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# The Plan Put into Practice: USAAF Bombing Doctrine and the Ploesti Campaign

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The Plan Put into Practice: USAAF Bombing  
Doctrine and the Ploesti Campaign

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B.A., History, University of Missouri – St. Louis,  
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John Gillingham III, Ph.D.

Daniel Rust, Ph.D.

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## Acknowledgements

The ideas contained within this study have been with me throughout my graduate career. The unprecedented amount of technological development during the twentieth century has had a profound impact not only on the way we live but more importantly on the way we think. Before the development of the computer, did anyone have to ponder the issues of digital copyrights or spam email legislation? The invention of the automobile resulted in an entirely new system of traffic signals, taxation, and inspection. Before the rise of the airplane the question of who owns the sky was a non-issue. The discussion of the proper and effective use of aerial bombardment in warfare did not exist until an Italian threw a grenade over the side of his plane in 1911 during the Italo-Turkish War. The focus of the historian should not be solely on the technology itself, which is inherently neutral, but on the matter in which the people of a specific time and place decided to utilize and incorporate this new technology into society and the ramifications of those decisions.

This thesis was greatly assisted by two trips to Maxwell Air Force Base, Alabama. I would like to thank the knowledgeable and friendly staff at the Air Force Historical Research Agency for their aid in locating vital primary sources. Special thanks go to Sylvester Jackson for his assistance while at the archive, and to Kevin Burge who tracked down loose ends via email. This thesis would not have existed without them.

I am incredibly indebted to the Department of History at the University of Missouri-St. Louis for the opportunities that have been offered me. The ability to work with such a knowledgeable and accessible faculty has greatly aided in the development of

this manuscript. Its bare beginnings can be traced back to Professor Acsay's strategic bombing seminar which, taken concurrently with Professor Rust's course 'Aviation and American Life', constituted my first exposure to the subject matter and created a desire to explore the topic in more detail. I am also grateful for the countless times Professor Gillingham indulged my meanderings through various topics, always pushing just a little further while keeping me grounded. I would like to personally thank Professor Acsay for all he has done throughout my academic career. While being firm but fair he has channeled my eagerness in constructive ways and has not thought twice to offer the appropriate criticism or praise as circumstances warranted. The process of focusing and organizing a thesis has been made infinitely easier because, by making time to talk at length on multiple occasions, he helped to refine key points while introducing new avenues of discussion. My time at the Department of History at the University of Missouri-St. Louis will always be remembered fondly through whatever lies ahead.

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## Introduction: Why Ploesti?

On June 5<sup>th</sup>, 1942, the United States declared war on Romania. American troops were nowhere near the southeastern European nation, nor would they ever have any significant presence there. The decision was due solely to two factors: the doctrine and equipment that had been developed by the United States Army Air Force (USAAF) during the period between the two world wars, and the view that Allied planners had of the importance of Romanian crude oil production to the German war economy. Romania became a target for American military planners a mere seven months after Pearl Harbor because of the technology of the four-engine heavy bomber, the uniquely American concept of strategic bombing, and certain assumptions of the German economic system.

The amount of literature on the strategic bombing of occupied Europe is voluminous. For the sake of simplicity, the existing historiography can be divided into three general views. The first focuses on the heroism of the combat crews in the face of impossible odds, an excellent illustration would be Steven Ambrose's The Wild Blue. The second view is one that recognizes the intentions and heroic sacrifices of those carrying out the bombing while also acknowledging that mistakes were made in the course of the campaign. Prime examples would be Bombs, Cities, and Civilians by Conrad C. Crane and Robert Pape's Bombing To Win. The third general conception is one that focuses on the civilian tragedy and questions the real motives of air commanders in no uncertain terms. Wings of Judgment by Ronald Shaffer exemplifies this line of argument. This study does not look to solve or contribute to the moral and philosophical questions that have bogged down the historiography of USAAF strategic bombing, but

rather focuses on the soundness of the fundamental beliefs on which strategic bombing missions in World War Two were based. The doctrine that inspired the USAAF's campaign above Romania and the rest of occupied Europe was based on theory and mathematical calculations that were in almost every respect removed from both practical and strategic reality. The strategic bombing campaign during the war is best understood as an attempt to align the hypothetical and much trumpeted destructive capabilities of air power with the realities inherent in an active struggle against a dynamic, adaptable enemy.

The various attacks upon the thirteen major oil refineries situated around the city of Ploesti, Romania combine to form the perfect case study for analyzing the practical application of U.S. strategic bombing doctrine by removing the variables of place and target type from the equation. Ploesti is useful as a case study because it contained industrial targets clearly distinguished from nearby population centers, all manner of anti-aircraft defenses available were represented, and every conceivable means available to achieve destruction of the target was employed by the Army Air Force. It is, in many ways, a microcosm of the strategic bombing campaign over Europe. The historical literature approaches the USAAF's missions over Ploesti in one of two ways. Either they are viewed as a series of individual attacks that are interesting in and of themselves, mainly due to the unique nature and costly attack of August 1<sup>st</sup> 1943, or they are discussed only in their relation to the overall oil campaign. Therefore there exists a gap in the literature for one to analyze the Ploesti raids collectively as a means by which to determine the effectiveness of 'precision' bombing.

The purpose of this study is not to provide a narrative of the air raids on oil refineries in the Ploesti area as there are previous works available that accomplish this extraordinarily well. In any work of history a firm understanding of the story is required, and it will be discussed as necessary. But the true focus of this paper is instead on the development of an intellectual concept, its refinement, and its practical application as allowed or restrained by the technology available at the time.<sup>1</sup> The central themes of

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<sup>1</sup> In a desire to provide a more integrated approach the author consulted not only scholarly and public works on the many bombings of the Ploesti area but also much time and energy was invested in understanding and presenting the thought process behind and implications of doctrinal development during the interwar period. Only by a marriage of the two is it possible to truly understand what occurred at Ploesti. For insight into doctrinal development both Thomas H. Greer's *The Development of Air Doctrine in the Army Air Arm, 1917-1941* and Robert T. Finney's *History of the Air Corps Tactical School, 1920-1940* are invaluable. These were supplemented by Stephen L. McFarland's *America's Pursuit of Precision Bombing*, which provides wonderful insight into the technological developments necessary to even attempt the concepts developed at the Air Corps Tactical School. "American Air Campaign Planning before Pearl Harbor" by Mark Clodfetter painted a much broader picture, allowing one to easily see how early doctrinal thought plugged into later theory. A central pillar of this theory is discussed by the person responsible for it, Donald Wilson, in his article "Origin of a Theory for Air Strategy." The doctrine developed at ACTS is codified in AWPD/1 and AWPD/42. James C. Gaston's *Planning the American Air War: Four Men and Nine Days in 1941* provides a wonderfully vivid portrait of the men and circumstances involved in the development of AWPD/1, and *The Air Plan That Defeated Hitler* by Haywood S. Hansell gives us a firsthand account of the entire doctrinal process from embryonic beginnings to the war's conclusion. In order to understand the value of USAAF strategic bombing doctrine and to properly analyze its effects a firm grasp of the system upon which it was to be unleashed is vital. For this purpose, Burton H. Klein's *Germany's Economic Preparations for War*, Alan S. Milward's *The German Economy at War*, John Gillingham's *Industry and Politics in the Third Reich: Ruhr coal, Hitler, and Europe*, and Adam Tooze's *The Wages of Destruction: The Making and Breaking of the Nazi War Economy* provided the framework. This was supplemented with "The German War Economy" by Nicholas Kaldor and R.J. Overy's "Hitler's War and the German Economy: A Reinterpretation." In "The Importance of Energy in the First and Second World Wars," W.G. Jensen takes a focused look at the role of this resource, while Alfred C. Mierzejewski convincingly bucks the established narrative in *The Collapse of the German War Economy, 1944-1945: Allied Air Power and the German National Railway*. R.L. Dinardo's "Horse-Drawn Transport in the German Army" and *Mechanized Juggernaut or Military Anachronism?: Horses and the German Army of World War II* complement Mierzejewski's view that oil was not the vital target system the Allies thought. In a desire for a more thorough understanding of the German air defense situation the author turned to *The Luftwaffe Fighter Force: The View From the Cockpit* by Adolf Galland and the phenomenal work that is Edward B. Westerman's *Flak: German Anti-Aircraft Defenses, 1914-1945*. For a more focused look at the Ploesti campaign James Dugan and Carol Stewart's *Ploesti: The Great Ground-Air Battle of 1 August 1943* and Leon Wolff's *Low Level Mission* provide a wonderful insight into that famous raid, while Leroy W. Newby's *Target Ploesti: View from a Bombsight* and Jay A. Stout's *Fortress Ploesti: The Campaign to Destroy Hitler's Oil* focus on the 1944 campaign by the 15<sup>th</sup> Air Force. For an analysis of the bombing, both then and now, the author looked to six different United States Strategic Bombing Survey (USSBS) reports, Albert Speer's memoirs *Inside the Third Reich*, John F. Kreis' *Piercing the Fog:*

conceptualization, development, societal acceptance, application, and evaluation hold true in the development of all technologies; this study simply addresses these issues in a military setting.

The United States' strategic bombing campaign in World War Two covered a large amount of time, proceeded at various levels of intensity, and regularly shifted target priorities. The many raids against Ploesti are ideal for the study of doctrinal application due to the many attacks against the area, the many different types of attacks used, and the single and continuous nature of the targeted system. The Ploesti raids, looked at collectively, can in fact be construed as a doctrinal laboratory; when studied detached from the broader picture it can be difficult to recognize an established bombardment doctrine in practice.

Another benefit from studying the Ploesti campaign is the illumination of the relationship between a rigid bureaucracy, the idea that brought about its establishment, and the capability of both to adapt to a rapidly changing situation. The United States Army Air Corps succeeded in selling its concept of strategic bombardment to both military planners and civilian policymakers, and in order to implement this theory a vast program of procurement and training was put into motion. This human and mechanical juggernaut took on the form of a Roosevelt-era bureaucracy, and as a result several

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*Intelligence and Army Air Force Operations in World War II*, Dwight D. Eisenhower's *Crusade in Europe*, Henry Harley Arnold's *Global Mission*, and The War Reports of Gens. Marshall, Arnold, and King. An extensive amount of archival material from the Air Force Historical Research Agency (AFHRA) at Maxwell Air Force Base, Alabama was used to understand the operations at Ploesti and the immediate military analysis. *Daylight Raids by the U.S. Eighth Air Force: Lessons Learned and Lingering Myths from World War II* by Frank Heilenday provided an insight into the positives and negatives of bombing, and of course the venerable series *The Army Air Forces in World War II* by Wesley Frank Craven and James Lea Cate provided a firm foundation to return to when the author found himself lost, distracted, or too far out on a limb.



changes demanded by combat experience were not incorporated into the strategic bombing system. After studying the disparity between what was expected to happen in regards to strategic bombing before the war and what was possible at Ploesti one cannot help but be more sympathetic to the plight of Yossarian in Joseph Heller's classic novel. In fact, Catch-22 is an excellent illustration of the frustration that must have been felt by bomb crews as they continually risked their lives attempting to force mathematical calculations and theory into reality. This very real disconnect between what was actually possible and what the established bureaucracy preached was possible is vividly apparent when one looks at the Ploesti raids in their totality.

## **Chapter 1: The Development of American Air Power Doctrine**

Since the Wright Brothers' first flight on December 17, 1903, the military implications of aviation were ever in the minds of decision makers. There was no doubt the airplane would have a role in modern military campaigns, the question was what that role would be. This debate would be the cause of great tension and even open conflict within both the military and civilian sectors. It was during the roughly two decades of the interwar years that, by equal parts persuasion and subterfuge, American airmen refined a unique concept of air power that was sold to the American public and politicians on the eve of World War Two.

United States strategic bombing doctrine as developed between the world wars consisted of four central tenets: 1) bombing was to be from high altitude, 2) it was to destroy 'precision' targets which would result in the collapse of the enemy's economic structure, 3) it was to occur during daylight, 4) the bombers were to be self-defending. Once exposed to prolonged combat it became obvious to many that number four was not feasible without sustaining prohibitive losses, and both contemporaries and historians have debated whether the second point was achieved or even possible. Therefore, only 50% of the USAAF's strategic bombing doctrine is 100% defensible. How was such a concept developed? How were so many Americans, both those in the command structure and those doing the actual flying and dying, convinced of its practicality?

## The Beginning

In order to fully understand the development of American strategic bombing doctrine it is necessary to begin at the first large-scale military application of airpower, World War One. During this conflict airpower was primarily used as an auxiliary to the land forces; it filled the roles of reconnaissance, artillery spotting, and was used to achieve and maintain air dominance over the field of battle. Though these were the accepted roles of this new technology at the time, there were those who saw possibilities beyond the immediate area of action. “Before the end of the war preparations were well advanced for a fairly extensive air offensive by the Allies. Furthermore, the Americans had developed a definite and thorough doctrine to support strategic bombardment.”<sup>2</sup> This was most succinctly stated in a document written by Lt. Col. Edgar S. Gorrell in his position as leader of the Strategic Aviation Branch. Disregarding all activities in direct support of the trenches as viable targets for bombardment, Gorrell looked to the destruction of the enemy nation’s productive capacity, which was supporting their military, as the proper target and one that could effectively break the stalemate. General Pershing fully approved the plan on January 5, 1918.<sup>3</sup> The trench warfare of World War One is important to keep in mind as the obsessive desire to ensure that such a situation would not happen again provided the drive for almost all interwar doctrinal and technological development.

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<sup>2</sup> Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941*. (Maxwell Air Force Base, AL.: USAF Historical Division, Research Studies Institute, Air University, 1955; Office of Air Force History, U.S. Air Force, 1985), 10.

<sup>3</sup> Mark Clodfetter. “American Air Campaign Planning before Pearl Harbor,” *The Journal of Military History*, 58, no.1 (Jan., 1994): 76.

Historian Thomas Greer clearly linked the work of Gorrell to what would follow at the Air Corps' most advanced school. "The Gorrell plan was a truly striking forerunner of the doctrine which matured years later in the Air Corps Tactical School."<sup>4</sup> This plan also marks the beginning of the detachment of bombing doctrine from strategic and practical reality. While the idea of destroying the economic foundation of the enemy, resulting in their complete inability to wage modern war, sounds very efficient, was it even possible to penetrate into the industrial heart of Germany with Handley Page O/400s and Vickers Vimys?<sup>5</sup> Even if these aircraft managed to survive both enemy pursuit aircraft and anti-aircraft artillery fire and reached their targets there was the matter of actually landing the bombs on a critical point in the system to bring about sufficient destruction so as to have an effect on the enemy's frontline combat troops. Gorrell's successors attempted to address these issues. The end of World War One prevented a combat test of Gorrell's theory, but the concept of bombing the production centers of belligerent industrialized nations did not go away.

American air power advocate Brigadier General William Mitchell, "generally regarded as the American counterpart of the RAF's Trenchard and the Italian Douhet,"<sup>6</sup> took three very important lessons from his experience in World War One. The first was that the nature of air power was one of flexibility and mobility; to tie it to slow and immobile ground armies was to surrender its greatest strength. Also, and this would be a

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<sup>4</sup> Greer, 11.

<sup>5</sup> The HP O/400 had a max range of 450 miles, a 8,500 foot ceiling, 76 mph max speed and a maximum bomb load of 2,000 lbs, while the Vimy managed to improve on the Handley Page in many respects with a 910 mile max range, 7,000 foot ceiling, 103 mph top speed and 4,800 lb bomb load. (Robert Jackson. *The Encyclopedia of Military Aircraft*. (Bath, UK: Parragon, 2006), 183, 363.)

<sup>6</sup> Greer, 17.

key point for later theorists, air power should not be diffused amongst the various commanders but rather amassed in a single striking force to allow for its concentrated application. Third, since air power was to be concentrated, only officers within the air service could possibly understand its potential and apply such a force properly. These beliefs all went against the established air organization during World War One, where individual commanders had control of the air resources within their theater of operations.<sup>7</sup> This would become a fundamental point in the interwar struggle. “The question of the organization of the air arm became inextricably interwoven with the question of deployment.”<sup>8</sup>

The effects of the interwar period upon the psyche of airmen cannot be overstated, and much would be learned in respect to public relations. “From 1919 to 1939 the history of the Army air arm was dominated by a struggle for recognition which left a deep imprint upon the air organization and its personnel.”<sup>9</sup> At first the struggle was for air independence, and when that could not be achieved the goal shifted to partial autonomy within the Army. Numerous bills, boards, and committees came into existence during this time, all seeking to address the question of where aviation would fit within the existing military structure, and always there was Mitchell and his disciples calling for separation

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<sup>7</sup> There were two exceptions to this, as at St.-Mihiel and Meuse-Argonne Mitchell was able to wrest control of available aircraft and apply this combined force on the battlefield to great effect. (Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*. (Maxwell Air Force Base, AL.: USAF Historical Division, Research Studies Institute, USAF Historical Division, Air University, 1955; Air Force History and Museums Program, 1998), 3.)

<sup>8</sup> Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*. (Maxwell Air Force Base, AL.: USAF Historical Division, Research Studies Institute, USAF Historical Division, Air University, 1955; Air Force History and Museums Program, 1998), 5.

<sup>9</sup> Wesley Frank Craven and James Lea Cate, eds. *The Army Air Forces in World War II Vol I*. (Washington, D.C.: Office of Air Force History, 1983), 17.

from the backward thinking and dogmatically-entrenched Army. The question of military organization became such a hotbed issue that “between 1926 and 1935 twelve bills for a Department of Aeronautics and seventeen for a single Department of Defense were presented in Congress.”<sup>10</sup> This does not include the plethora of ‘definitive’ boards established to analyze the matter, such as the Menoher Board in 1919, the Morrow Board in 1925, or the Baker Board in 1934. The repeated exercise of testifying before a committee and having the proceedings reported in the following day’s paper allowed the aviation ‘rebels’ to learn exactly what policymakers and the public would accept and reject in regards to the organization and proper use of air power. For instance, it was through this public discussion that it became obvious that Americans had no desire to partake in the indiscriminate bombing of population centers and airmen adjusted their doctrine (at least the public utterances of it) to accommodate public demand. “This ethical concern of the American people was largely responsible, also, for the development of the idea of precision bombing as opposed to mass attacks. An openly advocated program of mass bombardment would have found virtually no support in the United States.”<sup>11</sup>

It was during this period of institutional uncertainty that the Air Service Tactical School was established in 1920 at Langley Field in Virginia. The school was renamed the Air Corp Tactical School (ACTS)<sup>12</sup> and moved to Maxwell Air Force Base, Alabama in 1931. It was there that Gorrell’s theory would be refined and crystallized over the next

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<sup>10</sup> Ibid., 29.

<sup>11</sup> Greer, 15. (Underlined by the author for emphasis.)

<sup>12</sup> The name change was a result of the Air Corps Act of July 2, 1926, which provided for minimal reorganization.

decade. The influence of ACTS would be acutely felt in the next world war, as the school “would graduate 261 of the 320 generals serving in the Army Air Forces at the end of World War II.”<sup>13</sup> The school served as a collection point for those interested not only in the proven capabilities of air power but also its possibilities. “In 1929 the Tactical School adopted as its motto: *Proficimus More Irretenti*. (We Make Progress Unhindered by Custom).”<sup>14</sup> Though still officially chained to the Army’s doctrine for the use of air power, the atmosphere at ACTS was always one of pushing boundaries and its existence would be characterized by radical intellectual theory coupled with conflicting official pronouncements.

An illustration of this duality can be seen in the bombing tests upon naval vessels engineered by Mitchell in the early 1920s. In July 1921 the captured German battleships *Frankfurt* and *Ostfriesland* were successfully sunk, followed by the aging American cruisers the *Virginia* and *New Jersey* in September 1923. Though much was made of these displays at the expense of the Navy, “there was, however, nothing especially profound about aircraft dropping hundreds of bombs to sink immobile ships unprotected by antiaircraft artillery.”<sup>15</sup> At their core these tests were an attempt to wrestle funds for the expansion of military aviation, but they also provided a publicly accepted argument for such investment in a purely offensive weapon. It was decided that military aviation would be sold by the advocates of air power to the public and congressional leaders as a defensive weapon, one which could defend the coasts as well as, if not better than, the

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<sup>13</sup> Clodfetter, 83.

<sup>14</sup> Finney. vii.

<sup>15</sup> Stephen L. McFarland, *America's Pursuit of Precision Bombing*. (Washington: Smithsonian Institute Press, 1995), 47.

existing Navy. Due to economic considerations and the strong aversion to aggressive conflict during this period, the only hope of receiving any funding at all was in the name of defense. The fact that first two and then four engine bombers were even able to be discussed within a defensive context speaks volumes to the insight and wizardry of airmen at the time.

The focus in the 1920s on the proper organization of air power and use of force can be seen in the Air Service Tactical School's 1926 text *Bombardment*. While not going too far beyond the party line in regards to the use of military aviation in the field, it did push to codify the principle of massed force. It argued that bombardment aviation "is seldom, if ever, allotted to a group of armies. Such an allotment would be in violation of one of the fundamental principles of bombardment employment."<sup>16</sup> The text also recognized the reality that one mission would not suffice to knock out a target. "It is apparent that complete destruction by bombardment is to be accomplished only by concentrated and continuous operations."<sup>17</sup> If you cannot bomb continuously, should you then bomb at all? If you cannot ensure the destruction of the target then you have sacrificed men and planes needlessly and alerted the enemy to your intentions. This practical concept of continuous operations would be lost during the 1930s and the slightest resemblance of it would not come into use over Ploesti until 1944.

Unfortunately for the historian, *Bombardment* cannot be taken at face value. One must remember that the true philosophy of air men differed widely from what was accepted within the Army. After the 1925 court-martial of Gen. Mitchell, and his

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<sup>16</sup> United States. Air Corps Tactical School. *Bombardment*. (Washington D.C.: GPO, 1926), 1.

<sup>17</sup> *Ibid.*, 3. (Underlined by author for emphasis.)



subsequent early retirement in 1926, this philosophy did not wither and die but instead was removed to private conversations while the public dialogue conformed to accepted thought. This makes it very difficult for the historian who must therefore read between the lines and always take official Air Corps statements with a large grain of salt. Wesley Frank Craven and James Lea Cate, in Volume I of their seminal work, *The Army Air Forces in World War II*, summed up the situation beautifully:

So it was that the training guides, as textbooks for young officers, were not only dull in the inimitable style of Army manuals; on controversial issues they were at best noncommittal and at worst misleading. And hence, paradoxically, we must seek the air arm's underlying philosophy of warfare not in the official pronouncements but first in the public utterances of its radicals and later in the less widely disseminated thought of its most advanced school. This approach is not wholly satisfactory, but it is the only way to explain, other than by supporting a sudden reversal of opinion, the emergence shortly before World War II of a well-developed theory of warfare in which strategic bombardment played the predominant role. In its most essential features this theory was evolved by Mitchell in the mid-twenties; by 1939 it had become an article of faith privately held if not publicly proclaimed by the Air Corps.<sup>18</sup>

Of the four central tenets of bombardment discussed earlier, every one of them can be traced to the Tactical School, and the genesis and acceptance of each raises questions.

