz* (Oxford: Clarendon Press, 1989), 25-94; Peter Wilson, "Warfare in the Old Regime 1648-1789", in: Jeremy Black (ed.), *European Warfare 1453-1815* (New York: St. Martin's Press, 1999), 69-95; Armstrong Starkey, *War in the Age of Enlightenment, 1700-1789* (Westport: Praeger, 2003), 33-63.

[11] Leo Bagrow, *History of Cartography* (Chicago: Precedent Publishing, 1987), 125-139.

[12] On the integration of maps in warfare, see: Patrick O'Sullivan and Jesse W. Miller, *The Geography of Warfare* (London: Croom Helm, 1983), 18-22.

[13] The most important modern and pioneering study that examines the link between logistics and the conduct of war is that of Martin Van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge: Cambridge University Press, 1977). The book meticulously examines the main European systems beginning with the Thirty Years War (1618-1648) and ending with the Second World War.

ended (November 11, 1918).[14] During the course of the war French forces had already carried out small raids beyond the German lines, but Mitchell was the first to think in terms of parachuting an entire division, and in fact it may be said that the conception of vertical envelopment was born here.

Vertical envelopment can be defined as the circumvention or hemming in of the land forces and deployments of the enemy by means of airborne ground forces parachuted or landed by airplanes behind enemy lines.[15] Vertical envelopment differs from ordinary envelopment (by land or sea) in that the parachuted force and the allied land force are separated from each other by the significant enemy forces. Vertical envelopment can only be tactical, operational or strategic according to the kind of goals that were set up and in accordance with the results achieved by a specific campaign.

In the years that followed the First World War most armies in the world began to examine the idea of activating airborne forces. It may be assumed that behind military thinking in the activation of airborne forces there was wider theoretical speculation in search of a military mechanism to avoid a static dug-in war as the one that had occurred on the Western front during the First World War.[16] The activation of paratroop forces developed in parallel with new warfare doctrines that focused on armored corps maneuvers. These doctrines that went from theory to practice mainly in the Soviet Union and Germany, was based on armored forces that would burst through enemy lines and penetrate deeply into enemy territory while attacking long-range artillery, communication lines, command posts and logistics centers.[17] In this operative framework the airborne forces were supposed to undermine the ability of the enemy to organize by attacking or taking control over crossroads, bridges and airfields. It should be noted that both countries set up a massive paratroop system.[18]

The theory became practice in the early stages of the German invasion of Western Europe.[19] The opening moves in Denmark, Norway and the Netherlands offered enormous

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[14] Gerard M. Devlin, *Paratrooper! The Saga of U.S. Army and Marine Parachute and Glider Combat Troops during World War II* (New York: St. Martin's Press, 1977), 22-23; Michael Hickey, *Out of the Sky: A History of Airborne Warfare* (New York: Charles Scribner's Sons, 1979), 13-14.

[15] In the pre-war years and during the Second World War, three types of airborne forces were used: parachuted troops, infantry transported to the battle field by airplanes, and infantry landed by gliders. The last two methods can be defined in terms current today as air assault. After the war the use of gliders was discarded and from the first half of the 1960s the idea of air assault was based on helicopters.

[16] See: Jeremy Black, *Rethinking Military History* (London: Routledge, 2004), 203-207. For a general review of the military developments in the field of technology and military doctrine during the interim years between the two world wars, see: Williamson A. Murray, "The World in Conflict", in: Geoffrey Parker (ed.), *The Cambridge History of Warfare* (Cambridge: Cambridge University Press, 2005), 315-320; Archer Jones, *The Art of War in the Western World* (Urbana: University of Illinois Press, 1987), 489-497; Robert A. Doughty and Ira D. Gruber, *Warfare in the Western World*, Vol. 2: *Military Operations Since 1871* (Lexington Mass.: D.C. Heath and Company, 1996), 638-646. On the technological developments between the two world wars with an emphasis on land and air forces as RMA, see: Williamson Murray and Allan R. Millett, *A War to be Won: Fighting the Second World War* (Cambridge Mass.: The Belknap Press, 2001), 18-35.

