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PLAN

Solly Zuckerman, the unknown of the London Zoo
A new idea of the air ban
Bombing France
An absolute necessity?

TEXTE

- 1 The second most bombed country in Europe during the Second World War, France has long forgotten this tragic page in its history. In a historiography successively marked by the Resistance, collaboration and then the Holocaust, Allied bombings did not find their place. In 2014, on the occasion of the 70th anniversary of the Normandy landings, President François Hollande spoke in an unprecedented way about the French civilians who were the tragic victims of their liberators: “With each wave, despite the warnings, the alerts, the civilians were affected, their houses broken, and the cities themselves severely damaged”.¹ At the same time, a series of works has finally partially filled the historiographical gap, all written by British and American historians, such as Andrew Knapp, Claudia Baldoli or notably Richard Overy.²
- 2 A chapter on the history of Allied bombing of France, however, remained to be further highlighted. The one of 1944, with by far the worst bombings suffered by France of the entire war, in anticipation of the Normandy landings and its Liberation. Many of these strikes were carried out as part of a precisely planned operation, known as the “Transportation Plan”, “Transport Plan” or “Desert Rail”.³ Initially drafted to be limited to the North-West of France, these bombings eventually affected the whole of France, including seventy major cities. Unprecedented resources had been allocated to the implementa-

tion of the plan, including the provision of the two largest US and British strategic bombing Air Forces, the 8th US Air Force and British Bomber Command.

- 3 This “Transportation Plan”, complex in its different levels of purpose is the work of a British scientist little known outside the scientific circles, Solly Zuckerman. Unaware of military art in 1939, not engaged in politics, Zuckerman became in early 1944 the close advisor to Air Marshal Arthur Tedder, himself Deputy to General Dwight Eisenhower, Supreme Commander for Operation “Overlord”. How to explain such an ascent in just four years? What were the real purposes of the Allied air strategy in the months leading up to the Normandy landings? This study deals with the history of the “Transportation Plan” and its mastermind, Solly Zuckerman.⁴

Solly Zuckerman, the unknown of the London Zoo

- 4 Nothing foreshadowed Solly Zuckerman to become the mastermind of the Allied bombing of France in the spring of 1944. Born in Cape Town, South Africa, on May 30, 1904, Zuckerman quickly developed a passion for the natural sciences, especially the apes, whose life styles were little studied at the time. The young man showed a powerful detachment announcing his scientific career to follow. Shortly after the First World War, when South Africa was devastated by the Spanish flu epidemic, Zuckerman wandered the streets of Cape Town among the corpses without a shadow of emotion: “Death as a concept was not one of my concerns”,⁵ he says in his memoirs.
- 5 Solly Zuckerman graduated in zoology in 1926 and left South Africa and his family without a shadow of regret and sailed for London. He became an anatomy researcher at the London Zoological Society, with the opportunity to work on the social behavior of apes, and specialized in the reproduction of baboons. In 1932, the young man became known in the scientific circles thanks to *The Social Life of Monkeys and Apes*, a founding work that almost a century later is still authoritative.⁶
- 6 In parallel to his scientific activities, Solly Zuckerman was deploying his network of relationships in London society. Ambitious, the young

researcher seduced in academic, artistic and political circles, thus gaining recognition. In 1934, at only 30 years of age, Oxford University opened its doors to him as professor of anatomy. In an international context marked by tensions over the Nazis' coming to power, Zuckerman founded a dinner club bringing together the most prominent academics in London society. Guests talked about the situation in Europe, between abundance of dishes and drinks. Among the guests was Frederick Lindemann, Winston Churchill's scientific advisor, and Solly Zuckerman's future bitter opponent on the subject of bombing.