## The Influence of the Air Corp Tactical School

It is impossible to point to one instructor at ACTS who was responsible for the entirety of the bombardment doctrine that developed over the 1930s. The process was in many ways a synthesis of ideas, a type of group think that evolved slowly into something

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<sup>18</sup> Craven and Cate, vol. 1, 35. (Underlined by author for emphasis.)

that one would recognize as a cohesive theory.<sup>19</sup> One of the reasons for this was the circular flow of knowledge within the school; students became instructors and passed down theory as fact. “By the mid-thirties...of the 17 Air Corps officers on duty at the school, 16 were graduates of ACTS...”<sup>20</sup> Couple this with the freedom inherent in the distance between Alabama and Washington D.C. and it becomes understandable why something so different from established thought would be born and nurtured at the Air Corps Tactical School. Though it is not easy to pierce through this developmental fog, there are certain instructors who contributed vital pieces to the overall whole.

According to Dr. Stephen McFarland, Lieutenant Kenneth Walker is most responsible for the decision to bomb at high altitudes. During tests at the Aberdeen Proving Grounds between July and November of 1931, the curious phenomenon of bomb-skipping was discovered and studied intently. “If they landed on hard surfaces, the bombs tended to roll, skid, or tumble an average of 141 feet in range and 25 feet in deflection. The small angle of impact made fuses more liable to fail. Bombs tended to detonate on their sides, reducing the effects of both the explosion and resulting fragmentation.”<sup>21</sup> One must wonder if the planners of the 1943 low-level raid on Ploesti were aware of this study or if anyone protested based on this study’s findings. Gravity allowed bombs to bury before explosion and in order for this to occur time was needed; time that was only made available if bombing altitude was increased. “The inability to

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<sup>19</sup> The development of doctrine at ACTS would make for a very interesting study of group psychology.

<sup>20</sup> Finney, 23.

<sup>21</sup> McFarland, 86.

produce the mining effect for a low-altitude release, however, reduced the explosive power of bombs by four and a half times.”<sup>22</sup>

Could a bomb dropped from high altitude actually hit a precision target? The Norden M-I bombsight, though a remarkable development for its time, was not perfect.<sup>23</sup> The first of these new bombsights reached the Army in April 1933 and required a steady approach and clear weather over the target to be effective.<sup>24</sup> Once again, Walker came to the rescue and provided theoretical support for high-altitude bombardment. Using probability in much the same way as the artillery corps, he formulated the amount of aircraft needed, and hence bombs released, to hit the desired target. “But his next step was unfortunately too simplistic. If the “single-shot probability” of obtaining a hit within the area of a proposed target was, for instance, one in ten, he reasoned that one should drop ten bombs to be sure of one hit. Of course, this wasn’t so.”<sup>25</sup> Getting bombs ‘on target’ would be a continuous issue during the war and the bombsight tests compiled in the following table portray the difficulty in hitting a 100 x 100 foot ‘precision’ target.<sup>26</sup> It is important to remember that enemy defenses would force attack altitude and speed to be much higher than those used during bombsight testing. There was still much room for improving accuracy before America entered the war:

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<sup>22</sup> Ibid., 87.

<sup>23</sup> For a wonderfully detailed account of the development of this bombsight, and the impact it had on strategic thought, McFarland’s *America’s Pursuit of Precision Bombing* is a vital source.

<sup>24</sup> Ibid., 76

<sup>25</sup> Haywood S. Hansell, *The Air Plan That Defeated Hitler* (Atlanta: Higgins-McArthur/ Longino & Porter, 1972), 16-17.

<sup>26</sup> 100 ft. x 100 ft. was the assumed target size used in probability calculations within *AWPD/1*, prepared in 1941. (Air War Planning Division. *AWPD/1: Munitions Requirements of the Army Air Forces*. (Washington D.C.: War Department, Headquarters of the Army Air Forces, August 12, 1941. Air Force Historical Research Center, Maxwell AFB, AL 36112), Tab 3(b), 2.)

In the six months before Pearl Harbor, bombardiers dropped nearly 50,000 bombs on practice targets. At an average speed of 170 mph and with no drops from above 20,000 feet, not one group, on average, could achieve the standards set in Training Manual 1-250 for first-, second-, or third class bombardiers. This was in perfect weather against no enemy defenses.<sup>27</sup>

Table 5.1. Air Corps Tactical School Summary of Bombing Accuracy

Year	Bomber	Speed (mph)	Bombsight	Altitude (feet)	Radial Error (feet)
1930	B-3	75	D-4	5,000	135
	B-3	75	D-4	8,000	173
1934	B-4	85	D-4	5,000	120
	B-4	85	D-4	8,000	174
1935	B-4/6	100	D-4	5,000	130
	B-12	100	Norden	5,000	130
	B-4/6	100	D-4	8,000	181
	B-12	100	Norden	8,000	181
1936	B-10/12	125	Norden	5,000	145
	B-10/12	125	Norden	8,000	159
	B-10/12	125	Norden	15,000	410
1937	B-10/17	130	Norden	7,000	144
	B-10/17	130	Norden	10,000	202
	B-10/17	130	Norden	15,000	258
1938	B-10/17/18	135	Norden	7,000	107
	B-10/17/18	135	Norden	10,000	144
	B-10/17/18	135	Norden	15,000	235

Source: Kister to Arnold, n.d. (1939?), File 168.7012-23, HRA.

Along with the matter of delivery came the question of what constituted a viable target. As stated earlier, the bombing of non-combatants was looked upon with distain by the American public. Throughout the 1930s there were examples of such attacks, the Italian bombing of Ethiopia and the Condor Legion’s bombing of Guernica were but two of many, which only served to reinforce this notion in the United States. The concept of directly attacking military targets along the front, through close air support and interdiction missions, would more easily be facilitated by the commanders in the field and airmen desperately wanted control of their own destinies. These two reasons helped

<sup>27</sup> McFarland, 97.

<sup>28</sup> McFarland, 95. Note how radial error increases dramatically with an increase in altitude. The speed and altitudes used in these tests were far from the 250-300 mph and 20,000-30,000 feet the B-17s and B-24s maintained in actual combat missions.

the doctrine developed at ACTS to mirror Gorrell's from the previous war.

While Gorrell's reports were a matter of record, the primary intellectual supporting argument, the industrial web theory, according to Donald Wilson, originated in his courses at ACTS during the 1933-1934 term.<sup>29</sup> In an article written in 1971 to clarify doctrinal development, Wilson provides a stunning insight into the minds of air planners. By looking at the United States as a blueprint for every industrialized nation, the belief developed that only certain key points in the economic infrastructure would have to be destroyed for the entire structure to collapse. These lynchpins, according to Wilson, consisted of transportation, electric power, and steel production.<sup>30</sup> These were considered 'precision' targets due to the fact that they were specific, well-defined, and vital to the continuation of the enemy's war effort. In many respects the selection of targets can be viewed as an inverse pyramid, with the belligerent nation as a whole being the largest section on top. It was the goal of doctrinal developers at ACTS and later those charged with target selection to determine the pieces of the economy that supported the sections above them. Target priorities would change during the course of the war, resulting in target systems not being subjected to the continuous attacks required to ensure their destruction as discussed earlier in *Bombardment*. "As for the possibility of repairing this devastation, it seemed obvious that any air force should be able to destroy faster than repair or replacement could be effected."<sup>31</sup> The Germans, in many ways,

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<sup>29</sup> Wilson, Donald. "Origin of a Theory for Air Strategy," *Aerospace Historian* 18 (March 1971): 19.

<sup>30</sup> *Ibid.*, 19.

<sup>31</sup> *Ibid.*, 19.

invalidated this belief in assured destruction as they would many other assumptions during actual operations.

Due to the nature of the targets selected it was recognized that night bombing could not be the method adopted by the United States Army Air Force. It would be difficult to pick out population centers in pitch black, let alone 'precision' targets. "By 1932, the school had endorsed explicitly the concept of daylight bombardment."<sup>32</sup> One of the primary advantages of night bombing was the perceived difficulty it gave the defenders and hence the better survivability of the air crews. Wouldn't the planes flying in broad daylight be sitting ducks for enemy anti-aircraft defenses, especially if the target systems were known in advance? To counter this drawback in precision doctrine another intellectual theory was developed, that of the 'self-defending' or 'invincible' bomber.

The belief that an air offensive was indefensible was not a new one. H.G. Wells' fictional representation of the next international conflict, *War in the Air*, was published a mere five years after the Wright's flight and illustrates the terrifying position that this new invention held in the public mind. A plethora of books on the subject followed within the next twenty years, including one by Mitchell entitled *Winged Defense*. It was not that there was no defense whatsoever against bombardment, pursuit aviation and anti-aircraft artillery would continue to be improved throughout this period with the express intention of negating the bombers, but it was the strengths of aviation, speed and freedom of movement, that created the aura of invincibility. The crossing of the English Channel by Louis Bleriot in 1909 had a profound effect on the British and forced them to

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<sup>32</sup> Finney, 32.

reevaluate their concept of security in this new air age. The ideas first espoused by Wells quickly moved from science fiction to science fact in the eyes of the public and made their way upwards through the halls of policymakers and government officials. The fear of the bomber has been forever enshrined in the famous statement by then Member of Parliament Stanley Baldwin. “I think it is well for the man in the street to realize that there is no power on earth that can protect him from being bombed, whatever people may tell him. *The bomber will always get through...*”<sup>33</sup>

With this belief already prevalent it is understandable that the United States Army Air Force would accept the corresponding notion, that their bombers would be able to successfully bomb their targets regardless of enemy opposition. The major difference between what was being discussed by everyone from reporters to politicians and those at ACTS was the nature of the targets. If you are interested in indiscriminately bombing your enemy you have a plethora of targets from which to choose from, in fact anywhere within their borders, and such a vast number of possibilities would indeed be indefensible. On the other hand, if you have a doctrine that lists certain industries as the only acceptable targets due to a desired outcome then you provide the enemy the ability to centralize their fighter and anti-aircraft artillery at defined targets, making the job of the defender infinitely easier. If you then insist on making repeated attacks against such heavily defended targets the situation has the potential to become both tragic and darkly comical. Such a self-imposed target limitation, when combined with the newly developed

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<sup>33</sup> *The Times* (London), 11 November 1932. (Italics added by author for emphasis.)

technology of radar, would allow for a high level of defensive preparation before USAAF attacks.

Craven and Cate looked to the effect of the coastal defense exercises of spring 1933 upon Brigadier General Westover, Assistant Chief of Air Corps, as a reason for the incorporation of the invincible bomber theory into official USAAF doctrine. This was primarily due to the technical advances in bombardment aviation as represented in the Boeing B-9 and Martin B-10.

During these exercises, observation aviation appeared woefully obsolete in performance, as did pursuit aviation in speed characteristics. Since new bombardment aircraft possesses speed above two hundred miles per hour, any intercepting or supporting aircraft must possess greater speed characteristics if they are to perform their missions. In the case of pursuit aviation, this increase of speed must be so great as to make it doubtful whether pursuit aircraft can be efficiently or safely operated either individually or in mass.<sup>34</sup>

These may be solid conclusions based on production models in 1933, but if there is one constant about the aircraft industry during the twentieth century it is rapid technological advancement. While the B-9, with a maximum speed of 186 mph and a ceiling of 22,500 feet, and the B-10, with a maximum speed of 200 mph and ceiling of 25,200 feet, may have outperformed operational pursuit craft in 1933, pursuit aviation was not standing still.<sup>35</sup> The introduction of the Boeing B-17 Flying Fortress in 1935, with a maximum speed of 302 mph and maximum ceiling of 36,600 feet, may have

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<sup>34</sup> Gen. Westover, quoted in Craven and Cate vol. 1, 65.

<sup>35</sup> Jackson, 51 and 246.



upped the ante, but it did not force pursuit out of the game.<sup>36</sup> The failure of USAAF leadership to recognize that technology progresses much more rapidly than doctrine can incorporate change resulted in a significant disconnect between prewar doctrine and its application. One needed only to look at the speed and altitude records achieved during the 1930s to see what was on the way to face off against American bombers. Speed records for single seat aircraft went from 294 mph in 1932 to 351 mph in 1935 and would jump to 468 mph in 1939.<sup>37</sup> Altitude records would go from 43,978 feet in 1932 to 56,049 feet in 1938.<sup>38</sup> While these records may have been set by prototypes and specialized aircraft, today's prototype is tomorrow's production model and it is beholden upon policy makers to recognize this fact and plan accordingly.

### Blinded by the B-17

One cannot overemphasize the impact of the B-17 upon American bombardment doctrine. This aircraft, coupled with the Norden M-1 bombsight, provided the means which, in the minds of air planners at the time, would allow for strategic bombardment to come into reality. In order to justify these programs there again existed a certain amount of subterfuge on the part of the Army Air Corps as the B-17, an aircraft which at its core was a purely offensive weapon, was sold to both the public and politicians as the best means to achieve coastal defense. "As late as 1939 the impression persisted, outside of

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<sup>36</sup> Ibid., 52.

<sup>37</sup> Enzo Angelucci, *World Encyclopedia of Civil Aircraft*. (Edison, N.J.: Chartwell Books, 2001), 173.

<sup>38</sup> Ibid., 175.

the Army as well as in, that the Air Corps bombers were being built purely for defense.”<sup>39</sup>  
The strategy worked and the first 13 B-17s were delivered to the Army between January and August of 1937.<sup>40</sup>

With anywhere from ten to thirteen machine guns mounted on the B-17, depending on the model, the existence of such a heavily-armed aircraft reinforced the already established beliefs of bomber self-defense and bomber invincibility. Though this concept did result in a lack of an escort fighter during the early missions over Europe, prewar planners were not naïve enough to believe that even a B-17 could survive an onslaught of enemy fighter opposition alone. The use of formation flying, which allowed for the overlapping of gunfire, provided a stronger defensive network surrounding the aircraft.<sup>41</sup> This practice raises some very important points. First, the acceptance of formation flying can be seen as an acknowledgement of the advancements in air defense technology and an expression of a fear that the bomber may not be invincible after all. If planners were willing to go this far, then why not push for the development of an escort fighter as an indispensable component of the bomber offensive prior to massive losses over Europe? Secondly, formation flying may have provided a much more efficient defense against fighter aircraft, but what of anti-aircraft artillery? Clustering the bombers together would greatly assist the ground defense; not only would the probability of hitting a target in the general area increase but there would also be less space between targets,

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<sup>39</sup> Greer, 90.

<sup>40</sup> Craven and Cate vol. 1, 66.

<sup>41</sup> Tight formations would become a predominate aspect of USAAF operations. Practical experiences over Europe caused formation flying to be given a high level of emphasis both in training and active duty due to both its defensive nature and a desire for accuracy through tight bomb patterns.

requiring less time for sighting of subsequent targets, hence allowing more rounds to be fired per minute.

But the central problem inherent in formation flying deals with space and time. If you are advocating a 'precision' bombing strategy then it is implied that area bombing is not desired nor an effective means to achieve the desired ends. Truly 'precision' targets were expected to be small (100 feet x 100) and accuracy even under controlled conditions was difficult to achieve.<sup>42</sup>

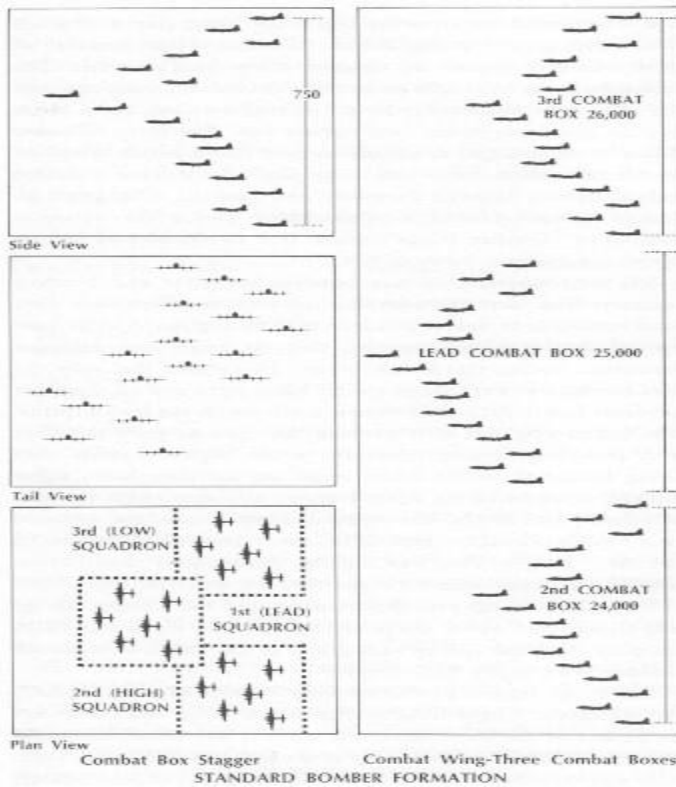
There exists at 23,000 feet a finite number of locations within which an aircraft can release its bomb and have it successfully land on target, and the smaller the target the fewer such places there are. At this time there were no GPS or laser guidance systems; successful delivery of ordinance was reliant upon properly choosing when to release the bomb to allow gravity to bring it to its desired destination. The Norden bombsight existed to calculate when this point in space and time had been reached, and even if human error did not affect the bomb run such precise computations only counted for the lead aircraft doing the calculations. Combined with the practice of 'dropping on the leader', formation flying was not a means to achieve true single-shot precision strikes. It was, in practice, "the area bombing of selected industrial targets and their immediate surroundings."<sup>43</sup> To achieve true precision bombing the attacking aircraft would have to approach the target single file, calculating their aiming points independently. Due to defensive necessity and the reliance on probability to achieve a precision strike individual approaches were not

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<sup>42</sup> See table page 19.

<sup>43</sup> Research Institute for Military History, ed., *Germany and the Second World War*, vol. 7, by Horst Boof, Gerhard Krebs, and Detfel Vogel (Oxford: Clarendon Press, 2006), 14.

possible and the result was that each aircraft had the final location of their bomb drop dictated by their position in formation. When the lead plane, whose bombardier had calculated when to release his bomb load to achieve a hit, dropped its load the other aircraft in the formation did as well and it was not physically possible for their bombs to hit the same location.



If the formation was the size of a football field and the aircraft all dropped their bombs at the same time then the bomb pattern would be the size of a football field, and formations were often much larger than this. “For example, in March 1943 the 54-bomber box was about 1 1/3 miles wide, spread 2500 feet in  
<sup>44</sup> altitude and 1/3 mile from

front to back.”<sup>45</sup> The only way that adding bombers could increase the probability of a hit on such small targets would be to bomb single file or in pairs, not in wide defensive formations. What the air planners had really devised was a means to achieve localized area bombing, though it was publicly claimed to be a technique that could achieve

<sup>44</sup> Hansell, 117.

<sup>45</sup> Frank Heilenday, *Daylight Raids by the U.S. Eighth Air Force: Lessons Learned and Lingering Myths from World War II*. (Santa Monica, CA : RAND, 1995), 13.

precision strikes to destroy the enemy's productive capacity with a minimum of collateral damage. The B-17 reinforced the defensible bomber theory which resulted in both the delaying of an effective escort fighter and the inability to achieve true 'precision'.

USAAF doctrine, according to one of its creators General Haywood Hansell, was "a concept developed through logic, map problems, and war games."<sup>46</sup> It was not the result of experience but rather calculations formed in an office with a calculator and probability tables based on limited testing data. Major Harold George, during the first session of his Air Force course in 1935, told his students: "From today on much that we shall study will require us to start with nothing more than an acknowledged truth and then attempt, by the utilization of common sense and logic, to evolve a formula that we believe will stand up under the crucial test of actual conditions."<sup>47</sup> While the creation of a new technological doctrine is an amazing feat and itself worthy of praise, the lack of thorough testing calls the motives of air planners into question. "In teaching the subject of air force employment, the instructors at the Tactical School solved the problem by ignoring the actual strategical demands of the United States and by discussing pure theory."<sup>48</sup> When boiled down to its most basic level, the doctrine developed at ACTS was one of assumption based upon assumption. While the lack of a conflict to test these new ideas was not the fault of the minds at ACTS, blind faith in untested doctrine and an inability to accept outside criticism solely belong to them. "Although it is not surprising that the Air Corps theorists developed such ideas in the absence of actual tests, what is

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<sup>46</sup> Hansell, 4.

<sup>47</sup> Maj. George, Quoted in Finney, 28

<sup>48</sup> Greer, 53

remarkable is the tenacity with which they held to them even when these ideas were discredited by the experience of war.”<sup>49</sup> Resistance to doctrinal revision when confronted with its operational shortcomings was a result of both bureaucratic rigidity and uncompromising ideology. By the end of the 1930s, air planners could argue their convictions with such fervor, tenacity, and statistical evidence that they eagerly awaited the day when they could proselytize to the great masses and unveil the dawn of the bomber.

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<sup>49</sup> Ibid., 116.

## Chapter 2: Making It Official

Early doctrinal developers knew that their ideas were outside of the accepted norms of the military system, and they chose to wait for the proper moment to present their new vision of the power of strategic bombardment. When the time came it provided an opportunity for airmen to codify their beliefs into a single document, a type of ‘Bombardment Constitution’.

*AWPD/1: Munitions Requirements of the Army Air Forces* was produced in response to President Roosevelt’s request of July 9th, 1941 which called for Army and Navy war production estimates. As it was almost impossible to answer this request “without asking fundamental questions about what the Army Air Forces were supposed to do in Europe,”<sup>50</sup> this document went beyond simply discussing hardware and manpower needs and became the vessel by which the doctrine developed at ACTS was presented and sold to decision makers in Washington for its application in a future conflict. “It marked the first time that airmen in the Army Air Forces were permitted to do their own planning, thus it was a critically important step in their move towards independence.”<sup>51</sup> General Henry ‘Hap’ Arnold, commander of the Army Air Corps, had fought against the idea of a simple air annex to the War Department’s overall report, and his tenacity paid off.<sup>52</sup> The idea that only airmen were truly qualified to deal with matters of aviation, a concept championed by Mitchell after World War I, had come one step

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<sup>50</sup> James C. Gaston, *Planning the American Air War: Four Men and Nine Days in 1941*. (Washington, D.C.: National Defense University Press, 1982), 17.

<sup>51</sup> *Ibid.*, ix.