[17] On the integration of paratroops in German military doctrine on the eve of the Second World War, see: Christopher Ailsby, *Hitler's Sky Warriors: German Paratroops in Action 1939-1945* (Dulles: Brassey, 2000), 7-19; Bruce Quarrie, *German Airborne Divisions* (Oxford: Osprey, 2004), 7-12. In this connection it is interesting to note that even France, which had adopted defensive thinking at the strategic level, set up paratroop forces.

[18] On the conceptual development of airborne forces in Germany and the Soviet Union, see: Maurice Tugwell, *Airborne to Battle: A History of Airborne Warfare 1918-1971* (London: William Kimber, 1971), 17-34; David M. Glantz, *The History of Soviet Airborne Forces* (Ilford: Frank Cass, 1994), 1-46. On the eve of the war the Soviet army had a larger number of paratroop divisions as well as infantry divisions that were trained and equipped for parachuting from airplanes. But the Soviets lacked the necessary transport plans to fly these recruits to the battlefield.

[19] The Germans had planned to activate airborne forces during the Anschluss, in the annexation of Czechoslovakia, and also during the campaign in Poland. But these air assault plans were cancelled as a result of the speed in the operational processes.

operational advantages that could be achieved by activating airborne forces. On April 9, 1940 German paratroopers (the Fallschirmjäger) took control over the airport in Åalborg in Denmark. This was the first operational parachuting in history. The Danish airport was the key point in advance of the invasion of Norway. The task of the German airborne forces in Norway was to conquer the airports around Oslo and Stavanger while in Holland and Belgium the task of the forces was to take control over the bridges across the main waterways that protected the Low Countries. Command over these bridges was vital because in case the Dutch and Belgians managed to blow them up, their two small armies could delay and even block the German advance. Although this was defined as a minor effort, an obstruction of this kind might have possibly allowed the French army to react with greater efficiency to the main effort the Army Group A, the invasion of France through the Ardennes. In spite of the success of these operations they were carried out by a small number of forces.

The original German plan for invasion of the West (Yellow Case) set out a maneuver similar to the one carried out at the beginning of the First World War. But in order to avoid the immobility that had prevailed in the previous war, General Kurt Student, commander of the 7th Paratroop Division, began to plan a number of airborne operations that would allow the armored corps to move towards the strategic centers of gravity of Holland and Belgium.

One of the most famous operations in the campaign for the conquest of the Low Countries was the capture of the Belgian fortress Eben Emael that protected the southern part of the Albert Canal. The canal was in fact a fortified waterway obstruction built after the First World War in order to withstand any future German attack on Belgium. In order to overcome this obstruction it would be necessary to take over a number of bridges over the Meuse River and over the canal. If these bridges were not taken it was clear to the German planners that an armored attack would be halted. In order to take the bridges it was first necessary to conquer the Eben Emael fortress that protected the bridges.

The fortress was considered as being impenetrable by frontal attack and was also impregnable against normal artillery bombardment. In case the enemy managed to break through the outer defense lines of the fortress, the adjacent outposts could discharge an artillery barrage on the attackers without injuring the defenders. After lengthy discussions, Student estimated that the fortress had to be conquered by sending gliders to land an advance force of paratroops and infantry on the roof of the fortress. As commander of the operation, he appointed Walter Koch, who after learning what was the strength of the forces in the fortress, decided to carry out the assault at night. The attack on Eben Emael began on May 10, 1940, and by noon on the morrow, after thirty hours of combat, more than one thousand of the fortress defenders surrendered. The Germans lost only six soldiers. A few hours earlier than this, the column of German tanks already began to cross the bridges of the Meuse and the Albert Canal and to move westward towards Brussels.

It should be noted that operations by regular regimental and division forces were also carried out by the Russians and the Japanese. The Japanese operations were similar in their range and the tasks imposed upon them to those that were imposed on the German airborne forces,[20]

However, a number of units from the Seventh Paratroop Division were parachuted into various places as reinforcements. It should be noted that German airborne units were under the command of the Luftwaffe and not army units as in the Soviet Union and later on in Britain and the United States. On the activation of German airborne forces, see: U.S. Department of the Army, *Airborne Operations: A German Appraisal* (Washington D.C.: US Army Center of Military History, 1951), 2-10.