- 7 During club dinners one topic frequently came up: the interest of science for the British army. Zuckerman was convinced of the potential of science to help troops in combat, to reduce casualties and to shorten conflicts. His interest was not limited to the air dimension, of which he is by no means a specialist (Zuckerman never read Giulio Douhet's theses), but to the whole art of war. Moreover, only the scientific prism is likely to guide his reflection, outside of any political consideration. In his memoirs, Zuckerman mentions no interest in this topic, unlike his friend Bernal, a committed communist, who does not fail to attract the attention of the British counterintelligence service.⁷
- 8 The proceeds of the Zuckerman Club's debates were published anonymously in 1940 as a pamphlet: *Science in War*.⁸ Little known in the context of eve of the Second World War, this book nevertheless contained the base of operational research: the scientific method at the service of war. The aim was to make the most efficient use of the means available to achieve the designated objective in the fastest and most cost-effective way in terms of costs and effort. This definition, codified in 1939 by the scientist Robert Watson-Watt, was the basis of the decisive developments made in parallel on the radar.⁹
- 9 In September 1939, like many scientists Solly Zuckerman was approached by the British authorities to bring his expertise to the war effort. The Oxford professor was invited by his friend Bernal to join him at the Ministry of Home Security. This organism was then engaged in research on the effect of blast caused by explosions, then very little known. In the absence of human cases -the bombing of England was still outlawed by Hitler, who still hoped to negotiate a

deal with British government- Zuckerman used his own monkeys as guinea pigs. The animals were placed in trenches, and explosive devices detonated nearby. These first experiments were an opportunity to make a discovery about the effect of breath, which contrary to conventional wisdom does not insinuate itself through the nose, but exerts pressure on the body surface, potentially fatal for internal organs.¹⁰

- 10 In the summer of 1940, the outbreak of the Battle of Britain led to increasingly massive bombing of the United Kingdom. Solly Zuckerman was able to deal without baboons, directly studying civilian corpses and wounded. Two years of research focused on the major cities of Hull and Birmingham allowed him to acquire an unprecedented knowledge of the effects of the bombings. The "Hull and Birmingham" report published by Zuckerman on 8 April 1942 contained several important lessons for the future of his research¹¹. The most significant effect of the bombing on the civilian population was the destruction of housing, rather than the loss of life. However, there was no drop-in morale among the British population, who, on the other hand, showed bravery and unity in the face of peril. This report was forwarded to Frederick Lindemann, the former member of the Zuckerman Dinner Club and now a personal scientific advisor to the Prime Minister Winston Churchill. In contrast to the findings of the "Hull and Birmingham" report, which highlighted the meagre effectiveness of bombs on civil morale, Lindemann persuaded himself to succeed where the Luftwaffe had just failed: to bomb Germany until it capitulates. With 10.000 heavy bombers, Lindemann estimated, it would be possible to target some 60 major German cities, destroying the homes and morale of its inhabitants. Lindemann succeeded in securing the Churchill agreement, which although hardly convinced about the real potential of strategic bombing, needed to send signals of goodwill to Soviet allies desperately calling for help. The Royal Air Force thus began its long and deadly campaign of strategic bombing, against Zuckerman's findings.

- 11 The British scientist, totally unknown in military circles and without any strong support, did not even have the opportunity to protest. Defeated and totally discouraged, Zuckerman chose to leave London. A few days later Zuckerman and Bernal received an invitation from the Chief of Combined Operations, Lord Louis Mountbatten. The Admiral

offered to introduce scientific knowledge to the very source of operational planning, despite the perplexity of some members of his staff. Zuckerman and Bernal were sent to Egypt, where the 8th British Army was fighting, to continue their investigations into the effects of the bombs.

A new idea of the air ban

- 12 In November 1942, Erwin Rommel's offensive broke on the fortified el-Alamein line. The proud German general will never reach the Suez Canal. In the rear area of the victorious British 8th Army, Solly Zuckerman performed his usual field research, analyzing the effects of explosions on equipment and buildings, and studying the documents taken from the enemy. The scientist followed the advance of the 8th Army through Libya to Tunisia, where the Germans established strong defensive lines. Zuckerman, whose innovative research began to attract interest, was then invited to the Allied forces headquarters of US Commander-in-Chief Dwight D. Eisenhower. His deputy, British Air Marshal Arthur Tedder, expressed an interest in the work of the scientist, whom he chose to take at his service as scientific advisor to plan the future allied campaigns. Tedder considered *a posteriori* "a lucky day when he was sent to the Mediterranean, his services being of incalculable value".¹² Zuckerman also met with the head of the US Air Force in Europe, General Carl A. Spaatz, who was also interested in his research. From field analysis, Solly Zuckerman suddenly moved to another undeveloped discipline: targeting. He was the first to be surprised: "One incident after another had turned me into a pioneer in this field of study."¹³
- 13 Following the fall of Tunisia in May 1943, the major challenge for the Allies was to gain a foothold in Italy, a partner in the Axis. Previously, two intermediate objectives were planned to secure the crossing of the Mediterranean: Sicily and first of all the small island of Pantelleria. Solly Zuckerman was responsible for identifying the targets to be bombed in preparation for the landing. The scientist focused in particular on batteries, calculating the number of bombs needed and their predictable effects. Severely bombed for a month, the Italian garrison (certainly demoralized even before the strikes), capitulated without a fight on June 11, 1943. Eisenhower and Tedder were posit-

ively impressed, inviting Zuckerman to continue his work for the next battles.