<sup>52</sup> Hansell, 64.

closer to reality. “Tacitly, though not legally, the AAF staff had assumed on this occasion a position of equality with those of the other arms.”<sup>53</sup> The team that was created consisted of former instructors from the Air Corps Tactical School: Lt. Col. Harold L. George, Lt. Col. Kenneth Walker, Major Haywood S. Hansell, and Major Laurence S. Kuter. As Hansell later wrote, “We realized instinctively that a major milestone had been reached.”<sup>54</sup> The plan would be created between August 5<sup>th</sup> and August 12<sup>th</sup> 1941 in the Munitions Building in Washington D.C.<sup>55</sup>

“The only restriction given George was that his proposal had to conform to RAINBOW 5, the overall war plan agreed to by the British and American staffs during the “ABC” discussions in May 1941.”<sup>56</sup> It was agreed that Germany constituted the greatest threat to the Allies and her defeat would be the primary objective in a future war. Once a potential enemy is known it becomes easier to develop a method of attack. What is amazing in this case is that an elaborate method of attack had been formulated, clarified, and fully accepted by airmen for the proper use of bombardment long before the enemy had become clear.

The document itself is fascinating, not only for its codification of and blind faith in doctrine as developed at ACTS but also the predominate role given to this untested theory in the overall war strategy. The purpose of air power in a future war with Germany was to “wage a sustained air offensive against German military power” and to “support a

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<sup>53</sup> Craven and Cate vol. I, 146-147.

<sup>54</sup> Hansell, 65.

<sup>55</sup> For a very compelling description of the writing process and the high pressure circumstances surrounding *AWPD/I*'s creation, James C. Gaston, *Planning the American Air War: Four Men and Nine Days in 1941* is required reading.

<sup>56</sup> Clodfetter, 90.



final offensive, if it becomes necessary to invade the continent.<sup>57</sup> After struggling with the Navy throughout the 1930s over the issue of coastal defense,<sup>58</sup> the Air Corps was now claiming, within an official document, that it could bring about Germany's surrender through bombing alone without the assistance of the other two established branches. This was not a requirements plan for joint action, but rather a document that focused solely on what was needed for the USAAF to destroy the enemy. Not only was it a go-it-alone war plan, it also disregarded many of the lessons already learned by other nations in two years of modern warfare. "In spite of earlier German and English experience, it was concluded that... it would be feasible to make deep penetrations into Germany by day."<sup>59</sup> The belief that they could accomplish the complete destruction of Germany's economy and therefore bring about its capitulation without the other branches of the armed forces is a wonderful example of the quasi-religious belief that airmen had in their new weapons and doctrine.

It is important to note that there were no economic or industrial experts among the four officers who would establish industrial target priorities for the bombers. Haywood Hansell made much of his time in the newly created Strategic Air Intelligence Division in 1940 and of his trip to England to gather intelligence of German industry, but he was not

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<sup>57</sup> Air War Planning Division. *AWPD/1: Munitions Requirements of the Army Air Forces*. (Washington D.C.: War Department, Headquarters of the Army Air Forces, August 12, 1941. Air Force Historical Research Center, Maxwell AFB, AL 36112), tab 2, 1. (Underlined by the author for emphasis.)

<sup>58</sup> The coastal defense argument, as pointed out earlier, was and still is considered by many to have been a ruse. As Greer so succinctly put it, "The just suspicion grew that the Air Corps had unlimited desires for ever-larger planes and that the defense argument was simply an expedient for obtaining the biggest planes then available." (Greer, 93.)

<sup>59</sup> Craven and Cate vol. 1, 149.

a technical expert in the field.<sup>60</sup> “What he knew was enough to convince Hal George and the others that their plan, whatever it turned out to be, would be based upon a theoretically and practically sound approach to targets in the German economy and war machine.”<sup>61</sup>

One of the key assumptions upon which *AWPD/I* was based was the state of the German economy. Looking at the situation in Europe from an American perspective, the Air War Planning Division team saw a system stretched to its limits that could easily be pushed over the edge by applying pressure to certain defined areas:

Nearly 17 million men are directly engaged in this war, to the exclusion of all normal civil pursuits and production. Hence, there is a very heavy drain on the social and economic structure of the state. Destruction of that structure will virtually break down the capacity of the German nation to wage war.<sup>62</sup>

This presumption neither takes into account the impact of foreign workers nor the elasticity inherent within the German economic system. It was assumed that Germany was at full production simply because if America was in that situation it would be, and is more the projection of the American system upon Nazi Germany than reality. According to Gaston, this was largely due to Hansell, who “knew far more than they had any right to expect, and less than any of them could imagine.”<sup>63</sup>

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<sup>60</sup> Hansell, 49-50.

<sup>61</sup> Gaston, 32.

<sup>62</sup> *AWPD/I*, tab 2, 2.

<sup>63</sup> Gaston, 35.

## Proposed Target Systems

Target priorities consisted of three major systems: electrical power, transportation, and oil. The planners also included morale which was to be a target only if the enemy needed a final nudge after the destruction of the first three target systems. Electricity was seen as the backbone of an industrialized society, and fifty electrical targets were selected. “They are precision targets. A typical plant covers an area about 500 ft. x 500 ft. The British estimate that about 17 hits in that area will guarantee destruction of the plant.”<sup>64</sup> The Luftwaffe itself was listed as an “intermediate objective, whose accomplishment may be essential to the accomplishment of the principle objectives.”<sup>65</sup> It is interesting that the enemy’s air force was not considered a primary target. This illustrates the depth to which the invincible bomber theory had taken root among airmen and also the desire to remove themselves from the counter-air role assigned to aviation since World War One.

*AWDP/I* claimed that “the German railways are working at capacity.”<sup>66</sup> Though the network covered the entire extent of Germany it was still seen as a viable target due to perceived strain. Forty-seven transportation weak points were selected, consisting of both railway targets (marshalling yards and bridges) and inland waterway targets (ship elevators, locks, and harbors).<sup>67</sup> The importance of the German transportation system is acutely understood within *AWPD/I*, unfortunately this insight would not return until the very end of operations in Europe. “It is estimated that disruption of the marshalling yards

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<sup>64</sup> *AWPD/I*, tab 2, 3.

<sup>65</sup> *Ibid.*, tab 2, 2.

<sup>66</sup> *Ibid.*, tab 2, 4.

<sup>67</sup> *Ibid.*, tab 2, 6.

of the Ruhr for 24 hours sets back the production of the Ruhr about two weeks.”<sup>68</sup> What the planners failed to do was take this a step further; why would this disruption have such an effect on production? The answer lies in Germany’s dependence on coal, not oil. This gap in the understanding of German industry can largely be attributed to the projection of the American industrial system upon Germany and would prove to be one of the failures of prewar doctrinal development.

Oil was seen as indispensable to the German system. “German transportation, the German Air Force, the German Navy, and German industry all are dependent upon oil.”<sup>69</sup> Note the exclusion of the Wehrmacht from this list, and postwar analysis would show that only the Luftwaffe was entirely dependent upon oil. According to *AWPD/I*:

About 60% of aviation gasoline comes from synthetic production in Germany proper. Eighty per cent of this production comes from 27 plants. These plants vary from 400 to 1,000 miles from England. They are easily distinguishable in daylight, and they are susceptible to destruction by bombing. They are precision targets.

About 22% of the oil for aviation gasoline comes from Rumania. It is refined in Rumania and is moved primarily by water transportation up the Danube to Germany. Success in the oil venture might necessitate operating against the Danube to stop this flow. Hence, the importance of retaining bases in Asia Minor or Syria.”<sup>70</sup>

This section is important in two respects. First, it illustrates a lack of understanding of the German crude and synthetic oil industries. While aviation fuel was indeed dependent upon synthetic production through either the Fischer-Tropsch process or Bergius hydrogenation method, it was to a much greater extent than believed. In fact, aviation fuel was almost entirely reliant upon synthetic production due to the high octane

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<sup>68</sup> Ibid., tab 2, 4.

<sup>69</sup> Ibid., tab 2, 7. (Underlined by the author for emphasis.)

<sup>70</sup> Ibid., tab 2, 7.

content required.<sup>71</sup> Also, as will be discussed in more detail in the next chapter, Germany knew of its precarious position in regards to crude oil supplies and had adjusted its economic base accordingly. “Less than 15 per cent of their aviation fuel and only a fourth of all their oil products made early in 1944 came from crude oil. The rest came from coal as did also nearly all of Germany’s rubber, explosives, and other war materials.”<sup>72</sup> This of course raises the larger question of just how critical Ploesti was to the German economy.

The doctrine developed at the Air Corps Tactical School saw its culmination in *AWPD/I*. It was believed that by destroying electrical, transportation, and oil targets a wholesale disruption of the German economy would result and the industrial web would crumble due to the loss of these few vital strands holding it together. It is important to note that of these three systems electrical power would never become an actual target during the war and transportation, until the very end of the war in Europe, would play second fiddle to oil.

## Plan Feasibility and Requirements

Once the mission of bombardment had been presented the planners were able to address the purpose of the document, the hardware and manpower requirements to achieve victory. But first a vital question had to be addressed: was the plan possible? Would the bombers make it through? In reference to German fighter opposition it was recognized that the B-17 could not outrun the more agile interceptors. “The B-17s rely

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<sup>71</sup> United States Strategic Bombing Survey. *Oil Division Final Report*. (Washington, D.C.: U.S. GPO, 1947), 14.

<sup>72</sup> *Ibid.*, 10.

upon speed, altitude, and deception. However, they have been intercepted, and each time the ME 109s were capable of flying above them and of overtaking them.”<sup>73</sup> It was due to this that a reversal occurred within *AWPD/I* and a call for a long-range escort fighter was added into the document. Aircraft take time to develop, test, and manufacture, and to finally recognize the need for such a fighter in 1941 calls into question the earlier motivations of bombardment planners at ACTS. In their desire to establish a mission apart from that of pursuit and observation forced upon them by the military establishment the Air Corps failed to produce a well-rounded, all inclusive doctrine during the 1930s. Hansell would later see this as a significant weakness within ACTS doctrine. “Failure to see this issue through proved one of the Air Corps Tactical School’s major shortcomings.”<sup>74</sup>

The deadliness of anti-aircraft artillery was also recognized, though the solution provided was not a practical one. “It is necessary for bombers to keep maneuvering to avoid being shot down, even at 18,000 feet. The Germans use radio predictions, and fire with amazing accuracy, even through an overcast.”<sup>75</sup> The Norden bombsight required a steady bomb run, in fact the pilot lost control of the aircraft when the bombardier was setting up for the approach. Due to the technical advances to bring about ‘precision’ attacks it was not possible to maneuver for up to five minutes during the approach to the target.<sup>76</sup> Because of the doctrine of precision bombing, which was a result of the industrial web theory, air crews were, in essence, sitting ducks over these heavily

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<sup>73</sup> *AWPD/I*, tab 2, 11.

<sup>74</sup> Hansell, 22.

<sup>75</sup> *AWPD/I*, tab 2, page 12.

<sup>76</sup> Leroy W. Newby, *Target Ploesti: View from a Bombsight*. (Novato, CA: Presidio, 1983), 53.

defended target areas. That a call for an escort fighter and a countermeasure for anti-aircraft fire, however superficial, were included within *AWPD/1* demonstrates that when push came to shove air planners themselves were not truly convinced of the invincibility of the bomber. Despite these acknowledgements of the reality of German defenses, somehow the conclusion was reached that the mission was possible. “Consideration of all these factors leads to the conclusion, that by deploying large numbers of aircraft with high speed, good defensive fire power, and high altitude, it is feasible to make deep penetrations into Germany in daylight.”<sup>77</sup> The argument is not convincing, and it would be severely tested in the skies over Schweinfurt and Regensburg.

In order to justify force requirements the *AWPD* team had to present the logic behind their calculations, and to do so they looked to U.S. bombing range data from June through December of 1940. First, the assumed altitude of attack was set at 20,000 feet and the target size was set at 100 feet x 100 feet. The current American range error of 220 feet and structure error of 275 feet were factored into the equation and, to allow for combat conditions, the current bombing error was multiplied by 2.25. Then the single shot probability (SSP), the probability that at least one bomb would hit the target, was calculated at .012. Based on this data it was determined how many aircraft, and therefore would many bomb drops, would be required to ensure destruction of the target. “SSP of .012 results in a requirement of 220 bombs (planes) to secure one hit. To secure one hit

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<sup>77</sup> *AWPD/1*, tab 2, page 12.

against target of selected size – 220 airplanes (bombers) are required.”<sup>78</sup> There were some very important preconceptions which went into this probability formulation:

Assumption – one hit of proper size bomb on target should affect its destruction. The majority of targets will be susceptible of (to) destruction by bombs of the smaller sizes (1000#, 500#). One hit of such size bomb indicates a high probability of other hits from remaining bombs released from plane simultaneously. Hence, for purposes of calculation, one bomb equals one airplane as a conservative basis for calculating force.<sup>79</sup>

Equating one bomb on target with that target’s destruction would cause immense frustration not only for planners but also for the men who were sent back over heavily-defended targets again and again. The idea that either a 500 lb. or 1,000 lb. bomb would be sufficient against targets with hardened defenses proved false. The most amazing aspect of all this is that there were no trials against dummy targets within the United States prior to the war to support these assertions. There is no record of tests against old or mock refineries and electric powerhouses, nor discussion of bombardment tests upon rail centers during peacetime to demonstrate the feasibility of ACTS doctrine.

The amount of planes required for the destruction of the target based on these calculations is phenomenal. With 36 aircraft per group, it was determined that, after factoring in the 2.25 factor for wartime error, it would require 30 group missions to destroy the target, or 1,080 effective sorties. George and his team were not only calling for a total of 98 groups (6,834 bombardment aircraft total)<sup>80</sup> to test their industrial web

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<sup>78</sup> Ibid., tab 3b, page 2.

<sup>79</sup> Ibid., tab 3b, page 2. (Underlined by author for emphasis.)

<sup>80</sup> Ibid., tab 3a, page 1. It is important to point out that this number also included 2992 aircraft of an as yet nonexistent 4000 mile radius type. Not only did *AWPD* presuppose many of its conclusions, it also assumed the materialization of aircraft that only existed on drawing boards to accomplish them.



theory, but also the industrial, economic, and human requirements to put them in the air. However, the most chilling aspect of *AWPD/I* is its discussion of expected attrition rates. “Current W.D. attrition rates (20% per month loss in airplanes by all units except operational training units were (sic) 3% prevails) applied throughout.”<sup>81</sup> With 6,834 total aircraft called for this would be a loss of 1,367 aircraft per month. With an average crew of ten per bomber this would mean an expected casualty rate of 13,670 men per month. Men with families and futures. And this plan was accepted without radical modification by Secretary of War Henry Stimson and General George Marshall. Hansell, writing later, would claim a higher expected rate than that. “Anticipated attrition called for a monthly replacement rate of some 2,133 aircraft.”<sup>82</sup> The fact that that this plan was sold to the public as an efficient means to wage war against Germany and that it was not significantly challenged speaks to the power of prewar notions about the possibilities of airpower.

## From Paper to Reality

President Roosevelt came to see the diplomatic leverage that could be gained from what is perceived to be a powerful air force after the Munich Crisis in September of 1938. William Bullitt, Ambassador to France, wrote to Roosevelt on September 20<sup>th</sup> stating that “If you have enough airplanes you don’t have to go to Berchtesgaden.”<sup>83</sup> Though FDR became acutely aware of the position of air power within modern

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<sup>81</sup> Ibid., tab 3a, page 1.

<sup>82</sup> Hansell, 88.

<sup>83</sup> Quoted in Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon*. (New Haven, CT: Yale University Press, 1987), 76.

diplomacy, this does not mean that he was immediately sold on strategic bombing as developed at ACTS during the 1930s. As Sherry points out, “He formed no alliance with the bomber enthusiasts, probably as yet unfamiliar with their ideas.”<sup>84</sup> The pivotal event for the realization of the Air Corp’s vision was Roosevelt’s May 16, 1940 address before a joint session of Congress. After painting the picture of a highly vulnerable America because of the aviation advances of the Axis Powers, FDR proceeded to call for a 50,000 aircraft force along with the industrial capacity to reinforce it completely every year. To pay not only for the material but also the necessary training and logistical costs he requested a total appropriation of \$896,000,000.<sup>85</sup> Though this was not the first appropriations request for war materiel, and by no means the last, it was a firm and public acknowledgement by the President that, in his belief, airpower in some form would play a decisive role in the next conflict. Having been a Navy man, it would have been understandable had Roosevelt called for a predominately naval expansion. The fact that he did not is very telling. Roosevelt recognized that in modern warfare the airplane provided something in abundance that was difficult to attain through conventional land and sea forces. “Defense cannot be static. Defense must grow and change from day to day. Defense must be dynamic and flexible, an expression of the vital forces of the nation and of its resolute will to meet whatever challenge the future may hold.”<sup>86</sup> Nothing embodied flexibility, nor allowed for the offensive defense alluded to by Roosevelt, like airpower.

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<sup>84</sup> Ibid, 89.

<sup>85</sup> Franklin Delano Roosevelt, *Request to Congress for Additional Defense Appropriations*. May 16, 1940. <http://www.ibiblio.org/pha/7-2-188/188-16.html> accessed 3/6/2009.

<sup>86</sup> Ibid.

With the public endorsement of the President and the financial backing of Congress a large bureaucratic system emerged to implement the strategic vision of air planners. Not only was there an immense desire for aircraft but also for the crews to fly them. Civilian trainers at private air schools contracted with the Army and “Air Corps personnel jumped from 20,503 on 1 July 1939 to 152,569 just two years later.”<sup>87</sup> In discussing his training to become a B-24 pilot John J. Hibbits portrayed a program that focused on producing quality crews as rapidly as possible. Through his journey from Preflight Training to Primary, from Basic to Advanced, and lastly to B-24 Training, it is clear that there existed a rush to get these boys flying. Just the sheer number of schools in the training process shows the seriousness and thoroughness demanded by the Air Corps even in times of imminent hostilities. Hibbits makes one extremely important point: while rigorously educated in the principles of aerodynamics, meteorology, navigation, formation flying, and air and naval identification there was no indoctrination of the theory underlying the tactics. “There was as little discussion of theory as possible, while practical facts were poured into our brains every minute.”<sup>88</sup> Those putting the plan into action were not trained in the intricacies of the doctrine underlying their missions; they were to carry them out, not understand the reasoning behind them. Craven and Cate point out that training “emphasized the importance of formation flying at all altitudes, of accuracy in bombing and gunnery, and of the development of well-integrated combat crews.”<sup>89</sup>

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<sup>87</sup> Craven and Cate, vol. 1, 110.

<sup>88</sup> John Joseph Hibbits, *Take 'Er Up Alone Mister!* As told to F.E. Rechnitzer. (New York: Whittlesey House, McGraw-Hill Book Co., 1943), 77.

<sup>89</sup> Craven and Cate vol. 1, 112.

Before Pearl Harbor American airmen had developed a plan for the effective use of the new air weapon and had convinced their superiors of the soundness of it. President Roosevelt became convinced of the necessity of airpower due to events in Europe and it was through his demands that air planners were allowed the means to bring their vision of strategic bombing into reality.

## Chapter 3: The True Nature of the Enemy Economy

In order to properly analyze the effects of American strategic bombing doctrine it is necessary to take a look at its intended target, the German economy. Only when these two pieces of the puzzle are interlocked can one step back and appreciate the final picture, the results of the American bombing campaign. This raises the question of just how important was Ploesti to the Nazi war machine. Was it, as many then and now have argued, the foundation upon which the German military depended? Did this reliance carry over to the German economy? It is important to remember that American doctrine was aimed at the economic foundations of the enemy's military, not the military itself. In order to properly address the importance of Ploesti we must first look at the German war economy and specifically the role of petroleum in it.

As discussed in the previous chapter the American view of the German economy was of one operating under heavy strain, stretched to the limit and teetering on the edge. It was viewed as being in such dire straits that only six months of bombardment would be needed to bring about its collapse, and with it the capitulation of the German military. Yet, the German economy was able to support the army until 1945. Why the discrepancy? Going against the stereotype of efficiency, Germany's economy was never completely harnessed for war. "While the German economy was approaching its basic limitations in mid-1944, it never attained its full war potential."<sup>90</sup> This was due to the

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<sup>90</sup> United States Strategic Bombing Survey. *The Effects of Strategic Bombing on the German War Economy*. (Washington, D.C.: U.S. GPO, 1945), 8.

German economy never truly being put on a total war footing. According to historian Alan S. Milward, “In 1942 consumers’ expenditures, in terms of 1939 Reichsmarks, stood practically equal to 1937 when the civilian population was almost the same size.”<sup>91</sup> The Nazi regime was determined to produce both guns and butter as long as possible to placate the population.

The economic initiatives under first Fritz Todt and then Albert Speer were able to wring increased production from an economy under siege by introducing new methods of efficiency and limiting production models. Many of the reforms enacted, such as double and triple shifts, were already in effect in Britain and America. This modernizing of the German economy had an immediate and pronounced effect upon German war production. “Despite the damage wrought by air attack and territorial losses, and despite the general drop in production in the second half of 1944, total industrial output for the year was the highest of the war.”<sup>92</sup> One can only wonder what would have happened if Germany had developed a total war economy prior to 1939.

It is interesting that when one studies the German economy the discussion invariably gravitates towards Germany’s raw material situation, in particular that of oil. Is this due to oil’s central place within the German industrial system or more so because of the Allied bombing campaign against it? “With the exception of synthetic oil, basic industrial materials were not major targets in the combined air offensive against Germany.”<sup>93</sup> War planners projected many aspects of the American economy and war

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<sup>91</sup> Alan S. Milward, *The German Economy at War*. (London: Athlone Press, 1965), 29.

<sup>92</sup> USSBS, *German War Economy*, 26.

<sup>93</sup> *Ibid.*, 63.

experience into their understanding of Germany, was oil yet another victim of this phenomena? Has oil maintained its historical status as a critical economic target system due to it actually being one or due to the effort expended in lives and material in attacking it?

On September 9, 1936, the Four Year Plan was implemented in Germany under the auspices of Hitler's second in command, Hermann Goering. The purpose of this measure was to bolster Germany's raw material production capabilities, especially in the areas of synthetic fuel and rubber. 1,261 million Reichsmarks were set aside for the program and "one-half of the total investment undertaken in connection with the Four Year Plan was related to the production of synthetic fuel."<sup>94</sup> The belief was that Germany would be capable of supporting military operations within four years without requiring raw material imports which, if World War One was any guide, would be cut off due to a blockade of the continent. "Capacity for synthetic oil production was increased more than twofold (in) 1936 and 1939. But the 1939 output was 45 per cent below what had been envisioned."<sup>95</sup> Though unable to achieve the desired growth, investment along these lines did not stop with the beginning of hostilities in 1939:

Synthetic rubber production was raised from 5,000 tons to 134,000 tons per annum between 1939 and 1944; the latter was adequate to cover all requirements. In the case of oil, synthetic production was raised from 1.3 million tons in 1938 to an annual rate of 6 million tons by early 1944, while crude oil production was expanded (through the development of Austrian fields) from 0.6 to 2.0 million tons. Together with the Rumanian and Hungarian supplies of about 2.5 million tons, these were adequate to

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<sup>94</sup> Gillingham, John. *Industry and Politics in the Third Reich: Ruhr coal, Hitler, and Europe*. (New York: Columbia University Press, 1985), 69.