[20] The exception was the German airborne operation to conquer Crete, which will be discussed later on in this article.

which were that a few hundred paratroops were sent to conquer strategic points such as airports and oil refinery installations.[21] The Soviets sent out their paratroop forces into battle firstly as infantry with the aim of filling gaps in their defense system in face of the savage advance of the German tank columns. Later on in the war a number of paratroop operations were conducted mainly in order to break up the logistic supply lines of the German forces.[22]

The airborne operations conducted by the Germans in the spring of 1940 were small in range (up to the brigade level). Nevertheless, even in such operations one can already see the undermining of the classical LOC paradigm. Although the capitals of Holland and Belgium were conquered by ground forces, but these operations were more than merely secondary efforts in the framework of tank maneuvers. The German planning groups understood the strength of the defense and therefore it may be claimed that ground maneuvers were dependent, sometimes critically, on the success of airborne operations, and this formed the basis of operational planning by the Germans. It is true that the conquest of the Low Countries by Army Group B was secondary to the attack of Army Group A. But as said earlier, if the armored division of Army Group B had been blocked by the Dutch and Belgian defense systems this would have allowed the passage of some of the French forces to halt the advance of the German forces invading through the Ardennes. The course of battle itself proves this claim and this is not a case of "what would have happened if…".

This fact becomes outstandingly clear with the drastic change in the German plan to conquer France. The Germans presumed that it would not be possible to break through the Maginot Line and therefore at first there was the 'Yellow Case' plan for the invasion of France through the Low Countries. General Erich von Manstein, the head of Army Group A estimated that the fate of this plan would be similar to what had happened to the German army in the initial months of the First World War. Therefore his plan was to invade through the Ardennes while most of the French army moved northward in order to meet the invasion of the von Bock army on Belgian soil. Again it should be noted that the Dutch and Belgian armies would have been able to halt the German army had the French been able to transfer its forces to block the invasion through the Ardennes. The delay of the Germans in 1914, partly by the stubborn defense of the Belgians and the efficient fighting of the British expeditionary force, allowed the French to deploy their defense lines along the Marne River and to halt the German advance.

I would like now to examine four large operations (from the division level and above) that in my opinion strengthen and exemplify very well the claim that the massive activation of airborne forces in the Second World War constitutes a military revolution at the tactical level, but the results of the operations had an influence at the systematic and even the strategic level.

Crete: Operation Mercury (May 1941)

In the spring of 1941, Germany waged an offensive against the Balkan states, with most of the effort directed at Yugoslavia and Greece. Its mission was to achieve dominance over the central and eastern areas of the Mediterranean, after Italy's failure to do the same. Dominance of the Mediterranean was crucial to continuing the North African campaign. By the end of April 1941, German has taken over the Balkan region, but the most crucial strategic target for

[21] On Japanese airborne operations at the beginning of the Pacific War, see: John Weeks, *Assault from the Sky: A History of Airborne Warfare* (New York: G.P. Putnam's Sons, 1978), 64-67; Hickey, *Out of the Sky: A History of Airborne Warfare*, 133-135.
[22] On Russian operations, see: Glantz, *The History of Soviet Airborne Forces*, 47-73.

controlling the central Mediterranean area was the island of Crete. For the UK, this island was more important than mainland Greece, as the bases on it enabled the Royal Air Force to attack Romania's oil fields. Of course, with the fall of Greece, the island's importance rose. Germany also recognized the strategic importance of Crete and the resultant threat, and began preparing for the conquest of the island. The initial plan, prepared in winter 1941, determined that forces would be parachuted in order to take over airports in Crete, and that an amphibian landing would be the main attack.[23]

However, the destruction of most of the Italian fleet, and the control of the Royal Navy over that part of the Mediterranean led the German planning team to place full responsibility for the mission on parachuted and airborne forces.[24] The final plan was simple but bold: to take over the three airports in Crete by using three types of airborne forces. In the first stage, paratroopers and infantry flown with gliders would take control of the airports. Once control over the airports was achieved and secured, transport planes would land infantry soldiers to reinforce the bridgeheads.[25]