- 14 On July 10, 1943, the Allies landed in Sicily, seizing the island on August 17 after a bloody campaign. Solly Zuckerman, now having his own investigative team, was at work shortly after the Allied victory. Unlike Africa, Sicily had developed infrastructures including its rail network with the huge Palermo and Maleme railway stations. Zuckerman, who published his report at the end of 1943, was particularly interested in these extensive railway facilities:

The strategic effect of destroying enemy railway communications is best achieved by attacks on large railway centres, containing large repair facilities and large concentrations of locomotives and rolling stock. Secondary targets [railways, warehouses, repair sheds] are highly concentrated targets in these railway centres that are also susceptible to shelling. The high vulnerability of rolling stock to concentrated bombardment is partly explained by the indirect effects of bombs [fire spread], which greatly increase the direct effects.¹⁴

- 15 This report proved decisive for the future of the aerial strategy thinking developed by Solly Zuckerman. To effectively disrupt the enemy's movements, the most effective solution would be to paralyze the railway system, the most economical means of transportation for any modern army. In particular, Zuckerman recommended targeting locomotive hangars and repair shops to deprive the entire network in order to tow convoys. Once the enemy would be deprived of a rail network by this new form of air ban concentrated on major railway stations, it should be forced to use the road system. This would result in a potentially decisive waste of time to cope with the landing, while using equipment and fuel precociously, and exposing itself to air attacks. These elements formed in essence the strategic concept developed by Zuckerman, who called it "Transportation Plan".
- 16 In early 1944, the center of gravity of Allied operations shifted from the Mediterranean to North Europe. The aim was now to regain a foothold in France from England, in order to bring the final blow to the heart of Nazi Germany. General Eisenhower was appointed commander-in-chief of Operation "Overlord", with his loyal deputy Tedder. The latter kept his scientific advisor, Solly Zuckerman, at his

side. In four years, the Oxford professor had moved from the study of apes to aerial planning, directly with the great Allied military leaders. The rest made sense. Drawing his conclusions from the Mediterranean theatre of operations, Solly Zuckerman from now on intended to test his "Transportation" Plan in France.

Bombing France

- 17 Back in his familiar world of London society, Solly Zuckerman prepared in early January 1944 his plan to bomb the French railway network. Seventy major stations were targeted, with a dozen targets in Belgium. The aim was to paralyze the entire railway system of Western Europe, in order to decisively hinder enemy movements after the Allied landings would have taken place in Normandy in the late spring of 1944.¹⁵ This type of air offensive, which today would correspond to so-called tactical, operative or strategic interdiction operations, was still a new and misidentified era, starting with its own author, Solly Zuckerman, who never set foot in a military school. "I myself have never been able to say which was tactical or strategic in the use of air force",¹⁶ he honestly admitted, pointing out his ignorance of the art of war, which, actually, does not bother him in any respect to develop his own ideas.
- 18 Solly Zuckerman's "Transportation Plan" was quickly validated by Arthur Tedder and then decisively by Dwight Eisenhower. The latter intended to gather all the means at his disposal to ensure the success of the Normandy landings: aerial reconnaissance, spying, deception, French Resistance, airborne operations and preliminary bombings. A recent episode also haunted the conscience of the Supreme Commander. In September 1943 a double Allied landing operation had taken place in Italy, Salerno for the Americans, and Calabria for British. Although the latter had met with little opposition, the case had proved highly perilous in Salerno. The American soldiers had been immediately counter-attacked by powerful German armored formations, who had failed to throw them into the sea. Only the intervention of the air force and artillery firing practically point blank had made it possible to stop the attackers from the ground. For Eisenhower, Salerno's "brilliant lesson" was clear: everything had to be done to prevent German reinforcements from quickly reaching the

front.¹⁷ With this in mind, Solly Zuckerman's "Transportation Plan" seemed perfect.