<sup>95</sup> Milward, 20.

achieve the needs of the armed forces, whose pattern of consumption was, of course, itself adjusted to the oil situation.<sup>96</sup>

## Oil and the German Military

The belief that the German's were heavily dependent upon oil is mostly the result of a serious misconception of the German army both then and now. With the development of blitzkrieg warfare and its reliance on mechanized units, the impression was purposely made upon the world that the entire German military was a modern force powered by the internal combustion engine. This belief does not stand up under scrutiny. In fact, mechanized and motorized divisions "generally composed well under 25 percent of the divisions deployed by the Wehrmacht."<sup>97</sup> The small number of motorized divisions is astonishing when one looks at the composition of the German forces during the invasion of Poland. "Of the total of 102 divisions, only the 14 mobile divisions were completely motorized."<sup>98</sup> This is a long way from the perception, created by images played in newsreels around the globe, of a fully modern and mobile army pouring across the border. The tip of the sword may have been motorized for quick thrusts and piercing attacks, but the bulk of the German land force would rely on that ancient means of locomotion, the horse. "The standard German infantry division (1939 pattern) required

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<sup>96</sup> Nicholas Kaldor, "The German War Economy," *The Review of Economic Studies* 13, no. 1 (1945-1946): 43. (Underlined by author for emphasis.) Kaldor was a member of the team that worked on the USSBS economic effects study and as such this paragraph appears almost verbatim within that report. (USSBS, *The Effects of Strategic Bombing on the German War Economy*, 10.)

<sup>97</sup> Dinardo, R.L. *Mechanized Juggernaut or Military Anachronism?: Horses and the German Army of World War II*. (New York: Greenwood Press, 1991), 2.

<sup>98</sup> *Ibid.*, 21.



anything from 4,077 to 6,033 horses to move.”<sup>99</sup> Knowing that they lacked the means to fuel a fully mechanized military, German leaders did not create one. “Of the 35.6 billion Reichsmarks to be spent between 1937 and 1941, less than 5 per cent (4.7 percent) was earmarked for tanks and motor vehicles. By contrast, guns, artillery and ammunition were allocated 32 per cent of the budget.”<sup>100</sup> The main exception to this was of course the Luftwaffe, which was wholly reliant on aviation-grade fuel to be of any use whatsoever.

Total petroleum production in 1940 within Germany and its occupied territories (excluding Romania) was 3,963,000 tons. Though total consumption amounted to 5,856,000 tons, the total produced within the Reich more than covered the 3,005,000 tons necessary for the armed forces. In 1943, when the Combined Bomber Offensive began, Greater Germany was producing 6,563,000 tons of petroleum with a military requirement of 4,762,000 tons.<sup>101</sup> Germany may not have been able to produce enough petroleum within her borders to meet all requirements but she was able to meet her military needs. The system was designed for short, decisive wars that would produce, and were based upon, an ebb and flow of petrol stocks. Fuel stocks from conquests were no small factor and, though not sources of continuous supply, must also be factored into the equation.<sup>102</sup> The invasion of the U.S.S.R. does not appear initially to have upset the oil situation in regards to domestic and industrial use. Jensen points out that, “with the exception of one

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<sup>99</sup> Dinardo, R.L. “Horse-Drawn Transport in the German Army,” *Journal of Contemporary History* 23, no. 1 (Jan., 1988): 132.

<sup>100</sup> Tooze, Adam. *The Wages of Destruction: The Making and Breaking of the Nazi War Economy*. (New York: Viking, 2007), 212.

<sup>101</sup> Jensen, W.G. “The Importance of Energy in the First and Second World Wars,” *The Historical Journal* 11, no. 3 (1968): 551.

<sup>102</sup> According to Jensen, German confiscated 785,000 tons of fuel stocks with the fall of France. (Jensen, 548.)

million tons of oil delivered to Germany, the rest of the Rumanian oil production went directly to the front in the East.”<sup>103</sup> This fact forces one to draw the conclusion that industry, and therefore the German economy, was not reliant upon Romanian crude. This source was necessary to allow for extensive military activities, such as Operation Barbarossa. Only when operations had to be maintained over an extended period of time did fuel stocks become an issue.

The predominant school of thought is that Germany’s oil situation was precarious, bordering on crisis, even at the earliest stages of the war and that she struggled throughout. According to Klein, “stocks and current production of oil products...could guarantee consumption requirements for a period of only three to six months.”<sup>104</sup> The question then becomes, like so many aspects of this study, one of perception. To someone living in a highly mechanized, oil based society, the level of stocks discussed by Klein would cause severe worry and nervousness. To someone from a less industrialized nation, or one that had an industrial base supported by a different type of energy, this supply may appear more than sufficient to meet projected needs. Jensen portrays Germany as a nation deep in the grip of oil addiction living hand to mouth, with the shadow of painful withdraw ever-present. Tooze does see a reliance upon oil within Germany, but also recognizes that her infrastructure and requirements were much different than those of her opponents. As has already been mentioned, the USSBS team studying the effects of

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<sup>103</sup> Jensen, 553.

<sup>104</sup> Klein, Burton H. *Germany’s Economic Preparations for War*. (Cambridge, Harvard University Press, 1959), 58.

bombing on the German war economy believed that, for the most part, Germany's supply of oil met her limited needs.

## A Coal-Based Economy

If the military was not as oil-hungry as has been popularly understood, was there a dependence upon oil within Germany's civilian and industrial sectors? The Reichsbahn, the German rail system, operated almost entirely on coal; apart from lubrication oil, petroleum-based fuel was noticeably absent in its daily operations. With the vast majority of industrial transport by rail, the necessity of oil for logistical purposes was largely removed. As far as civilian consumption, though it was indeed Hitler's dream to create a nation of motorized citizens, a rabid desire for consumer petrol was never brought into existence within the Reich. Tooze points to the high entry costs of the automobile, even after Opel's price drop in the early 1930s to 1,450 Reichsmarks, as the main reason Hitler's vision did not materialize.<sup>105</sup> This amount was still a sizable chunk of income for the average worker, and the Volkswagen project was unable to meet consumer demand due to the war.<sup>106</sup> This left the luxury of the automobile in the hands of the upper and upper-middle classes, and though they had the funds available to purchase fuel such a small market could not affect oil supplies to a great extent. In 1933, the ratio of automobiles to Germans was 1 per 90.<sup>107</sup> This increased within the following years,

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<sup>105</sup> Tooze, 152.

<sup>106</sup> According to Tooze, "not a single Volkswagen was ever delivered to a civilian customer in the Third Reich." (Tooze, 156.)

<sup>107</sup> Gillingham, 71

reaching 1 per every 47 people by 1937.<sup>108</sup> Though automobile ownership did increase during the 1930s it was far from the American ratio of 1 car per 3.5 people in 1933.<sup>109</sup> It is curious that Hitler would deliberately try to create a situation of dependence upon a substance in limited supply, but one can say the same thing about late twentieth-century America.

What of the other pillar of modern industrial economies, electricity? “Electric power was derived almost exclusively from coal.”<sup>110</sup> This resource which, according to *AWPD/1*, all industry relied upon was itself wholly reliant upon the German coal industry and the transportation network that delivered this precious commodity. Electrical power would be reduced to fourth priority by U.S. planners, after transportation and before oil, in the follow-up to *AWPD/1*, *AWPD/42: Requirements for Air Ascendancy*, presented September 9, 1942.<sup>111</sup> Going much more in depth than its predecessor, it would ultimately not be approved due to its inability to persuade Admiral King.<sup>112</sup> “The combat experience to date was still too meager to provide a realistic yardstick for bombing accuracy and for the size of the force required. However, the computations were still based on the old tables of probability, which were in turn based on independent sighting operations.”<sup>113</sup> It would appear that the Navy, dealing with its own situation on two fronts and after having observed limited air success, was not about to take another leap of faith

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<sup>108</sup> Dinardo, *Mechanized Juggernaut*, 9.

<sup>109</sup> Gillingham, 71.

<sup>110</sup> Klein, 33.

<sup>111</sup> Air War Planning Division. *AWPD/42: Requirements for Air Ascendancy*. (Washington D.C.: War Department, Headquarters of the Army Air Forces, September 9, 1942. Air Force Historical Research Center, Maxwell AFB, AL 36112), part IV, 3.

<sup>112</sup> Due to this *AWPD/42* is useful as a statement of air ideology, though not as an actual war plan.

<sup>113</sup> Hansell, 106.

based on charts and graphs. Instead the target priorities of the Committee of Operational Analysts, which was created by order of Gen. Arnold on December 9, 1942, would be accepted. Electrical power and transportation would not make their list. The COA believed that these systems were “too widely dispersed” to allow for the practical application of force.<sup>114</sup> Why was it so hard for the Allies to understand the basic foundations of the German economy? Oil was considered a valid strategic target from *AWPD/I* to the war’s end, and this fact strongly supports the notion that Americans could not completely grasp the concept that an industrialized system may not mirror their own. The German economy, though often achieving the same results, was based on an entirely different foundation:

Wartime Germany was a chemical empire built on coal, air and water. Eighty-four and a half per cent of her aviation fuel, 85 per cent of her motor gasoline, all but a fraction of 1 per cent of her rubber, 100 per cent of the concentrated nitric acid, basic component of all military explosives, and 99 per cent of her equally important methanol were synthesized from these three fundamental raw materials.<sup>115</sup>

History has shown us that nations have a tendency to develop that which they process in abundance; they do not create an elaborate infrastructure based on materials which are foreign or sparse. America had massive amounts of crude and the means to exploit it in the twentieth century; therefore she developed an extensive oil system to complement her existing coal base. This allowed for a thorough exploitation of the internal combustion engine. Germany was not blessed with large amounts of oil reserves

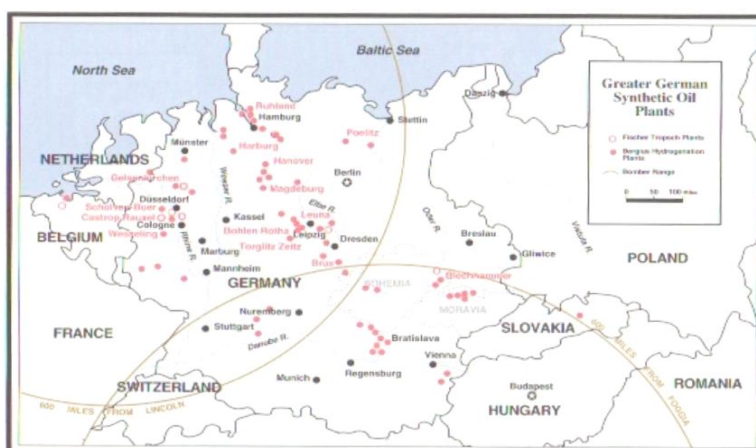
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<sup>114</sup> Kreis, John F, ed. *Piercing the Fog: Intelligence and Army Air Force Operations in World War II*. (Washington, D.C.: Air Force History and Museums Program, 1996), 155.

The COA was a non-permanent advisory body that submitted its European report on 3/8/1943.

<sup>115</sup> USSBS *Oil Report*, 1. (Note the exclusion of oil.)

and neither was most of the continent of Europe, therefore she developed a coal-intensive system complemented by the limited supplies of oil available. Germany even turned to coal as a means to fulfill her petroleum needs, utilizing an intricate system of synthetic oil plants. Due to their reliance upon coal they were situated close to coal deposits, which put them in range of Allied four-engine bombers based in England.<sup>116</sup>



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The synthetic industry produced such vital components as oil, nitrogen, and rubber, and was entirely dependent upon coal. The ratio of tons of coal to finished tons of synthetic gasoline was 6:1.<sup>118</sup> This may seem staggering, but German coal production from 1938-1939 was 240 million tons, which was increased to 340 million by 1942-

<sup>116</sup> This is yet another reason that oil was decided upon as a target system, it is pointless to target a system you are unable to reach.

<sup>117</sup> Kreis, 200.

<sup>118</sup> Alfred C. Mierzejewski, *The Collapse of the German War Economy, 1944-1945: Allied Air Power and the German National Railway*. (Chapel Hill: University of North Carolina Press, 1988), 22.

1943.<sup>119</sup> Though this is a massive number, one must take in to account the demand. Coal permeated every aspect of German life and coal shortages had the potential to be felt system-wide; oil shortages would affect a much narrower and primarily military sector. Various grades of coal were used in almost all levels of manufacturing, kept the locomotives of the Reichsbahn moving, heated the homes of the population in winter, were burned to generate electricity, and were the primary component in the vital synthetic industry. If the desire of strategic planners was to target the absolutely fundamental pillars of the German economy the focus should have been on coal and the transportation system that distributed this vital commodity across the nation, not oil.<sup>120</sup>

## What Good is a Plane without Fuel?

As mentioned previously, there was one area where oil products, particularly synthetic oil, were vital: aviation fuel. “Between 11 September and 19 September (1944), the Allies succeeded in stopping completely all aviation spirit production in Germany except for one day.”<sup>121</sup> Though the Allied oil campaign did succeed in causing massive aviation fuel shortages, can this be considered a ‘strategic’ result? According to the USSBS *Oil Division Final Report*, the air offensive succeeded because it “effectively stopped oil production with decisive military consequences.”<sup>122</sup> It is the consensus of

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<sup>119</sup> Klein, 121.

<sup>120</sup> Mierzejewski calls this the “coal/transport nexus”. (Mierzejewski, 178) One of the possible reasons for the lack of coal as a target and why the transport attacks were not begun in earnest until September 1944 may have been that photographs of damaged refineries were much more ‘sellable’ to the public and politicians, regardless of effects, than damaged rail and lower production figures. The AAF was always mindful of its public perception, and this point is worth examining in a future study.

<sup>121</sup> Milward, 169.

<sup>122</sup> USSBS, *Oil Report*, 8. (Underlined by author for emphasis.)

historians that the constriction of aviation fuel stocks and the consequent defeat of the Luftwaffe were the primary accomplishments of the USAAF in World War Two. While such results are laudable and no doubt contributed to the defeat of the German military, it is not the total capitulation resulting from an aerially-imposed economic breakdown envisioned by American air theorists in the interwar years.

Germany did not create a military and industrial juggernaut and leave it defenseless against air attack. In fact, due to its central position on the continent, Germany developed one of the most extensive and intricate systems of active and passive air defenses on the planet. Active defense can be divided into two main groups, fighter aircraft and anti-aircraft artillery (flak). Passive defense consists of various means of confusion and concealment, such as the use of smoke screens, dummy installations, barrage balloons, camouflage, and radar countermeasures. All of these were used to defend the oil refineries at Ploesti. Smoke screens were considered “one of their most successful camouflage measures” and would be used extensively by the Germans.<sup>123</sup>

German fighter aircraft production continued to increase throughout the war but a lack of fuel and pilots nullified these gains. 1943 production was almost twice as high as 1942, and 1944 saw nearly three times the level achieved in the early months of 1942.<sup>124</sup> The German fighters, flying the by then dated Focke-Wolfe 190s and Messerschmitt 109s, did have to develop new tactics to overcome the range difference between their guns and the .50 caliber guns of the B-17 and the Consolidated B-24 Liberator. “The

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<sup>123</sup> United States Strategic Bombing Survey. *Physical Damage Division Report*. (Washington, D.C.: U.S. GPO, 1947), 92.

<sup>124</sup> Milward, 192-193. Using January-February 1942 as a base of 100, total 1942 production hit 133, 1943 came to 216, and 1944 totaled 277. The last entry presented is Jan. 1945, which saw aircraft production holding steady at 231.



attack from the front, high front, or low front all with low speed was the most effective of all.”<sup>125</sup> The Luftwaffe was neutralized as a fighting force through a battle of attrition; forced to defend multiple targets it was bled slowly by first the bomber crews and then the long-range escort fighter. The coup de grâce was the constriction of the fuel supply, virtually eliminating training of replacement pilots.

## The Role of Flak

Flak defenses would constitute a much graver threat to Allied bombers than *AWPD/1* expected. In his insightful study, entitled *Flak: German Anti-Aircraft Defenses, 1914-1945*, Edward Westerman sheds some much needed light on this misunderstood aspect of the air war over Europe and details how ground-to-air defenses “accounted for at least half of American aircraft combat losses during the war.”<sup>126</sup> With a maximum ceiling of 33,000 feet for the 88-mm flak gun and a 48,559 feet maximum for the 128-mm gun, the safety of high-altitude was greatly negated.<sup>127</sup> USAAF losses in Europe from flak would total 5,400, with 2,076 of these from the 15<sup>th</sup> Air Force which operated against Ploesti in Romania. In all, flak caused four times more USAAF casualties than fighters.<sup>128</sup>

Challenging the emphasis on fighter aircraft in the historical narrative Westerman takes a more holistic approach to the Germany defense system, seeing both active and

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<sup>125</sup> Adolf Galland, et al, David C Isby, ed. *The Luftwaffe Fighter Force: The View From the Cockpit*. (London: Greenhill Books, 1998), 200.

<sup>126</sup> Edward B. Westerman, *Flak: German Anti-Aircraft Defenses, 1914-1945*. (Lawrence: University Press of Kansas, 2001), 2.

<sup>127</sup> *Ibid.*, 54, 69.

<sup>128</sup> *Ibid.*, 286.

passive elements as interlocking and playing off each other's strengths to present a formidable opponent to the Allied air offensive. He poses a fundamental question, that of what constituted success in German defenses. "Would the measure of effectiveness lie in the number of aircraft brought down, or would it be found in the more indeterminate standard associated with success in protecting the bomber's intended target from damage?"<sup>129</sup> The prevalence of the first view would explain the emphasis on active defenses within the historical dialogue. If held to this standard the anti-aircraft defense of German cannot be viewed as a success; U.S. production more than compensated for any loss of aircraft. If the second perspective is taken then one can argue that, due to industrial production increases in spite of bombardment, the German defensive network performed remarkably well under heavy strain. This question of perception and what constitutes success is also vital in understanding the actions and results of the USAAF at Ploesti.

The Germans developed a system based on the resource most abundantly available to them, and though the internal combustion engine necessitated oil stocks it did not result in the realigning of the German economy to petroleum. This was a fact lost on American planners and, combined with the sizable air defense network created in Europe, would be the cause of much grief in the campaign to come.

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<sup>129</sup> Ibid., 67.

## Chapter 4: Too Little Too Soon

If the German economy's absolute dependence upon oil is questionable, or rather if there existed target systems that were much more vital to its operation, how did the Allies come to see it as being a necessary industrial component? A misunderstanding was incorporated into policy because personal preference had as much to do with target selection as solid analysis. Mierzejewski discusses in detail the struggle over target priorities, with Gen. Spaatz's desire to target oil conflicting with Air Chief Marshal Sir Arthur Tedder's (RAF) focus on transportation.<sup>130</sup> General Arnold himself considered Ploesti, and the oil refined there, to be "the most important target in the war."<sup>131</sup> The difference in opinion was fueled by an increasingly powerful and unrestrained intelligence apparatus composed of various agencies competing to ensure their target sets were adopted. "The decisive factor, then, in determining what targets were attacked by the Allied strategic air forces were the views of the decision makers, especially Harris, Spaatz, and Tedder, their advisors access to them, the credibility that the intelligence agencies enjoyed with them, and what was known about the German economy, especially its energy and transportation sectors."<sup>132</sup> These bureaucratic entities included ad hoc ones such as the Air War Planning Division and the Committee of Operations Analysts (COA), and more permanent ones such as the British Ministry of Economic Warfare, the Enemy Objectives Unit (EOU), the Research and Analysis Branch of the Office of

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<sup>130</sup> Mierzejewski, Alfred C. *The Collapse of the German War Economy, 1944-1945: Allied Air Power and the German National Railway*. (Chapel Hill: University of North Carolina Press, 1988), 76. This was ultimately decided by General Eisenhower.

<sup>131</sup> Arnold, Henry Harley. *Global Mission*. (New York : Harper, 1949), 329.

<sup>132</sup> Mierzejewski, 76.

Strategic Services (OSS, R&A), and the Assistant Chief of Air Staff - Intelligence (AC/AS A-2).<sup>133</sup>

## The Allure of Ploesti

A fascination with the importance of oil had existed long before the outbreak of war and was pervasive throughout both the military and civilian leadership. Winston Churchill, in his first address as Prime Minister, lauded the air crews that were “striking nightly at the tap root of German mechanized power, and have already inflicted serious damage upon the oil refineries which the Nazi effort to dominate the world directly depends.”<sup>134</sup> Due to its position as the number one supplier of crude oil on the European continent, Ploesti would naturally catch the eye of both politicians and planners. In 1939, production of crude petroleum from Romania totaled 6,240,000 tons, which was 2.18% of total world production. To put this into some perspective, the United States produced 173,512,939 tons that same year which constituted 60.45% of world output.<sup>135</sup> With these production numbers in mind it is easy to see the difference between the American economy and that of Axis-dominated Europe. The United States had the luxury of establishing oil-intensive industrial and military projects whereas Germany, with its largest source of crude on the continent being only 3.59% of U.S. output, was limited

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<sup>133</sup> Ibid, 81-85.

<sup>134</sup> Winston Churchill, “*Be Ye Men of Valour Speech*” Broadcast May 13, 1940. Available at <http://www.churchill-society-london.org.uk/BeYeMofV.html>, accessed 12/19/2008.

<sup>135</sup> Mihail Pizanty, “General Survey of the Petroleum Industry of Romania.” Romanian Economics Institute, April 15, 1940 (142.042-21, in the USAF collection, AFHRA), 3.

from the start as to the shape of its 'modern' state.<sup>136</sup> It is also important to keep in mind that Romanian refining capacity in 1939 was approximately 11,000,000 tons.<sup>137</sup> This would leave *excess* capacity in the amount of 4,760,000. This massive amount would first have to be destroyed for any attacks to have an effect upon Romanian production and therefore on the German war machine.