The first day of the operation (May 20) almost ended disastrously for the German airborne forces, but on the evening of that day, the paratroopers managed to hold the three airports, and over the next days the initial attack wave was reinforced with infantry soldiers flown in with gliders and transport planes under close air support by the Luftwaffe. On May 26 approximately 20,000 additional soldiers landed in the Souda Bay, and on May 28 an Italian force landed on the eastern part of the island. In light of the danger of siege, the British command decided to evacuate its forces from the island. The evacuation was completed on June 1, 1941.[26]

The German attack on Crete was an airborne attack, in which the invading army came in from the air, rather than land or sea, and the attack was decided on the ground, with no assistance from ground forces. The main characteristic of the way the German force was used was complete reliance on air transport at the start of the attack. Land means of transport were not used in the attack at all. The complete geo-strategic control of the British Navy of the sea routes to the island of Crete was completely negated by the German vertical envelopment performed on the basis of the parachuted and airborne forces. For Germany, victory in the Battle of Crete was a Pyrrhic victory,[27] but the study of the battle by the British and especially the Americans, and the creation of airborne units in Allied Forces are clear proof of the strategic efficiency of the vertical envelopment.

In September 1941, the American military attaché in Egypt published a summary report for the Battle of Crete in general, and the airborne campaigns in particular. The report was circulated throughout the military, reaching the Secretary of War, Lewis Stimson, the Army Chief of Staff, George Marshall, and the General of the Army Air Force, Henry Arnold. Junior staff officers were convinced that air mobility was critical for the United States, and the

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[23] G. C. Kiriakopoulos, *Ten Days to Destiny: The Battle for Crete 1941* (Brookline, 1997), 14-28.

[24] Gerhard L. Weinberg, *A World at Arms: A Global History of World War II* (Cambridge, 1994), 228.

[25] John Keegan, *The Second World War* (New York, 1990), 161-162.

[26] For a thorough review of the Battle of Crete, see: Keegan, *The Second World War*, 160-172.

[27] Out of 13,000 soldiers parachuted, over 4,000 were killed, and in fact the Luftwaffe's 7th Parachute Division was destroyed. This was the German army's best infantry division. Out of 600 German aircraft, 350 were downed, 170 of them being cargo planes. In the year following the Battle of Crete, General Student, the commander of the German airborne forces, proposed a number of other airborne campaigns, such as the conquest of the Suez Canal and Malta, and blocking reinforcement routes on the eastern front, but the great losses in Crete led Hitler to abandon large scale airborne campaigns.

American army accelerated the creation of airborne divisions, learning from the German case.[28] The most famous of these were the 82nd Airborne Division (All American) and the 101st Airborne Division (Screaming Eagles), elite units that are still in service. The American airborne forces were first used in Operation Torch – the Allied invasion of North Africa (November 1942) – and to a greater degree in Operation Husky, the invasion of Sicily in 1943.[29] In both parachute campaigns, combat teams from the 82nd Airborne Division were used. But all airborne campaigns analyzed and mentioned above were of small range, of up to a division.

Paratroop Operations in the Normandy Invasion (June 1944)

A few hours before the landing of the major part of the Allied forces in Normandy, two American divisions (the 82nd and the 101st) and one British division (the 6th) parachuted into the flanks of the landing area. The airborne invasion was the spearhead of the Allied invasion of Europe (Operation Neptune) and the conception of activating airborne forces reached operational maturity. Before the invasion an operative debate was conducted on the missions that should be imposed upon the airborne divisions. A brief discussion of this debate can teach us about the way in which the airborne forces created at this stage of the war a conceptual change in how future operations should be conducted.

On one side were those arguing that paratroopers should be operated deep in German-occupied France until control of the roads to the west of Paris was seized. This opinion was held by the General of the Air Forces, General Arnold, and especially by the Army Chief of Staff, General Marshall.[30] On the other side were the staff officers in the Planning Headquarters of the Anglo-American Supreme Commander, General Dwight Eisenhower, who argued that a number of small operations behind the immediate German lines of defenses on the canal (the Atlantic wall) should be carried out, meaning that paratroopers should be used as special forces, similar to the raids performed by British commandos behind German lines in North Africa, in order to disrupt the German forces along the front.