- 19 The implementation of the "Transportation Plan" immediately met with strong opposition, first military and then political. The Allied air chiefs, British Marshal Arthur Harris and American General Carl A. Spaatz had a negative view of the plan made by a neophyte civilian coming from nowhere. Above all, the Allied air forces were engaged in an independent campaign on Germany, divided between daytime bombings for the Americans, and night bombings for the British. The official objective was to destroy the economy and the opposing morale, in order to promote to ease the future ground campaign. In fact, Harris and Spaatz conducted their operations at their discretion, with the unofficial aim of making Germany capitulate only under the bombs. The two proud commanders-in-chief immediately challenged Zuckerman's interference. Despite his talents as a diplomat and his amazing capacity for conviction, Eisenhower eventually became annoyed and driven to extreme conclusions: "If a satisfactory solution is not achieved, I am ready to make a decision and inform the combined Chiefs of Staff that unless the problem is resolved immediately, I will ask to be relieved of this command."¹⁸ Finally, only a reminder of the Chief of the General Staff of the Armed Forces, George S. Marshall, intimated to the slingers to comply with the orders received.
- 20 Solly Zuckerman's "Transportation Plan" finally came into action in March 1944, in preparation for the Normandy landings. Nine preliminary night raids were carried out by the RAF, on the major rail yards of Trappes, Le Mans and Amiens, and in Belgium on Laon, Vaires and Kortrijk. The results were immediately satisfactory, especially on the Trappes train station, which was decommissioned for the remainder of the hostilities. But even if the RAF shows remarkable precision in using its "Pathfinder" (elite targeting units), inevitable fire errors sometimes cause severe damage as in Courtrai, where 252 civilians were killed around the yard.¹⁹
- 21 Following these beginnings of the "Transportation Plan", a new opposition emerged, this time from the civilian world, with casualties as a stumbling block. The leader of this new slingshot was the worst adversary Eisenhower could have feared: Winston Churchill. The Prime Minister was especially concerned about the impact on civilian casu-

alties. He feared both a reversal of public opinion of the French and Belgians against the Allies shortly before the landing, with a postponement in favour of the Soviets, while relations were again strained with Moscow. Churchill was supported by his scientific advisor Frederick Lindemann, the great organizer of the British strategic bombing of Germany, also bothered by the "Transportation Plan". The Prime Minister multiplied the meetings of the War Cabinet and the Defence Committee, campaigning for an end to the bombing.²⁰

22 In the field, the "Transportation Plan" expanded in April 1944. A forceful outing took place on the night of the 19th on Juvisy, Rouen and Noisy-le-Sec. The train station of the latter city was pulverized, but with it 750 houses were destroyed, 464 civilians killed and 370 others wounded. The station of La Chapelle was attacked the next day, with a large scattering of bombs, some of which lost as far as Paris, which because of its population density and its symbolic character was not included in the Allied objectives. The *Sacré Coeur* of Montmartre failed to be wiped out by a few metres, while 670 civilians were killed and 143 wounded.²¹ Other cities such as Lille, Tergnier, Tours and Orléans were severely hit. At the same time, sensing the opportunity to block the "Transportation Plan", Frederick Lindemann had carried out forecast studies on the expected number of civilian casualties. The estimate was alarming to say the least, with 80.000 to 160.000 expected losses.²²

23 Solly Zuckerman was doubly surprised by this controversy. From the height of his purely scientific reasoning, the Briton had never thought of the obvious risks of his plan on civilians. "By that stage of the war, I had become inured to the idea of casualties, whether our own or the enemy's", he says in his memoirs. "That was what war was about"²³ This post-war coldness does seem to correspond to the attitude of the scientist during the conflict -and generally throughout his life-, by the very admission of his relatives. The scientist Isidor Raabi, Nobel Prize in Physics in 1944, speaks of his friend as the "fearsome Sir Solly Zuckerman".²⁴

24 Far from being moved by this focus on civilian casualties, Zuckerman chose instead to counter-attack, checking Lindemann's calculations, which proved to be largely biased (voluntarily or not). Corrected data showed a total of 8.000 to 16.000 victims, whether or not evacuations

occurred from the most threatened neighborhoods. Those estimates were considered acceptable even by Churchill, who hammered Tedder for not exceeding 10.000 civilian casualties.²⁵ Despite this potential arrangement, Churchill continued to slow down the execution of the plan.