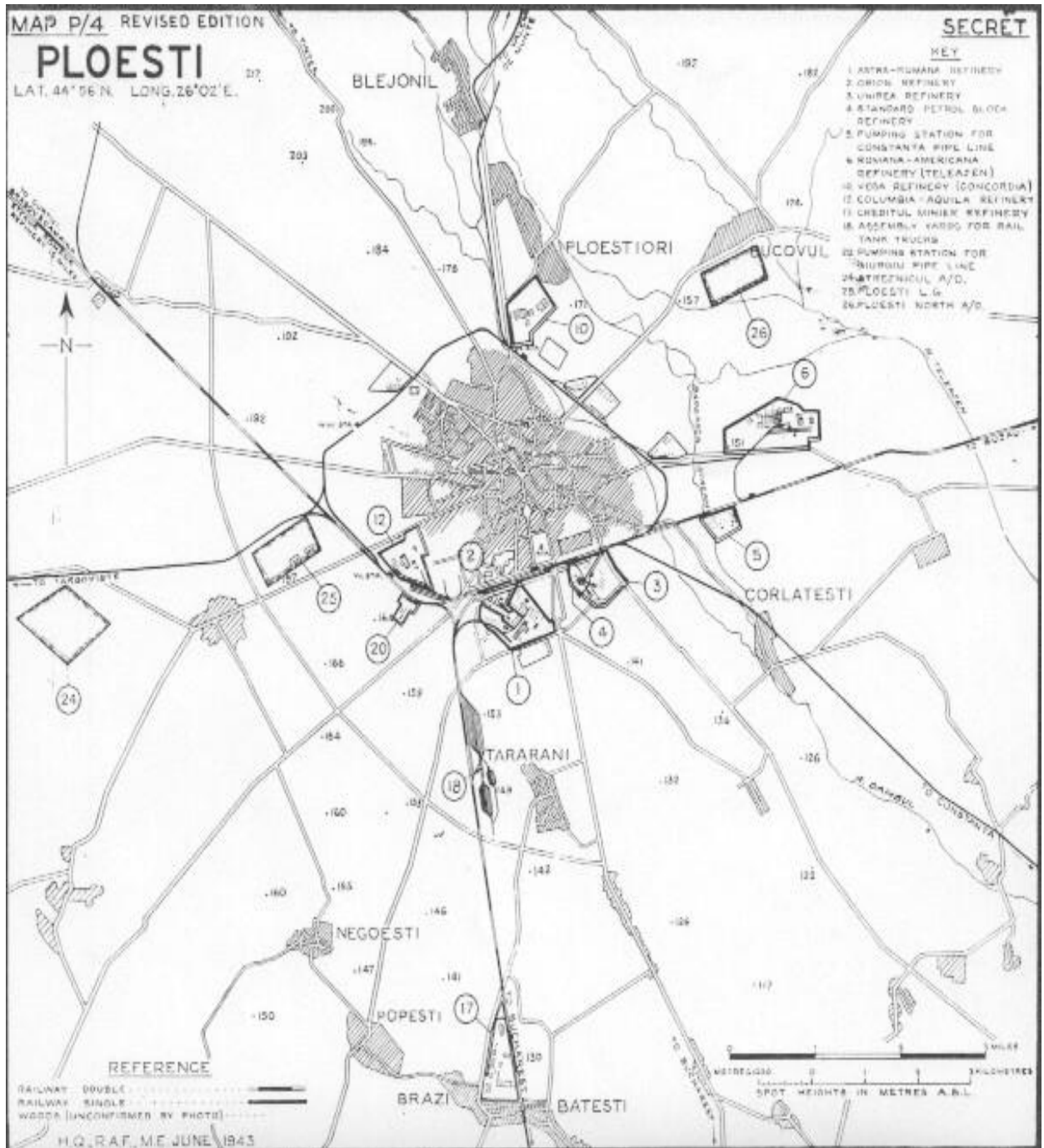
Germany was not the only nation that wanted access to Romanian crude. Before the Germanization of Romanian oil production in 1940 the British, Dutch, French, Belgians, Americans, and Italians all had a commercial interest in refinery operations. The major refineries in the Ploesti area consisted of Astra Romana (British-Dutch), Concordia Vega (French-Belgian), Romana-Americana (American), Unirea (British), Orion (British), Standard Petrol Block (Romanian-foreign stock holders), Columbia Aquila (French), Redeventa and Xenia (stock holders), Dacia, Steaua Romana (French-British-Romanian located northwest of Ploesti at nearby Campina), and Creditul Minier (the only entirely Romanian owned refinery in the area south of Ploesti at Brazi).<sup>138</sup> With Ion Antonescu's seizure of power on September 5, 1940, a much more German-friendly regime assisted in the ousting of foreign interests in Romania. As the following map illustrates there was a clear distinction between the refinery areas and the population centers, thus the campaigns against Ploesti provide a clear means to judge the effectiveness of USAAF precision bombing doctrine in practice.

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<sup>136</sup> And this amount was not all exported to Germany, as of 1939 the Reich (Germany and Czechoslovakia) only received 1,285,153 tons (30.8%) of Romanian oil exports. (Pizanty, 6.)

<sup>137</sup> Pizanty, 5.

<sup>138</sup> Ibid., 8-26.



<sup>139</sup> AAF Evaluation Board Report, "Ploesti". Mediterranean Theater of Operations, December 15, 1944 (138.5-12 in the USAF collection, AFHRA)

## The Defensive Situation at Ploesti

Even before the American entry into the war an idea of the extensive defenses at Ploesti was available to air planners. Mr. Paul W. Lambright, the General Manager of Standard Oil in Romania and a retired U.S. naval officer, submitted a series of reports in 1941 detailing the situation on the ground at the refineries. One of the key points of his report is the necessity of accuracy to assure destruction of vital plant components. “Since such vital points as boiler installations and electric power plants are already in most instances, especially in the refineries, housed in brick buildings this is generally considered sufficient protection except against direct hits.”<sup>140</sup> Due to blast walls erected around key points, Lambright determined that it would “require direct hits to effect much damage on the units, unless very powerful bombs are used.”<sup>141</sup> As far as anti-aircraft defense are concerned, Lambright painted the picture of an area bristling with guns and with fighter support close by.<sup>142</sup>

This situation was discussed much more in depth by William Mattingly, Manager of Standard Oil in Romania and on location until October 1941. “The area is surrounded by anti-aircraft batteries principally of 108 mm. guns, although there are also smaller 50 mm. rapid-fire combination anti-tank and anti-aircraft guns for use against low-flying planes. The air defense of Ploesti has been taken over exclusively by the German Army, both the material and the personnel thereof are German and all regulations for air-raid

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<sup>140</sup> Military Intelligence Division, “Anti-Aircraft Protection of Oil Tanks and Depots” Mr. Lambright, source. April 25, 1941. (142.042-21 v.2 1942, in the USAF collection, AFHRA), 3.

<sup>141</sup> Paul W. Lambright, “General Report on Romanian Situation as of October, 1941.” April 24, 1942 (142.042-21, in the USAF collection, AFHRA), 2.

<sup>142</sup> Ibid., 2.

protection are adopted and enforced by the German military authorities.”<sup>143</sup> It was made perfectly apparent even before America entered the war that Ploesti would be a very demanding target and would have to be approached with both effective planning and sufficient force; the first American attack against it would demonstrate neither.

## Showing Their Hand

In the wake of Pearl Harbor American citizens and their leaders desired to strike back at their new enemies and the best and only means at their disposal was the long-range bomber. The Doolittle Raid on Tokyo was not the sole attack planned upon Japan. The Halverson Project, named after the mission’s commander Colonel Halverson and nicknamed HALPRO, was originally slated for an attack on Japan but due to the loss of Chinese airbases the B-24s remained in Khartoum, Sudan. Their target was changed to Ploesti. There were some reservations about the mission, “but the Joint Chiefs overruled the misgivings of some airmen who said that Ploesti was too far for planes to carry an effective bomb load. They would have to trade bombs for extra gas to bring them back.”<sup>144</sup>

The attack was launched against Ploesti before midnight on June 11, 1942, making it the first attack by the USAAF against European targets in World War Two.<sup>145</sup> It was kept a secret and the mission would not make its way into the press until June 14,

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<sup>143</sup> Statement by William Mattingly, February 11, 1942. (142.042-21 in the USAF collection, AFHRA) (Underlined by author for emphasis).

<sup>144</sup> James Dugan and Carol Stewart. *Ploesti: The Great Ground-Air Battle of 1 August 1943*. (New York : Random House, 1962; Brassey's, 2002), 9.

<sup>145</sup> This goes against the popular belief that the Eighth Air Force began the USAAF bombing of Europe on August 17, 1942.



and even then many vital details were not released.<sup>146</sup> According to a post-mission summary dated June 29, 1942, thirteen B-24s were launched from Fayid, Egypt, hardly the massing of force called for by Mitchell. Formation flying was not used. Traveling just under 1300 miles one way the crews were met with a less than optimal bombing environment:

An overcast at 10,000 feet compelled many crews to bomb below the clouds. Objectives were reported to be camouflaged. Heavy anti-aircraft fire was encountered, and some planes met fighter resistance. At the same time, technical difficulties, including ineffective bomb mechanisms and duds, were encountered. The American Military Attaché at Ankara has forwarded a report from French sources in Bucharest confirming that the bombing results at Ploesti were restricted to several casualties and a few destroyed houses, with no hits on the refineries.<sup>147</sup>

All that the HALPRO mission did, in effect, was inform the Nazis that the Americans possessed the range, capability, and desire to attack Ploesti. According to Dugan and Stewart, this fact was not lost on General Alfred Gerstenberg, the German officer in charge of defending the town. He would oversee the construction of an above-ground piping system which connected the refineries to allow for quick repair and continued production while making Ploesti the third-largest concentration of flak in Europe.<sup>148</sup> HALPRO did achieve one more thing in the mind of General Eisenhower, it “did something to dispel the illusion that a few big planes could win a war.”<sup>149</sup>

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<sup>146</sup> *The New York Times*, 14 June 1942. Speculation continued in *The New York Times* all the way until June 21, when the story was apparently dropped. The importance of the oil at Ploesti to the Nazi war effort would become a hallmark of the newspaper.

<sup>147</sup> Brock, A.W. “Tactical and Technical Phases of HALPRO Operations.” June 29, 1942 (142.042-21, in the USAF collection, AFHRA), 2.

<sup>148</sup> Dugan and Stewart, 28-34. Wolff, 202.

<sup>149</sup> Eisenhower, Dwight D. *Crusade in Europe*. (Garden City, N.Y.: Doubleday, 1948), 161.

## What Should Be Bombed?

After HALPRO the question regarding the bombing of Ploesti was not whether it should be attempted but rather what constituted the optimal target to deny the Nazis Romanian oil products.<sup>150</sup> While acknowledging both the active and passive defenses around vital areas within the refineries Lambright still saw them as being the optimum target. An AAF Intelligence assessment of Ploesti pointed to the important role of the refineries themselves, stating that the “twelve large oil refineries in this objective area produce approximately 86% of the refined petroleum products of Rumania and represent 96% of the total cracking capacity.”<sup>151</sup> The same report went on to mention the importance of transportation in the region:

The Rumanian petroleum production (crude or refined) is of assistance to the Axis only if the oil can be effectively transported from the Ploesti area. Although the pipelines move a considerable amount of oil from Ploesti to Giurgiu, yet (sic) 80% of the oil leaving this area moves by rail. Continuous and effective operations against refineries and transportation objectives in Rumania would result in a serious blow to the German war effort.<sup>152</sup>

The importance of transportation to Ploesti was not lost on the OSS. In a report written December 30, 1942, while it is recognized that the loss of the oil-producing capabilities of the region would have a crippling effect on Axis supplies, the report reinforces the opinion of AC/AS. “Germany’s greatest problem has been one of transportation. Should

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<sup>150</sup> The *New York Times* even contributed its two cents to the debate, claiming that the refineries were a much more lucrative target than the pipelines or oil fields. (*NYT*, April 14, 1941).

<sup>151</sup> Intelligence Service AAF (AC/AS A-2), “Air Objective Folder No. 69.1: Ploesti Area, Rumania.” 15 October, 1942 (142.65169-1, in the USAF collection, AFHRA), 1.

<sup>152</sup> *Ibid.*, 1.

the railroad between Ploesti and the crest of the Carpathians – a distance of about 50 miles – be bombed it would completely upset Germany’s transportation system.”<sup>153</sup>

The COA took a different view of the oil situation and broke the system down into crude and synthetic production at a committee meeting on December 23, 1942. In regards to crude, the situation was quickly determined to be near insurmountable due to the scope of the effort that would be required. “The refining capacity in Europe is far in excess of the necessary consumption. It is so far in excess that it would be necessary to destroy or neutralize 39 of the major refineries before you cut the refining capacity down to the present consumption.”<sup>154</sup> During the course of the meeting the consensus developed that the sixteen Bergius hydrogenation plants within Germany were the optimal link in the oil chain due to their flexibility and role in the production of precious aviation fuel. The target was chosen not due to its strategic economic consequences but its purely tactical military effect. There was the question of the possible rerouting of raw materials to continue production, and the importance of transportation as a supporting target became apparent. “The destruction of the Bergius plants and hitting transportation to prevent Rumanian crude from being transported would have disastrous effects.”<sup>155</sup>

Any supposed attack on the transportation network of Ploesti was always assumed to coincide with attacks on its refineries. The real question is: why not just attack transportation out of Ploesti? The refineries could produce all the petroleum products in the world but if the finished product was unable to get to the engines that required fuel

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<sup>153</sup> Office of Strategic Services, “Report dated December 30, 1942.” (142.042-21, in the USAF collection, AFHRA), 1.

<sup>154</sup> Captain Lowe, Committee of Operations Analysts, “Minutes of Meeting of Western Axis Industries.” December 23, 1942 (118.151-1, in the USAF collection, AFHRA), 1.

<sup>155</sup> Ibid., Colonel Moss, 7.

then the oil was useless. The refineries were concentrated and therefore heavily defended, whereas it would be impossible to defend every mile of rail leaving the city. The map on page 61 shows one rail line leading northwest to Germany, one to the north, and one to the eastern front. As mentioned previously rail moved 80% of the oil from Ploesti. Add to this an extensive mining of the Danube and you have the means to produce the same effect as the destruction of the refineries without having to eat away at excess capacity or send men over an extremely heavily defended area. Why was this not attempted? Was it the need to sell pictures of bomb damage to the public regardless of results? Did the idea of strategic bombing burn so brightly in the minds of air planners that they were blinded to alternate considerations?

The Bombardment Advisory Committee of the COA actually tackled the question of making Ploesti's transportation the primary target. The report is not convincing. While transportation along the Danube was important, its position in Ploesti's transportation network was overestimated. "The blocking of the Danube appears to be a very doubtful project. If it cannot be accomplished, it appears impossible to insure denying German access to Rumanian oil."<sup>156</sup> A USSBS report after the war would claim that the limited attacks on the Danube were extremely effective, that they "slowed traffic decisively," and that more extensive mining could have had a much more dramatic effect.<sup>157</sup> "Fifty-two percent of the mine explosions resulted in total losses."<sup>158</sup>

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<sup>156</sup> Bombardment Advisory Committee, COA "Feasibility of Air Attack on European Axis Transport. Appendix D: Transport Targets as a Means of Isolating the Ploesti Oil Region." January 21, 1943 (118.04-4, in the USAF collection, AFHRA), 2.

<sup>157</sup> United States Strategic Bombing Survey. *The Effects of Strategic Bombing on German Transportation*. (Washington, D.C.: U.S. GPO, 1947), 27.

<sup>158</sup> *Ibid.*, 27 (Underlined by author for emphasis.)

Amazingly the Bombardment Advisory Committee disregarded transportation, resulting in the COA not advocating it as a strategy at Ploesti. “The conclusion seems inescapable that to deny Rumanian oil to the Axis war economy can be accomplished through transportation targets only at a great expense and that the results in any event would be uncertain.”<sup>159</sup> As we shall see, one can look back at the entire USAAF campaign over Ploesti and easily replace “transportation targets” in the above phrase with “refinery targets” and it fits perfectly. Recognizing the fact that refinery capacity was “nearly double” the output, the Committee still advocated for the targeting of the oil refineries themselves.<sup>160</sup> Ultimately, transportation would give way to refineries as the optimum target at Ploesti due to the priorities and perceptions of the decision makers.<sup>161</sup>

## ACTS Doctrine Discarded

There would be quite a time laps between the HALPRO mission and the USAAF’s return to Ploesti. This well publicized and studied mission would be undertaken by the Ninth Air Force stationed in Libya under General Lewis Brereton and would run counter to many of the central tenants of the strategic bombing doctrine developed at ACTS. This mission “had the unique distinction of killing more airmen (over 300) than persons on the ground (under 120) and the highest wastage (planes that

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<sup>159</sup> Bombardment Advisory Committee, COA, 2.

<sup>160</sup> *Ibid.*, 3.

<sup>161</sup> According to Stout, “Spaatz was personally obsessed with his plan to execute a concerted campaign against Germany’s oil production centers.” (Stout, Jay A. *Fortress Ploesti: The Campaign to Destroy Hitler’s Oil*. (Havertown, PA: Casemate, 2003), 99.)

never flew again) rate of any major mission of the war.”<sup>162</sup> Again the refineries themselves would be the targets, and the desire was to halt production at Ploesti through a single devastating attack. Even at ACTS it was understood, at least early on, that repeated missions would need to be flown to achieve total destruction of the target. According to General Brereton, the return to Ploesti was “agitated in London” as early as April 9, 1943. Believing that current campaigns took precedence Brereton was “strongly opposed” to such a mission at that time.<sup>163</sup> Colonel Jacob Smart, an advisor in General Arnold’s staff, was given the job of planning the attack. He had “no combat experience” and was assigned the nigh impossible task of knocking out production at Ploesti in a single attack.<sup>164</sup>

Smart’s solution was to attack the heavily-defended refineries at Ploesti at low-level. He would later say that he got the idea by observing a Douglas A-20 Havoc demonstration.<sup>165</sup> This was an aircraft designed for close-combat support, which was not the case with the B-24 bomber.<sup>166</sup> “It was understood that four-engine heavies were totally unsuited for such a mission,”<sup>167</sup> but the plan was approved by General Eisenhower, General Arnold, the Joint Chiefs of Staff, and by Roosevelt and Churchill at

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<sup>162</sup> Frank Heilenday, *Daylight Raids by the U.S. Eighth Air Force: Lessons Learned and Lingering Myths from World War II*. (Santa Monica, CA : RAND, 1995), 21.

<sup>163</sup> Lewis H. Brereton, *The Brereton Diaries: The War in the Air in the Pacific, Middle East, and Europe, 3 October 1941-8 May 1945*. (New York: W. Morrow and Company, 1946), 183.

<sup>164</sup> Stout, Jay A. *Fortress Ploesti: The Campaign to Destroy Hitler’s Oil*. (Havertown, PA: Casemate, 2003), 28.

<sup>165</sup> Oral History Interview of Gen. J.E. Smart by Lt. Col. A.W. McCants and Dr. J. C. Hasdorff, November 27-30, 1978. Typed Transcript, p. 71, K239.0512-1108 C.1 IRIS No. 01041988, in USAF Collection, AFHRA.

<sup>166</sup> The use of the B-24 over Ploesti in a role completely opposite that for which it was designed calls to mind the use of B-29s in the low-level firebombing of Japan. Both aircraft were created to bring about the realization of a strict doctrinal ideology, and yet during battle they were put into a role that was contrary to both doctrine and design.

<sup>167</sup> Wolff, Leon. *Low Level Mission*. (Garden City, N.Y.: Doubleday, 1957), 92.

the TRIDENT Conference in May 1943. According to Smart the decision was once again a matter of numbers, as “it was quite apparent that we could not destroy the targets by high-level attack. We could never muster and bring to bear the required force in sufficient time to destroy the productive capacity effectively.”<sup>168</sup> This is an extraordinarily telling statement. It shows that there were those within Arnold’s inner circle that had not bought into the doctrine as developed at ACTS; many doubts remained about high-altitude bombing and its ability to effectively destroy a target.<sup>169</sup> Eisenhower would later discuss his severe misgivings about the plan:

One feature to which we objected was the confidence placed in the efficacy of a single attack. Too often we had found that factories listed by our experts as destroyed were again working at full output within a matter of weeks or even days. We raised another question as to the advisability of the undertaking. The target selected was a great refinery, but our information led us to believe that the enemy had a surplus of refining capacity and that his true oil shortage was in production and distribution facilities. Our doubts and objections were not, however, decisive in the matter...<sup>170</sup>

What of Ploesti’s defensive situation? Much unwarranted emphasis was put on the element of surprise that was thought could be achieved by a low-level attack. It was believed that “the defenses, primed for high-altitude attack, would be confused and inefficient. There would be little danger from heavy flak and the surprise from a low-level attack might render ineffective a large proportion of enemy ground and air defenses

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<sup>168</sup> Oral History Interview of Gen. J.E. Smart, p.78.

<sup>169</sup> It was believed that 1,700 sorties over a period of four to six weeks would be necessary to achieve the same results as one low-level attack. (AC/AS A-2, “Operations of Heavy Bombardment Units against Rumanian Oil Refineries in Ploesti Area.” September 30, 1943. (142.034-2, in the USAF collection, AFHRA), 5.)

<sup>170</sup> Eisenhower, 161.

such as light flak, fighters, balloons, and smoke-pots.”<sup>171</sup> A study of RAF wartime experience would have provided a much needed insight for both Smart and Brereton.<sup>172</sup> For example, during a mission against German shipping at Schillig Roads on December 14, 1939, British aircrews experienced the low-level accuracy of anti-aircraft fire. “Poor weather forced the aircraft down at times to as low as 200 feet. The formation then came under coordinated attack from anti-aircraft fire and German fighters and lost five aircraft. The RAF ascribed these losses to anti-aircraft, not to German fighters, and ordered bombers subsequently to attack their targets from altitudes above 10,000 feet.”<sup>173</sup> By believing that the defenses would be negated by a low-level attack the Ploesti planners were carrying on a long tradition of assumption in aerial warfare. “Intelligence firmly estimated that the flak and detection systems were arraigned in Ploesti’s eastern approaches, toward the Soviets, and denied the possibility of effective defenses in the northern, western, and southern salients of Ploesti.”<sup>174</sup> Air crews were also told that barrage balloon cables would not be a problem; the wings of the B-24 would break them. According to 376<sup>th</sup> Bombardment Group Captain Jack Preble, “At the briefing they were told that if they ignored the balloons and knifed right through the cables they would stand

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<sup>171</sup> AC/AS A-2, “Operations of Heavy Bombardment Units against Rumanian Oil Refineries in Ploesti Area.” September 30, 1943. (142.034-2, in the USAF collection, AFHRA), 4.

<sup>172</sup> Dugan and Stewart mention that “the RAF furnished ostensible proof that low strikes by heavy bombers were too costly.” (Dugan and Stewart, 41.)

<sup>173</sup> Westerman, 89.