Eisenhower's plan was a compromise between both schools of thought, in that it determined that the airborne forces should be used in a concentrated manner in the coastal flanks, so that they would be able to block the transport of German reserves from inland towards Normandy and the landing beaches.[31] Eisenhower's approach stemmed from the characteristics of the German armored force concentration in France. The German defense concept of the Atlantic Wall was a compromise between Rommel and von Rundstedt.[32] While Rommel wanted to fight on the beaches themselves, von Rundstedt argued that the Allies should be allowed a foothold on the beach, and should then be attacked with armored force before their forces had the chance to reorganize. As German intelligence could not exactly determine the landing site (although the conception was that it would be in Pas-de-Calais), von Rundstedt placed the armored forces in the rear, and the coastal fortifications were manned solely by infantry. World War II literature does not answer the question of whether Allied Forces were aware of the

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[28] Edward M. Flanagan, *Airborne: A Combat History of American Airborne Troops*, (New York, 2002)17-32; Leonard Rapport and Arthur Northwood, *Rendezvous with Destiny: A History of the 101st Airborne Division*, (Old Saybrook, 2001), 4-39.
[29] A. N Garland and H. M. Smyth, *Sicily and the Surrender of Italy*, (Washington D.C., 1965), 115, 116-119.
[30] Stephen. E. Ambrose, *D Day, June 6 1944: The Climactic Battle of World War II* (New York, 1994), 91-92.
[31] Dwight D. Eisenhower, *Crusade in Europe* (Garden City, 1948), 240; Ambrose, *D Day*, 92.
[32] Rommel was appointed at the beginning of 1944 as Commander of the Army Group B, and was charged with the protection of the coasts of France, Belgium, the Netherlands and Denmark. Von Rundstedt was the commander of the entire Western front (OB West).

disagreement between the two German Field Marshals,[33] but there is no doubt that Allied intelligence succeeded in locating the German armored force concentration, thus enabling an understanding of the German armored forces and defense system deployment.

Eisenhower himself explains why he chose the method of operation as it was finally executed. He believed that a dispersed use of airborne forces was a waste of resources, and he rejected the notion of deep airborne penetration because of the belief that in the first days, no strong mobile land forces (meaning armored forces) would be able to rendezvous with the paratroopers. Eisenhower also argued that distant operation of airborne forces would not pose a strategic threat to the Germans in France, as they might amass significant firepower and destroy the isolated force. This opinion was held by both General Bradley, Commander of the 1st American Army on D-Day, and General Montgomery, who was the commander of the 21st Army group, and in fact the commander of all invasion forces. With the acceptance of Eisenhower's opinion, the Allies began planning the parachute campaigns. At Eisenhower's disposal were three airborne divisions – the American 82nd and 101st, and the British 6th.[34]

The mission of the 82nd Airborne Division, under the command of General Ridgway, was to take over the town of Saint Mere Eglise, which was a main crossroads in the Contentin Peninsula, and to seize crucial passages across the Merderet and Douve rivers. The mission of the 101st Airborne Division, under the command of General Taylor, was to take over the departure routes from the Utah Beach and protect the south-eastern flank of the beachhead within the landing area of the American VII Corps.

The American sector of the amphibian landing area (Omaha and Utah) was spread over many extensive flooded areas, with few roads. The mission of the airborne forces was also to take control of roads so that the landing armies could use them from the beaches inland. Another mission was to take control of the bridges on the two major rivers of Normandy, thereby preventing the Germans from crossing them in a counter-offensive, which meant that the mission of the two American airborne divisions was to secure the western flank of invasion.

In the eastern flank of the British landing area (Sword) was the best access route for a German counter-offensive. Blocking this flank was the mission of the 6th Airborne Division, under the command of General Gale. The division was ordered to operate in the eastern flank of the landing, and capture vital passages on the Orne River and Caen Canal.