- 25 The final decision rested as a last resort with Franklin D. Roosevelt. The President of the United States, who had little taste for military affairs, agreed with his close adviser Georges S. Marshall, Chief of staff of the US Army: "However regrettable the successive loss of civilian is, I am not prepared to impose from this distance any restrictions on military action by the responsible commanders that in their opinion might militate against the success of Overlord or cause additional loss of life to our Allied forces of invasion",²⁶ he announced on May 11, 1944. Marshall being a personal friend of Eisenhower, whom he had previously supported during the previous slingshot of air chiefs, the "Transportation Plan" could continue freely. "This was decisive",²⁷ Churchill admitted in his memoirs. Solly Zuckerman held his revenge, two years after being beaten by Lindemann on this same field of networks influence. For now, in 1944 within allied coalition the balance of power leant decisively in favor of the USA.

An absolute necessity?

- 26 Following the full agreement of the US President, the "Transportation Plan" was proceeding freely on the ground. The end of May 1944 was marked by bombings of unprecedented intensity since the beginning of the conflict. The poorly planned high-altitude American raids proved particularly deadly, with hundreds of casualties in Nice, Saint-Étienne, Lyon and Toulon. The worst attack known to date by France took place in Marseille on May 27, 1944, with nearly 4.500 victims including 1.752 killed.²⁸ At the same time, at the end of May the bridges over the Seine and then on the Loire were bombed, as well as the trains in order to perfect the paralysis of transport.
- 27 After enjoying his revenge on Lindemann, Zuckerman resumed his activities on the field. Following the difficult progress of the Allies in Normandy, the scientist studied the results of his bombings on the ground, just as in Sicily in 1943. The technique was still the same: study of the effects of bombings on equipment, interrogatory of pris-

oners, analysis of documents seized. Zuckerman's odyssey continued through the euphoria of Paris liberated on August 25, 1944, and then Brussels on September 3. In the Belgian capital, important documents were collected by Zuckerman's men, indicating the state of traffic in France in the spring of 1944. Maps and diagrams pointed to the sharp fall in railway movements. For Zuckerman, success appeared to be obvious.²⁹ Its "Transportation Plan" seemed to have had a decisive impact on the arrival of German reinforcements to Normandy. The investigations carried out by the Scientific Bureau of the French Army shortly after the liberation confirmed Zuckerman's statements, with a halving of all rail traffic at the beginning of June 1944, and then three-quarters in early July.³⁰ The North region was the most affected, with the same month falling by 85%.³¹ In his memoirs, the British scientist relished his success and overwhelmed his many detractors: "They were all wrong".³²

- 28 An analysis that goes beyond the simple observation of the fall in rail traffic would, however, significantly mitigate the success of the "Transportation Plan". Although the crisis of the French railway system in June 1944 was very real, a small military traffic remained at the beginning and throughout the Battle of Normandy, although considerably hampered by the disorganization of the network and air attacks. Zuckerman also unknowingly clashed with a formidable opponent (this time in the enemy camp): Colonel Eberhard Finckh. A former quartermaster of the 16th Army who was annihilated in Stalingrad, Finckh was in charge in 1944 of supplying the Ob West, the highest command structure of the front of the Ouest. Remarkably skillful, Finckh is determined to circumvent the effects of the "Transportation Plan", notably by exploiting a means of communication forgotten by Zuckerman: navigation on the Seine. Although this type of transport did not allow for an immediate response to the decisive first hours of the landing, it subsequently helped to slow the British advance towards Caen. Fortunately for the Allies, in Finckh's unofficial activities there was also resistance to Hitler. The German colonel was a member of the military conspiracy in connection with Operation "Walkyrie", which began in Berlin and Paris on 20 July 1944. Following the total failure of the operation, Finckh was arrested shortly afterwards and dragged before the People's Court on 29 August 1944, and hanged the next day.³³