<sup>174</sup> James Dugan and Carol Stewart, *Ploesti: The Great Ground-Air Battle of 1 August 1943*. (New York : Random House, 1962; Brassey's, 2002), 43-44. (Underlined by author for emphasis.)



a good chance of coming through with little damage to their bombers. This Pollyanna information was greeted with quiet skepticism.”<sup>175</sup>

The pre-mission assurances of the ineffectiveness of Ploesti’s defenses did not convince many of the men that would be flying the mission. In fact, General Uzal Ent, Brereton’s Chief of Staff, wrote a very detailed report comparing and contrasting the high-altitude and low-level attacks based solely on his “personal opinions”. He pointed to the increased morale inherent in a high-level attack and the fact that the crews had already been trained in this method; a low level mission would require intensive retraining. He also pointed to the difficulty of target selection during a low level attack, the possibility that smoke “could easily cause an abortive mission”, and estimated losses at “75 A/C or 71% greater than for high level.”<sup>176</sup> However, the risk to the crews was overshadowed by the pressure from on high to strike a single decisive blow against Ploesti. Ultimately the type of attack to be used was decided upon by Brereton and he took full responsibility.<sup>177</sup> “After receiving the target folders I studied them for two weeks before making up my mind on the low-level attack. I invited no discussion whatsoever among the commanders.”<sup>178</sup>

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<sup>175</sup> Capt. Jack Preble, “Written in the Sand: A Personalized History of the 376<sup>th</sup> Bombardment Group (H), AAF.” (GP-376-H1 (BOMB) Dec 1942-April 1945, in the USAF collection, AFHRA), 117.

<sup>176</sup> U.G. Ent, “Letter to Major General Brereton.” June 30, 1943. (533.424-1, in the USAF collection, AFHRA).

<sup>177</sup> This precedent would later be used with Lemay in his missions against Japan. In both cases the desired outcome was made plain by Washington and the means to achieve it was left to the commanding officer. This put the responsibility of the mission’s success or failure squarely upon the unit commander in the field.

<sup>178</sup> Brereton, 192.

On the early morning of August 1, 1943, 178 B-24s<sup>179</sup> took off from Benghazi Libya carrying “500-lb and 1,000-lb demolition bombs totaling 311 tons.”<sup>180</sup> The mission did not unfold as planned. As several detailed narratives of the attack exist there is no need for an in-depth description here, but there are several aspects that are important to this study.<sup>181</sup> As the aircraft crossed Albania they were separated into two distinct groups due to cloud cover. Radio silence was to be maintained throughout the mission to assist in achieving surprise. This lack of communication would not only be felt in the clouds over Albania but also when the lead group mistook the town of Targovisti for its initial point of Floresti and turned south towards the target too early, putting the 376<sup>th</sup> and 98<sup>th</sup> Bomb Groups on course to bomb Bucharest. Radio silence was finally broken to correct the mistake. Not only had the force become separated but now two groups would be approaching from the south/southeast instead of the northwest as briefed. The result over Ploesti was bombers flying every which way through intense flak that was fully capable of hitting them.

What is fascinating about the strict order to maintain radio silence which contributed to the separation and wrong turn is that no element of surprise was ever achieved by the Americans on August 1, 1943. The utmost secrecy was attempted during the planning stages of the mission; the crew members were not officially informed of their target until the night before. Regardless of the strict control of information,

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<sup>179</sup> The Bomb Groups involved in the 8/1/1943 mission were the 98<sup>th</sup>, the 376<sup>th</sup>, the 44<sup>th</sup>, the 93<sup>rd</sup> and the 398<sup>th</sup>, the last three being on loan from the Eighth Air Force in England.

<sup>180</sup> Leon Wolff, *Low Level Mission*. (Garden City, N.Y.: Doubleday, 1957), 94.

<sup>181</sup> The fascination with the 8/1/43 raid has resulted in several works detailing the operation and the heroism of the crews. The seminal works are Dugan and Stewart’s *Ploesti*, Wolff’s *Low-Level Mission*, and Stout’s *Fortress Ploesti*.

everyone in the area could tell that something major was underway. The addition of 120 aircraft from England did not go unnoticed by the local population nor did the intense low-level training in the desert. According to Dugan and Stewart, due to spies in Libya and the deciphering of the Allied code, “the Germans knew immediately that the force was up from Benghazi.”<sup>182</sup> Was it even possible to conceal a mass of 178 four-engine bombers? “Between German radio and radar contact, sightings over Bulgaria, and the spectacle created by the heavy bomber formation motoring over the Danube at extremely low altitude, the defenders of Ploesti knew that an attack was coming.”<sup>183</sup> It is incomprehensible that a plan could be executed that relied solely on surprise, which was not at all achievable, as the primary means to protect the lives of American crewmen.<sup>184</sup>

How did the pre-mission assumptions hold in action? The defenses exacted a heavy toil upon the American crews who were sent on a mission that called for the exact opposite of their aircraft’s purpose and official training. “Indications are that 90 per cent of the damage was caused by antiaircraft fire. 20-mm and 37-mm or 40-mm were used with telling effect. 88-mm guns were fired point-blank with shells bursting within relatively short distance of the muzzle.”<sup>185</sup> In addition to the stationary defenses, the Germans surprised the attackers with a flak train, the results of which were disastrous due to the pilots having been instructed to follow the rail line on their approach.<sup>186</sup> On the return trip the survivors were set upon by German fighters resulting in even more losses.

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<sup>182</sup> Dugan and Stewart, *Ploesti*. 86.

<sup>183</sup> Stout, 51.

<sup>184</sup> Reconnaissance flights were not even allowed to determine the exact strength of the defenses before the attack due to the fear that surprise would be lost.

<sup>185</sup> AC/AS A-2, “Operations of Heavy Bombardment Units against Rumanian Oil Refineries in Ploesti Area.” September 30, 1943. (142.034-2, in the USAF collection, AFHRA), 30.

<sup>186</sup> Dugan and Stewart, 147.

Several made their way for neutral Turkey, unable to complete the return trip to Libya. “The price was 53 Liberators, including eight interned in Turkey. The official report said that 446 airmen were killed or missing, 79 were interned in Turkey, and 54 were wounded.”<sup>187</sup>

### The 8/1/1943 Balance Sheet

Did the raid achieve a significant return for this investment in blood and material? The answer is no. Though “airplane for airplane, the attackers on this particular raid caused more damage than any other subsequent raid against Ploesti,”<sup>188</sup> due to the huge cushion between refining capacity and production the damage did not achieve the desired results. In fact, “within a few weeks Ploesti was producing at a greater rate than ever before.”<sup>189</sup> An OSS study of the raid concluded that its “major result...is the elimination of approximately 3.9 million tons of excess refining capacity. The capacity destroyed represents almost all efficiently located spare refinery capacity in Axis Europe. Immediate loss of supplies by reason of the Ploesti raid is thought to be inconsiderable.”<sup>190</sup> According to this evaluation, though the 8/1/1943 attack did not in and of itself reduce the production of Axis petroleum, if followed up with a full-scale attack upon the oil system the results could have been felt immediately and may have had a dramatic effect on Germany’s ability to wage mechanized warfare. Yet none were

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<sup>187</sup> Ibid., 222.

<sup>188</sup> Stout, 79.

<sup>189</sup> Wolff, 183.

<sup>190</sup> OSS Research and Analysis Branch, “Bomb Damage Report.” September 18, 1943 (142.035-3, in the USAF collection, AFHRA), 9. According to the OSS report capacity at Ploesti went from 9,235,000 ton per year to 5,310,000. (Ibid., 10)

made. The Ninth was in no position to continue bombardment operations after the mauling it received on the first of August. Additional attacks against Ploesti had been planned but were scrapped soon after the cost of the mission became clear. According to Brereton, "ACM (Air Chief Marshall) Tedder advised me that he had recommended that further attacks on Ploesti be postponed in favor of direct support to the coming missions in Italy."<sup>191</sup> Pressure was not maintained and the limited accomplishments of the August raid were nullified.

The OSS was not alone in their dim analysis of the 1943 raid. Lt. Col. Forster, in the first interpretive report of the mission photographs, looked to the bombs used as the reason for the lack of serious and long-lasting damage. "The evidence indicates that the aircraft bombed the targets accurately but many of the bombs do not appear to have exploded, for this reason the damage is not as great as might have been expected."<sup>192</sup> Problems with the bombs themselves would become a serious issue and, according to a USSBS postwar analysis, reached epidemic proportions. "One in every six bombers sent on these attacks might just as effectively loaded its bomb bays with scrap iron. Missions were wasted and lives of airmen lost flying junk to Germany."<sup>193</sup> Forster also addressed the issue of bomb weight. "As a general indication it is suggested that neither 500-lb nor 1,000-lb (bombs) falling outside the protective blast walls are certain to cause vital damage, although they may cause very serious secondary damage."<sup>194</sup> It is almost as if Lambright never wrote his report. Since pinpoint accuracy was not possible, even at low-

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<sup>191</sup> Brereton, 206.

<sup>192</sup> Lt. Col. W.L Forster, "Roumanian Oil Targets: Appraisal of Attack by Ninth U.S.A.A.F. on 1<sup>st</sup> August 1943." August 13, 1943. (142.042-21, in the USAF collection, AFHRA), 1.

<sup>193</sup> USSBS Oil Division Report, 129.

<sup>194</sup> Forster, 10.

level, larger bombs would have to be used. It is amazing that throughout the subsequent 1944 attacks against Ploesti no bombs larger than 1,000 pounds were ever used by the USAAF. Regardless of these points Forster still asserts that the mission was a success “in view of the great distance covered and the difficulties encountered.”<sup>195</sup> As with German flak defenses the definition of success was vital and in this case it became flexible based on results; the definition changed in the minds of many to the mere fact that the mission had taken place at all. In the end it is results that are important and the 1943 low-level raid did not achieve its desired effect, hence it cannot be considered successful. “It is therefore concluded that there will be no ultimate loss of products except such stocks as were actually destroyed during the raid.”<sup>196</sup>

What did the Germans think of this daring low-level raid? Did they feel it was successful? According to a Luftwaffe report, “a repetition of this type of attack should by no means be expected, as the B-24 proved insufficient in a flak protected area and the light flak proved to be considerably more effective than was expected.”<sup>197</sup> The Germans clearly recognized the toll their defenses had taken on the presumptuous attackers, and the inability to repeat the attack was taken as a defensive victory.

The British proposed an attack on Ploesti to maintain pressure on oil production. In a telegram dated November 1, 1943, they brought up the possibility of contributing to the attacks on Ploesti in their own unique way:

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<sup>195</sup> Ibid, 1.

<sup>196</sup> AC/AS A-2, “Damage Report to Assistant Chief of Air Staff, Intelligence on Ploesti Oil Refineries.” September 6, 1943. (533.424-1, in the USAF collection, AFHRA), 4.

<sup>197</sup> “Report on the attack of the 9th USAAF on the Ploesti and Campina region on 1/8/43, as secured from P/Ws and documents. OBERURSEL, 8/9/43. Translated September 20, 1944. (670.424-1, in the USAF collection, AFHRA), 1.

As you may not be able to make further heavy day attack on Ploesti in immediate future consider that an attack by Wellingtons on Ploesti town might have beneficial effect. Refinery workers who live in badly built and flimsy houses in that town would thus be exposed to temperatures of the order of minus twenty degrees centigrade with obvious results on their work. A few blockbusters might therefore achieve a very substantial effect and keep the pot boiling until you are in a position to do a day raid on refineries.<sup>198</sup>

Though this offer was not accepted by the USAAF, it is comforting to know that the British were willing to “do their part” during this phase of the Ploesti campaign.

With the amount of excess capacity and an obvious inability to achieve the much necessary element of surprise, why was such an attack launched? There is the very real issue of momentum to consider. Just shy of 80,000 aircraft were produced and approximately 2,400,000 personnel trained for the Army Air Force to achieve its objectives during the course of World War Two.<sup>199</sup> Such a force required that some action be taken to justify its creation, political leaders and the public expected as much. This concept was perfectly expressed by General Anderson after the war when he was asked to describe the reasoning behind August 1<sup>st</sup>, 1943:

There wasn't any. No Sir. It was all: we've got a program, we've got to run it; we've got a force, we've got to use it. The same reason why we did our airborne operation in Orne: we've got some airborne forces, goddam it; we've got to use them, to justify the building of them.<sup>200</sup>

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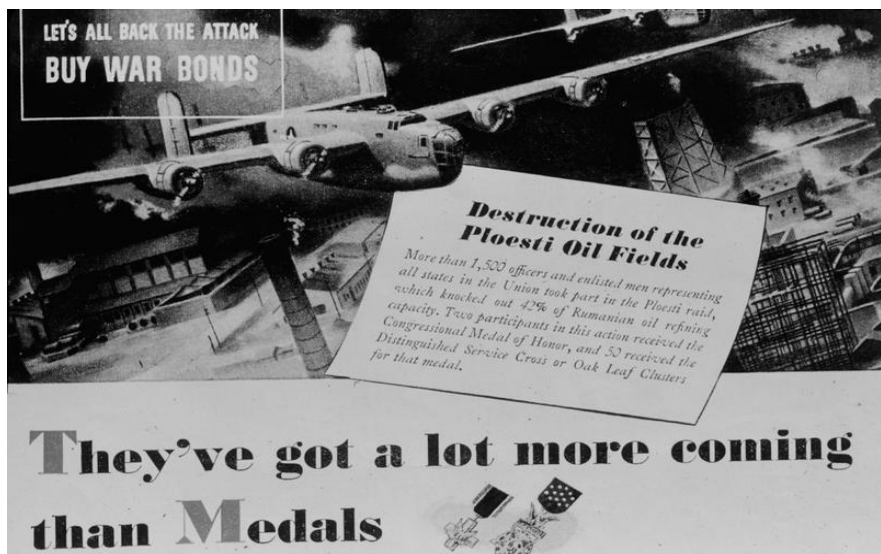
<sup>198</sup> Telegram from MAAF Advanced to Med. Strategical AF, (622.424-6, in the USAF collection, AFHRA).

<sup>199</sup> Clodfetter, 99.

<sup>200</sup> Oral History Interview of Gen. O.A. Anderson by Dr. Donald Shaughnessy, October 27, 1959. Typed Transcript, p. 105-106, K239.0512-898 C.1 IRIS No. 01016301, in USAF Collection, AFHRA.

General Anderson also disapproved of any mission against Ploesti taking place after the summer of 1942, claiming that once the German advance into Russia had been halted Ploesti lost much of its strategic importance.<sup>201</sup> This need to use the tools that have been developed, regardless of whether or not they fit the role demanded of them, would not be limited to World War II; it continued throughout the second half of the twentieth century and into the present. B-52s over Vietnam are a prime example, as are unarmored Humvees patrolling the streets of Baghdad.

Though the 1943 raid on Ploesti did not achieve its stated goals, it was incredibly useful as a propaganda tool. The USAAF skillfully diverted attention from the strategic and tactical failures of this venture and instead focused the public light on the courage and valor of American air crews. Like Custer's Last Stand and the British retreat at Dunkirk, manipulation of public perception turned a grim situation into one of benefit.



<sup>201</sup> Ibid., 104 (Anderson was intimately involved with the HALPRO mission and was Secretary of the Air Corps Board, Planning and Logistics.)

<sup>202</sup> Using the raid to sell war bonds. <http://history.sandiego.edu/cdr2/WW2Pics4/58582.jpg>



Unlike the HALPRO mission, the raid made the next day's headline in the *New York Times* and was praised as an action that "may materially affect the course of the war."<sup>203</sup> Though claiming that Ploesti produced "90 per cent of the German Air Force's gasoline", which was demonstrably false, the *New York Times* correctly stated the number of aircraft involved and the fact that they were all B-24s. The paper took a much more analytical tone on August 3<sup>rd</sup>, recognizing that the complete destruction of Ploesti would not force Germany out of the war but would limit her abilities on the Eastern Front.<sup>204</sup>

As we have seen, the first two visits to Ploesti by the USAAF were fundamentally different from the doctrine developed at ACTS. Almost a year had passed between the two, negating the concept of repeated attacks to maintain pressure upon the target. The HALPRO raid was flown at mid-altitude with an incredibly small force that attacked targets randomly. The famous raid of 1943 was extraordinarily micromanaged, but the realities of warfare and the element of chance negated this preponderance of planning. The disregarding of one doctrinal pillar (high-altitude bombardment) resulted in the adoption of a false assumption, that low-altitude would provide surprise. While the 1944 operations against Ploesti would more closely resemble the doctrine taught at the Air Corp Tactical School, air planners were not yet finished experimenting with ways to address both the inability of their equipment to live up to their expectations and the impressive defenses amassed around this Romanian town.

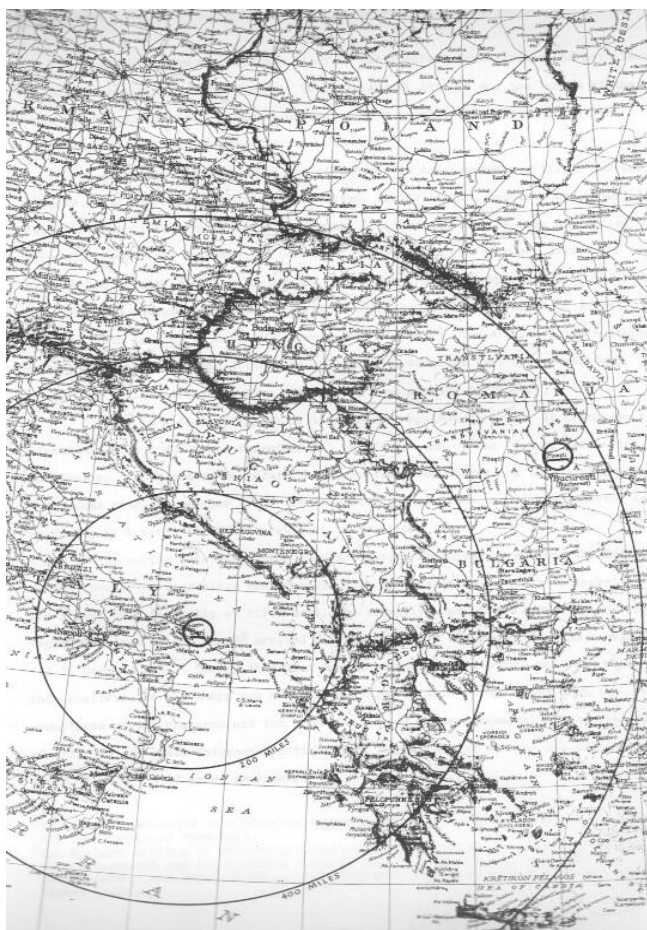
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<sup>203</sup> *The New York Times*, 8/2/1943.

<sup>204</sup> *The New York Times*, 8/3/1943.

## Chapter 5: Trying to Force Doctrine into Reality

Though the planned follow-up missions after August 1, 1943 did not occur, the obsession with Ploesti remained with USAAF leaders. Spaatz was still focused on the



destruction of Germany's oil supply and America's return to Ploesti was not a question of if but of when.<sup>205</sup>

With the capture of Southern Italy the Allies occupied a base of operations that allowed for penetrations into Southern Germany, the Balkans and Eastern Europe. The area around Foggia, Italy was turned into a giant air base and became the operational center of the Fifteenth Air Force which had been activated<sup>206</sup> on November 11, 1943 under

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<sup>205</sup> Richard G. Davis discusses at length the origins of Gen. Spaatz's fascination with oil. At first it was grabbed on to merely as a viable alternative to Tedder's transportation plan which would have required close tactical coordination with ground troops and a subsequent loss in strategic independence. Over a short period of time Spaatz came to be convinced of the profound *military* ramifications of an oil campaign. He saw it as the single most effective means to both force the Luftwaffe to fight and ultimately ground it while also denying German mechanized forces their freedom of movement. (Richard G Davis, *Carl A. Spaatz and the Air War in Europe* (Washington D.C.: Center for Air Force History, 1993), 345-348.)

<sup>206</sup> AAF Evaluation Board Report, "Ploesti". Mediterranean Theater of Operations, December 15, 1944 (138.5-12 in the USAF collection, AFHRA).

General Doolittle. When Doolittle was transferred to the Eighth Air Force, General Nathan F. Twining was put in command of the Fifteenth. By June 15, 1944 the Fifteenth Air Force was comprised of five bomb wings, the 5<sup>th</sup>, 47<sup>th</sup>, 49<sup>th</sup>, 55<sup>th</sup> and the 304<sup>th</sup>, divided into 21 bomb groups. This massive bombing force was protected by the 306<sup>th</sup> Fighter Wing which utilized Lockheed P-38s, North American P-51s, and Republic P-47s.<sup>207</sup>

The question once again became how to effectively use this force. Spaatz and other oil enthusiasts did not find a champion within the Committee of Operations Analysts. In a report reexamining the crude oil situation, the COA determined that, “in its judgment, although the events of the past year have increased the target importance of crude oil refineries, they should not be given a higher target priority.”<sup>208</sup> This recommendation was due to the belief that it would require six months for the Germans to use their current stocks, only then would the attacks have an effect upon enemy actions in the field. Even then, the paralyzing effect of an increased attack on oil was by no means certain in the eyes of the members of the COA. It was estimated that production could only be cut by 2,750,000 tons through an oil offensive, and that “a reduction of this order would mean curtailment and not collapse.”<sup>209</sup> Oil’s importance as a target whose destruction would end the war was by no means certain nor agreed upon,

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<sup>207</sup> Craven and Cate vol. 3, 398. The 5<sup>th</sup> Wing was made up of the 2<sup>nd</sup>, 97<sup>th</sup>, 99<sup>th</sup>, 301<sup>st</sup>, 463<sup>rd</sup>, and 483<sup>rd</sup> Bomb Groups (B-17), the 47<sup>th</sup> Wing by the 98<sup>th</sup>, 376<sup>th</sup>, 449<sup>th</sup> and 450<sup>th</sup> (B-24), the 49<sup>th</sup> Wing included the 451<sup>st</sup>, 461<sup>st</sup>, and 484<sup>th</sup> (B-24), the 55 Wing was comprised of the 460<sup>th</sup>, 464<sup>th</sup>, 465<sup>th</sup>, and 485<sup>th</sup> (B-24), and the 304<sup>th</sup> encompassed the 454<sup>th</sup>, 455<sup>th</sup>, 456<sup>th</sup> and 459<sup>th</sup> (B-24) Bomb Groups.

<sup>208</sup> Committee of Operations Analysts, “Memorandum for the Assistant Chief of Air Staff, Plans: Report on German Aviation Gasoline Position.” January 18, 1944. (118.04Q-7, in the USAF collection, AFHRA), 1.