Many books have been written about the invasion campaign and the actions of the paratroopers, and this is not the place to describe the course of the battles themselves.[35] The most important thing is that despite of the difficult problems in parachuting, and the disbanding of organic units into smaller forces, at the end of the first combat day the three divisions reported that they had completed their primary missions. Historical research supports this claim, and the discussion on the heroic fighting of the paratroopers and the success in their mission despite

[33] One of the first attempts to present this dispute was the work by Liddell Hart, *The Other Side of the Hill*. The book, published in 1948, is based on interviews Liddell Hart conducted with German Generals who were held captive by the Allies. On the dispute between Rommel and von Rundstedt, see Liddell Hart, *The Other Side of the Hill*, 242-243.

[34] More on the planning to use airborne forces in the invention to Normandy see: James M. Gavin, *Airborne Warfare*, (Washington D.C.: Infantry Journal Press, 1947), 41-46; Tugwell, *Airborne to Battle: A History of Airborne Warfare 1918-1971*, 204-212.

[35] Of all research, memoir, biography and autobiography books, some of which are mentioned in this work, I wish to point out one impressive book by Stephen Ambrose, which tells the story of one company (Easy Company) of the 101st Airborne Division, *Band of Brothers*. Chapters 4 and 5 detail the fighting by the division during the first month of the invasion.

enemy superiority, are at the center of discussion. But was the operation of the airborne divisions critical? And how does this example serve the hypothesis of this work?

As aforesaid, the mission of the airborne forces was to isolate the landing beach flanks, thereby preventing German armored reinforcements from waging a counter-offensive. Eisenhower claimed that the air force alone could not stop travel in the roads of northwestern France. The example he cited was that of American experience in Italy at that time. On that front as well, the American Air Force had aerial superiority, and roads in Italy were few, but even though the Air Force had launched approximately 1,000 bombing raids a day on the three main German roads, it still could not stop German movement at night. Therefore, a military effort to drive a wedge between the German reserves inside France and the line of defense forces in the Atlantic Wall was required. The airborne operations "skipped over" the German line of defense on the Channel, and managed to isolate the field of battle, which meant that these operations canceled the geostrategic advantage the German defense forces enjoyed. This is another example of the cancellation of the geographic aspect on the strategic level.

Operation Market Garden (September 1944)

During the two months from the Normandy landing until September 1944 the airborne forces acted like infantry troops. The parachute operations that were planned were cancelled mainly because of the rapid American and British advance through France and Belgium that led to the collapse of the German army in the West and its retreat eastward. At the Allied staff headquarters in Western Europe an argument began to develop about the desirable strategy for the final defeat of the German army and the end of the war. The main cause for the argument was the lack of available logistical support in the offensive efforts of two Army groups (the 12th of Bradley and the 21st of Montgomery).[36] After an argument over strategy Eisenhower accepted the plan of General Montgomery, the commander of the 21st Army. His plan was to break through Holland and then to turn eastward and invade the Ruhr Valley which was a German heavy industry center. Another reason was the fact that the Germans were firing V-1 and V-2 rockets from Western Holland and creating widespread destruction in England. Therefore invading Holland would lead to control over the launching sites. Logistically, the allies could not support both plans of action and Eisenhower had preferred a breakthrough on a wide front. But an intensive exchange of correspondence between Montgomery and Eisenhower and the pressure from Britain to eliminate the rocket threat led eventually to the decision of the Commander of the Allied forces in Europe to adopt the "narrow front" approach of Montgomery. A further reason was the desire to make use of the First Allied Airborne Army that had been established on August 2, 1944. This was an operational framework that included all the airborne divisions of the United States and Britain.

Operation Varsity (March 1945)

The importance of vertical envelopment as a military device can also be exemplified in the last airborne operation that was carried out by the Western allies in the European arena.

[36] On the situation on the Western front and the strategic argument among the western allies, see: Murray and Millett, *A War to be Won: Fighting the Second World War*, 437-439; Weinberg, *A World at Arms: A Global History of World War II*, 699-701; Keegan, *The Second World War*, 436-437; Jeremy Black, *World War Two: A Military History* (London: Routledge, 2003), 180-182. On the logistic-operational aspect of the argument, see: van Creveld, *Supplying War*, 216-230.