- 29 Another consideration tends to put Solly Zuckerman's success into perspective. The premise of the "Transportation Plan" was based on the immediate dispatch of German reinforcements once the Allied landings would start in Normandy. In reality, the first limited movements did not occur until the afternoon, once the bridgeheads had already been established. Departures of large units would take place from the following days, or even weeks later. Largely mystified by "Operation Fortitude", which suggested an Allied landing on the Pas-de-Calais, Hitler saw the offensive in Normandy as mere diversion. The best elements of the German army in France, in this case the 15th Army in the Pas-de-Calais, remained in a defensive position until the end of July -according to Eisenhower's wishes.³⁴
- 30 Finally, a final observation is necessary, taking precedence over all other considerations. In 1944 the German Army never managed to reach a fully motorization. With the exception of a few fully motorized elite units, most divisions moved on their own, with vehicles commandeered, on horseback, on bicycles or simply on foot. The shortage of fuel and spare parts further impaired the situation. Many units were thus static by default. Moreover, although these problems could in theory be compensated by the use of the train, the railway system at the beginning of 1944 was unable to withstand the movements of the 800.000 German army stationed in Western Europe, including ten armored divisions.³⁵ Unmaintained and cannibalized for four years of occupation, the rail network was already largely paralyzed, even before the start of the bombardment. Thus, without being useless, the "Transportation Plan" had aggravated a situation already compromised for the German Army.
- 31 Far from these observations, which were certainly far from obvious to conclude before and even shortly after the Normandy landings, Solly Zuckerman continued his role as Tedder's advisor until the end of the war. Its "Transportation Plan" was again applied to West Germany from the autumn of 1944, especially on the Ruhr, this time with the will to move to the strategic level, decisively striking the Nazi economy. The relevance of this evolution of the "Transportation Plan", however, proved difficult to assess, as the Allies bombarded multiple targets over all of Germany, such as oil targets for the Americans, and industrial urban areas for the British.³⁶ The very effectiveness of the

strategic bombing of Germany during the Second World War is still debated.³⁷

- 32 Demobilized at the end of the war, Zuckerman returned to his academic career and was again scientific advisor to the British Ministry of Defense in 1960, this time in the nuclear weapon context that Zuckerman vehemently opposes. Atomic and thermonuclear bombs are weapons of destruction with a certain potential for deterrence, but nothing could stop the process of general devastation. Nuclear weapons thus go beyond the limits of planning by blurring the notion of belligerents, since it is able to raze all the opposing countries.³⁸
- 33 In 1971 Solly Zuckerman abandoned his involvement in political affairs to devote himself to his last assignment, the new University of East Anglia, Norwich.³⁹ Shortly before his death in 1993, the professor returned in his final book on his "Transportation Plan", which still seemed to haunt him half a century later. Although admitting some errors of appreciation, Solly Zuckerman was still convinced of the necessity of his plan. Most importantly, in all of his writings, no lines were devoted to the 12.000 to 15.000 deaths and 20.000 serious injuries of the civilian casualties of the "Transportation Plan". To the end, skillful, methodical and cold, Zuckerman never showed any qualms about his plan.

NOTES

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- 3 Solly Zuckerman refers in his writings only to the name of "Transportation Plan". University of East Anglia (UEA-Norwich), The Zuckerman Archive, AEAf Planning 1943-44, SZ/AEAf/1/2: *Outline Air Plan*.
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- 5 S. Zuckerman, *From Apes to Warlords: The Autobiography (1904-46)* of Solly Zuckerman (London: Collins London, 1978), p. 8.
- 6 S. Zuckerman, *Social life of Monkeys and Apes* (London: Routledge, 1981); *Functional Affinities of Man, Monkeys and Apes*, (London: Kessinger Publishing, 2010).
- 7 John Bernal is the author of a book advocating the interest of science applied to the communist model: J. Bernal, *Social Function of Science* (Abingdon-on-Thames: Routledge, 1944). Bernal, introduced to the secrets of the Normandy landings, was spied daily by the British MI-5, which however found no compromising evidence on a possible hidden connection with Moscow. Zuckerman, though not a communist but a supporter of socialism, also attracted the MI-5 investigations –just as vainly. J.-C. Focquier, *La Guerre des Scientifiques* (Paris: Perrin, 2019), p. 366-371.
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- 11 *Quantitative Study of Total Effects of Air Raids* (Hull and Birmingham Survey – 8.4.1942), in S. Zuckerman, *From Apes to Warlords*, p. 405.
- 12 A. Tedder, *With Prejudice* (London: Cassel, 1966), p. 503.
- 13 S. Zuckerman, *From Apes to Warlords*, p. 178.
- 14 University of East Anglia (UEA-Norwich), The Zuckerman Archive, Bombing Survey Unit [BSU], Sicily and Italy, 1942-1946, *Air Attacks on Rail and Road Communications (Sicily Report)*, BSU Report Bo.4, 28 December 1943.
- 15 The landing was originally scheduled for May 1944, and then postponed several times at the last moment due to climatic conditions, until June 6.
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- 17 D. D. Eisenhower, *Croisade en Europe* (Paris: Nouveau Monde, 2013), p. 298.