<sup>209</sup> Committee of Operations Analysts, “Memorandum for the Assistant Chief of Air Staff, Plans: Requested Comment on JIC 106/2.” January 12, 1944. (118.04Q-7, in the USAF collection, AFHRA), 2.

but it continued to be a quixotic vision to those that wished to bring into reality the doctrine developed during the interwar years. The struggle over bombing priorities among Allied leaders continued throughout the spring of 1944. With the planned invasion of Europe on the table Eisenhower tended to side with Tedder over the immediate use of airpower and transportation targets were given top priority.<sup>210</sup>

### Blurring the Lines

A mission-by-mission breakdown of the 21 attacks that made up the 1944 campaign against Ploesti (18 by the USAAF, 3 by the RAF) is neither necessary nor desired for our purposes, but there are some aspects of these missions that require further discussion.<sup>211</sup> On April 5, 1944, as part of the new campaign against transportation, the Fifteenth Air Force sent a force to Ploesti to attack the large marshalling yards south of the city. There appears to be some subterfuge on behalf of the USAAF to circumvent the British-backed transportation priority and the nearby refineries were intentionally hit along with the rail yards.<sup>212</sup> An addendum to the 376<sup>th</sup> Bomb Group's strike report for this date also makes mention that "several clusters (of bombs were) far over and to left in

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<sup>210</sup> In many ways the missions supporting the Normandy invasion can be argued to be the most successful USAAF operations of the war. Not one German aircraft was seen in the sky during the Normandy landings, and the campaign against transportation greatly reduced Germany's ability to move reinforcements of men and material to the area. It is ironic that an interdiction campaign, and not a strategic one, would have such a direct and profound effect upon the conclusion of the war. As this did not fit into the USAAF's propaganda or the political postwar desires of air planners it has a tendency to be downplayed and overshadowed.

<sup>211</sup> For a wonderfully detailed account of the 1944 campaign against Ploesti please see Jay Stout, *Fortress Ploesti*.

<sup>212</sup> Both Stout and Wolff see the April attacks against Ploesti as really oil attacks disguised as a transportation campaign. (Stout, 103 Wolff, 209-210)

city area.”<sup>213</sup> The 301<sup>st</sup> Bomb Group report discusses a similar instance, with the city area taking hits due to the bombs falling short and to the left of the target.<sup>214</sup> What is important about these occurrences is that, though there was fierce fighter and flak cover, there was no report of a smoke screen in operation during this raid. What would the toll be upon the city as the smoke screen became a vital component in the defense of the refineries? 444.5 tons worth of 500 lb general purpose bombs and 144.2 tons of incendiaries were dropped by 95 B-17s and 136 B-24s on this first raid by the Fifteenth Air Force.<sup>215</sup> The USAAF would rarely use incendiaries at Ploesti and the general purpose bomb, in the 500 lb and 1,000 lb varieties, became the standard package. Air planners had learned at least one lesson from August 1943 and no heavy bomber attack against Ploesti during 1944 would be below 19,000 feet.

The two return trips in April, on the 15<sup>th</sup> and the 24<sup>th</sup>, would continue to officially target the marshalling yards, but the bombing ‘accidentally’ struck oil targets as well. In this case the inability to achieve true precision appears to have benefited Spaatz and like-minded USAAF leaders. The Intelligence Operations (INTOPS) report for April 24<sup>th</sup> brings to the surface some interesting questions. It states that there were three primary targets that day, the south, east, and north marshalling yards. Due to ‘smoke’ over the east and north marshalling yards the 70 aircraft of the 449<sup>th</sup> and 450<sup>th</sup> Bomb Groups assigned to the east and the 39 from the 376<sup>th</sup> that were to attack the north all assisted the

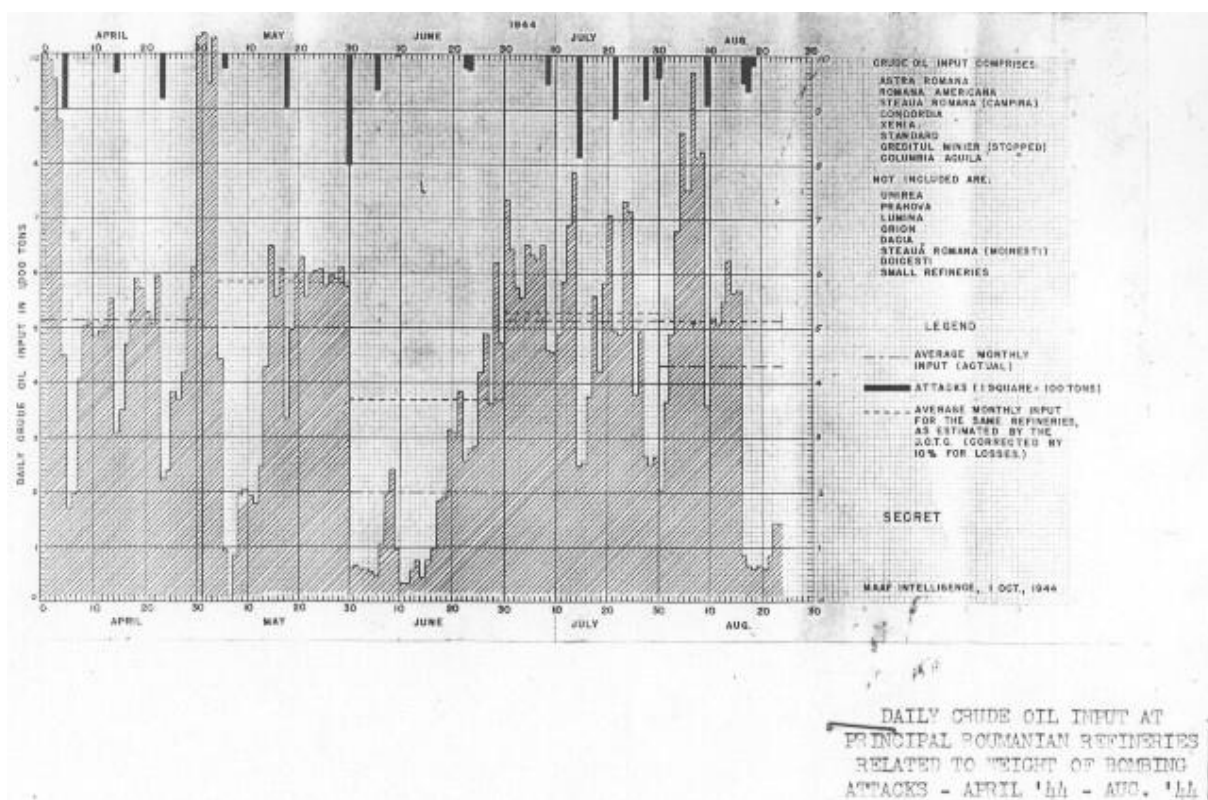
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<sup>213</sup> Fifteenth Air Force, 376<sup>th</sup> Bomb Group Strike Report. April 5, 1944. (670.3652 , in the USAF collection, AFHRA).

<sup>214</sup> Fifteenth Air Force, 301st Bomb Group Strike Report. April 5, 1944. (670.3652, in the USAF collection, AFHRA).

<sup>215</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 258”. April 5, 1944. (628.3071 April 1944, in the USAF collection, AFHRA), 1.

204 aircraft attacking the south marshalling yard. Due to the inherent nature of strategic bombardment at the time the bomb strings ‘accidentally’ entered the Astra Romana refinery.<sup>216</sup> After reading this report one cannot help but get the impression that this mission was in reality an attack upon Astra Romana. As the following table illustrates, these ‘transportation’ attacks in April somehow succeeded in cutting into oil production, but the damage was by no means permanent.



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<sup>216</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 277”. April 24, 1944. (628.3071 April 1944, in the USAF collection, AFHRA), 2-3.

<sup>217</sup> MASAF Intelligence Section, “Preliminary Statistics on Results of Attacks Against Roumanian Oil Refineries by Ninth and Fifteenth Air Forces.” October 14, 1944. (622.424-5, in the USAF collection, AFHRA), 4. This table is of immense value in understanding not only the effects of the 1944 attacks on production but also the unbelievable ability of Ploesti to both withstand and come back from them.

On May 5<sup>th</sup> the Fifteenth launched a total of 523 aircraft to officially attack the Ploesti marshalling yards and pumping station, 93% of which (486) would drop their bombs (somewhat) over the target.<sup>218</sup> This was Leroy Newby's first mission to Ploesti with the 460<sup>th</sup> Bomb Group as the bombardier aboard the *Hanger Queen*. He claims their target was not the marshalling yards as listed in the INTOPS Report but rather Xenia refinery, where they were to attack the "tank farms and nearby distillation unit."<sup>219</sup> The flak was listed as "very intense, accurate, heavy."<sup>220</sup> This would become a familiar phrase in the INTOPS reports to come. Not much had changed since the time of *AWPD/I* as far as the bomber crew's defense against flak was concerned. "Our instructions were very clear. Fly into and through the box of flak."<sup>221</sup> The defenses of Ploesti were so great and the suggested responses to them so blatantly ridiculous that seven aircraft were lost to flak and 132 of the 486 aircraft over the target were hit by it, a whopping 21 percent of the total.<sup>222</sup> Once again, 500 lb bombs were used. All following missions list refineries as primary targets due to a compromise between the transportation and oil factions. In fact, on June 8, 1944 Spaatz was secure enough in his position to issue an order to all air forces in theater "that their primary strategic aim henceforth would be to deny oil to the enemy's armed forces."<sup>223</sup>

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<sup>218</sup> Mediterranean Allied Strategic Air Force (MASAF), "INTOPS Summary No. 288". May 5, 1944. (628.3071 May 1944, in the USAF collection, AFHRA), 1.

<sup>219</sup> Newby, Leroy W. *Target Ploesti: View from a Bombsight*. (Novato, CA: Presidio, 1983), 50.

<sup>220</sup> Mediterranean Allied Strategic Air Force (MASAF), "INTOPS Summary No. 288". May 5, 1944. (628.3071 May 1944, in the USAF collection, AFHRA), 2.

<sup>221</sup> Newby, 60.

<sup>222</sup> Mediterranean Allied Strategic Air Force (MASAF), "INTOPS Summary No. 288". May 5, 1944. (628.3071 May 1944, in the USAF collection, AFHRA), 2.

<sup>223</sup> Craven and Cate vol. 3, 281. (underlined by the author for emphasis).

This order may have marked the official change, but there is telling evidence that an active concealment took place up to this point in the skies over Ploesti. According to the May 5<sup>th</sup> INTOPS report, the 304<sup>th</sup> Bomb Wing was to attack the north marshalling yards. As the following photograph indicates, they dropped their load to the south of the marshalling yards, in the northeastern section of the town.



While this in itself is cause for concern, what is even more so is the fact that the Concordia Vega refinery is used as the aiming point to judge the accuracy of the mission.

<sup>224</sup> Bomb Plot Photo, 301<sup>st</sup> Bomb Wing. May 1944 (670.3652, in the USAF collection, AFHRA) Note the clear distinction between the refineries and the population center.



If the crews were to be held to this aiming point as the standard that would determine whether their mission was successful then they had to have been told so. If this is the case then the INTOPS report writer was either grossly misinformed or there was something very wrong.

There is also a discrepancy between the MASAF (Mediterranean Allied Strategic Air Force) INTOPS report from the May 31 raid and the reports of the 376<sup>th</sup> and 449<sup>th</sup> Bomb Groups. According to the theater-level report, the two groups, both elements of the 47<sup>th</sup> Bomb Wing, had the Romana Americana refinery as their primary target.<sup>225</sup> Both of the group-level reports list the city itself as their target, with the 449<sup>th</sup> even listing its aiming point as the “center of city.”<sup>226</sup> Whether this was the briefed target or the point where the bombs were released due to smoke cover and enemy opposition is unclear. Newby discusses at length the effect of smoke cover on this particular mission.<sup>227</sup> “I couldn’t see the target, let alone the aiming point. It was a helpless feeling to relocate my hairs on a nebulous section of white nothing, hoping my target would somehow be at that spot.”<sup>228</sup> Someone must have hit something because as shown by the MASAF Intelligence Section’s statistical data on page 85, the May 31 raid had a profound impact upon production at Ploesti.

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<sup>225</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 314”. May 31, 1944. (628.3071 May 1944, in the USAF collection, AFHRA), 1-2. The report also states that 13 aircraft from the 376<sup>th</sup> bombed their secondary target (the marshalling yard at Turnu Severin) due to difficulty in finding their primary target.

<sup>226</sup> Fifteenth Air Force, 449th Bomb Group Strike Report. May 31, 1944. (670.3652, in the USAF collection, AFHRA).

<sup>227</sup> The defenders at Ploesti had a forty minute advanced warning before each attack, which was more than enough time to activate the multitude of smoke pots that would cause the Fifteenth Air Force such difficulty. (Craven and Cate vol. 3, 282-283).

<sup>228</sup> Newby, 105. The bombardier being able to actually see the target made a huge difference and the smoke cover at Concordia Vega proved effective against the 460<sup>th</sup> on May 31, resulting in only three confirmed hits on the storage tank area and nearby marshalling yards. (INTOPS Summary 314, May 31, page 3).

## The Struggle against the Defenses

June was the month of the smoke screen. The effectiveness of this passive defense once again depends on one's definition of success, but if frustrating the efforts of the American bomb crews is to be the standard then it was highly successful. Trying to bomb visually on June 6 must have been a nightmare, flying through flak to drop bombs into a sea of fluff. It is hard to justify putting one's life on the line if you are unable to evaluate the outcome. The day's INTOPS Summary results section is riddled with variations of the phrase "heavily obscured by smoke pots making bomb strike assessment impossible."<sup>229</sup>

Col. Barr, deputy Air Chief of Staff, A-2, in a memorandum to the Chief of Staff, recommended two ways to overcome the highly effective smoke screen at Ploesti. The first was to utilize dive bombing, and the second was the use of P.F.F. (PathFinder Force, or radar-assisted 'H2X' bombing).<sup>230</sup> On June 10 seventy-five Lockheed P-38 'Lightnings' were launched against Ploesti, thirty-six carrying a single 1,000 lb bomb to be used in a dive-bombing attack on Romana Americana with the rest providing fighter escort. Even more so than the attack of August 1, 1943, this went completely contrary to accepted doctrine and is in effect an admission that it was not working against such a heavily defended target as Ploesti. A total of twenty-three P-38s were lost, almost 31% of the force.<sup>231</sup> The next attack on June 24 against Romana Americana by B-24s would

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<sup>229</sup> Mediterranean Allied Strategic Air Force (MASAF), "INTOPS Summary No. 314". June 6, 1944. (628.3071 June 1944, in the USAF collection, AFHRA), 1-2.

<sup>230</sup> Col. P.M. Barr, "Smoke Defenses of Ploesti." June 9, 1944. (670.424-1, in the USAF collection, AFHRA).

<sup>231</sup> Craven and Cate vol. 3, 283. There is some confusion about this raid in the secondary literature. Dugan and Stewart have the attack occurring on June 24 with a loss of twenty-six aircraft (Dugan and Stewart, 270), Stout lists the losses at twenty-five on June 10, 1944 (Stout, 167).

again be thwarted by a highly effective smoke screen resulting in an almost wasted mission. “Post raid recon shows heavy concentrations of strike on all sides of the refinery, but only a few scattered hits inside the plant causing only negligible damage.”<sup>232</sup>

High-altitude heavy bomber attacks continued throughout July and August as the Fifteenth struggled to overcome the defenses of Ploesti. The attack of July 9<sup>th</sup> utilized every means available at the time in an attempt to put the bombs on target. Against Xenia the 2<sup>nd</sup> and the 463<sup>rd</sup> Bomb Groups were able to bomb visually but the 97<sup>th</sup>, 99<sup>th</sup> and 483<sup>rd</sup> had to resort to PFF assistance “due to the smoke screen over the target.”<sup>233</sup> It is interesting to note that in a raid lasting nine minutes that 40% of the attacking force could see the target and utilize the more effective method of visual bombing. The attack on Concordia Vega by the 98<sup>th</sup>, 376<sup>th</sup>, 449<sup>th</sup> and 450<sup>th</sup> Bomb Groups was executed utilizing a mixture of visual bombing, offset, PFF and synchronous methods.<sup>234</sup> The results were unknown due to the mission photos being concealed by smoke. Almost the entire attack of July 15 was executed with PFF methods.<sup>235</sup> Though radar-assistance had been used against Ploesti to some extent since the beginning of the Fifteenth’s operations, its use would increase throughout the summer of 1944. As illustrated by the table on page 85 the effectiveness of the bombing missions decreased substantially over those that relied more upon visual methods during the spring. “The accuracy obtained with H2X through 10/10

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<sup>232</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 338”. June 24, 1944. (628.3071 June 1944, in the USAF collection, AFHRA), 2.

<sup>233</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 353”. July 9, 1944. (628.3071 July 1944, in the USAF collection, AFHRA), 1.

<sup>234</sup> *Ibid.*, 2.

<sup>235</sup> Mediterranean Allied Strategic Air Force (MASAF), “INTOPS Summary No. 338”. July 15, 1944. (628.3071 July 1944, in the USAF collection, AFHRA), 1-2. The targets consisted of Creditul Minier, Standard, Dacia, and Romano Americana, the last being targeted with a mixture of visual, synchronous and PFF.

clouds is .02 per cent of the bombs within 1,000 feet of the aiming point as compared with 30 per cent dropped under visual conditions.”<sup>236</sup> How could precision targets, protected from all but direct hits, be effectively attacked under these circumstances?

Such methods inevitably resulted in bombs hitting places other than their desired industrial targets. Dugan and Stewart discuss the negative view that the Romanian people had for the “Italians”, those bombing from Italy in 1944, due to the inaccuracy of their methods and the casualties that resulted.<sup>237</sup> To counter this public perception the Allies launched a parallel ‘bombing’ mission which showered the Romanians with leaflets referred to as nickels. These placed the blame for the destruction squarely on the German smoke screen and called on the Romanians to do everything within their power to destroy and sabotage the generators.<sup>238</sup> This assumes that if it were not for this passive defense system only industrial and military targets would be on the receiving end of the bombs.

The amazing thing about the smoke screen is that there were ways to counteract it but the American propensity to cling to regimented, predictable order greatly assisted the defenders. The post-campaign interrogation of Colonel Rudieanu, a Romanian officer who assisted in overseeing flak defenses at Ploesti, by Lt. R.H. Dorr bears this out. The smoke was of limited duration, having only about a three hour window of effectiveness. “If American planes had attacked in waves over a period of 5 hours, it would, according

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<sup>236</sup> United States Strategic Bombing Survey. *Bombing Accuracy, USAAF Heavy and Medium Bombers in the ETO*. (Washington, D.C.: U.S. GPO, 1947), 13.

<sup>237</sup> Dugan and Stewart, 269.

<sup>238</sup> <http://natureonline.com/37/16-op6.html> accessed 1/5/2009. Please refer to Appendix 1.

to Colonel Rudieanu, have been impossible to replace the used smoke barrels fast enough to maintain the screen; and the last groups would have been able to see the target.”<sup>239</sup>

Not only was the smoke screen a defensive measure that could have been overcome by adjusting procedure, but the effectiveness of flak defenses could have been reduced as well. Appendix Two contains a diagram of the flak defenses over Ploesti and provides an idea of the interlocking hail of shrapnel that would greet the approaching bombers. Attacks from the northeast, southeast, and southwest were under continuous fire for around three minutes, while attacks made from the northwest were “held under fire for over four minutes.”<sup>240</sup> With 256 anti-aircraft guns of 88-mm size or larger beginning their defensive fire at 12,000 yards out Ploesti was a formidable and dangerous target.<sup>241</sup> Multiple approaches during a small time period at various altitudes could have divided the defenses, diluting their effectiveness.

Returning over and over again to such a heavily defended area took its toll on the bomb crews. When writing about the August 17<sup>th</sup> raid, Captain Jack Preble of the 376<sup>th</sup> Bomb Group described the mission as “another tiresome and dangerous Ploesti raid.”<sup>242</sup> Again, one cannot help but think of the plight of Yossarian in Joseph Heller’s novel. Newby makes mention of the insanity of it all when he discusses the route to Belgrade. They were told to fly on a straight path to the target, even though that took them over four flak guns at Mostar which never failed to shoot at them. When this fact was brought

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<sup>239</sup> Lt. R.H. Dorr, “Notes on Enemy Flak Defenses Ploesti Area.” September 11, 1944. (670.424-1, in the USAF collection, AFHRA), 2.

<sup>240</sup> Flak Intelligence from Ploesti: Preliminary Report by AC/AS, Intelligence.” December 2, 1944. (670.424-,1 in the USAF collection, AFHRA), 2.

<sup>241</sup> Ibid., 2.

<sup>242</sup> Capt. Jack Preble, “Written in the Sand: A Personalized History of the 376<sup>th</sup> Bombardment Group.” December 1942-April 1945. (GP-376-HI (Bomb), in the USAF collection, AFHRA), 268.

to the attention of their commanders they were told they had to continue taking this route to conserve fuel.<sup>243</sup> Aviation fuel was apparently more important than lives to the United States though it possessed the resource in abundance.

### And the Credit Goes to...

The three days of August 17, 18, and 19 would be the last that the Fifteenth would see of Ploesti. 1,320.5 tons of 500 lb. bombs were dropped over these three days through a still highly effective smoke screen by a mixture of visual, offset and synchronous PFF.<sup>244</sup> The historical literature either alludes to or simply comes out and claims that it was the bombing by the Allies that shut down production at Ploesti, but is this truly the case?<sup>245</sup> If we refer back to the table on page 85 we see a cycle of bombing and repair, and in fact this cycle begins anew after the raid of August 19<sup>th</sup>. There was something else vastly more important taking place in August 1944 than just another series of USAAF raids. This was the advancing Red Army, which entered Ploesti on August 30<sup>th</sup>. Would it make any sense for the Germans to repair the refineries only to leave a functioning Ploesti for the Soviets? While the three day attack dropped a massive amount of tonnage upon Ploesti there was nothing different in the methods or bombs used from previous missions during the summer. It seems rather too coincidental and convenient that the

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<sup>243</sup> Newby, 36.

<sup>244</sup> Mediterranean Allied Strategic Air Force (MASAF), "INTOPS Summary No. 392, 393, 394". August 17, 18, 19, 1944. (628.3071 August 1944, in the USAF collection, AFHRA). There was also a night raid by the RAF on August 18<sup>th</sup> that dropped 86 tons of bombs ranging from 4,000 lbs to 250 lbs.

<sup>245</sup> Stout concludes that "Ploesti was dead" after the August 19<sup>th</sup> raid (Stout, 226), Craven and Cate say that by August the destruction of Ploesti, "in terms of productive capacity, was virtually complete" (Craven and Cate vol. 4, 298), while both Dugan and Stewart and Wolff recognize that the attacks were successful in virtually eliminating production but only for a time.

Allies would get it right just before the Russian capture of the city, though this is the picture painted in the popular narrative.

## Evaluating the Campaign

The entire American campaign against the oil refineries of Ploesti Romania came at a rather high price. “At the end Gerstenberg’s bill was 286 U.S. heavy bombers and 2,829 men killed or captured.”<sup>246</sup> Was it worth the cost? Though Ploesti was not available for study by the United States Strategic Bombing Survey several of its reports are of value in answering this question and, more importantly, an OSS mission was allowed into Ploesti to conduct its own analysis immediately after its surrender to the Soviets.<sup>247</sup> It is from these sources that we can piece together an understanding of the Ploesti operation and use that conclusion to determine the overall effectiveness of prewar doctrine.