During the second half of February 1945 the final assault in the West began against Germany. In the framework of this assault, the British and American armies had to cross the Rhine at a number of crossing points. As part of the general assault, 21st Army group was given the task of crossing the river near the German city of Wesel (Operation Plunder). The width of the river at this front ranged between 400-500 m, with a tendency to widen up to 1,200 m. "With this breadth of water to cross" writes Fuller, "the whole operation was organized as amphibious lines – it was an inland water-borne invasion".[37] The plan of Montgomery therefore resembled in pattern to Operation Neptune.

The final plan stipulated the parachuting of two divisions, the British 6th and the American 17th on the eastern bank of the Rhine, parallel with the crossing of the river by the armies. In view of the lessons learned from Operation Market Garden, Montgomery decided that the airborne forces would not be parachuted or landed deep inside the German deployment, with the aim that the ground forces would be able rapidly to join up with the paratroop forces. The aim of parachuting these forces was to support the ground effort of the 21st Army group by taking control over key points on the eastern bank of the Rhine. The mission of the 6th Airborne Division was to capture the cities Schnappenberg and Hamminkeln, to clear some of the forest of Diersfordt of German forces, and to secure the three bridges over the Issel River. The 17th Airborne Division was given the task of conquering the city of Diersfordt and clearing the rest of the forest. From this forest it was possible to overlook the Rhine and aim artillery fire on those crossing over it.

Operation Varsity began in the morning hours of March 24, 1945. The parachuting of the two airborne divisions in a single flyover and in a limited area made Varsity the largest operation in history. Altogether about 16,000 paratroopers were dropped from about 2,000 transport planes and about 1,300 gliders.[38] By noon, most of the parachuted forces had attained the goals that were set for them in the framework of the operation. Contrary to studies that claim the operation was unnecessary and also caused many casualties, there are other studies that determine the operation was vital and constituted a critical component for the success of Operation Plunder. Gerard Devlin asserts forcefully that "the way was now clear for the ground troops to continue their drive deep into Germany".[39]

Operation Varsity can be regarded as a closing of the circle with the plan that Colonel Mitchell had proposed thirty years earlier. Assault from the air over enemy targets with the aim of creating chaos in its rear deployments (but near enough to the front lines) allowed ground forces to move towards the main goal of the operation. Although, as in the case of Normandy and Holland, the airborne effort of Operation Varsity was secondary to the ground effort, yet in all three examples, and certainly in the case of Crete, it was a vital component for the success of the ground effort. It may be asserted that the very idea of activating parachuted forces reflected the doubts in the minds of the planners that the ground operation was not feasible. And thus we may claim that a new understanding had been created that required a change in the operational paradigm.

[37] J.F.C. Fuller, *The Second World War 1939-45* (London: Eyre & Spottiswoode, 1954), 359.
[38] For review of the operation, see: Gavin, *Airborne Warfare*, 131-137.
[39] Devlin, *Paratrooper!*, 616. For further reference to the useful effect of the operation, see: Clay Blair, *Ridgway's Paratroopers: The American Airborne in World War II* (New York: Quill William Morrow, 1985), 465-466.

The four test cases presented above show vertical envelopment operations in which it was attempted to render irrelevant the geographical difficulties and the geostrategic advantages the defender enjoys along the line of operation. These examples also show a method of operation that attempts to cancel out geographical distance and turn the distance between the origin base and the destination into an advantage for the attacking forces. This means that the physical line of contact between two armies and progress routes (line of communications) are no longer the sole strategic point of reference, as the thinkers of the late 18th century determined. Airborne operations and the vertical flank option made the physical line of communication, although still a factor, only another factor, rather than the only factor. As a process, vertical envelopment cancels the geographical constraints of a physical line of communication set by the war zone in the classical paradigm and shifts into a new paradigm.

Discussion and Conclusions

This article has attempted to determine, through a discussion of a series of test cases, whether the classical paradigm relating to the concept of the line of communication has undergone a change as a result of the development of vertical envelopment.