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- 23 S. Zuckerman, *From Apes to Warlords*, p. 246.
- 24 J. Peyton, *Solly Zuckerman*, p. 214.
- 25 I.W.M., S. 417-10/8, Kingston McCloughry, *The Transportation Plan*, 38.
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- 27 *Ibid.*
- 28 E. Florentin, *Quand les Alliés bombardaient la France*, p. 379-399.
- 29 S. Zuckerman, *From Apes to Warlords*, p. 298-301.
- 30 Bibliothèque de Documentation internationale contemporaine (BDIC-Nanterre), *Les Bombardements aériens des chemins de fer français de janvier à août 1944 – Analyse de leurs effets*, F 178 1/2/3/4, 4 fascicules. Ministère de la Guerre, état-major de l'Armée – Bureau scientifique de l'Armée, 189.
- 31 *Ibid.*
- 32 S. Zuckerman, *From Apes to Warlord*, p. 286-305.
- 33 W. Von Schramm, *Les Généraux contre Hitler*, (Paris: Hachette, 1956), p. 68.
- 34 J. Levine, *Operation Fortitude* (London: Collins, 2012), p. 282.
- 35 N. Zetterling, *Normandy 1944: German Military Organization, Combat Power and organization Effectiveness* (Altona: J.J. Fedorowicz Publishing, 2000), p. 28-29.
- 36 S. Cox, *The Strategic Air War Against Germany, 1939-1945: The Official Report of the British Bombing Survey Unit* (London: Frank Cass, 1998), p. 68-

77.

37 The Allied bombings did not provoke any revolt by German civilians against the Nazi rule, which was one of the major objectives of the British strategy. The effectiveness of strikes on the Reich's industrial potential effectively felt only in the final months of the war on military operations, after breaking production records until the summer of 1944. A. Tooze, *Le Salaire de la destruction* (Paris: Les Belles Lettres, 2012), p. 620.

38 S. Zuckerman, *Scientists and War*, p. 53-54, 76.

39 J. Peyton, *Solly Zuckerman*, p. 190.

RÉSUMÉS

English

During the Second World War France was, after Germany, the most bombed country in Europe. The worst bombings occurred in 1944, in the course of a planned operation very little known: the "Transportation Plan". This plan was the brainchild of a British biologist, Solly Zuckerman, who knew nothing about the aerial warfare four years ago. Drafted to support the Allied landings in Normandy, the "Transportation Plan" affected the whole of France, resulting in many casualties and strong controversies.

The subject of Allied bombings has been emerging for only a few years in French and especially British and American historiography. This study is based on a doctoral thesis completed by the author in 2015 at the University of Paris-IV Sorbonne, and published two years later under the title "La Stratégie de la Destruction". It deals in particular the questions of military strategy, controversies about civilian casualties and the effectiveness of bombing.

Français

Au cours de la Seconde Guerre mondiale la France fut, après l'Allemagne, le pays le plus bombardé d'Europe. Les pires frappes se déroulèrent en 1944, dans le cadre d'une opération très peu connue : le « *Transportation Plan* ». Le concepteur de ce plan original était le biologiste britannique Solly Zuckerman, ignorant tout de la guerre aérienne quatre années plus tôt. Conçu pour faciliter le débarquement allié en Normandie, le « *Transportation Plan* »

toucha l'ensemble de la France, provoquant de nombreuses victimes et d'intenses controverses.

Les bombardements alliés se sont imposés seulement depuis quelques années dans l'historiographie française, et dans une plus vaste mesure parmi les historiens britanniques et états-uniens. Cette étude se fonde sur une thèse soutenue par l'auteur en 2015 à l'Université Paris-IV Sorbonne, et publiée deux années plus tard sous le titre « *La Stratégie de la destruction* ».

L'article évoque en particulier les questions de stratégie aérienne, les controverses sur les victimes civiles et l'efficacité des bombardements.

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Mots-clés

Seconde Guerre mondiale, guerre aérienne, victimes civiles, bombardement, ciblage

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