Captain W.A. Salant, a member of the R&A Intelligence group sent to Ploesti, wrote a rather interesting report. According to the information he found on site, the 1943 raid was the most successful when comparing bomb tonnage dropped to capacity denied the enemy. His overall conclusion of the 1944 campaign is striking due to the inclusion of a counterfactual to bolster the effort:

Although a heavy weight of attack was directed against Ploesti between April and August, refinery activity in July and August was just as high as it had been in April, May and June. This does not mean that, if Rumania had continued in the war, the same weight of attack would have been required to hold action down to the 40% level. The August attacks left Ploesti in a highly vulnerable position. All but one of the larger refineries were incapable of any substantial production for some weeks or months.

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<sup>246</sup> Dugan and Stewart, 277.

<sup>247</sup> Gen. Eaker visited Bucharest and Ploesti himself on September 14<sup>th</sup> and 15<sup>th</sup>.

The single exception, Astra Romana, accounted for considerably more than half of the potential production of the next month. One successful attack on it and Standard, comparable with the successful August raids on other installations, would have knocked production down to 15% of the base level for a substantial period.<sup>248</sup>

Repair estimates based on photographic analysis left much to be desired.<sup>249</sup>

Questionable conclusions in turn dictated the type, frequency, and targets of the missions flown. Repairs were made quickly due to the many refinery installations in such a close area which allowed for the moving around of parts to maintain production. In an interview with the Romanian Secretary General in charge of fuel, a Mr. Andonie, it was discovered that after a mere five days of continuous repairs in September 1944 production was expected to reach 2070 ton per day, 7420 after ten days, and 8570 tons after twenty days.<sup>250</sup> The USSBS Physical Damage Report would second this discrepancy, pointing out that building damage did not always equal a reduction in production.<sup>251</sup> Lieutenants Clark and Rutenberg, themselves photographic interpreters, were dispatched to Romania and toured seven refineries between September 23 and October 4. The recommendations based on their observations are very telling. They state that photo interpreters in the future should be provided the weight and fusing of bombs used as well as have a “good knowledge of bombs (size and fusing used for particular

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<sup>248</sup> Capt. W.A. Salant, “Bombardment of Ploesti oil Refineries: Intelligence Gathered in Bucharest and Ploesti.” September 26, 1944. (670.424-1 Jan-Aug 1944, in the USAF collection, AFHRA), 2. (Underlined by the author for emphasis.) Note that the refinery situation before the Russian occupation of Ploesti was “in a vulnerable position” and not destroyed, defeated, or inoperable.

<sup>249</sup> See Appendix 3 for a comparison of production estimates by two intelligence agencies with actual production.

<sup>250</sup> Interview of M. Andonie by W.A. Salant. September 2, 1944. (670.424-1 Jan-Aug 1944, in the USAF collection, AFHRA), 2. Work at Ploesti was halted on 8/23, and resumed 9/1.

<sup>251</sup> United States Strategic Bombing Survey. *Physical Damage Division Report*. (Washington, D.C.: U.S. GPO, 1947), 106. Yet the USSBS Oil Division Final Report found photographic interpretation to be “on the whole remarkably accurate.” (USSBS Oil Division Final Report, 132.)



installations; what a bomb of a given weight and fusing is expected to do; blast and shock effects; ect.).<sup>252</sup> One would expect that these would have already been a vital part of photo interpretation training, and the fact that their inclusion was being recommended in October 1944 is surprising.

As we have already seen there was much discussion pertaining to the use of large bombs to effectively damage the protected vital parts of the refineries, and after the fall of Ploesti we have more of the same. "Inspection of damage at Astra Romana suggests that bomb sizes and fusings have not been optimum."<sup>253</sup> Larger bombs were vital to achieve the desired results and yet no change in bomb type occurred throughout the entirety of the USAAF Ploesti campaign. Only during R.A.F. night raids were the recommended sizes used. Who was responsible for making these recommendations reality?

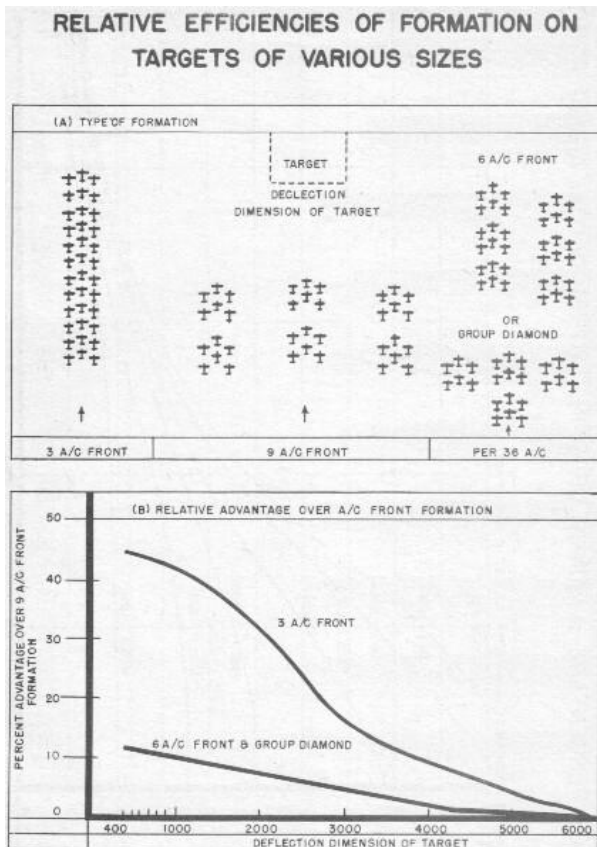
One reason for a lack of change in bomb size could be the American reliance on probability. If an aircraft can only hold one 4,000 lb bomb or eight 500 lb bombs, and you are basing your entire strategy on the chance that at least one bomb must hit something, than the 500 lb load is more conducive to achieving such a hit. Whether or not that hit actually results in enough damage to effect production is secondary. This belief finds its roots with interwar planners, who argued that any direct hit from a 500 lb or 1,000 lb bomb would destroy a target. Photo interpretation helped to reinforce this notion. Only after physical examination of the refineries could the truth be known. "An optimistic estimate is that 5 percent of the bombs which were dispatched to industrial

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<sup>252</sup> Inspection of Bomb Damage at Roumanian Oil Refineries by photographic interpretation Officers of 4<sup>th</sup> Photo Tech. Squadron." October 10, 1944. (622.424-6, in the USAF collection, AFHRA), 3.

<sup>253</sup> Lt. Russell Dorr, "Ploesti Raid Damage, Preliminary Note on Bomb Size and Fusing." September 2, 1944. (118.OAQ-13 1944, in the USAF collection, AFHRA), 1.

targets caused either structural or superficial damage.”<sup>254</sup> This could easily have been discovered if practice raids against refinery installations under something even remotely resembling wartime conditions had taken place within the United States at some period before actual operations. Bomb size and fusing explains the inability of hits and near-misses to produce the desired destruction, but this only helps to understand those few that actually made it close to their intended target. What of all those that did not?



Getting bombs to hit their targets was crucial and, as was discussed in chapter one, air planners between the wars believed they had solved this problem by dropping as many bombs as possible at the target hoping that one would result in its destruction. This led to the belief that the more bombers the better. The reality of wartime experience would tell a different story. “Two of the most important factors affecting accuracy<sup>255</sup> are altitude of attack and size of the

<sup>254</sup> United States Strategic Bombing Survey. *Physical Damage Division Report*. (Washington, D.C.: U.S. GPO, 1947), 7.

<sup>255</sup> United States Strategic Bombing Survey. *Bombing Accuracy, USAAF Heavy and Medium Bombers in the ETO*. (Washington, D.C.: U.S. GPO, 1947), Exhibit F.

attacking force.”<sup>256</sup> Altitude was necessary during daylight due to ground defenses, a large attacking force was required to achieve the required probability of hits, and massive formations were necessary for protection against German fighters. Unfortunately these formations had a negative effect on accuracy at the target.

The Bomb Groups attacking Ploesti not only had to deal with the difficulties of accuracy inherent in the system, but also those brought about by their target. “Of the 10 target complexes analyzed, the two which proved most difficult to bomb accurately were synthetic oil and oil refineries.”<sup>257</sup> While studying synthetic plants in Western Europe, the USSBS Oil Division found that only 12.9% of the bombs dropped fell within the fences of the plants, and only 3% of the total dropped hit any structures or equipment at all.<sup>258</sup> Visual bombing was more or less useless over Ploesti due to the smoke screen and reliance on PFF and offset did not increase accuracy. “During six attacks, 37 groups which used these methods dropped 11,988 bombs on their briefed targets whereas refinery records reveal only 40 bombs landed within the target areas. This is an accuracy of 3.66%.”<sup>259</sup> Since they had to return until the job was done to the satisfaction of their superiors, it is easy to see why the men flying these missions dreaded hearing that this Romanian town was their target that day.

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<sup>256</sup> Ibid., 5.

<sup>257</sup> Ibid., 1.

<sup>258</sup> USSBS Oil Division Final Report, 4.

<sup>259</sup> AAF Evaluation Board Report, “Ploesti”. Mediterranean Theater of Operations, December 15, 1944 (138.5-12 in the USAF collection, AFHRA), 12.

## Conclusion: A Matter of Perception?

There is much to be learned from the study of the Ploesti raids. The first and most important is that real-world situations will require flexibility and this is most easily acquired if some level of adaptability is built into the plan before operations begin. The concept developed must be fluid enough to be effective once it is outside of the laboratory that created it.<sup>260</sup> Though the practical application of any theory does have an element of chance that influences the outcome, there is much that can be done to limit the effects of the unknown. At Ploesti the USAAF grabbed on to a few novel ideas but did not properly and thoroughly evaluate its operating procedure. Though technology may develop rapidly, fresh ways of thinking take longer to materialize.

New targeting technologies were adopted due to the effectiveness of the German defenses, but the bureaucratic nature of the USAAF contributed to its difficulties over Ploesti. The flak defenses were static; it was beholden to the attackers to find ways to minimize their effectiveness. The main advantage of an aircraft is its freedom of movement. The inability of American planners to properly utilize this characteristic is a glaring fault that would continue in future operations, most notably in Vietnam. The following, listing the standard operating procedures which assisted the enemy based on interviews with the defenders, shows a lack of inventiveness that can also be found in conflicts throughout the latter half of the twentieth century:

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<sup>260</sup> This weakness in U.S. doctrine was perceived before the beginning of the Combined Bomber Offensive. Air Chief Marshall Arthur Harris, when presented with the American plan, made it clear to USAAF Gen. Ira Eaker that he “found the plan to some extent inflexible in view of what in practice were rapidly changing situations.” (*Germany and the Second World War*, vol. 7., 12.)

1. Altitudes of attack were from 6000 to 8000 metres.
2. Attacks so close to schedule defenders never worried before 10 o'clock in the morning or after 3 o'clock in the afternoon.
3. After passing the I.P. a long straight bomb run to targets were made with no feints, evasive action or deviation.
4. After first attacks in April it became evident that one of about five well defended ground areas were being used for the I.P.
5. A standardized approach and departure system which, after two or three raids, was completely predictable because it was unvaried.
6. Speed was within a few miles-per-hours of the average of first four attacks.
7. Attacks were made when weather conditions and clouds were favorable to our defenses and optical range finding.<sup>261</sup>

It is rather amazing that such creativity could be harnessed to facilitate doctrinal development before the war yet once operations commenced bureaucratic rigidity and predictability took its place.

Regardless of the effectiveness of the bombs used and the accuracy of the bombing, reductions in crude oil production at Ploesti were made. The ultimate question then must address whether the bombing campaign was a success. When held to the standard championed by those at ACTS and the developers of *AWPD/I* the answer must be no. It was believed that high-altitude bombing could destroy the enemy's ability to wage war and thus force them to sue for peace. This did not happen as a result of the bombing campaign against Ploesti, against oil, or even in the overall Combined Bomber Offensive. The oil campaign is seen by historians as the greatest strategic contribution made by the USAAF in World War Two. As we have seen, the fundamentals of the German economy were based upon coal and not oil. Therefore the major contribution of

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<sup>261</sup> Mediterranean Allied Tactical Air Force, Intelligence Section, "Anti-Aircraft Memorandum No. 6: Flak at Ploesti." March 4, 1945. (670.424-1, in the USAF collection, AFHRA), 2.

the oil campaign was the grounding to a halt of that small mechanized portion of the German military machine. This effect was most pronounced upon the Luftwaffe, which simply could not operate without aviation grade gasoline. “No one can doubt that the oil offensive was extremely effective in reducing the combat power of the Wehrmacht and especially the Luftwaffe. Nor can it be doubted that it exerted no influence on the operations of German industry.”<sup>262</sup> The greatest achievement of the USAAF during World War Two was completely separate from the vision which it had promoted. It is ironic that the main effect of the oil campaign was against the enemy air force; by strategic action the USAAF accomplished the same anti-air role it had originally been pigeonholed into which had resulted in its ‘rebellion’ and turn to strategic doctrine.

Curiously, the USAAF found a champion in General Eisenhower if they were willing to modify their definition of success. Being an Army man Eisenhower had a different opinion of the effective use of air power, he believed it “did not destroy – it damaged.”<sup>263</sup> He recognized a definite usefulness in the steady depletion and erosion of the enemy’s abilities through bombardment. He saw airpower as a means to sow confusion and cause difficulty in supply and production for the enemy, but it was the job of the ground forces to successfully and completely deny them resources. This view was the antithesis of an independent air force controlled by airmen, something so desperately desired by the leadership of the USAAF. A consensus on the definition of success is as important as the actual operation itself. We see this played out in Korea, Vietnam, and

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<sup>262</sup> Mierzejewski, 101. (Underlined by author for emphasis.)

<sup>263</sup> Eisenhower, 323.

Iraq. A definition of victory must be agreed upon by both the political and military leadership and the public at the earliest opportunity.

In reference to the American bombing campaign against the German economy, Albert Speer wrote, “The idea was correct, the execution defective.”<sup>264</sup> In this he was partially correct. Hopefully this study has demonstrated that, though based on solid theory, the doctrine developed prior to World War II was influenced by the projected reality in which it was developed; a bubble of intellectual reasoning, presumption, and assumption that turned out to be very different from the conditions faced in wartime. These preconceived notions resulted in fundamental misunderstandings by Allied war planners, and the expected results of bombing that many believed and preached caused a disconnect between decision makers and the reality on the ground. Due to bureaucratic rigidity and strict adherence to ideology, many of the lessons learned through combat operation over Ploesti were not promptly or effectively implemented. The results of such a divide between the perceived uses of new technology and its actual effects were waste, confusion, disappointment, prolonged suffering, and unnecessary deaths on both sides of the conflict. These aspects become clearly visible when one takes an overall view of the Ploesti campaign.

Driven by a desire to prove their beliefs correct, both to achieve victory and to insure an independent Air Force after the war, American air planners attempted to force their vision into being beyond the point required to admit reality. Due to a

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<sup>264</sup> Albert Speer. *Inside the Third Reich: memoirs, Translated from the German by Richard and Clara Winston. Introduction by Eugene Davidson.* (New York: Macmillan, 1970), 419.

misunderstanding of the fundamentals underlying their enemy they repeatedly attempted to achieve their goals while continuously compromising the doctrine they had so painfully developed, nurtured and protected. Ploesti is a prime example of the circular nature of bureaucratic systems. A bureaucracy will perpetuate the belief that established it, even past the point when it has been proven incorrect or invalid. As Freeman Dyson so eloquently stated, “The responsibility for criticizing and controlling military policies belongs to the political authorities of each country.”<sup>265</sup> In a representative government, it is beholden upon the voting populace to expect and demand constant vigilance from their representatives. Those in positions of power, along with the citizenry, must demand that ineffective ideas and practices be discarded for new ones based in reality.

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<sup>265</sup> Freeman Dyson, *Weapons of Hope*. (New York: Harper and Row, 1984), 8.



## Appendix 1



### ROMANIA IN FOG

As you have seen, the German fog cannot prevent the destruction of the oil refineries at Ploesti

**BUT**

ROMANIAN LIVES CAN STILL BE SAVED, IF YOU KNOW HOW TO IMPOSE AN END TO THIS KIND OF CAMOUFLAGE.

Also the fog of the German lies, made up specially to keep Romania at war, cannot prevent the United Nations smashing any resistance on Romanian land.

**BUT**

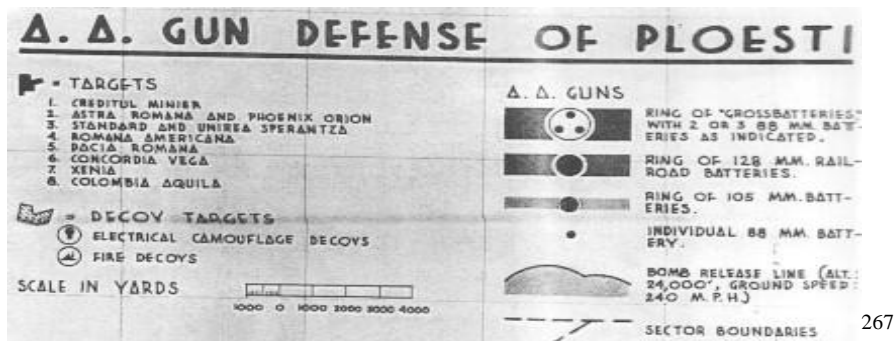
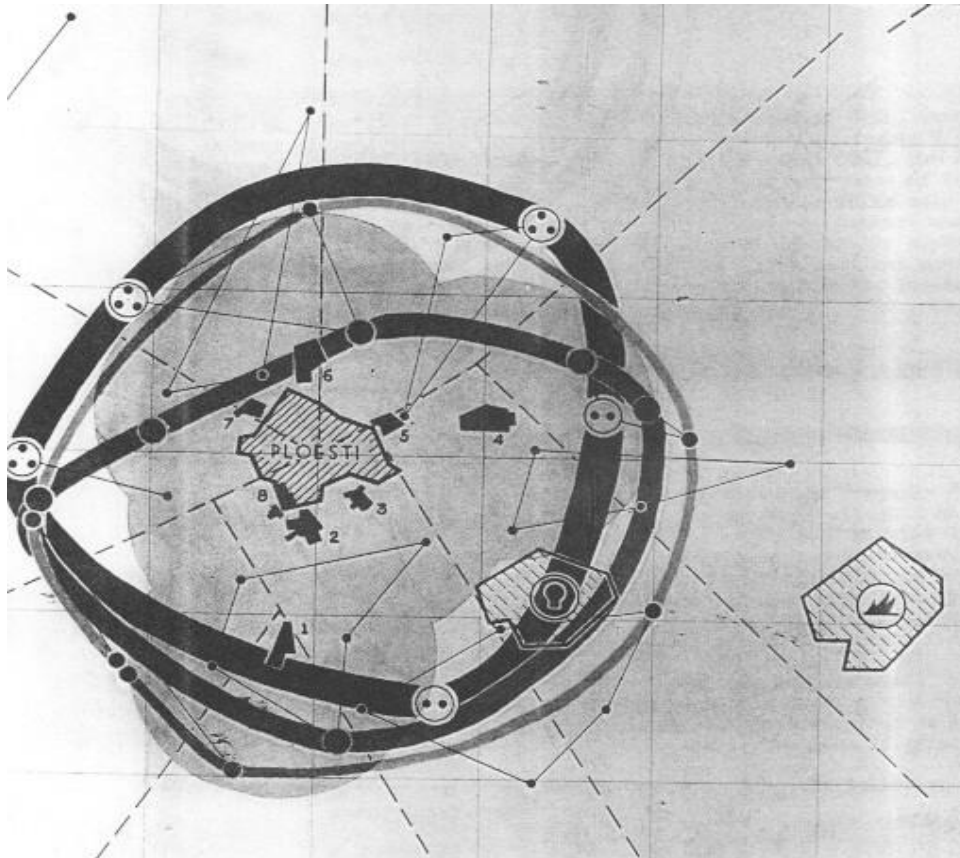
Hundreds of thousands of Romanian lives can still be saved, if you can impose the ending of the policy of sacrifice of Romania for Germany.

**THE FATE OF YOUR COUNTRY LIES IN YOUR HANDS. REMOVE THE GERMAN FOG.**

Dropped by the British Royal Air Force  
and the United States Army Air Force<sup>266</sup>

<sup>266</sup> An example of a 'nickel' dropped on the Ploesti area. Note tha it places the blame for the death of civilians and the destruction of their homes squarely upon the German smoke screen.  
<http://natureonline.com/37/16-op6.html>. Accessed 1/15/2009.

## Appendix 2



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<sup>267</sup> "Flak Intelligence from Ploesti: Preliminary Report by AC/AS, Intelligence." December 2, 1944. (670.424-1, in the USAF collection, AFHRA). Keep in mind that the guns would start firing when the attacking aircraft were still 12,000 yards out from their targets.

Appendix 3

Comparison between Estimates of Rumanian Production and Actual Production Obtained from Captured German and Rumanian Documents (in red)  
(Figures in Thousands of metric tons monthly)

	January	February	March	April	May	June	July	August
Astra Romana	A-2 JOTC Prod 138 146*	A-2 JOTC Prod 123 125*	A-2 JOTC Prod 133 146*	A-2 JOTC Prod 17 25	A-2 JOTC Prod 0 0	A-2 JOTC Prod 0 0	A-2 JOTC Prod 25 25	A-2 JOTC Prod 10 30
Steaua Romana	125*	29	30	28	25	0	0	0
Concordia Vega	121*	63	67	100*	50	23	25	22
Romana Americana	97½*	66	60	97½*	80	40	40	23
Phoenix Orion	61*	37	7	51	0	0	0	0
Creditul Miner	0	0	0	0	0	0	0	0
Columbia Aquila	0	0	0	0	0	0	0	4
Standard Petrol Block	40½*	33	34	9	7	5	10	20
Phoenix Unirea	37*	0	0	10	10	0	10	5
Xenia	24*	13	0	3	0	0	0	7
Dacia	10*	4	4	10*	5	12	0	10
Prahova	16½*	10	3	4	0	0	0	0
Others	10½	3	30	8	7½	7½	3½	4
Steam at Hoinesti	5*	4	2	5	5	5	5	5
TOTAL	694**	406	694**	173	150	211	162	184
		385	370	446**	150	141	189	143

\* Estimates were made for capacity not production  
\*\* To handle crude oil production of 430,000 tons monthly

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268 Comparison between Estimates of Rumanian Production and Actual production Obtained from Captured German and Rumanian Documents. October 25, 1944. (118.O4Q-13 1944, in the USAF collection, AFHRA).

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