Historical perspective may assist us in understanding processes, and in retrospect one may reach conclusions whether a certain process already included within itself those elements that lead to revolution. From a study of the test cases that have been discussed in the course of this article it may be assumed that airborne warfare or vertical enveloping did indeed include revolutionary elements within it, certainly in a case of high intensity conventional war, in the tactical and operational levels.

The test cases have proved that the use of vertical envelopment was not a substitute for land maneuvers but was operated when such maneuvers were not feasible. This was the case in Crete. In the Normandy and Market Garden cases, the land maneuver was depended on the success of the vertical envelopment. It should be said once again that even though the Market Garden campaign failed, it must be assumed that Montgomery would not have launched the campaign without Allied airborne power as a main adjunct to land advancement.

In other words, during the course of World War II a new campaign methodology was created that began to undermine the classical paradigm based on an essentially physical ground plan of the line of communication. Although the physical aspect has not yet been discarded, military thinking in connection with vertical envelopment in wars of high intensity creates a pattern of action that reduces the physical importance of geography and of geo-strategy.

Vertical envelopment as RMA can also be examined according to the model of scientific revolution proposed by Thomas Kuhn in his book, The Structure of Scientific Revolutions (1962). His main argument was that scientific progress was not based on a gradual and chronological accumulation of data and theories, that is to say in a process of natural emergence, but was achieved through "jumps" or revolutions. [40] In his view, a new paradigm or meta-theory was created when a previous scientific theory found it difficult to explain phenomena that were discovered through scientific research within a specific field. [41] A new scientific theory could appear only when a detachment was felt from the previous tradition of scientific practice and its replacement with a new tradition. Although in his book Kuhn examines revolutions in the field

[40] Thomas. S. Kuhn, *The Structure of Scientific Revolutions*, (Chicago, 1996), 3.
[41] Ibid., 57, 74-75.

of the exact sciences, he claims that scientific revolutions can be found in all the spheres of science. Revolution arises from a feeling within a certain scientific community that it can no longer cope properly with problems in various fields that are derived from science or that the existing paradigm has ceased to function in the investigation of a certain aspect of a scientific field. [42] Thus, according to Kuhn, an innovative theory appears only after the declared failure to solve problems by the presuppositions and theories of the dominant paradigm. The very fact that problems were revealed after solutions had supposedly been found for them creates a perceptual crisis. In other words, the innovation appears with the discovery of difficulties against a background of expectations.

With regard to vertical envelopment, it may be said that the first idea of operating forces beyond enemy lines had been conceived during World War I with the aim of breaking through the deadlock on the Western front. To the same extent one should define the early deployment of the armored corps. In World War II the airborne forces provided executive solutions that classically trained forces could not provide. Crete could not have been conquered by landing forces on its shores because the British Navy controlled the Eastern and Central Mediterranean. The only way to secure the flanks of the beachhead on the shores of Normandy was by parachuted forces.

The idea of setting up airborne forces during the First World War and their practical operation during World War II shows that classically trained forces could not provide operative solutions to military problems. The first notions regarding the establishment of airborne units during World War I were put forward when it became apparent that the infantry was not longer relevant in the battlefields of the Western front that was rife with trenches, barbed wire, sniper positions and mines. Therefore, in accordance with Kuhn's model of scientific revolutions, it may be asserted that the airborne forces constituted RMA. Perhaps it is still too early to eulogize the demise of the classically trained forces, yet as this article has tried to show, the presence and operation of airborne forces undermine the classical paradigm in all that relates to the operation of forces in a conventional war.

The parameters for the definition of RMA are organizational, technological and doctrinal changes leading to a new operational perception that has an influence on the strategic level. These parameters underlie the perception of operating airborne forces and vertical envelopment. According to this model one can determine with certainty when the use of airborne forces began and when vertical envelopment was created, although it is difficult to estimate what other developments might occur and what their long-term influence might be (if at all). Just as the gunpowder revolution has been defined as such only through historical perspective, it may be that the definition of airborne forces as revolutionary will eventually be made in the same way.

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[42] Ibid., 92.